STEP ZERO FOR MARINE CONSERVATION: DRIVING FACTORS OF VOLUNTARY FISHERY CLOSURES IN NEWFOUNDLAND AND LABRADOR

KIM OLSON

Step Zero for Marine Conservation:
Driving Factors of Voluntary Fishery Closures in Newfoundland and Labrador

By

© Kim Olson

A Thesis submitted to the
School of Graduate Studies
in partial fulfillment of the
requirements for the degree of
Master of Arts

Department of Geography
Memorial University of Newfoundland

July, 2011

St. John's Newfoundland and Labrador

Abstract

Fishery closures are a form of conservation measure employed to protect fish stocks, a key resource for many coastal communities. Due to the social and economic importance of fisheries, there are challenges associated with limiting access to marine resources. Nonetheless, fishery closures are gaining popularity in the province of Newfoundland and Labrador, particularly as voluntary initiatives. Voluntary fishery closures take shape as community-based conservation initiatives driven by fish harvesters and further include the fish harvesters' union and the federal department of Fisheries and Oceans in their implementation and monitoring.

Not all closures discussed are implemented, and not all implemented closures are successful in meeting their conservation objectives. Research on closures has focused primarily on outcomes or compliance, often excluding the steps, processes, and interactions that either lead to or inhibit their implementation. This thesis argues that knowing how a closure is conceived, discussed and communicated, as well as what the state of the fisheries system is prior to its implementation help explain why they succeed or fail. This can further our understanding of the role of voluntary closures in fisheries management and the factors that generate their support or opposition. Knowledge of what drives voluntary closures can further provide insight on what factors need to be in place for fish harvesters to support or be engaged in fisheries conservation.

Research for this thesis was conducted in the Bay of Islands, Western Newfoundland, where a voluntary snow crab closure was discussed among inshore crab harvesters in the spring of 2010, but was not implemented. Thirty semi-structured interviews with fish harvesters, the fish harvesters union, fishery managers, scientists, and other community members were conducted to examine the step zero of fishery closure discussions in the area, i.e. the drivers, steps, processes and interactions leading to the closure discussions. Questions explored the motivation, initiators, support, opposition, and expectations for a voluntary closure in the area. Furthermore, interviews sought information on each component of the fish chain (marine environment, harvest, processing and marketing) to enhance the aforementioned 'step zero' understanding.

Interviews illustrated that the initiative was influenced first and foremost by declining crab stocks, and was also driven by an existing closure in the nearby area, as well as low prices of snow crab. The closure was further conceivable because of a low economic reliance on the crab fishery in that area. While concerns about the stock were shared, stakeholder's support for the closure varied, as did their expectations of the closure and their roles in marine conservation. It is clear through this study that the crab stocks in the Bay of Islands are depleting and require attention; however closure discussions did not fully address the needs and concerns raised by all harvesters in the area. Until these issues are addressed a consensus among crab harvesters to close the fishery is unlikely, as a result it is improbable that a voluntary crab closure will be implemented.

Acknowledgements

This project was made possible with the support from many people to whom I owe gratitude.

I am sincerely thankful to my supervisor, Dr. Ratana Chuenpagdee, without whose help I could not have completed this project. I am further indebted to my committee members Dr. Bob Hooper and Dr. Gabriela Sabau for their guidance and support, and colleagues at the International Coastal Network for their encouragement and advice.

I would like to offer further thanks to Don Ball, John Lubar, and Conrad Mullins, DFO; Monty Way and Jason Spingle, FFAW; Sheldon Peddle, ACAP Humber Arm; to all interview participants and communities within the Bay of Islands.

I am grateful to Memorial University's Department of Geography, Harris Centre, and International Coastal Network for their financial support towards this project.

Lastly, I would like to offer my regards to all of those, there are many, who have supported me in any respect during the completion of this project.

Table of Contents

List of Tables

List of Figures

List of Acronyms

ACAP	Atlantic Coastal Action Program
ASP	Association of Seafood Producers
BOI	Bay of Islands
CBM	Community Based Management
CBRM	Community Based Resource Management
CFA	Crab Fishing Area
CMA	Coastal Management Area
DFA	Department of Fisheries and Aquaculture
DFO	Department of Fisheries and Oceans
EI	Employment Insurance
FFAW	Fish, Food, and Allied Workers
GOSLIM	Gulf of St. Lawrence Integrated Management
IQ	Individual Quota
LOMA	Large Ocean Management Area
MPA	Marine Protected Area
NAFO	Northwest Atlantic Fisheries Organization
NL	Newfoundland and Labrador
SPONL	Seafood Processors of Newfoundland and Labrador
TAC	Total Allowable Catch

Chapter One
Introduction

This chapter provides an introduction and overview of the pre-implementation process of voluntary fishery closures with particular emphasis on the Bay of Islands (BOI), Newfoundland. Setting context for the research, a general introduction to voluntary fishery closures is provided. This is followed with background information on step zero, partnered with an introduction to the central research questions and subsequent objectives. Next, an overview of fisheries in the Bay of Islands is presented to set the framework for the study and to offer an introduction to the study area. Lastly, an outline of the ensuing chapters is used to provide a snapshot of contents within this thesis.

1.1. What are voluntary fishery closures?

Fishery closures are a type of conservation measure commonly employed to protect commercial and non-commercial fish stocks, endangered and threatened species, unique habitats, marine biodiversity (DFO, 1999), and historical fishing traditions (Anderson *et al.,* 2000). Closures take many different shapes and forms. They can be differentiated by area, species, or gear restrictions; they vary temporally; and moreover can be initiated by fish harvesters, fisheries managers or conservation groups. In this thesis fish harvester-initiated closures are further subdivided into two categories: those initiated by fish harvesters from inside the targeted fishery, and those initiated by fish harvesters outside of the targeted fishery. The former are referred to herein as voluntary fishery closures since they are initiated by harvesters who participate in the fishery targeted to close, i.e. they are voluntarily pursued. The latter, however, are not referred to as

voluntary because they are initiated by fish harvesters who seek to close a fishery in which they do not participate. In both cases, these closures differ from those initiated by fisheries managers as they are conceived at the community level and driven by fish harvesters whereas the latter are derived from more centralized management and may or may not include stakeholders.

Fish harvester-initiated closures have had a presence in Newfoundland and Labrador (NL) since the early 1960's, when a group of hand-line harvesters in Petty Harbour-Maddox Cove worked to close the gillnet fishery to protect historical fishing practices. Since then, a variety of harvester-initiated closures have emerged, many following the same objective of protecting traditional fishing activity. More recently, however, voluntary closures have gained popularity. Examples can be found throughout the province, including small area-based lobster closures in the communities of St. Brendan's and Trout River, a shrimp-trawl closure in Northern Labrador, and a snow crab closure in Bonne Bay (Anderson *et al.,* 2000). These local initiatives have broad implications, reaching beyond the closure at hand. In light of threatened fish stocks and the correlating loss of fishery-related livelihoods, they contribute to the bigger picture of marine conservation.

The focus of this thesis is on voluntary fishery closures. Voluntary closures are unique as their origin lies within the community. Rather than opposing the conservation measure, as is often expected, fish harvesters themselves craft the policy and take collective responsibility over fishery resources. Bearing resemblance to a form of co-management, voluntary fishery closures demonstrate a governance process whereby fish harvesters, fisheries management, and the fisheries union work together to design, implement, and monitor a specific closure (Wilson *et al.,* 2003).

1.2. Why 'step zero'?

Examining the pre-implementation of voluntary closures reveals the likely environmental, social, and economic outcomes a closure may have upon the fish chain, as well as the community at large. Moreover, like other management tools, closure is not a quick-fix solution (Degnbol *et al.*, 2006), and understanding the pre-implementation process may help to determine when and where this approach may be appropriate, and will help identify the factors that may foster or prohibit their implementation. Voluntary closures exemplify responsible fisheries management (Krishna, 2002), employ the precautionary principle, and regardless of the factors driving their implementation they provide direct ecosystem benefits. Nevertheless, understanding these closures may reveal conditions otherwise unseen. They may be a cost-efficient option for fisheries management or lead to increased bargaining power for fish harvesters. On the other hand, a closure may re-direct pressure onto other fish stocks, reduce employment in processing plants, or have unanticipated impacts for the community such as decreased food security or increased outmigration. In this context it is necessary to understand the process of voluntary fishery closures.

The purpose of this research is to understand the closure process through a 'step zero' approach. Step zero, or pre-implementation, studies seek to understand the steps, processes, conditions and drivers that lead to an event: in the case of this research, voluntary closures. The term "step zero" refers to everything that occurs before an action takes place (i.e. a closure is implemented) or, in other words, everything that transpires prior to the official decision to implement. Step zero aims to understand the environmental, policy, and social implications that occur when a conservation measure is initially conceived and communicated, the policy is

formed, and a decision to implement is made (Chuenpagdee and Jentoft, 2007).

In the Bay of Islands, western NL, a fish chain study has been built into the step zero analysis to develop a more thorough understanding of the process of fishery closure discussions, encompassing each element of the fish chain. The fish chain includes the entire fisheries system and the interactions throughout, i.e. the marine environment, as well as fisheries capture, processing and marketing (Kooiman *et al.,* 2005). By using step zero in conjunction with a fish chain analysis, this research has established a foundation for understanding voluntary fishery closures, and the fish chain components that contribute to or hinder their implementation.

In employing a step zero approach to voluntary fishery closures, the key research question is to understand the drivers, factors, and conditions that contribute to discussions and subsequent implementation (or not) of voluntary closures. From this central research goal, four subsequent objectives have emerged:

1) Understand the steps and processes that led to the discussion about voluntary crab closure in the Bay of Islands.
2) Describe the fish chain and identify factors that are conducive to fishery closure.
3) Examine the level of participation and interaction of key stakeholder groups in the closure discussions.
4) Identify the importance of community support for closure implementation.

These goals have been realized primarily through the use of qualitative data in the form of semi-structured interviews, key informant meetings, archival research, and a review of literature.

1.3. Fisheries in the Bay of Islands

This research has taken a single case study approach to examine the step zero of voluntary snow crab (*Chionoecetes opilio*) closure discussions in the Bay of Islands, NL. NL is Canada's easternmost province, located on the Atlantic Ocean. The province, due to its strong historical ties to the fishery, is often associated with rich fishing grounds and a rich fishing culture. Despite the large decline in groundfish species experienced in the province, leading to the closure of the cod (*Gadus morhua*) fishery in the early 1990's, and subsequent moratoria (triggering large employment cuts in the fishing industry), NL remains relatively dependent on the fishing industry both economically and socially. In 2005 the fish harvesting and processing sectors in NL comprised 20,635 individuals, providing employment to roughly 8 percent of the working population, in addition to other fishery-related jobs such as transportation, management, and sales (Government of NL, 2006). The high employment connected to the fishing industry remains possible due to a shift in the fishery's focus from groundfish to crustaceans, particularly three key species: shrimp, lobster, and snow crab (DFO, 2010b).

There are 265 fish harvesters residing in the Bay of Islands, each with their own suite of licenses, targeted species, vessels, and gear (Government of Newfoundland and Labrador, 2006). Harvesters in the area hold multiple licenses for species including snow crab, lobster (*Homarus americanus)*, cod, halibut, capelin, mackerel and herring. Beginning in the 1980's, the snow crab fishery is relatively new to the Bay of Islands, and is small in comparison to the crab fishery on the east coast of the province. In 2009, crab fisheries in western NL (NAFO division 4R3PN) accounted for roughly two percent of the landings in eastern NLs NAFO divisions 3L and 3K (see Figure 4.5) (DFO, 2010g). Nonetheless, this fishery plays an important role in the

livelihoods of select fish harvesters in western NL. In the spring of 2010, discussions regarding the implementation of a voluntary snow crab closure arose in the Bay of Islands. Closure discussions were driven by factors including declining local crab stocks and a low provincial market value. However unlike the voluntary snow crab closure in neighbouring Bonne Bay, it was not implemented. This research examines the process, interactions, and events behind closure discussions in the Bay of Islands, including factors that led to the decision not to proceed with the closure.

1.4. Organization of Thesis

This thesis is organized into seven chapters. The first chapter provides an introduction to voluntary fishery closures, states the need for pre-implementation studies, and identifies the research objectives. The second chapter presents a review of pertinent literature and explores various topics including conservation measures, fishery closure, wicked problems, fisheries governance, and participation in fisheries management in addition to a general overview of fisheries in NL. The term "wicked problem" refers to a complex problem which is difficult to solve (Rittel and Webber, 1973), as found in the study of fisheries (Jentoft and Chuenpagdee, 2009). Complexity, diversity and dynamics as factors of "governability," i.e., the overall governance qualities of the systems (Kooiman and Chuenpagdee, 2005), are further examined in the review of literature. Understanding wicked problems requires comprehension of their human nature as well as the nature of the ecological system itself. These problems are, according to Jentoft and Chuenpagdee, issues of governance and can be a result of governability (Jentoft and Chuenpagdee, 2009). The third chapter outlines the methodology employed in this step zero study, including a detailed description of the interview style and process, the case study, key-

informant meetings, and the literature review. The fourth chapter describes the social and physical characteristics of the Bay of Islands and an overview of fishing activity in the area. The fish chain is employed in this chapter to augment the understanding of both the study site and fisheries system. The fifth chapter explores the findings from interviews and key informant meetings. This is done through exploring a series of step zero questions which seek to respond to the predefined research objective and goals. The sixth chapter discusses the results from the data collection and literature review process, while the seventh and final chapter concludes with key research findings and implications of the study.

Chapter Two
Literature Review

This chapter reviews the literature relevant to the pre-implementation of voluntary fishery closures. First, a general overview of Canadian fisheries management is provided. A brief synopsis of how fisheries management has evolved over time is followed by a summary of select policies and legislations that guide modern fisheries management. Next, stakeholder participation in natural resource management is explored, including approaches which have been developed to enhance stakeholder participation in Canadian fisheries management. This examination is essential, as voluntary closures are a form of stakeholder participation. More specifically, they showcase participation by fish harvesters – a key stakeholder in the fishery. Subsequently, community-based and co-management are explored, and their institutional advancements for stakeholder participation. These are defined, and then discussed as forums for enhancing stakeholder participation, and a differentiation between the two is provided. This is followed by a section examining fishery closures and their role in marine conservation and resource management, paired with discussions on mandatory and voluntary fishery closures. Finally, pre-implementation is explored with a particular emphasis on the benefits it can provide to research in resource management.

Prior to, during, and following field work literature was reviewed pertaining to the Bay of Islands, fisheries conservation, fishery closures, and participation in fisheries management. To address the interdisciplinary nature of fisheries, the review of literature examines material from both the natural and social sciences. In addition to published work, including journal articles and book chapters, a variety of websites and grey literature was reviewed such as newsletters,

research reports, and fisheries statistics specific to the Bay of Islands. Information on fisheries landings in the area was often unavailable on websites or through other published literature. As a result, much of this information was received directly from the Department of Fisheries and Oceans, or from other research reports if accessible. A lack of available research on fisheries in the Bay of Islands is, in part, attributed to the strong presence of logging and pulp and paper production in the area. Pulp and paper has been the main industry in the Bay of Islands since 1925, with the opening of Corner Brook Pulp and Paper Limited. As a result the majority of research in the area has focused on the forestry, particularly the pulp and paper, industry.

2.1. Canadian fisheries management

Canadian fisheries are valued at over CDN $5 billion annually, provide employment to more than 130,000 Canadians, and are the economic mainstay of roughly 1,500 rural coastal communities (Agriculture and Agri-Food Canada, 2009). Capture fisheries make up 76 percent of Canadian seafood production, of which lobster, crab and shrimp represent 67 percent of its landed value (Agriculture and Agri-Food Canada, 2009).

The 1867 Constitution Act provided the federal government with exclusive authority over Canadian fisheries management (Gough, 2007). The Department of Fisheries and Oceans (DFO) is the federal agency responsible for administrating fisheries management, and is guided by the Fisheries Act which provides a framework for Canadian fisheries management. Due to the diversity of Canada's marine environment and coastal communities, DFO is subdivided into six regions (Pacific, Central and Arctic, Quebec, Maritimes, Gulf, and Newfoundland and Labrador) and, as such, fishing regulations vary accordingly (DFO, 2010c).

The Fisheries Act has been in place since 1868, when it was first enacted to manage and protect fish resources in Canada's fishing zones, territorial seas, and inland waters. Following the implementation of the Act, a period of early growth in fisheries set the foundation for fisheries management in Canada (Gough, 2007). From 1945 to 1968 Canadian fisheries went through heavy industrial expansion, encouraged by the federal government. Technological advancements led to increased boat sizes and more intensive fishing gear such as large purse seines and trawls. This triggered declining stocks, and accordingly, the desire for an improved approach to marine conservation. Consequently, from 1968 to 1984 fisheries management evolved to include time, area, gear, and fish size regulations as the main means of management, in addition to licensing, which was already in place. Several decades later, these remain the main control measures employed in fisheries management (Gough, 2007).

The ground fisheries' collapse in the 1980s generated increased concern for fish stocks and called fisheries management strategies into question. This triggered increases in fisheries research, enforcement, and dockside monitoring, in addition to the implementation of new legislation and policies (Gough, 2007), including a revision of the aging Fisheries Act in 2007 to modernize and update the document. The proposed Act aimed to provide a fisheries management system with improved transparency, stability and stakeholder participation (DFO, 2007).

In addition to regionally specific regulations and conservation measures, DFO has established three national overarching priorities for fisheries management: environmental sustainability, economic viability, and the inclusion of stakeholders in decision making (DFO, 2009a). These goals are, in part, sought through the Fisheries Act, and further involve the development of fisheries programs, initiatives, and management policies at both the federal and regional level. Due to the diversity of coastal and ocean users, these are not governed by DFO

alone, but extend to include Transport Canada, Environment Canada, Parks Canada Agency, and Indian and Northern Affairs (DFO, 2009a).

While the Fisheries Act is the core legislation for Canadian fisheries management, oceans management is guided by separate legislation and strategies aligning with the specific objectives set for fisheries management. The Ocean Strategy, Oceans Action Plan, and Health of the Oceans Initiative are key policies stemming from the Oceans Act (DFO, 2010d). Other major marine legislation in Canada includes the Canadian Environmental Protection Act, Canada National Marine Conservation Areas Act, and the Species at Risk Act. Together, these strategies and pieces of legislation seek to address shortfalls of past ocean management arrangements that have resulted in environmental and social impacts such as declining fish stocks, invasive species, marine habitat loss, declining biodiversity, growing user conflicts, and lost or delayed investments (DFO, 2010d).

The Oceans Act, passed in 1996, represents a legal commitment to "conserve, protect and develop the oceans in a sustainable manner" (DFO, 2010d, para. 9). The Act is guided by three key principles: sustainable development, integrated management, and the precautionary approach. Moreover, the Act legally defines Canada's ocean boundaries, encourages government-wide collaboration, and engages stakeholders in decision making (Government of Canada, 1996). The Oceans Act was followed by the release of Canada's Ocean Strategy in 2002 which outlined the government's direction for oceans governance, reaffirming the principles outlined in the Act. Subsequently, the Ocean Action Plan was implemented to coordinate and implement oceans governance arrangements, particularly those which, in accordance with the Oceans Act, focused on integrated management and ecosystem science (DFO, 2010d). In 2007, the federal government announced the Health of the Oceans Initiative, building on the Ocean Action Plan to

improve ocean health through the National Water Strategy. It aims to protect sensitive marine environments and reduce pollution though strengthening pollution prevention at source, increasing protection of ecologically significant areas, and investing in scientific research (DFO, 2010d).

Sustainable development, integrated management, and the precautionary approach are recurring objectives in the aforementioned legislations and align with the key priorities for Canadian fisheries management. Together, they acknowledge the shortfalls of past fisheries management strategies and seek to address issues of stakeholder inclusion, economic viability, and environmental sustainability in fisheries. Within this, there has been a shift from the stand-alone application of top-down fisheries management, to an emergence of fisheries governance. In fisheries, this shift to an emphasis on fisheries governance versus management has evolved as an attempt to institutionalize sustainability (Memon and Kirk, 2010). Governance encompasses the whole of interactions between those governing and those governed (Kooiman *et al.*, 2005). There is an emphasis on the importance of actors other than the state in governing at the local, national, and international level and additionally a focus on collective action and social learning that extends to independent users, authority and community interests (Memon and Kirk, 2010). Governance reaches beyond government or management, and is a process in which actors including the state, market, and civil society each play a crucial role (Kooiman *et al.,* 2005).

Within Canadian fisheries management, under the auspice of the Ocean's Strategy, a national approach to oceans governance has lead to commitments of collaborative work within and among federal government agencies, shared responsibility and stakeholder engagement. This includes the advancement of oceans governance in three key areas. First, the establishment of institutional mechanisms to enhance collaborative oceans management; secondly, the

implementation of integrated management planning which includes decision making structures; and thirdly, the promotion of stewardship and public engagement in ocean resources (DFO, 2002). These will be discussed further in the subsequent sections which examine participation and conservation in fisheries management.

2.2. Stakeholder participation in fisheries management

Stakeholder participation has been widely recognized as essential in resource management decision making processes (Kearney *et al.,* 2007). In general, stakeholder participation refers to the involvement of individuals who hold a 'stake' in the resource at hand and are impinged by policy decisions. Within this definition, however, two central questions are raised. First, who constitute as stakeholders? Secondly, what constitutes participation?

Participation in resource management encompasses many titles in addition to the use of "stakeholder participation", and extends to include user, public, and citizen participation, terms often used interchangeably. Who is considered to be holding a stake, however varies, and this can restrict the term to include only individuals within a particular geographical proximity to the resource or with a particular relationship to the resource, and sometimes excludes government (Baker, 2006; Grey and Hatchard, 2008). Advocates for an inclusive stakeholder vision encourage the representation of individuals that range beyond resource users in decision making processes, e.g. community members and consumers (Mikalsen and Jentoft, 2001). This broad view recognizes that the scope of impacts from natural resource management reach beyond the confines of industry and direct users, and moreover that a narrow use of the term will increase the likelihood that meaningful interests and interest groups will go unrepresented (Mikalsen and Jentoft, 2001). However, within processes of stakeholder participation, not all stakeholders are

engaged in decision making and the community is often excluded (Jentoft, 2000). Moreover, depending on the process employed, stakeholder participation can further reinforce local elite power (Berkes, 2009).

