

# **Implications of Marine Protected Areas on Social-Ecological Wellbeing in the Bay of Fundy, Canada**

by

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A thesis  
presented to the University of Waterloo  
in fulfillment of the  
thesis requirement for the degree of  
Master of Environmental Studies  
in  
Environment and Resource Studies

Waterloo, Ontario, Canada, 2018

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## **Author's Declaration**

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

## Abstract

Globally, marine protected areas (MPAs) are proliferating to meet Aichi Target 11 under the Convention on Biological Diversity – to protect 10% of coastal and marine areas by 2020. MPAs hold promise to enhance the ecological integrity of the oceans, but their social implications require closer examination. MPAs create a range of benefits and costs that are distributed differentially across stakeholders, including coastal communities that depend on marine resources. Support from these communities is critical to enhance the effectiveness of MPAs. This research develops and applies a social-ecological wellbeing perspective to examine the relationship between MPAs and the wellbeing of an inshore fishing community in the Bay of Fundy, Canada. Specifically, this research addresses the following three objectives: (1) understand stakeholder perceptions of MPAs in relation to social-ecological wellbeing; (2) examine how the social and ecological benefits and costs of MPAs are distributed across two cases, and across stakeholders; and (3) generate social-ecological wellbeing insights to contribute to the effectiveness of MPA governance.

This research applies an inductive qualitative case study approach to the coastal region of Southwest New Brunswick. Within this region, two cases were examined: (1) the Musquash Estuary MPA, which was designated in 2006, and (2), the Outer Quoddy Ecologically and Biologically Significant Area, which is on a longlist of areas that may become an MPA in the future. Research methods included a literature review, observations, 49 semi-structured interviews, and four visioning focus groups. Participants included 27 fishers and 22 other non-fisher informants.

Key findings from this research first reveal that 15 attributes of wellbeing were perceived to be influenced by MPAs, across material, relational, subjective, and ecological dimensions. At both locations, the most-referenced attributes were collaborative decision-making and fishery access, suggesting that these particular issues were most significant to participants. Second, attributes were more commonly perceived as benefits at the Musquash MPA, whereas they were generally perceived as costs to fishers at Outer Quoddy. The disparity between cases demonstrates that despite the historical precedent of a relatively low-impact MPA at Musquash, there is still apprehension in the region about potential future MPAs. Apprehension was largely attributed to the current top-down government mandate driving MPA network development in Canada. Third, in order to be more effective, MPA governance must address the potential displacement of fishers as a result of MPAs, improve the decision-making approach for MPA network planning, and enhance the social and ecological fit between MPAs and the local context of the region. These governance implications may be better addressed using a model of co-management, which would

recognize the role of the central government in decision-making, while giving fishers more authority to plan locally relevant and meaningful conservation initiatives.

Major contributions of this research include the development and application of a social-ecological wellbeing framework, as well as governance insights to enhance MPA effectiveness. Ultimately, this research has revealed a complex and context-dependent relationship between MPAs and the wellbeing of the inshore fishing community in Southwest New Brunswick. Given the current momentum behind MPAs, an opportunity exists to develop marine conservation strategies that align with local priorities and contribute to the conservation of biodiversity in the Bay of Fundy.

# Acknowledgements

## Land Acknowledgment

I would like to begin my thesis by acknowledging that the land on which I conducted my field research includes the traditional unceded territories of the Paskotomuhkati (Passamaquoddy) and Wolastoqiyik (Maliseet) peoples. These territories are covered by the *Treaties of Peace and Friendship* which the Wolastoqiyik, Mi'kmaq, and Paskotomuhkati peoples first signed with the British Crown in 1725. The treaties did not deal with surrender of lands and resources but in fact recognized Wolastoqey, Mi'kmaq, and Paskotomuhkati title and established the rules for what was to be an ongoing relationship between nations.

I also acknowledge that I am privileged to base my studies at the University of Waterloo, which is on the traditional territory of the Neutral, Anishnawbe and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes six miles on each side of the Grand River.

## Personal Acknowledgements

This journey has been a culmination of good fortune and hard work on the part of many individuals. I could not have written this thesis without the support and time of many people. First, thank you to the communities who welcomed me in the Maritimes and took the time to lend me their voices, knowledge, and wisdom. This includes fishers and their families in Southwest New Brunswick, other participants in this research, and all the people I had the privilege to meet along the way. I have learned about so much more than fisheries and marine protected areas from you. Thank you for the life lessons and for imparting on me a level of warmth and hospitality that I can only hope to carry with me in my life.

Next, thank you to my academic circle at the University of Waterloo. To my supervisor, Derek, thank you for your guidance and respect. Your words have always encouraged me, and have assured me that I am capable of the task at hand. Your calm reassurance that it was “still early days” when I was feeling uncertain in the beginning was always welcome (and still is, even in later days). To Simon, thank you for always making time to meet me and share your wealth of insights. Those meetings were often ‘aha’ moments for me. To the members of ECGG, thank you for your continued support in all its forms, and for putting up with my constant distractions in the fishbowl (sorry, Evan). Cheryl and Evan, thank you for being my guides on literally every aspect of how-to-grad-school. I would also like to acknowledge

financial support I have received from the OceanCanada Partnership, the Social Sciences and Humanities Research Council of Canada (SSHRC), and various awards through the University of Waterloo.

Thank you to my family and friends. To my family, thank you for your love and support in all my endeavours. To DR, MD, and MM, I cannot believe my fortune in sharing both coasts with you. To the GGs, you inspire me and make me better. To EC, thank you for being my mam in Waterloo. You have done *so much* for me, hook, line, and sinker (yes, that is the thesis pun). All the words of affirmation in the world could not express my gratitude for you, and for all the almonds you have provided. Dani girl, I am so happy we have journeyed together and I await our future adventures with great anticipation (and a few puffins). To the Keats Crew, you will always be my entry to Waterloo. Thank for long nights procrastinating and sitting under the projector.

Finally, I would like to remember the life of Joe Howlett. Joe died on July 10, 2017, after freeing a right whale in the Gulf of St. Lawrence. I only ever spent one day with Joe, but his memory is a testament to the bravery that is required to be a steward of the ocean.

## **Dedication**

To the stewards and storytellers of the ocean.

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## List of Acronyms

CBC	Canadian Broadcasting Corporation
CBD	Convention on Biological Diversity
DAAF	Department of Agriculture, Aquaculture and Fisheries
DFO	Fisheries and Oceans Canada
EBSA	Ecologically and Biologically Significant Area
ENGO	Environmental non-governmental organization
ENVI	Standing Committee on Environment and Sustainable Development
IUCN	International Union for the Conservation of Nature
MA	Millennium Ecosystem Assessment
MPA	Marine protected area
MSC	Marine Stewardship Council
NB	New Brunswick
NCC	Nature Conservancy of Canada
NS	Nova Scotia
OEABCM	Other effective area-based conservation measure
SES	Social-ecological system
SEWB	Social-ecological wellbeing
SWB	Social wellbeing
SWNB	Southwest New Brunswick

The tides of Fundy dictate the daily rhythms and life cycles of all those who dwell along its shores, underneath or upon its waters – creatures and people alike.

– Harry Thurston, *Tidal life: A natural history of the Bay of Fundy*

# Chapter 1: Introduction

## 1.1 Problem Context

Marine conservation initiatives are proliferating, but are they effective? There are now more than 6000 marine protected areas (MPAs) worldwide, accounting for a fivefold increase in ocean space under protection from 2006 to 2013 (Boonzaier & Pauly, 2016). Much of this progress is aligned with meeting Aichi Target 11 under the Convention on Biological Diversity (CBD), to protect 10% of coastal and marine areas by 2020 (Box 1.1) (Boonzaier & Pauly, 2016; CBD, n.d.). Progress to-date is commendable, and holds promise to enhance the ecological integrity of the oceans. However, a closer examination of the relationship between MPAs and coastal communities that depend on marine resources is required. What are the implications of MPA designations on these communities, and how do they in turn affect the conservation outcomes of MPAs?

### **Box 1.1 Aichi Target 11 (CBD, n.d.)**

By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.
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Ecological success of marine conservation initiatives depends in part on social factors (Coulthard, Johnson, & McGregor, 2011; Mascia et al., 2017). Community support enhances the likelihood of meeting conservation objectives by reducing political resistance (Lubchenco & Grorud-Colvert, 2015), enhancing community buy-in, and improving compliance (Agardy et al., 2011; Bennett, 2016). However, garnering community support for such interventions is complex, as MPAs often create an unequal distribution of benefits and costs within and across different stakeholder groups (Hill, Johnson, & Adamowski, 2016; Mascia, Claus, & Naidoo, 2010; Woodhouse et al., 2015). Many benefits of MPAs to people and coastal communities have been observed or predicted, such as enhanced fishery resources (e.g., Angulo-Valdés & Hatcher, 2010); however, costs such as displacement from traditional fishing grounds may offset how these benefits are perceived (e.g., Rees et al., 2013a). How communities perceive these benefits and costs, and how MPAs influence the wellbeing of coastal communities more broadly, are understudied (Mascia et al., 2010; Pita et al., 2011; Rees et al., 2010). Therefore, examining this gap in understanding is critical to the effectiveness of MPAs.

This research applies a social-ecological wellbeing (SEWB) perspective to examine the interplay between MPAs and the wellbeing of an inshore fishing community in the Bay of Fundy, Canada, by examining



two embedded cases. In doing so, the goals are to understand how these perceptions may influence the ultimate success of MPAs, and identify opportunities to enhance MPA governance in the region. I define SEWB as:

a state of a social-ecological system in which (1) the ecological subsystem can absorb disturbances and reorganize to retain essentially the same function, structure, identity, and feedbacks, (2) the social subsystem exists such that human needs are met, one can act meaningfully to pursue one's goals, and one enjoys a satisfactory quality of life, and (3) the ability of each subsystem to attain these criteria are interdependent (adapted from McGregor, 2008; Walker et al., 2004)

Applying the SEWB concept encourages the integration of social and ecological considerations to enhance MPA effectiveness, and reflects a moral imperative to foster the best possible outcomes for coastal communities adjacent to marine conservation initiatives.

This research contributes an empirical case to an emerging literature on the interplay between conservation initiatives and wellbeing (e.g., Milner-Gulland et al., 2014; Woodhouse et al., 2015), and gauges the theoretical and applied usefulness of the SEWB conceptual framework in this context. Drawing from SEWB insights, this research also discusses MPA governance implications in order to enhance the siting, design, and implementation of MPAs. To enhance the understanding between wellbeing and MPAs, a set of research questions guided this research, which are specified in the following section.

## **1.2 Research Questions**

The purpose of this research is to critically examine social-ecological wellbeing within inshore fishing communities in relation to MPAs in the Bay of Fundy, using a qualitative case study in Southwest New Brunswick (SWNB). Within this case study, two embedded cases are examined. The central research questions guiding my research are:

What is the relationship between MPAs and social-ecological wellbeing in the inshore fishing community of SWNB?

1. How do stakeholders perceive MPAs in relation to social-ecological wellbeing?
2. How are social and ecological benefits and costs of MPAs distributed across cases and stakeholders?
3. How can social-ecological wellbeing insights contribute to the effectiveness of MPA governance?

Perceptions include “the way an individual observes, understands, interprets, and evaluates a referent object, action, experience, individual, policy, or outcome” (Bennett, 2016, p.7). Examining the perceptions of stakeholders as per the first sub-question is necessary to gain an in-depth understanding of wellbeing, which contains subjective dimensions (McGregor, 2007). Moreover, perceptions provide insight into the social acceptance of MPAs (Leleu et al., 2012), and whether stakeholders perceive conservation initiatives as fair (Bennett, 2016). Investigating the distribution of benefits and costs of MPAs, as per sub-question two, also recognizes that MPAs may influence actors differently (Hill et al., 2016). Differences in benefits and costs across both embedded cases and stakeholders can also reveal key conditions that have contributed to the reasoning behind perceptions of MPAs.

Findings from the first two sub-questions provide insights for MPA governance, as per sub-question three, as social acceptance and legitimacy are critical for MPA governance (Leleu et al., 2012). Governance can be defined as “the ways in which communities, societies and organisations (e.g. fisher cooperatives, government agencies) choose to organise themselves to make decisions about important issues (such as environmental protection, use of fishery resources)” (Armitage, Charles, & Berkes, 2017, p. 2). Governance insights can contribute to fostering the effectiveness of MPAs by organizing decision-making to better meet conservation objectives (Section 2.1.2). Ultimately, the purpose of sub-question three is to identify opportunities to improve MPAs based on perceived relationships between MPAs and wellbeing. Together, the findings from these three sub-questions reveal the nature of the relationship between MPAs and wellbeing in the region, and address the literature gaps identified in Section 1.1 (and further elaborated in Chapter 2).

## **1.3 Case Study Introduction**

### **1.3.1 National Context**

Canada is currently expanding its network of MPAs (Figure 1.1), and as such, this research coincides with a real-time process of network development. Following the 2015 federal election, the Minister of Fisheries, Oceans, and the Canadian Coast Guard (hereafter “the Minister”) was mandated by the Prime Minister to protect 5% and 10% of our coastal and marine areas by 2017 and 2020, respectively (Office of the Prime Minister, 2015). This signified a Canadian re-commitment to attaining Aichi Target 11. At the time, Bailey et al. (2016) argued that rapid expansion of MPAs would be necessary to meet these targets, as only 1% was formally protected at the time. Rapid expansion has indeed followed, with several new designations of MPAs and Other Effective Area-Based Conservation Measures (OEABCMs). The Minister recently announced that Canada has met its 2017 target (Canadian Broadcasting Corporation [CBC], 2017b).



**Figure 1.1 Map of Canada’s network of MPAs (adapted from World Wildlife Fund, 2017).** *Oceans Act* MPAs and some National Marine Conservation Areas are included. Purple dots indicate MPAs that were designated pre-2015, solid blue dots indicate MPAs that have been designated since, and dashed blue dots indicate proposed MPA sites.

Canada’s plan to reach its marine conservation targets includes five areas of action (Table 1.1) and various mechanisms for protection. The federal department of Fisheries and Oceans Canada (DFO) leads MPA network development and implementation, primarily using *Oceans Act* (1996) regulations (McDorman & Chircop, 2012). For the purpose and scope of this research, ‘MPA’ refers to *Oceans Act* MPAs, as the primary MPA legislation in the country. However, other types of protected areas exist, and may count towards Canada’s marine conservation targets. These include Parks Canada’s National Marine Conservation Areas (*Canada National Marine Conservation Areas Act*, 2002), as well as Environment and Climate Change Canada’s National Wildlife Areas (*Canada Wildlife Act*, 1985) and Migratory Bird Sanctuaries (*Migratory Birds Convention Act*, 1994). The latter two mechanisms have been criticized for low protection standards (e.g., Standing Committee on Environment and Sustainable Development [ENVI], 2017).

Canada’s plan also includes the category of other marine conservation efforts (OEABCMs) which do not qualify as protected areas. While there is international and national guidance as to ‘what counts’ as an OEABCM (e.g., International Union for the Conservation of Nature [IUCN] World Commission on Protected Areas, 2017; DFO, 2016a), DFO has not specified comprehensively what other types of conservation initiatives fit within this category aside from fishery closures under the *Fisheries Act* (1985).

**Table 1.1 Action areas to meet Canada’s marine conservation targets (DFO, 2017b)**

Action Area		Description
1	Finish what was started	Formally designate areas that have been identified as Areas of Interest as MPAs under the <i>Oceans Act</i>
2	Protect large areas	Implement new large MPAs offshore under the <i>Oceans Act</i>
3	Protect areas under pressure	Implement new MPAs that are under pressure from human activities under the <i>Oceans Act</i>
4	Advance other effective area-based conservation measures	Identify existing and establish new OEABCMs, such as fishery closures under the <i>Fisheries Act</i>
5	Establish MPAs faster	Determine how the <i>Oceans Act</i> can be amended to designate MPAs faster†

† Bill C-55 proposes amendments to the *Oceans Act* to enable interim protection during MPA designation (DFO, 2017c)

### 1.3.2 Regional Context

The Bay of Fundy coastal area of Southwest New Brunswick provides the case context for this research (Figure 1.2). New Brunswick is a Maritime province in Atlantic Canada, with coastlines along the Gulf of St. Lawrence and the Bay of Fundy. The Bay of Fundy is characterized by the highest tides in the world, a high diversity of species, and a wide range of unique habitats (Thompson, 2010). As such, there is much to protect from a marine conservation perspective. The region of SWNB was chosen for this case study because it contains both an existing MPA at the Musquash Estuary, as well as the Outer Quoddy Ecologically and Biologically Significant Area (EBSA). The latter is designated on a longlist of other EBSAs that are being considered for potential inshore protection in the future (DFO, 2017d). Studying both cases enables examination of the relationship between the wellbeing of coastal communities with an existing MPA, as well as with prospective MPAs in forward-looking terms.



**Figure 1.2 Map of Canadian Maritime provinces (adapted from Google Maps, 2017).** The boundaries of the SWNB coastal area are indicated with red markers.

The focus of this research is on the inshore commercial fishing community at each of these locations. Commercial fishers are often the group of stakeholders most impacted by MPAs, and as such, they may also exert influence to oppose MPA implementation if they perceive MPAs negatively (Pita et al., 2011). Further, the influence of MPAs on inshore fishers is likely to be greater than that of their offshore counterparts, as smaller-scale fishers are often less mobile and operate in more defined spatial contexts (Stevenson et al., 2013). This is indeed the case in SWNB, where inshore fishers operate within informal areas that are smaller than their legally designated formal fishing areas (Walters, 2007).

The region of SWNB is mostly rural, with approximately 65,300 inhabitants (Statistics Canada, 2017). Communities here remain strongly attached to fishing. This is reflected more broadly in Atlantic Canada, where many communities still exhibit a strong dependence and cultural attachment to fisheries (Parsons, 2010). This attachment is certainly visible in SWNB, with signs of the fishery on the water (e.g., fishing vessels), in rural infrastructure (e.g., fishery suppliers, wharves, tourism), and at homes (e.g., lobster traps, decorations). The lobster fishery is currently at an all-time high in terms of landings, and has become the most important commercial fishery in the region (Thompson, 2010; Walters, 2007). Other commercially important fisheries include scallops, herring, and groundfish (Walters, 2007), and there are many spinoff jobs related to the fishery including fish processing (Lapointe, 2013), dock work, marketing, and transportation (Knott & Neis, 2017).

While the historical connection to the fishery remains strong, SWNB is undergoing social and ecological change. Change is not a new phenomenon in the commercial fishery, as markets, environmental conditions, populations, and social conditions have always been dynamic (Lapointe, 2013). More recently, declines in important fish stocks (e.g., herring, groundfish) (Wiber, Young, & Wilson, 2012), warming waters (Lapointe, 2013), and the propagation of salmon aquaculture (Walters, 2007) have caused concern in the inshore fishing community. Other concerns about the marine environment in SWNB include oil-related activities, extensive tourism, and marine debris. Given the importance of the marine environment to the local coastal community and the intensity of human use, SWNB is a fitting case to explore the interplay between fisheries, marine conservation, and wellbeing, and is described in detail in Chapter 3.

## **1.4 Research Design**

This research applies an inductive qualitative case study approach to understand the relationship between MPAs and SEWB in the inshore fishing community. This approach is appropriate as it reflects contextual

knowledge (Flyvbjerg, 2006) and complexity of the systems under study, allowing for greater depth in exploration of the cases (i.e., Musquash MPA and Outer Quoddy EBSA) (Yin, 2013a). The research methods applied include a detailed literature and document review, observations, semi-structured interviews, and visioning focus groups. Observations, interviews, and focus groups took place during a field season from June to November, 2016, with a follow up verification trip in October, 2017.

Participants in this research included fishers as well as other key informants, such as decision-makers and representatives of marine industries. The focus of data collection at each embedded case was slightly different. At Musquash, inquiries were aimed at understanding how the establishment of the MPA had influenced SEWB in the fishing community since its designation. At Outer Quoddy, informal scenario-building was directed at 'latent stakeholders' (Mitchell, Agle, & Wood, 1997) who would be affected in the event that an MPA was implemented in the region. All coding was conducted inductively and iteratively, and data were integrated to present findings comprehensively in Chapter 5. A full description of the research design applied in this research is provided in Chapter 4.

## **1.5 Thesis Structure**

This thesis comprises seven chapters in total. Chapter 1 has described the research problem from the standpoint of the literature as well as the Canadian context, and has provided the research questions guiding this research. In this chapter, an overview of the SWNB case study and research design has also been provided. In Chapter 2, I present a literature review on the major concepts that relate to this research. The concepts covered include MPAs and governance, social wellbeing, and resilience thinking. A conceptual framework for SEWB is then presented in Section 2.4. Chapter 3 provides a detailed description of the case study context of SWNB, overviewing the ecological and social subsystems, and the MPA governance context of the case. Both embedded cases are then described in detail. Following this, the research design is presented in Chapter 4, explaining and justifying the research methods applied in data collection and analysis, as well as making research limitations and assumptions of this research explicit. The following two chapters are organized by the specific research question being addressed. Chapter 5 addresses the first two sub-questions (i.e., perceptions of SEWB as they relate to MPAs, and distribution of benefits and costs of MPAs), and Chapter 6 provides insights to answer the third sub-question (i.e., how MPA governance can enhance the effectiveness of MPAs). Finally, Chapter 7 concludes this thesis with a summary of key research insights and recommendations for governance and future research. In the conclusion, the overarching research question addressing the relationship between MPAs and SEWB in the inshore fishing community is re-visited.

## Chapter 2: Literature Review

In this chapter, I review the literature on the central concepts in my research – marine protected area effectiveness and governance (Section 2.1), social wellbeing (Section 2.2), and resilience thinking (Section 2.3). I describe their origins, definitions, applications, and critiques, as well as the linkages between them. Following a summary of the literature, I outline the conceptual framework for social-ecological wellbeing that I developed and applied in this research (Section 2.4).

### 2.1 Marine Protected Areas

The use of MPAs as a method of marine conservation has increased internationally since the 1990's (Figure 2.1) (Jamieson & Levings, 2001) and is expected to continue increasing to meet targets under the Convention on Biological Diversity (Woodcock et al., 2017). The boundaries of MPAs delimit regions of ocean space where special rules and management considerations apply, generally limiting human use and thereby protecting ecosystems. However, MPAs are variable in their design (e.g., size, allowable activities) and in their specific objectives.

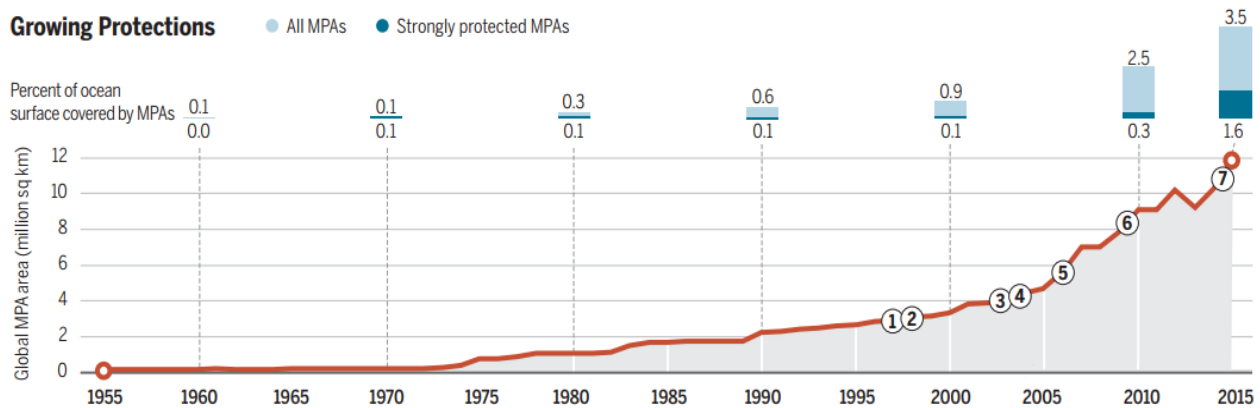


Figure 2.1 MPA coverage of global ocean surface (adapted from Lubchenco & Grorud-Colvert, 2015)

The IUCN defines an MPA as “a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values” (Day et al., 2012). An MPA may include zones with varying levels of restrictions on human activities, and is not necessarily a strict no-take area (Day et al., 2012). However, in order to meet the IUCN’s definition, the primary objectives of an MPA must be long-term *conservation* objectives. Most commonly, MPAs are implemented to conserve biodiversity (species and their habitats), and/or for fisheries management (Pita et al., 2011; Woodcock et al., 2017). Reported conservation benefits often include increases in biomass, size, and species diversity (Mascia et al., 2017),

and reviews have been conducted to identify factors that contribute conservation benefits in ecological terms (e.g., Edgar et al., 2014; Woodcock et al., 2017). However, social objectives are increasingly being included in MPA design, and links between social and ecological objectives are now also being recognized (Rees et al., 2013a; Mahajan & Daw, 2016).

### **2.1.1 Social Implications of Marine Protected Areas**

In social terms, reported outcomes of MPAs have included livelihood (e.g., wealth, food security) and cultural (e.g., identity) benefits (Bennett & Dearden, 2014; Mascia et al., 2017). For example, MPAs have been shown to enhance fishery resources by replenishing stocks, which can then ‘spill over’ into adjacent regions (Gjersten, 2005; Jamieson & Levings, 2001; Mahajan & Daw, 2016). Despite an array of reported benefits, MPAs may also cause undesirable social effects (Ferraro & Pressey, 2015). Through the management and restriction of human activities, MPAs change resource access regimes (i.e., who is able to access what, and where), and may consequently redistribute the benefits of resource access. For example, MPAs often restrict certain fishing activities (Rees et al., 2013b), which may displace fishers or cause them to alter their fishing practices (Agardy et al., 2011; Charles & Wilson, 2009). Fisher displacement has been reported in many case studies of MPAs, with various implications such as increased travel time and fuel costs (Gjertsen, 2005; Stevenson et al., 2013; Voyer et al., 2014), as well as overfishing due to concentrated effort in new locations (Suuronen, Jounela, & Tschernij, 2010).

Understanding the social implications of MPAs, and how they are distributed across stakeholders, is critical for several reasons. First, political resistance to MPAs from the most negatively impacted stakeholders “has been the single biggest impediment to the creation of reserves” (Lubchenco & Grorud-Colvert, 2015, p. 383). Indeed, coastal communities have expressed concerns and resistance over the socioeconomic consequences of MPAs (Agardy et al., 2011; Voyer et al., 2014). This may result in politically ‘easy’ areas being chosen for protection rather than areas that would yield the most benefits (i.e., ‘residual reserves’) (Devillers et al., 2015; Jamieson & Levings, 2001), and may create the appearance of protection without ‘tough enough’ restrictions (Agardy et al., 2011). Second, people are also more likely to comply with MPA regulations when they perceive benefits from the intervention (Agardy et al., 2011; Bennett, 2016). Third, practitioners and researchers have an ethical responsibility to ensure that conservation interventions result in minimum harm to communities in which they work (Woodhouse et al., 2015).

Despite increasing recognition of the importance of social outcomes in the literature (Agardy et al., 2011; Charles & Wilson, 2009; Leenhardt et al., 2004; Rees et al., 2013b), MPA planning and management



continue to focus predominantly on ecology and high-level economics, and overlook the social contexts as a result (Mahajan & Daw, 2010; Rees et al., 2010). Success is often assessed in ecological terms (Christie, 2004; Eklund & Cabeza, 2017). In cases where social outcomes have been addressed, differences across groups of people have not been distinguished (Woodhouse et al., 2015). In order to bridge this ‘social gap’, the concept of wellbeing has been proposed. In Section 2.2, I review the concept of wellbeing and its applicability to MPA research.

### **2.1.2 Marine Protected Area Governance and Effectiveness**

Governance can be defined as “the ways in which communities, societies and organisations (e.g. fisher cooperatives, government agencies) choose to organise themselves to make decisions about important issues (such as environmental protection, use of fishery resources)” (Armitage, Charles, & Berkes, 2017, p. 2). Thus, MPA governance involves the institutions and decision-making processes that determine MPA siting, design, implementation, and management. Management is a component of governance, and refers to the set of specific mechanisms and operational decisions that are used in decision-making (Armitage et al., 2017; Armitage, de Loë, & Plummer, 2012b). While there is a lack of understanding on *how* governance influences the effectiveness of protected areas (Eklund & Cabeza, 2017), it is clear that governance structures can enable or hinder the achievement of MPA objectives (Bennett & Dearden, 2014).

MPA effectiveness is generally assessed in terms of ecological outcomes or management effectiveness (Eklund & Cabeza, 2017). This thesis adopts the definition for management effectiveness as employed by *Canada’s Federal Marine Protected Areas Strategy*, as “the evaluation of the outcomes of a particular marine protected area measured against specific objectives” (DFO, 2005, p. 11). This definition aligns with the widely-applied *How is your MPA doing?* framework to assess management effectiveness, which considers an effective MPA as one that is designed adequately for its stated function, has appropriate and adequate management systems, and is meeting its stated objectives (Hockings et al., 2004; Pomeroy et al., 2004). More nuanced definitions of MPA effectiveness do exist, however. For example, Ramirez (2016) defines it as a “convergence of multiple and interlinked aspects (ecological, socio-economic, and cultural) that underpin MPA performance perceptions of involved actors (park authorities, coastal communities, NGOs)” (p. 49). This view highlights the normative, and therefore complex, aspect of assessing MPA effectiveness.

Bennett & Dearden (2014) add that MPA governance should apply principles of good governance. For protected areas, these include legitimacy, transparency, accountability, inclusiveness, fairness,

connectivity, and resilience (Lockwood, 2010). Stakeholder participation, captured by the principle of inclusiveness, is increasingly being recognized because it has shown to result in more effective MPAs (Charles & Wilson, 2009; Mascia et al., 2017). Involving stakeholders increases social acceptance and helps to build support for MPAs (Gaymer et al., 2014; Leleu et al., 2012). As such, alternatives to traditional top-down and centralized governance approaches have emerged in conservation, including the devolution of governance and the use of more participatory and bottom-up approaches (Armitage et al., 2012b; Berkes, 2010). However, participation can range from simply being informed or consulted about MPA plans, to the full devolution of powers to local communities (Hogg, Noguera-Méndez, Semitiel-García, & Giménez-Casalduero, 2013).

Co-management lies between these two extremes, and has gained prominence as a promising MPA governance approach (Jones, Qiu, & De Santo, 2011). There are many empirical examples of MPA co-management (e.g., Alexander, Armitage, & Charles, 2015; Bown, Gray, & Stead, 2013; Hogg et al., 2013; Vokou et al., 2014). Co-management is a process of sharing responsibility and power between the state and local communities of resource users (Carlsson & Berkes, 2005; Jones et al., 2011; Plummer & Armitage, 2007). Despite the term ‘management’, co-management may be understood as a system of governance (Carlsson & Berkes, 2005). Indeed, the collaborative organization of different actors in making decisions about resources aligns with the definition of governance provided above. Different arrangements of co-management exist between the state and resource users (Carlsson & Berkes, 2005), and as such, Jones et al. (2011) highlight that MPA co-management can still overemphasize either parochial resource use (i.e., too bottom-up), or broader biodiversity objectives that neglect meaningful participation (i.e., too top-down).

Increased participation also enables the incorporation of contextual factors into MPA governance, which is critical for MPA success (Bennett & Dearden, 2014). This relates to a broader literature on the fit of environmental governance, which asserts that institutions must align with the social and ecological systems that they govern (Epstein et al., 2015). In the context of MPAs, fit can be defined as “the dynamic alignment between the governing system for conservation and the social and ecological dimensions of a system that influence the outcomes of conservation policy and practice” (see Berdej & Armitage, 2016). Better social fit results in more effective conservation, if governance operates with appropriate decision-making processes and reflects the local social context (e.g., values, needs, pre-existing activities) (Berdej & Armitage, 2016; Epstein et al., 2015). For example, pre-existing resource use can be incorporated into MPA design (Bennett & Dearden, 2014). In ecological terms, governance approaches should align with the spatial, temporal, and functional aspects of ecosystems (Epstein et al.,

2015). For example, small unconnected MPAs may not be as useful for protecting species with wide ranges (Ban et al., 2012). To enhance the fit between governance and the dynamics of social and ecological systems, the concept of adaptive governance has emerged (Chaffin, Gosnell, & Cosens, 2014). Consequently, it is comprised of institutions, actors, and processes that are flexible and have the ability to learn from and respond to change (Folke et al., 2005; Steelman, 2015). Being more adaptable means that governance can better respond to situations of mismatch (Folke et al., 2005). Thus, adaptive MPA governance should be more effective for achieving better social and ecological fit.

## **2.2 Wellbeing**

The concept of human wellbeing has increased in prominence in the past several decades in the fields of psychology, health, and development studies (Coulthard, 2012; Dodge et al., 2012). Wellbeing has been used to shift attention to the positive aspects of health and development to focus on what people *have* as opposed to what they are lacking (Coulthard, 2012; Dodge et al., 2012), and has been applied as both an analytical lens and an end goal for policy (Angner, 2010; Coulthard, 2012; Weeratunge et al., 2014). Various approaches to the concept of human wellbeing have emerged from both hedonic and eudaimonic traditions (Dodge et al.; Kjell, 2011). Hedonic approaches focus on happiness and life satisfaction, likening wellbeing to the presence of positive affect and absence of negative affect, whereas eudaimonic approaches go further in observing that not all subjective desires for happiness will result in wellbeing, and focus instead on self-fulfillment and life meaning as requirements for wellbeing (Kjell, 2011).

More recently, the concept has been useful in shifting away from a traditional focus on economic indicators of progress to more holistic interpretations of what it means to have a good quality of life (Woodhouse et al., 2015). Economic performance on both macro- (i.e., national) and micro- (i.e., household, individual) levels has been shown to be inadequate for representing quality of life or environmental sustainability (Coulthard, 2012). For example, increases in GDP are not necessarily accompanied by enhanced wellbeing once basic needs have been met, and discrepancies have been reported between individual income levels and perceived wellbeing (Povey, Boreham, & Tomaszewski, 2016). The recognition that wellbeing depends on more than just material benefits has been accompanied by more holistic interpretations of wellbeing, including both objective and subjective attributes, such as wealth, physical health, interpersonal relationships, goal attainment (Ryan & Deci, 2001), security, freedom of choice and action (Millennium Ecosystem Assessment [MA], 2005), life satisfaction, and affect (Organisation for Economic Co-operation and Development, 2013).

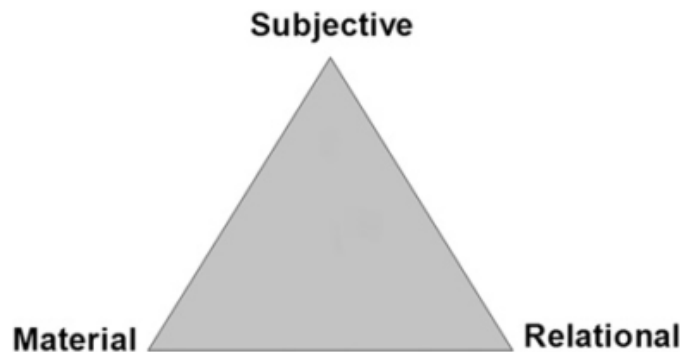
Multidimensional approaches to wellbeing have been applied in the field of sustainable development as a useful method to examine the interconnectedness between humans and their natural environments (Breslow et al., 2016), or social-ecological systems (SES), which recognizes the embeddedness of ‘humans-in-nature’ and the interdependence between social and ecological systems (Folke, Hahn, Olsson, & Norberg, 2005). By linking social, psychological, biophysical, and ecological domains, the concept of wellbeing is well-suited to gain a more holistic and complex understanding of the relationships among people and nature (Loring, Hinzman, & Neufeld, 2016), and in turn enhance decision-making for sustainability and resilience. Further, subjective dimensions of wellbeing have the potential to indicate what is important to individuals and communities (Weeratunge et al., 2014) and the reasoning behind human behaviour (Coulthard, 2012), and may consequently be used to align policy to enhance wellbeing. Various wellbeing frameworks have been applied in assessments of sustainability and natural resources (e.g., Breslow et al., 2016; MA, 2005; Weeratunge et al., 2014), including the three-dimensional conceptualization of social wellbeing, which I review next (Section 2.2.1).

### **2.2.1 Three-Dimensional Social Wellbeing**

The three-dimensional framework for social wellbeing (SWB) is based on five years of empirical research from 2002 to 2007 by the Wellbeing in Developing Countries study at the University of Bath. SWB is defined as “a state of being with others, where human needs are met, where one can act meaningfully to pursue one’s goals, and where one enjoys a satisfactory quality of life” (McGregor, 2008, p.4), and includes three dimensions: material, relational, and subjective (Figure 2.2). Material wellbeing, or what people have (McGregor, 2007), comprises the objective physical requirements of life, such as income and assets (Coulthard, 2012). Relational wellbeing, or what people can do with what they have (McGregor, 2007), accounts for how social relationships affect wellbeing (Coulthard, 2012). In other words, it relates to how people interact with others and institutions (both formal and informal), and how these interactions influence the pursuit of wellbeing (Coulthard, 2012). The subjective dimension of wellbeing, or people’s own perceptions, consist of how people think and feel about their situation in life (McGregor, 2007). This includes levels of satisfaction, values, and aspirations (Coulthard et al., 2015). Each dimension is interconnected, but separating them in the framework is analytically useful (Woodhouse et al., 2015), and allows a focus on both objective and subjective dimensions of wellbeing, as well as an explicit focus on relational aspects (Coulthard et al., 2015).

In much of the literature on human wellbeing approaches, the SWB framework has been described as the most ‘promising’, comprehensive, and holistic, allowing it to incorporate myriad values and attributes when applied to decision-making processes (Trimble & Johnson, 2013; Weeratunge et al., 2014;

Woodhouse et al., 2015). Further, the framework can be applied universally because it does not define exactly what constitutes wellbeing in local contexts, making it well-positioned to assess what matters to local communities and locally-relevant phenomena (Coulthard et al., 2011). This is critical because wellbeing depends on contexts of culture, community, and time (Woodhouse et al., 2015).



