

An analysis of Newfoundland and Labrador's shrimp fishery crisis using the Provincial
Coastal and Oceans Management Strategy and Policy Framework

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1.0 Introduction

The ocean is one of Earth's most valuable natural resources. From regulating the climate to providing a source of food, the ocean has an interrelated economic, ecological and social importance. The economic, environmental and cultural history of Newfoundland and Labrador (NL) are all intrinsically linked to the Atlantic Ocean and its resources. Protection of the coastal and ocean environments was not only important to the province's past but is also widely recognized as vitally important for the future of the province. In June of 2011 the provincial Government of Newfoundland and Labrador introduced a Coastal and Ocean Management Strategy and Policy Framework (Government of NL, 2011a). The framework is designed to recognize the diversity of various stakeholders who rely on healthy coastal and ocean areas and to work together to provide long-term sustainable use of resources. One of the goals of the policy framework is to guide the coordination of provincial coastal and ocean policy in relation to priority issues identified for the province, with increased collaboration between governments, stakeholders, and communities (Department of Fisheries and Aquaculture, 2010). This research paper asks the question: how might the province's new coastal and oceans management strategy and policy framework be used to address major coastal and oceans problems? To answer this question, the paper applies the policy framework to an emerging crisis in one of the province's most important fisheries – the northern shrimp fisheries.

Despite fundamental social-ecological transformations in recent decades, the province of Newfoundland and Labrador continues to rely heavily on the ocean for the fishery resources it provides. Following the collapse of the cod fishery in 1992, and the subsequent moratoria on cod and other groundfish fisheries that put tens of thousands of people in the province out of work, many harvesters and processors in coastal communities in the province turned to increasingly lucrative and abundant crab and shrimp as a new means of income and industry (Foley et al. 2013). However, due to a number of reasons, including an increase in cod numbers and rising ocean temperatures, northern shrimp stocks are in decline (Lilly et al, 2000). This decline led the Department of Fisheries and Oceans (DFO), the federal agency responsible for fish allocations, to make cut backs on the shrimp quota in recent years. These quota reductions are impacting the inshore fishery, which supports the shore based and community-based processing plants where workers produce cooked and peeled shrimp, much more negatively than the offshore fishery, which produces frozen shell on shrimp onboard offshore vessels for sale into global markets (Keenan and Carruthers, 2015). The allocation of higher quota reductions in the inshore sector than the offshore sector in ocean areas close to the province has led to intense and highly

politicized disagreements and distraught feelings from local rural communities that depend on the fishery for their livelihoods.

The purpose of this research paper is to apply the province's Coastal and Ocean Management Strategy and Policy Framework to the province's northern shrimp fishery. The paper uses the framework as an analytical approach to explore potential ways to practically address and overcome the multi-faceted social, environmental, and political issues the province's northern shrimp fishery, particularly the inshore sector, is currently facing. The policy framework is designed to address specific coastal and ocean issues, some of which can be related to the shrimp fishery. The issues are divided into six objectives: Healthy Marine Environments, Social, Cultural, and Economic Sustainability, Coastal Land Use, Competing Needs and Interests, Coastal and Marine Infrastructure, and Climate Change.

This paper begins by examining the Coastal and Ocean Management Strategy that the province has developed to protect the ocean and coastline. This includes analyzing the goals, principles, tools, and departments involved in the strategy. Following this, the paper introduces the history and current issues facing the shrimp fishery in the province, specifically focusing on the decline in the resource and recent allocation changes and controversies. The policy framework is then applied to key issues in the fishery using some of the strategy objectives outlined above. The ultimate goal of this research is to develop a better understanding of how the NL Coastal and Ocean Management Strategy and Policy Framework can be potentially applied to coastal management challenges, such as at the shrimp fishery, to promote solutions.

2.0 Methods

The paper uses content analysis to contextualize interpretation of data contained in texts and documents. The texts and documents were retrieved through a review of existing published literature and grey literature. Documents were gathered via e-journal databases, including ASFA: Aquatic Sciences and Fisheries Abstracts, ScienceDirect, and Scopus. Data was gathered from peer-reviewed academic journal articles, policy reports, government fisheries management plans, provincial policy frameworks, provincial news reports, and minutes of stakeholder meetings. This data review provided a comprehensive background for understanding the current knowledge and relevant information available for this area of research. After the information was obtained from the various databases, the provincial coastal and ocean management strategy and the shrimp fishery were examined; the policy framework was then applied to the various issues and challenges within the shrimp fishery.