When making decisions regarding a particular resource, the identification of stakeholders is one of the first steps (Townsley, 1998). However, as exhibited by Grey and Hatchard, not everyone with a stake or interest in a resource is always regarded as a stakeholder, and who constitutes as a stakeholder may vary from one situation to the next (2008). To facilitate the process of defining stakeholders in resource management, they can be further divided into two groups: primary and secondary stakeholders. Primary refers to those with a direct interest in a resource because they either (a) depend on it for their livelihood or (b) are involved in its exploitation (e.g. fish harvesters or processing workers). These differ from secondary stakeholders who are involved in either managing institutions or are in part dependant on wealth or business from the respective resource (e.g. fisheries managers or transport operators). Primary and secondary stakeholder groupings require further classification as they themselves are not homogenous groups. Moreover, this system of grouping excludes those with non-economic or management interests such as conservation groups. Further identification of key stakeholders concerned with a particular fishery or issue is needed, and will largely depend on the legislative context in their respective participatory arrangements (Townsley, 1998).

In the management of natural resources, participation occurs along a continuum, ranging from the simple sharing of information to the transfer of power and responsibility (Johannes, 1978). At one end of the spectrum, participation is employed through a top-down approach whereby the government acts unilaterally. This can be restrictive and offers limited one-way communication, i.e. government talks and fish harvesters listen. At the other end it involves a

system whereby fish harvesters and/or communities have full control, owning and operating their own management system, as is the case with community based management. Not all communities, however, have the capacity or interest to be involved at this level. Arnstein (1969) constructed a typology of participation, known as the ladder of citizen participation, in which each rung of the ladder corresponds to one of eight levels of participation. The rungs are further categorized into three groups: the bottom rungs (manipulation and therapy) represent non participation; the centre rungs (informing, consultation, and placation) represent tokenism; and the top rungs (partnership, delegated power, and citizen control) represent citizen power (Arnstein, 1969). Those characterized as citizen power arrangements recognize participation as an important part of the formulation, implementation, and evaluation of policy processes, thus reaching beyond the narrow unilateral system of one way communication (Baker, 2006).

Stakeholder participation has been identified as a priority in Canadian fisheries management, a comprehensive definition of the term however has not been provided (DFO, 2010c). Several approaches have been developed to enhance stakeholder participation in Canadian resource management. In 1992, Environment Canada launched the Atlantic Coastal Action Program (ACAP) to help restore watersheds and adjacent coastal areas in Atlantic Canada. Within this program, objectives were set to build stakeholder capacity and encourage their leadership in identifying and addressing local environmental issues. Specific to fisheries, the 1996 Oceans Act includes Integrated Management as a priority, formulated to balance ecosystem conservation and resource use, and to provide the opportunity for stakeholder participation. Integrated Management promotes stakeholder participation in various capacities, including approaches such as community-based management (CBM) and co-management, both emphasizing the inclusion of what Arnstein would refer to as citizen control in fisheries

management (National Roundtable on the Environment and the Economy, 1998). Nonetheless, there remain few examples of CBM processes supported by Integrated Management in Canada and stakeholders can have limited control of Integrated Management processes (Kearney *et al.*, 2007).

2.2.1. Co-management and community based management in fisheries

Co-management and community based management are institutions that help build and enhance stakeholder participation. Sometimes referred to as collaborative management, co-management represents a power sharing arrangement between government and user groups. It is an alternative approach to resource management that recognizes the link between natural and social systems, and acknowledges the requisite of a stakeholder focus. Co-management in Canada has grown from a need to address crises and challenges faced by natural resources. Berkes (1989) has noted the 1975 James Bay and Northern Quebec Agreement, working towards Aboriginal land claim, as Canada's first co-management arrangement (Berkes, 1989). The same year also saw the first push in fisheries for co-management from Fisheries Minister Romeo LeBlanc, who saw need for fish harvesters to hold power in fundamental decisions regarding fisheries management, and advocated for full disclosure of information used as the basis for fisheries decision making (Gough, 2007). The later establishment of the Fisheries Resource Conservation Council in 1993, however, was DFO's first attempt to open up planning and decision-making processes in fisheries management to fish harvesters, seafood processors, academics, government scientists and other interested members of the public.

Co-management represents a shift from centralized, top-down management to an arrangement involving partnership and power-sharing between government and user groups

(Jentoft, 1989; Chuenpagdee *et al.*, 2004; Kearney *et al.*, 2007). This arrangement includes the sharing of decision-making power, responsibility and risk. It can extend beyond resource users to community members, and seeks to maintain the ecological integrity of the resource at hand (National Roundtable on the Environment and Economy, 1998). Parallels have been drawn between the goals of co-management and decentralization. According to Pomeroy and Berkes (1997), both seek to mobilize and strengthen participation, particularly toward a more equitable distribution of power and resources to local organizations and communities.

Similar to Arnstein's ladder, co-management is often described as having a wide spectrum of collaborative decision-making arrangements or partnerships between users and government. This is exemplified by Sen and Nielsen's (1996) co-management continuum, describing the process as having one of the following five degrees of power sharing: instructive, consultative, co-operative, advisory, or informative. Pomeroy and Berkes (1997) have also noted a hierarchy in co-management arrangements, ranging from cases whereby government merely consult with fish harvesters prior to the introduction of regulations, to arrangements whereby fish harvesters design, implement and enforce regulations with assistance from government. This is similar to Pinkerton and Weinstein's (1995) placement of co-management between two and nine, on a continuum from one to ten, whereby one represents full community management and ten represents complete government management.

The degree of power sharing in a co-management initiative, in addition to the stage in which users become involved in management (i.e. planning, implementation or evaluation), differs from one situation to the next and can influence the success of a co-management initiative (Sen and Nielsen, 1996). If users are not invited to collaborate until late in a management process, the time and costs associated with implementation, enforcement, and monitoring are subject to

increase and may become more challenging if the design is not understood or supported by users, if they were excluded during the design phase, or given little power or input in the process (Sen and Nielsen, 1996). Jentoft (1989) considers flexibility an immense benefit to co-management processes, asserting that governmental organizations are less flexible than fish harvester organizations, which are more capable of reacting to a situation in a timely manner.

Community-based management (CBM), also known as community-based resource management (CBRM), refers to the community organization of social processes that lead to complete community control over resource management or a particular aspect thereof (Sen and Nielsen, 1996; Chuenpagdee *et al.,* 2004). While some definitions state that CBM differs from co-management in that government is not involved in the decision making process (Sen and Nielsen, 1996), others place CBM on the co-management continuum, whereby CBM exists on its own, or government delegates authority to community groups though a process of decentralization (Pomeroy and Rivera-Guieb, 2006).

While there are many parallels between CBM and co-management, Pomeroy and Rivera-Guieb (2006) differentiate the two strategies by the degree and timing of government participation therein. CBM is described as being primarily community-centered and is a self-governing system which engages those living closest to the resource in the design, implementation, and monitoring of the management measure (Kearney *et al.,* 2007). Co-management, while encompassing the local community; places additional focus on the development of partnerships between government and stakeholders in the local area. Co-management is, for that reason, said to have a larger scope with a focus beyond the local community (Pomeroy and Rivera-Guieb, 2006).

The term "community based co-management" has been established to identify co-management processes whereby organizations at the community level are involved "as the most basic unit of the management system" (Jentoft, 2000, p. 5). Pomeroy and Rivera-Guieb (2006) also refer to this as traditional or customary co-management stating that such systems involve a formal recognition of informal, traditional systems used. These institutions facilitate a process that may protect and legally recognize traditional fisheries systems, and furthermore create power sharing arrangements between government and community.

While participatory management systems such as CBM and co-management hold many advantages, such as improved transparency, increased stewardship among fish harvesters, localized solutions, and improved cost efficiency (Pomery and Rivera-Guieb, 2006), they are not without challenges. Local resource characteristics may make it difficult for communities to manage their resources, incentives may not exist, social capital or local leadership may be lacking, and it may not be economically feasible and financial capital may be lacking. As a result, these options may not be suitable for every community and should not be regarded as a panacea. This is supported by Pomeroy and Rivera-Guieb (2006) who state the following:

> "[neither] should be viewed as a single strategy to solve all problems of fisheries management, but rather as a process of resource management, maturing, adjusting and adapting to changing conditions over time. A healthy co-management process will change over time in response to changes in the level of trust, credibility, legitimacy and success of the partners and the whole co-management arrangement… [It] involves aspects of democratization, social empowerment, power sharing and decentralization… [and] attempts to overcome the distrust, corruption, fragmentation and inefficiency of existing fisheries management arrangements through collaboration. Co-

> management is adaptive; that is, through a learning process, information is shared among partners, leading to continuous modifications and improvements in management" (Pomeroy and Rivera-Guieb, 2.2).

Jentoft (1989) further asserts that in the case of co-management, which can also carry over to CBM, the success of the arrangement as a democratic process involving equity and fairness are largely dependent on the participatory process employed. These processes have shown to foster increased responsibility and conservation ethic, and mobilize stewardship in the respective area (National Roundtable on the Environment and the Economy, 1998). Moreover, they involve negotiation, knowledge generation and joint learning, and the most successful examples are often adaptive, flexible processes that exhibit a learning-by-doing approach (Berkes, 2009).

2.3. Fishery closures

This section will explore conservation tools used in fisheries management, particularly fishery closures, in addition to global examples of bottom-up initiatives employed by fish harvesters. First, a brief overview of conservation measures and management tools will be provided, followed by a definition and more detailed description of fishery closures. Secondly fishery closures will be examined, and examples of mandatory, harvester initiated, and voluntary closures will be provided.

2.3.1. Fishery closure overview

Conservation and management tools are employed globally to assist the recovery of fish stocks (Johannes, 1978) by generally limiting free-entry into the fishery. They take a variety of shapes and forms, and can be categorized as either input or output controls. Input controls are the

restrictions placed on the intensity of fishing effort, and include licensing, limited entry, seasonal closures, as well as vessel and gear restrictions (Cochrane, 2002). They further include spatial conservation tools such as Marine Protected Areas (MPA). MPA offer various types of protection, while some are designated as 'no-take zones' (resembling a spatial fishery closure), others permit multiple uses within the respective area which can include fishing with designated gears or within designated areas, tourism and recreational activities (Toropova *et al.,* 2010). Output controls differ as they directly limit the amount of fish that can be removed from the water and include quota restrictions such as total allowable catch (TAC), daily catch limits, bycatch limits, as well as individual and vessel quotas (Cochrane, 2002).

Fishery closures can be classified as either input or output controls depending on their objective. Seasonal or gear closures, for example, are input controls as they reduce the intensity of fishing effort, whereas closures based on a particular species can be considered output controls as they reduce the amount of fish being harvested. Cochrane and Garcia, however, regard area and time closures differently than input and output controls, arguing that they achieve wider objectives of conservation and equity (2009). Regardless of the control, fisheries closures are a common tool employed in fisheries management, and are implemented by various government agencies, non-governmental organizations, and fisheries interest groups worldwide (Cochrane, 2002).

Fishery closures hold many benefits as a tool in marine conservation. They safeguard bycatch species that are difficult to protect using other measures; they are an effective tool to protect sensitive benthic habitats; they can protect reproductive capacity; they are well-suited for stock protection in areas where data is poor or a system is complex; and, furthermore, they can provide an environment for researchers to increase their knowledge of the

ecological system (Cochrane and Garcia, 2009). However, with advantages come drawbacks such as reduced economic efficiency of harvest (e.g. if fish harvesters have to travel greater distances to fish), foregone fishing opportunities for select harvesters, and increased competition with localized fish harvesters in other areas due to displacement of harvesters impacted by a closed area (Murawski *et al.,* 2000). Moreover, the implementation process for closures can be time consuming. If objectives interfere with stakeholders or institutions outside of the fishing industry, they need to be involved in the negotiation process which can be time intensive (Cochrane and Garcia, 2009).

Fishing seasons are one of the oldest and most common types of fishery closure employed in Canada. They restrict the harvest of species to a designated period of time, often established around spawning, migration, and seasonal ice patterns, and vary by location and species harvested. Beyond seasons, fishery closures are widely employed as a means to safeguard the marine environment from fishing pressure and to assist the recovery of fish stocks (Charles, 1997). Closures vary in their length, can be specific to a particular species, gear, or location, and can be implemented by both fisheries managers and fish harvesters. In addition to those mentioned above, closures can be implemented in order to prevent fish harvest during a particular life cycle stage, protect depleting stocks and habitats, resolve issues of gear conflict or protect traditional fishing practices (Anderson *et al.,* 2000). A number of factors contribute to the level of protection rendered to various fish stocks from the designation of closed areas including the proportion of the stock circumscribed by the closure, the extent of movement of fish outside the boundaries of the closed area, and the level of fishing effort and the capacity of regulations in adjacent areas (Murawski *et al.,* 2000).

In this thesis, fishery closures have been divided into two broad categories: mandatory and voluntary. Mandatory closures refer to those initiated by fisheries managers as a conservation tool, and include fishing seasons, closures for contaminated waters, closures to protect endangered or threatened species, and closures to address issues of stock decline. Voluntary closures differ as they are initiated by fish harvesters and originate at the community level. They can be both implemented by harvesters outside and inside of the targeted fishery, and in some cases extend to include the community-at-large, researchers and non-governmental organizations. In the Canadian context, however, for a closure to be supported and monitored by government, it must first be formally implemented by fisheries managers. In this respect, even the voluntary closures mentioned within this thesis have been implemented by government officials (unless otherwise indicated). Mandatory and voluntary fishery closures occur in various capacities worldwide, and differ significantly in both design and objective. Drawing from examples in the Pacific Islands, Mexico, and Canada, brief illustrations of closure types are provided.

Mandatory closures

Mandatory closures will refer herein to those initiated, administered and enforced by DFO or other governmental agencies. They can vary significantly and include temporary closures due to poor weather conditions, restrictions on the harvest of a particular species for conservation purposes, or restrictions on the harvest of bivalves due to contaminated waters (Gough, 2007). The groundfish moratoria implemented in Atlantic Canada in the early 1990's, for conservation purposes in response to ground fisheries collapse, are one example of this. The closures were

originally set for a two year period, but remain largely in place due to low stock recovery (Gough, 2007). Other mandatory closures include seasonal groundfish closures in the Georges Bank (located between Massachusetts, US and Nova Scotia, CAN) implemented in the 1960's to address overfishing from distant-water fleets, and closed areas for the protection of yellowtail flounder in southern New England in 1986, implemented to reduce fishing mortality and protect spawning stock (Murawski *et al.,* 2000).

Fish harvester-initiated closures

Fish harvester initiated closures are those implemented by harvesters outside of the fishery targeted to close. They are typically implemented for one of two reasons: to restrict the harvest of one species for the protection of another, or to reduce conflicts over the timing or method of harvest. In the Pacific Islands closed fishing areas and seasonal closures have been traditionally employed by fish harvesters to protect spawning fish and help conserve stocks. Additionally, short-term closures have been employed for ceremonial purposes or to ensure a large catch for a period of celebration or feast (Johannes, 1978).

Other harvester initiated closures can be found in British Columbia and NL, Canada. In the Fraser Valley, BC, several First Nations bands voluntarily agreed to zero allocations of Coho salmon throughout the mid-1990's (Interior Fraser Coho Recovery Team, 2006). Similarly, hand-line cod harvesters in the community of Petty Harbour-Maddox Cove, NL, collectively agreed to close the gillnet fishery. This closure was established in 1961 to protect traditional fishing practices in the area, and remains in effect today (Anderson, *et al.,* 2000). A comparable initiative was implemented in 2002 in Funk Island Deep, Labrador (NAFO Division 3K), where

a large vessel shrimp fleet has voluntary stopped fishing in a designated area to protect crab stocks. This closure was initiated by crab harvesters in the area, and was accepted by fleet of large shrimp vessels (DFO, 2010e).

Harvester-initiated and voluntary closures follow the same general implementation framework. First, fish harvesters put forth the idea of a closure and if communities are in favour the fish harvesters union is consulted. Here the union works with the fish harvesters to determine if a closure is suitable for the area (in the Bay of Islands this was done through a consensus-based process). If the closure is acceptable, the DFO department of Resource Management will implement the closure with the appropriate conditions. A notice will then be made to fish harvesters to announce the closure and the closure can be incorporated as a license condition for the following year(s). Once a closure is implemented the DFO department of Conservation and Protection will monitor for compliance (Thorne, pers. com).

Voluntary closures

As mentioned above, voluntary closures are those implemented by harvesters from inside the targeted fishery. They are unique, as harvesters forgo a portion of their livelihood or make direct changes to their fishing methods for the greater good of marine conservation. In Baja California Sur, Mexico, fish harvesters voluntarily implemented a 'Fishers Turtle Reserve' in 2006 to protect loggerhead turtles accidentally caught as by-catch. This closure was triggered by research on loggerhead by-catch in the local area that was accompanied by an awareness campaign on the status of the turtles. Efforts to legally declare this an official reserve are currently underway (Peckham, *et al.,* 2007).

In the Fraser Valley, BC, fish harvesters voluntarily agreed to release Coho salmon caught by gillnet. Unlike the abovementioned closure, this one is fully voluntary and not enforced by management officials, i.e. if harvesters choose to fish there are no formal repercussions (Interior Fraser Coho Recovery Team, 2006). In 2002 another voluntary closure was implemented in British Columbia, whereby bottom trawlers voluntarily stopped fishing in areas known to have glass sponge reefs. Following the voluntary agreement to halt harvest in the specified areas, the closure was enforced by DFO as a result of increased fishing pressure on the sponge reefs. The increase in fishing pressure, according to the Canadian Parks and Wildlife Society, can be attributed to 'fear fishing' (CPAWS, 2009), a phenomena reported to "[occur] when fishermen fish an area more aggressively than normal because they are afraid it will soon be closed" (Ardron, J. pp.10, 2005).

Additional examples of voluntary fishery closures can be found throughout Newfoundland. In the communities of Eastport and Trout River, lobster harvesters have voluntarily closed small areas to provide a safe haven for lobster in 1997 and 2002 respectively. The voluntary area-based closures in the community of Eastport have since been converted into a MPA, while the other area remains voluntarily closed (Anderson, *et al.,* 2000). Differing from the small area-based lobster closures, crab harvesters in the Bonne Bay area voluntarily closed the entire snow crab fishery in 2009 to help rejuvenate stocks, and the fishery re-opened in the spring of 2011 (DFO, 2010f).

Stakeholder preference for closures is based on a variety of factors including real or perceived costs, culture, education, occupation, and history of interactions with resources (Baker, 2006). Voluntary and fish harvester initiated closures are not a panacea and may not be suitable for every fishing community. Not all communities are willing or able to take on such an initiative,

risks may be too high for some harvesters, government support may be lacking, and resource characteristics may not be suitable for the proposed action (Pomeroy and Rivera-Guieb, 2006). This can be seen in the attempted voluntary trawl closure in British Columbia, which resulted in increased fishing pressure (Ardron, pp.10, 2005).

Community-based initiatives, such as voluntary closures, have been successfully implemented and have received strong support among fish harvesters worldwide, as is showcased above. However, as is demonstrated by the sponge coral example, not every implemented voluntary closure is effective. Their success, in part, can be attributed to the benefits of voluntary closures that reach beyond the marine environment to fish harvesters, in addition to the persistence of traditional fishing methods. While not suitable for all situations, voluntary closures can help create a more autonomous management approach with improved transparency, cost efficiency, and local stewardship, in addition to increased social capital, use of local knowledge, and high levels of compliance (Pomeroy and Rivera-Guieb, 2006).

2.4. Wicked problems in fisheries management

Fisheries are inherently ecological and social, and this social context is arguably the most important aspect of fisheries management and marine conservation (Kareiva, 2006). Problems in resource management, such as with fisheries, that occur in a socially-oriented context are inherently complex, as both the ecological and social systems need to be taken into consideration (Jentoft and Chuenpagdee, 2009). This complexity makes it difficult to determine a clear management solution as it becomes impossible to delineate the natural and social issues. Rittel and Webber (1973) have termed these as 'wicked' problems. They are complex, multi-layered,

and cannot be separated from others. Wicked problems require an understanding of both the nature of the ecological system and the human nature of the problem (Rittel and Webber, 1973).

"Wicked problems have no technical solution, it is not clear when they are solved, and they have no right or wrong solution that can be determined scientifically" (Jentoft and Chuenpagdee, 2009, p.1). Accordingly, fisheries are wicked problems. They are diverse, complex and dynamic, and the problem itself cannot be detached from others (Jentoft and Chuenpagdee, 2009), as is the case with the groundfishery collapse in Atlantic Canada. Diversity, complexity, and dynamics are concepts that can be employed to assist in understanding the governability of a resource, i.e. the overall capacity for a fishery to achieve its governing goals. In brief, diversity refers to the variability of system elements; complexity refers to linkages, interactions, and interdependencies of system elements; and dynamics refers to temporal changes that occur to system elements (Chuenpagdee *et al.,* 2008). If a system has high diversity, complexity, or dynamics, according to Chuenpagdee *et al.* (2008), it is generally expected to be less governable. This is similar to what Rittle and Webber (1973) have titled 'wicked'. Understanding the diversity, complexity and dynamics of the social, natural and governance structures of a particular system can help identify needs within the system that must be addressed to best manage the resource at hand.

2.5. Pre-implementation studies

The concept of governance has many interpretations. The limits of its understanding as a state-dominated government however have been widely recognized, leading to the concept of governance as the whole of interactions between those governing and those governed (Kooiman *et al.,* 2005). Governance theory emphasizes the importance of actors other than the state in

governing at the local, national, and international level. Accordingly, governance reaches beyond government and management, and is a process in which actors including the state, market, and civil society each play a crucial role (Kooiman *et al.,* 2005). In fisheries, the governance approach applies to every level in the fish chain (pre-capture, capture, and post-harvest) and the linkages between all parts (Kooiman *et al.,* 2005).

Interactive governance theory places emphasis on the interactions of governing processes and, according to Kooiman *et al.,* (2005) is described as "the whole of public as well as private interactions taken to solve societal problems and create societal opportunities. It includes the formulation and application of principles guiding those interactions and care for institutions that enable them" (p.17). A governance approach, therefore, promotes the understanding of processes at every level, including the pre-implementation.

Implementation research has grown from Political Science in recognition of the need to understand the process of policy formation. Implementation studies have acknowledged a lack of understanding of the interactions within policy processes, and emphasized the effects of the implementation process upon policy outcomes. It has been noted that implementation not only shapes, but in some circumstances determines policy outcomes (Palumbo and Calista, 1990).

The implementation of a policy or process has three key phases: the beginning (pre-implementation), implementation, and post-implementation. The pre-implementation phase involves problem recognition, preliminary planning, idea formulation, meetings, and the weighing and selection of options; the implementation phase involves continued meetings and dialogue, the refinement of a plan, and the project implementation; and the focus of the post-implementation phase is evaluation and monitoring (Pomeroy and Rivera-Guieb, 2006). These

three phases are cyclical, rather than linear, as policy processes evolve and adapt. As a result, the phases overlap and are not distinct.

