Exploring Innovation in the Inshore Fishery in Newfoundland and Labrador

TELFER SCHOOL OF MANAGEMENT, UNIVERSITY OF OTTAWA

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Foreword

This exploratory study emerged from discussions in 2012 among the researchers regarding innovation and the nature of innovation in the inshore fishery in the province of Newfoundland and Labrador. The *Policy for Preserving the Independence of the Inshore Fleet in Canada's Atlantic Fisheries* defines the inshore fishing sector in the Newfoundland and Labrador Region as commercial fish harvesters using licensed vessels usually less than 27.4m (90') Length Over All (LOA) (Fisheries and Oceans Canada 2010). This fleet is dominated by vessels less than 35' LOA. In 2012, the less than 35' boats represented 85% of the total commercial fishing fleet in Newfoundland and Labrador (Fisheries and Oceans Canada, 2013).

The authors have been involved in community-based fisheries research projects for decades on topics ranging from fishing practices, the social impacts of the fisheries and fisheries support, fisheries management and regulatory operations policies. However, it is acknowledged that very little discussion has taken place on innovation in Newfoundland and Labrador's largest commercial inshore fleet. This document addresses this concern by presenting the context of innovation in the inshore fishery and three case studies that highlight applied innovations in the fishery that have been developed and implemented. The case studies presented in this report investigate and document inshore fisheries innovation in harvesting and processing in Newfoundland and Labrador, and uncover the barriers and facilitators to innovation in this sector.

Key issues in the analysis of innovation in the inshore fishery in NL depend on the business context. Review of this context reflects barriers to innovation characterized by insufficient funding, disincentives for risk-taking due to government support programs, regulatory impediments to small-scale harvesters for integrating limited processing activities, and divisive industry structure (e.g., division of responsibility for fisheries governance among DFO, DFA and the FFAW, two associations representing processors, and lack of an NL fish marketing board). These factors do not foster an entrepreneurial spirit among fish harvesters or processors operating in a global marketplace. Facilitation of innovation is stimulated in this context by the need to adapt to major shifts in the fishery, and by the leadership under these threats to develop partnerships locally and internationally, and by taking advantage of support programs for innovation. The report recommendations are presented toward highlighting new business development opportunities, improve viability, and maintain a sustainable livelihood. Examples of innovation are broad and involve new technology, but also new markets, marketing and product diversification, as well as individual "tinkering" by entrepreneurs who adopt or adapt new technologies and create their own modifications for improved performance.

Case studies interviews were conducted by the authors with the consent of the representative personnel in the inshore harvesting and processing sectors in Newfoundland and Labrador, under the permission applied for and granted by the Ethics Review Board of the University of Ottawa and Memorial University of Newfoundland.

1. Background and Context

Since the early 1990s, the commercial fisheries in the province of Newfoundland and Labrador have changed dramatically. Following years of decreased landings, Northern cod, the keystone commercial species of the fishery on the Island since settlement began, finally collapsed in 1992. A fishing moratorium was declared in July of that year putting over 30,000 persons out of work. *The Task Force on Incomes and Adjustment in the Atlantic fishery* (Fisheries and Oceans, Canada 1993) concluded there was over-dependence on the resource which resulted in "more people and capacity than the fishery could sustain" (p.14). Poor management was also cited as a reason for the collapse. There was a "failure to control, to enforce limits and [a] lack of meaningful partnership with the users of the resource" (p.14).

Prior to the moratorium on Northern cod in 1992, the total number of registered fish harvesters was 24,915, with 11,075 full-time fish harvesters (Fisheries and Oceans, Canada 1993, p.140, Table 4). By 2010, the number of registered fish harvesters had dropped to 4,636 individuals (Fisheries and Oceans, Canada 2010). Similarly the province's fisheries processing labour force decreased from an estimated 30,000 full time equivalent (FTE) workers in 1990 (Fisheries and Oceans, Canada 1993, p.6) to 9,214 individuals in processing labour in 2012 (Department of Fisheries and Aquaculture 2012b).

Over the same period, licensed plants decreased from 241 licensed primary processing plants in 1991 (Fisheries and Oceans, Canada 1993), to 87 licensed primary processors plants in 2012 (Department of Fisheries and Aquaculture 2012a). Figure 1 provides the map of fisheries processing plants in Newfoundland and Labrador in 2012. Statistics on the fisheries harvesting and processing sectors in Newfoundland and Labrador are presented in Appendix A - NL Harvesting and Processing Statistics.