3.0 Results

3.1 NL Coastal and Ocean Management Strategy

Newfoundland and Labrador (NL), including its culture, settlement patterns, and economy, has developed from its association with the ocean. For centuries, the people who live in what is now the Canadian province of NL have relied on the extensive coastlines for deriving a livelihood. Most NL residents lived near the coast at the turn of the 20th century and were dependent on the ocean and its resources to make a living. Historically the coastal communities of NL exist because of the fishery. The settlement patterns along the more than 10,000 kilometers of rugged coastline gave excellent access to the inshore fishing grounds (Woodrow, 2003). A majority of the province's population still reside along the coast today (Power & Mercer, 2011). The province's coastal communities are both uniquely valuable and vulnerable. It is critically important to have effective management and governance of these communities and the resources surrounding them. Living near well-managed coastal ecosystems plays an important role in the sustainability of rural NL communities. This context provides the background motivation for the province's interest in developing new coastal and ocean policy frameworks.

The increase in human activity in coastal and ocean areas over centuries, and the increase in economic development in these areas more recently, has led the government to recognize the need to respect and protect the province's natural coastal environment. Consultations were conducted across the province in 2007 and 2008 to identify coastal and ocean issues most important to the people of the province. In July 2010, the Department of Fisheries and Aquaculture, in partnership with the Department of Environment and Conservation, released a discussion paper which sought feedback from the public on an approach to coastal and ocean management in the province. The paper attempted to incorporate economic, environmental, and socio-cultural goals while recognizing all industry sectors. The paper states "The Coastal and Ocean Management Strategy and Policy Framework that will result from this Discussion Paper will provide guidance about how our coastal and ocean areas are to be used and protected (Department of Fisheries and Aquaculture, 2010. Page 1).

The discussion paper outlined the provincial government's vision to become more engaged in the management of the province's coastal and ocean areas and resources. It set forth the coastal issues identified as most important to the province's regions (including social, cultural and economic sustainability, coastal land use planning, competing needs and interests, coastal and marine infrastructure, healthy marine environments, and climate change), and the current status of provincial efforts to address these (Department of Fisheries and Aquaculture, 2010, p. 28.) The overall purpose of the paper was to engage the public and receive feedback on the proposed approach to coastal and ocean management. The paper was distributed directly to stakeholder groups in a variety of sectors and industries. The public could then respond with written feedback on the paper and contact the Department of Fisheries and Aquaculture with additional questions.

One year after the discussion paper was released, the provincial government implemented the Coastal and Ocean Management Strategy and Policy Framework, with an investment of approximately \$900,000 over three years as announced in Budget 2011 Standing Strong: For Prosperity (Government of NL, 2011a). The Department of Fisheries and Aquaculture is the lead provincial department in developing and coordinating the strategy and framework. The strategy and framework can be accessed online in the form of a document via The Department of Fisheries and Aquaculture government website. The contents of the document are broken down into sections. These sections cover the vision, purpose, structure, principles, and tools that make up the document. Part 1, Strategic Direction, outlines the actions needed to achieve overarching goals and address priority issues. Part 2, Policy Framework, guides the coordination of provincial coastal and ocean policy in relation to six priority issues identified for the province. These six issues, as discussed earlier, are addressed individually through strategic objectives. The province is the first jurisdiction in Canada to implement such a strategy, which provides a long-term vision for planning and management, conservation and sustainable use of the province's coastal and ocean areas and resources (Government of NL, 2011a).

Found within Part 1, Strategic Direction, are three main goals. The first goal is “A Coordinated Approach”. This means that policies and programs are coordinated across government and provide clear strategic direction for integrated coastal and ocean management and planning (Government of NL, 2011a). In the province, coastal and ocean areas are not managed by one single government department or level, but by all orders of government. The Coordinated Approach goal asserts that it is important that all jurisdictions work together to develop integrated management plans. Local stakeholders, the public, non-government organizations, and aboriginal groups also need to be involved in the decision-making process, according to this goal. Local representation and community involvement is also considered an important aspect of taking a coordinated approach to management because of their direct relationship with the area. The policy suggests that specific actions need to be taken in order to fulfill this goal. Some of these actions include: clearly defining legislative roles of government departments to better clarify issues to the public and stakeholders, building on federal department relationships, and ensuring management initiatives are consistent when issues arise that involve multiple departments.

The second goal is “Information and Research”. The goal here is that collaborative initiatives advance research and information sharing in support of coastal and ocean conservation and sustainable resource use (Government of NL, 2011a). In order to make sound management decisions, the best available resources and information need to be used. The assumption behind this goal is that proper research in this area will improve the understanding of the marine environment and the impacts that various activities may have on it. With an in-depth understanding of how coastal areas and the ocean behave and react to certain activities, management decisions will better address issues that are of priority. In order for this to happen, the policy framework suggests that partnerships need to be made with academia, communities, and organizations to increase marine research capacity. It further suggests that specific actions that need to be made include: supporting initiatives to promote coastal and ocean research and information

gathering, identifying knowledge gaps and priority areas of research, and incorporation traditional knowledge (Government of NL, 2011a).