**Figure 2.2 Triangle of three-dimensional social wellbeing (Britton & Coulthard, 2013)**

Applications of the SWB lens have been able to elicit what people need for their wellbeing (Coulthard et al., 2011). These applications have been particularly useful in fisheries research due to the highly social and relational nature of inshore fisheries (e.g., Coulthard et al., 2011; Weeratunge et al., 2014). Indeed, fishing has often been described as a ‘way of life’ rather than ‘just a job’ (e.g., Santos, 2015; Trimble & Johnson, 2013), and the SWB approach “indicates the importance of understanding fishing not just as an activity, nor just as a livelihood but as a *way of life* in which strong issues of social identity and relationship are at play” (p. 459). For example, it may explain why fishers continue fishing under circumstances of economic decline (Armitage, Béné, Charles, Johnson, & Allison, 2012a), and why providing alternative livelihoods to fishers when restricting fishery access might fail (Coulthard et al., 2011). In these examples, the SWB approach more effectively captures fishers’ strong attachment to their way of life than a traditional biological or economic approach to fisheries management would, and increases the likelihood of effective policy in this regard (Coulthard et al., 2011).

Many attributes of SWB have been identified in the literature. For the purposes of my research, I provide a list of selected attributes in Table 2.1 to exemplify each domain. This list is intentionally broad, as individuals may ascribe value to other attributes of wellbeing that have not been summarized by the SWB literature. Indeed, “It seems unlikely that local people will cognitively parcel their well-being into the same categories that typify various academic frameworks [of wellbeing]” (Loring et al., 2016, p. 155). Recognizing this point is in keeping with my inductive research approach to elicit wellbeing attributes, by

allowing participants to describe what it means to live a good life, rather than prescriptively pre-assigning wellbeing indicators.

**Table 2.1 Sample SWB attributes**

	Material	Relational	Subjective
Example Attributes	Income Food Shelter Health Infrastructure Access to natural resources	Relationships of love and care Relations with the state Social institutions Markets Social learning Rules and norms which dictate access to resources	Values Beliefs Sense of self Satisfaction Spirituality Place attachment

Sources: Britton & Coulthard, 2013; Coulthard et al., 2015; Trimble & Johnson, 2013; White, 2009

### 2.2.2 Critiques of Wellbeing

Despite the strong potential of SWB, there are several critiques of the concept. First, the concept is ‘fuzzy’ (Coulthard et al., 2011). It is often used in many disparate ways and is rarely explicitly defined, likely due to its intangible nature (Dodge et al., 2012). Dimensions that constitute wellbeing are manifold and there is tension in the literature on which dimensions to prioritize (Angner, 2010). Selecting a narrower set of dimensions to conceptualize wellbeing can be arbitrary (Povey et al., 2016), but selecting too many variables can be overly complex and unpractical (Fry et al., 2017). The result is that the concept of wellbeing is “plagued with ambiguity” and difficult to operationalize (Coulthard, 2012, p. 358), which is compounded by the dynamic nature of wellbeing (Armitage et al., 2012a). Even a clearly defined and applied framework only captures wellbeing at one point in time. However, these reflections may also be viewed as an opportunity, as a broad range of conceptualizations may also uncover additional and novel perspectives about what it means to live well.

Second, despite a significant shift towards more holistic interpretations of wellbeing, much focus remains largely on the economic and material dimensions of wellbeing. Environmental monitoring (e.g., conservation assessments) in particular tends to favour material and objective dimensions, leaving subjective aspects unaddressed (Fry et al., 2017; Woodhouse et al., 2015). However proponents of subjective wellbeing are critiqued based on perceived reliability and validity issues in measuring subjective wellbeing (Angner, 2010), which reflect a broader dismissal of subjectivity and perceptions as ‘anecdotal’ and therefore insufficient as evidence (Bennett, 2016).

Finally, social wellbeing on its own is insufficient to achieve sustainability, if enhancing social wellbeing comes at the cost of ecological degradation (Armitage et al., 2012a). Loring et al. (2016) call for

empirical study to “test and build on [wellbeing] frameworks to further understand our theoretical understanding of the links (both real and potential) between environmental and societal outcomes” (p. 154), and further recognize that the relationship between wellbeing and the environment is not necessarily always interdependent. Thus, pursuing solely social wellbeing may not be a sufficient objective in the pursuit of sustainable development.

### **2.2.3 Interplay between Marine Protected Areas and Wellbeing**

In this section, I examine the interplay between MPAs and wellbeing, and review previous work that has applied the concept of wellbeing to MPA research. Framing social implications in terms of wellbeing is useful to address the ‘social gap’ in MPA research (see Section 2.1.1) because enhancing the wellbeing of people is inherently important. Framing benefits and costs in terms of wellbeing carries more ‘ethical weight’ (Milner-Gulland et al., 2014). In turn, integrating the concept of wellbeing into MPA processes may improve the legitimacy and levels of support given to conservation efforts by both governments and communities, the relevance of policy, and ultimately enhance conservation outcomes (Agardy et al., 2011; Bennett, 2016; Charles, 2012; Milner-Gulland et al., 2014). Critically, the holistic nature of wellbeing enables a more comprehensive understanding of the social implications of MPAs, as well as the meanings, needs, and motivations behind how benefits and costs are perceived across stakeholders (Coulthard et al., 2011). Understanding people’s visions for their wellbeing can also provide insights into consequent responses to policy decisions (Coulthard et al., 2011). Coulthard et al.’s summary of SWB in fisheries can also be applied to an assessment of the social implications of MPAs, whereby they conclude the following:

The social wellbeing approach provides researchers and policy makers with a framework to explore the intermix of interests and constraints of different actors who relate to the fishery, and as such a possible basis for the design of the institutional arrangements of governance so as to secure greater legitimacy and compliance for policy. (2011, p. 460)

To-date, a handful of studies have reviewed or empirically assessed the interplay between MPAs and wellbeing, but most have been conducted in narrower or less explicit terms than a SWB approach would enable. For example, Gjersten (2005) assessed the effects of MPAs in the Philippines on human wellbeing by looking only at child nutritional status, and Stevenson et al. (2013) researched the influence of an MPA network in Hawaii on fisher wellbeing using five selected indicators focusing largely on material wellbeing. Mascia et al. (2010) reviewed the implications of MPAs on fishing communities using five indicators focused on material wellbeing, but concluded that their sample size was too small to statistically assess three of the indicators, highlighting the “scarcity of rigorous research on the social impact of MPAs” (p. 1428). In a more holistic wellbeing assessment, Voyer et al. (2014) assessed the

impact of two Australian MPAs on fishers' financial, emotional, and relational wellbeing, including aspects of all three SWB domains.

Some studies have applied the concept of wellbeing less explicitly or directly. For example, Rees et al. (2013b) researched fishers' perceptions on the influence of proposed MPAs in the United Kingdom on their wellbeing in order to inform future MPA management decisions. They applied the concept of wellbeing as an end goal, rather than applying the concept as an analytical approach, and did not provide a definition or framework for wellbeing. Bavinck & Vivekanandan (2011) applied wellbeing in order to explain social conflicts that arose from the establishment of an MPA in India, but also omitted a definition or description of a wellbeing framework. Some studies have examined the linkages between ecosystem services and MPAs (e.g., Chan, 2017; Rees et al., 2014; Mahajan & Daw, 2016), which have captured the social implications of MPAs more holistically than choosing a narrower subset of social indicators. For example, Chan (2017) assessed how changes in access to ecosystem service bundles as a result of the implementation of an MPA in Jamaica influenced SWB across different groups. However, Mahajan & Daw (2016) reflected that applying an ecosystem services framework did not adequately capture the effects of Kenyan MPAs on certain aspects of SWB (e.g., subjective wellbeing). Thus, building on previous work, there is an emerging opportunity to expand the scope of SWB to assess the social implications of MPAs.

### **2.3 Resilience Thinking**

Resilience thinking dates to the work of ecologist C.S. Holling (1973) on stability domains, but has since been applied in many largely social science disciplines and practices such as development, international relations and security, disaster reduction, climate change, and planning (Brown, 2014). Holling's empirically-based work led to the recognition that an ecological system could exist in more than one possible stable state (Folke, 2016), and as noted above, has since been extended to social systems through the concept of social-ecological resilience (Brown, 2014). Resilience is defined as the "capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks" (Walker et al., 2004, p. 2). This definition differs from engineering resilience which only considers how quickly a system returns back to equilibrium after a disturbance and thus only accounts for one possible stable state of a system (Walker et al., 2004). In contrast, resilience thinking "deals with complex adaptive system dynamics and true uncertainty and how to learn to live with change and make use of it", and focuses on regeneration and reorganization rather than recovery (Folke, 2016, p.2).



The resilience of a system depends on its closeness to a threshold in addition to its resistance to change (Walker et al., 2004). A threshold is the point which, once it has been passed, a system moves into a different stable state (Folke et al., 2004; Stevenson, 2011). Crossing a threshold changes the identity of the system, and may be described as a transformation or regime shift, depending on the context (Allen, Angeler, Garmestani, Gunderson, & Holling, 2014; Folke et al., 2004; Walker et al., 2004). Disturbances cause systems to move closer to thresholds. Natural disturbances tend to be pulse events, however many human activities exert more chronic pressure on systems and are considered press disturbances (Bengtsson et al., 2003). As such, human activities degrade system resilience and cause regime shifts, which can be irreversible and can occur over short or long periods of time (Bengtsson et al., 2003; Folke et al., 2004). For example, human input of nutrients into a clear water lake system can reduce the resilience of the system until it crosses a threshold and becomes a eutrophic turbid lake (Schallenberg & Sorrell, 2009).

There are several attributes associated with resilience thinking. First, social and ecological subsystems mutually influence one another across temporal and spatial scales (Allen et al., 2014; Folke, 2016). For example, human activities can influence the resilience of the ecological subsystem, and vice versa. Thus, system feedbacks can enhance or reduce resilience of a system (Resilience Alliance, 2010). Second, systems are complex, and their resilience depends upon the relationships between a multitude of system components (Resilience Alliance, 2010). Further, systems are dynamic and have high variability (Folke, 2006). Dynamics are nonlinear, as disturbances do not necessarily cause equal and opposite reactions, and can result in cascading effects (Folke, 2016; Kofinas, 2009). Third, systems undergo adaptive cycles (i.e., how a system changes over time) which are nested at different scales (i.e., panarchy) (Allen et al., 2014; Folke, 2006). In other words, the resilience of a focal system depends on interactions with smaller and larger scales (Walker et al., 2004).

The significance of these attributes is that complex systems are subject to uncertainty and surprise, and therefore have low predictability (Folke, 2006). Governance implications follow from this, as the focus shifts to governing for adaptability and emergence rather than stability (Folke et al., 2004; Kofinas, 2009; Resilience Alliance, 2010; Walker et al., 2004). Rather than looking for catch-all end solutions, the emphasis is on reflection and learning, and on the creation of favourable conditions to navigate change (Folke, 2016). Resilience thinking also shifts attention to opportunity and innovation, as humans are agents in SES and can opportunistically foster transformations to new systems where they may be desirable (Folke, 2016; Nelson, Adger, & Brown, 2007). Further, in monitoring SES, attention can be focused on key 'controlling variables' which determine the majority of the system dynamics and

proximity to thresholds, rather than attempting to manage every single fluctuation within a system (Armitage et al., 2012a; Resilience Alliance, 2010). In the following section (2.3.1), I elaborate on monitoring and measuring resilience.

### 2.3.1 Attributes of Ecological Resilience

There is no ‘best’ way to measure resilience, as complex adaptive systems are constantly changing (Folke, 2016). Indeed, resilience “is not a single number or a result. It’s an emergent property” (Walker & Salt, 2012. P. 67). Several methods have been used to measure both general and specified resilience, such as assessing early warnings of resilience loss, changes in ecosystem services, surrogates for resilience, and sources of resilience (e.g., Table 2.2) (Folke, 2016). General resilience pertains to how a system copes with all varieties of disturbances (including ‘surprises’), whereas specified resilience has to do with the resilience of particular system components (e.g., coral reefs) to specific disturbances (e.g., nutrient buildup) (Walker & Salt, 2012). General resilience more strongly determines the proximity of a system to a threshold, as compared with specified resilience (Walker & Salt, 2012).

**Table 2.2 Attributes of ecological resilience**

Attribute	Description
Biological Diversity	<ul style="list-style-type: none"> <li>• Ecosystem function depends on the diversity of functional groups (i.e., species that perform a certain type of service, such as pollination)</li> <li>• Ecosystem renewal and reorganization depends on the diversity of functional responses (i.e., how different species within a particular functional group respond differently to environmental change)</li> </ul>
Modularity	<ul style="list-style-type: none"> <li>• Modularity can isolate disturbances to smaller parts of the system and reduce the spread of harm throughout the system</li> <li>• Modularity comes at the cost of connectivity, which can also be useful for rebuilding populations and spreading important information</li> </ul>
Tightness of feedbacks	<ul style="list-style-type: none"> <li>• Tight feedbacks allow a faster time from response to signal, enhancing resilience</li> </ul>
Openness	<ul style="list-style-type: none"> <li>• The capacity for species and information to move in and out of systems influences resilience</li> <li>• Closed systems tend to be more static and fragile, but too open or too closed can both be detrimental to resilience</li> </ul>
Reserves	<ul style="list-style-type: none"> <li>• Natural reserves act as a source for system renewal after disturbance</li> <li>• Biological legacies contribute to internal memory (e.g., a habitat patch within a disturbed system)</li> <li>• Mobile link species contribute to external memory (i.e., species that operate at larger spatial scales can be recruited to local systems after disturbance)</li> </ul>
Capital	<ul style="list-style-type: none"> <li>• All types of capital (financial, human, natural, built, social) can be drawn upon to respond to disturbance</li> </ul>

Sources: Bengtsson et al., 2003; Elmqvist et al., 2003; Folke et al., 2004; Levin et al., 2012; Levin & Lubchenco, 2008; Walker & Salt, 2012

My research applies the concept of attributes (i.e., sources) of general ecological resilience, which are summarized in Table 2.2. This list of attributes is not comprehensive given the context-dependent nature of resilience, but serves as a starting point to assess the resilience of a system rather than as a comprehensive set of indicators (Walker & Salt, 2012). Maximizing each attribute of resilience does not necessarily enhance the overall resilience of a system, as there is normally an optimal level of each attribute depending on the context (Levin & Lubchenco, 2008). Walker & Salt (2012) suggest thinking about resilience attributes in the historical context of a system, to identify what has helped it cope in the past, and fishers are well-suited to do this given their in-depth knowledge of the ecosystem and its history. Indeed, fishers have previously been recommended for identifying resilience in systems (e.g., Burt et al., 2014). Thus, a modified list from that presented in Table 2.2 can be expected from this research, as it is contextually-grounded, inductive in nature, and elicits the knowledge of fishers and other stakeholders.

### **2.3.2 Critiques of Resilience Thinking**

Critiques of resilience thinking have paralleled those of SWB in that the definition and application of resilience thinking has been inconsistent and “startlingly vague” (Cretney, 2014, p. 629). Further, while resilience thinking is clearly distinguished from engineering resilience, in practice it is often still applied using the equilibrium model (Folke, 2006). Resilience has also been criticized because it emerged from ecological sciences, and the tendency has been to focus on ecological resilience (Armitage et al., 2012a). Applying an ecological concept to the social sciences assumes that the underlying dynamics between ecological and social systems are the same, when in fact they differ (Brown, 2014; Cretney, 2014). Further, there is a strong focus on institutional function, with a tendency to assume that resources will be resilient and sustainable so long as our institutions are diverse and adaptable (Cote & Nightingale, 2012; Folke, 2006).

Resilience thinking is also frequently critiqued for a tendency to assume that increasing resilience is necessarily good, whereas it is possible to have a very resilient system that is entrenched in an undesirable state (Folke, 2006; Walker & Salt, 2012). Moreover, determining what is desirable is highly normative. Values are involved when determining of what and for whom resilience should be sought (Armitage et al., 2012a; Cote & Nightingale, 2012). Despite attention on adaptability and transformation, the focus of resilience applications maintains the status quo by attempting to preserve or enhance the resilience of an existing system (Brown, 2014; Cretney, 2014; Nadasdy, 2007). This entrenches existing structures, without adequate attention to power relations and inequalities surrounding who is (not) benefitting (Brown, 2014; Cretney, 2014; Nadasdy, 2007). For this reason, resilience thinking has been critiqued for entrenching capitalistic and neoliberal structures, encouraging communities to fluctuate with market

disturbances (Brown, 2014; Cretney, 2014), as well as entrenching colonial structures (Nadasdy, 2007). Increasing recognition of politics, power, and intentional transformations have begun to address these shortcomings (Brown, 2014), but resilience thinking ultimately “serves as one useful lens among many to ask questions, learn, and improve understanding of social-ecological systems” (Folke, 2016, p. 3).

### **2.3.3 Resilience Thinking and Marine Protected Areas**

There are many linkages between resilience thinking and MPAs. Indeed, resilience may be maintained or enhanced by MPAs (Cumming, 2016), and studies have assessed the effects of MPAs on the resilience of ecosystems (e.g., Barnett & Baskett, 2015; Camargo et al., 2009; McCook et al., 2010; Mellin et al., 2016). Several important policy documents also apply concepts of resilience as desirable outcomes or ecological principles, including the *National Framework for Canada’s Network of Marine Protected Areas* (DFO, 2011) and the IUCN’s *Guidelines for Protected Areas Legislation* (Lausche, 2011). Indeed, much of the literature referring to resilience focuses on resilience as an MPA objective or end goal (e.g., Bennett & Dearden, 2014; Rees et al., 2014; Weigel et al., 2014). For example, Burt et al. (2014) list ecological objectives for the implementation of an MPA network in British Columbia. One stated objective is to “maximize the ecological resilience of desirable ecosystem states” (p. 9). Where resilience is not explicitly defined or stated in MPA objectives, ecological principles for MPA effectiveness often align with attributes of resilience (e.g., connectivity, biodiversity). In terms of resilience attributes, protected areas could be viewed as ‘reserves’ embedded within larger-scale systems, as they are often areas in natural states that may act as a source of renewal and reorganization after disturbance. Additionally, MPAs could also move a system further away from a threshold by restricting human activities and minimizing disturbances in the first place. However, these uses of resilience thinking and MPAs are subject to the critiques of resilience thinking outlined in the previous section (2.3.2), and generally assume that enhancing resilience of the current system is desirable.

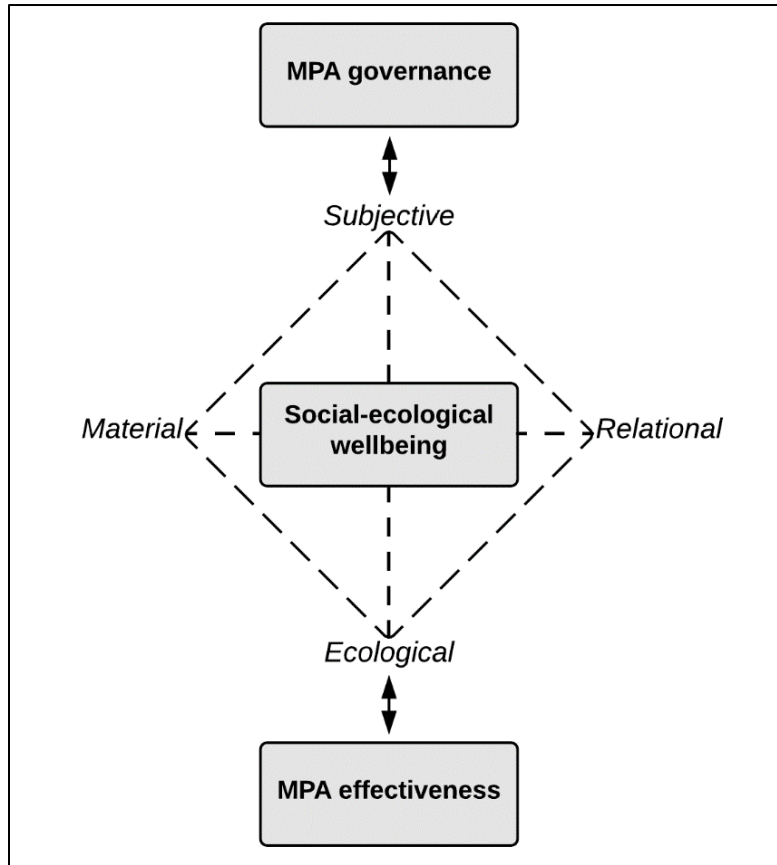
## **2.4 Conceptual Framework for Social-Ecological Wellbeing**

My research applies a SEWB perspective to assess the social implications of MPAs in Southwest New Brunswick (Figure 2.3). I developed this framework by synthesizing the literature described previously in this chapter. As such, this framework operationalizes emerging thinking about the interplay between the concepts of ecological resilience and social wellbeing (Armitage et al. 2012a; Karst, 2017; Loring et al., 2016). Building on the definitions for these concepts, I define SEWB:

A state of a SES in which (1) the ecological subsystem can absorb disturbances and reorganize to retain essentially the same function, structure, identity, and feedbacks, (2) the social subsystem

exists such that human needs are met, one can act meaningfully to pursue one's goals, and one enjoys a satisfactory quality of life, and (3) the ability of each subsystem to attain these criteria are interdependent (adapted from McGregor, 2008; Walker et al., 2004)

As shown in Figure 2.3, there are four interacting dimensions of SEWB: ecological resilience, and material, relational, and subjective wellbeing. The framework presumes that MPA governance influences SEWB, which in turn influences MPA effectiveness. However, there are many other factors beyond the scope of this research which could interact with and influence SEWB.



**Figure 2.3 Conceptual framework for SEWB**

This framework addresses calls in the literature to integrate wellbeing with other ecological concepts (e.g., Folke, 2016; Loring et al., 2016; Weeratunge et al., 2014), and links the strengths of SWB and resilience thinking, while addressing some of the limitations of each concept on its own. A SEWB approach thus addresses the need to understand the social implications of MPAs in a holistic manner, without ignoring the ecological subsystem. Coupling these concepts enables a focus on social interests without de-emphasizing long-term biophysical needs, recognizing that SWB alone is not necessarily sufficient to achieve sustainability (i.e., that it is possible to enhance SWB at the cost of the environment) (Armitage et al., 2012a). Integrating SWB with ecological resilience also addresses critiques of resilience

thinking by making normative values more explicit (Armitage et al., 2012a), and draws attention to the social subsystem with a concept that was developed from social science traditions (i.e., SWB) rather than one which was developed from ecological principles (i.e., social resilience) (Brown, 2014; Cretney, 2014). This approach assumes that aspects of social resilience will be encompassed by SWB. For example, the presence of diverse and robust institutions may improve social resilience, but may also be captured by material and relational dimensions of wellbeing.

This conceptual framework guided the research methods reported in Chapter 4 as well as the framing of research findings described in Chapter 5 in relation to my research objectives. During data collection, perceptions of SEWB were elicited using each dimension. I first asked participants to identify the most important ecological, material, relational, and subjective attributes of wellbeing, and subsequently how they related to MPAs (Section 4.3.3.2). Wellbeing priorities during focus groups, as well as coding analysis, were also categorized by SEWB dimension (Section 4.4). Finally, the perceptions in Chapter 5 are also organized according to the framework, which provide the foundations for MPA governance insights discussed in Chapter 6.

## **2.5 Chapter Summary**

MPAs are increasingly used for marine conservation, and they have a suite of ecological and social benefits and costs. However, assessments of MPA outcomes tend to focus on ecological benefits, often overlooking the social implications of MPAs, which may undermine community support and ultimately the success of MPAs. The concept of SWB is a useful lens through which to examine this ‘social gap’ in more comprehensive and explicit terms than have previously been conducted. SWB comprises of material, relational, and subjective dimensions, and is a more holistic framework to examine different attributes of human wellbeing. Since enhancing SWB in and of itself may not result in desirable ecological outcomes, it is useful to consider ecological outcomes in tandem with social outcomes. Resilience thinking is well-positioned for this, as it recognizes the complexity, dynamics, and uncertainty inherent in ecological systems. Enhancing resilience is often an objective of MPA design, emphasizing the ability of an ecosystem to reorganize after disturbances. Resilience thinking affirms that systems may exist in more than one possible stable state. In application, however, working to enhance resilience of the existing state overlooks normative questions of who the status quo is benefitting. In contrast, SWB helps to reveal such normative considerations. Therefore, this research applies a conceptual framework for SEWB, integrating the concepts of SWB and ecological resilience, to examine the interplay between MPAs and coastal community SEWB in SWNB. The following chapter outlines the case study context of SWNB, where the SEWB framework was applied.

## Chapter 3: Case Study Context

In this chapter, I describe the Southwest New Brunswick region that served as a case study for my research. I begin with an overview of the SWNB region by describing its ecological and social subsystems (Sections 3.1.1 and 3.1.2), in addition to the marine protected area governance context (Section 3.1.3). Following the regional overview, I describe the embedded cases of the Musquash Estuary MPA and the Outer Quoddy Ecologically and Biologically Significant Area (Sections 3.2.1 and 3.2.2).

### 3.1 Coastal Southwest New Brunswick

New Brunswick is one of Canada's maritime provinces, with coastlines along the Gulf of St. Lawrence and the Bay of Fundy that total approximately 5501 km in length (NB Department of Environment and Local Government, n.d.). The Bay of Fundy is part of the Gulf of Maine system, and is over 270 km long and 60 km at its widest point (Thompson, 2010). The bay borders the provinces of New Brunswick and Nova Scotia, and the state of Maine. In my research, I am focusing on the coastal region of SWNB (Figure 3.1). Specifically, this includes Deer Island, Campobello Island, and the coast from Dipper Harbour to Lorneville (Figure 4.1, Section 4.3.3.1).

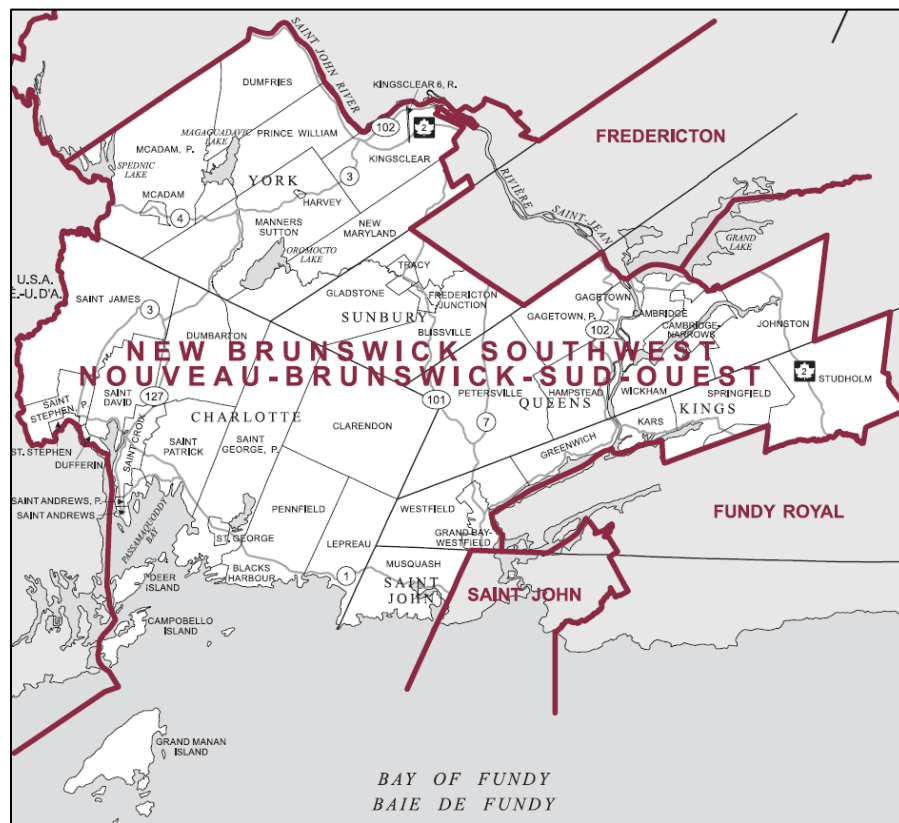


Figure 3.1 Federal electoral district of NB Southwest (adapted from Elections Canada, 2013)

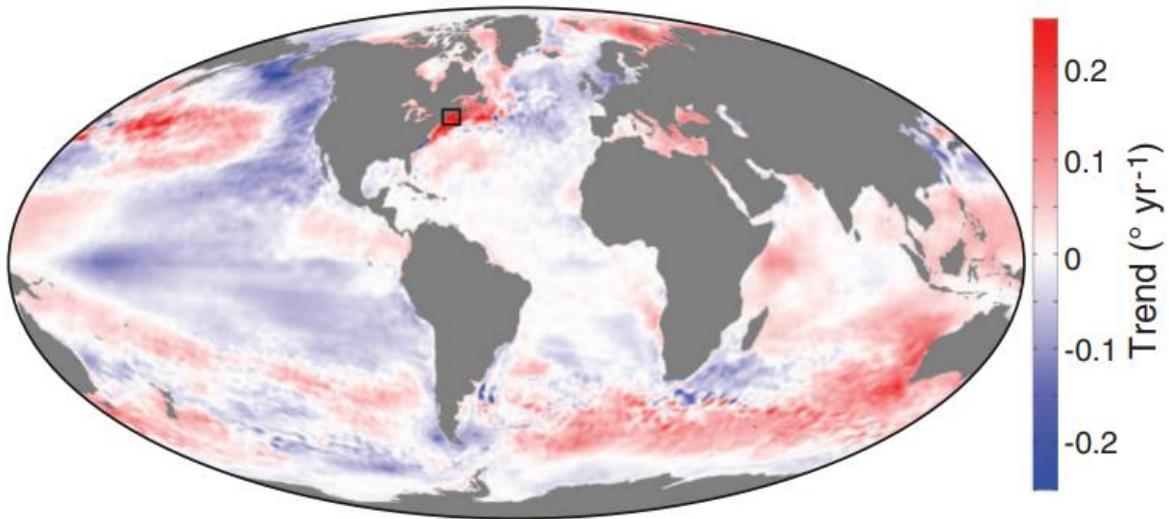
This research focuses on the aforementioned regions in terms of participant sampling, however participants were able to define the scale at which they discussed relevant ‘zones of influence’ of MPAs in relation to their wellbeing (Section 4.3.3.1). Given this methodological consideration, as well as the fact that fishers operate at variable and larger spatial scales when fishing than simply the location of their ‘home’ wharves, the ecological and social subsystems are both relevant at larger scales than the aforementioned regions. Thus, the following sections provide an overview of the ecological (3.1.1) and social subsystems (3.1.2) of SWNB and the Bay of Fundy more broadly, as well as the regional MPA governance context (3.1.3). Since this research focuses on the inshore commercial fishery, Section 3.1.2 also provides contextual information to understand the fishery of SWNB. This baseline information is relevant as it provides local context to understand perceptions of social-ecological wellbeing (Chapter 5) and MPA governance implications (Chapter 6).

### **3.1.1 Ecological Subsystem**

The Bay of Fundy is characterized by the most extreme tides in the world. Tides cause strong currents, upwellings, and nutrient cycling, which generate high productivity and support an abundance and diversity of species of fish, birds, and mammals (Daborn, 1997, 1997; Thompson, 2010). In SWNB, tidal mixing supports the most productive fishery in the Bay of Fundy, with over 100 species of fish (Thomas, 1983). This includes spawning grounds for commercially important fish stocks, such as groundfish (cod, pollock, haddock), herring, and lobster (Walters, 2007; Wiber et al., 2012). Life in the bay is also supported by a wide range of habitats at a variety of depths, including seagrass and kelp beds, cold-water corals (Thompson, 2010), rocky intertidal areas (Thomas, 1983), salt marshes, and mudflats (DFO, 2014a). Further, naturally occurring inflows from major rivers in the watershed, including the Saint John River in NB, influence biophysical characteristics in the bay (Thompson, 2010). These natural ecological conditions vary seasonally as well as geographically (Thompson, 2010).

Ecological conditions are also influenced by human activities (e.g., see Section 3.1.2), which are increasing pollution levels (Thompson, 2010) and posing significant threats to habitats and species (Daborn, 1997; DFO, 2014a). Human pressures such as overfishing, species introductions, and land-based sources of pollution are causing declines in the ecological quality of SWNB (DFO, 2014a, 2014b). Climate change intensifies ecological change. Between 2004 and 2013, water temperatures in the Gulf of Maine warmed faster than 99% of the global ocean (Figure 3.2) (Pershing et al., 2015). Thus, it is clear that the ecological subsystem is linked with the social subsystem, which I describe in the following section.





**Figure 3.2** Sea surface temperature trends of the global ocean from 2004 to 2013 (Pershing et al., 2015). The black box identifies the Gulf of Maine.

### 3.1.2 Social Subsystem

SWNB has a population of approximately 65,300, and its population is declining faster than the rest of the province (Statistics Canada, 2017). The region is primarily rural, but has several towns with populations under 5000 (Statistics Canada, 2017). SWNB includes the traditional territory of the Peskotomuhkati (Passamaquoddy) and Wolastoqey (Maliseet) peoples, but has undergone extensive European colonial settlement in the past 500 years. There were also Loyalist influxes during the 18<sup>th</sup> century from the US (Caldbick, 1997), and many families in SWNB now trace their ancestry to these times. Throughout history, inhabitants of the region have relied on marine resources from the Bay of Fundy for subsistence and economic purposes (Thompson, 2010; Parks Canada & Tourism NB, 1985). Today, there are many relevant marine activities in the bay, including fisheries, oil and gas, aquaculture, tourism, and tidal energy development (DFO, 2014b).

#### 3.1.2.1 Commercial Fisheries

Coastal communities in Atlantic Canada depend strongly on commercial fishing, with a “prevalent fishing culture that reflects that fishing is the preferred way of eking out a living” (Parsons, 2010, p. 410). Thus, culturally, fisheries are very important in the region (Lapointe, 2013; Thompson, 2010). Fisheries also account for the largest portion of NB’s marine economy (DFO, 2014b). Within the natural resources sector of NB, 9.4% of the labour force are fishers (Government of NB, 2016), and the commercial fishery also creates spinoff jobs in processing plants (Lapointe, 2013), dock work, marketing, and transportation

(Knott & Neis, 2017). Most seafood exported from NB is sent to the United States. However markets have diversified to other countries such as China, following the 2008 recession (Lapointe, 2013).

Inshore fishers in the Bay must hold individual fishery licenses, and must abide by owner-operator policies (DFO, 2007). These policies stipulate that fishers must operate their own vessels and personally fish their own licenses, to prevent license leasing to larger-scale corporations, as well as maintain local control, access, and community benefits of fisheries (DFO, 2007). Critiques of poor enforcement have led to recent commitments to strengthen these policies (e.g., CBC, 2017a; Canadian Independent Fish Harvester's Federation, 2016; Withers, 2016). In addition to individual owner-operator licenses, commercial fisheries in NB include Aboriginal Communal licenses. These licenses are held communally by First Nations communities, and were established following the 1999 Marshall Decision by the Supreme Court of Canada. This decision affirmed the right of 34 First Nations communities in the Maritimes and Quebec to take part in the commercial fishery due to Wolastoqiyik, Mi'kmaq, and Pakotomuhkati treaty rights (Atlantic Policy Congress, 2009; Nixon, 2001; Parsons, 2010). The Marshall Decision was an important development in Maritimes fisheries, as the department of Fisheries and Oceans Canada re-allocated approximately 200 commercial licenses to First Nations communities at the time (Parsons, 2010).

The inshore fishery is defined as the fishing sector where vessel sizes must be less than 65 feet (DFO, 1996). Inshore areas are formally divided into species-specific Fishing Areas for allocation purposes, but these vary in size and location depending on the fishery in question. However, many inshore fishers in the region still operate boats under 45 feet (Wiber et al., 2012) within informal boundaries that are smaller than their legally designated Fishing Areas (Walters, 2007). These informal boundaries depend on a multitude of factors, including proximity to home port, location of other fishers, and local knowledge (Walters, 2007), which has often been passed down over five or six generations of fishing (Wiber et al., 2012). A high degree of adaptability is exercised within these informal arrangements, as fishers experiment with methods, locations, and competition in fishing (Walters, 2007).

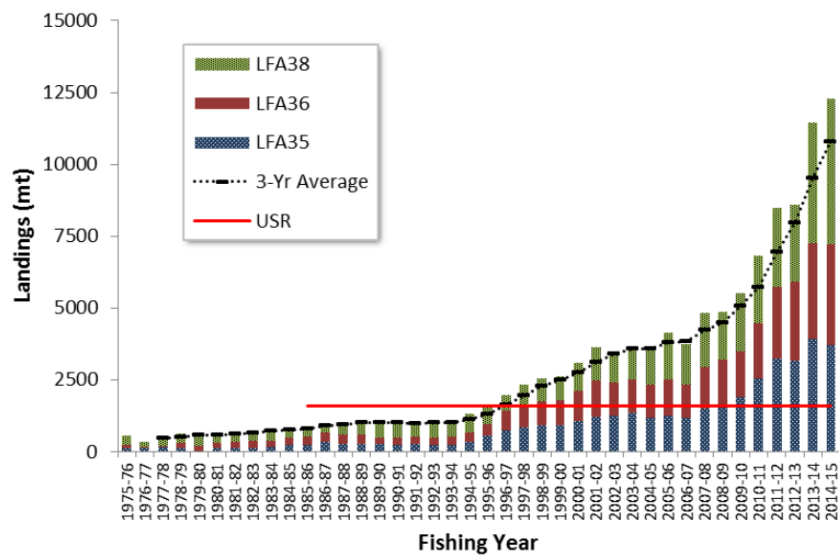
Adaptability is critical in these fisheries, as “established fishing communities are forced to adapt to new social, economic, and environmental conditions in part because of a lack of marine resources from over-fishing and increased fishery management regulations” (Thompson, 2010, p. 25). Traditionally, inshore fishers in SWNB have relied on a multi-species commercial fishery because the relative importance of different species fluctuates over time. Fishers often retain their inactive licenses for several species so that they can use them again as ecological and social conditions change (Lapointe, 2013). Thus, MPAs that

restrict fishing activity by species (e.g., Musquash) may influence the ability of fishers to switch between licenses and exercise this adaptability. In this event, fishers may also be able to rely on licenses for other species that are still allowed within an MPA, which may influence how they perceive MPAs and SEWB. In SWNB, the multi-species fishery includes herring, groundfish (e.g., cod, pollock, haddock), seaweeds, and invertebrates (lobster, scallop, crab, and clams) (Walters, 2007) (Figure 3.3).

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Shrimp											
Scallop							Scallop				
Lobster				Lobster						Lobster	
			Herring Weir								
						Groundfish					
Clams, periwinkles, dulse, mid-bay scallop											

**Figure 3.3 Bay of Fundy commercial fishing seasons (Fundy North Fishermen’s Association, 2016)**

However, lobster is currently the most economically important species, with record landings in recent years (Figure 3.4). Increases in landings have been attributed to high stocks, more efficient technology, and strong markets (Lapointe, 2013; Walters, 2007). Lobster effort has also increased as a coping strategy due to declines in other fisheries (Thompson, 2010), such as herring and groundfish (Wiber et al., 2012). Consequently, fishers have been concentrating their investment and effort into lobster, increasing individual incomes, but also making coastal communities vulnerable as many of their economies are almost exclusively dependent on the lobster fishery (Thompson, 2010; Walters, 2007). Ultimately, fishery dynamics impact the wellbeing of coastal communities, as market demand, climate and environmental change, population change, socioeconomic conditions, and fisheries management all influence fish stocks, effort, and landings (Lapointe, 2013).