Early implementation studies have argued that implementation is the missing link in policy processes: however, more recently, the need to understand the pre-implementation stage has also been recognized (Hill and Hupe, 2002). Jentoft and Chuenpagdee (2007) argue that the pre-implementation or step zero phase of a process is as important as the process itself. A step zero study seeks an understanding of the steps, processes and interactions that lead to an event. This is based, in part, on the theory of path dependency, which asserts that early decisions can impact outcomes and, moreover, that the direction a process takes is determined in part by those early decisions (Mahoney, 2000). Step zero seeks to understand pre-implementation by investigating the drivers and conditions behind the policy, including the conception and development of the idea, the contributions of participants in initial discussions, and the status of the stocks, markets and communities in question at the time discussions arose. These investigations help determine what preparatory measures may be necessary before implementation (Chuenpagdee and Jentoft, 2007).

In fisheries research, pre-implementation studies have been employed in co-management contexts. Chuenpagdee and Jentoft (2007) assert the importance of such research, and have consequently examined global co-management initiatives by investigating the conception of co-management arrangements including the idea formulation, participation in initial discussions, and necessary pre-implementation preparations. Their study shows that co-management arrangements may be conceptualized from existing research but can also evolve from informal, local practices. Moreover, the study reveals that co-management initiatives are largely driven by a crisis in management, and often have expectations of rapid change. At the same time, the study

reveals that co-management initiatives do not offer rapid change, rather involve a timely process which includes the pre-implementation phase (Chuenpagdee and Jentoft, 2007). A co-management handbook by Pomery and Rivera-Guieb (2006) places further emphasis on pre-implementation, including it as an integral component for the successful implementation of co-management. Both the study by Chuenpagdee and Jentoft, and the co-management handbook, share a common understanding of the importance of a step zero understanding in fisheries management processes, emphasizing the need to understand the motivation, interactions, and processes that lead to an event. Both examples showcase how this knowledge assists in understanding the interactions that take place during the pre-implementation of a policy, identify the stumbling blocks faced by fish harvesters and fishing communities, recognize the origins of the idea, understand the conditions under which it was accepted, and help avoid unrealistic expectations in policy formation.

Chapter 3
Methodology

This chapter provides an overview of the methodology employed in this research. It is subdivided into four sections, each describing a component of the methodology used. First, the case study and selection approach used to choose a site for research are discussed. Next, the use of informal key informant meetings and their role and timing in this research is explored. This is followed by a description of semi-structured interviews, including the interview design, sample, and process employed. Lastly, an overview of data analysis is provided, including the coding process used to analyze the interview data.

3.1. Selection of case study

A case study is an empirical investigation of a phenomenon in its real-life context (Mohd Noor, 2008), and aims to generate an inclusive picture of a situation or process from the perspectives of all actors (Hakim, 1987). They provide a rich portrait of an identified phenomenon, allowing the researcher to retain the holistic attributes of a particular process (Yin, 2009): in the case of this research, the implementation of voluntary fishery closures.

Criticisms of case studies typically question their ability for generalization, as well as the amount of time and resources they require. Although case studies are not always generalizable to populations, they can be generalized to theoretical propositions. Moreover, they are well suited for contemporary research that seeks to answer 'how' or 'why' questions (Rowley, 2002). This makes case studies appropriate for this research, which examines the drivers and process of

voluntary closures, and examines how and why they are implemented (Yin, 2009). The Bay of Islands was selected as the study site for this research for a number of reasons. The recent emergence of the closure discussions in the area provided a case study that was still fresh and relevant to stakeholders in the area. Second, the presence of voluntary closures in neighbouring communities provided the opportunity to understand if there were any linkages between the occurrences of voluntary closures. Third, the closure discussions in the Bay of Islands, unlike in other areas, did not result in the implementation of a closure. This provided the opportunity to learn not only factors contributing to closure discussions, but also those that hindered the closures implementation.

3.2. Key informant meetings

A series of key informant meetings were held during the early field stages to provide background information before entering the interview phase and augment the understanding of fisheries and fishery closure discussions in the Bay of Islands. They provided a platform to introduce the research to the community, and to develop initial recommendations of individuals to interview. Key informants included fisheries managers and scientists with DFO, representatives of the Fish, Food and Allied Workers union (FFAW), the regional director of the Department of Fisheries and Aquaculture (DFA), and the executive director of the ACAP Humber Arm (see table 3.1). Key informants were identified by key institutions working with fisheries and involved in fishery closure discussions in the Bay of Islands. Individuals were then selected due to their expertise in fisheries or coastal activity in the Bay of Islands, and are shown in the table below. This expertise has been incorporated into this research through two main avenues: (1) papers

recommended (and in some cases written) by key informants have been cited and, (2) personal communication from key informant meetings has been incorporated into the research.

Table 3.1 List of key informants

Key Informant	Subject	Meeting Location
Ocean Management Biologist, DFO	Fishery closure discussions in the BOI	Corner Brook, NL
Fill-in Chief of Resource Management, DFO	Fisheries system in the BOI	Corner Brook, NL
Chief of Resource Management, DFO	Process of voluntary closures in NL	Corner Brook, NL
Staff Representative, FFAW	Snow crab closure discussions in the BOI	Corner Brook, NL
Scientific Coordinator, FFAW	Snow crab closure discussions in the BOI	Corner Brook, NL
Regional Director, DFA	Role of DFA in fisheries management	Corner Brook, NL
Representative, Barry Group	Fish processing in the BOI	Corner Brook, NL
Executive Director, ACAP Humber Arm	Role of ACAP and the Coastal management Area in the BOI	Corner Brook, NL
Snow Crab Scientist, DFO	Crab stocks in the BOI, impact of a temporary closure on stocks	St. John's, NL

3.3. Interviews

Interviews are a common method employed in both qualitative and quantitative research, used either on their own or in conjunction with other methods. This method aims to improve the understanding of a situation or event, and is often applied to a body of knowledge with theoretical importance (Seidman, 2006; Warner and Karner, 2005). This research employs qualitative, semi-structured interviews targeted primarily at fish harvesters, but also extending to

include key community members (e.g. councillors and individuals heavily involved with local organizations), and fish processors.

Semi-structured interviews draw upon the advantageous characteristics of both structured and unstructured interviews. They allow the researcher to follow a predetermined questionnaire, retaining the interview's focus, a typical challenge in unstructured interviews (Hay, 2005). Furthermore, addressing the critique that structured interviews are less organic than their unstructured counterparts, the semi-structured interview does not force the researchers to follow the questionnaire in sequence, and rather offers them flexibility during the interview. This helps create a more natural relationship with the interviewees, a frequent challenge in structured interviews (Burgess, 1984). Interviews have four main uses which benefit the researcher: first, they fill a knowledge gap that other methods are unable to address. Second, they investigate the complexity of behavior and motivation. Third, they provide insight on the consensus and diversity of opinions within a group. Lastly, interviewing shows respect to the informants, as their information is valued and appreciated (Hay, 2005).

To ensure the interview was nonthreatening to informants, a funnel structure was employed (Hay, 2005). Funnelling places initial focus on general, easy-to-answer questions, and gradually progresses toward more focused questions specific to the research. This process aims to mitigate the potential discomfort that researchers or informants may encounter in an interview that begins with detailed questions. Moreover, funnelling helps to develop a rapport between the researcher and informant, allowing an interview to be more culturally and socially sensitive while decreasing the likelihood of an interview's discontinuation (Hay, 2005).

The interview guide was divided into five sections: pre-harvest (marine environment), harvest (fishing activity), post-harvest (processing and marketing), governance, and snow crab

closure discussions in the Bay of Islands (see Appendix A). Each section of the interview guide was designed to pursue in-depth information on the step zero of fishery closure discussions in the area, i.e. the drivers, steps, processes and interactions leading to the closure discussions. A combination of closed- and open-ended questions examined the motivation, initiators, support, opposition, and expectations for a voluntary closure in the area.

Selection of interview respondents followed a purposive non-probabilistic, snowball sampling technique. This allowed the researcher to interview individuals from predefined groups sought for the purpose of the research. Given that the research focus was the implementation process of voluntary snow crab closure discussions in the Bay of Islands, interviews were targeted towards snow crab harvesters. In attempt, however, to gain a broader understanding of a closure and its impacts, interviews extended to include fish harvesters outside of the crab fishery, as well as processors, and community members. The snowball sampling method requested key informants to identify individuals who meet set criteria, as abovementioned. They were then contacted, asked to conduct an interview, and to further recommend others they knew who may also meet the criteria. Snowball sampling was very helpful in a tight-knit community, and increased the likelihood of interviewees agreeing to participate in an interview as it built trust and made contact with individuals within the fishery or the community at large, making them more open to participate.

The Bay of Islands covers a large geographic area and, as classified here, it contains 11 communities. Due to the vast geographic expanse of the Bay of Islands, interviews took place in 5 key communities which include: Cox's Cove, Benoit's Cove, Frenchman's Cove, York Harbour and Lark Harbour (see Figure 4.1). These communities in particular were selected because they are the main fishing communities in the region. The research took place from May

to September of 2010. During this time, informal key informant meetings were held, in addition to semi-structured interviews and archival research. The archival research consisted of a review of newspaper articles and documents relating to historic fishing activity in the Bay of Islands, and was sourced primarily from the Corner Brook Museum and Archives. This was then used to enhance the understanding of fishing activity in the Bay of Islands and how it has changed overtime.

Thirty semi-structured qualitative interviews with fish harvesters, the fish harvesters' union, fishery managers, scientists, and other community members were conducted. The summer field season was chosen for various reasons, including the project research schedule, and aimed to ensure fish harvesters would be present in the Bay of Islands, as it was hypothesized some harvesters would be working elsewhere during the off season. The fishing season in the Bay of Islands begins with crab in April, and ends with herring (*Clupea harengus harengus*) and mackerel *(Scomber scombrus)* in November. Throughout the fishing season, many inshore harvesters reside at their cabins, accessible only by boat, and return only once a week to see their families and do business with fish processors. This made it difficult to schedule or track down fish harvesters for interviews. As a result, five recommended contacts were unable to participate in an interview. At the same time, had the research been conducted any earlier it would have been while closure discussions were in progress. This could have interfered with the process and may have required changes to the interview guide because at the time it was unknown whether the closure would be implemented or not. While select recommended harvesters were unable to participate in the interview, the research timing was advantageous as the discussions were very recent. This added an additional level of relevance to the research for crab harvesters as they were still actively thinking about and discussing closure in the area.

Interviews were pre-scheduled, lasted roughly one hour in length, and took place in interviewees' homes, fishing wharves, and offices. Prior to the interview, participants were informed that the study followed an approved ethical protocol for research involving human subjects of Memorial University, reminded that their participation was voluntary, they could withdraw from the study at any time, and that they would remain confidential throughout the process. Furthermore, they were welcomed to skip any questions they did not wish to answer. Participants were asked if the interviews could be recorded to assist the transcription process; 21 of the 30 participants agreed to have the interviews recorded. If interviews were not recorded, detailed notes were taken, whereas for recorded interviews only key points were noted to allow for greater attention to the respondent, and to reduce the length of the interview.

The sample size was determined by using the saturation concept (Seidman, 2006). After conducting 30 interviews, saturation was reached at two levels. First, information obtained from interviews had reached a point at which no new information was observed. Secondly, the potential interviewees recommended reached a point of saturation as only individuals who were previously interviewed were proposed.

3.4. Data analysis

Data analysis took place throughout the interview process. Main themes were identified from questions in the interview guide and used as headings in an Excel spreadsheet. The spreadsheet consisted of five pages: one for each section of the interview guide, i.e. marine environment, fishing activity, processing and marketing, governance, and closures. Following each interview, the notes and recordings were partially transcribed, with particularly relevant responses transcribed in full, and then inserted into the spreadsheet.

To further interpret and understand the collected data, coding categories were developed for each section after all interviews were entered into the spreadsheet. Data from key informant meetings and archival research was also entered in the spreadsheet and coded. The coding categories are shown in Table 3.2 below.

Table 3.2 Interview analysis coding themes

Section	Coding Categories
Marine environment	Fishing and non-fishing activity in the BOI Health of the marine environment Challenges in the marine environment Concerns for fish stocks
Fishing activity	Fisheries management for each species (i.e. gear, vessel, quota, season, etc.) Landing declines Overcapacity Ranking of species by importance
Processing and marketing	Prices received for each species Buyers Importance of processing plants Market concerns Impact of market on species harvested
Governance	Actors in fisheries management Satisfaction with fisheries management Involvement in fisheries management Changes in fisheries management Future in fisheries
Closures	Initiators Role in closure discussions Drivers Issues raised Support and opposition Past closures Requirements for closure to work Outcomes Impacts on community

Once the data was coded, it was then subdivided into two categories: (1) information relating to closure discussions and information that may have influenced closure discussions, and; (2) information pertinent to understanding the fisheries system in the Bay of Islands. These data categories were subsequently interpreted by looking for patterns, discrepancies and possible explanations and employed to augment understanding of their respective subjects. In addition to the completion of this thesis, a knowledge mobilization plan has been developed to disseminate research findings. This included a series of presentations at conferences, community meetings and university classrooms; in addition to the completion of a hand book for communities within the Bay of Islands.

Chapter Four
The Bay of Islands Fish Chain

The fish chain is an analytical framework used to represent the fisheries system through the flow of goods and services from the marine environment (pre-harvest), fishing activity (harvest), and processing and marketing (post-harvest) (Kooiman *et al.,* 2005), as well as to identify the institutions and governing interactions within the chain. The research employs this framework for comprehensive discussion of the Bay of Islands case study. Moreover, the fish chain perspective contributes to a thorough understanding of factors which influence the implementation of voluntary fishery closures. Accordingly, findings from the fish chain analysis will be used to substantiate the interview data and enhance the step zero assessment in the subsequent chapter.

This chapter provides a description of the Bay of Islands in addition to an overview of the fish chain in the area. First, a general description and introduction to the Bay of Islands is provided. Second, the fish chain is explored in three sections, each describing a component of the chain. Lastly, institutions and governing interactions are presented to depict the linkages between each section of the fish chain.

4.1. General description of the Bay of Islands

The Bay of Islands is located in western Newfoundland, in the northern Gulf of St. Lawrence. The area is comprised of three arms: Humber Arm, Middle Arm (which is further subdivided into Goose Arm and Penguin Arm), and North Arm, as well as the open bay, peppered with

twelve major islands, which give the region its name (Figure 4.1). The area is characterized by its small coastal communities, fishing activity, and scenic coastal landscape. There are 11 communities in the Bay of Islands, with a total population of 25,245, including the city of Corner Brook where the vast majority of the population reside (20,085, in 2006) (Government of Newfoundland and Labrador, 2006). The locations of the communities selected for the study, Benoit's Cove and Frenchman's Cove (formally referred to as Humber Arm South), Lark Harbour, York Harbour, and Cox's Cove are shown in Figure 4.1. Together, they have a combined population of 3,430, and are the main fishing communities within the Bay of Islands, with roughly 25% of population working in either the harvesting or processing sectors (see Table 4.1). The second-largest employment is construction and related trades, which employ 21% of residents, followed by the sales and service industry, employing 19% (Government of Newfoundland and Labrador, 2006).

Table 4.1 Employment in the Bay of Islands *(Source: Government of Newfoundland and Labrador, Community Accounts, 2006)*

Occupation	BOI (Corner Brook Included)	% Overall Employment	BOI (Corner Brook Excluded)	% Overall Employment
Health	1,035	6.1	85	5.0
Education	750	4.3	30	1.8
Fishing	270	1.5	230	13.5
Fish Processing	310	1.8	195	11.5
Sales and Service	4,365	25.5	330	19.4
Management	1,200	7.0	50	2.9
Office	2,205	13.2	195	11.5
Construction	2,370	13.9	365	21.5
Total	12,505	73.3	1,700	87.0

Communities within the Bay of Islands have been shaped by three hundred years of dependence on the area's fish and timber resources (Hackett, 1992). Fishing activity persists in the area today, and residents remain involved in the traditional herring, lobster, and cod fisheries that founded these communities in the 1800's. Additional fisheries have been developed, including halibut (*Reinhardtius hippoglossoides*) in the early 1900's, mackerel and capelin (*Mallotus villosus)*, in the 1950's, and snow crab in 1980's.

Today, coastal activity in the area remains heavily connected with the fishing industry

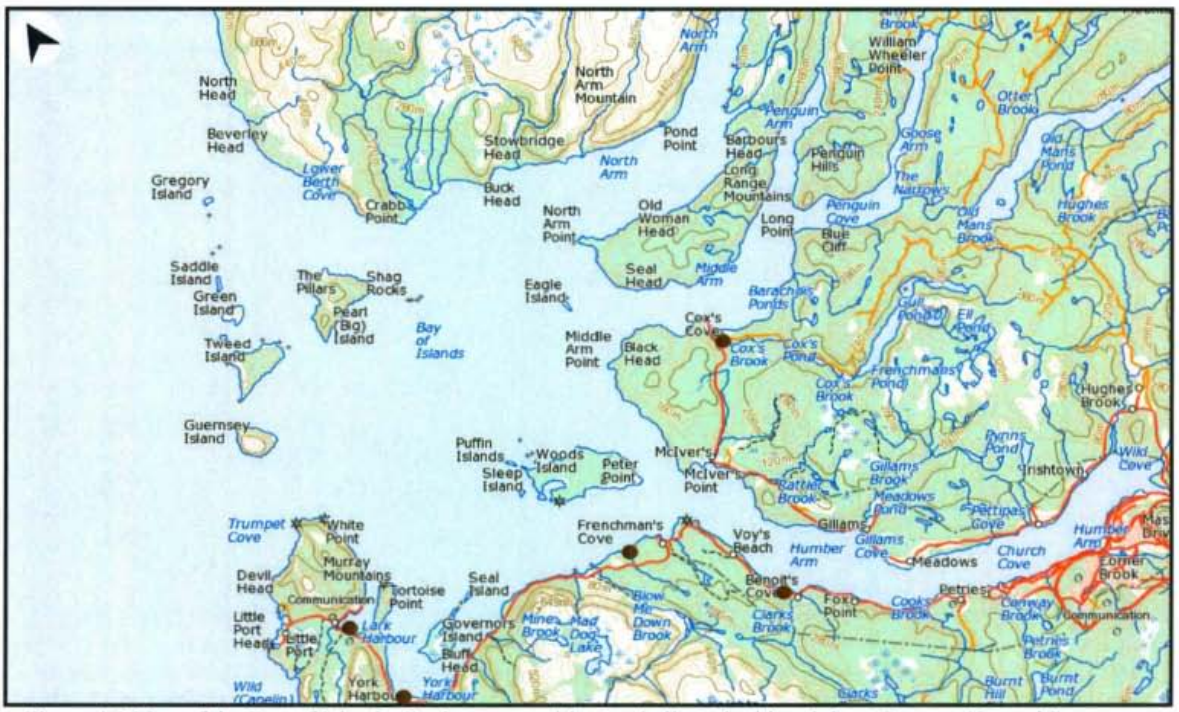

Figure 4.1 Map of the Bay of Islands. Study communities are indicated with red dots *(Source: Natural Resources Canada, Atlas of Canada, 2007)*

and shipping (freight, particularly pulp and paper), but also includes tourism (whale watching, cruise ship tourism, fishing), recreational boating, housing developments, as well as beach and cabin visitation. Coastal activity in the area is expanding with increases in cruise ship tourism, container traffic and shipping of timber and non-timber products, as well as oil and gas

exploration (Corner Brook Port Corporation, 2010). This can, in part, be attributed to efforts by the Corner Brook Port Corporation to increase water front use and tourism (Corner Brook Port Corporation, 2010).

4.2. The Bay of Islands marine environment

The Bay of Islands is a bay connected to the Gulf of St. Lawrence, which opens further to the North-west Atlantic Ocean through the Cabot Strait and the Strait of Belle Isle. The Bay of Islands is a fiord most recently eroded during the Wisconinan glaciations between 110,000 and 10,000 years ago, and is comprised of three separate arms with steep troughs. The inner Bay of Islands comprises the three arms of the fiord and ranges from inside White Point to Beverly Head, with depths from 15-147 fathom (27-269m). The outer Bay of Islands fall within the fiord's terminal morainal sill, extending roughly eight miles into the Gulf of St. Lawrence from Bear Head to Cape St. Gregory. Depths in the outer Bay of Islands range from 12-47 fathom (22-86m), much shallower than the inner Bay of Islands as a result of deposited glacial debris (see Figures 4.2 and 4.3) (DFO, 2005). While snow crab can be found in the inner and outer Bay of Islands, the depths and cold temperatures within the inner Bay of Islands create a preferred habitat.

Seasonal ice and terrestrial freshwater runoff are both common to the Bay of Islands. Seasonal ice varies from one year to the next, depending on winter temperatures. However it is not uncommon for pack ice or even sections of the Bay of Islands to freeze. Ice conditions can play a role in the opening of spring fisheries in the area, and the combination of cold water conditions in the winter and warm water conditions in the summer make the area home to a wide

range of species, including those at the southern and northern edge of their distributional range, including Greenland cod (*Gadus ogac*) and yellowtail flounder (*Pleuronectes ferruginea*) respectively (DFO, 2005). In addition to snow and ice melt, the Bay of Islands receives large amounts of freshwater drainage primarily from the Humber River (DFO, 2005).