The final goal is “Education and Awareness”. This goal suggests that NL citizens need to be aware of and understand both the tangible and intangible value of the coastal and ocean environment and the issues impacting them (Government of NL, 2011a). This goal further asserts that the more educated a person is in a subject area, the more likely they will be interested in being involved in a decision concerning that subject. This goal is supported by research that finds that people with more education and awareness tend to be more likely to support investments that address long-term environmental issues and threats (Kahn, 2006). Understanding coastal and ocean management and the issues that can arise from the various activities associated with it is therefore essential to ensuring sustainable use of the marine environment in the province. This goal anticipates that local communities, with proper awareness, will better understand the economic, social, cultural, and ecological benefits that the coastal and ocean environments provide for the province. This awareness can be achieved via public education, communication, and engagement initiatives. The actions to promote this include: working with partners to promote public communication, and encouraging local educational programs aimed at marine environments.

Part 2 of the document is composed of the Policy Framework, covering six priority issues. The first issue is Healthy Marine Environments. This section explains the province’s belief that the ecological, economic, social, and aesthetic value of a healthy ocean cannot be underestimated. It suggests that healthy marine environments have intrinsic values and are essential for sustaining the diversity of coastal and marine life. With an increasing demand on marine resources, this section explains that it is essential that conservation efforts are made and maintained to protect marine ecosystem health. Water quality is provided as a major example of a healthy marine environment, and in many coastal communities wastewater can negatively affect the ocean. The Provincial Government monitors pollutants and environmental effects from land-based facilities to ensure compliance with environment regulations and has responsibility regarding oil waste management, land-based spill response, and shoreline clean up under the Environmental Protection Act (Government of NL, 2011a). There are three further policy directions to be followed here: healthy coastal ecosystems, sustainable coastal activities and development, and coastal water quality.

The second issue –Social, Cultural, and Economic Sustainability—is of particular significance for the purposes of this paper. The sustainability of the province socially, culturally, and economically is directly linked to the ocean and its resources. The heritage and traditional knowledge of the people of the province is an important component of coastal and marine management. Sustainable economic opportunities need to be encouraged while respecting the need to conserve the marine environment and to maintain the province’s cultural identity. There are two sub-policy directions to be followed here: supporting social and cultural values, and supporting sustainable economic opportunities.

The third issue is Coastal Land Use. Planning in the coastal region, which includes the coastline as well as the coastal ocean itself, means looking at and involving social, economic, political and environmental elements. Enabling sustainable coastal

development, reducing coastal erosion, and adapting to changing conditions are all identified by the framework as factors that need to be considered when planning coastal land use. The policy direction to be followed here is addressing the impact of land activities.

The fourth overall policy issue is Competing Needs and Interests. There are a variety of user groups that are in competition for access to marine resources. Conflicts arise when two or more users have the desire to use the same space for similar activities, or if one activity affects another activity. The provincial policy framework suggests that finding a balance between resource users can be achieved through effective planning. The policy direction to follow in this context is mitigating and avoiding conflicts through consultation and communication.

The fifth issue is Coastal and Marine Infrastructure. Sufficient infrastructure, particularly wharves, is needed to support and accommodate multiple users. Wharfs in the province are used by a variety of people and companies, including fish harvesting and aquaculture operations. The policy framework suggests that infrastructure must be safe, efficient and increase economic opportunities. The policy direction to follow is identifying coastal and marine infrastructure needs and address issues through collaborative efforts.

The sixth and final issue is Climate Change. Climate change is considered an important issue by the province of NL. As a large coastal province with over 90 per cent of the population living near the sea, NL is exposed to many long-term impacts of climate change including sea-level rise, more storm surges, greater coastal erosion and volatile changes in seasonal weather patterns (Government of NL, 2011b). The policy framework suggests that adapting to climate change must be a collaborative effort, and coastal communities need to be able to adapt to changing conditions. The policy directions to follow are: enhanced research and awareness of climate change, and recognizing vulnerabilities and strengthening the ability to adapt.

Overall, this policy strategy and framework provides an approach to increasing integrated coastal and ocean management capability and overarching guidance for policy development in relation to coastal and ocean activities and resource use across the province. In order to understand the extent to which this strategy and framework can be used to guide decision making regarding the management of the northern shrimp fishery, it is important to provide a brief analysis of the key characteristics of the fishery and the current problems facing the fishery.

3.2 NL Shrimp Fishery

Despite the 1992 cod moratorium, outport resettlement and ongoing threats to fishery resources and coastal communities, fishing traditions have continued in NL on a relatively large scale. The fishery has changed in many ways, including the establishment of numerous rules and regulations brought about in part as a response to the collapse of groundfish fisheries, as well as the emergence of new target species (i.e. shellfish) and global economic markets (Smith et al., 2008). Several shellfish species have replaced groundfish as the most important marine resources caught since 1992 in terms of volume landed. Shrimp has become one of the main species targeted off the coast of the province.

The significant growth in NL's shrimp industry has played a vital role in alleviating the impact of the moratoria for some companies, workers and communities.