**Figure 3.4 Lobster landings in the Bay of Fundy from 1975 to 2015 (DFO, 2017a)**

### **3.1.2.2 Other Activities**

There are many other ongoing human activities in the Bay of Fundy. Most notably, the aquaculture industry accounts for the largest agriculture-based export from New Brunswick (Atlantic Canada Fish Farmers Association, 2015) and has the highest sales value of all food commodities in the province (NB Department of Agriculture, Aquaculture and Fisheries [DAAF], 2017b). Salmon aquaculture has been credited with generating “considerable employment and economic prosperity in New Brunswick coastal communities that might otherwise be in decline” (Walters, 2007, p. 141), and is particularly concentrated in SWNB where approximately one in five jobs is in the aquaculture industry (DAAF, 2017b). However, the industry has also been contentious, as a small number of multinational corporations have concentrated ownership and receive significant government subsidies (Knott & Neis, 2017). Net cages are farmed directly within the Bay of Fundy, causing concerns about the environmental impacts of pesticide use, disease, and escapees (Walters, 2007). Concerns from the fishing industry in particular relate to the impact of pesticide use on lobsters, and physical displacement from traditional fishing grounds by net cages (Walters, 2007).

The fishing industry is also concerned about activities related to oil, shipping, and tidal energy development (e.g., Bresge, 2016). More than 80% of cargo in the Gulf of Maine is oil or petroleum product, and the Saint John harbour handles 26.3 million metric tonnes of cargo each year (Thompson, 2010). This places adjacent waters of SWNB at a relatively higher risk for oil spills (DFO, 2014b). The Bay of Fundy is also famous for tidal energy development, however intermittent testing has been taking place outside of SWNB (FORCE, 2016; Thompson, 2010).

In addition to ‘heavier’ industrial activities, SWNB has a high concentration of tourism, recreation, and research activities around St. Andrews. Tourism and recreation make up the largest marine sector in the Gulf of Maine (Thompson, 2010), and activities include sport fishing, boating, whale watching, diving, swimming (DFO, 2014b), and birding (Thompson, 2010). SWNB is also a hub for marine research, with several scientific institutions based out of St. Andrews. The St. Andrews Biological Station, established in 1908, is Canada’s oldest permanent marine research station (DFO, 2014d), and the Huntsman Marine Science Centre and the Atlantic Salmon Centre are also in the region.

### **3.1.3 Marine Protected Area Governance Context**

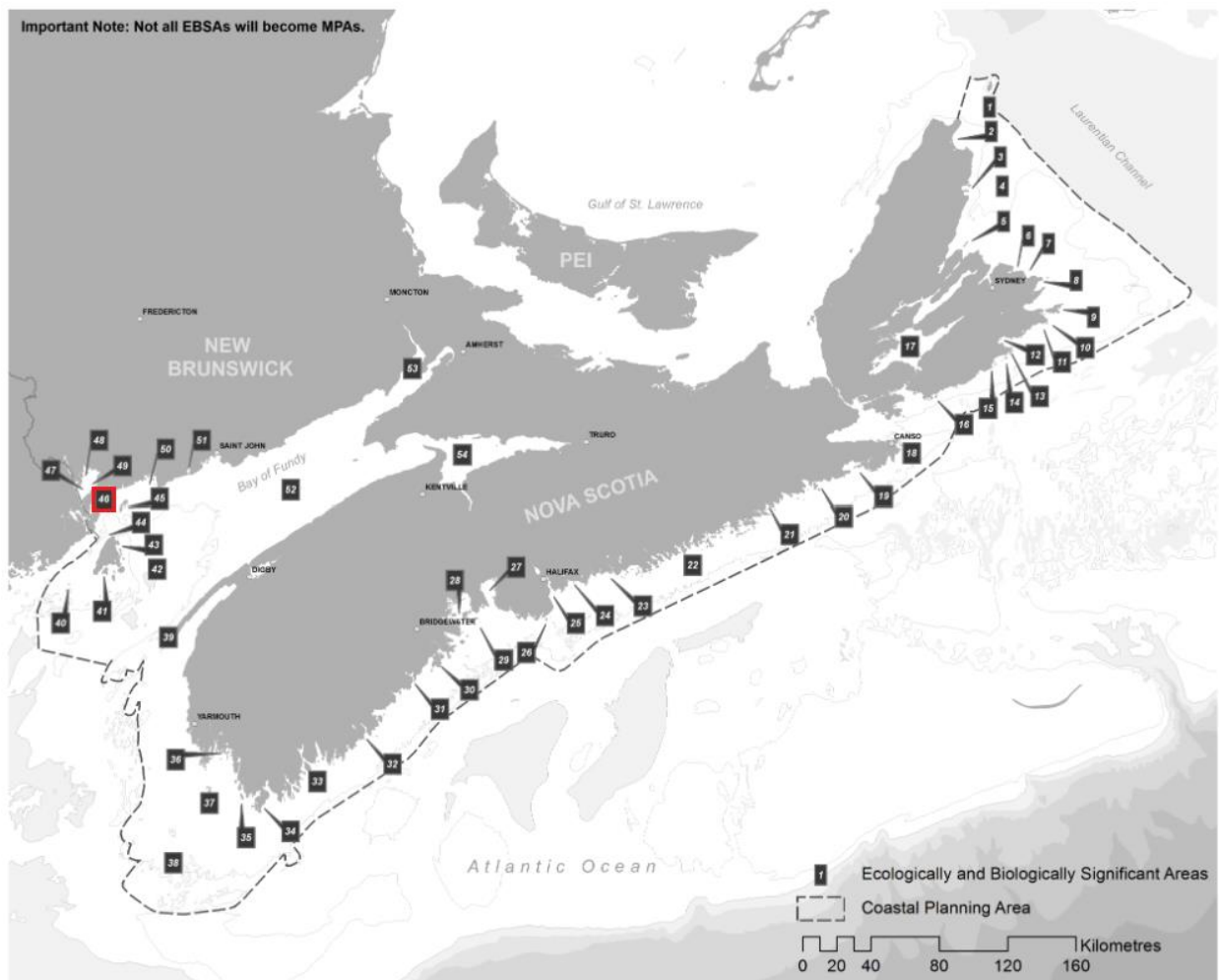
The purpose of this section is to outline regional MPA governance structures in SWNB, as a research objective of this research is to provide insights into the effectiveness of MPA governance (Section 1.2).

However, details about MPA governance of the Musquash MPA, specifically, are provided in the following section (3.2), where contextual details are provided about each embedded case. As defined in Section 2.1.2, governance is “the ways in which communities, societies and organisations (e.g. fisher cooperatives, government agencies) choose to organise themselves to make decisions about important issues (such as environmental protection, use of fishery resources)” (Armitage et al., 2017, p. 2). In Canada, oceans governance largely falls upon DFO, which has primary authority in policy-making for the country’s 200-mile exclusive economic zone (McDorman & Chircop, 2012). As such, DFO has central authority over MPA implementation and management under the *Oceans Act* (1996), in addition to all fisheries within Canada’s exclusive economic zone under the *Fisheries Act* (1985). The Bay of Fundy is one of three planning areas within the jurisdiction of DFO Maritimes, where the Oceans and Coastal Management Division is responsible for MPA planning and management (DFO, 2014b). This division works to implement the first two priorities of the Regional Oceans Plan (DFO, 2014c), which are (1) the development of a regional MPA network, and (2) MPA establishment, management, and monitoring. These priorities are guided by management plans and advisory committees (see section 3.2.1 for Musquash MPA) (DFO, 2014b).

Other actors are involved in MPA governance to a lesser degree within the Bay of Fundy. Provinces have jurisdiction over public lands adjacent to MPAs as well as intertidal areas. Further, there has been some uncertainty as to who has legislative authority over harbours, bays, and inlets in the Bay of Fundy, resulting in several cooperative arrangements between the provinces and the federal government (McDorman & Chircop, 2012). While the NB DAAF does not have direct management authority over fisheries, it works to foster market demand, innovation, and sustainability in the sector, through its focus on post-harvesting aspects of fisheries (DAAF, 2014, 2017a). Thus, the department has an interest in MPA outcomes insofar as they may affect the growth of the sector. Other federal departments exercise authority over different aspects of oceans governance (i.e., Environment and Climate Change Canada, Transport Canada, Natural Resource Canada, and Parks Canada), and legislation under their authority still applies within the boundaries of MPAs.

In terms of implementing MPAs, DFO Maritimes is working under the respective 2017 and 2020 federal mandate timelines to increase MPAs within their jurisdiction (Section 1.3.1). Implementation is guided by policy, including *Canada’s Federal Marine Protected Areas Strategy* (DFO, 2005) and the *National Framework for Canada’s Network of Marine Protected Areas* (DFO, 2011). The initial focus for inshore protection is based on EBSAs (DFO, 2017d). These are “areas that have been identified through a formal assessment as having special biological or ecological significance when compared with the surrounding

marine ecosystem.” (DFO, 2014b, p. 27). Several EBSAs have been identified within the Bay of Fundy (Figure 3.5), based on a set of ecological criteria (DFO, 2014a). Essentially, pre-identified EBSAs make up a shortlist of ‘candidates’ for consideration as MPAs. However, DFO Maritimes has been clear that not all EBSAs will become MPAs, nor will they represent exact boundaries of potential MPAs (DFO, 2014a, 2017d). Further, they state that “every effort will be made to select areas of high ecological value, while also minimizing potential economic impacts” (DFO, 2017d). A draft network plan for the Maritimes region is expected to be released by the end of 2017.



**Figure 3.5 Map of EBSAs in the Scotia-Fundy region (adapted from DFO, 2017d).** The red box identifies the Outer Quoddy EBSA (no. 46).

In terms of design, MPA regulations are determined on a case-by-case basis. They generally include an overarching prohibition on all human activities that disturb the ecosystem, followed by a list of exceptions. Exceptions are specific human activities which are exempted from the overarching prohibition. Certain activities are also enabled through Activity Plans, which must be approved by DFO.

Other legislation, such as the *Fisheries Act*, is still applicable within MPAs. For example, fishery regulations such as limited-entry licensing and other resource allocation and conservation regulations still apply (e.g., quotas, gear specifications) (Parsons, 2010).

There are existing mechanisms for the participation and representation of fishers in decision-making related to marine resources, which may be used in MPA processes. For example, the Scotia-Fundy Fishing Sector Roundtable is the main body for discussion between the government and the fishing industry (DFO, 2014b), and fishers also participate in management committees for each commercial fishery (Wiber et al., 2012). During 2017, DFO Maritimes invited public feedback on EBSAs using an online form (DFO, 2017d). However, targeted consultations are also expected to occur with the fishing industry given the principles of consultation and collaboration with stakeholders in relevant guiding policy (DFO, 2005, 2011). Additionally, the Fundy North Fishermen's Association (hereafter "Fundy North") represents inshore fishers in SWNB and acts as a liaison between fishers and the government. The mission of Fundy North is "to support fishermen, promote healthy fisheries, and encourage viable fishing communities in Southwestern New Brunswick" (Fundy North, 2017), and as such, represents fishers in SWNB on MPA issues.

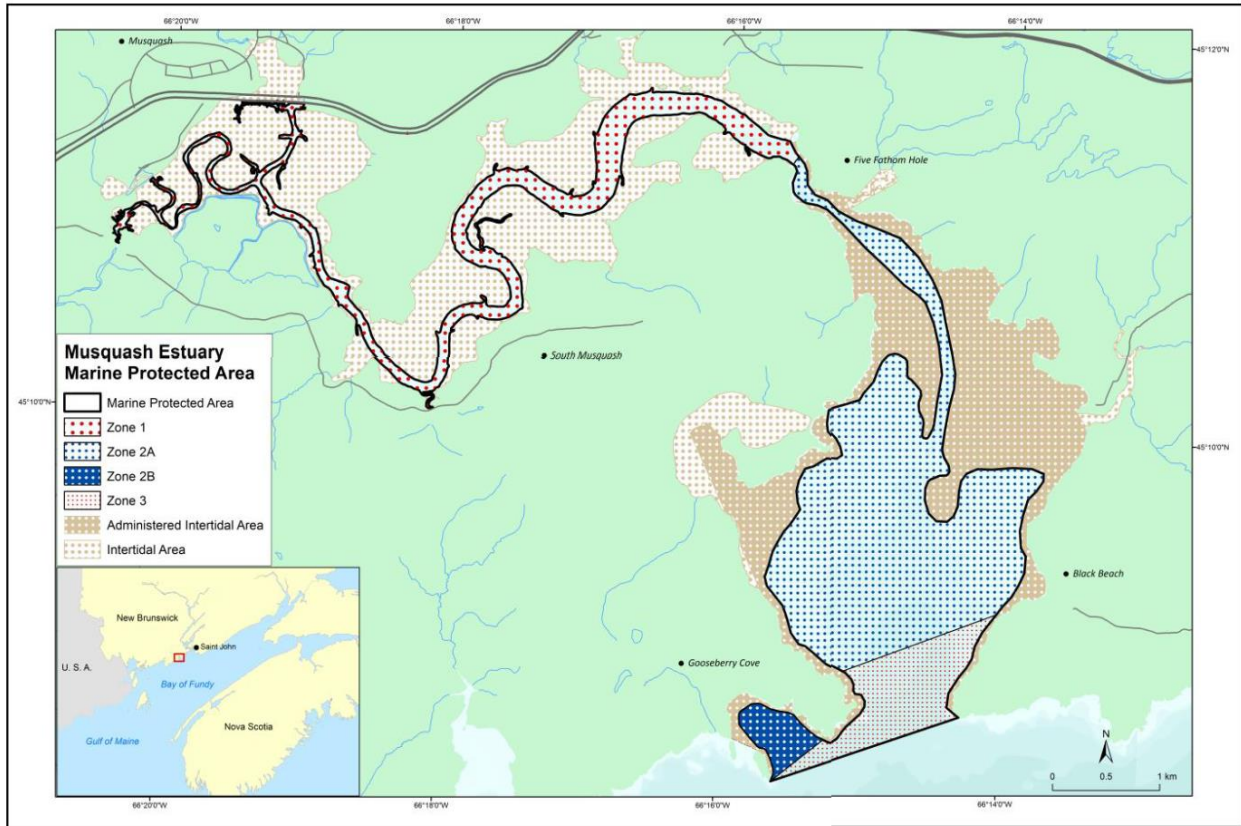
## **3.2 Embedded Cases**

In the previous section, I provided an overview of the ecological, social, and governance contexts relevant to SEWB and MPAs in SWNB. The purpose of this section is to describe the two embedded cases of the Musquash Estuary MPA and the Outer Quoddy EBSA in greater detail. The reasoning for selecting these cases is provided in Section 4.1.1. Briefly, the Musquash case study was chosen out of all MPAs in Atlantic Canada based on a set of criteria: theoretical (e.g., likelihood of addressing literature gaps), methodological (e.g., proximity to coastal community), logistical (e.g., appropriate scope), and relevance (e.g., social traction). Once I was in the field, I selected the Outer Quoddy EBSA based on the same criteria, but with the additional assistance of local experts.

### **3.2.1 Musquash Estuary Marine Protected Area**

The Musquash Estuary MPA was designated in 2006 to protect one of the last remaining ecologically intact salt marsh-estuary systems in the Bay of Fundy (Cooper, Curran, Singh, Chang, & Page, 2011). The MPA covers an area of 7.4 km<sup>2</sup>, approximately 20 km southwest of Saint John, where it drains the Musquash watershed into the Bay of Fundy (DFO, 2008) (Figure 3.6). The conservation objectives of the MPA are to protect habitat, biodiversity, and productivity within eight distinct ecosystem types found at

Musquash (Cooper et al., 2011; DFO, 2008). These include rocky shores, tidal flats, and salt marsh, and support a wide range of plankton, invertebrates, plants, fish, and rare birds (Cooper et al., 2011). In addition to the MPA, there are special conservation arrangements for much of the surrounding watershed at Musquash. In 2010, approximately 80% of surrounding land was under conservation ownership, and significant watershed lands are protected as Class II under the NB *Protected Natural Areas Act* (2002) to protect source water for the city of Saint John (DFO, 2008).



**Figure 3.6 Musquash Estuary MPA (Cooper et al., 2014)**

The designation process at Musquash began in 1998 when the Conservation Council of New Brunswick proposed the area as an MPA to DFO, with the support of Fundy North (DFO, 2008). A variety of stakeholders were engaged during the planning process, including DFO, the government of NB, the Conservation Council of NB, Fundy North, environmental non-governmental organizations (ENGOS), First Nations, and the non-profit Friends of Musquash Inc. group of local landowners and community members (DFO, 2008). Some of these community members were frustrated by the slow designation process (Sheppard, 2004), as the estuary became an Area of Interest in 2000 and was only designated as an MPA in 2006 (DFO, 2008).



There are various human uses of marine space and land in the Musquash area. There is relatively little fishing effort at the MPA relative to other areas of SWNB (e.g., Figure 3.7), with approximately 12 and five vessels fishing lobster and scallop within the MPA respectively, in addition to five to seven fishing vessels using Five Fathom Wharf in Zone 2A of the MPA (DFO, 2008). Fishing activity is greater in areas adjacent to the MPA, particularly by fishers based from other wharves along the adjacent shoreline from Dipper Harbour to Lorneville (Figure 4.1, Section 4.3.3.1). The surrounding land is used mostly by rural residents of the Musquash Parish, with several small communities forming a population of 1194 (Statistics Canada, 2017).

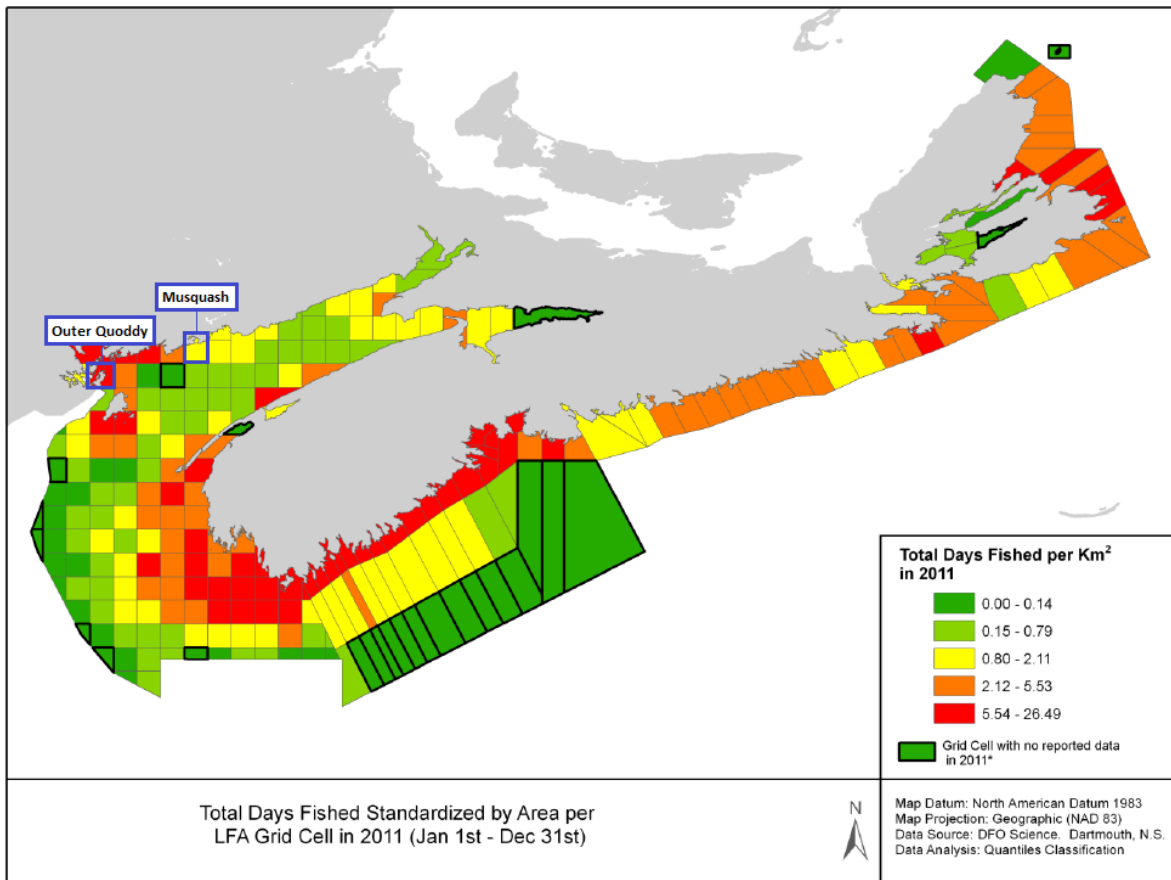
Allowable human activities within the MPA are stipulated by the *Musquash Estuary Marine Protected Area Regulations* (2006). These regulations state that no person may “disturb, damage or destroy, or remove from the Area, any living marine organism or any part of its habitat” or “carry out any activity...that is likely to result in the disturbance, damage, destruction or removal of a living marine organism or any part of its habitat” (Section 3). However, a set of exceptions follows, and specifies that the following commercial fisheries are allowed within particular zones, and by specific means: lobster, scallop, herring, clam, elver, dulse, and Aboriginal fisheries (DFO, 2008) (Appendix A). Further, commercial tourism, scientific research, and educational activities are permissible, subject to approval of an activity plan (DFO, 2008).

Management of the MPA is delineated by the Musquash management plan (DFO, 2008). A series of monitoring and management reviews have been conducted to assess ecological and governance indicators against MPA objectives (DFO, 2015b, 2015c). However, a systematic monitoring plan is still being developed (DFO, 2015c). DFO also states that short-term management measures (e.g., temporary fishery closures, stronger enforcement) and longer-term policy changes may be introduced if it is found that the MPA is not meeting its objectives (DFO, 2008).

The management plan also emphasizes the importance of ongoing community participation in decision-making. DFO manages in collaboration with the Musquash MPA Advisory Committee which provides stakeholders an opportunity for input into decision-making (DFO, 2008). The committee was established in 2002, and meets biannually to advise DFO on matters of MPA management, however it has no regulatory authority (DFO, 2008). Its membership primarily includes those stakeholders who were involved in the designation process (DFO, 2008). In addition to the advisory committee, there have been several community-based outreach efforts to enhance community understanding of the MPA and its rules, such as brochures, signage, and school visits (DFO, 2015c).

### 3.2.2 Outer Quoddy Ecologically and Biologically Significant Area

The Outer Quoddy region of SWNB is an archipelago of approximately 40 small islands, located between Deer Island, Campobello Island, and the community of L'Etete on the mainland (Parks Canada & Tourism NB, 1983). Outer Quoddy has been identified as an EBSA in the Bay of Fundy, under the name “Head Harbour, West Isles, the Passages” (Figure 3.5) (DFO, 2014a). It is the only EBSA in the Bay of Fundy which meets all DFO and Convention on Biological Diversity criteria for EBSA designation. Outer Quoddy is ecologically unique, with the highest biodiversity in Bay of Fundy (DFO, 2014a). Its extreme productivity draws in hosts of feeding, breeding, and migrating species, including sponges, fish, marine mammals, and birds (DFO, 2014a). The aggregation of marine life in Outer Quoddy also attracts a multitude of human activities, including commercial fishing, aquaculture, ferries, tourism, and recreation. Compared to the Musquash MPA, Outer Quoddy has a much higher concentration of commercial fishing effort (Figure 3.7). Lobster, scallop, herring, sea urchin, and sea cucumber are all harvested, but there are concerns that fishing and other human activities are degrading ecological conditions within the EBSA (DFO, 2014a).



**Figure 3.7 Map of total days fished per Lobster Fishing Area in the Maritimes region (adapted from Coffen-Smout, Shervill, Sam, Denton, & Tremblay, 2013).** The blue boxes indicate the corresponding grid cells for Outer Quoddy and Musquash.

For the Outer Quoddy case, I conducted interviews in the surrounding communities of Deer Island and Campobello Island. Both islands are rural communities, with respective populations of 797 and 872 (Statistics Canada, 2017). They are both strongly dependent on inshore fisheries and aquaculture. Despite these similarities, Deer Island and Campobello Island are distinct communities. They are traditionally known for different fisheries (herring and groundfish, respectively), and have different circumstances influencing community dynamics. For example, Deer Island is home to Paturel International, an international corporate lobster processing plant that employs many foreign workers. A year-round government ferry also serves the island. In contrast, Campobello Island can only be accessed year-round by a bridge from Lubec, Maine, as private ferry service is seasonal. Thus, residents of Campobello Island are strongly tied to the economy of the United States.

In the past, the Outer Quoddy region has been recommended for marine protection (e.g., DFO, 2014a; Parks Canada & Tourism NB, 1983; Sheppard, 2004). In 1978, the West Isles National Marine Park Feasibility Study was launched by Parks Canada to determine the feasibility of a marine park in the Outer Quoddy region (Parks Canada & Tourism NB, 1983). Despite being deemed ‘technically feasible’ (Parks Canada & Tourism NB, 1985), Parks Canada was unable to garner local support to establish the park, and the “experience was characterized by a lack of trust and community participation in the early years” (Walters & Butler, 1995, p. 209). Community members expressed concerns about the impact of a park on the inshore fishery and local lifestyle, and suspected that Parks Canada was not being transparent about intentions to bolster tourism rather than conserve the marine environment (Sheppard, 2005). There was also a lack of confidence in the ability of the government to work together with local communities (Parks Canada & Tourism NB, 1985). Ultimately, the process was divisive among community members, and as a result, there is a negative lasting impression of government marine conservation initiatives in the region (Sheppard, 2004).

### **3.3 Chapter Summary**

In this chapter, I provided an overview of the case study context of SWNB to provide the necessary information so that fishers’ perceptions of SEWB and consequent MPA governance implications may be understood in Chapters 5 and 6, respectively. The coastal regions of SWNB border the Bay of Fundy, which is a highly dynamic body of water characterized by extreme tidal ranges. The focus of my research is the inshore commercial fishery, which continues to be both economically and culturally important in the region. However, there are a multitude of other human activities in SWNB (e.g., aquaculture, oil-

related activities) which contribute to the economy but also add pressure to the ecological subsystem of the bay.

DFO Maritimes is responsible for implementing and managing MPAs in the Bay of Fundy, although mechanisms exist for stakeholder (e.g., fisher) participation in MPA governance. DFO Maritimes is currently working under the federal mandate to increase areas under protection to 10% by 2020. Initially, they are looking at EBSAs for initial areas of consideration for new MPAs. As such, two embedded cases were selected for closer examination in this research: the Musquash Estuary MPA and the Outer Quoddy EBSA. Musquash was designated in 2006 to protect the last intact salt marsh in the Bay of Fundy. Its regulations stipulate that most fishing activities are allowed to continue within its boundaries, by zone. The Outer Quoddy EBSA is significant due to its unique and productive ecosystem, and the area has been proposed for marine conservation initiatives in the past. In the following chapter, I provide the research design for this thesis, and describe the methods that were used at each of these embedded cases to assess perceptions of SEWB and MPAs for the inshore fishing community of SWNB.

## Chapter 4: Research Design

The purpose of this chapter is to describe my research design. The chapter begins with an overview of the qualitative case study methodological approach taken in this research (Section 4.1) and the case study selection process (Section 4.2). Next, I describe the research methods (Section 4.3) and data analysis methods (Section 4.4) that I employed to address the research questions introduced in Section 1.2. Finally, I discuss limitations and assumptions of this research (Section 4.5).

### 4.1 Methodology

This research applies an inductive qualitative case study approach to examine the relationship between marine protected areas and social-ecological wellbeing (Section 2.4) in the inshore fishing community of Southwest New Brunswick. A case study may be defined as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (Yin, 2013a, p. 13). In other words, it is a methodology that involves studying a topic within a bounded system, and often involves data collection from several sources (Creswell, 2007). This approach emphasizes that the phenomenon may be strongly associated with the context of the case, and as such, that it should not be separated from its context when being studied (Yin, 2013a). Rather than generalizability, case studies embrace complexity and allow for a holistic and deep understanding when examining social phenomena by focusing on ‘how’ and ‘why’ questions (Yin, 2013a).

These characteristics are useful when proposing governance insights for MPA effectiveness (Chapter 6) given the recognition that incorporating contextual factors into MPA governance enhances the likelihood of MPA success (Section 2.1.2). Indeed, examining the SWNB case study in-depth recognizes the importance of local context, and is well-suited to address all three ‘how’ questions of this research (Section 1.2). More broadly, qualitative research is particularly appropriate when the purpose of research is to understand the perceptions, experiences, and meanings that participants attribute to the research topic (Richards & Morse, 2013). As such, a qualitative case study is an appropriate methodological approach for eliciting perceptions about the relationship between MPAs and SEWB (Chapter 5) and describing governance implications of that relationship (Chapter 6).

An inductive approach is a bottom-up approach “in which questions, insights, propositions, and pictures emerge from the data collection” (Rowley, 2002, p. 18). In contrast, a deductive approach tests a pre-determined theory to see whether it is verified by data collection (Creswell, 2009). Inductive approaches

are not very prescriptive during early research stages because the researcher learns throughout the data collection process, and makes adjustments iteratively based on this learning (Creswell, 2007). With respect to wellbeing research in particular,

research that seeks to uncover people’s *emic*, or personally held cognitive models of well-being and ecosystem health, will help both scientists and policymakers to better understand the place-based nature of these phenomena. Such work may also illuminate new and promising strategies for intervention on social and environmental problems. (Loring et al., 2016, p. 155)

Therefore, I have chosen an inductive approach to strengthen the relevance of my research to the inshore fishing community of SWNB, by allowing them to define what wellbeing means to them, and to reduce the likelihood of missing important issues by providing participants with opportunities to raise and elaborate on issues that are relevant to the research questions. As suggested by Loring et al. (2016), this strategy may be useful for identifying intervention points to enhance the outcomes of MPAs in terms of both SEWB and MPA effectiveness.

#### 4.2 Case Selection

There are a variety of factors to be considered in the process of selecting a case, such as representativeness, theoretical contributions, and practical considerations (Seawright & Gerring, 2008). Case selection can be challenging, as relatively little may be known about the case details before it has been studied (Yin, 2003b). I developed a set of selection criteria to compare across candidate case studies and purposefully select the most appropriate case study (Table 4.1). Candidate case studies included all National Marine Conservation Areas and *Oceans Act* MPAs in Atlantic Canada due to my desire to explore the influence of an existing MPA on coastal communities.

**Table 4.1 Case study selection criteria**

<p>Theoretical</p> <ul style="list-style-type: none"> <li>• Likelihood of addressing literature gaps</li> <li>• Year of MPA designation†</li> </ul>	<p>Logistical</p> <ul style="list-style-type: none"> <li>• Number and availability of prospective participants</li> <li>• Accessibility of case</li> <li>• Appropriate scope</li> <li>• Availability of existing documents and data</li> </ul>
<p>Methodological</p> <ul style="list-style-type: none"> <li>• Proximity to local coastal community</li> <li>• Level of ongoing vs. restricted human activities</li> <li>• Representativeness</li> </ul>	<p>Relevance</p> <ul style="list-style-type: none"> <li>• Social or political traction</li> <li>• Purpose of MPA or EBSA designation</li> </ul>

†MPAs >10 years old are more likely to yield conservation outcomes (Edgar et al., 2014); Musquash only

I engaged in scoping activities to compare criteria across cases, including literature and document review, and liaising with experts such as officials from Fisheries and Oceans Canada, and academics with experience at selected sites. Ultimately, the Musquash MPA was identified as the best candidate. During the scoping phase of my research (Section 4.3.2), I became more familiar with the region because I attended local events, visited field locations, and liaised with local experts. As such, I was in a better position to apply the criteria to select an EBSA as a second embedded case. The Outer Quoddy Ecologically and Biologically Significant Area aligned best with these criteria as a case to explore informal scenarios about the potential implications of MPA network planning on the local community (Section 4.3.3.2).

### **4.3 Research Methods**

The purpose of this section is to describe the research methods I employed for data collection, including literature and document review, observations, semi-structured interviews, and visioning focus groups. All field components of these methods were carried out between June and November 2016.

#### **4.3.1 Literature and Document Review**

An in-depth literature review was conducted to gain a broader understanding of the relationship between MPAs and wellbeing, to identify research gaps, and to formulate research questions (Chapter 2). Literature included peer-reviewed academic literature, legislation, policy, media coverage, and reports by government, NGO, industry, and multi-stakeholder committees. I also used locally-relevant literature and documents (e.g., place-based scientific reports and policy documents) to gain a better understanding of the case study context, and to ensure the appropriateness of my research questions and methods.

#### **4.3.2 Observations**

Early stages of fieldwork were used for scoping and observations to familiarize myself with the case study context and to gauge the appropriateness of pre-planned research methods. This stage was critical, as I had limited familiarity with the region and Atlantic fisheries prior to arriving in NB, aside from information that was available from the literature. Informally, I profiled the region by attending relevant events, visiting field locations, and consulting with local centres of knowledge (e.g., Fundy North). Further, I engaged in many informal conversations with stakeholders and other resources users to learn about the region, establish trust, and build rapport (Bolderston, 2012). Building trust with the fishing community in Atlantic Canada has been reported in the literature as a critical element in reducing

response bias and improving the willingness of fishers to participate openly in research processes (e.g., Carruthers & Neis, 2011).

Observations were made throughout all stages of data collection. I made observations during interviews and focus groups, in addition to my travels throughout the case study region. Where feasible, I sought opportunities for further observations, such as spending time on wharves, touring a fish processing plant, and hiking on the Musquash trails. I also undertook participant observation for contextualization and learning, with deliberate consideration of the potential for biases when directly involved in an activity (Yin, 2013a). For example, I participated in a beach cleanup at Musquash, went herring and lobster fishing, and participated in ecotourism operations including sea kayaking and whale-watching.

I recorded all observations and reflections in a research journal. Where appropriate, photos and videos were also recorded. The purpose of continued observations and documentation was to continue to contextualize my research, triangulate other sources of data, reveal insights that participants may have been unable to disclose (Creswell, 2009), and to track the rationale behind my decision-making. I referred back to previous journal entries frequently, which promoted important reflections that influenced how I proceeded in certain cases. For example, my initial plan was to conduct focus groups based on participatory mapping. However, I re-designed focus groups to conduct visioning focus groups (Section 4.3.4) based on a series of previous reflections in my journal. I wrote three personal reflections questioning the appropriateness of participatory mapping (July 5, 12, 23), and also documented advice from local individuals regarding mapping in three occasions (June 9, August 12, 24). The journal also helped me keep track of data saturation (Section 4.3.3.1). On August 15, I wrote, “I’m starting to hear more of the same names from fishermen during recruitment at [Deer Island] and Musquash,” and later on September 7, I wrote, “Even on [Campobello] I’m starting to notice that I’m hearing the same things from participant to participant.”

### **4.3.3 Semi-Structured Interviews**

Interviews focus on understanding issues as perceived by those involved (Bolderston, 2012; Creswell, 2009), thereby providing a method for assessing the perceptions of stakeholders on the relationship between wellbeing and MPAs. Specifically, semi-structured interviews follow a set of key questions, but allow the interviewer to explore emergent topics and change the wording of questions depending on the situation with each participant (Bolderston, 2012). As such, they are useful when trying to understand the meaning behind perceptions (Grindsted, 2005). In comparison to other methods for eliciting perceptions (e.g., surveys), semi-structured interviews allow for depth and flexibility, yet they are structured enough



to provide a level of consistency and comparability across interviews (Rowley, 2012) and to stay within the scope of research. Despite some degree of qualitative comparability, semi-structured interviews are less comparable than structured interviews or questionnaires. For example, emergent topics may have only been ‘top-of-mind’ for certain participants based on specific interview or personal circumstances, making quantitative comparisons less useful.

I conducted semi-structured interviews with 49 participants, including fishers and other key informants. My interview design was based on methods outlined by Britton & Coulthard (2013). The authors adapted the Wellbeing in Developing Countries methodology to survey the three dimensions of social wellbeing of fishers in Ireland. These methods include a profile of household resources, as well as interviews that assess importance of relationships and other subjective quality of life measures of individuals. Britton & Coulthard concluded that their methods were “equally applicable and relevant to other developed country contexts” (2013, p. 36). However, while I adapted them for my purposes (i.e., to be administered as semi-structured interviews, where participants self-identified wellbeing attributes), I also added questions about ecological resilience. Since fishers are well-suited to identify attributes of resilience, I used the literature on these attributes to guide how I formulated questions about ecological resilience (Section 2.3.1). Broadly, interviews were designed to explore definitions and views of SEWB in the inshore fishing community, and subsequent links to benefits and costs of MPAs.

#### ***4.3.3.1 Sampling and Recruitment***

When I first arrived in the region, I was initially unfamiliar with prospective participants. Further, I required a finer geographical scale of fishers’ locations than was available on information that could be provided by DFO or Fundy North. I therefore employed snowball sampling as the most practical sampling method, relying on an initial small sample of participants to identify others who would be appropriate for participation (Koerber & McMichael, 2008). Snowball sampling is a process whereby participants refer a researcher to potential other participants, who then refer the researcher to more potential participants (and so on) (Noy, 2008). In this research, I also found that snowball sampling improved trust and willingness to participate through the referral of existing acquaintances, in contrast to the prospect of ‘cold-calling’ on wharves.

My initial sample was identified by attending the Bay of Fundy Ecosystem Partnership Biennial Workshop from June 9 to 11, 2016 in Fredericton, NB. The individuals that participated in this workshop assisted me in identifying other fishers and key informants (e.g., ENGO representatives), from which point I began snowball sampling. In most cases, I contacted prospective participants directly to schedule

interviews. On limited occasions, it was more appropriate for prospective participants to be contacted by previous participants on my behalf and to provide them with my contact details.

Ideally, sampling and recruitment should continue until the point of data saturation, when no new findings or themes emerge from consecutive interviews (Francis et al., 2010). This was not possible at the Musquash MPA because there were too few available participants to be able to confidently establish saturation, given relatively low fishing activity in the region. However, similar themes did emerge from interviews with fishers. Saturation was achieved at the Outer Quoddy EBSA, however, as the same themes were emerging from interviews with key informants and fishers towards the end of sampling. Further, snowball sampling started to yield the same names of prospective participants and therefore, I stopped recruiting further participants. In total, I interviewed 27 fishers within an age range of 22 to 80, all of whom identified as male (Table 4.2). I interviewed 22 non-fisher key informants who identified as female or male (13 and 9 respectively), representing government (DFO and NB Department of Agriculture, Aquaculture and Fisheries), industry (fisheries, aquaculture, and tourism), First Nations, ENGOs, and local advisory committees related to marine resources in SWNB (Table 4.3).