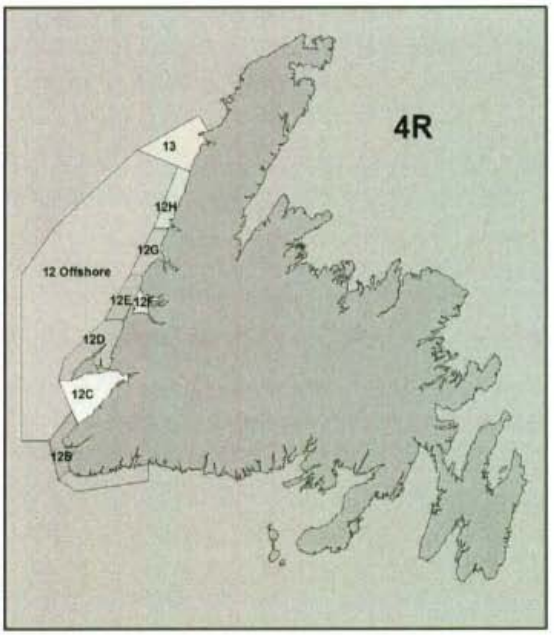

Figure 4.2 Map featuring Bay of Islands Crab Fishing Areas 12E and 12F *(Source: FFAW, 2011).*

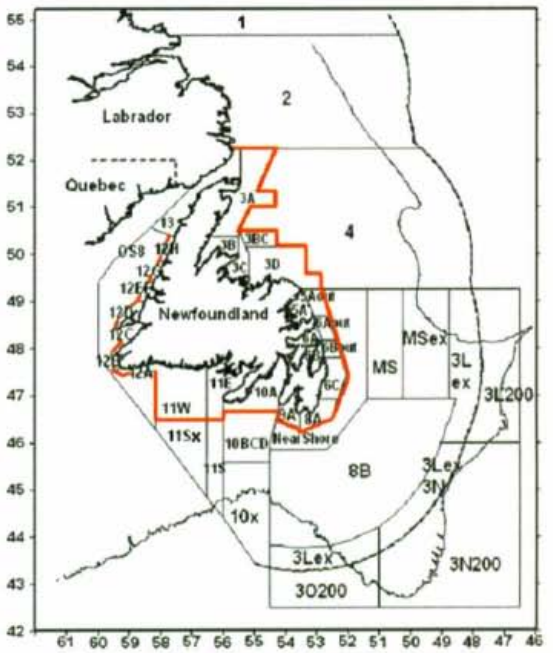

Figure 4.3 Map of Crab Fishing Areas in NL *(Source: DFO, 2010g).*

Supplementary to those mentioned above, the Bay of Islands hosts a variety of marine species, several of which are harvested for commercial purpose, including snow crab. The area's biota further encompasses a variety of kelps, rock weeds, and sea grasses; algae, bacteria, and plankton; molluscs, including clams, mussels, limpets, sea worms, and sea slugs; echinoderms such as sea stars, brittle stars, urchins, and barnacles; as well as a variety of groundfish and pelagics. Moreover a range of marine mammals including sharks, seals, whales and dolphins, as

well as sea birds including terns, gulls, and cormorants can be found in the area (DFO, 2005). On a whole, the marine ecosystem of Bay of Islands is very diverse.

4.2.1. Snow crab characteristics

Figure 4.4 Snow Crab harvested from the Bay of Islands

Snow crab can be found throughout the Arctic, North Pacific, and Northwest Atlantic Oceans (see Figure 4.4). In the Northwest Atlantic, they occur over a broad range, from Greenland to the Gulf of Maine; this includes a widespread distribution in the waters off Newfoundland. The majority of snow crab harvested in NL is from the Northeast coast of the province (in NAFO divisions[1] 3L and 3K) which in 2009 had landings of roughly 28,000 MT and 17,000 MT respectively. Nevertheless, there is a small fishery on the west coast (in NAFO division 4R3Pn), with landings of about 1,000 MT in 2009 (See Figure 4.5) (DFO, 2010g) Western NL, however, comprises only a small component of the Gulf of St. Lawrence crab fishery. Snow crab is also harvested in Nova Scotia (particularly Cape Breton), Prince Edward Island, New Brunswick and Quebec in numbers comparable to eastern NL (DFO, 2010h; Choi and Zisserson, 2011).

Figure 4.5 NAFO Fishing Areas (*Source: DFO, 2010c*)

[1]In NL, Northwest Atlantic Fisheries Organization (NAFO) divisions are used by DFO to establish boundaries for fisheries management. Within NAFO divisions there are further smaller fishing areas designated for the harvest of other species, such as is exhibited with the Crab Fishing Areas.

While large crab are more common in greater depths, cold temperatures, and muddy substrates, smaller crab can be found in more shallow, gravel-mud substrates (Dawe *et al*, 2002). Snow crabs prefer temperatures ranging from -1 to 3°C and depths between 38.28 – 169.5 fathom (70-310m) (Biron *et al*, 2008). For this reason, the cold and deep waters in the fiords basins within the Bay of Islands (and Bonne Bay) provide a desirable habitat for crab.

Snow crab movement is thought to occur at a local scale, traveling less than 20km over their lifespan (Biron *et al.,* 2008). This distance, however, can be affected by factors including topography, water temperature, and direction of bottom water currents. This is made evident in a study on the movement of male snow crab which shows the average distance traveled in the southern Gulf of St. Lawrence to be 16.7km during their lifespan, differing from 61.5km in eastern Nova Scotia (Biron *et al.*, 2008). This demonstrates that crabs have a limited distribution but, in some cases, may travel outside of the management areas designated by Fisheries and Oceans Canada (Biron *et al.*, 2008). These reports suggest that a temporary closure is not likely to result in immediate spin offs of large adult male crabs migrating to other crab fishing areas.

Snow crabs grow through a process of moulting, i.e. shedding their shells. This has been observed within Bonne Bay and the Bay of Islands (Hooper, pers.com.) in late winter and early spring although water temperature influences their moult. Juveniles of both sexes moult frequently, until they reach sexual maturity at roughly 8 to 12 years of age, with an approximate carapace width of 65 mm for females and 115 mm for males. Snow crabs of both sexes undergo a terminal moult. Females generally do not grow any larger after they become reproductive. Males do not have the strength, size and large claws necessary for effective reproduction until they undergo their final moult at an average carapace width of approximately 120mm in Bonne Bay and Bay of Islands (Hooper, pers. com). Male snow crab can reach a maximum carapace

width of 150mm, considerably larger than females. For this reason, the snow crab fishery is male-only, as female snow crabs never meet the minimum legal size limit of 95mm carapace width (DFO, 2009b). It should be noted, however, that large males are very important for crab reproduction, as females prefer larger males who can offer better protection (Dawe, pers. com).

Female snow crabs can carry 10,000 to 135,000 eggs, which they bear for an average of one year before hatching. Once released, eggs experience a 3-5 month larval distribution period before settling on the sea floor. The large-scale, near-surface circulation in the North West Atlantic contributes to the transport of snow crab larvae in the Gulf of St. Lawrence and Bay of Islands (Puebla *et al*, 2008).

Snow crab diets include polychaete worms, crustaceans, molluscs, small fish, brittle starts, urchins, and large zooplankton. They are preyed upon by cod, halibut, wolffish, skate, seal, American plaice, and larger crab. After moulting the new shell remains soft for several months; during this period it is referred to as soft-shell crab which is particularly vulnerable to predators and to rough handling by fish harvesters (DFO, 2009b). During the first month, they bury themselves in mud or sand, where they remain until their shell hardens enough for them to move safely. Because of a low meat ratio and little market value during this period (DFO, 2009b), fisheries protocol has been developed to mitigate the harvest of soft shell crabs, and if more than 20% of the harvest are soft shell crab, the fishery will be closed (DFO, 2010g).

4.3. Fishing activity in the Bay of Islands

The transformation of fisheries in NL over the past 30 years is a result of ecosystem change as well as the emergence of new markets. The groundfish collapse in the mid-1980s triggered province-wide moratoria, which shifted the focus of the fishery from groundfish to invertebrates,

primarily snow crab, lobster, and shrimp. The Bay of Islands snow crab fishery emerged in 1988, followed by a shrimp fishery in the early 1990s in the Gulf of St. Lawrence. In order to ease the impacts from the groundfish collapse and distribute wealth from the crab fishery, the Minister of Fisheries issued small temporary crab licenses to all core[2] fish harvesters in the province in 1997 (Pinfold, 2006). Today the snow crab fishery is one of the province's most lucrative fisheries, accounting for the highest value of NL seafood exports ($302 million CAD) in 2010 (DFA, 2010).

In the Bay of Islands, this change in policy resulted in the issuance of 61 temporary licenses to inshore harvesters, in addition to the eight larger licenses that existed previously in the area. These temporary licenses were later converted to permanent licenses. Today, the 61 smaller licenses combined have a quota of approximately 244,000 lbs, which is roughly twice as large as the combined quota of the original eight harvesters (about 136,000 lbs). While this influx of new licenses may have assisted in mitigating the impacts of the groundfish moratorium amid inshore harvesters in the Bay of Islands, it has also placed increased pressure on crab stocks in the area (Pinfold, 2006).

Fish harvesters in the Bay of Islands hold multiple licenses for species including lobster, snow crab, cod, halibut, herring, mackerel, and capelin. Lobster, herring, and mackerel are considered by harvesters to be the most economically important species in the area; however each species harvested makes up a vital component of a fish harvester's overall income. A

[2] To classify as a 'core' harvester you must meet the following criteria: be the head of an enterprise, hold a key license, and be dependent on the fishery (i.e. the majority of your income is derived from the fishery). Fish harvesters with a core status are subject to fewer regulations and are the only harvesters who qualify for new licenses. In order to qualify for a core status, harvesters must hold Level II certification and transfer an existing core license from another license holder. When this system of certification was first introduced, however, all experienced harvesters were given Level II status. Today, to qualify as level II harvester one must go through training to receive Apprentice and Level I qualifications, in addition to a minimum of five years work experience before they qualify as Level II harvesters (*DFO, 1996*).

species may mean more to one harvester than the next, depending on the combination of licenses they hold and their quotas for the respective species. This is particularly relevant for the snow crab fishery, where 61 harvesters hold licenses with Individual Quotas (IQs) of roughly 4,000lbs and 8 harvesters hold licenses with IQs for roughly 17,000 lbs. Crab comprises a smaller percentage of overall income for harvesters with a low quota; however of those with larger quotas select harvesters stated up to 70 percent of their income as being derived from crab.

Each species has a suite of conservation measures which must be adhered to, such as gear used, boat size, quota, season, and fishing location, as illustrated above with the inner and outer Bay of Islands. All large IQ crab harvesters fish within the inner Bay of Islands (CFA 12F). Crab harvesters with small IQs are further subdivided into two groups of equal size, which rotate their fishing areas annually, i.e. if they fish in the outer Bay of Islands (CFA 12E) one year, they will fish in the inner Bay of Islands (CFA 12F) the next. This measure was established by DFO to reduce activity in each fishing area, particularly in the inner Bay of Islands. This area is preferred for crab harvester over the outer Bay of Islands for two main reasons: first, it is geographically closer to the fishing communities, reducing fuel costs and travel time. Second, the waters within the inner Bay of Islands are cold and deep, providing a desirable habitat for snow crab.

4.3.1. Fishing methods

Fish harvesters have some flexibility in selecting the gear they use, depending on species harvested. In the case of cod, harvesters have a choice between gillnets or longlines. Some harvesters do not like to use gillnets due to the method's tendency to decrease fish quality. Additionally, there is a small financial incentive for harvesters who use a longline. This incentive, however, does not seem to be the deciding factor, as many harvesters in the Bay of Islands keep

their cod for personal use due to a combination of small quotas and catch, in addition to low prices. In the case of lobster, harvesters can choose between wooden or wire pots, or may choose to use a combination of the two (this is not an option for cod). Some harvesters prefer wire pots due to decreased wear and tear, lower weight, and the method's perceived increase in yield. Other harvesters, however, fear that wire pots lead to increased ghost fishing (whereas the wood pots, if lost, are consumed by gribbles and shipworms and quickly biodegrade), and feel that the wood pots yield similar catches to wire. Beyond cod and lobster, there is little flexibility in gear use. Longlines are used for halibut and fish harvesters use either a purse seine or tuck seine for pelagic herring and mackerel. Herring or mackerel is typically used for bait in crab traps. Many harvesters have specific bait licenses; however, they often choose to purchase their bait from a processing plant because they do not have freezing capacity to store it.

Baited conical traps are used for snow crab (see Figure 4.6). In the Bay of Islands, crab harvesters are permitted to use 100 baited conical traps, regardless of their IQ, and vessels used are less than 35 ft. Traps must have a minimum legal mesh size of 65 mm, and retained crab must have a minimum carapace width of 95 mm. Some harvesters follow a 'buddy up' arrangement, which allows them to join with another crab harvester to fish both licenses (with equal IQs) from the same vessel. The two quotas cannot be caught simultaneously; rather one must be met before another is started. Harvesters in the Bay of Islands find it favourable to buddy up with someone holding a license in the adjacent CFA, as this allows them to harvest crab in the preferred area, CFA 12F, first and to CFA 12E if time permits. The buddy up arrangement is popular in the Bay of Islands as it helps fish harvesters reduce operational costs.

Figure 4.6 Conical traps employed in the crab fishery

4.3.2. Seasons

Fishing seasons in the Bay of Islands vary from one species to the next. Fishing halts in the winter months, during which time harvesters repair their gear and boats for the following season (see table 4.2). The snow crab fishery is typically the first to start, beginning in early April and running into lobster season. If crab harvesters with small licenses have not met their quotas, they will typically switch to harvesting lobster provided that they are licensed to do so. They will, however, continue to fish crab on Sundays, when lobster fishing is banned. Crab harvesters with large licenses typically put more effort into the crab fishery because it is their main species (see 4.3.3). It is only in recent years, as crab landings have declined, that harvesters have encountered difficulties meeting their quota before the beginning of the lobster fishery.

The capelin fishery often begins before lobster and crab fisheries close. Harvesters with a capelin license will typically abandon the lobster and crab fisheries to begin to fish for capelin because they can receive greater economic return, especially at the end of the lobster and crab seasons when lobster and crab become scarce and their catches are low. Herring and mackerel seasons occur concurrently, beginning in late August. Mackerel are targeted because of a high price and a larger quota. It is common, however, for harvesters who actively fish for mackerel to switch to herring if they encounter a school of fish. Normally, harvesters are able to meet their herring quota as they search for and harvest mackerel.

Table 4.2 Fishing seasons by species in the Bay of Islands

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Lobster												
Crab												
Cod												
Halibut												
Herring												
Mackerel												
Capelin												

4.3.3. Quotas and landings

Fish quotas are output controls that restrict the amount of fish a harvester is permitted to catch. Quotas can be individually based, as in the crab fishery, or they can be overall quotas set for a certain geographical area. In the lobster fishery, trap limits are used in place of a quota system. The crab fishery uses a management system that combines total allowable catch (TAC), individual quotas (IQ) and trap limits. A TAC is set for each crab fishing area which is then

subdivided so that every license holder is given an IQ. The TAC and IQ are assessed annually and may be adjusted depending on the biological status of the respective species.

In western NL, inshore and offshore crab landings and effort have declined since 2004, and the overall TAC has not been met since 2002. In 2004, landings in the Bay of Islands peaked at 222 MT, and have since steadily declined, reaching 85 MT in 2010 (See Figure 4.7) (DFO, 2010a). Effort and landings reached historical lows for offshore harvesters in 2006, and for inshore in 2009. Recruitment has been low in recent years, and long term prospects remain unknown. With the exception of Bay St. George, south of the Bay of Islands, catch per unit effort in western NL is declining. There has been little research specific to snow crab stocks in the Bay of Islands, apart from annual post-season crab surveys conducted by the FFAW and log book data collected by fish harvesters. Quotas have been unattainable by harvesters in the area since 2006. This has triggered quota cuts in 2008 by 20% (DFO, 2010g).

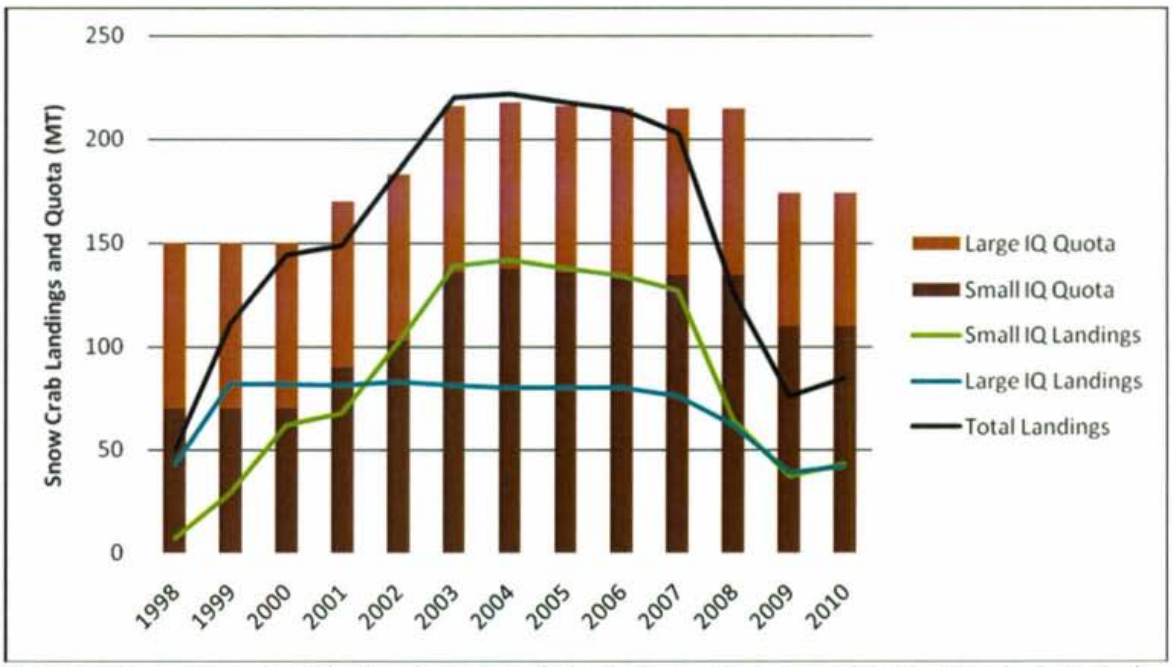

Figure 4.7 Snow crab quota and landings in the Bay of Islands *(Source: Fisheries and Oceans Canada, Snow Crab Species Quota Reports, 2010a)*

4.4. Fish processing and marketing in the Bay of Islands

As indicated in the *Fish Inspection Act*, all fish harvesters in NL are required to sell their catch to processors in the province (Gov. NL, 2007). This process is described below in three sections, first exploring processing plants, then prices, and lastly fish markets.

4.4.1. Fish processing plants

There are three processing plants in the Bay of Islands; two are owned and operated by Barry's Fisheries Ltd. (located in Curling and Cox's Cove), and one by Allen's Fisheries Ltd. (located in Benoit's Cove). Both companies remain family enterprises and have had a presence in the Bay of

Islands for over 100 years. Lark Harbour also houses two collector's wharves[3]: one is operated by Golden Shell Fisheries Ltd., a processing company based in the east coast community of Hickman's Harbour, and the other is operated by Allen's Fisheries. Together, these companies purchase the majority of the fish harvested in the Bay of Islands, although on occasion processors from other parts of the province come to the area to purchase fish. In addition to the plants in the Bay of Islands, Barry's Fisheries has processing plants throughout the province, as well as in Nova Scotia, New Brunswick, Maine, and Iceland. They process a variety of groundfish, pelagic, and crustacean species; however their plants in the Bay of Islands deal primarily with pelagics and a small amount of lobster. Barry's Fisheries also holds crab in Cox's Cove for Allen's Fisheries, who process it in addition to lobster, pelagics, and groundfish. At the provincial scale, only a small percentage (roughly 4%) of crab harvested comes from the Bay of Islands (Allen's Fisheries, pers. com). As a result Allen's Fisheries purchases and ships in the majority of their crab from other parts of the province for processing in Benoit's Cove.

Limited processing plants in the Bay of Islands paired with legal requirements to sell to processors within the province offer few alternatives for harvesters to sell their fish. Fish harvesters largely sell to the processor in closest proximity, which is most economical as it saves on additional fuel costs for transport. In the communities of Lark Harbour and York Harbour, harvesters have a greater choice between processing companies, because Golden Shell and Allen's Fisheries are located side-by-side. Since prices seldom differ between processors, social relationships are the main factor determining which company a harvester will sell to.

[3] Collector's wharfs are areas where processors can weigh and store fish until it is trucked to a processing facility.

4.4.2. Prices

Fish prices vary from year to year, and may fluctuate throughout the season due to factors such as operational costs (e.g. fuel prices), exchange rates, and global demand (See Figure 4.7). Typically, fish prices (including snow crab) are set by an agreement between the fish harvesters union and a processing group (either the Association of Seafood Producers or the Seafood Processors of NL, depending on who represents the majority of processors for the harvest of a particular species). If an agreement is not made the provincial Standing Fish Price Setting Panel will act as an arbitration panel and negotiate fish prices through a collective bargaining process between processors (represented by a processing group) and fish harvesters (through the fish harvesters union) (NL Standing Fish Price Setting Panel, 2011). The panel sets a minimum price; however, processors can pay more at their discretion. Prices set by processors are influenced by the market, fish size and, to a certain degree, gear. For pelagics, price changes depending on size, and for capelin, the percentage of females also plays a factor (with males being less valuable than females). In the case of snow crab, larger crabs are more valuable, while soft-shell crab have no value to processors. While accounting for NL highest value seafood export in 2010, the price received by harvesters has declined to $1.35/lb in 2010, after peaking at $2.45/lb in 2004.

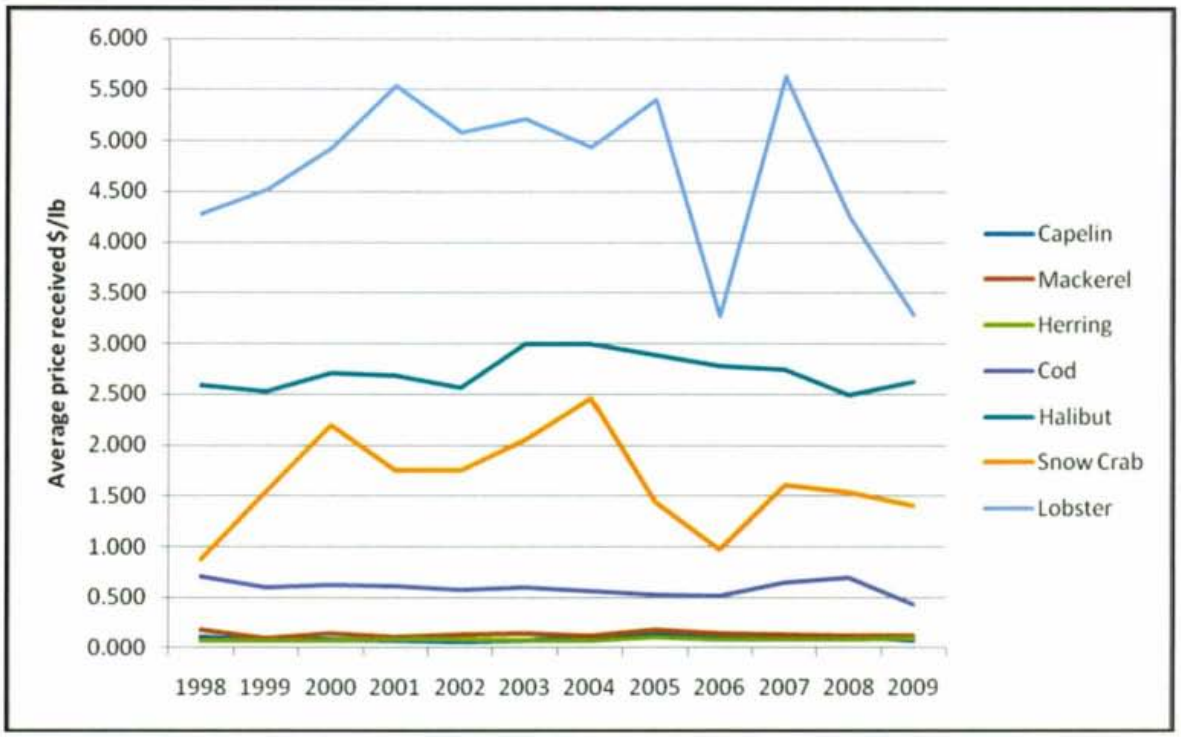

Figure 4.7 Changes in province fish prices 1998-2009 *(Source: Fisheries and Oceans Canada, Landings and Landed Value Statistics, 2010b)*

4.4.3. Seafood marketing

With the exception of lobster, which is part of a fresh live trade, the majority of fish in the Bay of Islands undergoes secondary processing before being sold to markets throughout the US, Asia, Japan, and Europe. Herring is sold round, filleted, or in chunks; mackerel and capelin are sold mostly whole; and crab is primarily sold frozen either in sections or cooked in the shell (Barry, pers. com). The bulk of snow crab is sold to markets in the US, followed by sales in China (DFA, 2008).