The Canadian northern shrimp fishery began in the early 1970s when an exploratory fishing program confirmed the presence of shrimp stocks stretching southward from Baffin Island to the northeast coast of Newfoundland. The fishery takes place off the coast of eastern Canada from 47°15' N (Flemish Cap and the northern edge of the Grand Banks) to 75° N (Baffin Bay) in DFO management zones called Shrimp Fishing Areas (SFAs) (DFO, 2010) (See Appendix A, Fig. 1). SFAs 2, 4, 5 and 6 are the principal fishing grounds, accounting for 75% of total allowable catch. The Northern shrimp fishery is primarily a single species fishery comprised of *Pandalus borealis*, commonly known as Northern shrimp. These shrimp live in areas where the ocean floor is soft and muddy and where bottom temperatures range from two to six degrees. (Noble, 1999) These types of conditions are found throughout the NL region, providing a suitable and preferred habitat for the shrimp.

The fishery is managed under the authority of the Canadian government and the Minister of Fisheries and Oceans in particular, who has the authority to allocate fish resources to particular parties. By the mid-1980's, both resource and market conditions for the shrimp had grown substantially and industry responded with significant increases in fishing effort and quota. While the offshore fleet had gained access to shrimp in the late 1970s when shrimp were most abundant in the northern range of the species, federal Fisheries Minister Fred Mifflin allowed the inshore fleet based in NL access in the late 1990s when a significant growth in biomass occurred in areas adjacent to the northeast coast of the province in SFA 6. This population growth can be linked to both changing ocean temperatures and a decrease in cod stocks at the time (Lilly et al., 2000).

With the extension of access and allocations to the inshore fishing sector for shrimp fishing in SFA 6 in the late 1990s and 2000s, many people living in coastal communities in the province of NL have come to depend on the shrimp fishery as a means of making a living. However, recent changes in provincial policies and shrimp population numbers have caused significant conflict between the offshore and inshore sectors and between province and the federal government over allocation policies and their social, economic, and cultural impacts. These conflicts are rooted in debates and disagreements over how locals can access the resource and how allocations and reductions in allocations are shared and distributed among different fleets in the northern shrimp fishery. For the purposes of this paper, the decline in the shrimp resource and recent allocation changes between onshore and offshore fleets will be of focus.

3.2.1 Decline of Resource

The entire Atlantic Canadian shrimp fishery reached a record high in catch numbers around 2007 at 180,000 metric tonnes, but recently stock size of almost all northern shrimp has declined, particularly off the northeast coast of NL where many inshore sector, smaller-scale harvesters gained access to the resource in the 1990s. This decline coincides with a changing ocean climate and an increase of major predator

abundance. Factors controlling the dynamics of shrimp populations include “top-down” (predation) and “bottom-up” (environmental) mechanisms. This decline in population has raised concerns in coastal communities about the future fishing possibilities of this valuable resource (Wieland et al., 2012). Understanding environmental conditions and change is therefore crucial and both the “Information and Research” and “Healthy Marine Environments” components of the province’s policy framework can be applied to this issue.

Throughout the North Atlantic, shrimp provide an abundant source of food for many fish, mammals and invertebrates. Parsons (2005) examined population trends for northern shrimp and its predators off the coast of NL. The key predators that were identified were Atlantic cod (*G. morhua*), Greenland halibut (*R. hippoglossoides*), redfish (*Sebastes* spp.), wolffish (*Anarhichas* spp.), skates (*Rajidae*) and roughhead grenadier (*Macrourus berglax*). The trends in abundance for key predators of shrimp proved to be variable in the study. For many fish species that declined in the early 1990’s, the predation pressure provided a convincing explanation for the increase in shrimp biomass occurring at the same time. A major predator on shrimp stocks is the Atlantic cod. The relation between shrimp and cod stocks is not fully known, but negative associations have been reported from several geographic areas. Examples of this can be seen in the waters off West Greenland in the late 1970’s (Carlsson & Smidt, 1978), as well as Iceland in the late 1990’s (Jakobsson & Stefansson, 1988). Gilbert & Gascon (1987) determined that shrimp represented a major component of the cod diet in the Gulf of St. Lawrence, occurring in over 50% of the stomachs examined. Although these negative correlations exist, at the present time the interactions between the two species in the waters off NL are poorly understood. Due to this lack of scientific data, it is challenging to form fundamental management options for the shrimp based on predation (Parsons, 2005).