**Table 4.2 Number of fisher participants by age range and location**

Age†	18 – 39	40 – 64	65 +	Undisclosed	Total
Musquash	1	6	2	-	9
Outer Quoddy	3	9	5	1	18

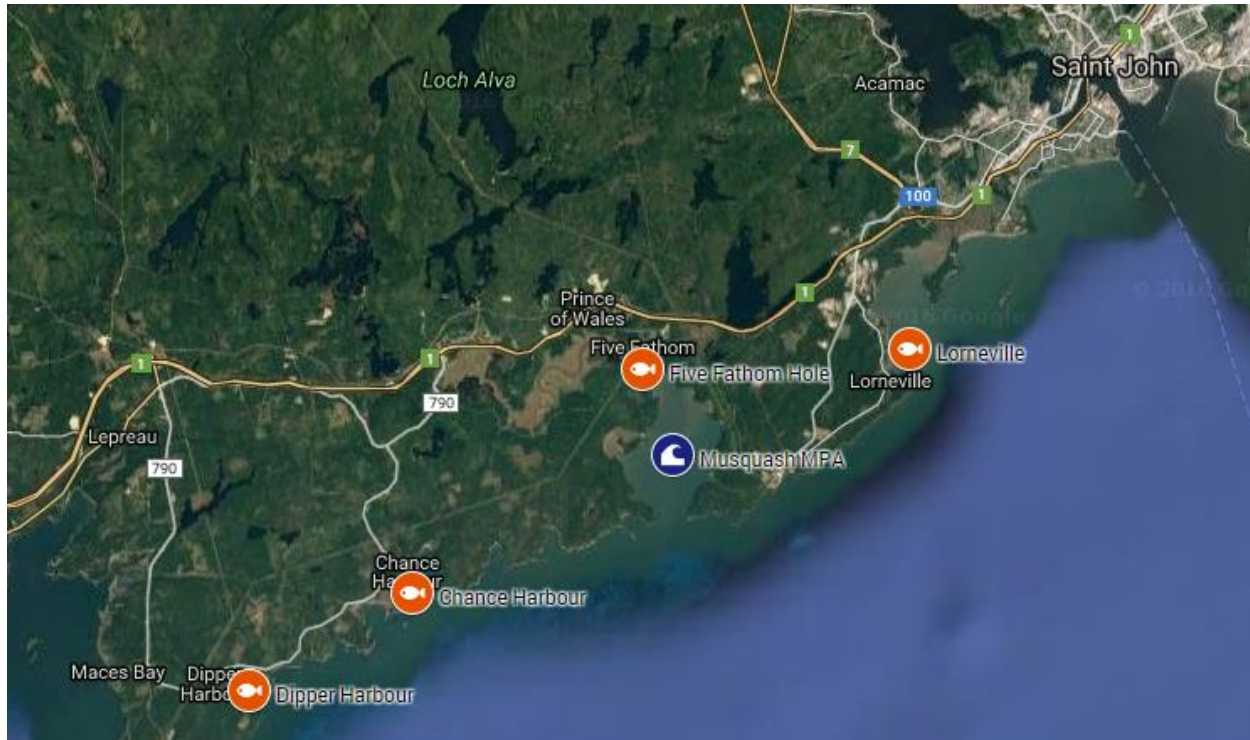
†as of December 31, 2016

**Table 4.3 Number of non-fisher key informants by sector and location**

Sector	Government	Industry	First Nations	ENGO	Advisory committees	Total
Musquash	-	-	-	1	3	4
Outer Quoddy	-	3	1	-	2	6
Both	4	5	-	3	-	12

To meet selection criteria, fishers were required to have previously fished, or to currently be fishing, within or adjacent to the respective case designation boundaries (i.e., the Musquash MPA, or the Outer Quoddy EBSA). Adjacent locations were included as possible ‘zones of influence’, given the potential for MPAs to yield spillover effects (e.g., Halpern, Lester, & Kellner, 2010; Harmelin-Vivien et al., 2008). Relevant adjacent areas were determined using fishers’ knowledge, as fishers were able to identify locations in which their wellbeing could foreseeably be influenced by the respective MPA or EBSA. Fishers generally identified these locations based on wharves, given their tendency to fish close to home (Walters, 2007).

Fishers were sub-categorized as either a fisher at the Musquash MPA or at the Outer Quoddy EBSA. At the Musquash MPA, this included fishers using wharves along the coast from Dipper Harbour to Lorneville (Figure 4.1), and for the Outer Quoddy EBSA it included those who fished from all wharves on Deer Island and Campobello Island. Non-fisher key informants were participants of current or past official positions giving them authority, expertise, or access to information about MPAs at either Musquash, Outer Quoddy, or both locations.



**Figure 4.1** Map of wharves from Dipper Harbour to Lorneville (adapted from Google Maps, 2016). Wharves are indicated with orange fish icons, and were used to categorize fishers at the Musquash case.

#### **4.3.3.2 Interview Procedure**

A total of 49 interviews were conducted between June and November 2016. An interview protocol (Appendix B) was used to ensure a degree of consistency across primary and follow-up questions (Bolderston, 2012). The general format of interviews consisted of first asking background questions about the participant and their relationship to the ocean, and then eliciting variables that contribute to each dimension of SEWB (Section 2.4). Specifically, SEWB was explored using the following prompts: threats to environmental quality in the Bay of Fundy and things that help the environment cope or buffer with these treats (i.e., ecological resilience), access to materials and natural resources (i.e., material wellbeing), relationships that influence quality of life (i.e., relational wellbeing), and subjective requirements in order to have a good quality of life (i.e., subjective wellbeing). Participants were asked to

define their own attributes for each dimension to maintain an inductive approach. This helped to ensure locally relevant conceptualizations of wellbeing (Woodhouse et al., 2015), and to avoid arbitrarily selecting attributes from the literature (Povey et al., 2016). Next, depending on the embedded case, participants were asked about (1) how the Musquash MPA had influenced those variables, or (2) the potential for an MPA at the Outer Quoddy EBSA to influence those variables.

In most cases, one-on-one in-person interviews were conducted at mutually agreed upon locations such as participants' homes and offices, wharves, and libraries. However, I conducted one phone and one email interview based on participant availability. At times during one-on-one interviews, up to one non-participant member of the household was in attendance (e.g., a family member in the home). Further, two interviews were conducted with two participants simultaneously as they were members of the same household or organization. Consent for audio-recording was received in 45 cases. For the remaining four interviews, hand-written notes were taken and typed as soon as possible following the interview. During and after all interviews, observational notes were recorded.

#### **4.3.4 Visioning Focus Groups**

I also conducted focus groups which applied the principles of sustainability visioning to elicit wellbeing priorities. Sustainability visioning is an emerging methodology which integrates participatory visioning with sustainability principles to achieve more holistic, systemic, and sustainable outcomes (e.g., Chitakira, Torquebiau, & Ferguson, 2012; Hara, Kumazawa, Kimura, & Tsuda, 2016; Kallis, Hatzilacou, Mexa, Coccossis, & Svoronou, 2009). Often, it entails a visioning component, or a “process of creating... a representation of a desirable future state” (Wiek & Iwaniec, 2014, p. 497), in addition to a planning or strategizing component in order to formulate a plan to attain that state (Kallis et al., 2009). Participatory visioning has widely been used in urban planning (e.g., City of Saint John, 2007; Downtown Vancouver Business Improvement Association, 2015) in order to create shared visions as reference points for planning and policy processes, while simultaneously empowering participants through ownership and accountability (Wiek & Iwaniec, 2014). Visioning is based on the assumption that deliberate and innovative change is more strongly motivated by pull factors towards what is desirable, as opposed incremental or reactive change (Gaffakin & Sterrett, 2006; Kallis et al., 2009).

Sustainability visioning is a relevant tool for exploring the interplay between marine conservation measures and SEWB in fishing communities of SWNB, as it encourages participants to identify and rank their priorities for enhancing SEWB. It can also generate a rich discussion about *why* elements of the vision are relevant, as elements may be influenced by various marine planning and conservation contexts

(including MPAs). Further, participatory visioning has been shown to build capacity and foster mutual learning for those engaged in the process (Hara et al., 2016; Iwaniec & Wiek, 2014).

I designed focus groups for my research to align with sustainability visioning criteria and guidelines established by Wiek & Iwaniec (2014) (Box 4.1). A focus group is a data collection method whereby a researcher identifies a topic for discussion among a group of participants (Morgan, 1996). Data is collected in the form of transcripts and observations of interactions between participants (Morgan, 1996). The purpose of my focus groups was threefold: (1) to address research questions, particularly the third sub-question related to MPA governance (Section 1.2), by using vision priorities to inform ideal marine conservation options for supporting SEWB, (2) to explore emergent themes from the first phase of interviews, and (3) to provide an opportunity for fishers to express their voices through a process of mutual learning and capacity-building. While the focus groups provided useful input for decision-making processes, the primary intention of the visioning workshops was not to create a plan for action or integration into policy processes.

**Box 4.1 Visioning criteria and methodological guidelines (Wiek & Iwaniec 2014)**

<b>Criteria</b>	Visionary Sustainable Systemic Coherent	Plausible Tangible Relevant Nuanced	Motivational Shared
<b>Methodological Guidelines</b>	Meaningful sequence Iterative procedure	Creativity techniques Visualization techniques	Participatory settings

#### ***4.3.4.1 Sampling and Recruitment***

Focus group recruitment began after all interviews with fishers had been conducted. I attempted to contact all fishers who had been identified through previous snowball sampling for focus group recruitment in order to maximize the total sample number and reduce possible biases. Telephone calls were made to fishers to determine their interest and availability in participating, and I attempted to compose groups of three to five participants. Participants were grouped based on case location. For Outer Quoddy, groups were further subdivided by the region of their home wharf, and age ranges (Table 4.4). Homogenous groupings were sought based on local advice that fishers were more likely to participate in group settings in their home communities, and to explore potential differing opinions between fishers at different locations and of different ages. For example, age has been associated with different fishing patterns in the region (Walters, 2007), and younger fishers now face higher entry costs than their predecessors did (Canadian Independent Fish Harvester’s Federation, 2016). A total of 13 fishers participated in four focus groups.

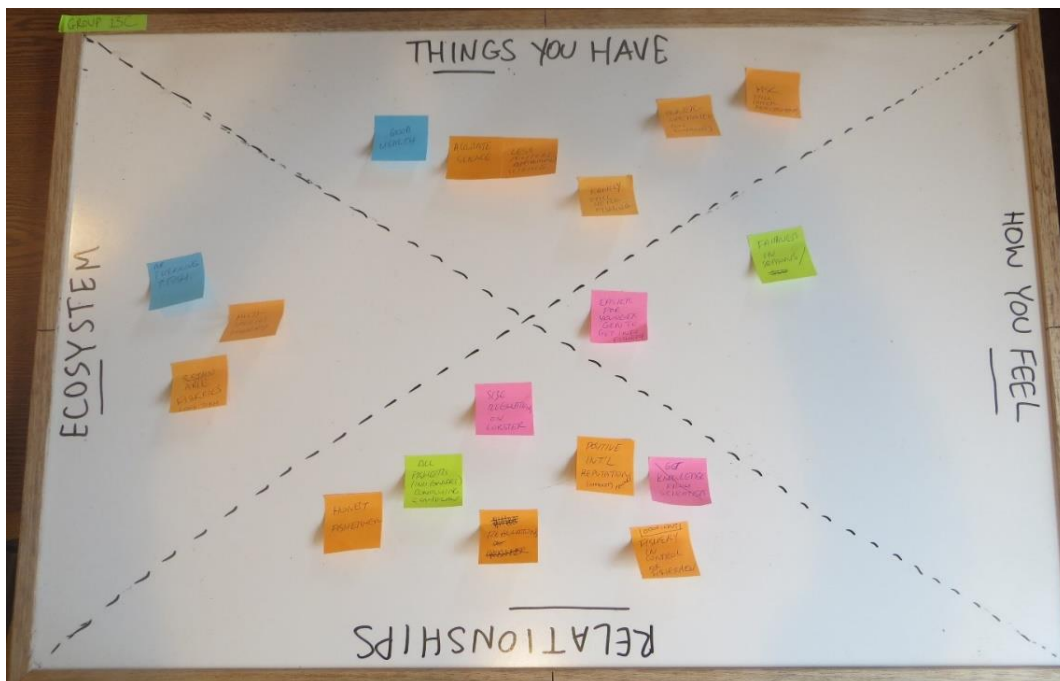
**Table 4.4 Summary of participants in focus groups**

Focus Group	Location	Home Wharf Region	Participant Age Category†	Sample Size (n)
1	Musquash	n/a	≥40	3
2	Outer Quoddy – Deer Island	Deer Island	≥40	5
3	Outer Quoddy – Deer Island	Deer Island	18-39	2
4	Outer Quoddy – Campobello Island	Campobello Island	≥40	3

†as of December 31, 2016

#### 4.3.4.2 Focus Group Procedure

Four focus groups were conducted in September 2016 at respective local community centres to ensure neutral locations. All groups were audio-recorded upon receiving consent from participants, and observational notes were recorded during the meetings. A semi-structured discussion guide was used as a reference (Appendix C). At each focus group, I began with a brief introduction and framing, in which I outlined themes that emerged from interviews and provided an opportunity for participants to comment. Then, I facilitated the visioning exercise using a white board and Post-It notes (Figure 4.2).



**Figure 4.2 Categorization of priority elements into the four dimensions of SEWB (Focus Group 2)**

Visioning entailed three sections. First, participants were to consider their vision for the future that would protect their way of life and the environment (i.e., SEWB). These were expressed on Post-It notes by writing down vision elements (hereafter “priority elements”), or value-based statements about the future

that would be critical to attain the best possible state of wellbeing in the future (e.g., “more fish stocks”). In cases where participants were not able to write down vision elements, I facilitated the process by writing them down. Second, participants categorized each priority element into one of the four domains of SEWB on the white board. I asked them to assign a priority rank from one to five for each element. Third, I posed semi-structured questions to the group to elaborate on vision priorities, and assess aspects of Wiek & Iwaniec’s (2014) visioning criteria as outlined in Box 4.1. The process was iterative, as fishers had the opportunity to modify elements and their importance ranking throughout the focus group.

## **4.4 Data Analysis**

The purpose of this section is to describe how I analyzed interview and focus group data. Analysis was conducted after the field components of this research, between January and August 2017, with a follow up verification trip in October, 2017.

### **4.4.1 Interviews and Focus Group Discussions**

#### ***4.4.1.1 Transcription and Summary***

All audio-recorded interviews and focus group discussions were transcribed in full to reduce selection bias and enhance my familiarization with the data (Rowley, 2012). For discussions that were not audio-recorded, typed notes were used in lieu of full transcripts for subsequent analysis. From the transcripts and notes, I created summaries of all interviews and individuals’ participation in focus groups, which averaged approximately 1000 words, depending on the length of the interview or focus group. I sent these summaries back to all participants with feedback letters (Appendix D), thanking participants and outlining how to revise or clarify my interpretation of their comments. To maintain confidentiality, focus group summaries only disclosed information about the personal participation of the individual fisher receiving the summary, rather than summarizing the focus group as a whole. Summaries were sent to encourage participant involvement in the research process, provide fishers with a tangible record of their participation, and enhance validity of my findings (i.e., member checking). All participants were given three months upon receipt of their summary to contact me with any desired revisions. Overall, 15 participants replied regarding receipt of their summaries, four of whom made clarifications. Clarifying points were added to respective transcripts in square brackets.

#### ***4.4.1.2 Coding***

After transcription and summary, I coded interview and focus group transcripts and notes using NVivo qualitative coding software (QSR International). My coding approach was inductive and iterative. I

created four categories: SEWB in relation to Musquash, SEWB in relation to Outer Quoddy, SEWB priorities (from focus groups), and other. Within each of these categories, I created sub-categories for each domain of SEWB. As I systematically read through transcripts during the first round of coding, I identified emergent codes from the text, and classified them under these categories. Emergent categories included topic codes (i.e., segments of text according to the subject of the text) in addition to analytical codes (i.e., interpretation of segments of text to give meaning within the research context) (Richards, 2009). All text deemed relevant was coded into at least one category. Text was coded based on the subject of the comment, rather than the categorization of the participant. In other words, if a fisher from Outer Quoddy made a comment about Musquash, it was categorized under Musquash.

For the second round of coding, I systematically reviewed all coded text in each category as opposed to re-examining all transcripts. As I did so, I continued to refine coding by (1) moving broadly categorized text into more specific codes that had emerged part-way through the first round of coding, (2) subdividing codes with more than one key concept, and (3) consolidating codes that were redundant. I continued to refine some codes after the second round of coding. Throughout the entire coding process, I modified the coding key and associated descriptions to keep them up-to-date. Codes for SEWB in relation to the Musquash MPA and Outer Quoddy EBSA formed the basis of the perceptions presented in Chapter 5. The SEWB priorities codes were used in Chapter 6 to describe wellbeing priority rankings qualitatively in-text (see Section 4.4.2 for priority ranking analysis). Other codes were used where they provided clarifying information, but otherwise were not applied systematically in this thesis.

#### **4.4.2 Focus Group Wellbeing Priorities**

Wellbeing priorities from focus groups were analyzed quantitatively using the priority rank (from one to five) that was assigned to each priority element (Section 4.3.4.2). First, I compiled all priority elements (52 in total) verbatim into a spreadsheet with each of their corresponding importance rankings. For example, a priority element that was identified in a focus group of five participants would have five corresponding importance rankings (one from each participant). I then calculated the average of these rankings for each priority element. The average was taken rather than the sum to account for any cases where a participant chose not to rank a particular priority element.

Second, I processed data as per Iwanciec & Wiek (2014). This included standardizing priority elements. For example, “shorter ferry ride” and “better ferries” both became “improved ferry service”. I then consolidated redundant priority elements, and took the sum for their rankings. This resulted in 31 total priority elements (Appendix F). Third, I coded priority elements according to the same coding scheme



that was used for interview and focus group transcripts, and took the sum of their rankings, to yield a total of 11 overall wellbeing priorities (i.e., attributes of SEWB) (Figure 6.1, Section 6.1). The purpose of coding was to generate attributes that were directly comparable to interview findings.

#### **4.4.3 Integration of Findings**

In addition to the reasons stated above, the purpose of employing more than one data collection method was for the overarching purpose of triangulation. Often, triangulation is seen as an important component of validity and reliability in qualitative research (e.g., Diefenbach, 2009; Yin, 2013a). I cross-referenced interview and focus group responses with one another, with my research journal (i.e., my observations), and relevant documents. When several sources aligned, this supported validity of my findings. For example, when I reviewed themes that had emerged from individual interviews during the focus groups, participant comments generally supported and strengthened the validity of my findings. In cases where findings varied, these differences were stated in the text in Chapter 5.

White & Pettit (2004) note a tension within the concept of triangulation, as it can also be used to illustrate differences in viewpoints or to see information from different angles. In reporting the breadth of perceptions of the linkages between MPAs and wellbeing, my goal in integrating several research methods was also to explore and explain such differences. Further, I was able to build on earlier methods in order to proceed appropriately with my research. For example, as described in Section 4.3.2, I re-designed focus groups after I had completed the majority of interviews. I was thus able to incorporate feedback I had received during interviews into focus group planning. Overall, findings from the interviews I conducted were my primary data source for reporting participants' perspectives (Chapter 5), which were integrated with focus group data to generate governance insights (Chapter 6). Literature review and observations were used to generate a baseline understanding of the local context, to 'fact-check', and to provide supplementary information for analysis.

#### **4.4.4 Verification Trip**

After analyzing my findings, I conducted a follow-up verification trip to SWNB in October, 2017. During this trip, I presented my research findings to various stakeholders (including both participants in my research as well as non-participants) to assess whether my data interpretation was verified in the local context. Additional purposes for the trip were to bring my results back to the communities that assisted me in my research, and to gain practical insights about the interpretation of my research findings. With the assistance of Fundy North, I presented my findings at a fisher meeting with 16 individuals in St.

George, NB, and facilitated a discussion afterwards. I also presented my findings to nine DFO officials in two separate meetings, as well as one ENGO representative. I found that my research findings and interpretations were still supported by the views expressed by these stakeholders. I used practical insights from the trip to help frame governance implications in Chapter 6. For example, comments made by stakeholders during this trip re-emphasized differing interpretations of ‘consultation’ across stakeholders (Section 6.3).

## **4.5 Limitations and Assumptions**

The purpose of this section is to make research assumptions explicit and to recognize the limitations of my research design.

### **4.5.1 Scope and Generalizability**

The intent of my research design is to yield a rich narrative rather than aim for generalizability, which is reflected in the choice of using semi-structured interviews and focus groups. While it is possible that my research findings will provide useful insights into other cases (Flyvbjerg, 2006; Yin, 2013a), particularly when scaled up to the broader Maritimes region, the direct scope of my research is limited to the geographical and temporal scales of the case study. This case study only focuses on one region of NB, and the embedded cases were selected under the assumption that MPAs will influence adjacent communities most strongly. In reality, the Bay of Fundy is a transboundary system across provinces and states, and MPAs may exert influence over larger geographical regions. As MPA network planning is currently ongoing, participants’ views may evolve over time depending on the stage of planning and other social and ecological variables. Further, the theoretical scope of my research applies but one of many possible conceptualizations of wellbeing, therefore affecting the lens through which the research has been undertaken.

### **4.5.2 Researcher Reflexivity**

My personal position as a researcher undertaking this project also necessarily affects my research outcomes. Personal attributes such as demographics and lived experiences influence access to information shared by participants (Berger, 2015), in addition to the lens through which researchers ask questions and interpret findings (Berger, 2015; Creswell, 2009). During my time in the field, I felt that my personal interactions with participants and other relevant community members were shaped by my identity as a white female early career researcher, particularly given the male-dominance of the participants in my research. I felt that my positionality gave me an advantage in terms of the number of people willing to

speak with me, in addition to the level of depth they afforded me. Chiswell & Wheeler (2016) described a similar experience in which their positions as young female non-farmers were advantageous when interviewing mostly male farmers in their research. They suggested that this was because they were perceived as less threatening than other demographics. However, they noted that these advantages also came with unsolicited comments and actions based on their gender and age. While my time in the field was overwhelmingly positive, I did occasionally have such experiences.

Studying subjects that are personally unfamiliar to the researcher (i.e., being a non-fisher focusing on fishing communities) can be beneficial in creating fresh insights and empowering participants as the experts, however it can also be challenging to ask the ‘right’ questions, catch subtleties (Berger, 2015), and duly interpret findings (Diefenbach, 2009). Indeed, researcher bias may contribute to ‘one-sidedness’ in interview questions and analysis (Diefenbach, 2009). To address these drawbacks, researcher reflexivity can improve data interpretation and cultivate ethical relationships between researchers and participants (Berger, 2015). As suggested by Berger (2015), I maintained reflexivity throughout the research process through continued interaction with participants and ‘insiders’, member checking, triangulation, maintaining a research journal in which I tracked reasoning and emotional reactions, and more broadly “embracing humbly the standpoint of the uninformed and actively seeking guidance and feedback from participants and from peers who are familiar with the study topic and population (‘tell me what I may be missing’)” (p. 231). Further, I am using first-person language in my thesis to be reflexive and to draw attention to my positionality throughout my research.

#### **4.5.3 Sample Representativeness**

The perspectives of who is interviewed are ultimately what get expressed in research findings, leaving out the perspectives of who has not been interviewed (Diefenbach, 2009). My research aims to report on a broad range of perspectives, and purposive sampling may result in samples which do not adequately represent such ranges (Koerber & McMichael, 2008). A common sampling limitation which could reduce representativeness pertains to who is available for participation (Creswell, 2009). In my research, I was unable to recruit some individuals due to inability to make contact with them, or based on their ability and desire to participate. Collecting data in the summer months was ideal for recruiting fishers who were mostly off-season, however it may have limited the participation of other key informants such as tourism operators who were busy in their peak season. As discussed by Francis et al. (2010), there are also challenges in identifying the point of saturation when conducting interviews. For example, there is no clear answer to how many interviews in a row should occur where no new information arises before a researcher can claim saturation.

Further, those who are *not* interviewed are often less powerful voices within existing social structures (Diefenbach, 2009). Particularly with snowball sampling, it is possible that my research inadvertently propagated expression of the ‘loudest voices’ or favoured certain participants based on existing relationships within the community. This risk was likely mitigated in my research given that communities under study were relatively small, however my research clearly reflects a gender gap in fisheries as men are predominantly captains and crews on boats. Despite evidence on the critical role of women in contributing to fishing activities and the wellbeing of fishing communities (e.g, Britton & Coulthard, 2013), my research perpetuates the male-dominated gender bias because I needed to maintain a realistic project scope. My research also largely overlooks the relationship of Indigenous peoples with Bay of Fundy fisheries and wellbeing, which has received more recognition in Atlantic fisheries since the Marshall Decision in 2001 and the subsequent creation of Aboriginal communal commercial fishing licenses (Atlantic Policy Congress, 2009). While I did interview some participants who identified as Indigenous, I had neither the scope nor the expertise to conduct appropriate, meaningful research into this relationship. It is therefore important to be explicit that the perceptions which emerged from this research do not necessarily reflect reality for all members of the fishing community and that there are also differences within communities (White & Pettit, 2004).

#### **4.5.4 Reported Wellbeing**

The methods I employed to assess wellbeing rely on the perceptions of participants (i.e., second reality) irrespective of whether those perceptions truly reflect the world (i.e., first reality) (Diefenbach, 2009). My research avoids this criticism to some extent, as I am explicitly seeking the perceptions of participants, as they are invaluable in understanding conservation outcomes (Bennett, 2016). However, it can be challenging to compare wellbeing before and after a conservation intervention since wellbeing changes over time (Milner-Gulland et al., 2014). For example, there are many factors other than the inception of the Musquash that could have affected the wellbeing of the fishing community since 2006, and it may be difficult for participants to accurately correlate changes in their wellbeing to specific factors. This is compounded by the time lag and fluctuations between conservation interventions and impacts (Margolous et al., 2009).

Response bias may also occur unconsciously or intentionally, if participants modify their answers to please interviewers (Diefenbach, 2009) or to avoid disclosing sensitive information (Bolderston, 2012). It is possible that certain prompts, or the way in which questions were worded, influenced the way in which participants replied. In some cases, non-participants present during interviews may have also influenced

participants' responses. Response bias is more likely to occur during focus groups when participants are asked to voice their thoughts in front of others (Seal, Bogart, & Ehrhardt, 1998). To mitigate this, focus groups were facilitated carefully and confidentiality was explicitly discussed from the outset to make participants as comfortable as possible to share their views honestly.

#### **4.6 Ethics Review**

Prior to conducting any research involving human participants, an ethics review process was required by the University of Waterloo's Office of Research Ethics. For the review, I determined recruitment, informed consent, and feedback processes to follow for data collection. The review also included consideration of participant risks, anonymity, and confidentiality. Ethics clearance was obtained in May 2016 and accepted for renewal in March 2017 (Appendix E).

#### **4.7 Chapter Summary**

My research applies an inductive approach to a qualitative case study in the SWNB fisheries context. Within this region, the Musquash MPA and Outer Quoddy EBSA were selected as embedded cases based on established criteria in order to examine the influence of respective existing and potential future MPAs on SEWB within the fishing community. I employed a range of research methods, which included a literature review, observations, semi-structured interviews, and visioning focus groups. Purposive sampling for interviews and focus groups was employed, and I coded transcripts as the main method of data analysis. Limitations of these methods were explicitly addressed, such as my positionality and efforts at adequate sample representativeness. I integrated findings from these complementary methods and analyses to report on participants' perceptions and discuss key themes in relation to my research questions, which are respectively presented in the following Chapters 5 and 6 of this thesis.

## Chapter 5: Perceptions of Marine Protected Areas and Social-Ecological Wellbeing

In this chapter, I present participants' perceptions of marine protected areas in relation to the social-ecological wellbeing framework, and describe the reasoning behind these perceptions. My aim here is to unpack a broad range of perspectives and explore differences between Musquash and Outer Quoddy (Section 3.2), as well as differences between the perceptions of fishers and key informants where they arose. In doing so, I address the first two questions of my research objective:

- How do stakeholders perceive MPAs in relation to social-ecological wellbeing?
- How are social and ecological benefits and costs of MPAs distributed across cases and stakeholders?

The chapter is organized to first set the stage for describing SEWB findings, by reporting participants' overall sense of satisfaction with the Musquash MPA, and with future MPA planning processes as they relate to the Outer Quoddy region (Section 5.1). Following this, I describe attributes of SEWB that emerged from interviews, categorized into the four dimensions of SEWB (Section 5.2). A comparison table is provided in Section 5.3 (Table 5.2). Findings in this chapter do not necessarily represent attributes of SEWB that are the most important to participants' sense of wellbeing, but rather the attributes that participants identified as being important *and* having linkages with MPAs (i.e., attributes that may influence, or be influenced by MPAs). I present these findings qualitatively to focus on the breadth of perspectives, while recognizing that the semi-structured interviews I conducted did not cover every topic in the same way (Section 4.3.3).

### 5.1 MPA Satisfaction and Outlook

Satisfaction levels and expectations from MPA processes in the region highlight the wide disparity between participants' overall impression of MPAs at either case. At Musquash, fishers and other informants were universally satisfied with the MPA. Participants perceived the influence of the MPA on personal and community wellbeing either neutrally, or somewhat positively. They tended to report that they had no reason to think negatively of the MPA, rather than expressing strongly positive feelings about the MPA. For example, "I've never heard of someone say a bad word about the Musquash MPA" (Informant 9). Participants expressed perceptions about Musquash using phrases such as 'positive', 'working fine', and 'happy enough'. Overall, participants felt that the community accepted and supported the MPA.

On the contrary, perceptions about the prospect of an MPA at Outer Quoddy, in addition to ongoing regional MPA network expansion, were almost universally negative. Participants were highly dissatisfied with discussions of MPAs in the region, either because they opposed MPAs altogether, or because they supported MPAs and felt that the process or speed of planning was inadequate. Only two fishers expressed any level of support for an MPA, based on “small areas, a little bit here and there, and [trying] not to impact any one fishery too much” (Fisher 9). Otherwise, fishers expressed opposition such as “scares me” (Fisher 1), “it’s just going to ruin my life” (Fisher 2), and “it’s going to be negative all around” (Fisher 6).

Outlook on how MPA planning will unfold in the region was also contentious. Fishers predicted conflict and expressed intentions of rallying against any potential MPA in the region, although one fisher was more optimistic: “[An MPA] is going to be a hard sell...but I think people can be made to see the value of it. We’ve got to keep replenishing our oceans and protecting them” (Fisher 13). Key informants generally felt that it would be too difficult to implement an MPA in Southwest New Brunswick due to politicization of the process and resistance from the fishing community. One informant expressed this as a ‘brick wall’ of fishers opposed to MPAs, and eight informants raised concerns about the possibility of Fisheries and Oceans Canada going for ‘low-hanging fruit’ in response, such as protecting very small areas, or allowing inappropriate activities within a prospective MPA, as expressed below:

I understand that to be a lot of apprehension and I anticipate challenges with interaction between the government and the fishing community...I’m prepared for there to be compromise, and I’m nervous about the ability of the federal government to emerge with a meaningful result.  
(Informant 9)

However, some informants suggested that there may indeed be fishers who are more supportive of MPAs, but that they may simply not be the loudest voices.

## **5.2 Relationship between Marine Protected Areas and Social-Ecological Wellbeing**

In this section, perceived linkages between MPAs and attributes of SEWB are reported and organized by each domain of SEWB (material, relational, subjective, and ecological). I describe perceptions for both Musquash and Outer Quoddy, where applicable. However, some attributes were only discussed in relation to one case. Table 5.1 lists the number of sources (i.e., interview and focus group transcripts) that referred to each attribute of wellbeing, providing an indication of the attributes that were brought up most by participants.

**Table 5.1 Number of sources that referred to each SEWB attribute in relation to MPAs**

SEWB		Number of Sources	
Domain	Attribute	Musquash	Outer Quoddy
Material	Fishery resources	11	20
	Fishery access	19	33
	Income	0	31
	Additional resources	8	6
Relational	Community relations	9	30
	Collaborative decision-making	19	39
	Enforcement	0	11
	Learning	0	5
	Markets	2	9
Subjective	Place-identity	16	17
	Equity	5	18
	Adaptability	13	15
Ecological	Natural capital	15	24
	Disturbances	15	27
	Scale	12	11

### 5.2.1 Material Wellbeing

Material wellbeing refers to what people have, or the objective physical requirements of life (Coulthard, 2012). The following attributes of material wellbeing were identified by participants, and are described in this section: fishery resources, fishery access, income, and additional resources.

#### 5.2.1.1 Fishery Resources

Fishery resources are “elements of a natural aquatic resources (e.g., strains, species, populations, stocks, assemblages) which can be legally caught by fishing” (Food and Agriculture Organization, 2017).

Participants discussed fishery resources in terms of commercial fish stocks, and explored them in terms of material wellbeing rather than ecological resilience. Fishers expressed their material need for fish stocks to make a living, which is not necessarily indicative of ecological resilience. For example, a desirable species composition in terms of landed product or market value may not align with that in terms of resilience.

Participants were unclear as to whether the Musquash MPA had been effective at protecting or enhancing commercial fish stocks, or whether there was any potential for spillover into adjacent regions. One fisher felt that protecting commercial species within the MPA was an asset to the fisheries, whereas others did not believe that the MPA designation had influenced stock levels to any extent. More commonly, participants expressed that they did not see a connection, or referred to the lack of evidence to support any



claims of enhanced fish stocks, given the multitude of other variables that could be influencing stock levels in the region.

At Outer Quoddy, the influence of an MPA on fish stocks was a priority to fishers, as explained by one participant, “When you talk to a fisherman, the first thing that they think of when you mention MPAs is ‘okay, you’re trying to protect commercial species,’ because that’s all we’re involved in, because really that’s our concern as a fisherman” (Fisher 25). Another fisher asserted that community levels of support for an MPA would depend on its ability to regenerate commercial stocks, and several others commented on misalignment of priorities between the fishing industry and other stakeholder groups in terms of priority species for conservation. For example, three fishers mentioned that DFO and conservationists in the region are interested in protecting special sponges and corals, which they felt were irrelevant to their livelihoods.

The ability of an MPA to enhance stocks was questioned by participants at Outer Quoddy. Only one fisher believed that an MPA would cause fish stocks to proliferate and spillover. Some participants felt that enhanced fish stocks within an MPA would not spillover and thereby remain inaccessible to fishers, while others doubted that an MPA would influence fish stocks at all given their migratory patterns and lack of protections outside of a potential MPA. Fisher 10 challenged the assumption that fish stocks would improve within any region simply by restricting human activities: “This idea that we just have to stop fishing in a certain area and everything will flock there, and they’ll overflow, and there’ll be bountiful resources everywhere, that’s pie in the sky. That doesn’t happen.” Four participants alluded to careful MPA design considerations to increase the likelihood of spillover, two of whom suggested targeting spawning grounds for MPAs. Difficulty in showing evidence of improved fish stocks, especially in the short term, was also vocalized.

#### ***5.2.1.2 Fishery Access***

Fishery access was also discussed in relation to MPAs. Having access to a resource is not the same as the presence of that resource, therefore comments in this section differ from those about the presence of fishery resources (Section 5.2.1.1). The Musquash MPA has not changed fishers’ traditional access to the estuary, since most fishing activities were grandfathered at the time of designation through a zoning process, exempting most commercial fishing and the use of Five Fathom Wharf from MPA regulations (Figure 5.1) (Appendix A). For this reason, the MPA was described as a ‘win-win’ situation for the conservation and fishing communities. However it was also often described as ‘low-hanging fruit’, especially when contrasted with Outer Quoddy, because there has consistently been a relatively low level

of fishing within and adjacent to the estuary. Thus, any theoretical issues of displacement would have affected few fishers. Fishers attributed any changes in their fishing locations away from the MPA region to changes in fish stocks, gear use, and technology, all of which were unrelated to the MPA. Continued allowance of scallop dragging in Zone 3 was perceived as a rare exemption for *Oceans Act* MPAs, and one fisher felt that any future MPAs in the region would not receive such a concession.

Five participants also noted that the MPA maintains spatial access given its perceived role as a ‘sanctuary’ from other industrial activities such as shipping (Section 5.2.4.2). Four elaborated that this minimizes gear conflict, by keeping shipping traffic away from equipment such as buoys, lines, and traps. This was particularly relevant given the proximity of Musquash to Saint John Harbour, where gear conflict is more problematic given the high level of shipping activity to the harbour.



**Figure 5.1 Commercial fishing vessels docked adjacent to Five Fathom Wharf inside Musquash MPA**

Despite recognizing that the MPA has had no influence on traditional fisheries access, there was significant concern (eight participants) about potential expansion of the Musquash MPA and resulting implications for continued fisheries access in the future. Recent media coverage (CBC, 2016) in addition to informal talks about expanding the Musquash MPA have led stakeholders to feel suspicious that any new MPAs would serve as a ‘foot in the door’ for later expansion or further restrictions. For example, “once something’s protected, then they’ll want ten more, and ten more, and ten more, and pretty soon there’s no place for anybody else” (Fisher 10). At the time of writing, there is no formal plan to expand the Musquash MPA.

The most frequent finding relating to material wellbeing at Outer Quoddy was apprehension about losing access to fishing grounds (27 participants). One participant put this bluntly: “It’s sheer old displacement” (Informant 7). Overwhelmingly, fishers indicated that loss of access would trump any potential long-term benefits of MPAs. Participants often used the precedent that their family had always fished in a particular location as a claim to continue fishing there, and described how displacement would be experienced differently depending on several factors. Many fishers stated that it would depend on species-specific regulations within an MPA, and therefore affect fishers differently depending on the specific fisheries in which they are engaged. For example, fishers relying solely on a restricted fishery would be more adversely affected than a fisher engaged in several fisheries. Further, displacement would depend on whether an MPA was situated on lucrative fishing grounds, as opposed to less valuable areas. The Outer Quoddy Ecologically and Biologically Significant Area was described as a ‘high stakes’ location given the sheer number of people fishing a multitude of species within its boundaries. Fishers unanimously agreed that if the Outer Quoddy became an MPA based on its current boundaries, it would displace the majority of fishers on Deer Island and Campobello Island, at least to some extent. Indeed, several fishers expressed that they fished most or all their gear within the boundary. Another said they would likely sell their license if they had to move to new fishing ‘bottom’ (i.e., fishing grounds).