Little fish is sold locally in the Bay of Islands. Allen's Fisheries is the only processing plant that operates a year-round fish market. Barry's Fisheries does not have a fish store, but does sell lobster from the plant in Cox's Cove during the season. Also, they will give small

amounts of capelin and herring (in season) to individuals looking for fish. Cod is consumed locally, especially among harvesters in Cox's Cove, who often decide to keep their fish rather than travel to sell it to a processor in another community. There is a food fishery during the summer and fall, which allows recreational harvesters a maximum of five codfish a day for the duration of the fishery, lasting roughly four weeks (two weeks in the summer and two weeks in the fall). This is commonly pursued in the Bay of Islands and contributes to local food security in the area.

4.5. Governing Institutions

The pre-harvest, harvest, and post-harvest parts of the fish chain are linked through a series of stakeholders and institutions, which interact in the fishing activities, processing, marketing, and governance of fisheries and coastal resources. In fisheries, a stakeholder is any individual (or group) that has an interest in the resource at hand, while institutions help shape their interaction. Stakeholders in the Bay of Islands include fish harvesters (inshore and offshore), fisheries managers, fisheries scientists, community members, processors, processing workers, fisheries union representatives, tourists, tourism operators, and NGO's; however, the degree to which they are involved in fisheries governance varies, as does their position. Institutions "are the instrument through which the formation and execution of fisheries governance occurs. They introduce structure, order, and predictability into human relations and interactions" (Kooiman *et al.,* 2005). Institutions occur at national, provincial, and local scales, which will be described below.

National institutions

At the national scale, DFO is the central institution in fisheries management. They are responsible for coordinating various policies and programs related to ocean activity including fisheries, aquaculture, conservation, and habitat protection. There is a division of DFO located in Corner Brook which regulates fishing activity in western Newfoundland. Moreover, as part of the Oceans Action Plan, DFO has established a series of Large Ocean Management Areas (LOMAs) instituted to help form a planning basis for the implementation of integrated management plans. Five LOMAs have been established, including the Gulf of St. Lawrence Integrated Management (GOSLIM), which includes the Bay of Islands. Transport Canada is a federal institution that works towards safe marine transportation, sustainable marine practices, and furthermore regulates the transportation of dangerous goods by water. National institutions have an array of responsibilities including designation of fishing areas, fishing quotas, license arrangements, fishing seasons, rules and regulations, and enforcement, in addition to the design and implementation of fisheries and oceans policy.

Provincial institutions

There are several institutions at the provincial scale, including the DFA, the provincial Standing Fish Price Setting Panel, the FFAW, the Association of Seafood Producers (ASP), and Seafood Processors of Newfoundland and Labrador (SPONL). The DFA, ASP, and SPONL are primarily connected to the processing sector; however, they also have direct implications for fish harvesters. DFA is responsible for the management and coordination of aquaculture, seafood processing, and quality assurance in the province, while the ASP and SPONL are not-for-profit corporations that represents seafood producers in NL by providing input in policy decisions,

promoting the industry, and participating in research and development programming. The Price Setting Panel is responsible for facilitating collective bargaining and acting as an arbitration panel for setting fish prices in the province.

The FFAW represents fish harvesters (including boat owners and crew) and processing workers in the province, and often serves as a link between fish harvesters and the DFO, or fish harvesters and the ASP or SPONL. They lobby the government on issues such as fisheries management, assessing fish stocks, providing training and education, and negotiating fish prices and collective agreements. Their main headquarters is located in St. John's, and regional offices operate throughout the province.

Local institutions

In addition to national and provincial institutions, several local institutions can be found in the Bay of Islands. The Bay of Islands has a Coastal Management Area (CMA) committee for integrated management that aims to address coastal and ocean management in the area. It is designed to support collaboration among coastal actors, respond to environmental threats, and support economic activity. CMAs are overseen by various local institutions and partners, which differ from one area to the next. In the Bay of Islands, the CMA is overseen by ACAP Humber Arm, located in Corner Brook. ACAP Humber Arm is a local institute and regional body working towards integrated management of coastal and ocean areas in the Humber Arm (DFA, 2007). ACAP conducts research, strategic planning, and public consultation on issues that affect the region, including the ecosystem and quality of life for residents. To date, ACAP has dealt primarily with water currents, sewage and effluent outflow, as well as education; while little of their work is specific to fisheries, they have a strong focus on general ocean health (DFA, 2007).

Town councils throughout the Bay of Islands are also local institutions. While they are not directly engaged in fisheries, they do take on related tasks. Some councils, including York Harbour, apply for grants to assist fish harvesters who are unable to qualify for employment insurance (EI). The grants provide up to 10 weeks employment (typically community service projects, e.g. painting, bush cutting, etc.) to help fish harvesters qualify for EI. These are referred to locally as 'cookie grants'. The South Shore Fishermen's Committee is another local institution in the Bay of Islands. This is a group of fish harvesters on the south shore of the Bay of Islands who relay their concerns to the FFAW. They consist of inshore harvesters from the entire south shore of the Bay of Islands, however their concentration lies in York Harbour – Lark Harbour Area. This is where the meetings are held, and many of the active members reside. The committee operates on an informal basis, meeting when an issue or concern arises. Members, nevertheless, communicate regularly as they live and work in close proximity, many of whom have family ties. While their design varies, fish harvester organizations are common to NL fishing communities. There used to be a Fishermen's Committee on the North Shore of the Bay of Islands, however over the past few years, as key members have retired from the fishery, the committee has dissipated.

Although the Bay of Islands crab fishery is relatively small in comparison to what is carried out in other areas of the province, it nonetheless plays an important role for the livelihoods of fish harvesters in the area. Decreasing landed values, however, make it increasingly challenging for harvesters to viably pursue crab. Moreover, a lack of information on snow crab and crab stocks in the Bay of Islands make it difficult to establish appropriate management options for the fishery, and may also play a role in the current situation of decreasing catches. Federal institutions are evolving to address the complexities presented in

today's fisheries, and are incorporating approaches such as integrated management to try to address the shortfalls of past fisheries management, similar initiatives are spreading to provincial institutions. At the local level, such as can be seen with the South Shore Fishermen's Committee, institutions are working towards developing their own mechanisms to deal with short falls in fisheries management, as seen with the emergence of crab closure discussions in the Bay of Islands. Nevertheless there remains a lack of information on snow crab in the Bay of Islands, thus making it difficult to make choices without understanding the consequences and outcomes, positive or negative, of these actions.

Chapter Five
Step Zero of Voluntary Fishery Closure Discussions in the Bay of Islands

The chapter has been divided into six sections, each with a focus on step zero questions used in the interview guide. These questions were based on a previous step zero study conducted by Chuenpagdee and Jentoft (2007). First, a brief introduction of the interviews employed in addition to a profile of respondents is provided. Second, interview results are used to depict the initiators of closure discussions in the Bay of Islands and participation throughout the pre-implementation period. Next, drivers and conditions which motivated closure discussions are provided, followed by a description of the support and opposition for a crab closure in the area. Ensuing sections outline the impacts and benefits a closure may have the Bay of Islands, and lastly, the potential for a prospective crab closure in the Bay of Islands is discussed.

5.1 Interview respondents

This research has been designed to address interdisciplinary concerns in fisheries, focusing on the implementation of closed areas, specifically those voluntary in nature. Semi-structured interviews were used to seek information pertinent to the social, environmental, and economic dimensions of fisheries and fishery closures in the Bay of Islands. Questions were directed to not only fish harvesters and processors, but also community members such as town councils and tourism operators. The research extended to the community level, drawing inspiration from Jentoft (2000), who asserts that the overall health and vitality of fishing communities is dependent on healthy natural resources and vice versa.

Interviewees were initially selected and contacted by recommendation of key informants through a snow ball sampling technique. Interviews were conducted in various locations including interviewees' homes, places of work, processing plants, and fishing wharfs. In total, 30 interviews were conducted between May and September 2010 (excluding key informant meetings). Interviewees were from the communities of Benoit's Cove, Frenchman's Cove, York Harbour, Lark Harbour, and Cox's Cove and with the exception of one interviewee, all respondents were male. This is attributed to a predominantly male fish-harvesting sector in the Bay of Islands. An overview of the interview respondents is shown in Table 5.1 and 5.2.

Table 5.1 Number of respondents by occupation

Community Group	Benoit's Cove	Frenchman's Cove	York Harbour	Lark Harbour	Cox's Cove	Total
Fish harvester	5	3	5	3	5	21
Retired harvester	1	1	-	-	-	2
Community member	-	-	1	-	1	2
Processor/processing worker	1	-	-	1	3	5
Total	7	4	6	4	9	30

Table 5.2 Number of fish harvesters (including retirees) by species harvested

Group	Crab harvester (small IQ)	Crab harvester (large IQ)	Non-crab harvester
Lobster	12	4	6
Cod	11	3	2
Halibut	10	3	2
Capelin	3	1	7
Mackerel	3	1	7
Herring	3	1	7
Total # Harvesters	12	4	7

5.2. Initiators, discussions, and participation

Closure discussions in the Bay of Islands involved various institutions and stakeholders, including DFO, the fish harvesters union, and local crab harvesters. The discussions were initiated by the South Shore Fishermen's Committee, a small group of fish harvesters in the Lark Harbour – York Harbour area who speak on behalf of harvesters on the south shore of the Bay of Islands, particularly regarding concerns or issues with the fishery.

Dialogue regarding a closure began in the spring of 2009, mid crab season, when the Fishermen's Committee proposed a voluntary crab closure to address concerns in the fishery. The timing of the initial discussions was poor, as the fishery had already began for the season, meaning that harvesters had prepared and set their gear; consequently, harvesters advocating a closure decided to keep the discussions on hold until the following season. In the spring of 2010, prior to the opening of the crab fishery, closure discussion resumed – once again spearheaded by the Fishermen's Committee.

The Fishermen's Committee, with assistance from the FFAW, called a meeting at the community hall in York Harbour for all crab harvesters in the Bay of Islands to discuss temporarily closing the crab fishery. The meeting was announced by word of mouth and also aired on the Fisheries Broadcast. At the meeting committee members presented information on the current state of the crab fishery in the Bay of Islands and discussed holding a vote among all crab harvesters on whether to implement a voluntary two-year crab closure.

Closure discussions were driven by a combination of declining crab stocks and prices, neighbouring closures, and prospects of increased control in the fishery (see section 5.2 Drivers and Conditions). For some, however, a closure was not desired due to the associated livelihood

constraints that would result. Opposing views concerning closure implementation made it difficult to achieve consensus on whether to hold a vote. To facilitate this process, a second smaller meeting was held with five crab harvesters who were selected by the FFAW to represent the diversity of crab harvesters in the Bay of Islands. They were a mix of large and small IQ harvesters from both the North and South shore of the Bay of Islands, and not all harvesters were part of the Fishermen's Committee. At the meeting crab harvesters remained unable to agree on holding a vote to closing the crab fishery and, as a result the FFAW refrained from holding a vote and the crab fishery opened in early April. The requirement for consensus on holding a vote was established by the FFAW. This process is described below by a small quota crab harvester who participated in both meetings regarding the closure:

> We had a fishing meeting up at the community hall and we had all the fishermen there, all who wanted to come. There were fishermen from the entire Bay of Islands, and our union representative was there... We talked about how we needed a closure, but we couldn't get [any] consensus at the meeting about having a closure, there [were] two or three people that didn't want it. That was it. We had a meeting at the union hall after. We picked four or five guys to go to the meeting to see if we could come to a consensus on it. I was on this committee... Then we discussed it at the meeting and we still never came to a consensus. Then we could not have a vote, we just wanted to have a vote. We still could have had a vote in my opinion. We went around and interviewed the people, me and another guy talked to the fishermen to see what they wanted and everyone wanted the closure (sic).

Although no votes or closures moved forth, some harvesters remained optimistic that there would be a closure for the 2011 crab fishery and planned on continuing discussions.

However, as evidenced by the above quote, some harvesters did not understand why a consensus was required in order to hold a vote. Feeling discouraged by both the process and results, select harvesters who initially advocated for a voluntary closure and were actively involved in the process no longer wished to be involved in future efforts (see Section 5.7). The FFAW asserted that if landings remained low for the 2011 season, they would proceed with a vote to close the fishery (no consensus would be required for this). Two-thirds must vote in favour of a closure before it will be implemented (Spingle, 2010).

5.3. Drivers and conditions

Fish harvester initiated and voluntary closures typically arise from either a concern or dilemma within a particular fishery – this is also true for the Bay of Islands. One section of the interview guide was devoted specifically to examining the drivers and conditions that motivated closure discussions in the Bay of Islands. There were four key drivers that surfaced from interviews: the crab stock, neighbouring closures, a desire for increased fish harvester control in conservation measures and regulations, and price. Of the 16 crab harvesters interviewed, 100% listed the declining crab stock as the main driver behind the closure, while 25% listed the neighbouring closure, 19% listed increased fish harvester control and 13% listed price. Each of these will be described below.

The stock

There has been a steady decline in snow crab stocks in the Bay of Islands since 2004, where landings dropped from 222 MT to 85 MT in 2010. These declines have been accompanied by quota cuts and, according to fish harvesters in the Bay of Islands, they have been one of the main

factors contributing to closure discussions in the area. Concerns regarding stock decline and decreased landings were frequently expressed during interviews and are illustrated in the following statement from a small quota crab harvester in the Bay of Islands:

> I was one of the ones that pushed this year so that it wouldn't be open. Last year there wasn't enough crab here to eat. That's the way we say it, you couldn't get enough for a sandwich, so we said let's close it, let's close it for two to three years...Anyhow, we had a meeting here in the spring saying do not open the Bay... I said, it's not worth us setting our pots because there wasn't [any crab] there last fall and there's not going to be any this year. And this year, we don't know where they've come from, but there was any amount of crab in the Bay. Well, not any amount, but we caught our quota. I don't know where they came from. And it was a lot of soft shell. But if they didn't fish it this year like we wanted it closed, than next year we would have had a great fishery, because it would have been all hard shell. We destroyed a lot of crab this year.

The above quote speaks to the stock declines, as well as resurgence of crab stocks. Landings data for snow crab shows that, while landings did increase from 76 MT in 2009 to 85 MT in 2010, they remain down from 126 MT in 2008 and even higher numbers in the preceding years (see Figure 4.3). Landing declines generated mixed feelings among crab harvesters in the Bay of Islands; while many felt a temporary closure would help rejuvenate the stocks, others felt the landing declines were normal and such lows could be expected in the crab life cycle, explaining the increased landings in 2010. Despite increased landings in the Bay of Islands, in NAFO division 4R (which includes the Bay of Islands), snow crab landings were at historical lows in 2010 (DFO, 2010g). Key informant meetings, interviews, and snow crab reports all revealed a lack of information on crab stocks in the Bay of Islands. The only ongoing research and data

collected on crab stocks in the area is that obtained from crab harvester logbooks and an annual post-season crab survey.

Also mentioned in the above quote is the high incidence of soft shell crab in the 2010 fishery, a reoccurring comment among interviewed harvesters. While this is not an indication of declining stocks, as all snow crab undergoes a moulting process, it may be an indication of poor timing of the fishery or the need for improved soft shell protocols. During their soft shell period, snow crab are extremely vulnerable to any handling by fish harvesters, and there is an estimated 90 percent mortality rate of released soft shell crab (DFO, 2009b; Dawe *et al.,* 2010). As a result, large-scale soft shell capture can be very harmful to the stock.

The neighbouring closure

Voluntary closures are gaining popularity in the province. In addition to closure discussions in the Bay of Islands, a voluntary crab closure was implemented in Bonne Bay; while voluntary lobster closures have been implemented in the communities of Trout River, Eastport, and St. Brendan's; and a voluntary shrimp closure has been implemented in Funk Island Deep, Labrador.

Fish harvesters in the Bay of Islands are aware of activity in Bonne Bay because the two areas have familial ties and are in close geographic proximity. Bonne Bay is roughly 30km north of the Bay of Islands (via water), and in 2008 crab harvesters in the area implemented a temporary two-year voluntary crab closure. Crab harvesters in the Bay of Islands felt a similar closure would help address the issue of stock declines in the area. One crab harvester stated:

> "They've done it in Bonne Bay, it's been [two] years they haven't had a fishery down there, you still got to pick up your license and everything, but they got a freeze put on it, the fishermen got

> together… were hoping that if we shut it down like they did in Rocky Harbour or Bonne Bay for 2-3 years that our stocks would come up and we could manage it more".

This quote demonstrates the influence of the neighbouring closure on discussions in the Bay of Islands in addition to the optimism of harvesters for the implementation of a closure.

Increased fish harvester control

The majority of fisheries conservation measures and regulations are implemented and enforced by DFO (see section 4.3 Fisheries Capture). While fish harvesters appreciate the presence of DFO in the area, they neither understand nor agree with all of the conservation measures and regulations in place. This is exemplified in the crab fishery, whereby restrictions prevent crab harvesters from buddying-up with harvesters who have different IQs (see section 4.3 Fisheries Capture). In some cases, this prevents family members from being able to fish together, and can increase the cost if a harvester is not able to find another 'buddy' to fish with.

Gaining a means of control over the fishery was seen as a motive behind implementing a voluntary crab closure. Crab harvesters felt this voluntary initiative would not only allow harvesters the privilege to re-open the fishery at their discretion, but would also prevent IQs from being reduced. A crab harvester explained the situation with the following:

> We tried to get it shut down this year, ourselves, among the fishermen. Instead of DFO shutting it, we wanted to shut it ourselves. If DFO shuts it they've got us over a ball again, they don't have to open it… Our quotas did increase, but now they're on a decline. We were up to [roughly] 5,600lb, now were back down to 4,000lb again... If we keep fishing and all the log books go in now that's

> another big thing. If they [DFO] see we're hauling 60, 70, or 80 traps and only catching 400-500lbs of crab when we should be coming in with a lot more they're going to keep decreasing our quotas. So that's why we wanted to shut it down, to shut it down ourselves. That's pretty much all DFO's got to go by is our log books…There still going to drop our quotas. But the fishermen wanted to shut it down to conserve the crab and hopefully it will pick up again and then we should be able to maintain it (sic).

This quote reveals the awareness of harvesters regarding the declining catches, and a fear that their quotas will be reduced accordingly. Harvesters felt that, by taking a precautionary approach and closing the fishery before DFO takes other managerial approaches, the stocks could rebound and, in turn, eliminate the need for further quota cuts or a mandatory closure. This was a reoccurring theme in interviews; however, some respondents showed the need for additional measures beyond a closure. One crab harvester stated that "if we close it ourselves we could control when it would open again. We're hoping if we shut it down for a few years, then our stocks will recover and then we can continue to manage it better". While specific measures were not put forth, this response is an acknowledgement of the need to adopt conservation measures following the implementation of a potential closure.

The price

In addition to a decline in stocks there were other driving factors which contributed to closure discussions in the Bay of Islands. Low prices were mentioned in interviews as influencing factors in the discussions. One crab harvester described the influence of price on closure discussions in the following statement:

> The price was down this year to 90 cents. That's what the buyers wanted to pay, and there wasn't much crab so we said, well why not hold off. And it may have even made it better for the market if the buyers say [] the fishermen are not going to fish we better up the price a little bit to entice them to go fishing. But if the buyers put the price down to 90 cents and everyone went fishing they'll say listen, we can give them what we like.

The $0.90 price in the above quote makes reference to low crab prices offered at the beginning of the 2010 season. The provincial price setting panel set the price for crab at $1.35lb; however processors stated they could not offer this price and were only able to offer prices in the range of $0.90 -$1.00/lb. Negotiations went back and forth for roughly three weeks between processors (represented by the Association of Seafood Producers) while the FFAW and fish harvesters throughout the province protested the low prices and refrained from harvest. In late April, processors agreed to pay the $1.35/lb initially set by the price setting panel. Due to the lengthy protest, the crab fishery was delayed for roughly three weeks.

Crab prices are set at the provincial level and vary from year to year, largely affected by supply and demand in the global market. In the last six years the landed value for snow crab has declined, drastically reducing fish harvester's profit. Prices have declined from a high of $2.45/lb in 2004, to $1.35/lb in 2010. As a result, some harvesters have decided not to fish for cod as well as crab. While all 8 large IQ crab harvesters fished in 2009, of the 61 small IQ harvesters only 29 actively fished, in comparison to 43 in 2008. Fish processers are intermediaries between harvesters and the consumer market, and harvesters have little say on price setting, except through their representation by FFAW. While harvesters in the Bay of Islands alone are unlikely

to directly influence the price of snow crab, especially due to the small quantity of crab harvested in the Bay of Islands, the above quote showcases that if prices fall too low harvesters will choose not to fish. This is further demonstrated by the trends of decreasing active licenses in the Bay of Islands.

5.4. Support and opposition

While a voluntary closure proposition received strong support, with (according to several respondents and key informants) between 70 and 90 percent of crab harvesters in favour of its implementation, there was also a small but strong opposition. Support mainly came from crab harvesters holding small IQs; particularly on the south shore of the Bay of Islands, this includes the communities of Lark Harbour, York Harbour, Frenchman's Cove and Benoit's Cove. Opposition came primarily from large IQ crab harvesters as well as small IQ harvesters on the north shore of the Bay of Islands (Cox's Cove is the main fishing community in this area) and new entrants into the crab fishery. In this, however it is important to note that there are more small IQ harvesters than large, and moreover there are more harvesters on the south shore than the north shore. These statements represent trends rather than universal agreements: not all large-IQ harvesters, or harvesters on the North shore, were opposed to the closure, nor were all small-IQ or South shore harvesters in support of it.