Ocean temperatures are linked with the circulation of ocean currents. Climate-driven changes to these circulations are major drivers of ecosystem variability. A general warming of the North Atlantic has been observed in recent years and these changes result in fluctuations of fish populations (Rijnsdorp et al., 2009). All marine species can only tolerate a specific range of environmental conditions. Climate change alters many aspects of the marine environment, including changes in precipitation, river run-off, and temperature. Ocean temperatures and climatic changes greatly influence the amount and location of nutrients in the water. The presence or absence of these nutrients influence where and when phytoplankton blooms occur. Water temperature will determine whether or not zooplankton are present to consume the phytoplankton, which would provide more food to the pelagic food web (Department of Environment and Conservation, 2014). Shrimp are highly sensitive to water temperature. Off the coast of Iceland and Greenland, an increase in sea temperature has led to a decrease in shrimp biomass. Temperature increases cause shrimp to hatch earlier than they should, meaning they struggle to find food (Ramsden, 2014). Anne Richards, a fishery biologist at the Northeast Fisheries Science Center in Woods Hole, Massachusetts, stated in an interview with Portland Press (Bell, 2014) that it’s unclear how warming water temperature affects shrimp reproduction rates, but she suspects it is connected to the timing of plankton blooms. Northern shrimp hatch their eggs to coincide with the release of springtime plankton blooms, which

provide larvae with a ready food source. If warming water temperatures cause those two events to be out of sync, larvae have no food. This period of low or declining shrimp biomass may be extended if the trend in warm conditions and earlier spring phytoplankton blooms continues. The fishable biomass is expected to remain low or decline further over the next 5 years, based on the delayed response of shrimp production to recent and anticipated future unfavourable conditions (DFO, 2014).

3.2.2 Allocation Changes (Inshore vs. Offshore)

There are two fleets engaged in the Canadian northern shrimp fishery, the offshore fleet and the inshore fleet. The offshore fleet license holders operate under an Enterprise Allocation (EA) system based on equal shares in each fishing area. The offshore fleet has had exclusive access to Areas 0 through 6 (See Figure 1) from 1978 to 1996. There are 17 offshore licences, which are owned by 14 companies. Eight of these licences reside in NL. Each vessel employs two rotating crews of 30 people (Department of Fisheries and Aquaculture, 2014). There are 10 vessels in the offshore fleet, with each vessel employing a crew of around 60 individuals. Operations run year round on the offshore. This fishery is steered by factory/freezer trawlers, where shrimp can be caught then processed onboard. The shrimp that is processed by this fishery is often sold as a higher-valued product into Russia and China, and very little is sold in Canada (Department of Fisheries and Aquaculture, 2014).

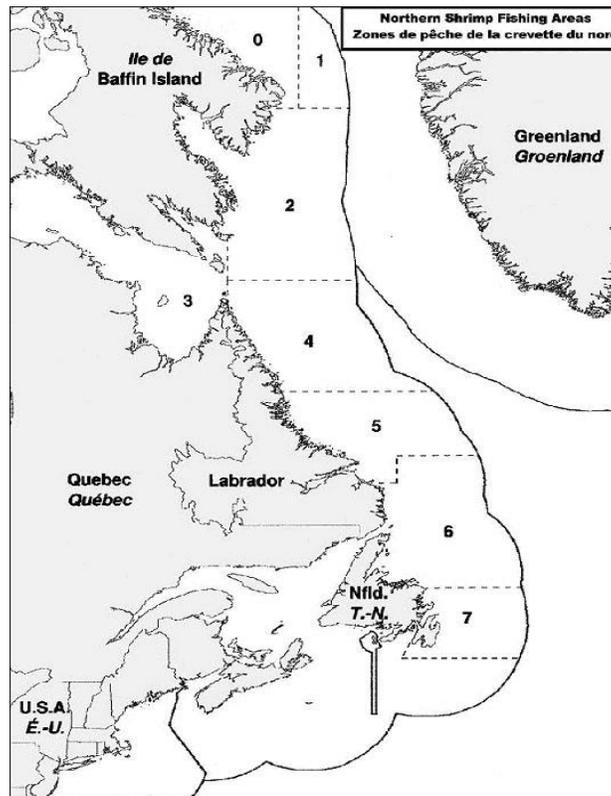


Figure 1. Shrimp Fishing Areas in NL

Source: <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/ifmp-gmp/shrimp-crevette/shrimp-crevette-2007-eng.htm>

In 1997, inshore harvesters were granted access to SFA 6 by then-Minister Mifflin. The inshore fleet is conducted on a competitive basis with trip limits and harvesting caps determined and regulated by the industry (DFO, 2010). When the inshore fishery began, Mifflin outlined new sharing principles via a press release. These principles included: Adjacency will be respected, Priority access will be given to inshore vessels less than 65 feet in length, and Employment will be maximized in both the harvesting and processing sectors where possible. At its peak in 2008, there were more than 3,000 inshore landings of shrimp per year and 13 onshore processing plants were established (Department of Fisheries and Aquaculture, 2014).

All shrimp fisheries in eastern Canada are subject to a range of management measures, including the setting of individual quotas within an overall total allowable catch limit (TAC). TAC-based management limits fishing to protect the reproductive potential of the population. The fishery has been managed by TAC since 1982 (DFO, 2010). Other management measures include limits on the number of licenses and size of vessels used, minimum mesh size, use of a separator grate that allows fish larger and small than shrimp to escape, and mandatory dockside monitoring of all inshore landings. In NL, industry participants and the federal government have also agreed on a principle of stakeholder priority.