The six years following the moratorium focused on individual adjustment. Fish harvesters and plant workers were encouraged to retrain, relocate, or retire. Programs such as the Northern Cod Adjustment and Recovery program (NCARP) followed by The Atlantic Groundfish Strategy (TAGS) provided funding for these initiatives. By the turn of the century, the focus was on restructuring the industry. At the same time, the lucrative crab industry provided employment for fish harvesters and processors.

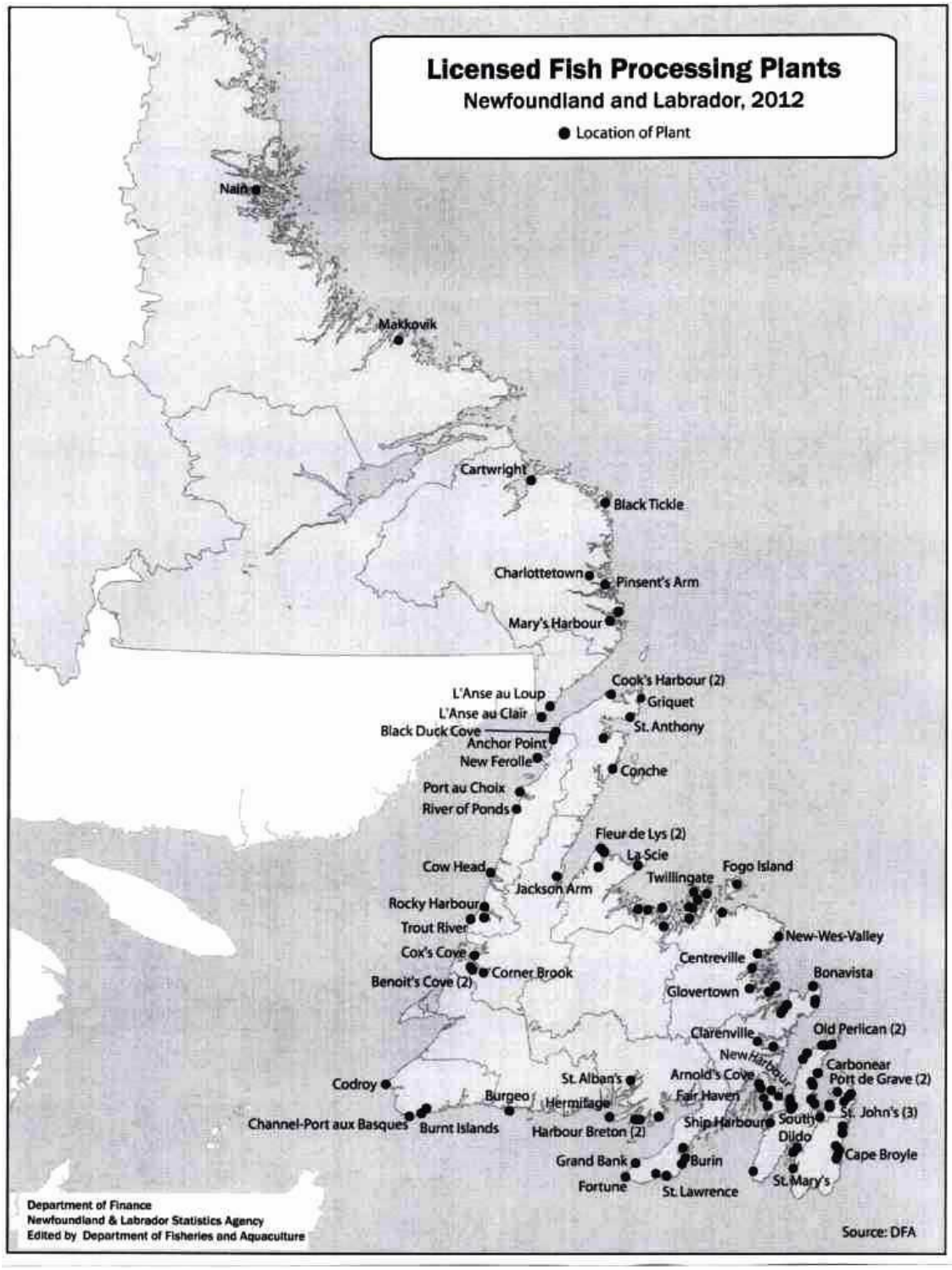

Figure 1. Fisheries processing plants in Newfoundland and Labrador in 2012. (Source: Department of Finance 2012)

1.1 Fishing Industry Renewal

The federal-provincial Fisheries Adjustment and Restructuring Initiative was shaped after the conclusion of the TAGS program. The Fisheries Diversification Program (FDP), announced in 1999 and budgeted at $10 million was part of that effort. It supported industry-wide research and development initiatives that reflected the economic development priorities of the Newfoundland and Labrador fishing industry. A key objective of the FDP was to "make the benefits of the research and/or development initiatives available to the whole industry" (Department of Fisheries and Aquaculture 2013c).