One key informant countered these concerns, suggesting that fishers feared the worst-case scenario (i.e., no-take MPAs) due to their distrust of DFO (Section 5.2.2.2), emphasizing that MPA restrictions would be species- and area-specific. However, another fisher expressed that the closure of any fishery, in any area, would be exceptionally detrimental given the context of increasing limited access regulations and loss of fishery diversity in what was traditionally a more diverse multi-species fishery.

Primary concerns about displacement were the potential for lost income (Section 5.2.1.3) in addition to the implications of moving elsewhere. Participants elaborated that non-fishers often assumed that fishers could move to new fishing grounds relatively easily, overlooking the reality that specific fishing grounds can be critical for several reasons. First, fish stocks tend to aggregate in certain locations as opposed to others, making other locations less desirable for fishing in terms of economic viability. For example, several fishers observed much lower lobster stocks in the eastern regions of Lobster Fishing Area 36 as compared to Outer Quoddy during the spring lobster season in 2016. Second, displacing fishers from lucrative grounds *other* than Outer Quoddy would still influence fishers at Outer Quoddy because displaced fishers could encroach and concentrate fishing effort around Outer Quoddy, as described below:

If you push somebody out of an area they’ve been fishing all their life, they’ve got to go somewhere, and it causes more crowding in a smaller place. Everybody gets less ‘cause you’re

competing for the same resource instead of having the fleet spread out, and you're getting gear tangled around your neighbour. It's no good. (Fisher 24)

Third, if fishers had to move further offshore, it may entail re-rigging of boats and gear, which is expensive. Fishing further offshore in stronger weather conditions also has safety implications. Finally, many expressed their location-dependent knowledge for successful fishing (Section 5.2.2.4).

### **5.2.1.3 Income**

Fishers who spoke about the potential impact of an MPA at Outer Quoddy on their income universally expected loss of income due to displacement. Displacement to less lucrative grounds (i.e., grounds with lower commercial stocks) would evidently result in decreased income, and re-rigging gear and boats to fish in new areas would be costly. Simply put, "if we don't produce, we don't get a paycheque. When you take your most productive areas away from you, your paycheque is going to go downhill" (Fisher 16). Participants explained that loss of income would require extensive lifestyle adjustments. One informant suggested that rather than necessarily being against the principles of an MPA, fishers were understandably more immediately concerned about their livelihood.

Many fishers estimated the total value of product within the EBSA that could be lost under various MPA scenarios. One informant discussed the need for a standardized method to assess the economic impact of a potential MPA, with opportunities for community review. They also expressed the need for transparency when factoring an economic impact assessment into decision-making processes for siting MPAs (Section 5.2.2.2). One informant also questioned whether displaced fishers would be offered any compensation.

Eight participants also discussed spinoff effects on the broader regional economies of Deer Island and Campobello Island, expressing the dependence of these economies on the fishery. Discussing the lack of economic alternatives, Fisher 19 stated, "there's not one other thing that I can do on this island to make the money I make right now to pay the bills I have." Most fishers felt that lower incomes would reduce the number of fisheries-related jobs available, using expressions such as 'devastating' and 'death sentence' to describe the impact of reduced fisheries work on surrounding communities. For example, when a captain makes less in a season, they hire fewer crew, and fewer buyers are needed. At worst, participants feared that an MPA would cause families to move elsewhere in search of work.

Fishers felt strongly that alternative economic activities, such as potential tourism benefits from an MPA, would not make up for fishery losses. They reasoned that the tourism season is even shorter than fishery seasons, and that most tourism jobs are service positions with low wages. Other fishers described the

work ethic and identity in being a fisher, and felt it would make them incompatible for working in the tourism industry (Section 5.2.3.1). Fisher 7 elaborated, “You can’t convert the fisherman into something else...It’s something that’s in your blood.” There was also speculation about whether tourism opportunities could be seized by outsiders rather than benefitting local community members.

In contrast, several key informants discussed the economic opportunities of an MPA for the fishing and tourism industries, in addition to the marine research community. Key Informant 8 elaborated, “anything that comes into place to protect biodiversity when your industry is based on the presence of that biodiversity is incredibly helpful.” They generally felt that an MPA would protect marine resources and maintain ocean health, thereby enhancing the fishing economy and generating benefits to surrounding communities. In the context of the tourism industry, several informants discussed the potential for an MPA to market the region to visitors through improved name recognition, business opportunities (e.g., sustainable seafood in restaurants), and more broadly, the ability to attract tourism dollars with a clean environment.

#### ***5.2.1.4 Additional Resources***

The Musquash MPA was perceived favourably by eight informants due to its role in increasing resources for research and monitoring at Musquash, consequently providing a baseline ecosystem in the region. Several monitoring programs, including partnerships between DFO and ENGOs, were referenced by informants, however no fishers commented on this attribute. This perception is supported by official documentation for Musquash. In 2015, the management performance for research and monitoring at Musquash was evaluated as ‘good’ (DFO, 2015a), and the Musquash management plan states that “since the designation there has been an increase in research by oceanographers, benthic ecologists and many other scientists” (DFO, 2008, p. 10). The designation has secured dedicated resources to the region, but participants felt that a more significant environmental monitoring program would be beneficial to demonstrate tangible evidence of the MPA’s benefits, especially in terms of garnering community support for future MPAs. While research and monitoring has been ongoing at Musquash, it is not systematic, nor is it being assessed against conservation objectives (Cooper et al., 2011).

Similarly, six key informants discussing Outer Quoddy felt that an MPA was a way to ensure that resources would be devoted to the area, and saw increased funding and research as a benefit to fishing and other industries. One informant explained that their confidence in securing resources was strong because of the current political momentum behind MPA planning in Canada. Informants expressed the importance

of establishing an adequate monitoring program from the outset, to better understand the impacts of MPAs and enable adaptive management. No fishers at Outer Quoddy commented on this attribute.

## **5.2.2 Relational Wellbeing**

Relational wellbeing refers to what people can do with what they have, and how their interactions with others and institutions influences the pursuit of wellbeing (Coulthard, 2012). This section outlines the relational wellbeing attributes that were discussed by participants, including community relations, collaborative decision-making, enforcement, learning, and markets.

### ***5.2.2.1 Community relations***

For the purpose of this section, community relations include the relationships between fishers and their families, and within the fishing and broader communities (e.g., fishers, buyers, local residents, individuals involved in other sectors). Participants at Musquash did not observe marked changes in community relationships as a result of the MPA designation. Although one fisher felt that the MPA had led to cooperation among fishers, four others expressed that it had resulted in no change in the relationships among fishers. One explained that this was because the MPA had not greatly impacted their regular activities. Informants felt more strongly that the MPA had enhanced community relations, recognizing that families came together to donate lands to the Nature Conservancy of Canada [NCC] as a result of the designation (Section 5.2.4.3.1), and that it had played a role in maintaining a sense of community around the MPA.

In contrast, participants at Outer Quoddy predicted significant conflict among community relationships due to MPA processes. First, eight participants anticipated spatial conflict among fishers due to redistribution of traditional fishing grounds from displacement and concentration of effort (Section 5.2.1.2), causing feelings of pressure, disagreement, and potential obstructing actions such as gear cutting. Fisher 2 expressed this concern: “[An MPA] is going to put people that never fished in spots where other people fished, and... it’s going to be hell. It will be the biggest fight you’ve ever seen.” One informant noted that spatial conflict could also occur between fishers and other marine industries.

Second, there was concern that MPA discussions and potential designation processes could become divisive within communities due to differing viewpoints on MPAs (12 participants), and some recalled previous experiences where controversial topics created community and family divides, such as the West Isles National Marine Park Feasibility Study (Section 3.2.2). Participants speculated that divisiveness

could be based to some extent on the age of fishers, level of involvement in MPA processes, and affiliation with different sectors. Fisher 11 explained potential conflict across age differences:

The age difference would be a big factor in this, because some of the old-school fishermen, they don't want any change. They want it as-is, 'leave us alone'... The younger ones can see there's room for change, and it's time for some change, and when things like this are brought into play or even discussed on the local wharf, then the two fishermen will lock horns.

One informant pointed out that polarization was already beginning to occur, as actors with different stakes were already experiencing an unwillingness to change their positions on the matter, rather than being open to discussions. This informant expressed concern as to how these divisions would play out, and “that without strong leadership from decision-makers, or facilitators, or somebody who can take that discussion and massage it in a way that it isn't riddled with conflict, it can easily get out of hand” (Informant 3), and emphasized the importance of maintaining strong community relationships throughout these processes. Other reasons cited for MPA conflict included high stress, poaching within an MPA, reduced income in families, and loss of intergenerational access.

However, three participants were optimistic that the strength of existing community relationships could withstand potential conflict over MPAs, and four participants suggested that MPAs could become a rallying point around which fishers and other industries could set aside their differences and work together against MPAs in the region. In a more positive light, Informant 15 acknowledged that “the whole MPA discussion brings [various stakeholders] into the room” who would otherwise not normally come together, and another informant expressed that healthy community relationships are dependent upon a healthy economy and environment, both of which they felt an MPA would enhance.

### ***5.2.2.2 Collaborative Decision-Making***

This section describes participants' perceptions on participation, transparency in decision-making, and its effects on relational wellbeing. Decision-making was the most-referenced attribute of SEWB (Table 5.1), and perceptions often referred to the application (or lack thereof) of participatory, transparent, and scientifically sound approaches in MPA planning and decision-making processes. At Musquash, several participants described opportunities they had to collaborate during decision-making. From the outset, a diverse range of stakeholders were involved in the designation because the MPA proposal was a bottom-up recommendation, resulting in mutual benefits for those involved. Participants described how the Conservation Council of New Brunswick approached Fundy North at the outset for support in proposing an MPA to DFO (Section 3.2.1) and developed trusting relationships with clear communication.

Informant 12 explained, “at the beginning, there were people of diverse backgrounds in the room, and they set it up, and I think it was positive in that way.”

Participants generally described a high level of input by fishers and local community members into MPA planning, and there was a sense that stakeholders worked together to achieve a common objective. One fisher appreciated that DFO was receptive to feedback during this time, but another felt that “they did what they wanted to do” anyways, despite minimal opportunity for feedback (Fisher 24). In terms of continued engagement, three participants acknowledged that they were aware of ongoing Musquash Advisory Committee meetings, but that they did not feel a need to participate given the relatively low impact of the MPA. However, Friends of Musquash members continue to actively participate in regular advisory committee meetings.

At Outer Quoddy, perceptions starkly contrasted findings at Musquash due to the current political momentum behind MPA planning. Participants noted the critical role of the federal MPA mandate in differentiating the current situation from the Musquash case, resulting in a top-down approach to planning, with implications for participation in decision-making. Informant 2 expressed that “this new approach is very different from the approach used to establish...Musquash,” and Informant 21 explained that at Musquash “there weren’t targets for MPAs at the time” and that “it wasn’t the same tenor as it is now.”

In total, 24 participants reflected on implications of the mandate with mixed perceptions. Three informants reasoned that the mandate is accelerating MPA network planning that had previously been idle and mobilizing important discussions and resources for ocean protection:

[DFO has] ramped up their activities. The recommitment to the international commitment, and basically the Prime Minister giving the Minister’s mandates to get this done I think has really spurred an awful lot of extra activity from DFO, which I think is good. They had a lot of background research already from previous years when they weren’t able to do quite as much, and a lot of their science capacity had been reduced, but now...it’s being built back up again. (Informant 3)

However, others explained that this was resulting in unilateral decision-making in a top-down manner on the part of the federal government. One informant described meetings on MPAs that had been a ‘one-way’ flow of information, without room for feedback. Five participants also expressed concern that the motivation behind MPA establishment was solely to ‘tick a box’ and attain an international commitment, rather than legitimate ocean protection. Participants expressed their dissatisfaction that this motivation was being prioritized over the livelihoods of local communities. Fisher 19 explained, “I’m not against



marine protected areas, but I am against driving it down people's throats and putting people out of work." Indeed, as a result of the mandate, many fishers felt that MPAs were being forced on them without an opportunity to participate.

Fishers did not feel they would be adequately consulted due to a lack of trust in DFO. This was expressed bluntly by the following participants: "There's no trust. Absolutely no trust" (Fisher 16); "People don't trust DFO" (Informant 4); "Every time I talk to somebody from DFO, they tell me something different" (Informant 7). Many participants attributed mistrust to feeling disrespected or misinformed by scientists and government officials in past experiences. Apprehension about their ability to participate in planning processes was also because early MPA discussions were already underway without any formal consultation with fishers. Doubts were expressed as to whether DFO would genuinely listen to fishers and take their recommendations seriously. For example, Fisher 19 expressed that "it would be awful nice for them to in fact consult and do something that the fishermen has told them to do, but so far, they have got a failing grade on everything they've touched." Feelings of mistrust were also expressed in discussions surrounding transparency in MPA decision-making. Participants described transparency in decision-making in terms of content, as well as the way in which information was being disclosed (e.g., speed and clarity of communication), during MPA planning processes and discussions.

For example, many participants at Outer Quoddy asked questions about the 'core facts' of MPAs and voiced concerns that this information was missing or not being communicated clearly. The 'core facts' included the definition, purpose, process, design, and outcomes of MPAs and associated planning. First, ten participants felt that the definition and specific objectives of MPAs are unclear. What would an MPA be protecting, and from what threats? Second, what would be the process to create an MPA? Three informants indicated a need for DFO to lay out 'rules of engagement' in a clearly articulated process. Informant 7 stated that "lack of process is the problem. They don't have any idea what they're asking for," and all three worried that if they began consulting without clear rules, that the process might change unfavourably from what they initially agreed to support. Third, and most notably, 19 participants expressed frustration that they did not know what the rules and allowable activities would be within an MPA, using expressions such as 'pie in the sky', 'moving target', and 'mixed messages'. While one informant pointed out that it was still early and that MPAs in the region were still just a concept, others were frustrated by the slowness of DFO in communicating this information given the short mandate timeline. This was expressed by Fisher 6: "Someone needs to come out and say what's going to be restricted, what's going to be allowed. That's the main thing." Finally, seven participants wanted to know what the outcomes of an MPA would be. What would be the specific benefits and costs? Participants felt

that they needed more information on the ecological and socioeconomic consequences of an MPA, and a fisher acknowledged that fishers' perceptions of MPAs were negatively influenced by this uncertainty.

In addition to wanting more information regarding MPA planning, participants expressed doubts about the quality of evidence being used to plan MPAs. Among fishers, "there's also a lack of faith in the science, suggesting that there is mistrust in the claim that MPAs work" (Informant 21). Concerns were expressed about scientific claims that had been made in the past that did not align with what fishers witnessed on the water. The science behind EBSA designations was discussed by Informant 13:

EBSAs are a good basis for designating some MPAs, though not the best, nor most accurate. It is the best available [information] achieved with limited resources and time. A systematic survey would be better, but that is not going to happen. Science will never be up to date. The time lag is too large between research, or in this case, a review of the literature, and the decisions to designate an EBSA (never mind a MPA!)

However, the informant went on to explain that the science behind EBSAs was still better than that used in many other sectors for marine planning (e.g., aquaculture). Informants expressed concern that scientific documents or old data would be utilized for 'evidence-based decision-making' by decision-makers without recognizing uncertainty in the data, and fishers advocated for the use of their local knowledge to make decisions regarding marine conservation.

Non-fisher participants tended to view DFO's intentions for consultation and communication more optimistically, pointing out that there is, or will be, a relatively high level of ongoing consultation with MPAs in SWNB. For example, Informant 21 reflected, "I think [the fishing community] should appreciate that there is actually quite a high level of consultation going on. Certainly, DFO's pumping extra resources into this region than they are pumping into other areas, and that's important." Informant 17 stated, "I think their intent is honourable. They're not trying to hoodwink the industry. That's not the case." The short timeline and resistance of the fishing community were both identified as potential barriers to effective consultation by informants. Informants also voiced concern about the communication style of decision-makers. For example, Informant 8 observed that "the message isn't being communicated in a way that's understandable or in a way that's appropriate so that it isn't condescending." Informant 3 was "not sure the government is qualified or able to manage that kind of conversation in an enlightened way." Both expressed the need for trained facilitators to more effectively communicate, rather than scientists using highly technical and potentially inaccessible language.

When asked what should be changed about the MPA process to-date, the most common recommendation

among fishers and informants at Outer Quoddy was about increasing collaboration in the planning process (50% and 28%, respectively). Put simply, DFO should “always be in conversation with fishermen” (Fisher 18), given the high stake that fishers have in MPA outcomes. Asking the ‘right’ people with local contextual knowledge (e.g., fishers, social scientists) would be critical, rather than aligning decisions with solely natural scientists or corporate lobbyists. Fishers pointed to their ability to apply local knowledge to identify ecological and socioeconomic value to regions of marine space. One informant felt very strongly about the value of integrating scientific and local knowledge, and some participants advocated for DFO to move beyond consultation and shift some decision-making authority to fishers and local communities. Participants suggested empowering locals through participatory decision-making, summarized by the following quotes:

If they could give local people more authority to make decisions, I think local people would do a better job. (Informant 5)

Put the people that it’s most going to affect...in the decision-making process. Don’t push them away. That’s the best way to sum it up. The people that are going to lose the most, put them in the decision-making process. It might surprise you to how much a fisherman can help them in this process, if they could only put some trust in them and ask them the questions. (Fisher 19)

It’s a top-down process right now. This is the government, and this is what they say, and then this is the model, and this is the regulation, and this is how it fits, and it would be more helpful and probably more likely to succeed, and you’d probably get a better protection, if you started with the community, this area, and said, ‘What do we need? How do we see it happening?’ and having a more open process at the start, and saying ‘Well, these are how all the things can fit together, and this is how it works in the regulation,’ ... It’s messier, but in the end you’re more likely to have something that people will be proud of and that will actually work. (Informant 8)

### ***5.2.2.3 Enforcement***

In total, 41% of all fishers discussed enforcement in a prospective MPA. Five fishers indicated that DFO was not effectively enforcing existing fisheries regulations, and consequently questioned how they would be able to enforce the regulations within an MPA. There were also questions about the manner in which DFO would patrol an MPA, and whether fishers would engage in informal enforcement activities. One fisher indicated that their level of support for an MPA would dictate whether they were willing to report violations. Given these questions, three fishers feared misunderstanding any new enforcement activities for an MPA, and one expressed that this would cause a higher level of stress:

Am I over the line inside the MPA, or am I outside the MPA? Am I legal, or illegal? It’s only an imaginary line. Your GPS might be out a few numbers or points, and you could be inside as far as [DFO] is concerned. (Fisher 7)

#### **5.2.2.4 Learning**

Learning refers to the “acquisition of knowledge or skills through study, experience, or being taught” (Oxford Dictionary, 2017). Learning occurs at both the individual and social level, and formal organizational learning is increasingly being recognized (Berkes, 2009). Rather than referring to any formal organizational learning, I refer to learning by individuals and within social groups (e.g., fishing crews, families), in accordance with how it was discussed by participants at Outer Quoddy.

Following discussions about potential displacement (Section 5.2.1.2), five fishers explained that the implications of moving to new fishing grounds was significant because it would require extensive re-learning of new fishing bottom. They also expressed that this was often overlooked by non-fishers when considering the mobility of inshore fishers. Participants reaffirmed that knowledge of fishing in particular locations is often passed down over generations (e.g., Wiber et al., 2012). Of the 81.5% of fishers who discussed how they learned to fish, 86% described fishing with family members of other generations. Participants also described that learning takes place over these generations, and that displacement to new grounds would reduce the value of previous learning and could require extensive re-learning of how to fish particular grounds. This was exemplified using the analogy of obtaining a university degree after years of training, only for it to be no longer recognized as a certification. Fisher 2 summarized this perspective:

I've spent 16 years of my life so far learning how to fish in that spot. It's almost like I have a degree for fishing in here. The government thinks that people can just go out and set traps there and you catch lobsters. That isn't the case. My dad has been doing it for 40 years, and he's one of the best, and he can sometimes catch 70 or 80 percent more than somebody who doesn't know what they're doing... I've put [fewer] years into it and I'm still learning every day... so [an MPA here] is going to screw me up, because then I have to go out here and re-learn.

Two fishers also explained that learning how to fish is especially challenging at Outer Quoddy because of the strong tides moving around the archipelago of islands, creating highly diverse conditions of water movement (DFO, 2014a).

#### **5.2.2.5 Markets**

Only two participants discussed the linkages between the Musquash MPA and markets, stating that it had caused no change in markets for commercial fisheries. However, an informant recognized that the MPA designation *could* be used to demonstrate sustainable fisheries management, which could have implications for third party eco-certification of seafood products. At Outer Quoddy, the potential to enhance marketing opportunities through the optics of an MPA was perceived favourably by five

informants. This was explained: “MPAs can be really helpful in terms of third party certifications, which are becoming more and more important, in terms of both being able to sell seafood products at a premium, and just being able to access certain markets” (Informant 21). Having an MPA in the region could improve the reputation of the quality and sustainability of products coming from the region, making them more valuable and marketable. Two fishers also recognized this link, although more reluctantly. One perceived MPAs and third party certification negatively, observing that the two were linked and proliferating in other parts of the world, adding more pressure to small-scale fishers in terms of cost and regulations.

### **5.2.3 Subjective Wellbeing**

Subjective wellbeing refers to how people feel about what they have and what they do (Coulthard, 2012). In the context of MPAs, participants discussed place-identity, equity, and adaptability as attributes of subjective wellbeing, which are described in this section.

#### ***5.2.3.1 Place-identity***

Place identity can be defined as “those dimensions of the self that define an individual’s personal identity in relation to the physical environment” (Fresque-Baxter & Armitage, 2012, p. 252). Participants discussed the dimensions of emotional attachment to place, aesthetic/experiential value, and cultural and familial heritage (Fresque-Baxter & Armitage, 2012; Poe, Donatuto, & Satterfield, 2016). At Musquash, emotional attachment to place was mostly discussed in terms of pride. All informants unanimously described an increase in community pride as a result of the MPA designation. They elaborated that the surrounding community was happy about the protection of the estuary, which had enhanced a sense of community ownership and ultimately, pride of place. One said, “There is a little inner pride that I live next to it. Not everybody can, and I do” (Informant 19). Another informant expressed contextual significance of feeling a sense of pride:

It’s a New Brunswick problem where we have this inferiority complex and we don’t feel proud about what we have, and having these kinds of designations...we have something that the world is interested in saving. Being able to have that pride in a place where we’re constantly feeling downtrodden and inferior, and like we always have to trade off between the economy and the environment, it’s a big thing to be able to be proud of something like that. (Informant 8)

However, it was also noted that the extent of this benefit was probably limited to the immediate surrounding land-based community and ‘environmentally-minded’ individuals and groups in the region, as other individuals may not even be aware of the MPA designation. Informants pointed out that events and activities to do with the MPA reflected an increase in pride. For example, community members can

rent kayaks and canoes at the annual Musquash Paddle event to see the estuary ‘from the inside out’. Other examples given were the conservation of surrounding lands (e.g., private land donations) (Section 5.2.4.3.1), volunteers dedicating time to the initial designation and ongoing activities such as trail-building with the NCC (NCC, 2016) (Figure 5.2), and consistent attendance of Friends of Musquash to Musquash Advisory Committee meetings.



**Figure 5.2 Marked Black Beach Trail on land adjacent to the Musquash MPA**

On the other hand, fishers did not perceive place-identity at Musquash in the same way as key informants. Two fishers expressed that they did not personally feel any enhanced attachment to place due to the MPA. One explained this discrepancy by distinguishing the land-based and fishing communities: “There’s probably people that are more tied to the so-called land, more so than the fishing industry, that would probably have the pride in the area” (Fisher 26). Four fishers described the aesthetic/experiential value of the estuary, using words like ‘beautiful’, ‘natural’, and ‘peaceful’, but did not explicitly link these values to the MPA designation. However, two of these fishers attributed these values to a lack of development around the estuary, which could be interpreted as a spinoff benefit of the MPA as a sanctuary from industry (Section 5.2.4.2).

Fishers often used the term ‘way of life’ when discussing place-identity at Outer Quoddy, expressing the importance of being able to continue ‘fishing *here*’ to their identity, rather than just fishing in general. Fisher 19 explained: “For us to be able to stay on this island where we love – where we live and love –

we're going to have to be able to go fishing," and Fisher 7 explained, "[fishing] is something I look forward to doing. It's not a matter of money, it's a way of life." In total, 67% of all fishers discussed 'way of life' when describing their general fishing habits, many of whom reported dimensions that were important to maintain their way of life (Box 5.1).

**Box 5.1 Reported dimensions of the fisher way of life**

Work ethic	Confidentiality	Motivation
Independence	Being own boss	Honest competition
Family and community support	Determination	Discipline
Learning	Love of fishery	Fun/thrill/excitement
Camaraderie		

Fishers' perceptions at Outer Quoddy focused on cultural and familial heritage rather than emotional and aesthetic attachment to place. Participants more commonly referred to their identities as fishing families, rather than as individuals, when discussing MPAs and place-identity. These perceptions were generally negative, and based upon an assumption of some level of displacement (Section 5.2.1.2). Five fishers expressed a potential loss of heritage if they, or their children, were no longer able to fish in the same locations or using the same methods as their forebears. Many added that their families had been fishing at Outer Quoddy for hundreds of years, and feared that an MPA would take that away from their families. Fisher 21 said "we want to keep it the way that history has gone for over 100 years," and another expressed the difficulty in taking people out of the environment that they are used to.

Among key informants, opinions were divided as to whether an MPA in the region would allow continuance of fishing as a way of life. Three expressed that an MPA in Outer Quoddy would protect the necessary resources for this, and one described an MPA as an "insurance policy with continuance of our traditional fishery (Informant 6). Another recognized the importance of protecting resources for future generations, but was skeptical that an MPA was the most effective means for protection, especially given the potential for changing social and ecological conditions. Some informants recognized that fishers were more apprehensive about potential loss of familial heritage from an MPA. In contrast, four others predicted that an MPA could enhance community sense of attachment to place because the identity of the region is dependent on a clean environment. Protecting that environment would maintain its beauty and raise awareness about the Outer Quoddy region.

**5.2.3.2 Equity**

This section aims to outline participants' perceptions of equity in terms of MPA processes and outcomes. Outcomes of the Musquash MPA were described as 'win-win' because fishers are able to continue

fishing, while environmentalists are able to have an MPA. It was described by informants as either neutral, or mutually beneficial, and one fisher explained:

There's no impact on me, and I don't think there's any impact – minimal, minimal, minute, on any other fisherman, so it's a win-win. The environmentalists are happy about it, the guys that like to kayak and stuff, they get to look at nature...Everybody wins on that one, and if there's an environmental bonus from it, we all get it. (25)

At Outer Quoddy, concerns were expressed about equity amongst fishers, as well as between fishing and other sectors. Fishers explained that the distribution of benefits and costs of an MPA would depend on the specific fisheries that were restricted, and who was involved in them. For example, scallop fishers would bear a larger burden of MPA costs if scalloping was restricted and other fisheries were not. It would also depend on where an MPA was located. Even if an MPA was placed outside of the Outer Quoddy region, it would still presumably be taking fishing bottom away from another fisher elsewhere. One fisher explained that this was the problem with a 'not-in-my-backyard' approach to MPAs, as there would still be implications for equity amongst fishers in the Bay of Fundy.

However, participants more frequently discussed equity in terms of disparities between inshore fishers and other industrial sectors (e.g., oil-related). They felt that that it would be unrealistic to expect MPAs to address 'heavier' industry because such industries are more powerful. These industries have lobbyists and exercise a high degree of influence over government decisions. Further, aquaculture in the region is highly subsidized by the government, giving it more control over the regional economy of NB, as discussed by Knott & Neis (2017). One participant explained:

[The government] has spent a lot of time bowing to aquaculture, and so I'd be very surprised if there's ever an MPA proposed that would force an aquaculture site to move, just because who wants to fight industry that powerful? (Informant 21)

Another participant explained, "I don't think that the government of Canada has the fortitude to address the pulp and paper industry or the aquaculture industry, or any of those things. I think the fishing industry is an easy low-hanging fruit to target" (Informant 5). Consequently, ten participants felt that inshore fisheries would be partially restricted within an MPA, but that other industries would not, perpetuating inequities as well as ineffective protections on the environment (Section 5.2.4.2). Fisher 10 elaborated, "if there's an adverse effect, it's going to be on us, and we're not getting the ability thus far, the way it's being laid out, to have the opportunity to protect the things that are important to us." This was accompanied by a sentiment that inshore fishers would be paying for environmental problems that were caused largely by other actors. Informant 21 discussed declines in fish stocks as a global concern, and summarized this sentiment:



There's concern from the small boat coastal fleets that fish in highly productive waters like the Bay of Fundy. They serve to lose the most from an MPA even though there are arguably least or less responsible for declines [in fish stocks], that there'll be other people much more responsible for the declines that won't be impacted by MPAs...So there's this sense that, 'we didn't cause the problem, but we're being asked to take a hit to solve it.'

Two informants also challenged the prevailing notion of fairness among fishers, suggesting that fishers did not necessarily have the right to fish somewhere based on historical precedent. Both asserted that nobody owns the bay, and that stewardship is a shared responsibility among stakeholders. To ensure fair planning processes, two informants recommended taking time with careful facilitation processes to balance values and minimize the number of people who end up on the 'losing' end.

### **5.2.3.3 Adaptability**

Participants expressed the importance of being able to adapt their resource use patterns to maintain a livelihood in an ever-changing environment (i.e., 'boom and bust' conditions). They felt that MPAs are too static to allow for adequate adaptability. Fishers were particularly concerned about existing mechanisms in Canada to designate and modify regulations within MPAs. The MPA designation process is very long once an area has been identified, especially for creating *Oceans Act* MPAs (approximately seven years) and their associated management plans (ENVI, 2017). Any changes to regulations establishing boundaries and allowable activities within MPAs would require going through the same regulatory process (see Privy Council Office, 2001), which would likely also be time-intensive. Thus, adaptability to changing social and ecological conditions at an MPA would be lengthy and reactionary. It is in this context that this section elaborates on the importance of adaptability for continued fisheries access.

Although Musquash has not influenced traditional fisheries access, it was perceived to have decreased fisher adaptability by restricting access to emerging fisheries. The commercial sea urchin fishery in Lobster Fishing Area 36 emerged in 1989, and included 14 SCUBA dive operations by 2009 (DFO, 2010). The fishery was not highly active around Musquash at the time of designation, but is since perceived to have become a desirable fishing location for sea urchins. Since the importance of the fishery only increased post-designation, it was not accounted for in the original designation when fishers believed that they had 'covered all their bases' by grandfathering all the relevant commercial fisheries at the time. Now, despite primarily being a low-impact dive fishery, urchins cannot be harvested within the MPA unless a time-consuming regulatory process occurs, which participants thought would require significant lobbying efforts to DFO. Fishers and key informants alike felt that this case demonstrated inconsistent

regulations within the MPA, given the continued allowance of scallop dragging in Zone 3, which is arguably more damaging to habitat than diving for urchins. Generally, participants felt that this case exemplified the inflexibility of MPAs under conditions of change and uncertainty. One fisher explained:

[Musquash] is a place or an instance that we as fishermen overlooked, or didn't realize. It was a new fishery that came along... So when you start shutting places down to fish in, you don't know what the future brings, what species that you may be trying to harvest, which may be very lucrative in that protected area. (Fisher 7)

One key informant stressed that not all fisheries should be allowed within an MPA, but that the inconsistency in regulations at Musquash set a bad example to the fishing industry, especially since the reason for the omission was a lack of foresight when creating regulations.

Participants at Outer Quoddy also expressed the importance of adaptability given their inability to predict a changing environment, fish stocks, and markets in the future, especially in the accelerated context of climate change. Many fishers recounted major changes they had witnessed over the previous decades, which they had not been able to foresee beforehand. "The paradigm is everything comes in cycles" (Fisher 15). Fishers gave examples of areas of ocean space that could not conceivably have been useful fishing grounds 30 years ago, but were now where they fished exclusively. Given that fishers have been able to stay in their communities and continue to fish due to their ability to adapt to such changes, they expressed fear of being 'frozen' or 'locked in' to conditions at any one time:

You can't change a rule in a marine protected area without this huge effort by people, and this is one thing that scares fishermen out of talking, because fishermen do not like being locked in... because we've seen things change. (Fisher 10)

Another fisher discussed this in the context of specific fisheries restrictions. For example, the effect of restricting scalloping would not be as severe if lobstering was still allowed. However, if lobster stocks declined to historic levels, the scallop fishery would no longer be a viable fishery upon which to fall back. Many fishers further contextualized these fears using previous unsuccessful attempts to effect changes in other fisheries regulations, such as efforts over several years to make minor changes to dates of the lobster season. Such experiences explained the perceived permanency of adding more boundaries or districts (such as an MPA). For example, "I'm just scared of government lines, because when one's put on, you cannot get it off" (Fisher 16).

#### **5.2.4 Ecological Resilience**

As defined in Section 2.3, resilience is "capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks"

(Walker et al., 2004, p. 2). This section describes the linkages between MPAs and ecological resilience, and includes perceptions about natural capital, disturbances, and scale.

#### *5.2.4.1 Natural Capital*

When prompted about attributes of resilience in the Bay of Fundy, the most common response was about tidal mixing and its ability to disperse pollutants (18 participants). The next most common replies were that participants could not identify specific attributes of resilience (9 participants), that attributes were non-existent (8 participants), or that participants did not know whether there were any attributes of resilience present in the bay (7 participants). Thus, a relatively high level of participants did not directly identify attributes of resilience during interviews. I asked participants about attributes of resilience in colloquial terms (e.g., things that help the environment buffer or cope with environmental threats), suggesting that the concept was not salient with participants. However, some participants did identify attributes of resilience in broad terms (i.e., natural capital) when asked to identify linkages between MPAs and ecological resilience. Some of these comments crossed over with other attributes, such as biological diversity and reserves, however natural capital has been used here as the more encompassing term.

Participants generally felt that the MPA designation at Musquash provides a level of protection to the ecosystem within the estuary by preserving ecological processes and maintaining natural features. As such, the MPA acts as a reserve of natural capital, which can be drawn upon when the ecosystem is faced with disturbances and threats, and it was described as “the perfect insurance policy” (Fisher 25) and “like a trust fund” (Informant 19) in this respect. Participants valued that the MPA is preserving one of the last remaining intact salt marsh-estuary systems in NB. During interviews, the role of Musquash in preserving habitat, biodiversity and productivity were all discussed. Many participants felt that the primary ecological benefit of the MPA was its protection of wildlife, while the influence of the MPA on productivity and spawning grounds was less certain. Uncertainty as to the MPA’s role in mitigating or buffering specific threats, such as climate change, was also expressed. Despite these uncertainties, the MPA was seen positively in terms of overall ecosystem health.

However, a lack of tangible evidence to demonstrate the direct ecological benefits of the MPA was underlying most comments about the role of the MPA on ecosystem resilience. The resulting uncertainty was often expressed as a question: “Does [the MPA] contribute to the biological health of the bay? I’m told it does. I can’t see it. I have to rely on people telling me” (Fisher 10). Key informants suggested that it might take more time and monitoring to establish an accurate baseline before ecological benefits could be identified, which has also been recognized by DFO (Cooper et al., 2011; Singh & Buzeta, 2007).

Perceptions on whether an MPA at the Outer Quoddy EBSA would influence ecological resilience were similar to those expressed at Musquash, and also included aspects of natural capital, biological diversity, and reserves. Informants also noted the heightened importance of protecting attributes of resilience at Outer Quoddy due to its high biodiversity, productivity, and proportion of unique habitats in comparison to other regions in the Bay of Fundy. Participants generally agreed that an MPA would maintain resilience by maintaining intactness and protecting biodiversity under conditions of environmental change, and five participants thought that an MPA would serve as a source of productivity by protecting species within its boundaries. One informant also suggested that an MPA could be an indirect pathway to a healthier ecosystem by raising the profile of the region and changing attitudes towards ocean conservation. However, participants did not believe an MPA was likely to mitigate climate change and its direct implications, despite feeling that climate change was a significant threat facing the Bay of Fundy. Further, eight participants at Outer Quoddy expressed more doubts and uncertainty about the ability of an MPA to maintain the resilience of the ocean, and every fisher interviewed recognized the likelihood that ecological benefits would come at the cost of other wellbeing trade-offs, such as the ability to earn an income (Section 5.2.1.3).

#### **5.2.4.2 Disturbances**

Participants were asked to identify disturbances (prompted as ‘threats to environmental quality’) in the bay as an entry point to talking about attributes of resilience. Given the definition of resilience above, it is useful to consider *what* disturbances the system must absorb to maintain its form. Indeed, other research has first identified disturbances before measuring system resilience (e.g., Blythe, 2015; Resilience Alliance, 2010). In contrast to questions about attributes of resilience, participants were more descriptive and clear when discussing disturbances (e.g., commercial fishing activity, industrial pressures) and the ability of MPAs to address those disturbances. Only three participants did not identify specific disturbances when prompted, as opposed to 17 who were unable or chose not to identify specific attributes of resilience (Section 5.2.4.1). This suggests that the concept of disturbances may have been more salient than the concept of resilience among participants.

Given the relevance of disturbances to participants in the local context, I have described them in this section, recognizing that they do not fit the SEWB framework as clearly as other attributes of resilience. However, the concept of disturbances does relate to attributes of resilience. As the resilience of a system decreases, a smaller magnitude of disturbances is required to cross a system threshold (Folke et al., 2004; Folke, 2016). Thus, the addition or removal of disturbances (e.g., through the intervention of an MPA),

can alter the proximity of a system to a threshold and thereby influence its ability to absorb further disturbances (i.e., its resilience). Participants discussed how the extent of commercial fishing and other industrial activities could be influenced by MPAs. Other industrial activities included aquaculture, shipping, and land-based industries, but did not include the service or tourism industries.