Allocations made in 1997 were issued on a temporary basis, but no formula was explained for how reductions in allocations would be distributed. In the early 2000s, the Integrated Fisheries Management Plans for shrimp began to state that any decreases in quota allocation would begin with newer entrants first, in what has become known as the 'last-in, first-out' (LIFO) principle and policy. If there were a decline in the population of shrimp, temporary participants would be removed from the fishery in reverse order of gaining access (Department of Agriculture, 2009). When the federal government announced they would be making cuts to provincial shrimp quota allocations, the LIFO policy was applied. This policy application meant almost all of the quota cuts would be experienced by small boat operators in the inshore fleet in NL because they were the "last in". Inshore quotas were reduced from a high of 77,000 tonnes in 2009 to 33,428 tonnes in 2014 based on the application of LIFO since 2010 (Department of Fisheries and Aquaculture, 2014). The Department of Fisheries and Oceans announced in the fall of 2014 it would be cutting the inshore shrimp quota by 26 per cent, while the offshore quota would be cut by three per cent. A 9,000-tonne cut was made from the inshore fishery quota, while only a 1,000-tonne cut from the offshore trawler fleet (DFO, 2015).

These cuts have resulted in significant controversy recently, with inshore harvesters protesting the federal government's allocations decisions. It also resulted in the formation of a committee with the leaders of all three provincial parties in NL that investigated the shrimp allocation issues. The inshore sector and the provincial all-party committee argue that the LIFO policy is unfair, will threaten the livelihoods of thousands of people and dozens of communities, and that it was put in place without consultation and serves the interest of the offshore sector. They argue also that the allocation policy should focus on adjacency, meaning that the inshore harvesting and processing sector of the shrimp fishery ought to benefit most from the shrimp resources in SFA 6. In the

Canadian fisheries, the principle of adjacency means that the people who live closest to the resource should be the main beneficiaries of the development of that resource (Keenan & Carruthers 2015). The offshore sector argues that the LIFO policy is fair and that dropping it would threaten hundreds of workers that work on offshore factory freezer trawlers. An intense conflict has therefore been brewing for years now between inshore and offshore fleets over shrimp fishery allocation policies.

3.3 Application of Policy Framework

The purpose of the provincial coastal and ocean strategy and policy framework is to provide direction for developing policies and actions to address priority coastal and ocean issues and for making decisions about the management of ocean resources. The framework can help guide and facilitate provincial action towards a coordinated and strategic approach to managing issues that have arose within the shrimp fishery. In order to address coastal and ocean issues such as these, the Government of Newfoundland and Labrador must take an active leadership role and engage in integrated ocean and resource management processes.

Coordination is a critical area where the process can start. The province has existing institutional capacity for further enhancing coordination and communication on the shrimp issue. For example, the Provincial Coastal and Ocean Network (PCON) was created in 2006 to promote interdepartmental communication on coastal and ocean matters within the Provincial Government. PCON offers a venue for provincial departments to provide input into the federal decision-making process related to ocean management in the province. (Department of Fisheries and Aquaculture, 2011). Issues within the shrimp fishery, specifically resource decline and allocation changes, should be brought forward to this venue so that management decisions can be made via a coordinated approach. Using some of the priority issues outlined in the policy framework, and previously discussed, management options for disputes and conflicts surrounding the shrimp fishery can be formed. The priority issues within the framework that can be applied to fishery include: Healthy Marine Environments, Social, Cultural and Economic Sustainability, Competing Needs and Interests, and Climate Change.

Healthy Marine Environments

Healthy coastal and marine ecosystems that provide us with resources are under constant stress from anthropogenic and environmental stress. The effects of industrial fishing, pollution, and climate change combine to pose a constantly increasing threat to coastal and marine environments. Commercial fishing is a major human induced stressor on the ocean. There are ample data that suggest fisheries exploitation affects not only target stocks but also communities of organisms, ecological processes, and even entire ecosystems (Agardy, 2000). Shrimp are an important fragment of the marine ecosystem food chain. As explained above, shrimp feed on a variety of zooplankton and are major prey for groundfish species, especially cod, hake, redfish, Greenland halibut and flounder (DFO, 2010). It is important to protect the coastal and ocean habitats that shrimp thrive in

and to promote sustainable fishing that do not result in damage or harm to the ecosystem. Maintaining the ocean in a healthy form requires a precautionary and strategic conservation planning approach.

The Policy Framework promotes engagement with the Federal Government and other relevant stakeholders to ensure conservation of sensitive coastal and marine habitats in the province. Promoting proper management of fishing activities, including conservation of shrimp stocks and shrimp habitat, protecting the ecological integrity, and social and economic value of fisheries resources is needed to ensure environmental sustainability of NL. The shrimp fishery in the province is dependent on a healthy marine environment. Encouraging research and developing management plans that support sustainable harvest of shrimp will ensure that future generations will have access to the resource. This sustainable harvest will in turn play a role in maintaining a healthy marine environment, without which we cannot have sustainable fisheries-supported coastal communities.