Reasons for supporting the closure mirrored the drivers that motivated discussions in the Bay of Islands. These include:

- Protecting the crab stocks. Harvesters were beginning to fear they were in jeopardy in the area due to low catches in recent years.
- Preventing DFO from closing the fishery. Harvesters felt that if something was not done to protect crab stocks that DFO would close the fishery for an undetermined period of time, whereas if harvesters closed the fishery they would be in control of the re-opening date.
- Prevent quotas from being cut. Harvesters felt that if they continued to have low catches, then the department of fisheries would reduce IQs in the area, as experienced in 2008. They saw a closure as protecting their quotas while allowing the stocks time to rebuild.
- Not worthwhile. Harvesters felt the low prices received for crab, increased expenses and low yields made it not economically viable to harvest crab.
- Gaining more control in the market. Harvesters felt that by not fishing, processors may offer increased prices.

Not all harvesters agreed with the benefits of a closure; some felt they were outweighed by its limitations. Some harvesters are dependent on the crab fishery for their livelihood, with one large IQ harvester stating that over 70 percent of his income is derived from crab. There are also small IQ harvesters who derive a significant portion of their income from the crab fishery. On the north shore of the Bay of Islands in particular, fish harvesters are not as diversified in the fishery because there are no pelagic licenses in the area – only groundfish, lobster, and crab. It is easier for harvesters with many licenses to adopt a voluntary closure, than those harvesting few species, even if the closure is only temporary. Some harvesters opposed to the closure also stated,

while acknowledging stock declines in the area, that with increased effort they were able to meet their quotas. This made them feel entitled to continue harvesting crab.

Another root cause of opposition links back to the introduction of small IQ licenses in the Bay of Islands in the 1990's. At this time, large IQ harvesters opposed the new licenses, stating that the crab stocks could not support increased fishing activity. Today, many large IQ harvesters feel that the issue is one of overcapacity in the fishery. They do not feel that a temporary closure will resolve the declining stocks; rather they suggested that fishing activity needs to be reduced. One large IQ harvester stated:

> When I bought that license there were still only 8 licenses here... Its way over doubled the amount of crab being landed since they let the extra guys into it, they had permits before, then [DFO] made them all licenses…Once they made it a license, [DFO] couldn't take back the crab. We were telling the fisheries that there is too much capacity going into this area and that the Bay can't take it. The crab stocks [were not large]…. But that issue is gone now because [DFO] gave all of them licenses and you've just got an overcapacity in the fishery here. There is too much crab allotted for how much is there to catch. There's no way there should have been anymore than eight licenses in the Bay… They were saying that you're going to keep damaging [the stock] if you keep on going, if you keep on catching all the crab. Sure that is an issue. But the overall issue is the capacity in the crab fishery right now; no one is talking about that issue. That is the issue. How is it ever going to come back with the amount of crab that is being caught here now? And if it comes back, how is it going to be able to withstand the pressure (sic).

The permits mentioned in the above quote refer to temporary fishing privileges, which can easily be removed by DFO. These were initially allocated as a means to alleviate the impact of the

groundfish moratorium and explore potential within the crab fishery. Once converted into licenses, however, the fishing privileges became more permanent. As a result, when stocks began to decline, rather than removing licenses which is difficult to do, crab quotas were reduced. The above quote posits two important points. The first goes back to the scientific understanding of crab stocks in the Bay of Islands. Is there an accurate understanding and knowledgebase on snow crab, and snow crab populations in the Bay of Islands, and can the population sustain the current level of fishing activity in the Bay of Islands? Secondly, it reiterates the need for something beyond a closure, i.e. if a closure were implemented, what actions would follow to ensure the stock was not again over harvested?

5.5. Closure impacts

A snow crab closure would have a range of impacts on fish harvesters in the Bay of Islands, and it is precisely these impacts which have generated opposition for a closure in the area. A closure would affect those who have a greater economic reliance on the crab fishery more than those who have alternative sources of income either within or outside of the fishery. Those facing the largest economic impacts include large and small IQ harvesters with few alternative fishing licenses. The impact of a closure for select fish harvesters was noted by those crab harvesters opposing a closure, and further reiterated by a purse seiner who stated: "I wouldn't support [a closure]… if you were in support of it, you would be supporting half the crowd and seeing the other crowd starving to death. So rather than seeing people go hungry, no I wouldn't".

Nevertheless, outside of crab harvesters and their respective families, a crab closure does not appear to have large impacts on the community. Although as one harvester mentioned, the

economic setbacks that would be experienced by crab harvesters would have a rippling effect on the community as less money would be spent in the Bay of Islands. When asked about the impact of a crab closure on the community, one crab harvester stated the following: "Oh it probably would yes, for different fellers it would but the community itself, not so much".

With respect to food security, little crab is sold locally: there is only one fish market in the Bay of Islands (see section 4.4 Fish Processing and Marketing). However, lobster can be purchased from the fish plants (with the exception of Barry's in Curling, who do not process lobster) during season. One fish processor stated "we deal with big volume, local markets are primarily for groundfish, and the small volume demanded isn't really worth servicing". As a result, a crab closure would have little impact on local food security. Moreover, snow crab is not a traditional food in the area. Before the fishery began in the late 1980's, fish harvesters reported bringing it in as by-catch and not knowing what it was. As such, it was common for crab to be used as a garden fertilizer.

Fish processing plants are vital in the Bay of Islands, as they contribute an array of employment opportunities in the area. These include not only positions as processing workers, but also opportunities in the fields of engineering, management, and mechanics. There are over 300 people employed in fish processing within the Bay of Islands. When asked about the importance of processing plants to the community, all interviewees indicated them as an asset. One fish harvester asserted "not many communities are as fortunate as we are to have the work in the community, we're pretty lucky to have so much work as we do around here". If a crab closure were implemented, however, it would have little impact on processing plants and related employment due to the small percentage of crab processed in the Bay of Islands from the local area. For Barry's Fisheries, there would be no impact because they do not process crab at either

of their plants in the Bay of Islands. While Allen's Fisheries does process crab, the effect of a closure remains minimal because the majority of their crab is purchased and trucked in from the east coast of the province. Thus, a closure would have little economic impact for both processors and processing workers in the Bay of Islands. While a crab closure would not have large impacts on the community or processing industry, the above quotes show the individual livelihood impacts closure could bring. This is reiterated by community leaders who stated the overarching impacts of a crab closure were limited in the Bay of Islands to few harvesters who were dependant on the crab fishery.

5.6. Closure benefits

Benefits of a voluntary crab closure in the Bay of Islands extend beyond the marine environment to fish harvesters and also fisheries management. The full benefits of a temporary voluntary closure for crab stocks are unknown. Research in Bonne Bay shows positive signs, with increases in crab landings in the area following the two-year closure. Enhanced recruitment however, is not likely to show for another six to eight years (Hooper, pers. com). Crab stocks have faced declines in the Bay of Islands and it is possible such a closure would benefit the area. Male crabs that reach their terminal moult play a significant role in reproduction (see section 4.2 Marine Environment). A closure would allow more crab to reach their terminal moult, benefiting the reproductive capacity of the population in the area. This may also provide some long term benefits for neighbouring CFAs to the north (CFA 12G, Bonne Bay) and to the south (CFA 12D, Bay St. Georges) through larval drift. Ocean currents flow counter-clockwise in the Gulf of St. Lawrence transporting snow crab larvae during their larval distribution period.

A voluntary closure would provide crab harvesters with increased control in fisheries management. This would allow harvesters the opportunity to create a local management plan to address concerns in the crab fishery in the Bay of Islands. While fish harvesters feel that they were involved in fisheries management to a certain degree, they often expressed that they were not involved enough or that they were not listened to. Completing log books (with information on their catch), participating in the union, and attending meetings to put forth suggestions for fisheries management plans were listed as ways harvesters are currently involved in management. A voluntary closure would heighten their involvement and provide more direct control over fisheries in the area.

For fisheries management, voluntary and harvester-initiated conservation measures also provide benefits. They can reduce managerial costs as harvesters assume some of the roles or tasks otherwise carried out by managers, this including enforcement, planning, and consultation with other harvesters. Voluntary fishery closures can also be much faster to implement than similar mandatory closures such as a MPA, which can be a drawn out process involving many players including transportation, fish harvesting, and oil and gas. Moreover, the likelihood of compliance will improve if a conservation measure is implemented for and by harvesters (Baker, 2006) for their own benefit.

5.7. Prospective closures

While a voluntary closure was not implemented for the 2010 crab season, a series of questions were asked during interviews to examine the likelihood of a prospective crab closure being implemented in the area. Questions explored whether harvesters felt a closure was still needed and what it would take to get there. Following the crab fishery opening in April 2010, interviews

show that informal discussions regarding a voluntary closure have continued. The slight increase in landings experienced in the 2010 season has made some harvesters doubtful of the need for a closure and has reinforced the position of those who were in opposition. One large IQ harvester opposed to the closure stated the following:

> I don't know. Where the crab was a little bit better this year, I have a feeling they're [the South Shore Fishermen's Committee] going to leave it alone next year. Now that's what I'm thinking. But if they do go after it, it's really hard to say. I know this year they were too late getting it on the go trying to organize it; they never had enough time to make it work… I hope they don't... I didn't really care either way to tell you the truth, because there was [little] crab, we fought through the teeth for years with them out there and still I just watched them being depleted right underneath my nose, there was nothing you could do about it. And it got to this point that the crab was gone. I don't even care anymore, it's already been done. Close it, well it's too late now, that's how I feel about it. I feel like they had a chance to do it and didn't do it, up here the main point is overcapacity and there's not one person talking about it (sic).

Despite the increase in landings, there remains a group of fish harvesters who plan to push for a voluntary closure for the 2011 fishing season, though there are also select harvesters who, while they continue to support a closure in the area, do not wish to be involved in the process because they feel they wasted a lot of time trying to implement a closure in 2010. One large IQ harvester who advocated for closure stated the following: "I don't know what it would take. I always thought I had some say with DFO and the union [FFAW] because I spent some time at meetings. But next year, I don't mean to seem sour or anything, but they can do what they like with the crab. What they've done, I am [very unhappy] for them to not listen to us at all". A small IQ

harvester who participated on the committee to close the fishery further stated "...It's only useless for us to try to close [the fishery]. The union don't listen to us, and the fisheries [DFO] don't listen to us (sic)".

In addition to beginning closure discussions well in advance of the crab season, other requisites for closure implementation included 100% consensus among crab harvesters, a majority vote (with 2/3^{rds} in favour of closure), DFO enforcement of the closure, evidence of further decreases in landings, and improved dialogue with those who opposed the closure. Some harvesters were unable to determine what would be required for a closure to be implemented, and others did not support the idea. While there remained strong interest in pursuing closure discussions for the 2011 season, the fishery opened on schedule and, according to the FFAW, there were no further discussions attempting to close the fishery (Spingle, pers. com).

Chapter 6
Discussion

This chapter aims to examine the role of these closures in the broader realm of fisheries governance, by exploring the linkages between voluntary closures and modern fisheries management. The chapter begins by exploring the process of closure discussions in the Bay of Islands and assesses the impact of participant perceptions upon the progression of closure dialogue. Next, the implications of a closure on each facet of the fish chain are discussed. Lastly, by drawing on step zero and fish chain questions employed in the interview guide, the chapter examines how diversity, complexity, and dynamics in the Bay of Islands affects governability.

6.1. Voluntary closures and fisheries management priorities

Voluntary closure discussions were initiated by crab harvesters in the Bay of Islands as a result of concerns in the fishery, primarily decreasing catch and price, and were further triggered by neighbouring closures. Interview respondents stated that the main objective behind the implementation of a temporary snow crab closure was to help rejuvenate local crab stocks in the Bay of Islands and strengthen the fishery in years to come. Harvesters sought to implement a two-year voluntary closure, whereby all harvesters in the Bay of Islands would forgo the harvest of crab. This is similar to the voluntary crab closure implemented in the neighbouring Bonne Bay area.

Discussions on the implementation of a voluntary closure were initiated by crab harvesters, but also aligned closely with the overarching priorities, objectives, and legislations

set by DFO. Included in the Oceans Act is a national strategy for oceans management which comprises the coordination of a federal marine protected area program administered in part by DFO. The objective of this strategy is to "further conservation and protection of living marine resources and their habitats" (Government of Canada, p.1). While the proposed voluntary closure for the Bay of Islands was not intended as a permanent protected area, it did seek to conserve and protect inshore crab stocks, addressing the conservation objectives set by DFO as seen in the Marine Protected Areas Strategy (Government of Canada, 1996). Moreover, voluntary closure objectives draw further parallels with the three overarching priorities established for Canadian fisheries management, which include principles of economic viability, environmental sustainability and the inclusion of stakeholders in decision making (DFO, 2009a), each is discussed below.

Economic viability

Fish harvesters have little influence on the price they receive from processors, and by law, all fish harvesters in the province are required to sell to processing plants situated within the province. While fish prices may have slight variations from one processing plant to the next, minimum prices are negotiated and set at the provincial level. As a result, despite indications by harvesters that their efforts could impact price, a crab closure in the Bay of Islands is not likely to influence the market and related prices because the crab fishery in the area is insignificant at the provincial scale due to the relatively low allocation and catches in the area.

A combination of decreased landings and prices, partnered with inflation and high costs of fuel, has made it increasingly difficult for an economically viable crab fishery in the Bay of Islands, particularly for fish harvesters with a small crab quota. Consequently, harvesters in the

area felt that by taking a break from the crab fishery they could allow time for stocks to rebuild and return to the crab fishery after stocks have had time to rejuvenate. This could allow harvesters to focus on other species in the interim, including those with higher return, and create a more viable harvest when the fishery resumed.

Environmental sustainability

An economically viable harvest requires a stable crab population. Little is known on crab stocks in the Bay of Islands; however, fisheries statistics and fish harvesters knowledge show decreased landings in the area since 2004. While the full benefits of a temporary closure are unknown, it is likely even a short closure would provide some degree of benefit. DFO crab scientist Earl Dawe emphasized the importance of having large males in the snow crab population, particularly those which have reached their terminal moult. These males play a significant role in crab reproduction, and a two year closure would temporarily safeguard male crabs allowing more to reach terminal moult. This would increase reproductive potential in the area (Dawe, pers. com). Benefits of a temporary crab closure are supported by early observations from a snow crab population estimate which show evidence of stock recovery, following the voluntary two year closure in Bonne Bay (Neville and Hooper, 2011). Neville and Hooper demonstrate that resurgence in stocks was most prominent among crab ranging from 85-110mm in carapace width, and 48% of crab sampled had reached the minimum legal exploitable size. Few crabs in the sample, however, had reached their terminal moult. As a result authors suggest a reopening of the fishery in Bonne Bay could reverse recovery efforts (Neville and Hooper, 2011), thus showcasing that, while a temporary two-year closure is likely to demonstrate some degree of recovery, it may not be sufficient for the ecological sustainability of local crab stocks. Nevertheless, fish harvesters in

Bonne Bay are satisfied with the temporary closure results, and met their quotas in 2011 following the two-year closure. Whether quotas continue to be achieved following the opening of the fishery remains unknown, however results showcased by Neville and Hooper suggest landings will again fall - demonstrating a need for additional conservation measures.

Stakeholder participation

Although stakeholder participation was not an objective set by harvesters seeking to implement a voluntary closure, it remains a central outcome. Voluntary closures throughout NL and beyond exhibit stakeholder participation and, whether a closure is implemented or not, their voluntary nature demonstrates fish harvester involvement. This is the case with crab harvesters in the Bay of Islands, who, while they did not list stakeholder participation as an outcome for a voluntary closure in the area, were actively involved in the closure discussion process. They, along with harvesters of all species, expressed a desire for increased involvement in fisheries management decisions, and for crab harvesters this desire is exhibited in part through their attempt to close the fishery.

Stakeholder participation in the Bay of Islands closure discussions was closely examined to understand who was involved and the capacity of their involvement in the process. Participation in the closure discussions involved only primary stakeholders and thus did not extend far beyond crab harvesters. They were encouraged and invited to participate by crab harvesters from the South Shore Fisherman's Committee, who sought to involve other crab harvesters in the closure discussions due to their first-hand knowledge and interest in the fishery. The community at large had a general awareness of closure discussions but was not involved in

the process and expressed no interest in being involved. This is similar for non-crab harvesters who felt it was not their place to be involved, as they do not participate in the crab fishery.

The closure discussions, however, were conceived and developed by crab harvesters from the South Shore Fisherman's Committee, a local fish harvesters' organization that held meetings to involve other crab harvesters throughout the Bay of Islands in an attempt to close the fishery. Consequently, the initial discussions may have excluded the needs of individuals on the north shore of the Bay of Islands and did not involve the community-at-large. Nonetheless, crab harvesters were involved from the earliest planning stages, reducing concerns that harvesters would feel disengaged in the process. However, after a decision was made to keep the fishery open for the 2010 season, many harvesters who had advocated for the closure were left frustrated and felt their time was wasted and voices were unheard. This is attributed in part to harvesters not understanding why a consensus was necessary to decide whether to hold a vote. As a result, some harvesters involved in the process made strong statements that they would not be involved in any future attempts to close the fishery. At the same time, others still saw it as necessary, stating they would resume discussions prior to the following season.

Voluntary closures, unlike mandatory closures, are initiated from the community or fish harvester level. Varying from one situation to the next, voluntary closures can draw parallels with both community-based and co-management (Kearney *et al.,* 2007). Voluntary closures exhibit power-sharing, partnership, and flexibility in their design. Thus, making them more able to address the complexity within fisheries systems, and providing an integrated approach to fisheries management that involves institutions from local, provincial, and national levels. Furthermore, voluntary closures are community orientated, localized approaches to resource management. The implementation process for each closure, however, is unique and may exhibit

varying participatory arrangements. In addition to these voluntary crab closure discussions, there are a variety of other community-driven initiatives within Bay of Islands that go unrecognized. If catches are low, it is common for harvesters to voluntarily forgo the harvest of a particular species for a defined period of time. These closures are fully voluntary, are not enforced by DFO, and occur on a fish harvester by fish harvester basis. Moreover, particularly exhibited in the inshore sector, there are many examples of fish harvesters choosing to employ gears that results in improved fish quality and decreased by-catch.

6.2. Voluntary fishery closures as a conservation tool

Fishery closures and marine reserves are commonly employed as conservation tools. This is exhibited through Canadian fisheries management strategies and similar approaches worldwide. Fish harvesters, however, are often reluctant to support enforced reserves and conservation tools fearing they threaten their livelihood and the outcomes are uncertain. This results from what Gell and Callum refer to as "long experience with a growing body of regulations that have failed to halt fishery declines" (Gell and Callum, 2003, p. 7) thus, decreasing the credibility of conservation tools among fish harvesters. Helping mitigate or alter these perceptions, Kareiva (2006) argues that the social context is the most important aspect of marine conservation, and that developing local and community support for marine conservation or protected areas is of utmost importance. This suggests that voluntary closures may have an important role to play, beyond those achieved by closures, in increasing community support for conservation measures.

Voluntary closures exemplify community based conservation and, as mentioned above, align with the *Oceans Act* in addition to current objectives set for fisheries management. A report by Anderson *et al.,* (2000) further argues that areas of special protection have been implemented

by fish harvesters for decades and reaching beyond the typical input and output control measures such as fishing seasons, quotas, and gear restrictions. In NL, for example, many voluntary and harvester initiated closures have been implemented throughout the province, dating back to the 1960's. These closures have been both short- and long-term, and many remain in place today (Anderson *et al.,* 2000).

While little research has been done on the outcomes of temporary closures, fishery closures worldwide have led to increases in spawning stock size, fish size, and reproductive output of exploited species. Moreover, they have led to habitat recovery and have been reported to increase catch rates through both the transport of offspring and spill over of juveniles and adults from the protected areas to neighbouring fishing grounds (Gell and Roberts, 2003). The outcomes of fishery closures depend on multiple variables including reserve size, targeted species, migration, level of protection, and compliance among other factors. Nonetheless, Gell and Roberts (2003) state that fishery benefits from closures are quick to develop, and affirmative results are often observed within the first five years.

Voluntary fishery closures may not exhibit the same long term ecological benefits as other long-term conservation tools. Yet, they do demonstrate fish harvesters' interest and involvement from the earliest planning stages. Moreover, they show evidence of strong stakeholder participation and conservation effort, which may lead to long term ecological benefits resulting from increased stewardship from fish harvesters. Mandatory closures, on the other hand, are controversial among fish harvesters due to the uncertainty of benefits and the sacrifices they may entail (Gell and Roberts, 2003). Voluntary closures showcase awareness and action among harvesters, who work together towards the protection of the fisheries on which their livelihood depend. While the exact outcomes are uncertain, crab harvesters in the Bay of

Islands recognized declines in stock and saw a voluntary closure as a means to improve the fishery. For crab harvesters in the area, benefits of a voluntary closure could include conservation of fish stocks in addition to increased harvester control in fisheries management, increased sustainability of the crab fishery, and the authority to decide an appropriate time to re-open the fishery.

6.3. Implications of a voluntary closure in the Bay of Islands

Voluntary fishery closures have various implications across the fish chain, for the community-at-large and for fish harvesters alike. Step zero questions were asked in the interview guide to help understand the potential or anticipated implications of a crab closure in the Bay of Islands, as discussed below.

The implications of a closure vary from one harvester to the next, depending on their reliance on the crab fishery. One large quota crab harvester had indicated that up to 70 percent of his income is derived from the fishery. This differs greatly from harvesters with lower quotas, deriving the majority of their income from the harvest of other species. While it would affect some more than others, a closure could mean income cuts for all crab harvesters. These income cuts, however, may also occur if overfishing persists and landings continue to decline. To reduce the impact of income cuts, harvesters must diversify their livelihood to harvest other species (providing they hold additional licenses or are in a position to purchase new license) or find work outside of the fishery. The latter presents challenges, however, as core fish harvesters risk of losing their core status if the majority of their income is derived from sources outside of the fishery. As a result harvesters would lose their license purchasing privileges. In order to retrieve

their status, they would be required to go through a series of training, in addition to buying a new core license.

Apart from the direct implications of a closure on crab harvesters, there are few expected ramifications for fish processors, processing workers, or community members. The majority (over 95%) of crab processed in the Bay of Islands is from other areas of the province, and as a result little production or employment would be jeopardized. Furthermore, unlike cod, the local market for crab is limited and there is no recreational fishery. As a result, a closure would have little impact on local food security. If crab harvesters were faced with income cuts this could, however, result in a reduction of the amount of money spent in the area, or communities could face increased outmigration if harvesters choose to move elsewhere to find work. However, if the closure works the long-term result would be more money spent in the Bay of Islands and in their communities.