The most significant benefit to the environment at Musquash was perceived to be the role of the MPA in keeping out further industrial development from the region. The MPA was frequently described as a ‘sanctuary’ or ‘boundary’ from industry by both fishers and key informants. Participants provided several examples of rumours of industrial projects that were proposed shortly before and during the ten-year MPA designation process, such as expansion of a nearby generating station. Such developments were halted using the MPA designation as leverage. Since designation, at least one aquaculture proposal was denied from the region due to its proximity to the MPA:

There was an aquaculture site proposed directly adjacent to the MPA, not even on the MPA itself, but that was successfully fought off. But that wasn’t so much DFO as NGOs and community members just making it difficult for the companies. (Informant 21)

The Canadian Press covered this story in 2008, describing local opposition and discouragement of the site’s approval due to proximity to the sensitive ecosystem within the MPA. During interviews, one key informant discussed the question of how to treat adjacent ‘zones of influence’ of MPAs, and felt that this unforeseen issue had not been adequately addressed during the MPA designation process at Musquash. It is unclear whether this case served as a precedent to dissuade further attempts to site aquaculture pens near Musquash, as some participants expressed that environmental conditions in the region (e.g., tides) are too rough to support viable aquaculture operations regardless. However, participants almost unanimously felt positively about the MPA as both a sanctuary from industry and a designation to prevent further development.

The prospect of an MPA serving as a sanctuary from development at Outer Quoddy was also discussed by many participants, however opinion was more divided here. Some participants expressed that their overall level of support for an MPA would depend on its ability to mitigate threats from expanding industry, and those who believed that an MPA would serve a purpose in limiting such activities felt more positively towards the overall prospect of an MPA. First, some participants reflected on whether an MPA designation would provide clout against future industrial development in adjacent areas (e.g., increased tanker traffic in the event of new pipelines), similar to the 2008 aquaculture case at Musquash. Second, several participants discussed the implications of directly restricting industry through MPA regulations.

Implications were discussed in terms of the environment, but also in terms of being a ‘foothold’ against big companies from moving into space that has traditionally been occupied by inshore fisheries.

On the other hand, many participants perceived that an MPA would have a neutral impact on environmental quality in terms of industrial activity. For reasons described in Section 5.2.3.2, they did not believe MPAs would adequately address industrial pressures due to the higher level of influence exercised by the aquaculture and oil and gas sectors. This would perpetuate inconsistent and ineffective protections on the environment. There is a sound basis for this concern, as regulations for all five *Oceans Act* MPAs in Atlantic Canada have some level of fisheries restrictions, four of which do not explicitly mention oil and gas activities (Canadian Parks and Wilderness Society [CPAWS], 2015). These participants felt that it was more urgent to reduce threats from heavier industry (e.g., oil spills), but questioned whether an MPA would prioritize fishing restrictions instead. Ultimately, the role of an MPA as a sanctuary from industry would depend on what would be allowed within the boundaries of an MPA.

Fishers at Outer Quoddy also expressed that the ecosystem is already sufficiently protected from detrimental fishing activities, and that there is consequently no purpose for an MPA in the region. Most participants agreed that the environmental quality in the Bay of Fundy is better than most coastal regions, which fishers attributed to their improved stewardship (e.g., responsible disposal of garbage) in addition to existing fisheries management measures (e.g., seasons, quotas). They felt that an MPA would have negligible impacts in comparison to existing measures, and some fishers used their long history of fishing in the region as evidence that current fishing practices and management systems are sustainable.

Most participants were under the impression that any new MPAs would continue to allow lobster fishing but would restrict scallop dragging. Several fishers felt that restricting scalloping would allow rejuvenation of benthic habitat, however there was significant doubt as to whether dragging is indeed as harmful to benthic habitats as is generally presumed. Many fishers expressed the belief that dragging may in fact be beneficial to benthic habitats, using the analogy of tilling soil, and explained that scallops will die if they continue to grow without being harvested (within an MPA, for example). This was largely viewed as a waste of product.

Many participants also worried that if an MPA displaced fishers from a region as crowded as Outer Quoddy, it would significantly increase the fishing effort in other locations. Concentrating effort would increase boat traffic and the use of fishing gear, and consequently cause greater pollution and overfishing. This would be particularly concerning if fishers were being displaced to less productive fishing grounds,

as they would have to increase their effort in the new area to land the same amount of product as in their old grounds, with detrimental consequences for the quality of the environment.

#### *5.2.4.3 Scale*

Participants often initiated discussion on considerations of scale, despite not having any related prompts in my interview guide. They recognized critical elements of resilience thinking – that social and ecological subsystems mutually influence one another across temporal and spatial scales, and that the resilience of a focal system depends on cross-scale dynamics (Folke, 2006). This section describes participants’ perceptions on the scale of MPA interventions as related to that of the ecological system.

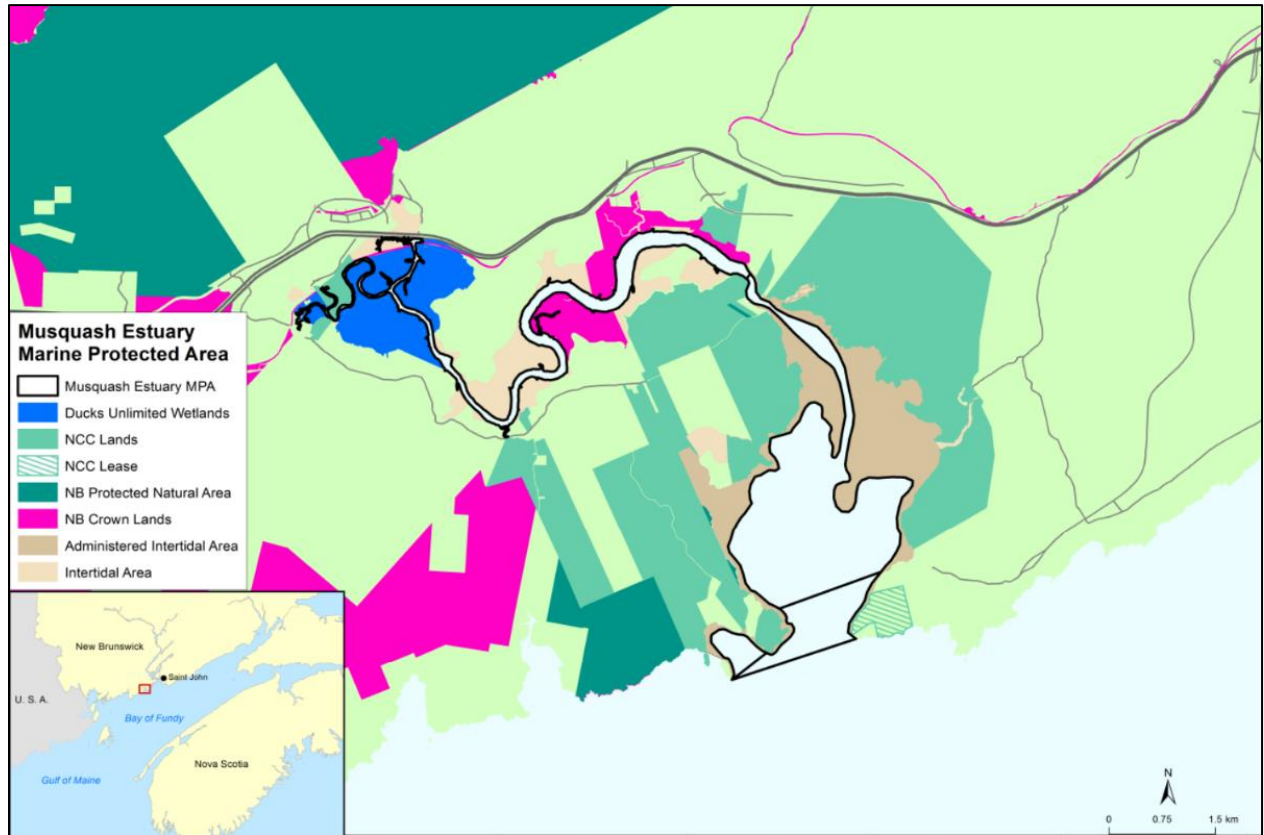
##### *5.2.4.3.1 Spatial Scale*

Whether or not MPAs were useful in building resilience or minimizing disturbances was debated due to the reality that many ecological processes are operating on larger scales than within the boundaries of an MPA. Most participants at Musquash were concerned about spatial scale in terms of transboundary pollution reaching the MPA and compromising the ability of the MPA to act as a reserve or source of resilience. Participants discussed upstream, land-based, and aerial sources of contamination that were external to the boundaries of the MPA itself, such as runoff and effluents from agriculture, forestry, and other industries. Two key informants discussed their concerns about aerial spraying of chemicals and the potential impacts on the quality of Musquash. The province of NB sprays glyphosate for maintenance of forested lands and hydro corridors (Robichaud, 2016) and despite having protected buffer zones, spraying is still allowed within the Musquash watershed outside of immediate buffer zones (NB Power, 2015). One informant felt that DFO was too concerned in managing activities within the MPA rather than potential external sources of contamination.

However, participants expressed that adjacent land conservation was useful for addressing some of the issues described above. The NCC began acquiring adjacent land in 2001 through purchases and donations from local landowners, and has since protected 84% of the estuary coastline (DFO, 2015c), and other surrounding lands are protected by the province as well as Ducks Unlimited (Figure 5.3). Participants felt that the Musquash MPA designation had catalyzed some of this adjacent land conservation.

Many participants felt very positively about this land conservation as a complement to the MPA, as it increases the level of protection afforded to the MPA by keeping forested areas intact, thereby reducing the potential of land-based sources of pollution reaching the MPA, and by making it more difficult for human activities to degrade the marine environment. Some participants spoke about private lands that

close community members have donated to the NCC, and the potential to donate more land in the future. Indeed, at time of writing, the NCC is fundraising to expand these protected lands (NCC, 2016). Only one fisher questioned the value of adjacent land conservation on the basis that it was no longer available for productive use by humans.



**Figure 5.3 Map of land conservation adjacent to the Musquash MPA (DFO, 2015c)**

The transboundary nature of ecological processes also arose in discussions at Outer Quoddy, mostly by key informants. Referring to the mobility and migration of many species in the Bay of Fundy, one fisher said, “fish don’t know it’s an MPA” (Fisher 16), and expressed concern about species moving outside of MPA protection and thus still being subjected to external threats. Like Musquash, participants voiced concerns about sources of pollution upstream the Saint John and St. Croix Rivers such as farming and pulp mills, which would contaminate the Outer Quoddy region if sources upstream were not adequately mitigated, regardless of any MPA. Similarly, Informant 8 stated that “anything that has set borders has issues when it comes to dealing with climate change.” One informant also stressed the importance of adjacent land conservation to any MPA as a buffer zone.



#### 5.2.4.3.2 Temporal Scale

Temporal scales were discussed at Outer Quoddy in terms of the ecological subsystem. Referring to past experiences where ecosystems have changed in unpredictable ways, participants were concerned that MPAs are not adequately adaptable to fit changing ecological conditions over time. According to the IUCN definition, MPAs must be “managed in perpetuity...over timescales of human generations” (IUCN, 2012, p. 13). One informant expressed the long-term requirement of an MPA as a benefit to the environment by protecting an area forever. However, several others saw this as a limitation of MPAs:

One of the problems with a marine protected area is that it's set, and the ocean shifts, particularly around climate change. Temperature shifts, and fish stocks shift, and I know that [MPAs] are set up essentially to protect the sedentary lifeforms, but at the same time, that lack of movement when you're in an entirely moving environment might be too restrictive. (Informant 8)

Participants were concerned about what would happen if environmental conditions changed in the future, and the area was no longer relevant for protections afforded by the MPA, or if it was no longer protecting what it was supposed to be protecting. In response to this concern, one informant highlighted the importance of planning MPAs which represent enduring features such as bottom habitat and upwelling zones rather than ‘charismatic’ species in the region like whales, which are migratory. If this was the case, the participant argued that ecological changes could still occur (e.g., changes in species composition, migratory patterns) but that the foundations of the ecosystem would remain in place through protection measures. Another participant suggested that “if the marine protected area is dynamic and flexible, then it can respond to different conditions that are being seen in different years” (Informant 14). These concerns were also often discussed in relation to slow MPA regulatory process in Canada (Section 5.2.3.3).

### 5.3 Distribution of Benefits and Costs

The purpose of this section is to more explicitly address the distribution of benefits and costs of MPAs across embedded cases and stakeholders. Benefits and costs were examined based on findings for the attributes of SEWB presented in the previous section (5.2). There was a notable difference in perceptions between the Musquash and Outer Quoddy cases (Table 5.2). Attributes of SEWB at Musquash were primarily viewed positively, with ten attributes perceived as benefits. The only clearly perceived cost at Musquash was a loss of adaptability. In contrast, attributes at Outer Quoddy were mostly perceived negatively, with nine attributes anticipated to be costs in the event of an MPA.

**Table 5.2 Perceived benefits and costs of MPAs across SEWB attributes and cases**

Domain	Attribute	Fishing Community Perspective			
		Musquash		Outer Quoddy	
Material wellbeing	Fishery resources	?	Uncertain as to influence on commercial fish stocks	?	Uncertain potential to enhance commercial fish stocks
	Fishery access	+	No loss of fishery access Minimized gear conflict	-	Anticipated access loss and associated implications on other wellbeing attributes
	Income	n/a	n/a	-	Anticipated loss of income due to displacement and consequences for local economy
	Additional resources	+	More research and monitoring dedicated to region	+	Potential to draw additional funding and monitoring resources
Relational wellbeing	Community relations	+	Enhanced land-based community relations due to adjacent land donations and cooperation	-	Anticipated conflict due to displacement and consequent encroachment  MPAs as polarizing issue within community
	Collaborative decision-making	+	Maintained opportunities for participation in decision-making	-	Doubts about opportunities for consultation and participation  Lack of trust and transparency
	Enforcement	n/a	n/a	?	Questions regarding how MPA would be enforced given existing enforcement challenges
	Learning	n/a	n/a	-	Anticipated re-learning and lower applicability of existing knowledge
	Markets	+	Third party certification potential	±	Third party certification potential useful for marketing, but may come with strings attached
Subjective wellbeing	Place-identity	+	Increased sense of pride for land-based community	-	Loss of cultural and familial heritage if displaced
	Equity	+	Overall, win-win MPA among stakeholders	-	Inshore fishers expected to bear highest burden of costs
	Adaptability	-	Has restricted ability to access emerging fisheries	-	Will restrict future possibilities with strict regulations
Ecological resilience	Natural capital	+	Protects naturalness and intactness of ecosystem	+	Ability to protect naturalness, biodiversity, and productivity
	Disturbances	+	Keeps heavy industry out	±	Potential for overfishing due to displacement and crowding  Potential to restrict heavy industry
	Scale	+	Adjacent land conservation prompted by MPA is beneficial for protection	-	Static MPA reduces ability to react to changing environment

Legend: + benefit, - cost, 0 no effect, ± mixed effect, ? uncertain effect, n/a not discussed

These findings demonstrate that forward-looking perceptions at Outer Quoddy do not reflect the lived experience at Musquash. These findings suggest some combination of the following explanations: (1) that the MPA experience at Musquash is not informing perceptions at Outer Quoddy, (2) that perceptions instinctively vary before as opposed to after an intervention, or (3) that the key conditions contributing to success at Musquash are not the same conditions defining the Outer Quoddy context. The first explanation may be due to fishers basing their expectations on a longer and more entrenched memory of fishery management experiences, rather than only one recent MPA experience. The second may be tied to feelings of uncertainty or apprehension about future scenarios. The third explanation compels an analysis of differences between each case to identify favourable conditions at Musquash that may not be in place at Outer Quoddy.

Two key differences between the case contexts include the driving force behind MPA implementation, as well as the intensity of human activity at both locations (e.g., Figure 3.7, Section 3.2.2). At Musquash, MPA establishment was driven by the community, whereas the community is not the driving force behind currently-mandated MPA network development. The vicinity of the Musquash MPA was also often described as a ‘low stakes’ fishing area, with arguably less fishery resources to be displaced *from* than at Outer Quoddy. In comparison, Outer Quoddy is a ‘high stakes’ fishing area with many resource users who depend on access to the marine space. These factors likely contribute to the differences in perceptions across cases given that collaborative decision-making and fishery access were also the most-referenced attributes of SEWB at both cases (Table 5.1).

Comparing perceptions across stakeholders is more challenging given that key informants represented a wide diversity of interests and that some were involved in the fishing industry, despite not being inshore fishers themselves. However, an assessment of SEWB perceptions reveals that participants differentiated the distribution of benefits and costs across fishers, members of the tourism community, conservationists, and other industries. Participants generally agreed that inshore fishers would bear more MPA costs than these other groups, given anticipated restrictions on fishing activities. In contrast, they expected marine tourism to mostly benefit from an MPA because of the marketing benefits of a clean environment (Section 5.2.1.3). They also expected conservationists to benefit by carrying out their mandate for conservation (e.g., protecting non-commercial species [Section 5.2.1.1]). Rather than anticipating benefits for other industries, participants expressed that they did not think other industries would bear the costs of displacement given that they were too powerful to displace in the first place (Section 5.2.3.2). This distribution was perceived as unfair, as fishers would be forced to alter their activities to mitigate environmental impacts that have been caused by many actors at different scales.

Most perceived inequities relate to implications of MPAs on stakeholders, but do not directly reflect benefits to the environment. In terms of the distribution of costs and benefits across dimensions of SEWB, ecological resilience was perceived the most positively in relation to MPAs. Participants generally recognized that MPAs benefit the resilience of the ecosystem, at least to some degree. Further, while these perceptions mostly aligned between fishers and other informants, there were some notable differences. For example, non-fishers expressed the potential for third party certification and potential benefits to fishers, whereas fishers were more skeptical of the importance of certification. Similarly, informants were more likely to see an MPA as a benefit to protect marine resources for the continued ability of families to stay and fish and maintain their familial heritage, whereas fishers were more likely to see this as a restriction on future access for their families. Ultimately, however, participants felt that inshore fishers were the most likely group of stakeholders to bear costs of MPAs.

## **5.4 Chapter Summary**

The purpose of this chapter was to report stakeholder perceptions of MPAs in relation to SEWB, and to examine how benefits and costs of MPAs are distributed across cases and stakeholders (research sub-questions 1 and 2). In terms of overall satisfaction (Section 5.1), participants were satisfied with the Musquash MPA and perceived it either neutrally or slightly positively. In contrast, the potential for an MPA at the Outer Quoddy EBSA was perceived negatively, and participants were dissatisfied with the process of MPA network development to-date. In total, 15 attributes of SEWB were discussed in detail in relation to MPAs (Section 5.2). These included material (fishery resources, fishery access, income, additional resources), relational (community relations, collaborative decision-making, enforcement, learning, markets), subjective (place-identity, equity, adaptability), and ecological (disturbances, natural capital, scale) dimensions. Many of these attributes were discussed for both Musquash and Outer Quoddy. However, attributes were overwhelmingly perceived as benefits at Musquash and costs at Outer Quoddy. The distribution of benefits and costs of MPAs (Section 5.3) was therefore clearly distinguished between each case, which may be due to different contextual circumstances at each case. Inshore fishers were also perceived as the group that would most likely bear the costs of MPAs. These findings form the basis of MPA governance insights in the following chapter.

## Chapter 6: Social-Ecological Wellbeing Insights for Marine Protected Area Governance

In the previous chapter, I examined stakeholders' perceptions of social-ecological wellbeing in relation to marine protected areas, and assessed the benefits and costs of MPAs across cases and stakeholders. The purpose of this chapter is to address the third question of my research objective:

- How can social-ecological wellbeing insights contribute to the effectiveness of MPA governance?

To examine this question, an understanding of MPA effectiveness is required. As discussed in Section 2.1.2, an MPA is effective if it is meeting its stated objectives. The broad objectives for Canada's network of MPAs are both ecological and social (Box 6.1), although individual MPAs have different objectives. The network will be effective if it meets these objectives.

### Box 6.1 Objectives for Canada's network of MPAs (DFO, 2011)

- To provide long-term protection of marine biodiversity, ecosystem function, and special natural features<sup>1</sup>
- To support conservation and management of Canada's living marine resources and their habitats, and the socio-economic values and ecosystem services they provide<sup>2</sup>
- To enhance public awareness and appreciation of Canada's marine environment and rich maritime history and culture<sup>2</sup>

<sup>1</sup>Primary goal <sup>2</sup>Secondary goal

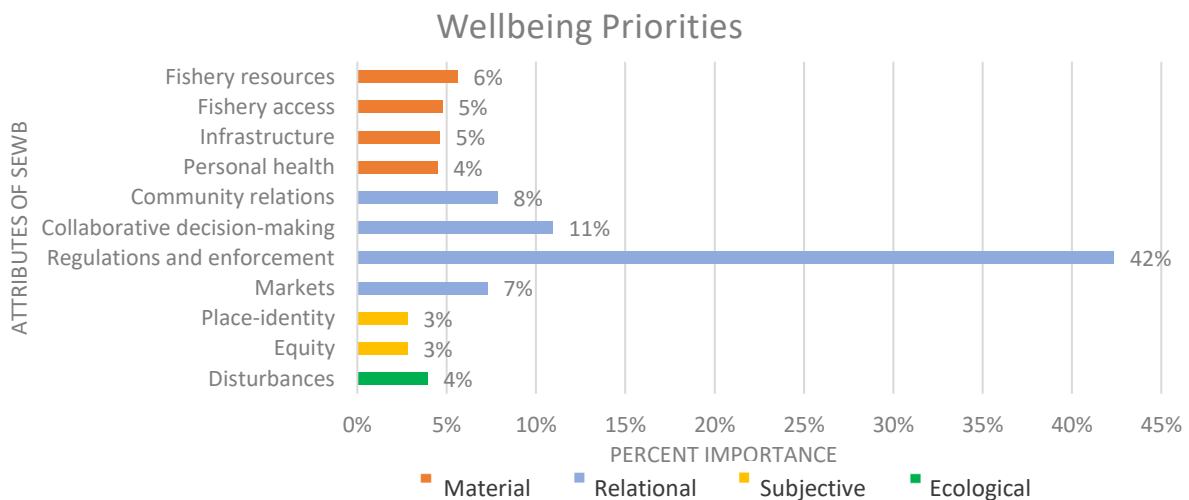
In this chapter, I develop governance insights under the premise that enhancing community support for MPAs will increase the likelihood of meeting these objectives. In relation to the network's primary goal (Box 6.1), protection of marine biodiversity, ecosystem function, and special natural features will be more likely under conditions of community support (Section 2.1.1). With respect to the network's secondary goals, socio-economic values and appreciation of the marine environment are captured by the holistic concept of SEWB, and therefore, enhancing perceptions of wellbeing attributes increases the likelihood of supporting these values.

My approach to developing these insights is grounded in the SEWB findings of this research (Chapter 5), and based on the following two arguments: support for MPAs will increase if (1) MPA objectives and outcomes are aligned with the wellbeing priorities of community members, and (2) negative perceptions or anticipated costs of MPAs are addressed. In line with these arguments, I first identify governance priorities using focus group findings of fishers' wellbeing priorities, as well as a brief reference to the SEWB attributes that were perceived negatively by participants in Chapter 5 (Section 6.1). Drawing from case study data, I then synthesize three main implications for MPA governance in the Southwest New

Brunswick context: (1) addressing potential displacement of fishers (Section 6.2.1); (2) improving the decision-making approach for MPA network planning (Section 6.2.2); and (3) enhancing the social and ecological fit between MPAs and the local context (Section 6.2.3). I summarize these governance insights in Section 6.3.

## 6.1 Identifying Governance Priorities

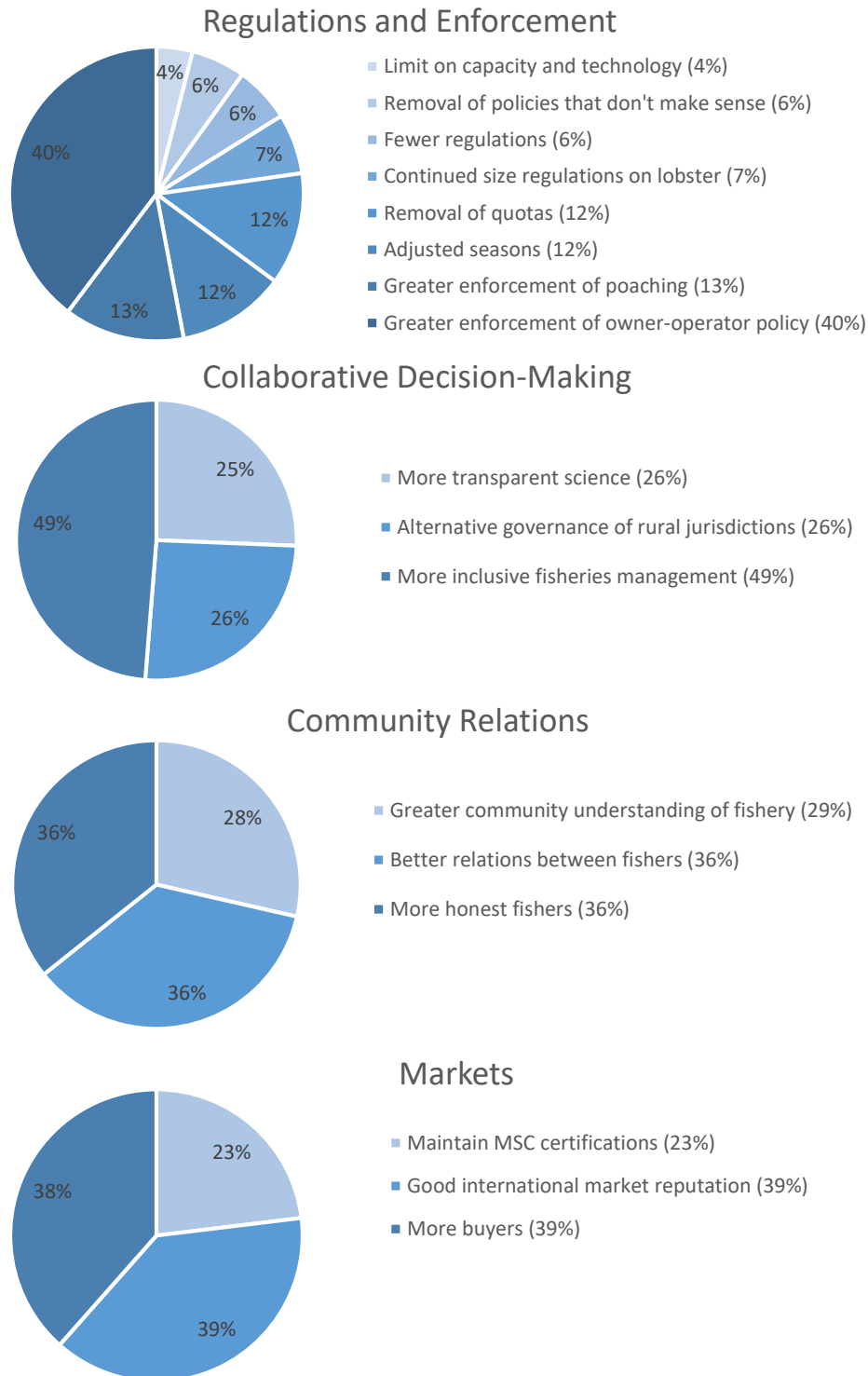
To identify the cross-cutting themes (i.e., governance priorities) that follow in this chapter, I present findings from focus groups in this section, and integrate them with attributes that were perceived negatively by fishers in Chapter 5. During focus groups, I asked fishers what they would need to protect their wellbeing in the future (Section 4.3.4.2). While some replies were more general (e.g., personal health), most prioritized the fishery, highlighting the fuzziness between fishing as a job and other aspects of fishers’ lives. A full list of replies (i.e., specific priority elements) is provided in Appendix F. Specific priorities from this list have been aggregated into broader categories of wellbeing priorities (Figure 6.1), as per the data analysis methods described in Section 4.4.2. This was done to maintain consistency with the wellbeing attributes reported in Chapter 5.



**Figure 6.1 Aggregated wellbeing priorities of focus group participants by percent importance**

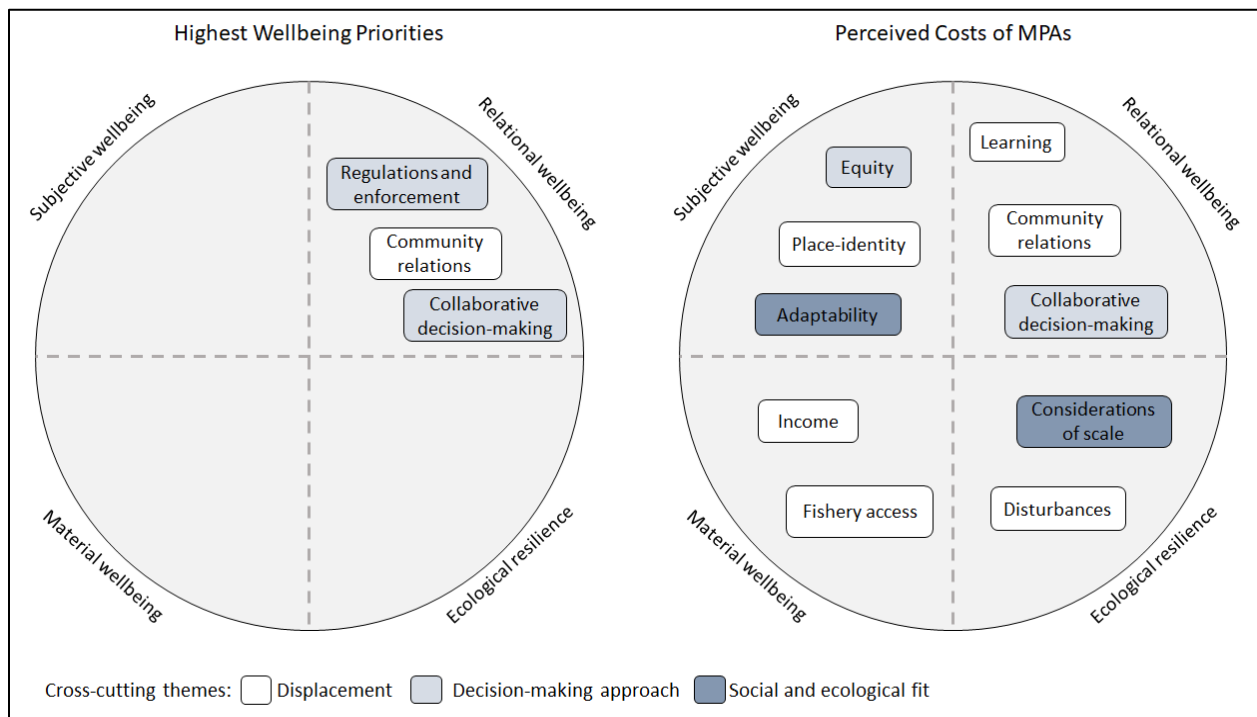
The findings in Figure 6.1 demonstrate that more attention was given to relational wellbeing priorities than the other SEWB attributes. The highest ranked priorities related to regulations and enforcement (42%), collaborative decision-making (11%), community relations (8%), and markets (7%), and are disaggregated in Figure 6.2 by more specific priority elements that fishers identified. In the regulations and enforcement category, the most important priority element was “greater enforcement of owner-operator policy” (40%), which generated rich discussions in all four focus groups about the importance of protecting the inshore fishery from license leasing in order to maintain local ownership (Section 3.1.2.1).

In the collaborative decision-making category, the most important priority element was “more inclusive fisheries management” (49%). Consequent discussions were about improving collaboration between fishers and other stakeholders (e.g., incorporating fishers’ knowledge), and context-appropriate solutions.



**Figure 6.2 Summary of relational wellbeing priorities**

To identify governance priorities, I grouped all the wellbeing attributes into Figure 6.3 that were (1) identified as the most important wellbeing priorities, and (2) perceived as costs, at least to some extent (i.e., mixed perceptions of benefits and costs), relating to MPAs at Musquash and Outer Quoddy (Section 5.3). I then examined the constituent perceptions (i.e., codes and priority elements) of each attribute to assess whether there were linkages between attributes that could be grouped more broadly into governance-related categories (i.e., cross-cutting themes). From this exercise, three governance themes emerged – displacement from traditional fishing grounds, concerns about the decision-making approach to MPAs, and the social and ecological fit of MPAs. Each attribute is colour-coded by theme in Figure 6.3. One attribute, ‘markets’, did not correspond to these themes and was therefore omitted from Figure 6.3. These three themes are governance issues relating to MPAs in SWNB and are discussed in more detail in the following section.



**Figure 6.3 Thematic categorization of the highest wellbeing priorities and the perceived costs of MPAs**

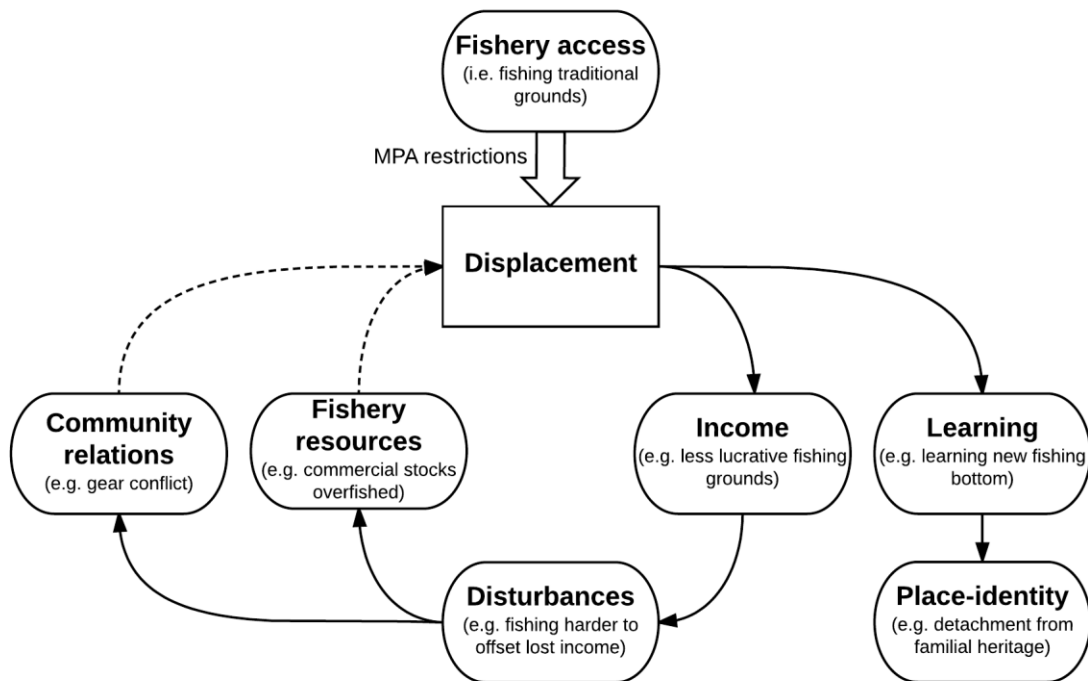
## 6.2 Insights for Marine Protected Area Governance

In the previous sections, I provided rationale and outlined my approach to determine key themes associated with more effective MPA governance in the case study sites. In this section, I elaborate on these themes and their implications for MPA governance in the SWNB case study, and also with reference to regional MPA planning efforts.



## 6.2.1 Displacement

The first cross-cutting theme is the concern that MPAs will cause fisher displacement by restricting commercial fishery access within their boundaries. Participants recognized that MPAs do not necessarily involve a no-take zone, but that MPAs could restrict commercial fishery access by location, species, and gear type. However, participants most commonly discussed displacement as the need to physically move elsewhere to continue fishing, as well as the consequences of displacement irrespective of the particular commercial species being restricted. In Chapter 5, concerns about displacement were largely captured by the ‘fishery access’ attribute of material wellbeing (Section 5.2.1.2), but the consequences of displacement were reflected across several attributes of wellbeing (i.e., those categorized under ‘displacement’ in Figure 6.3). Here, displacement and its consequences are explicitly addressed in terms of MPA governance.



**Figure 6.4. Consequences of MPA displacement on attributes of SEWB.** Solid arrows represent scenarios described by participants, and dashed arrows represent inferred relationships between attributes.

Participants often described scenarios about what would happen if fishers were displaced from an area by an MPA. A representation of these perceived consequences of displacement is presented in Figure 6.4. For example, if fishers are displaced from an area, it will influence (1) *learning*, as they will no longer be able to apply knowledge they have been learning over lifetimes and will be required to learn how to fish new grounds or ‘bottom’; (2) *place-identity*, since moving away from traditional fishing grounds can

serve to detach fishers from their sense of place-identity and way of life; (3) *income*, if they move to less lucrative fishing grounds; (4) the level of ecological *disturbance*, if lower income requires fishing longer and harder to offset losses; (5) *fishery resources*, if greater fishing effort results in overfished commercial stocks, and; (6) *community relations*, if displacement and/or increased effort in a smaller area results in crowding and gear conflict. Further, it is inferred that crowding and overfishing can cause further displacement on the basis of seeking better fishing grounds. These scenarios involve seven out of the 11 wellbeing attributes that were perceived as costs by fishers (Figure 6.3), demonstrating that a large proportion of negative perceptions about MPAs related back to an initial concern about being displaced.

Figure 6.4 highlights three key governance implications. First, concerns about displacement result in a suite of other perceived costs of MPAs. Thus, by addressing concerns about MPAs at their root, MPA governance could ease associated apprehensions more efficiently. In turn, this may improve perceptions of other attributes of wellbeing and foster greater support for (or less resistance to) MPAs in the region. This is a tall order, given the need for MPAs to protect ecosystems from human disturbances, which include commercial fisheries. Indeed, “the problem is, the places where the marine protected areas are most beneficial...are where the fish are” (Fisher 25), and simply allowing most fishing activities to continue within an MPA to address the issue of displacement could reduce overall MPA effectiveness, despite garnering greater community support. There are also campaigns in Canada currently pushing Fisheries and Oceans Canada to increase protections afforded in MPAs (e.g., CPAWS, 2015) which, if they have any effect, would only increase the likelihood of displacing fishers. In light of this challenge, first steps might be to explore ways in which displacement has been recognized and assessed in previous cases where fishers have been displaced from MPAs (e.g., Chollett, Box, & Mumby, 2015; Cinner et al., 2014; Stevenson et al., 2013; Vaughan, 2017; Voyer et al., 2014) and to articulate anticipated fishery restrictions as early as possible in MPA network development.

Second, displacement relates to all four dimensions of SEWB. Access to the fishery in SWNB does not simply equate to the material ability to catch fish, but also has implications across relational, subjective, and ecological dimensions. In establishing MPAs, a seemingly obvious assumption could be that fishers have high mobility, especially in fisheries using mobile gear (as opposed to aquaculture pens, for example, which are anchored to the seafloor). However, in reality, learning, place-identity, income, community relations, and fishery resources can all be influenced when a fisher relocates their fishing effort. Fisher 25 expressed this common misconception: “People don’t realize it unless they fish. They look at the water and they say, ‘What a vast area you have to fish here. What does it matter if we take this [small amount] in the whole ocean?’” Thus, displacing a fisher to another location that contains fish

stocks of equal quantity or quality, or attempting to compensate fishers in material terms for displacement, may not address the wellbeing of fishers adequately. One informant asked, “Will there be compensation to fishermen who are no longer able to fish in the area?” (9). This question is pertinent, and raises others, such as how a loss of less tangible attributes (e.g., place-identity) could be compensated. Recognizing the breadth of the displacement issue is critical if governance is to address the costs and benefits of MPAs holistically.