Social, Cultural, and Economic Sustainability

For centuries, community location, levels of economic complexity, and standards of living in NL were determined largely by the quality, quantity and diversity of local resources. These local resources were heavily linked to the ocean and marine environment via the fishery. A combination of geographical, economic, and historical forces have shaped NL society. One of the most influential of these forces has been its isolated location on the eastern edge of North America, its marine environment, and the work patterns and social relationships that developed in the fishing economy (Memorial University of NL, 1997). To this day, the social, cultural and economic sustainability of the province is tied to the ocean and its resources.

Commercial fisheries remain the most important economic base for many of the small communities throughout NL. Social, cultural and economic sustainability issues can be seen in the shrimp fishery crisis within the province. As previously mentioned, many rural NL communities depend on the shrimp fishery as a means of making a living. Without the fishery, many people living in those communities would need to move away from the province to make a living. Maintaining livelihoods for people working in rural NL is vital to local economies. Quota cuts for the inshore fishery will devastate not only the fishing industry, but also the local communities. These quota cuts will lead to a lack of sustainability in the social, cultural, and economic sectors of the province. For example, Sandy Crawford, a town councillor from Fogo Island, stated in an interview with CBC in April of 2014 that maintaining livelihoods for people working in rural NL is vital to local economies. Referring to the fishing related enterprises as small businesses and their impact on other non-fishery business activities, Crawford stated that "When people come to visit the island they need certain services, and if we start losing small business, or business in general, when people do arrive on the island the services aren't going to be there" (CBC, 2014) CBC also stated in the same article that residents of the province are concerned that the quota cuts are part of a trend that ends with people from this province moving west, to provinces such as Alberta, where they can find work.

The Policy Framework can be used here to ensure social and cultural values associated with coastal and ocean areas are appreciated, conserved and maintained for future generations in the province. The framework promotes sustainable economic opportunities pertaining to coastal and ocean areas and resource use. Using the framework, efforts to support and strengthen the fishing industry across the province through various programs and initiatives will continue as the fishery remains an important part of the province's economic and social well-being (Department of Fisheries and Aquaculture, 2011). Supporting local initiatives for the shrimp fishery and using traditional knowledge in coastal communities will help advance economic diversification and ensure sustainability of rural NL. The framework promotes an integrated management approach that engages all governments and stakeholders. This integrated engagement supports informed decision-making and good communication between users, thereby reducing conflicts while encouraging and supporting sustainable economic development (Department of Fisheries and Aquaculture, 2011).

Competing Needs and Interests

When there is an available resource, there is typically more than one user or group that will be interested in obtaining or having the rights to access the resource. This multi-interest situation will often lead to conflicts because of the desire to be in the same area accessing the same resource. One activity may also negatively affect or prevent another activity from occurring. In a marine environment, this competition of interest can result in disputes between resource users and can lead to issues such as resource access conflicts and resource depletion.

The competition of interests between inshore and offshore fleets is one of the most important issues within the shrimp fishery crisis. The LIFO principle that has been applied by the federal government to quota reductions is one among a variety of alternative ways to allocate a declining resource. This policy ignores and in some ways arguably contravenes the very complex allocation principles of adjacency, local economic development, community and regional dependency on the fisheries, and rural sustainability (Keenan & Carruthers 2015). By using LIFO, DFO does not consider rural coastal community issues that are linked to the fishery and past policy objectives. The lack of consultation between interest users and federal and provincial government leads to distraught feelings and increased conflict.

The Policy Framework promotes mitigation of conflicts pertaining to coastal and ocean areas and resource use through enhanced consultation and communication efforts. Establishment of consultation committees or structures can help address conflicts in areas where multiple users need a forum to share information. Enhanced communication between governments and local communities can promote principles such as adjacency. Adjacency, as previously discussed, means that the people who live closest to a resource should be the main beneficiaries of the development of the resources. The principle results in economic benefits to local communities, creating local jobs, higher standards of living, economic growth, and a stable population (Foley et al 2013). Promoting principles such as these can help establish a fairer quota sharing arrangement than LIFO by better

reflecting concerns of the workers that are engaged in the fishery adjacent to their communities. It is important to note here that although this type of principle would be beneficial, it is not a single solution. Open discussion involving all stakeholders can allow suggestions that will lead to informed and holistic management decisions that include multiple principles and courses of action. An integrated management approach can help mitigate conflicts between multiple users within the industry and can lead to the establishment of fair sharing of quota.