Interviews and key informant meetings further suggest the implications of leaving the fishery open. Post season crab surveys and interview results show that crab landings have been declining in the Bay of Islands since 2004. Harvesters in support of the closure fear that, if measures are not taken to reduce fishing activity, the situation will worsen. One harvester compared this to the cod fishery, which has not recovered two decades after a moratorium. Personal communication with snow crab scientists reinforces the dismal situation of snow crab stocks in the inshore areas of the region, including the Bay of Islands, stating that landings and effort have reached historical lows in 2009, have steadily declined since 2004, and that the TAC has not been met since 2002 (Dawe, pers. com). This is further supported by the regional Science Advisory Report which asserts that "maintaining the current level of fishery removals would have an unknown effect on the exploitation rate but may increase mortality on soft-shelled

immediate pre-recruits in some areas" (DFO, 2010g). All crab harvesters in the Bay of Islands have indicated that stocks have decreased or that it has taken them longer to meet their quotas. However, some harvesters feel that the issue is overcapacity in the crab fishery, and that a temporary closure will not provide a long term solution. This suggests that while stocks may benefit from closure, additional conservation measures may be required following the re-opening of the fishery.

Fisheries managers in the area are in support of voluntary closures. If fish harvesters, in conjunction with the fish harvesters union, develop a plan for a closure and a minimum of two-thirds of harvesters are in favour of the closure, DFO will help advertise, monitor and enforce the closed area. Voluntary closures have many benefits for fisheries management in addition to those aforementioned. In comparison to an enforced conservation measure like protected areas, or mandatory fisheries closure, voluntary initiatives may reduce managerial costs, increase stakeholder participation and involvement from early planning stages and offer high rates of compliance.

6.4. Effects of diversity, complexity, and dynamics in the Bay of Islands on fisheries closure

A governability assessment can be employed to help grasp the capacity of a fishery to meet its governing goals. While this was not the intended focus of the research, a combination of fish chain and step zero questions employed provided a snapshot of governability in the Bay of Islands. Additionally, by examining the roots of the natural, social, and governing systems in terms of diversity, complexity, and dynamics, the understanding of closure discussions in the Bay of Islands can be enhanced, as explored below.

The marine environment in the Bay of Islands is a diverse, complex, and dynamic system. The Gulf of St. Lawrence, including the Bay of Islands, has a mixture of deep and shallow waters providing sandy, muddy, and rocky habitats. Past glaciations have shaped the Bay of Islands as a triple-armed fjord, giving the Bay very steep troughs and deep waters, while the outer Bay of Islands is relatively shallow as a result of deposited glacial debris. This attracts a variety of species at differing water columns, all of which interact in an intricate food web. Kelp forests, for example, provide habitat for lobster and fish as well as food supply for urchins. Despite supporting a commercial fishery for over 200 years, there is a lack of biological data on commercial fish species in the Bay of Islands, inter-species interactions, growth rates, and migration and breeding patterns. For example, little is known about resident stock and range or the impact of water temperature and currents on the size or migration of crab and lobster, two of the key species harvested in the province. Water temperature plays a big role in species migration in the Bay of Islands and also influences fishing activity. Many species, such as cod, are without antifreeze proteins, limiting thus their potential for survival in subzero environments, forcing them to migrate to warmer waters.

Fish harvesters in the Bay of Islands harvest a variety of species including capelin, mackerel, herring, cod, halibut, lobster, and snow crab, and each species has its own designated fishing area. There are more fish harvesters on the south shore of the Bay of Islands than on the north shore, and no harvesters on the north shore hold pelagic licenses. While some inshore harvesters fish alone, others hire up to two crew members depending on harvesters' preference, availability of crew, and fish prices in the particular season. This differs from offshore harvesters, who often hire between six and eight crew members to assist with the harvest of large quantities of capelin, mackerel, or herring, and to operate the vessel and labour intensive gear. Many

offshore harvesters also hold inshore licenses for species such as lobster and cod. A buddy-up system is in place for inshore harvesters, allowing them to partner up with another harvester who holds the same license and fish both licenses from the same vessel, reducing operational costs.

During the offseason, the majority of harvesters are unemployed and collect employment insurance, while some harvesters work in construction-related trades. This non-fishing time is also used for preparing gear and vessels for the following season. On the whole, the area's socioeconomic system is not particularly complex, diverse, or dynamic as the livelihoods, challenges and gains of most individuals are similar. Challenges include outmigration, difficulties finding crew, inflation, unpredictable prices and catch rates, and poor weather. Gains include self-employment, the opportunity to be locally employed, and participation in a family business. Communities in the area are largely homogeneous and many families have roots tracing back to the first settlers in the Bay of Islands.

Unlike the social system, fisheries governance in the Bay of Islands is diverse, complex, and dynamic. DFO is the federal agency responsible for fisheries management; however, there are a number of other institutions involved at both the provincial and local levels including the FFAW, DFA, Association of Seafood Producers, the Standing Price Setting Panel, ACAP Humber Arm, Bay of Islands Coastal Management Area, the Gulf of St. Lawrence Integrated Management Area, and local fish harvester committees. Each governing body has its own roles and responsibilities, and all interact through a variety of regulatory institutions such as conservation measures, quality control, and harvesting regulations. Moreover, each species has its own suite of regulatory controls including the fishing area. In the crab fishery, for example, there are two different license classes and two different fishing areas in which harvesters rotate year after year.

In recognition of the shortfalls of early fisheries management, the past twenty years have brought changes to fisheries governance in the Bay of Islands, shifting from a system of primarily centralized top-down authoritative control to one that includes arrangements involving integrated management and stakeholder participation. This is exhibited, in part, through the formation of the Gulf of St. Lawrence Integrated Management (GOSLIM). GOSLIM was implemented to "bring relevant environmental, economic and social concerns into the planning process thus allowing for planning that truly considers the sustainable use of the ecosystem" (DFO, 2005, p.1). The GOSLIM is an interregional DFO initiative, working in Quebec, the Gulf of St. Lawrence, and NL regions.

Although the socio-economic system appears more governable than the natural and governance systems due to homogeneous characteristics within the community, the uncertainty and complex nature of the natural system, paired with the multiplicity of the governing system presents governability challenges in the Bay of Islands. For closure, this speaks to the uncertainty of biological outcomes which may reveal. Moreover, the range of governing institutions involved in fisheries is indicative of the vast scale of fisheries management in the Bay of Islands, which may translate to untimely decision making and lack of transparency at the local level. This can be seen through the confusion of crab harvesters regarding the requirement for consensus prior to holding a vote. While there are differing sentiments towards the implementation of a closure in the Bay of Islands, homogeneity at the local level suggests the range of closure impacts should be fairly even within the community. This can be seen in the vast support, despite some opposition, for closure among crab harvesters in the area.

Chapter 7
Conclusions

Fishery closures are one of many conservation tools employed in fisheries management. A number of authors have advocated the use of fishery closure in marine conservation and resource recovery, suggesting that they lead to increased local abundance of both migratory and sedentary species (Jensen *et al.,* 2010), spawning stocks (Gell and Roberts, 2002), and protection of fish habitat (Jamieson and Levings, 2001). While closure benefits depend heavily on their design and implementation, their popularity is shown with the current push to employ closures and protected area strategies as key tools in fisheries management worldwide. While voluntary fishery closures are not officially included as part of a conservation strategy, they may achieve many of the same benefits and could be incorporated within. Moreover, they encompass further benefits gained by stakeholder participation and engagement, which include more localized solutions, increased regulatory compliance, decreased costs, and augmented social capital.

A step zero study was employed to develop a greater understanding of these voluntary initiatives through examining the drivers behind voluntary closure discussions in the Bay of Islands, in addition to the conditions that motivate or hinder their implementation. This chapter will summarize the key findings from this step zero study.

7.1. Driving factors of crab closure discussions

Driving factors behind the voluntary closure discussions in the Bay of Islands were largely influenced by landings and stock decline, and further include decreasing landed value and neighbouring voluntary closures, specifically the crab closure in Bonne Bay. In addition to these

factors, the desire for increased power or authority in crab fishery management was a large motivation for the closure discussions. Crab harvesters were very much driven by the desire to take control of their position within the crab fishery, and, rather than waiting for DFO to implement regulatory measures, they wanted to take initiative in better managing the fishery in which they participate. Harvesters recognized declines in crab stocks, and felt that implementing a closure would not only revive the stocks before they reached an irreversible state, but also provide them with control on the opening date of the fishery. Harvesters also felt that it would lessen the likelihood of quotas being reduced as was experienced in previous years. When asked about the drivers behind the closure discussions in the Bay of Islands, many harvesters pointed to a combination of the factors mentioned above. It is likely that this combination of factors (i.e. low landings, inflation, decreasing landed values, and a nearby example of harvesters closing their fishery) made a voluntary closure an attractive option in the Bay of Islands.

A variety of conditions, however, hindered the implementation of a crab closure, including a small but strong opposition, late timing of the discussions, and the requirement by the FFAW of full consensus prior to holding a vote to close the crab fishery. Opposition was triggered for reasons including: (1) harvester dependence on the crab fishery; (2) belief that stock declines were cyclical and not triggered by overfishing; (3) doubt that a closure would reduce the issue of overcapacity in the crab fishery; and (4) feelings of entitlement to harvest snow crab. Many of these factors which inhibited closure discussions are interconnected. Individuals who are dependent on the crab fishery often felt entitled to fish, particular those with large IQs, as those licenses are of the original eight crab licenses in the Bay of Islands. Many large IQ harvesters believe the original crab fishery operated at a small capacity and was sustainable for the Bay of Islands, and the introduction of new licenses in the area by DFO brought with it an

overcapacity in the fishery. This has generated tension in the area, as the issuing of new licenses was contested by crab harvesters in the area when first issued. As a result, today large IQ harvesters do not feel at fault regarding stock declines, and equally question the outcomes of a temporary closure if the same level of pressure is exerted when it re-opens. These factors indicate considerations that must be addressed prior to the implementation of closures or other management measures in the future.

7.2. Stakeholder participation in closure discussions

Voluntary fishery closures begin at the community level as it is fish harvesters who craft the policy. In the pre-implementation stages, these closures grow from the bottom-up, in NL extending to include the fish harvesters union and DFO in the implementation and monitoring stages, the players involved may not be the same everywhere. Voluntary closures are similar to community-based co-management, whereby institutions at the local level, e.g. fish harvester organizations, are involved as the foundation of the management arrangement. However, there are additional power sharing agreements in place with government officials and other institutions (Jentoft, 2000). Such arrangements are indicative of high social capital and organization among fish harvesters in the Bay of Islands. This is paired with a strong desire among harvesters to be involved in fisheries management decisions in the Bay of Islands. This is particularly relevant in the communities of Lark Harbour and York Harbour. Fish harvesters in these communities are highly organized, and have come together to form the South Shore Fishermen's Committee. Closure discussions began within these communities, and crab harvesters from the committee engaged other crab harvesters from throughout the Bay of Islands.

While the closure discussions were spearheaded by the South Shore Fishermen's Committee, meetings were held to involve all crab harvesters in the process to close the fishery. As aforementioned, opposition to a closure, in addition to the requirement of reaching consensus prior to holding a vote to close the fishery, hindered the closure's implementation. Although the results from this process were applauded by harvesters in opposition to the closure, it left harvesters who supported the closure disappointed. Stronger feelings were expressed by harvesters active in pursuing the closure discussions, who were left frustrated and confused by the process and outcomes and stated they no longer wished to be involved in a movement to close the fishery, as they felt their voices were unheard and opinions were not taken into consideration.

7.3. Future of voluntary closures in the Bay of Islands

Despite a closure not moving forth in the Bay of Islands following two seasons' attempts, there remains support among crab harvesters to close the fishery. This interest lost from key harvesters who pursued closure discussions, however could hinder not only future closures, but also relationships between harvesters and the fish harvesters union, in addition to the support from harvesters towards future conservation initiatives. This may have been a factor contributing to the opening of the crab fishery for the 2011 season. Other contributing factors are likely to include continued opposition for the closure, in addition to an increase in crab prices from the $1.35 received in 2010, to $2.15 received in 2011.

A combination of landings and prices, in addition to outcomes of crab landings from the Bonne Bay closure (which re-opened for the 2011 fishery) are apt to play a role in the likelihood of prospective voluntary closures in the Bay of Islands. Moreover, a policy arrangements success

is chiefly dependent on the participatory process utilized and the appreciation and comprehension of this process among stakeholders (Jentoft, 1989; Sen and Nielsen, 1996). Consequently, for a voluntary closure to be implemented in the Bay of Islands, the requirement for consensus on the closure may need to be lifted by the FFAW, in addition to a new approach to support the implementation of closures by DFO and the FFAW and efforts to re-engage those harvesters who are discontent with previous closure efforts. Moreover, reliable population predictions on the Bay of Islands local stock on which to base quotas, paired with a clarification of the benefits for a temporary closure could provide not only strong grounds for harvesters to base their decision but also future sustainability for stocks following the temporary closure. Other possibilities to encourage closure include the adoption of market values that reflect both quality and size of snow crab, encouraging more sustainable harvesting practices – this would also have appeal for those with larger crab quotas, who typically found the idea of closure financially overbearing. If they received an increased market value for a more sustainable practice they may be more willing to temporarily close the fishery. Alternatively, to help alleviate issues of equity among those most impacted by closure, there could be full closure among small IQ harvesters, paired by a reduced quota (or partial closure) for those with large IQs (e.g. a temporary reduction of 4,000lbs – equivalent to the quota held by small IQ harvesters).

7.4. Policy Implications

The research findings presented here contribute to an improved understanding of the factors that motivate, drive, and influence the implementation of voluntary fishery closures. Voluntary closures exhibit the same disadvantages as mandatory closures, including reduced economic

viability for fish harvesters, potential for time intensive implementation, and the uncertainty of their outcomes (Cochrane and Garcia, 2009). However, the benefits extend to include increasing and fostering stakeholder participation, in addition to enhancing social capital and environmental stewardship.

These voluntary initiatives work towards many of the objectives set by fisheries and oceans management in Canada. First, by working to rejuvenate crab stocks and create a more sustainable harvest, they are meeting the objective of sustainable development. Secondly, by seeking to curtail their fishing activity so it becomes more economically feasible, harvesters are working towards the objective of economic viability. Third, by becoming engaged in fisheries management and taking initiative to improve their local fishery, harvesters are meeting the objective of stakeholder inclusion. Lastly, by attempting to take actions at early signs of stock depletion, harvesters are meeting the precautionary approach objectives.

By responding to challenges within the crab fishery and taking action to close the fishery, fish harvesters are creating their own governance structure to improve environmental, social and economic viability of local fisheries. If this is fostered, it could change the nature of fisheries management, while adhering to overarching objectives, and creating more localized measures for fisheries management in the Bay of Islands, and beyond.

7.5. Future research

Gaining a step zero understanding of voluntary crab closure discussions in the Bay of Islands enhances our awareness of the factors that motivate fish harvesters to take action in fisheries management and the elements that hamper their implementation. This is a valuable start to understanding voluntary fishery closures and increasing knowledge on bottom-up fish harvester

initiatives. This research has further demonstrated that, despite a rather homogeneous fishing community, the complexity of the fisheries and governing systems can make a particular fishery more difficult to govern, i.e. low governability. These perspectives push for an understanding of the root of the problem at hand, or, as it is referred to in this study, the 'step zero'. Understanding the root cause and drivers of a particular event can provide the information necessary to help facilitate new opportunities, whether they follow a similar design to those initially sought after or are re-formatted to address needs unmet in the previous plan.

Fisheries remain the mainstay of rural communities throughout the Bay of Islands; however, there is little research on fisheries in the area and their role in the respective communities. As mentioned, not all communities are able to take on a voluntary closure and the risk may be deemed too high for some harvesters to assume, as evidenced particularly by some large quota crab harvesters. Strong fish harvester interest, coupled with the localized nature of the crab and lobster fishing areas, provide strong potential for increased fish harvester involvement and control within fisheries management, be it through voluntary closures or other measures. Future research that involves local fish harvesters could help in working towards enhancing local management regimes in the area, identifying local solutions to stock decline of crab in addition to other species harvested, as well as determining potential methods of increasing the economic viability of fishing such as research on local marketing opportunities in the area. Moreover, knowledge on local stocks is essential for any successful conservation measure. The collaboration between scientists and fish harvesters in the Bay of Islands stock assessment is necessary to both understand crab stocks and behaviours in the area and develop conservation measures accordingly. Comparative work examining the similarities and differences between factors identified within this study and other settings would also be fruitful,

contributing to an enhanced understanding of voluntary conservation measures and their drivers and barriers to implementation.

References

Ardron, JA., 2005. Protecting British Columbia's corals and sponges from bottom trawling. *A report by Living Oceans Society* (v.1.0). Sointula, BC.

Anderson, T.C., Lambert, S.D., Simms, J.M., and Taylor-Walsh, T. 2000. Marine areas with special protection, Newfoundland and Labrador. *Canada Manuscript Report Fisheries and Aquaculture Science*. No. 2507: vii + 126p.

Agriculture and Agri-Food Canada, 2009. Fish and Seafood. Available at: http://www.ats-sea.agr.gc.ca. Accessed: March 23rd, 2011.

Arnstein, S.R. 1969. A ladder of citizen participation. *Journal of the American Institute of Planners*, 35 (4): 216-224.

Baker, S. 2006. *Sustainable development*. Routledge: New York

Berkes, F. 2009. Evolution of co-management: role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management,* 90(5):1692-1702.

Berkes, F. 1989. Co-management and the James Bay agreement. In: *Co-operative management of local fisheries: new directions for improved management and community development* (Ed. Pinkerton, E., 1989). The University of British Columbia Press.

Biron, M., Ferron, C., and Moriyasu, M. 2008. Movement of adult male snow crab, *chionoecetes opilio,* in the southern Gulf of St. Lawrence and eastern Nova Scotia, Canada. *Department of Fisheries and Oceans, Gulf Fisheries Centre.* Fish Res. doi:10.1016/j.fishres.2007.11.029

Bryman, A. 2004. *Social research methods*. Oxford University Press, New York, U.S.

Canadian Parks and Wilderness Society (CPAWS), 2009. *BC's glass sponge reefs: Jurassic park submerged*. Available at: www.cpaws.org. Accessed: January 23rd, 2011.

Charles, A.T. 1997. Fisheries management in Atlantic Canada. *Ocean and Coastal Management,* 35 (2): 101-119.

Choi, J.S., and B.M. Zisserson. 2011. Assessment of Scotian Shelf Snow Crab in 2009. *Department of Fisheries and Oceans,* Can. Sci. Advis. Sec. Res. Doc. 2011/005 viii + 88 p.

Chuenpagdee, R., Kooiman, J., and Pullin, R. 2008. Assessing governability in capture fisheries, aquaculture and coastal zones. *The Journal of Transdisciplinary Environmental Studies*, 7(1).

Chuenpagdee, R. and Fraga, J. 2004. Progressing toward comanagement through participatory research. *Society and Natural Resources,* 17: 147-161.

Chuenpagdee, R., and Jentoft, S. 2007. Step zero for fisheries co-management: what precedes implementation. *Marine Policy: International Journal of Coastal Affaires,* (31) 6.

Cochrane, K.L. and Garcia, S. 2009. *A fishery manager's guidebook*. Food and Agricultural Organization: United Nations.

Cochrane, K.L. Ed. 2002. *A fishery manager's guidebook: management measures and their application.* FAO Fisheries Department: Rome.

Corner Brook Port Corporation, 2010. Member Show Case Reception. June 14th, Corner Brook Port Corporation, Riverside Drive.

Dawe, E., Mullowney, D., Stansbury, D., Hynick, E., Veitch, P., Drew, J., Coffey, W., Colbourne, E., O'Keefe, P., Fiander, D., Skanes, K., Stead, R., Maddock-Parsons, D., Higdon, P., Paddle, T., Noseworthy, B., and Kelland, S. 2010. An assessment of Newfoundland and Labrador snow crab (*Chionoecetes opilio*) in 2008. *Canadian Science Advisory Secretariat*, Fisheries and Oceans Canada.

Dawe, E.G. and Colbourne E.B. 2002. Distribution and demography of snow crab (*Chionoecetes opilio*) males on the Newfoundland and Labrador Shelf. *Crabs in Cold Water Regions: Biology, Management, and Economics Alaska Sea Grant College Program*.

Degnbol, P., Gislason, H., Hanna, S., Jentoft, S., Nielsen, J.R., Sverdrup-Jensen, S., and Wilson, C.D. 2006. Painting the floor with a hammer: technical fixes in fisheries management. *Marine Policy*, 30 (5), 534-543.

Fish, Food and Allied Workers union, 2011. Map of Crab Fishing Areas in Western Newfoundland.

Department of Fisheries and Aquaculture (DFA), 2010. Seafood industry year in review. Available at: http://www.fishaq.gov.nl.ca/publications/yir_2010.pdf. Accessed: July 3rd, 2011.

Department of Fisheries and Aquaculture (DFA), 2008. *Industry Report: Snow Crab.* Available at: http://www.fishaq.gov.nl.ca/publications/industry_report_feb2008.pdf/. Accessed: January 24th, 2010.

Department of Fisheries and Aquaculture (DFA), 2007. Issues scan of selected coastal and ocean areas of Newfoundland and Labrador. *BAE-Newplan Group Limited*: Mount Pearl, NL.

Fisheries and Oceans Canada (DFO), 2010a. Snow Crab Species Quota Reports, 1999-2009.

Fisheries and Oceans Canada (DFO), 2010b. Landings and Landed Value Statistics for the Newfoundland and Labrador Region, 1969-2009. *DFO Policy and Economics Branch.*

Fisheries and Oceans Canada (DFO), 2010c. Fisheries. Available at: www.dfo-mpo.gc.ca. Accessed: March 20th, 2011.

Fisheries and Oceans Canada (DFO), 2010d. Managing our oceans: our governments' role. Available at: www.dfo-mpo.gc.ca. Accessed: March 20th, 2011.

Fisheries and Oceans Canada (DFO), 2010e. *Northern shrimp – shrimp fishing areas (SFAs) 0-7 and the Flemish Cap: resource management operations*. Available at: http://www.dfo-mpo.gc.ca. Accessed: January 23rd, 2011.

Fisheries and Oceans Canada (DFO), 2010f. Fisheries management decisions: snow crab fishing areas 2J, 3KLNO, 3PS, 4R3Pn. Available at: www.dfo-mpo.gc.ca. Accessed: March 30th, 2011.

Fisheries and Oceans Canada (DFO), 2010g. Assessment of Newfoundland and Labrador Snow Crab. *Department of Fisheries and Oceans* Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/020.

Fisheries and Oceans Canada (DFO), 2010h. Assessment of snow crab in the southern Gulf of St. Lawrence (Areas 12, 19, 12E and 12F). *Department of Fisheries and Oceans* Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/015.