Third, these findings stress the importance of thinking about MPAs and displacement systemically. Participants described the consequences of displacement as a feedback loop, whereby increased fishing effort would result in a decline of fish stocks. This could consequently become a source of further displacement and re-enforce the cycle. Displacement therefore has the potential to undermine ecological conservation (and presumably MPA objectives) if it results in overfishing in adjacent areas. This example emphasizes the interconnectedness of social and ecological systems, and that issues in one system can intensify those in the other. Thus, when considering displacement in regional MPA planning, it will be important to recognize these linkages between displacement and other aspects of the social-ecological system. In SWNB, systemic thinking is particularly important given the relative intensity of ongoing fishing effort in comparison to the rest of the Bay of Fundy (e.g., Figure 3.7). Further, such scenarios may scale up, as there are other activities in the Bay of Fundy which continue to displace inshore fishers.

Apprehension about displacement is not a new phenomenon in the Bay of Fundy, and MPAs fit into a broader context that is associated with displacement and access issues in Canada (Bennett et al., 2018). The West Isles National Marine Park study that began in 1978 caused concerns about displacement and resulting implications on fishers’ livelihoods (Ricketts, 1988; Sheppard, 2005). While this proposal did not materialize into a park, eight participants in my research brought up their experiences with the West Isles study, demonstrating the longevity of its legacy. Informant 11 summarized current sources of displacement in the Bay:

[Fishers] are losing access constantly. They lost a lot of access with the aquaculture industry, with all of the energy development in Saint John Harbour, and the impact of all the tankers. They’re losing access that way. There are corporate interests trying to buy out the fishery and they’re losing access to licenses that way. They need to maintain access and right now, they’re losing access in a big way. So MPAs is another thing that will restrict their access.

Similar consequences as those described in this section (e.g., crowding, gear conflict) have also been reported in the region as a result of displacement from aquaculture (Wiber et al., 2012). Thus, if an MPA was to displace fishers, the consequences would add to pre-existing experiences with displacement, as

well as the social and ecological implications of those experiences. As such, MPAs could intensify consequences which pre-exist from other sources of displacement.

The discussion above assumes that fishers *will* move elsewhere if they lose access to a fishery within the boundaries of an MPA. This reflects most participants' conceptualizations of access loss and subsequent displacement, however alternatives to displacement also exist. If a restriction was species-specific, fishers could choose to rely on other commercial species instead, if they held other licenses. For example, if scallop dragging was restricted, one fisher explained that they would rely solely on their lobster license instead, as long as lobster fishing was still allowed. Fishers could also retire from fishing rather than move elsewhere to fish. For example, when asked what they would do if they had to fish elsewhere than the Outer Quoddy Ecologically and Biologically Significant Area, another fisher replied, "I'd probably sell, myself, if I could get a good price [for the license]" (Fisher 27). This quote also demonstrates that decisions about reacting to changes in fishery access depend on other factors (e.g., licence prices).

An MPA might not necessarily result in displacement, as was the case at Musquash (Section 5.2.1.2). Indeed, continued fishery access was often described as a reason for participants' view of Musquash as a 'win-win' MPA. Since existing fisheries were grandfathered and the likelihood of gear conflict was reduced, fishers did not perceive or experience a decline in other attributes of wellbeing, such as income, community relations, and place-identity. Fisher 4 attributed a lack of negativity concerning Musquash to continued fishery access: "There is still some fishing activity that goes on in the protected area, so there's not much negativity as far as I can see in it." The Musquash experience informs MPA governance, as it demonstrates that MPAs *without* fisher displacement are more likely to be perceived positively by the inshore fishing community of SWNB. Further, it highlights that despite a generally positive experience at Musquash, without displacement, fishers are still apprehensive about the potential for displacement from future MPAs. Thus, addressing these concerns will be critical if MPA planning is to move forward in SWNB.

## **6.2.2 Decision-Making Approach**

Several insights regarding the decision-making approach for MPAs emerged from participants in this research. Generally, the approach was perceived to be misaligned with the needs and priorities of the inshore fishing community. Insights on the process relate to the following three issues: opportunities for collaboration (6.2.2.1), clarity and transparency in communication (6.2.2.2), and equity (6.2.2.3).

### **6.2.2.1 Opportunities for Collaboration**

When looking forward to future MPA planning, participants expressed significant concerns about the ability to participate in MPA governance. As reported in Section 5.2, collaborative decision-making was the most-discussed attribute of SEWB (n=19 and n=39 for Musquash and Outer Quoddy, respectively), indicating that this attribute was both important to participants and relevant in terms of MPAs. Many fishers were not satisfied with the level of fishers' involvement to-date in MPA planning, at various levels. For example, areas in the Bay of Fundy were identified for a long list of potential future MPAs (i.e., EBSAs) without fisher involvement, as highlighted by the following quote:

When they put a marine protected zone in place, who are they asking? They're taking science, they're having these meetings, but I don't see them right from the ground floor. As I said, they've already got a map out there that's showing some of these places they're considering for a marine protected area. Who did they ask? It wasn't a fisherman that knew about it until the rumour trickled down that they were considering marine protected areas, and they've already got [EBSAs] on a map. Who are they asking? (Fisher 19)

At the international level, decisions about MPA targets were also critiqued:

One of the problems is, you've got people who are going to these [international] meetings who are making these decisions [about MPA targets], and they're probably good decisions, and they're doing it for the right reasons. It's just that they're not considering the people on our end. *Now* they're going to consult us. (Fisher 25)

Indeed, international targets and the government mandate to expand the MPA network were discussed by many participants, and perceived to have resulted in a centralized and top-down planning approach, leaving little room for local influence over decisions.

However, some informants did recognize the intent and attempts of decision-makers to consult in the SWNB region, and participants also recognized the effectiveness of participation during Musquash MPA designation. Continued opportunities for engagement through the Musquash Advisory Committee were also recognized by several participants. Yet fishers at Outer Quoddy perceived that they would not have an opportunity to participate in decision-making, based on previous decisions made by DFO in matters of fishery management, rather than the MPA experience at Musquash specifically. Experiences of fishers working within DFO's fishery management structures outnumber the single MPA experience at Musquash, which may explain why memories of the former are more aligned with fishers' current expectations about MPAs. A more detailed discussion of the discrepancies between both cases is provided in Section 5.3

As a way forward, 14 participants at Outer Quoddy recommended various forms of involvement in MPA planning, demonstrating a desire to participate, apply local knowledge, and engage local leaders “rather than the consultation being led by folks from Dartmouth [Nova Scotia]” (Informant 9). Informant 5 said, “I can see better things coming from a really more authentically collaborative approach.” Further, fishers identified ‘more inclusive fisheries management’ as the most important priority element during focus groups (Figure 6.2). Thus, there is an opportunity for MPA governance to be more collaborative to enhance perceptions about MPAs and align with fishers’ priorities for the future.

Collaboration may take various forms, but should address the perceived lack of participation and top-down governance approach. Greater involvement of the fishing community should be sought as soon as possible, given perceptions that planning is already well underway without enough consultation. If there is a gap between perceived and real levels of consultation, MPA governance in the region must at least address concerns about future levels of involvement by clarifying the mechanisms through which more extensive consultation is planned.

One way to engage the community from the outset is to develop MPA objectives in collaboration with fishers. Data from this research suggest that such an approach could be useful, given the salience of fishery management over that of biodiversity conservation. Participants often discussed ecological resilience in terms of commercial fisheries and fish stocks, and three fishers discussed misaligned priorities for what to protect between fishers and conservationists (Section 5.2.1.1). Further, the highest ranked wellbeing priority from focus groups relates to fisheries regulations and enforcement (Figure 6.2), and this presents an opportunity (and potentially a risk, if conducted haphazardly) for MPA objectives to align with fishery management priorities to ultimately enhance wellbeing. For example, greater enforcement of the owner-operator policy was the highest ranked priority element, and several other fishery management priorities followed (e.g., greater enforcement of poaching, adjusted seasons). Other priorities, such as fostering greater community understanding of the fishery, and maintaining Marine Stewardship Council [MSC] certification, also have potential to align with MPA activities. If these objectives could be aligned with MPAs in the region, support for MPAs may increase by addressing issues that are more important to fishers. Indeed, it has been shown that fishers are more supportive of MPAs when the primary objectives are related to fisheries management rather than conservation (Pita et al., 2011). To consider MPAs in a broader context, certain stakeholders involved in this research advocated for dissociating MPAs from fisheries management thinking. However, given the importance of the inshore fishery to SWNB and the high levels of resistance from the fishing community, thinking in terms of fisheries will be useful to find much-needed common ground with fishers.

Another strategy to increase participation is to integrate fishers' knowledge into local MPA governance. Using fishers' knowledge would take participant recommendations into account, but also has the potential to address some of fishers' mistrust of science, as reflected in Section 5.2.2.2 and in the priority for more transparent science (Figure 6.2). For example, EBSAs in the Bay of Fundy were identified based primarily on natural science research (DFO, 2014a), without integrating fishers' local knowledge. The implications of this are twofold – that fishers feel excluded from decision-making, as described above, and that initial areas under consideration for MPAs do not necessarily correspond with meaningful areas that fishers would want to protect. In SWNB, fishers' knowledge has been integrated with science in previous work (e.g., Maillet, Wiber, & Barnett, 2017), demonstrating at least some degree of precedent, willingness, and pre-existing mechanisms that MPA governance could draw from. In addition to such strategies, clear and transparent communication will be necessary to address the skepticism that currently exists regarding expected collaboration.

#### ***6.2.2.2 Clarity and Transparency in Communication***

Participants expressed frustrations that the full meaning of an MPA designation in the region was still unclear. Specifically, participants wanted to know why and how MPAs were going to be implemented, and what the outcomes would be (Section 5.2.2.2). Some participants reasoned that the specifics of MPAs were still unclear because it was still during early stages of MPA network planning, whereas others expressed concerns that decisions were being made behind closed doors. Issues surrounding clarity are captured in the following quote:

[DFO] said they didn't know what was going to be involved, so they were sort of learning the process as well as we were. But that's what they *said*. Maybe they knew and didn't want to say, but there's a lot needs to be clarified. (Fisher 6)

Much of the information regarding MPAs reaches fishers through existing community relations at the local level (e.g., word-of-mouth), and by local representatives, such as members of Fundy North who attend formal meetings and report back to the community. Participants commonly expressed that their knowledge of MPAs was based on word-of-mouth from other community members. For example, Fisher 19 was quoted in Section 6.2.2.1 above: “wasn't a fisherman that knew about it until the rumour trickled down that they were considering marine protected areas.” Communication of important details through these networks may be filtered through the biases or interpretations of the individuals disseminating information. This may influence the clarity of information being received by fishers in the community, and has implications for how MPAs are perceived, particularly if those attending meetings have pre-

existing views on MPAs. For example, Informant 8 noted that “people that tend to come out to the meetings and participate in the process are the ones that are against it, and so it’s going to be important to try to get a balanced view from within the community.”

Information regarding MPAs is also communicated by DFO. At the regional level, DFO Maritimes is responsible for consultation. However, higher-level messaging strategies may also be reaching stakeholders in SWNB from other regions (e.g., DFO Ottawa). Based on community perceptions in SWNB, both levels of DFO are at risk of overselling the benefits of MPAs. At a local public open house in St. George, NB in October, 2016, information sheets listing the anticipated and potential benefits of MPAs were posted, exhibiting a heavy focus on fishery benefits (Box 6.2). That same month, at the national level, DFO released an online video to communicate the benefits of MPAs (Figure 6.5) (DFO, 2016b). However, the only “scientifically-proven benefits” described are as follows: “[MPAs] can be created to increase the size of fish stocks by creating refuges and by protecting fish habitats. As fish populations grow, they can spill over into surrounding areas and increase populations available for fishing.”

**Box 6.2 MPA benefits listed at DFO consultation on October 26, 2016 in St. George, NB**

Anticipated Benefits of MPAs	Potential Benefits of MPAs for Fisheries
<ul style="list-style-type: none"> <li>• Help restore and maintain fisheries</li> <li>• Support or enhance ecotourism</li> <li>• Preserve cultural heritage</li> <li>• Increase ecosystem resilience</li> <li>• Insurance policy against uncertainty</li> </ul>	<ul style="list-style-type: none"> <li>• More fish</li> <li>• Older, bigger fish that produce more eggs</li> <li>• Shelter for juvenile fish</li> <li>• More prey</li> <li>• Sustained catches (spillover)</li> <li>• Reduced bycatch</li> <li>• Support eco-certification</li> </ul>



**Figure 6.5 Screenshot of DFO video portraying the proliferation of fish stocks in an MPA (DFO, 2016b)**



While efforts at accessible scientific communication should be lauded, such messaging emphasizes fishery benefits that are widely believed to be unrealistic in SWNB, and may confuse the primary conservation objectives of MPAs. Indeed, participants demonstrated skepticism and uncertainty as to whether an MPA would enhance fish stocks or result in spillover (Section 5.2.1.1). For example: “This spillover effect they talk about...in small MPAs doesn’t really exist, and with species that migrate a lot, doesn’t really exist. In a large MPA, sometimes does exist, but we’re not going to have a large MPA here” (Informant 11). There is a trade-off between promoting the benefits of an MPA to garner community support, and overselling benefits. Overselling benefits risks entrenching pre-existing suspicions and perpetuating feelings of mistrust for DFO (Section 5.2.2.2).

Given these findings, decision-making processes for MPAs must include clear and transparent communication strategies to ensure that accurate information is reaching the fishing community, without exaggerating the benefits of MPAs to a community that anticipates mostly costs from MPAs. It is clear that the mode of communication contributes to fishers’ perceptions and support for MPAs, and also has implications for relationships and trust between fishers and DFO. As early as possible, details about MPA design and process should be communicated clearly with the fishing community through formal channels.

There is no easy solution to address the trade-off between promoting the benefits of MPAs and overselling benefits of MPAs to a skeptical fishing community in SWNB. Information regarding potential benefits should indeed be available to stakeholders, however this could be done with more explicit recognition for the *likelihood* of respective benefits. One option may be to engage in science communication strategies to provide evidence of benefits from Musquash, or rationale for why Outer Quoddy was chosen as an ESBA, for example. As MPA planning continues and specific sites emerge from the upcoming Maritimes MPA network plan, there may be a clearer method to identify specific anticipated benefits of selected sites. However, at the time of research, it is important to recognize that fishers feel that they will be asked to support an MPA in faith that there will be benefits to the fishery, when the reality is not necessarily the case.

### ***6.2.2.3 Equity Considerations***

Perceptions of inequity can undermine support for conservation initiatives (Halpern et al., 2013). This may be occurring in SWNB, where equity was raised in terms of both MPA outcomes and process. In terms of outcomes, participants felt that the distribution of costs of an MPA would vary amongst fishers depending on the location of the MPA, and that inshore fishers would bear more of the costs of an MPA

as compared with other industries (Section 5.2.3.2). In terms of process, some participants recommended careful consideration over who is participating in decision-making processes in order to be fair to different stakeholders.

Several participants deliberated over who should have input into MPA planning. Fishers often asserted or implied that they had historical precedent to continue fishing in an area. In contrast, other participants argued that the ocean is a public resource and thus decision-making should be shared by all Canadians. For example, Fisher 4 expressed, “I still feel it’s our fishery, and I say ‘our fishery’ as a fisherman. It belongs to the fishermen,” whereas Informant 3 said “It’s a natural resource. It’s a public resource, and it’s not yours. It’s also mine, and the part that’s mine, I’d like to see marine protected areas.” While these are strong views that were not shared by all fishers or informants, a multitude of views along a continuum between these divergent perspectives exemplifies the normative element of equity, and highlights the challenge in identifying stakeholders to be involved in decision-making processes.

Planning MPAs with explicit attention to the distribution of benefits and costs among stakeholders may enhance the fairness of MPAs in SWNB. However, it may not be possible to evenly distribute the benefits and costs of an MPA, and simultaneously maximize conservation benefits (Halpern et al., 2013). Thus, a more useful governance approach is to find ways to increase the acceptability of unequal distribution of benefits and costs, and shift the focus from *equality* to *fairness*. For example, including fishers in decision-making processes may help offset some of the perceived inequities of MPAs by enhancing equity in the process rather than outcomes (e.g., through participatory measures indicated in Section 6.2.2.1).

Another possibility may be to explicitly and transparently examine the trade-offs of benefits and costs across stakeholders. Conducting such an assessment would provide clear and transparent information about the impacts of an MPA. Rather than listing a number of anticipated benefits (e.g., Box 6.2), a comprehensive co-constructed list of anticipated and potential benefits, as well as costs, could be assessed in collaboration with fishers and other stakeholders in terms of who will receive the benefit or the cost. There are many more potential benefits that could arise from MPAs, and the use of a comprehensive typology may serve as a starting point for such discussions (e.g., Angulo-Valdés & Hatcher, 2010). The list of impacted parties could also include future generations (i.e., inter-generational equity), which would likely have strong relevance and importance for fishers in SWNB where the sense of place-identity and way of life is firmly tied to family heritage (Section 5.2.3.1). Such a process could also be the basis for discussions around compensation for those bearing greater costs. Ultimately, addressing perceptions

about equity will be critical to generate support from the fishing community if MPAs are to be implemented regionally.

### **6.2.3 Social and Ecological Fit**

Conservation initiatives are more effective if governance fits the social and ecological dynamics and contexts of the systems in which they are implemented (see Section 2.1.2). Evidence from my research indicates that there is an opportunity for MPA governance to better fit the local context in SWNB. Participants identified areas in which past experiences and current trajectories with MPA planning have, or do not adequately align with the underlying elements of the region, in both social (e.g., wellbeing priorities) and ecological terms (e.g., scale).

Fit is defined here as “the dynamic alignment between the governing system for conservation and the social and ecological dimensions of a system that influence the outcomes of conservation policy and practice” (see Berdej & Armitage, 2016) (Section 2.1.2). In the case studies I examined in SWNB, there are several examples of poor social fit between MPAs and the local context. Misaligned priorities are apparent from the disparities between MPA network objectives (Box 6.1) and the highest ranked wellbeing priorities of fishers, which mostly related to fishery management and relations between fishers (Figure 6.2). During interviews and focus groups, fisheries issues were also more salient than broader ocean conservation topics (Section 6.2.2.1). Fishers often described their interests in protecting spawning grounds and commercial fish stocks, rather than other features of the ecosystem that were important to conservationists. For example, “Things they would like to preserve sometimes aren’t even things we know that exist, like snails and all kinds of foolish things that maybe are important to some people, but to fishermen really not so much” (Fisher 25). It is clear that conservation objectives do not incorporate the priorities of fishers. Further, as described in the previous section (6.2.2), many concerns were voiced about the appropriateness of MPA decision-making processes.

Of particular note was the role of MPAs in changing pre-existing resource use patterns and related activities, rather than aligning with them. A commonly reported issue with MPAs was that they would likely reduce the number of options for fishing (e.g., location, species, gear types) and thereby reduce the ability of fishers to exercise adaptability in the face of accelerating ecological change (Section 5.2.3.3). In particular, participants were concerned about the lengthy legal process required to make changes to MPA boundaries and allowable fisheries, based on experiences with Musquash and past fishery management measures. Many participants also noted that MPAs do not take ongoing efforts towards sustainability into

account. For example, Informant 5 expressed the misfit between the MPA template and previous efforts by fishers to enhance the sustainability of their operations:

This whole area is pretty unique. Given its ecologically sensitive nature... and also given that the fishermen organizations here have been working really hard to create more sustainable fisheries and more sustainable communities, it seems like there's a convergence of some really positive things happening. So instead of just saying, 'okay well forget all that, and we're just going to plop down an MPA here,' it seems to me more sensible to take a more nuanced approach.

This informant later elaborated that specific conservation measures, such as using escape vents in the lobster fishery, were not accounted for under the current marine conservation agenda.

Ecological fit was also discussed by participants when they discussed issues related to temporal and spatial scale (Section 5.2.4.3). Given concerns about the effort required to change aspects of an MPA's design through a regulatory process, participants explained that MPAs may not be adequately adaptable to continue meeting ecological objectives under conditions of accelerated ecological change. The static nature of MPAs may inhibit the ability to respond to environmental change within and adjacent to MPAs effectively. Thus, in a temporal sense, MPAs may not fit ecological dynamics. Spatial scales were also discussed by participants, who expressed that marine areas within the boundaries of MPAs could still be impacted by sources of pollution on land and upstream. For example, marine debris originating in other areas is regularly found on beaches at Musquash due to ocean currents. However, the fact that the Musquash MPA accelerated adjacent land conservation was noted. In the Musquash case, designation of the MPA resulted in complementary conservation measures that better addressed the transboundary nature of pollution, enhancing the spatial fit of conservation in the estuary.

Three participants also noted that if the objectives of an MPA were to enhance productivity or spillover, the MPA would need to be designed to fit certain ecological functions. Specifically, the probability of spillover would depend in part on species' ranges. For example, Fisher 7 contemplated differences in the abilities of lobsters and scallops to migrate over the borders of an MPA into adjacent waters. Two informants also expected that spillover would be more likely if an MPA was strategically protecting spawning areas.

Insights emerge from this discussion to enhance the fit between MPA governance and the social and ecological contexts of the inshore fishing community in SWNB. Some of these insights align with those previously discussed in this chapter. MPA objectives can be aligned with the values and priorities of the local community, as discussed in Section 6.2.2. Recognizing the multidimensional nature of fishing is

also critical. For example, addressing place-identity and the learning required to fish in SWNB (Section 6.2.1) may result in MPA plans that are better aligned with local values. Further, decision-making processes could be more collaborative (Section 6.2.2) to improve the fit of MPA planning and implementation with the social context. However, MPAs inherently alter resource use patterns by restricting human activities within their boundaries. Thus, MPAs will alter pre-existing social patterns to some degree regardless of how they are implemented.

Another way to enhance the ability of an MPA to fit changing social and ecological dynamics over time would be to employ more adaptive governance (Section 2.1.2). Adaptive governance entails organizing actors (e.g., DFO) and processes (e.g., collaborating with inshore fishers) to be more flexible and to learn from and respond to change (Folke et al., 2005; Steelman, 2015). Rather than remaining a static MPA that risks becoming ineffective under conditions of change, mechanisms would be in place to adjust boundaries, allowable activities, or objectives, if circumstances (e.g., distribution of critical species) were to change. The ability to respond to change more effectively would differ from the current situation, which was perceived as overly bureaucratic and rigid. For example, Fisher 11 said that “in order for...the local fishermen to have any talks or any possible changes, there’s so much red tape,” and Fisher 13 asserted that “the whole bureaucracy in [DFO] has got to change.”

However, a certain degree of adaptability does exist within current MPA governance. For example, the MPA management plan at Musquash stipulates that “monitoring informs and guides management actions” (DFO, 2008, p. 29) and states that actions may be taken to offset negative ecosystem changes that are discovered from monitoring. Several management reviews have also been conducted (DFO, 2008, 2015a, 2015c). However, it has taken nine years to establish baseline data at Musquash, and a monitoring program has yet to materialize (DFO, 2015b). It will take more time still to determine whether the MPA is meeting its objectives. This timeline is comparable to the time it has taken for fishers to witness significant changes in the environment, rationalizing concerns that MPA management may not be able to keep up with ecological changes that are relevant to the fishery. For prospective MPAs in the region, a monitoring plan should be established as soon as possible once an Area of Interest has been identified. More coordinated monitoring would enhance the ability to learn from changes in the system, but would also provide evidence to more clearly demonstrate outcomes of an MPA to local stakeholders.

Further, a certain degree of flexibility and opportunity for fit already exists in the designation of MPAs in Canada given that regulations are established on a case-by-case basis. Despite criticisms that this generates confusion (CPAWS, 2015), case-by-case designation provides an opportunity to take local

context into account in individual MPAs, at least to some degree. Greater potential for flexibility was recently incorporated into provisions at the newest *Oceans Act* MPA in the Maritimes, St. Anns Bank, Nova Scotia. At this MPA, commercial fishing exceptions by zone are based on gear type, rather than specific fisheries (St. Anns Bank Marine Protected Area Regulations, 2017). Thus, a new fishery could be harvested if it was using one of the stipulated gear types. While the provisions at St. Anns Bank may limit the ability to use novel gear types in the future, they also demonstrate a degree of adaptive governance, as DFO applied a ‘learning by doing’ approach (DFO, 2014b) to address concerns that had emerged from previous MPA experiences at Musquash (Section 5.2.3.3).

Designing MPAs for better fit in SWNB may require more significant shifts in the approach to marine conservation. In SWNB, it may be more appropriate to explore other options for marine conservation, such as other effective area-based conservation measures. For example, fishery closures under the *Fisheries Act* are more temporally flexible than *Oceans Act* MPAs. Using this mechanism, variation orders can be issued relatively quickly, and are therefore well-suited to respond to changing conditions. Fishery closures also align with pre-existing fishery management measures, which may enhance their social fit. This OEABCM may count towards marine conservation targets, however concerns have been raised because fishery closures do not restrict other industries that may also be degrading the ecosystem (Forrest, 2017), demonstrating that trade-offs exist between various marine conservation options. It is beyond the scope of this research to propose a ‘best-fit’ solution for MPAs in this case study, as this would require broader community input. However, the suitability of different conservation models in SWNB should be examined from the perspective of decision-makers as well as local stakeholders.

### **6.3 Synthesis of Governance Implications**

Key implications for regional MPA governance from the preceding discussion in this chapter are summarized in Table 6.1. These findings can broadly be summarized as a need to address fishers’ concerns about displacement and its consequences, centralized and unclear decision-making processes, and the misaligned fit between MPAs and the local social and ecological context in SWNB. Focusing on these wellbeing insights will address perceived costs of MPAs and align more favourably with fishers’ priorities, and may enhance community support and MPA effectiveness.

These governance implications align with several existing policy directives that guide MPA network planning in Canada. Table 6.2 compares these directives to the governance insights from this case study, demonstrating that these insights have already been considered to some extent in MPA governance in Canada. Of the three major themes, considerations regarding decision-making processes align most

clearly and directly with Canadian policy, although considerations of equity are absent. The fact that benefits and costs will depend on the contextual circumstances is addressed (DFO, 2011) without clear reference to the *distribution* of benefits and costs across stakeholder groups. This absence is a shortcoming of the policy, given the requirement for “equitably managed” protected areas under Aichi Target 11 (CBD, n.d.). While displacement is not explicitly addressed, socioeconomic considerations are meant to be taken into consideration in MPA network planning (DFO, 2011). Social and ecological fit are also not explicitly addressed, however the concept of learning and responding to change is captured by adaptive management principles (DFO, 2005), which were identified in Section 6.2.3 as one of several methods for enhancing the social and ecological fit of MPAs in SWNB.

**Table 6.1 Key implications for MPA governance from SEWB insights**

Wellbeing Insights	Key Governance Implications
Displacement	<ul style="list-style-type: none"> <li>• Displacement is an entry point for addressing multiple other concerns about MPAs</li> <li>• Consequences of displacement are multi-dimensional, and as such, should be conceptualized holistically</li> <li>• MPAs are but one source of displacement, and must be considered in the context of the broader SES</li> </ul>
Decision-making processes	<ul style="list-style-type: none"> <li>• Collaboration with the inshore fishing community is essential for governing MPAs, and should be sought through all stages of MPA planning and implementation</li> <li>• The clarity and transparency of communication about MPAs has implications on community support for MPAs, and trust in DFO</li> <li>• Explicit attention to equity in terms of both process and outcomes may enhance the acceptability of MPAs (e.g., explicitly comparing trade-offs of benefits and costs across stakeholders)</li> </ul>
Social and ecological fit	<ul style="list-style-type: none"> <li>• As they stand, MPAs are perceived to have poor social and ecological fit in SWNB</li> <li>• Aligning objectives for conservation and fisheries may enhance local relevance and build support for MPAs</li> <li>• More adaptive governance may enhance the fit of MPAs in dynamic conditions</li> <li>• Mechanisms for enhanced flexibility of MPAs or OEABCMs would improve the acceptability of conservation initiatives</li> </ul>

In addition to policy overlap, governance insights from this case are well-aligned with best practice approaches in the literature on MPAs. Governance implications regarding the decision-making process in SWNB resonate particularly strongly with literature on the importance of good governance principles for protected areas, such as participation, transparency, and legitimacy (Section 2.1.2) (Lausche, 2011; Lockwood, 2010). Yet findings from this case study illustrate that these principles have yet to materialize either in practice, or in perception. The gap between recognition of these principles and stakeholder

satisfaction that these principles are being adequately addressed has been reported in previous research as well. In other cases, fishers have reported dissatisfaction with consultation and broader decision-making processes for MPAs (Pita et al., 2011). The importance of transparency and clear communication about the distribution of MPA benefits has also been highlighted by previous research (e.g., Cinner et al., 2014). With respect to fisheries management in the Gulf of Maine, specifically, Stephenson (2012) noted the following:

There is a perception of lack of transparency of governance and a lack of participation in management. While we have a considerable amount of consultation, it is claimed by some that there is insufficient feedback following deliberation and on decisions and that those with interest in activities want to be part of the governance process. (p. 411)

Aspects of governance fit have also been captured in previous work, and align closely with discussions surrounding participatory decision-making processes. For example, aligning biodiversity conservation with other MPA objectives that are more salient for local stakeholder groups has been proposed before (e.g., Charles & Wilson, 2009; Gaymer et al., 2014; Rees et al., 2013b). Alternatives to MPAs that may be more relevant in local fishery contexts have also been discussed, such as spatial-temporal fishery closures (e.g., Ferse et al., 2010; Kincaid & Rose, 2014) and more adaptive MPA models (e.g., Game et al., 2009; Mills et al., 2015).

**Table 6.2 Comparison of governance insights with Canadian marine conservation policy directives**

<b>Governance Insights</b>	<b>Policy Directives</b>	<b>Reference</b>
Displacement	<ul style="list-style-type: none"> <li>• Take socio-economic considerations into account</li> <li>• Consider potential economic and social impacts</li> </ul>	DFO, 2011
Decision-making processes	<ul style="list-style-type: none"> <li>• Consultation and collaboration</li> </ul>	DFO, 2005
	<ul style="list-style-type: none"> <li>• Identify and involve stakeholders and others</li> </ul>	DFO, 2011
	<ul style="list-style-type: none"> <li>• Transparency founded on engagement, consultation, and collaboration</li> </ul>	DFO, 2017b
	<ul style="list-style-type: none"> <li>• Ensure open and transparent processes</li> </ul>	DFO, 2011
Social and ecological fit	<ul style="list-style-type: none"> <li>• Adaptive management</li> </ul>	DFO, 2005
	<ul style="list-style-type: none"> <li>• Manage and monitor the MPA network</li> </ul>	DFO, 2011
	<ul style="list-style-type: none"> <li>• Practice adaptive management</li> </ul>	

In summary, there are parallels between literature on MPAs and case study findings from this research. Other research demonstrates a disconnect between perceptions ‘on the ground’ and how MPA governance ought to be working. Similarly, in Canada, ‘best practice’ governance principles are recognized in policy, but the inshore fishing community still perceives that these principles are not being (or will not be) adequately addressed in SWNB. This could be because of entrenched institutional structures despite existing policy (Jessen, 2011), lack of capacity (Canadian Independent Fish Harvester’s Federation,



2016), differing interpretations of the principles across stakeholders, or fisher mistrust or suspicion of DFO.

Moving forward, co-management is a more promising model of governance to enhance support for MPAs from the inshore fishing community in SWNB. This is because co-management would allow the community to address many of the governance implications listed in Table 6.1, while recognizing that a centralized government department and mandate are driving MPA network planning in Canada. Under such a model, DFO would continue to direct MPA network objectives, set the legal and policy framework, and provide technical and science assistance, while giving local communities more authority to plan marine conservation initiatives and provide input relating to local knowledge and priorities. True co-management entails power sharing (see Section 2.1.2), and as such, participation would have to move beyond one-way flows of information and consultation (i.e., as perceived by fishers) to collaboration and co-decision (e.g., Hogg et al., 2013). For MPAs in SWNB, this would involve integrating knowledge and co-determining MPA objectives and designs. Ultimately, co-management is an option that would better reflect local priorities and enhance the fit of MPAs to the local context, while continuing to move towards higher level objectives under the current MPA network mandate.

However, aligning high-level objectives with those of the local community will be challenging (Gaymer et al., 2014). If the marine conservation strategy that fits the local social and ecological conditions of SWNB is a more flexible mechanism, for example, it may not meet criteria for national targets. Another challenge entails building the trust of local communities (Gaymer et al., 2014). Building trust will be a challenge to MPA implementation in SWNB given a long history of mistrust of the government in the region. Learning from the West Isles marine park experience, Walters & Butler (1995) reflected that “conservationists are now fighting against a strong tide if they assume they can effectively enlist local communities in cooperative management arrangements without first changing the adversarial context that decades of centralized government policy has helped create” (p. 206). As such, careful attention should be directed to relationships and trust-building throughout MPA network planning.

In conclusion, accounting for displacement, decision-making processes, and social and ecological fit in MPA governance would take the wellbeing priorities of fishers into account, as well as address the perceived costs of MPAs that currently exist in the fishing community. Including SEWB considerations of the fishing community is important in MPA governance because of the moral imperative to ensure that MPAs confer the most possible benefits to communities, but also for practical reasons as fishers are

vocally opposed to MPAs in SWNB. Consequently, governance systems may be better poised to enhance community support for MPAs, which may result in more effective conservation outcomes.

## **6.4 Chapter Summary**

The purpose of this chapter was to examine how SEWB insights contribute to the effectiveness of MPA governance (research sub-question 3). Enhancing the effectiveness of MPAs may be achieved by either (1) aligning MPA objectives and outcomes with community wellbeing priorities, and/or (2) enhancing perceptions of MPAs so that they are viewed more positively. Fishers' wellbeing priorities were analyzed from focus groups (Section 6.1), and findings indicate that relational attributes were given the highest priority rankings. In order of most to least important, these included regulations and enforcement, collaborative decision-making, community relations, and markets. These findings were then integrated with perceptions reported in Chapter 5 to identify three major insights for governance (Section 6.1).

The three key insights for MPA governance relate to the implications of displacement, the MPA decision-making approach, and the social and ecological fit of MPAs. First, participants attributed many of their negative perceptions about MPAs to initial concerns about displacement (Section 6.2.1). Physical displacement from MPAs was perceived to have several other consequences that cut across all dimensions of SEWB. As such, MPA governance should address initial concerns about displacement to enhance community support for MPAs. Second, MPA governance must address current concerns about the MPA decision-making process (Section 6.2.2). These concerns may be addressed by creating opportunities for collaboration, communicating transparently, and addressing equity explicitly. Third, static MPAs are perceived not to fit the social and ecological conditions in SWNB in terms of pre-existing resource use patterns and the dynamic nature of ecosystems (Section 6.2.3). All three of these insights align with existing policy that guides MPA governance in Canada, in addition to the literature on principles of MPA governance, demonstrating a misalignment between local perceptions in SWNB and how MPA governance ought to be working in Canada. Ultimately, co-management may be more promising than the current top-down approach that is guiding MPA network development.

## Chapter 7: Conclusions

In this chapter, I summarize my research and provide future directions. Specifically, I provide a summary of the research context (Section 7.1) and the major findings of this research (Section 7.2). The findings are organized with respect to the research questions they addressed. Next, I describe the contributions that this research made in terms of the framework for social-ecological wellbeing (Section 7.3.1) and governance insights for MPAs (Section 7.3.2). I conclude by providing practical recommendations (Section 7.4).

### 7.1 Summary of Research Context

The use of marine protected areas to conserve biodiversity and reach marine conservation targets has increased dramatically in recent years (Boonzaier & Pauly, 2016; Lubchenco & Grorud-Colvert, 2015), and the expansion of a network of MPAs is currently underway in Canada (Chapter 1). However, the proliferation of MPAs has been accompanied by concerns about their associated social implications (e.g., Agardy et al., 2011; Chan, 2017; Charles & Wilson, 2009; Ferraro & Pressey, 2015; Rees et al., 2013b; Voyer et al., 2014). As a result, a growing number of studies have examined the relationship between MPAs and their benefits and costs to coastal communities (e.g., Gjersten, 2005; Mascia et al., 2010; Stevenson et al., 2013). However, these have been defined in narrow terms, leaving an opportunity for a more holistic assessment of the implications of MPAs on the wellbeing of coastal communities (Chapter 2).

This research addresses the need for a holistic assessment by applying a framework for SEWB (Section 2.4) to a case study of the inshore fishing community in the Southwest New Brunswick area of the Bay of Fundy (Chapter 3). Smaller-scale fishers are often disproportionately affected by MPAs (Pita et al., 2011) and their perceptions are therefore valuable for understanding levels of community support given to such interventions. With local stakeholder support, MPAs are more likely to be effective (Agardy et al., 2011; Bennett, 2016; Lubchenco & Grorud-Colvert, 2015). Using qualitative methods (Chapter 4), this research has sought to (1) understand perceptions within the fishing community about the relationship between MPAs and attributes of SEWB (2) understand the distribution of benefits and costs across stakeholders and two embedded cases (the Musquash MPA and the Outer Quoddy Ecologically and Biologically Significant Area), and (3) identify insights for more effective MPA governance. Ultimately, the use of SEWB perceptions to enhance MPA governance should improve the effectiveness of MPAs as Canada works towards its marine conservation targets.

## 7.2 Summary of Findings

In this section, I summarize my research findings and analysis in relation to the following three research questions:

1. How do stakeholders perceive MPAs in relation to social-ecological wellbeing?
2. How are social and ecological benefits and costs of MPAs distributed across cases and stakeholders?
3. How can social-ecological wellbeing insights contribute to the effectiveness of MPA governance?

These research questions were designed to examine the relationship between SEWB in the inshore fishing community and MPAs, and subsequently provide insights to enhance MPA governance. They were assessed in relation to the conceptual framework for SEWB presented in Section 2.4, and are summarized in the following three sections.

### 7.2.1 Research Question 1

*How do stakeholders perceive MPAs in relation to SEWB? (Chapter 5)*

There is no singular answer to this research question. Individual stakeholder perceptions on this issue varied significantly across all dimensions of SEWB in both cases. Perceptions at Musquash were generally neutral or positive as opposed to generally negative perceptions at Outer Quoddy. At Musquash, ten of 12 attributes were perceived as benefits, whereas only two of 15 attributes were perceived to be strictly beneficial at Outer Quoddy (see Section 7.2.2 for a summary of the distribution of benefits and costs). Fishers also more commonly perceived the linkages between MPAs and attributes of SEWB with apprehension, as compared with non-fisher informants.