Climate Change

As a large coastal province, Newfoundland and Labrador will be exposed to a number of potential impacts of climate change, including sea level rise, increased storm activity, flooding, coastal erosion, damage to coastal infrastructure, and changes to the marine ecosystem (Department of Fisheries and Aquaculture, 2011). Climate change can affect all trophic levels of marine ecosystems, eventually resulting in changes in the productivity and distribution of fish stocks. Different species within a food web will not all respond in the same way to climate change, therefore it is difficult to propose how individual species will be affected. Climate change could affect the distribution of particular species and hence their susceptibility to particular fishing fleets, becoming more or less “catchable” as a result (Rijnsdorp et al., 2009). As previously mentioned, climate change results in rising ocean temperatures, which in turn causes shrimp to hatch earlier than normal. Climate change directly impacts populations of northern shrimp, potentially resulting in decline of the species or geographic shifts in their location and distribution. Environmental and climactic change will have potentially significant implications for the shrimp fishery in the province and thus change the potential capacity of the resource in supporting social, economic and cultural outcomes.

The Policy Framework promotes identification of research and knowledge building priorities needed to understand the impacts of climate change in the coastal and ocean environment. Enhanced research and awareness of the implications of climate change on the shrimp fishery will lead to possible formation of adaptation initiatives. Collaboration between federal and provincial government, local coastal communities, academic institutions, and key stakeholders is necessary to create suitable climate change adaptation measures to help mitigate the impacts on the shrimp fishery.

4.0 Conclusions and Recommendations

Coastal and ocean resources are an important part of Newfoundland and Labrador’s history, well-being, and future prosperity. The Coastal and Ocean Strategy and Policy Framework provides NL with a long-term vision for management, conservation and sustainable use of the province’s coastal and ocean areas and resources. It fosters principles of collaboration, integrated management and sustainable development. These principles were developed through a planned strategic direction and a framework outlining the main issues that the province faces in respect to coastal and ocean areas. These issues included Healthy Marine Environments, Social, Cultural, and Economic

Sustainability, Coastal Land Use, Competing Needs and Interests, Coastal and Marine Infrastructure, and Climate Change. These issues can be addressed using three goals, with respect to the Strategy. These goals include collaborative efforts, information and research, and education and awareness. Through the research conducted on the strategy and framework, it proves to be a potential tool to address coastal issues within the province.

The purpose of this research was to develop a better understanding of how the NL Coastal and Ocean Management Strategy and Policy Framework could be potentially applied to coastal controversies, such as at the shrimp fishery, to promote solutions. The Framework contained some management strategies that could be applied to the shrimp fishery to form potential solutions to address some of the issues it is experiencing. The main issues found within the shrimp fishery that was the focus of this analysis was the decline in shrimp stocks and allocation changes between onshore and offshore fleets. Healthy Marine Environments and Climate Change were both issues outlined in the framework that could be used to analyze and address the issue of resource decline in the fishery. Northern shrimp stocks are in decline due to increases in predation and rising ocean temperatures yet the impacts of these factors on the shrimp fishery are not fully understood. Supporting an enhanced understanding of healthy marine environments through proper management of commercial fishing and sustainable fishing methods can help mitigate the impacts causing shrimp numbers to decline. Maintaining the ocean in a healthy form requires a precautionary and strategic conservation planning approach. Research is needed to identify how climate change will impact shrimp stocks. Collaboration is also needed between all stakeholders to form adaptation measures to alleviate the impacts of climate change on shrimp populations. The Strategy and Framework supports these initiatives in addressing resource decline.

Social, Cultural, and Economic Sustainability, and Competing Needs and Interests were also outlined in the framework. These issues can be used to address the social conflicts within recent allocation changes in the fishery. DFO recently made cut backs on the TAC of shrimp that had a disproportionate impact on the inshore sector within the province. The cuts heavily impacted the inshore fishery, which lead to major disputes between stakeholders and between provincial and federal officials. The sustainability of many rural coastal communities depend on the economic benefits of the shrimp fishery, and without the fishery many coastal communities may collapse. The social, cultural and economic sustainability of these communities needs to play a role in allocation decision making. Within the fishery, the onshore and offshore fleets both want access to the resource, and believe they should have the rights to the resource. This multiple interest situation leads to tension. The Strategy and Framework supports communication and consultation between all stakeholders within the fishery. This communication can help ease the tension between stakeholders. The northern shrimp fishery contains a number of venues for regular annual communication and consultation between stakeholders, but more innovative venues are needed in times of crisis and for discussion of long term issues. A review of the existing integrated management approach, particularly a reconsideration of allocation principles and policies that are apparently contradictory, can help mitigate conflicts between multiple users within the industry and can lead to the establishment of fair sharing of quota.

The residents of coastal communities are arguably the primary stakeholders in fisheries management but continue to have little input into what are currently top-down, and often-ineffective management strategies. Local people have valuable knowledge to share about the marine environment and concerns with current practices, regulations, and marketing. The federal and provincial government should strive to achieve a balance between the use and conservation of marine resources and sustaining vulnerable coastal communities over the long term. Not only are individual livelihoods at stake, but also the traditions that go along with them, the cultural heritage they represent, and even the survival of coastal communities in the province. The provincial Coastal and Ocean Management Strategy and Policy Framework can potentially promote solutions to the lack of meaningful communication, resource decline, and allocation dispute issues within the fishery by using its collaboration principles and sustainable development approach to management.

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