Fisheries and Oceans Canada (DFO), 2009a. Resource management. Available at: www.dfo-mpo.gc.ca. Accessed: March 20th, 2011

Fisheries and Oceans Canada (DFO), 2009b. Underwater World: Snow Crab. Available at: http://www.dfo-mpo.gc.ca/Science/publications/uww-msm/articles/snowcrab-crabedesneiges-eng.html. Accessed: January 19th, 2011.

Fisheries and Oceans Canada (DFO), 2007. Modernizing the fisheries act. Available at: www.dfo-mpo.gc.ca. Accessed: March 20th, 2011

Fisheries and Oceans Canada (DFO), 2005. The Gulf of St. Lawrence a unique ecosystem: The stage for the Gulf of St. Lawrence integrated management. *Fisheries and Oceans Canada, Oceans Science Branch.*

Fisheries and Oceans Canada (DFO), 2002. Canada's Oceans Strategy: Our oceans our future. Available at: http://www.dfo-mpo.gc.ca/oceans/publications/cos-soc/pdf/cos-soc-eng.pdf. Accessed: May 26th, 2011.

Fisheries and Oceans Canada (DFO), 1999. Working together for marine protected areas: a national approach. *Communications Directorate, Fisheries and Oceans Canada.*

Fisheries and Oceans Canada (DFO), 1996. Commercial fisheries licensing policy for Eastern Canada. Communications Directorate, Fisheries and Oceans Canada. Available at: http://www.dfo-mpo.gc.ca/communic/lic_pol/index_e.htm. Accessed: February 20th, 2011.

Gough, J. 2007. Managing Canada's fisheries: from early days to the year 2000. Les editions du Septentrion: Quebec.

Government of Newfoundland and Labrador, 2006. Community Accounts, Employment and Working Conditions. Available at: http://www.communityaccounts.ca. Accessed: January 18th, 2011.

Government of Canada, 1996. Oceans Act. Available at: laws.justice.gc.ca. Accessed: March 20th, 2011.

Government of Newfoundland and Labrador, 2007. Fish Inspection Act. Available at: http://www.assembly.nl.ca/legislation/sr/regulations/rc070074.htm. Accessed: May 4th, 2011.

Grey, T., and Hatchard, J. 2008. A complicated relationship: stakeholder participation and the ecosystem-based approach to fisheries management. *Marine Policy,* 32: 158-168.

Hackett, J. 1992. *Heartbeat: Bay of Islands Newfoundland.* Joseph B. Hackett, Corner Brook, Newfoundland.

Hakim, C. 1987. *Research design: strategies and choices in the design of social research.* Allen and Unwin: London, U.K.

Hay, I (Ed). 2005. *Qualitative research methods in human geography.* Oxford University Press: Victoria, Australia.

Hill M, and Hupe P. 2002. *Implementing public policy: governance in theory and in practice.* Sage Publications: London.

Interior Fraser Coho Recovery Team. 2006. *Conservation strategy for Coho salmon (Oncorhynchus kisutch), interior Fraser River populations.* Fisheries and Oceans Canada. Available at: http://www.pac.dfo-mpo.gc.ca. Accessed: January 23rd, 2011.

Jamieson, G.S. and Levings, C.O. Marine protected areas in Canada – implications for both conservation and fisheries management. 2001. *Canadian Journal of Fisheries and Aquatic Sciences,* 58: 138-156.

Jentoft, S., and Chuenpagdee, R. 2009. Fisheries and Coastal Governance as a Wicked Problem. *Marine Policy*, 33 (4), 553-560.

Jentoft, S. 2000. The Community: a missing link of fisheries management. *Marine Policy*, 24: 54-59.

Jentoft, S., and McCay, B., 1995. User participation in fisheries management: lessons drawn from international experiences. *Marine Policy*, 19 (3): 227-246.
Jentoft, S. 1989. Fisheries co-management: delegating government responsibility to fishermen's organizations. *Marine Policy*, 13 (2):137-154.
Johannes, RE. 1978. Traditional marine conservation methods in Oceania and their demise. *Annual Review of Ecology and Systematic,* 9: 349-364.
Kareiva, P. 2006. Conservation biology: beyond marine protected areas. *Current Biology*, 16 (4): 533-535.
Kearney, J., Berkes, F., Charles, A., Pinkerton, E., and Wiber, M. 2007. The role of participatory governance and community-based management in integrated coastal and ocean management in Canada. *Coastal Management*, 35(1): 79-104.
Kooiman, J., Bavinck, M., Jentoft, S., and Pullin, R. 2005. *Fish for Life: Interactive governance for fisheries.* Amsterdam University Press: Amsterdam.
Krishna, A. 2002, *Active social capital: tracing the roots of development and democracy.* Community University Press: USA.
Mahoney, J. 2000. Path dependence in historical sociology. *Theory and Society*, 29 (4): 507-548.
Memon, P. and Kirk, N. 2010. Barriers to collaborative governance in New Zealand fisheries. *Geography Compass*, 4 (7): 778-788.
Mikalsen, KH., and Jentoft, S., 2001. From user-groups to stakeholders? The public interest in fisheries management. *Marine Policy*, 25: 281-292.
Mohd Noor, KB. 2008. Case study: a strategic research methodology. *American Journal of Applied Science*, 5 (11).
Murawski, SA., Brown, R., Lai, HR., Rago, PJ., and Hendrickson, L. 2000. Large scale closed areas as a fishery-management tool in temperate marine systems: the Georges Bank experience. *Bulleting of Marine Science*, 66(3):775-789.
National Roundtable on the Environment and the Economy. 1998. *Sustainable strategies for oceans: a co-management guide.* Renouf Publishing Co. Ltd: Ottawa, ON.
Natural Resources Canada, 2007. Atlas of Canada. Available at: http://atlas.nrcan.gc.ca. Accessed: January 31st, 2011.
Neville, V., and Hooper, R. Effects of a fishing moratorium on snow crab (*Chionoecetes opilio*) in Bonne Bay, Newfoundland and its future implications for the local fishery. *Biology Honours Thesis*, Memorial University or Newfoundland and Labrador.
Newfoundland and Labrador (NL) Standing Fish Price Setting Panel, 2011. Fish price setting panel. Available at: http://www.hrle.gov.nl.ca/fishpanel/index.html. Accessed: March 23rd, 2011.
Palumbo, D.J. and Calista, D.J., Eds. 1990. *Implementation and the policy process: opening up the black box*. Greenwood Press: Connecticut.
Peckham, S.H., Maldonado Diaz, D., Walli, A., Ruiz, G., Crowder, LB., and Nicholas, WJ. 2007. Small-scale fisheries bycatch jeopardizes endangered pacific loggerhead turtles. *PLoS One*, 2(10): 1041.
Pinfold, G. 2006. Overview of the Atlantic Snow Crab Industry. Department of Fisheries and Oceans and Atlantic Council of Fisheries and Aquaculture Ministers.

Pinkerton, E., and Weinstein, M. 1995. Sustainability through community-based management. Available at: http://www.davidsuzuki.org/publications/downloads/1995/Fisheries_that_Work_web.pdf. Accessed: Sept. 15th, 2011. David Suzuki Foundation, Vancouver, BC.

Pomeroy, R.S., and Berkes, F. 1997. Two to tango: the role of government in fisheries co-management. *Marine Policy,* 21 (5): 465-480.

Pomeroy, R.S., and Rivera-Guieb, R. 2006. *Fishery co-management: a practical handbook hand book.* International Development Research Centre, CAIB publishing. Available at: http://www.idrc.ca/openebooks/184-1/. Accessed: February 28th, 2011.

Puebla, O., Sévigny, J.M., Sainte-Marie, B., Brêthes, J.C., Brumeister, A., Dawe, E.G., and Moriyasu, M. 2008. Population genetic structure of the snow crab (*Chionoecetes opilio*) at the Northwest Atlantic scale. *Canadian Journal of Fisheries Aquatic Science*. 65: 425-436.

Rittel, H.W.J., and Webber, M.M. 1973. Dilemmas in a General Theory of Planning. *Policy Sciences.* (4):155-169.

Rowley, J. 2002. Using case studies in research. *Management Research News*, 25(1): 16-27.

Seidman, I. 2006. *Interviewing as qualitative research: a guide for researchers in education and the social sciences*. Teachers College Press: New York, NY.

Sen, S., and Nielsen, R. 1996. Co-management: a comparative analysis. *Marine Policy*, 20(5): 405-418.

Silverman, D. 2005. *Doing qualitative research*. Sage Publications: London, UK.

Seidman, I. 2006. *Interviewing as qualitative research: a guide for researchers in education and the social sciences*. Teachers College Press: New York.

Toropova, C., Meliane, I., Laffoley, D., Matthews, E., and Spalding, M. (eds.) 2010. *Global ocean protection: present status and future possibilities.* International Union for Conservation and Nature (IUCN).

Townsley, P. 1998. Social issues in fisheries. *FAO Fisheries Technical Paper*. No. 375. Rome.

Warren, CAB., and Karner ,TX. 2005. *Discovering qualitative methods: field research, interviews, and analysis*. Roxbury Publishing Company: Los Angeles, California.

Wilson, C.D., Nielsen, J.R., and Degnbol, P. 2003. *The fisheries co-management experience: accomplishments, challenges and prospects*. Kluwer Academic Publishers: Denmark.

Yin, RK. 2009. *Case study research: design and methods*. Sage Publications.

Personal Communications

Allen's Fisheries, 2010. Personal communication. Allen's Fisheries Limited.

Barry, J. 2010. Personal communication. Barry Group Incorporated.

Dawe, E. 2010. Personal communication. Biologist. Department of Fisheries and Oceans.

Hooper, R. 2010. Personal communication. Director, biologist, and professor. Bonne Bay Marine Station, Memorial University.

Spingle, J. 2010. Personal communication. Representative. Fish, Food and Allied Workers Union.

Thorne, B. 2010. Personal communication. Oceans division. Department of Fisheries and Oceans.

Appendix A
Interview Package

Introduction Script

Hello, my name is Kim Olson and I am a graduate student at Memorial University. This research will lead to my thesis, entitled "Step Zero to Marine Conservation: driving factors of fishery closures in Newfoundland and Labrador." My research is being funded through *Memorial University*, *the Harris Centre*, *the Social Sciences and Humanities Research Council (SSHRC),* and *the International Coastal Network*.

This research will examine the implementation process of voluntary fishery closures, which includes the drivers, factors, and conditions that are conducive to and motivate their initiation. In addition, it will explore the 'fish web' within the Bay of Islands, examining the aquatic ecosystem, fish harvest, and marking, as well as the interactions occurring throughout.

As part of this research, I am conducting interviews to obtain information about these issues within the Bay of Islands. Given your knowledge and familiarity with the study area, I would like to ask if you would be willing to participate in a taped interview, which should take approximately thirty minutes to one hour depending upon the level of information you provide. Your participation is completely voluntary. You are free to not answer some questions or withdraw at any time without having to justify your decision.

The actual interview will not begin until I go through a detailed consent form, which will provide you with the overview of the project and the objectives and will inform you of any benefits and risks of participating in research of this kind. It will also not proceed unless you are comfortable and willing to take part in the study.

Consent Form

Project Title: Step Zero to Marine Conservation: Driving Factors of Fishery Closures in Newfoundland and Labrador

Researchers: Kim Olson and Ratana Chuenpagdee, Memorial University, St. John's.

Contact Information: Kim Olson
Graduate Student- Memorial University
Department of Geography
St. John's, NL A1B 3X9
Telephone: 709-758-3746
Email: kolson@mun.ca

This is an invitation to participate in research that will lead to my Master's thesis, entitled "Step Zero to Marine Conservation: Driving Factors of Fishery Closures in Newfoundland and Labrador". I am a graduate student at Memorial University, and my research is being funded through *Memorial University*, *the Harris Centre*, *the Social Sciences and Humanities Research Council* (SSHRC), and *the International Coastal Network*.

This consent form is part of the process of informed consent and it is intended to give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about anything included here or other information not included here, please feel free to ask. Please take the time to review this carefully and to understand any other information given to you by the researcher.

It is entirely up to you to decide whether or not to take part in this research. If you choose not to take part in the research or if you decide to withdraw from the research at any time once it has started, there will be no negative consequences for you, either now or in the future. You also do not need to explain or justify your decision.

Introduction:
This research will examine the implementation process of voluntary fishery closures, which includes the drivers, factors, and conditions that are conducive to and motivate their initiation. In addition, it will explore the 'fish web' within the Bay of Islands, examining the aquatic ecosystem, fish harvest, and marking, as well as the interactions throughout.

Purpose of the study:
The purpose of this study is to better understand voluntary fishery closures in Newfoundland and Labrador, with a particular emphasis on the driving factors in the implementation stage. This information will be used to complete my Master's thesis and will have practical applications. It will enable all stakeholders to better understand the benefits and limitations of voluntary fishery closures, in addition to comprehending the motivations behind fishery closures. Understanding the way in which closures are implemented in the Bay of Islands can also help determine the role fishers and voluntary closures can have within fisheries management.

What you will do in this study:
As part of your participation in this project, you will be asked to take part in a recorded semi-structured interview in which we will discuss your knowledge and your perspectives on discussions surrounding a voluntary snow crab closure in the Bay of Islands. I will ask you about your knowledge of fisheries in the Bay of Islands, the push to implement a snow crab closure in the area, and various aspects of fisheries in the area. Additionally I will also ask about other features of the area such as its natural, social and governance systems. My study will benefit greatly from the knowledge and information that you contribute.

Length of Time:
It is anticipated that the interview will take approximately one hour, but it may vary depending on how much or how little you have to say about particular topics. You are free to take a break or postpone the interview at any time.

Recording and Storage of Data:
With your permission, your interview will be recorded so that your responses can be reviewed at a later time for clarification and information accuracy. After the interview is over, I may transcribe the recording or parts of it. Both the tape and the transcript will be assigned a numerical code so that it will not be identifiable by others. They will be stored in a secure location at all times, so that nobody who is not authorized by the project can gain access to them. Digital copies of transcripts and interviews will be securely stored on the computer of the researcher in password protected files. I would also like to deposit copies of the interviews in the Folklore and Language Archive at Memorial University of Newfoundland after this project has concluded so they may be used by me or by other researchers who are interested in this information. You will be asked whether or not you agree to this at the end of this form. You will also be given the option to have me destroy all audio recordings after I have finished using them if you would prefer for them to not be used by anyone else.

Confidentiality:
I will do my very best to maintain the privacy of everyone who chooses to participate in this study. I will do everything I can to make sure that the information that you provide remains confidential and I will never quote you by name without first approaching you to formally ask for your permission. I will be sure to keep audio recordings, interview transcripts, and notes taken during interviews in secure locations. As mentioned earlier, both tapes and transcriptions will be assigned a particular numerical code rather than using the name of the person being interviewed.

Anonymity:
I will make every reasonable effort to preserve your privacy and anonymity as a research contributor. The information I collect will be used for my Thesis, academic publications, reports, and presentations and/or workshops and will *not* include the names of the contributors, unless permission has been granted by those individuals. Instead, I will use pseudonyms in subsequent publications or presentations. I will also disguise any information that could lead to you being easily identified by others, such as your specific position at your place of work. You must

recognize, however, that I cannot guarantee that some of the information you provide will not lead to your contribution being recognized by people who know you well or know the position that you hold. It is always possible that some participants may be identifiable to other people, despite the best intentions of the researchers.

Possible harms and risks:
Very little harms are likely to occur in the course of the project. The one possible source of risk is the potential that quotes or other information may appear in publications and other research outputs could lead to certain individuals being identified, thereby compromising their anonymity and confidentiality. This could have serious secondary consequences, as it could lead to sensitive information being revealed, thus putting those individuals in difficult social positions and/or bringing about psychological or financial stress. I take this concern very seriously and will take measures to reduce this risk to the greatest extent possible, through the use of codes to identify recordings and transcriptions, the use of pseudonyms in subsequent publications or presentations, and the secure storage of data at all times.

Possible Benefits:
This research will have some potential practical benefits. I hope that participation in this research will not only be enjoyable for those who take part, but will also provide them with an opportunity to have their knowledge and opinions documented and, possibly, for those perspectives to have some bearing on future policy decisions. Documenting the nature and extent of the process for fishery closure interest and implementation in the Bay of Islands is the first step in a process that could lead to fully understanding the conservation initiatives. Comprehending the way in which fishery closures are initially conceived, communicated, the policy is formed and a decision to implement is made can assist communities, fishers and fisheries managers better understand closures and their respective impacts. This increased understanding will assist all stakeholders in managing fishery resources, implementing conservation measures, and adjusting to related transitional issues. In addition, increased fisher participation in resource management may reduce managerial costs, increase compliance, and incorporate valuable local knowledge that may otherwise be left out. The research I conduct will produce original insights about the social and natural systems within the Bay of Islands, specifically relating to fisheries, which currently receives little attention in the area. These insights will be shared with my academic colleagues, government and stakeholder group members through academic publications, reports and presentations.

Right to Withdraw:
Please understand that your participation in this project is completely voluntary. You have the right to choose not to participate, and may withdraw at any time. You are also free to not answer particular questions, and are under no obligation to justify your decisions. If you choose not to take part in the research or if you decide to withdraw from the research once it has started, there will be no negative consequences for you, now or in the future. If you withdraw from the study, any data that you have contributed will not be used unless you grant me permission to use it.

Reporting of Results:
The research will be used in my Thesis, and may be used in reports, presentations and in academic publications, such as books and journal articles. In all of these cases, I will do my best to make sure that the confidentiality and anonymity of research contributors will be preserved.

Questions:
You are welcome to ask questions at any time during your participation in this research. If you would like more information about this study, please feel free to say so, or to contact me at a later time using the contact information provided at the top of this form.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-737-2861.

Consent:
Your signature on this form means that:

1) You have read the information about the research.
2) You have been able to ask questions about this study
3) You are satisfied with the answers to all of your questions
4) You understand what the study is about and what you will be doing
5) You understand that you are free to withdraw from the study at any time, without having to give a reason, and that doing so will not affect you now or in the future.

I would also appreciate it if you could answer either YES or NO to each of the following questions:

Would you mind if de-identified quotes from this interview were used in the project? YES NO

Would you mind if the interview is recorded? YES NO

Would you like to give me permission to store the interviews in the Folklore and Language Archive at Memorial University of Newfoundland after this project has concluded so that they may be used by me or by other researchers in the future? YES NO

Would you like me to destroy all audio recordings of the interview after I have completed this project? YES NO

If you sign this form, you do not give up your legal rights, and do not release the researcher from their professional responsibilities. **The researcher will give you a copy of this form for your records.**

Signatures:

"I have read and understood the description provided; I have had an opportunity to ask questions and my questions have been answered. I consent to participate in the research project, understanding that I may withdraw my consent at any time. A copy of this Consent Form has been given to me for my records."

_____ _____

Participant's Signature Date

"I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study."

_____ _____

Researcher's Signature Date

Interview Guide
Step Zero for Marine Conservation: Driving Factors of Fishery Closures in Newfoundland and Labrador

Date:_____
Participant:_____
Location:_____

Fishing Activity

Current Activity
How long have you been fishing?
Tell me how you fish (e.g. species, location, boat, gear, seasons, how long have you fished for each species, etc.) How important are these species/fisheries, in terms of tonnage or value, as well as time spent?
How/why did you begin fishing?
How many people do you fish with? Does anyone else in your family fish? Do you fish with them?
Do you want your children to fish? Why/why not?
Do you own the vessel? Do you use the 'buddy-up' or 'enterprise combining' arrangement? Can you explain how this works?
Do you fish the quotas for each species? Why or why not?
What species do you hold licenses for? How long have you had these licenses, and how did you get them?
Can you explain earning and payment arrangements on your vessel?

Change
Have there been any major changes in what/how/where you fish? Please explain what happened.
Have you experienced any decline in landings (for which species)?

Concerns
What are the main challenges you encounter fishing?
Is there an issue of overcapacity in the fishery? What is being done to address these issues you raised?
What do you do to address these issues? Do you participate in any of the conservation initiatives in the Bay of Islands such as v-notching?
Which of these are voluntary and which are mandatory?
Do you think they are effective/useful?

Post-Harvest

Current Activity
What do you do with your catches (where do you sell them, are they sold to more than one buyer)?
What price do you receive for each of the species?
Do you know the markets for any of the species that you catch (who purchases from the processing companies? Who eventually consumes it? Is any consumed within the community)?
How long is the fishing season? What do you do outside of the season? (Do you have alternate employment)?
How important is the processing plant to the community?

Change
Have there been any major market changes (e.g. prices, buyers, processing, etc.)?

Concerns
Does the state of the market effect how and what you fish?
Do you have any concerns with the current state of the market?
Has there been any competition between buyers over access to supplies of particular species?
Can you describe how this competition has played out over time?

Pre-Harvest

Current Activity
What type of coastal/marine activity is happening in the Bay of Islands? Do they negatively impact the marine environment?
Is the marine environment healthy in the Bay of Islands?
What is the Bay of Islands best attribute?

Change
Have there been any major changes to the marine environment? (Have there been any developments or activities that have affected the marine environment)?

Concerns
Are there any concerns for fish stocks in the area (for which species)?
Are there any concerns for the marine environment in the Bay of Islands?

Closures

Current Activity
Are you aware of the effort to close the crab fishery early this year?
Do you know who initiated the discussions about the closure?
What do you think was the driving factor to this discussion?

How was the situation in the fishery when the idea originated? (Was there a decline in stocks)?
Were you involved in the process? What was your role?
Who else participated in these initial discussions?
Were there conflicts between user groups?
Did you support the idea and why?
Who were against it and why?
Do you think there will be a closure next year?

Change
Have there been any fishery closures in the past? (What species/gear/area? Initiated by whom)?

Concerns
How does the closure affect you? How does it affect the community?
What do you think will be outcomes from the closure? (Will it revive the community/fisheries/fishery-livelihoods)?
What is needed for the closure to work?

Governance

Current Activity
Who are the key players in fisheries management? (E.g. Department of Fisheries and Oceans/Aquaculture, Fish Food and Allied Workers, fisher groups, etc.)
Do fishers play a role in management?
Can you tell me about the fisheries renewal strategy, and its rationalization component? (What is meant by rationalization)? How does it affect you personally?
Are voluntary closures a response to rationalization?

Change
Have there been any major changes in fisheries management?

Concerns
Are you satisfied with current management practices? (What are you satisfied/dissatisfied with, why? Do you feel they are over-regulated)?
What other measures do you think will be useful for the fisheries in the area?
Are fisheries to you and community? Why?
What do you think the fisheries and community will look like 10 years from now? Is this different from what you would like to see? (What would it take to get there)?