Participants discussed attributes across all four dimensions of SEWB (Table 7.1), highlighting that material, relational, subjective, and ecological aspects of wellbeing were all relatable to MPAs in the case study. However, MPAs were associated with more relational wellbeing attributes than the other dimensions. In-depth details about participants' perceptions on the linkages between each specific attribute and MPAs are provided in Section 5.2. The most-referenced attributes at Musquash were collaborative decision-making (n=19), fishery access (n=19), place-identity (n=16), natural capital (n=15), and disturbances (n=15). At Outer Quoddy, the most frequently discussed attributes were collaborative decision-making (n=39), fishery access (n=33), and income (n=31). This suggests that these particular issues were most significant to participants.

**Table 7.1 Summary of SEWB attributes related to MPAs in SWNB**

Material	Relational	Subjective	Ecological
Fishery resources Fishery access Income Additional resources	Community relations Collaborative decision-making Enforcement Learning Markets	Place-identity Equity Adaptability	Natural capital Disturbances Scale

### 7.2.2 Research Question 2

*How are social and ecological benefits and costs of MPAs distributed across cases and stakeholders?*  
(Chapter 5)

The social and ecological benefits and costs of MPAs were clearly distributed across cases, and somewhat distributed across stakeholders (Section 5.3). Attributes were more commonly perceived as benefits at the Musquash MPA, whereas at Outer Quoddy they were generally perceived as costs. Perceptions at both cases often differed greatly between the same attribute of wellbeing, as well. For example, fishery access was viewed as a benefit at Musquash because the MPA was perceived to have maintained fishery access and reduced the likelihood of gear conflict. However, fishery access was viewed as a major cost at Outer Quoddy because of the potential for an MPA to restrict fishery access in the future.

These findings demonstrate that cases and attributes can be viewed with divergent perceptions depending on the context. Musquash was a case where fishing stakes were much lower than Outer Quoddy, and the MPA was a community-driven initiative. In contrast, Outer Quoddy is a region with concentrated fishing effort, and ongoing MPA network planning is not community-driven. Rather, it is being driven by a central government mandate. Thus, despite historical precedent for a relatively benign MPA at Musquash, apprehension about potential future MPAs still abounds.

Finally, an unfair distribution of benefits and costs was perceived across stakeholders. Overall, participants reported that fishers would most likely bear most of the costs of an MPA when compared to other industries (e.g., tourism, aquaculture) and conservationists. These findings at Outer Quoddy were inconsistent with what happened at Musquash, which was often described as ‘win-win’ for coastal community stakeholders. Nonetheless, fishers and non-fisher participants alike anticipated that the benefits of MPAs were more likely to accrue for the tourism industry, and that other industries like aquaculture were not likely to be impacted with significant costs. This distribution was perceived as unfair, as fishers would be forced to alter their activities to mitigate environmental impacts that have been caused by many actors at different scales.

### 7.2.3 Research Question 3

*How can SEWB insights contribute to the effectiveness of MPA governance?*  
(Chapter 6)

In order for MPAs in Canada to meet their objectives, they must provide long-term ecological protection, support socio-economic values, and enhance public awareness and appreciation of Canada's marine environment (DFO, 2011). Attaining these objectives will be more likely with greater community support of MPAs, which may be achieved by either (1) aligning MPA objectives and outcomes with community wellbeing priorities, and/or (2) enhancing perceptions of MPAs so that they are viewed more positively. Chapter 6 applied wellbeing priorities from focus groups, as well as findings from the second research question (Section 7.2.2), to identify three salient cross-cutting governance insights to enhance MPA effectiveness in SWNB. These insights related to displacement, decision-making approaches, and social and ecological fit (Section 6.2).

First, participants reported linkages between physical displacement and material (e.g., income), relational (e.g., community relations), subjective (e.g., place-identity), and ecological (e.g., disturbances) attributes of wellbeing. For example, displacement from the boundaries of an MPA may result in crowding in adjacent regions, causing conflict among fishers and overfishing. Thus, maintaining access to the fishery in SWNB does not simply equate to the material ability to catch fish, and as such, MPA governance could ease apprehensions associated with MPAs more efficiently by addressing displacement as the source of much concern. Further, this finding demonstrates the multi-dimensional nature of displacement. Displacing a fisher to another location that contains fish stocks of equal quantity or quality, or attempting to compensate fishers in material terms for displacement, would only address the material component of wellbeing. Given that displacement is associated with other consequences that cut across both social and ecological systems, these findings also emphasize the importance of considering the implications of MPAs systemically.

Second, the approach to MPA decision-making does not align with the needs and priorities of the inshore fishing community. Participants identified a need for legitimate opportunities for collaboration. Findings from this research suggest that co-creating MPA objectives with the fishing community and increasing the use of fishers' knowledge in MPA decision-making would provide an opportunity for participation that may be more salient for the fishing community. Enhanced transparency and communication from decision-makers is also essential to build trust and ease suspicions about the intentions of decision-makers regarding MPAs in SWNB. Care must be taken to communicate clearly and not to oversell the benefits of

MPAs. This research also highlighted a multitude of views about equity in terms of who should be involved in decision-making processes. As a result, MPA governance must be explicit about who benefits from each anticipated MPA outcome, and strive for fairness within decision-making processes. Increasing opportunities for collaboration in decision-making processes may enhance the acceptability of unequal distribution of MPA costs and benefits.

Third, evidence from this research indicates that there is an opportunity for MPA governance to better fit the social and ecological systems of SWNB. Participants identified areas in which past experiences and current trajectories with MPA planning have, or do not adequately align with the local context. Examples of poor social fit included misaligned marine conservation priorities between decision-makers and inshore fishers, as well as the influence of MPAs on pre-existing resource patterns. For example, fishers identified the importance of adaptability in terms of being able to modify their fishing patterns in the face of changing social and environmental conditions. However, they felt that MPAs were too static to enable continued adaptability. Examples of poor ecological fit included the static nature of MPAs in changing marine environments, as well as scale mismatches between MPAs and environmental disturbances. More adaptive governance may enhance the fit of MPAs in SWNB to foster continued learning and adapting to changing conditions and local contexts.

These insights reveal a set of key governance implications (Table 6.1, Section 6.3), which can be broadly summarized by the following three points:

- The concern about displacement is an entry point for addressing a range of other multi-dimensional concerns about MPAs, and as such, displacement should be conceptualized holistically
- Collaboration with the inshore fishing community in decision-making will be essential to achieve effective MPAs in SWNB, and will require explicit attention to participation, transparency, and equity
- More adaptive governance and attention to social and ecological fit may address perceptions that MPAs do not align with the social and ecological conditions and context in SWNB

These implications align with much of the existing policy that guides MPA governance in Canada, in addition to the literature on principles of MPA governance. With a few exceptions (e.g., MPA policy does not explicitly address equity), findings from this research demonstrate a misalignment between local perceptions in SWNB and well-established ideas about how MPA governance ought to be working in Canada. Ultimately, co-management is more promising than the current top-down approach that is

guiding MPA network development. This would recognize the central government mandate and authority of Fisheries and Oceans Canada in setting the legal and policy framework for MPAs, while allowing local communities such as the fishing community in SWNB more authority to plan locally relevant and meaningful conservation initiatives.

### **7.3 Key Contributions**

The purpose of this section is to draw conclusions about the theoretical and practical value of this research. In the following sections, I discuss two major contributions of this thesis: the conceptual framework for SEWB (7.3.1) and governance insights for MPAs (7.3.2). In doing so, I revisit the expected contributions introduced in Section 1.1.

#### **7.3.1 Conceptual Framework for Social-Ecological Wellbeing**

This research developed and applied a conceptual framework for SEWB with specific reference to MPAs (Section 2.4). The purpose of the framework was to provide a lens through which to examine the implications of MPAs that was holistic, and that addressed some of the critiques of its constituent theories. The framework reflects wellbeing as a state that is determined by the material, relational, subjective, and ecological dimensions of a system, and is based on the premise that MPA governance and these domains are mutually dependent. In applying this framework, my research makes a theoretical contribution by testing this framework in an empirical case study, and by reflecting on its utility in this section.

The framework was useful for addressing the literature gaps identified in Chapter 2. Through this lens, an in-depth examination of the social implications of MPAs was conducted in terms of wellbeing, in more holistic and explicit terms than has previously been conducted (Section 2.2.3). The ability of this framework to capture wellbeing in broad terms is evident given the range of attributes that participants related to MPAs (Table 7.1). This range is a more holistic representation of the effects of MPAs than that of several previously-reported wellbeing findings in the literature (e.g., Gjersten, 2005; Stevenson et al., 2013). As such, the framework offers a heuristic for examining the linkages between MPAs and multiple dimensions of wellbeing, particularly with respect to issues of displacement which have been identified as a governance insight (Section 6.2.1). However, there may have been other important wellbeing attributes in SWNB that were not elicited using this framework, if they fell outside the four domains of SEWB. The likelihood of this was minimized using an inductive research design, and by asking participants if there



were any other considerations they wished to discuss. However, my research findings may more strongly reflect findings that more readily fit into the SEWB framework.

Integrating social wellbeing and ecological resilience together added value to using solely SWB or resilience thinking alone as a conceptual framework. This framework enabled a primarily social investigation without overlooking the ecological subsystem, thereby recognizing the interrelationship between social and ecological systems that is central to social-ecological systems literature. Perceptions that emerged regarding ecological resilience across both cases were viewed more positively than other wellbeing domains (Table 5.2, Section 5.3). If SWB alone had been used as a lens, it is more likely that perceptions about the environment would have been overlooked, and overall perceptions of MPAs would have been reported with greater negativity. Thus, including ecological resilience demonstrated that participants do see ecological value in MPAs in terms of their potential to protect the environment, despite other trade-offs and costs. This finding is important given that the primary purpose of MPAs is for marine conservation of ecological features (Day et al., 2012).

Other potential benefits of integrating SWB with resilience thinking include generating integrated understandings on the limits of optimization thinking, and including considerations of agency and values in resilience analysis (Armitage et al., 2012a). Indeed, using this framework, participants' perceptions challenged optimization thinking in both ecological and social terms. Participants recognized the role of MPAs in protecting redundancy in ecological systems as reserves of 'extra' natural capital. For example, Musquash was described as an 'insurance policy' for times of need (Section 5.2.4.1). In social terms, the importance of attributes *other* than income, such as collaborative decision-making, community relations, and place-identity, clearly challenges economic rationalization thinking in terms of MPA effects on the inshore fishing community. This research therefore demonstrates that participants do not solely subscribe to ecological or social optimization thinking. This framework also made normative aspects of MPAs more explicit, by bringing questions of resilient MPAs *for whom* to light through the subjective wellbeing attribute of equity, among others. For example, the agency involved in decision-making reflects ecological conservation values more than the values of the inshore fishing community (Section 6.2.2).

Despite these reflections, this conceptual framework is not a panacea and cannot address all the critiques of SWB or resilience thinking. For example, it contributes to the 'fuzzy' definition of wellbeing (Dodge et al., 2012) by adding yet another definition of wellbeing to the literature. Additionally, it validates the critique that notions of resilience are vague (Cretney, 2014) to some extent, given that participants generally responded in vague terms about attributes of resilience (Section 5.2.4.1). In contrast, the notion

of environmental threats (i.e., disturbances) was more concrete in terms of participants' responses (Section 5.2.4.2). Further, there were some tensions in the interconnections between different dimensions of wellbeing. For example, 'fish stocks' could be classified as an attribute of resilience or material wellbeing. In conclusion, the SEWB framework provided a useful lens to examine this research problem and empirically validated some theoretical thinking about these concepts, revealing findings in this case study from a novel perspective. However, the framework is but one possible lens through which MPAs may be examined.

### **7.3.2 Governance Insights for Marine Protected Areas**

This research also contributes MPA governance insights to the literature and for practical consideration in the Canadian context. First, it contributes a case study on the interplay between marine conservation, wellbeing, and governance to an emerging body of literature on these topics (e.g., Milner-Gulland et al., 2014; Woodhouse et al., 2015). This case study can now be examined in comparison with other cases to elicit commonalities (i.e., what is generalizable) and differences (i.e., when local context is critical) about considerations and approaches that result in the most effective MPAs. Further, this research aligns with other calls to include principles of good governance in protected areas decision-making (e.g., Lausche, 2011; Lockwood, 2010), and thus contributes to a growing body of evidence that local context, participation, transparency, and equity, are critical elements of effective MPA governance (e.g., Bennett & Dearden, 2014; Charles & Wilson, 2009). Contributing insights for 'best practice' MPA governance is particularly critical right now as MPAs are expected to continue proliferating to meet international targets in the coming years (Boonzaier & Pauly, 2016).

Findings from this research are also particularly useful for decision-makers in the Maritimes. By describing perceptions on MPAs across attributes of SEWB, Chapter 5 provides a current 'snapshot' to decision-makers about the breadth of perspectives on MPAs. These findings are also insightful for identifying opportunistic leverage points for garnering community support for MPAs (i.e., attributes perceived positively), as well as potential challenges that will need to be overcome if MPA network development is to proceed in SWNB (i.e., attributes perceived negatively). Consequent governance implications discussed in Chapter 6 provide key points that decision-makers should consider to enhance support for MPAs from the fishing community in SWNB.

Regardless of whether or not another MPA is ever implemented in this region, the array of perceptions from this case is likely to cover some similar concerns held by fishers at other locations in the Maritimes that *will* eventually host new MPAs. Perceptions gathered here may therefore provide a starting point for

decision-makers of the perspectives that may be encountered across the broader Maritimes region. Discussions of co-management (Section 6.3) may also be scalable, as the top-down framework for MPA network development would be consistent across the region, while the local context and bottom-up considerations for decision-making would vary from case to case. Ultimately, however, this research contributes a synthesis of how MPAs are perceived to influence the things that matter to the inshore fishing community of SWNB. This contribution gives voice to fishers, and begins to chart a path forward for more effective collaboration regarding decision-making about marine conservation in the Bay of Fundy.

## 7.4 Recommendations

This thesis provides an opportunity to make recommendations to enhance the likelihood of gaining community support for MPAs in SWNB. The following recommendations for decision-makers are based on my empirical findings from Chapters 5 and 6. The first two recommendations are also based on recommendations directly provided by fishers and non-fisher informants in my research. The recommendations are:

1. *As soon as possible, engage in multi-directional collaboration and communication with the inshore fishing community in SWNB regarding ongoing MPA network expansion.*  
Communication should provide clear and transparent information about network status and timelines, a clearly articulated vision and purpose for new MPAs, and anticipated social and ecological outcomes of MPAs. These directives are critical given the perceived lack of clarity and feelings of skepticism and mistrust among the fishing community. Specific actions could include establishing terms of reference with the fishing community that stipulate how the decision-making process will unfold and mechanisms for conflict resolution, as well as explicit articulation of how MPA network planning will adopt principles of good governance.
2. *In the event of MPA planning in SWNB, devolve some decision-making authority to local stakeholders.* Given perceptions of misalignment between MPAs and the local context of SWNB, giving the community greater voice would increase the likelihood of achieving fit. Devolving decision-making authority may mean that actors are prepared to discuss alternatives to MPAs for marine conservation (e.g., OEABCMs). Specific actions could include providing fishers opportunities to co-create local MPA objectives and design, as well as integrating science with fishers' knowledge for MPA siting.
3. *Prioritize "effectively and equitably managed" MPAs rather than achieving the 2020 timeline of Aichi Target 11.* Many participants expressed that MPA network development would be too

rushed to engage stakeholders in meaningful consultations, and MPAs were perceived to be inequitable. Greater emphasis should be placed on governance *processes* rather than solely MPA network outcomes. Specific actions could entail explicitly addressing equity trade-offs across stakeholders in terms of both MPA outcomes and decision-making processes, and exploring options for material and non-material compensation with stakeholders expected to bear costs of MPAs.

4. *Engage in trust-building strategies.* Much of the negative sentiment regarding MPAs in SWNB has to do with feelings of mistrust and suspicion of DFO and government based on historical precedent. Options should be explored for how to build trust with the inshore fishing community. Specific actions might include the use of a third party honest broker or professional facilitators.

## **7.5 Final Concluding Remarks**

The relationship between MPAs and SEWB in the inshore fishing community is complex, and is informed by context-specific considerations such as who is driving MPA planning and where MPAs are located. This thesis provides insights into those considerations by describing perceptions of communities at Musquash and Outer Quoddy, as well as consequent governance implications. While much of this thesis focuses on inshore fishers' perceptions of the costs of MPAs, it is important to emphasize that fishers are not inherently opposed to marine conservation. In fact, quite the opposite is true. Fishers are inherently stewards of the ocean because they have a stake in safeguarding their way of life. Given the current momentum behind marine conservation, there is a real opportunity to develop marine conservation strategies that align with local priorities and contribute the conservation of biodiversity in the Bay of Fundy and beyond.

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## Appendix A: Musquash MPA Allowable Human Activities (DFO, 2008)

TABLE 3: Human activities allowed and prohibited in the Musquash Estuary Marine Protected Area (MPA) and Administered Intertidal Area (AIA) provided that they abide by applicable legislation, regulations, and policies (Check Mark, ✓ – Activity is allowed and/or activity plan is required, No Check Mark – Activity is prohibited, and C – Condition with which the activity may be allowed).

ACTIVITY	MANAGEMENT ZONE					ACTIVITY PLAN REQUIRED	NOTES
	1	2A	2B	3	AIA		
<b>NATIONAL INTEREST</b>							
a. Public safety (e.g. SAR)	✓	✓	✓	✓	✓		
b. National defence	✓	✓	✓	✓	✓		
c. National security	✓	✓	✓	✓	✓		
d. Law enforcement	✓	✓	✓	✓	✓		
e. Environmental response and clean up	✓	✓	✓	✓	✓		
<b>PERSONAL RECREATION (e.g. swimming)</b>							
	✓	✓	✓	✓	✓		• Allowed provided it does not violate the General Prohibition, CAPP, and any other applicable legislation, regulations, and policies
<b>ABORIGINAL FISHING</b>							
	✓	✓	✓	✓	✓		• Allowed pursuant to the Aboriginal Communal Licences Regulations
<b>COMMERCIAL FISHING</b>							
a. Scallops				✓	✓		• Allowed pursuant to the Atlantic Fishery Regulations 1985 or the Maritime Provinces Fishery Regulations
b. Clams	✓	✓	✓	✓	✓		• Allowed by manual means pursuant to the Atlantic Fishery Regulations 1985 or the Maritime Provinces Fishery Regulations
c. Eelers or eels	✓						• Allowed by means of a hand-deployed fyke net or dip net pursuant to the Atlantic Fishery Regulations 1985 or the Maritime Provinces Fishery Regulations
d. Lobster		✓	✓	✓	✓		• Allowed by means of individual traps pursuant to the Atlantic Fishery Regulations 1985 or the Maritime Provinces Fishery Regulations
e. Herring		✓	✓	✓	✓		• Allowed by means of a weir, beach seine, bar seine, or drag net pursuant to the Atlantic Fishery Regulations 1985 or the Maritime Provinces Fishery Regulations
<b>RECREATIONAL FISHING</b>							
a. Scallops	✓	✓	✓	✓	✓		• Allowed by manual means pursuant to the Atlantic Fishery Regulations 1985 or the Maritime Provinces Fishery Regulations
b. Clams	✓	✓	✓	✓	✓		• Allowed by manual means pursuant to the Atlantic Fishery Regulations 1985 or the Maritime Provinces Fishery Regulations
f. Any other species	✓	✓	✓	✓	✓		• Allowed by means of angling or dip net pursuant to the Atlantic Fishery Regulations 1985 or the Maritime Provinces Fishery Regulations
<b>DULSE HARVESTING</b>							
a. Recreational harvesting		✓	✓	✓	✓		• Allowed by manual means
b. Commercial harvesting		✓	✓	✓	✓		• Allowed by manual means

MARINE VESSELS AND ALL-TERRAIN VEHICLES							
a. Marine vessels	C	✓	✓	✓			<ul style="list-style-type: none"> <li>• Marine vessel refers to any large vessel including ships, sail boats and motorized personal water craft</li> <li>• Allowed in Zone 1 for purposes of national interest (e.g. public safety), and special consideration given in support of a scientific activity and habitat restoration. Allowed in Zone 2A and 2B at a maximum speed of 5 knots, and in Zone 3 at a maximum speed of 8 knots</li> </ul>
b. All-terrain vehicles						C	<ul style="list-style-type: none"> <li>• Allowed for purposes of public safety, national defence, national security, law enforcement or environmental emergency response and clean up</li> </ul>

ACTIVITY	MANAGEMENT ZONE					ACTIVITY PLAN REQUIRED	NOTES
	1	2A	2B	3	AIA		
PHYSICAL WORKS AND UNDERTAKINGS							
a. Boat launches, wharfs, or navigational channels		✓				C	<ul style="list-style-type: none"> <li>• Allowed when approval or authorization is not required pursuant to the <i>Navigable Waters Protection Act</i> or <i>Fisheries Act</i>, or is carried out in accordance with an approval or authorization pursuant to this legislation, in support of construction, repair, maintenance or removal</li> <li>• This type of activity is only allowed in the AIA if it supports such an activity in Zone 2A</li> </ul>
OTHER							
a. Scientific research (including monitoring)	✓	✓	✓	✓	✓	✓	<ul style="list-style-type: none"> <li>• Allowed pursuant to an approved activity plan and is consistent with any other applicable legislation, regulations and policies</li> </ul>
b. Educational activities							<ul style="list-style-type: none"> <li>• Allowed pursuant to an approved activity plan and is consistent with any other applicable legislation, regulations and policies</li> </ul>
c. Archaeological studies	✓	✓	✓	✓	✓	✓	<ul style="list-style-type: none"> <li>• Allowed pursuant to an approved activity plan and is consistent with any other applicable legislation, regulations and policies</li> </ul>
d. Commercial tourism	✓	✓	✓	✓	✓	✓	<ul style="list-style-type: none"> <li>• Allowed pursuant to an approved activity plan and is consistent with any other applicable legislation, regulations and policies</li> </ul>
e. Archaeological studies	✓	✓	✓	✓	✓	✓	<ul style="list-style-type: none"> <li>• Allowed pursuant to an approved activity plan and is consistent with any other applicable legislation, regulations and policies</li> </ul>
f. Habitat restoration	✓	✓	✓	✓	✓	✓	<ul style="list-style-type: none"> <li>• Allowed pursuant to an approved activity plan and is consistent with any other applicable legislation, regulations and policies</li> </ul>

## Appendix B: Interview Protocol

### QS 1: BACKGROUND QUESTIONS

Are you ready? *Begin audio-recording.*

We'll start with some background questions.

- 1.1 Please tell me a bit about yourself and your connection to this region.
  - For example, your family, how you spend your time, and community involvement.
  - What do you do for work?
- 1.2 I'd like you to think about the ways in which the ocean is important to you to have a good life. These can be for activities you do for fun or for work, but they can also be values such as feeling a sense of place. Looking at this map (*show map*), can you point out the areas that are important to you and explain why?
  - Is there any ocean space that you feel is important to you that is missing from this map?
- 1.3 Can you tell me about your fishing activities, more specifically?
  - For example, licenses you hold, and how long you have been fishing in the area?
  - What percentage of your household income comes from fishing activities?
- 1.4 I'd like you to think about the things that threaten or degrade the environmental quality of the Bay of Fundy. These can be specific events or longer-term threats. They can be at the community or bay level or at larger scales. What are the main threats to the quality of the natural environment?
  - How have these threats changed over the years?
  - If these threats are not dealt with, how would the overall environmental quality of the bay change in the future?
- 1.5 I'd like you to think about existing means that help the ecosystem cope with these threats. For example, this could be the presence of a diversity of fish species. What are the things that protect the bay or help it cope with these threats?
  - How well are they able to offset damages?
- 1.6 Have there been any major occurrences which have changed your overall quality of life in the past ten years?
  - For example, changes in market conditions, severe weather events, political changes, etc.
  - How did it affect your quality of life?

### QS 2: WELLBEING AND MPAS

I'd like to move on to the topic of marine protected areas, or MPAs, in the Bay of Fundy.

- 2.1 How familiar are you with [the Musquash MPA/MPAs in the Bay of Fundy]?
  - Can you tell me a bit about what you know?
  - *Provide MPA background information if necessary*
- 2.2 How do you feel [the MPA has changed/an MPA at Outer Quoddy would change] your overall quality of life over the past 10 years?
  - Positively, negatively, or a mix of both?

- Are conditions the same regardless of whether or not there is an MPA, or do you just think you've been able to cope with changing conditions?
- 2.3 Earlier, you identified some threats to environmental quality in the Bay of Fundy, such as (*draw from question 1.4*). Do you feel that [the MPA has changed/an MPA at Outer Quoddy would change] the level of these threats or the ability of the environment to cope with these threats?
- In what ways/why not?
- 2.4 I'd like you to think of the areas of your life that are most important for you to be able to live well as a fisher in this community. These can be things that you need to have, be able to do, the sort of person you need to be, or important people or things you need to know about. Please tell me up to five crucial things you need to be able to live well as a fisher in the Bay of Fundy.
- Why are each of these areas important for you to live well?
- 2.5 Do you feel that [the MPA has affected/an MPA at Outer Quoddy would affect] your level of satisfaction in these areas of your life?
- Positively, negatively, or a mix of both?
  - Why has it affected/would it affect you in this way?
- 2.6 I'm going to rephrase the question a bit more specifically, now. What are the most important tangible material things that you have and use as a fisher? These are normally things you can touch.
- Why are these things important for you to live well?
- 2.7 Do you feel that [the MPA has affected/an MPA at Outer Quoddy would affect] your ability to have or use these tangible materials?
- Positively, negatively, or a mix of both?
  - Why has it affected/would it affect you in this way?
- 2.8 I'd like you to think about relationships that affect your quality of life as a fisher. These can be people who might affect how you fish, where you go fishing, and what you catch. They can be either helpful or unhelpful relationships.
- Please tell me up to three of the most important relationships or interactions with other people that affect your quality of life here as a fisher in the Bay of Fundy.
  - Why are these relationships important for you to live well?
- 2.9 Do you feel that that [the MPA has affected/an MPA at Outer Quoddy would affect] your level of satisfaction with these relationships?
- Positively, negatively, or a mix of both?
  - Why has it affected/would it affect you in this way?
- 2.10 Considering all of these factors, what's your overall level of satisfaction with the Musquash MPA?
- 2.11 If you could change one thing about the MPA so that it better supports a good quality of life in the Bay of Fundy, what would you change?
- What's the best way to foster this change?

### **QS 3: DEMOGRAPHICS**

Thank you for answering all of the major interview questions. Finally, I'd like to ask you some standard demographic questions.

3.1 In what year were you born?

3.2 What is your gender?

3.3 What is your ethnicity?

#### **QS 4: POST-INTERVIEW**

This completes the formal interview.

4.1 Is there anything else you would like me to know about what we've discussed today?

*End audio-recording.*

4.2 Who else do you know that you think I should talk to?

#### **CONCLUSIONS**

Thank you for taking the time to speak with me today. All the information you have disclosed will remain confidential. If you need to contact me, you can phone or email me any time. Feel free to contact me if you have questions or if you think of anything else you want me to know. May I contact you if I have any follow-up questions?

Once I've transcribed this interview, I'll send you a summary of our interview for you to review before incorporating it into my research findings. I will be returning to Waterloo in the fall and hope to have my research complete by July 2017. Would you like to be contacted about my final research findings?

## Appendix C: Focus Group Protocol

### FRAMING

To start off, I'd like to hear tell you what I've been hearing in interviews so far. I'd love to hear your thoughts or feedback. [Summarize initial findings]

### ELICITING VISION ELEMENTS

Let's move on to writing some things down. You each have sticky notes and I'd like you to write your ideas onto them to answer the question:

Imagine the best possible life for the fishing community [here] in the next 10 years.

- 10 years down the road, what will you need to protect your way of life and the environment?
- What do you see?

I'll give you a few moments to jot down some ideas (1 idea per sticky note). For example, I want to have a working relationship with the students I teach, but more specifically, I want it to be an honest relationship. So, I'll write down the description, "honest", and then the thing I want, "relationship", to describe the vision I see in ten years.

### CATEGORIZING VISION ELEMENTS

[Get white board]. I'm calling what we put down on the white board the "vision".

Now let's try to categorize them on the white board. There are 4 categories. I'll explain them one by one and give an example [Explain and exemplify with sticky notes]. Now it's your turn [Ask them 1 by 1].

[While categorizing] Why are these things important to you?

Now that we have a better idea about each category, try to think if there's anything else that comes to mind for each specific category. You can add more now, or as we continue, if more ideas come up.

### RANKING

Now I'd like you to rank how important each of these is to you, personally. I've given you each a colour of whiteboard marker. Beside each sticky on the whiteboard, I'd like you to rank how important that element is by writing a number from 0 to 5. These numbers correspond to the following labels, which are also on these sheets of paper on the table [gesture to scale labels on the table]: not at all important, slightly important, moderately important, very important, extremely important, and absolutely essential. Let's take a minute to do that now.

#### Importance Scale

Number	0	1	2	3	4	5
Label	Not at all important	Slightly important	Moderately important	Very important	Extremely important	Absolutely essential

### DISCUSSION

Let's talk about what we've put down here. [Choose from prompts].

### Discussion prompts:

1. Why are [highest ranked vision statements] so important?
2. How do these 'pieces' or parts of the vision relate to one another? Do they affect each other in any way?
3. How would the vision affect community members differently (e.g., different age groups, genders, economic sectors?)
  - How does your stake differ from that of others?
  - Who benefits? Who is responsible for what? (e.g., fishers, DFO, Fundy North)
4. How does the vision address:
  - a. the future that your children and grandchildren will inherit?
    - Do you want your children and grandchildren to have the opportunity to keep fishing or do you want them to choose other ways to make a living?
  - b. the availability of resources into the future?
    - Will there be enough resources and opportunities for people to use those resources?
    - Will there be a need (or opportunity) to change the way resources are used?
5. How does the vision address the fact that the environment and the ocean changes from year to year and over the long term?
  - If conditions changed unexpectedly, how would you adapt?
  - Is there anything we've just assumed will be the case without talking about it?
6. Overall, how does this vision enhance your wellbeing?

## Appendix D: Feedback Letter



**Date**

Dear **Participant**,

I would like to thank you for your participation in this study entitled “Implications of Marine Protected Areas for Coastal Community Social-Ecological Wellbeing”. As a reminder, the purpose of this study is to understand how marine protected areas influence the wellbeing of fishing communities in the Bay of Fundy region. The study is focusing on the following components of wellbeing: materials that people have, relationships that affect what people do, and subjectively how people feel about their wellbeing, in addition to the environmental quality in the bay.

The data collected during interviews will contribute to a better understanding of the way marine protected areas influence coastal communities. It will also contribute to a better understanding of how marine protected areas can be designed to take social considerations into account in a way that enhances benefits to the fishing community.

A summary of your interview is enclosed. Please review the summary and contact me if there are any points that you wish to clarify or revise. Please provide your remarks or changes to me within 4 weeks of your receipt of this letter. If you choose not to respond within 4 weeks, your data will be used as provided. Data collected during this study will be retained for 7 years in my supervisor’s locked office. Please remember that any data pertaining to you as an individual participant will be kept confidential. Once all the data are collected and analyzed for this project, I plan on sharing this information with the research community through seminars, conferences, presentations, and journal articles. If you are interested in receiving more information regarding the results of this study, or would like a summary of the results, please provide your email address, and when the study is completed, anticipated by July 2017, I will send you the information. In the meantime, if you have any questions about the study, please do not hesitate to contact me by email or telephone as noted below. As with all University of Waterloo projects involving human participants, this project was reviewed by, and received ethics clearance through a University of Waterloo Research Ethics Committee. Should you have any comments or concerns resulting from your participation in this study, please contact Dr. Maureen Nummelin, the Director, Office of Research Ethics, at 1-519-888-4567, Ext. 36005 or [maureen.nummelin@uwaterloo.ca](mailto:maureen.nummelin@uwaterloo.ca).

Irene Brueckner-Irwin  
University of Waterloo  
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250-920-8317  
[ibrueckn@uwaterloo.ca](mailto:ibrueckn@uwaterloo.ca)





# Appendix E: Ethics Clearance

## Ethics Clearance (ORE # 21516)

1 message

Office of Research Ethics <ohrac@uwaterloo.ca>  
To: Derek R Armitage <derek.armitage@uwaterloo.ca>  
Cc: Irene Brueckner-Irwin <ibruecknerirwin@uwaterloo.ca>

Tue, May 31, 2016 at 3:32 PM

Dear Researcher:

The recommended revisions/additional information requested in the ethics review of your application for the study:

Title: Implications of Marine Protected Areas for Coastal Community Social-Ecological Wellbeing  
ORE #: 21516  
Faculty Supervisor: Dr. Derek Armitage ([derek.armitage@uwaterloo.ca](mailto:derek.armitage@uwaterloo.ca))  
Student Investigator: Irene Brueckner-Irwin ([ibrueckn@uwaterloo.ca](mailto:ibrueckn@uwaterloo.ca))

have been reviewed and are considered acceptable. A University of Waterloo Research Ethics Committee is pleased to inform you this study has been given ethics clearance.

A signed copy of the notification of ethics clearance will be sent to the Principal Investigator (or Faculty Supervisor in the case of student research). Ethics approval to start this research is effective as of the date of this email. The above named study is to be conducted in accordance with the submitted application (Form 101/101A) and the most recent approved versions of all supporting materials.

University of Waterloo Research Ethics Committees operate in compliance with the institution's guidelines for research with human participants, the Tri-Council Policy Statement for the Ethical Conduct for Research Involving Humans (TCPS, 2nd edition), Internalization Conference on Harmonization: Good Clinical Practice (ICH-GCP), the Ontario Personal Health Information Protection Act (PHIPA), and the applicable laws and regulations of the province of Ontario. Both Committees are registered with the U.S. Department of Health and Human Services under the Federal Wide Assurance, FWA00021410, and IRB registration number IRB00002419 (Human Research Ethics Committee) and IRB00007409 (Clinical Research Ethics Committee).

\*\*\*\*\*

Renewal: Multi-year research must be renewed at least once every 12 months unless a more frequent review has otherwise been specified by the Research Ethics Committee on the signed notification of ethics clearance. Studies will only be renewed if the renewal report is received and approved before the expiry date (Form 105 - <https://uwaterloo.ca/research/office-research-ethics/research-human-participants/renewals>). Failure to submit renewal reports by the expiry date will result in the investigators being notified ethics clearance has been suspended and Research Finance being notified the ethics clearance is no longer valid.

Modification: Amendments to this study are to be submitted through a modification request (Form 104 - <https://uwaterloo.ca/research/office-research-ethics/research-human-participants/modifications>) and may only be implemented once the proposed changes have received ethics clearance.

Adverse event: Events that adversely affect a study participant must be reported as soon as possible, but no later than 24 hours following the event, by contacting the Chief Ethics Officer. Submission of an adverse event form (Form 106 - <https://uwaterloo.ca/research/office-research-ethics/research-human-participants/report-problems>) is to follow the next business day.

Deviation: Unanticipated deviations from the approved study protocol or approved documentation or procedures are to be reported within 7 days of the occurrence using a protocol deviation form (Form 107 - <https://uwaterloo.ca/research/office-research-ethics/research-human-participants/report-problems>).

Incidental finding: Anticipated or unanticipated incidental findings are to be reported as soon as possible by contacting the Chief Ethics Officer. Submission of the incidental findings form (Form 108 - <https://uwaterloo.ca/research/office-research-ethics/research-human-participants/report-problems>) is to follow within 3 days of learning of the finding. Participants may not be contacted regarding incidental findings until after approval has been received from a Research Ethics Committee to contact participants to disclose these findings.

Study closure: Report the end of this study using a study closure report (Form 105 - <https://uwaterloo.ca/research/office-research-ethics/research-human-participants/renewals>).

You are responsible for obtaining any additional institutional approvals that might be required to complete this study.

\*\*\*\*\*

Best wishes for success with this study.

-----  
Sacha Geer, PhD  
Manager  
Office of Research Ethics  
NH 1045  
[519.888.4567](tel:519.888.4567) ext. 37163

## Appendix F: Focus Group Wellbeing Priorities

Domain	Attribute	Priority Element	Importance Rankings		
			Rank	Percent Importance	
Material	Personal health	Good health	5	2.73%	
		Implemented health insurance	3	1.64%	
	Infrastructure	Improved ferry service	4	2.18%	
		Enhanced supporting infrastructure and services (non-fishery)	4.25	2.32%	
	Fishery Access	More accessible licenses	5	2.73%	
		New programs to facilitate entry into fishery	3.5	1.91%	
	Fishery Resources	Recovered multi-species fishery	5	2.73%	
		High commercial fish stocks	10	5.46%	
	<b>Total Material</b>			<b>39.75</b>	<b>21.69%</b>
	Relational	Markets	Maintain MSC certifications	3	1.64%
Good international market reputation			5	2.73%	
More buyers			5	2.73%	
Regulations and enforcement		Continued size regulations on lobster	5	2.73%	
		Removal of policies that don't make sense	4.5	2.46%	
		Removal of quotas	9.33	5.09%	
		Fewer regulations	4.7	2.55%	
		Implemented days at sea management policy	3	1.64%	
		Limit on capacity and technology	3	1.64%	
		Adjusted seasons	6	3.27%	
		Greater enforcement of poaching	10	5.46%	
		Greater enforcement of owner-operator policy	30	16.37%	
Collaborative decision-making		Alternative governance of rural jurisdictions	5	2.73%	
		More inclusive fisheries management	9.5	5.18%	
		More transparent science	5	2.73%	
Community relations		Greater community understanding of fishery	4	2.18%	
		Better relations between fishers	5	2.73%	
		More honest fishers	5	2.73%	
<b>Total Relational</b>			<b>122</b>	<b>66.58%</b>	
Subjective		Equity	Fairness in legal compliance	5	2.73%
	Place-identity	Maintained ability for family to fish	5	2.73%	
	<b>Total Subjective</b>			<b>10</b>	<b>5.46%</b>
Ecological	Disturbances	Cleaner aquaculture	4	2.18%	
		Stricter aquaculture enforcement	3	1.64%	
		Continued education about stewardship	4.5	2.46%	
	<b>Total Ecological</b>			<b>11.5</b>	<b>6.28%</b>
<b>TOTAL</b>			<b>183.25</b>	<b>100.00%</b>	