Prior to the 1992 Northern cod moratorium, and with the support of Atlantic Canada Opportunities Agency (ACOA) and the provincial government, Memorial University had undertaken to strengthen fisheries viability and capacity at the Marine Institute. A new agency, the Canadian Centre for Fisheries Innovation (CCFI), was established at the Institute in 1989 with the goal to make the fishing industry more productive and profitable. CCFI is a non-profit organization owned by Memorial University of Newfoundland and funded by the Government of Newfoundland and Labrador with additional support from the Maritime Provinces' Governments. The Newfoundland and Labrador Department of Fisheries and Aquaculture is a partner of the Centre. The Centre applies the fisheries related science and technology capacity of universities and colleges in the Atlantic region to the fishing industry (Canadian Centre for Fisheries Innovation 2013. It also initiates, co-ordinates and manages research and development projects. Innovation in the commercial fishing industry has taken place in collaboration with the CCFI on projects related to an industry strategy, e.g., for crab processing, and as a result of individual processing plant initiatives such as Seafreez Foods Inc. Other governmental programs in support of innovation include ACOA and the FDP.

1.2 Innovation

Definitions of "innovation" typically refer to risk taking, new products, processes or services, and the creation of value-added. Innovations are designed to improve economic or social well-being (Business Dictionary 2013, Martin 2010). Innovation means the creation and spread of new ways of doing things (Dicken 2007), e.g., a new (or significantly improved) product that meet an identified need, a new process, or way of organizing (OECD 2005). Creative local adaptations of ideas from elsewhere to suit local contexts, or 'new to a region' innovations, can also be important from a local development perspective. From a firm-level perspective, innovation is "applied creativity that achieves business value," requiring processes "… of solving problems by discovering, combining, and arranging insights, ideas, and methods in new ways" (Weiss and Legrand 2011, p.6-7)

Studies often focus on innovations that are viewed as 'new to world', technology-intensive and urban-based. Canadian innovation researcher Richard Hawkins suggests that the "techno-centric view of innovation" is giving way to a more integrated view (Gaffield 2012). Innovation, for example, may include upgrading and improving existing processes without technological investments (OECD 2012). An innovation for one organization may generate important opportunities for profitability and viability but may not necessarily be radically new (Vodden et al. 2013, Davies 2010).

A small but growing literature on innovation in rural regions suggests that innovation in these settings is often influenced by tradition and informal methods of information sharing, and less so by formal facilities and support services (Lindsay et al. 2005). Innovation in rural regions is also more likely to be incremental and process-focused, and to take place within traditional or externally-controlled industries (Doloreux 2003, Tödtling et al. 2004, Woods 2005, Vodden et al 2013). Rural areas have been observed as often lacking diversity and openness, with sparse local networks and external connections, and local leaders may also be unconvinced of the importance of knowledge and innovation as critical sources of relative economic growth (Spencer 2009, Gertler et al. 2002).

1.3 Innovation in the NL Fishery

In the inshore fishery, a consequence of innovative practice is that things are done differently. Innovations improve the practices of fish harvesters, or expand the efficiency in plant operations, markets, and marketing possibilities of processors. The modern shift in fisheries species mix and increased competition in global seafood markets requires innovation. In the study by Mondragon and Mondragon (2013) focused on innovation in the NL processing industry, it is declared that the industry has become more capital intensive. They determine that factors such as labour availability and cost, strong international competition, and availability of fishing resources are “transforming the way the industry conducts business”. Nevertheless, the Conference Report of the Public Policy Forum on “Innovation in Canada’s Resource Sectors” reported that fish harvesting and processing, along with other resource sectors, have weak capabilities to change and adapt (Public Policy Forum 2010). The proposed European free trade agreement (Comprehensive Economic Trade Agreement, CETA) may also lead to changes in the NL fishing industry.

Despite these challenges, examples of innovation in the inshore fishing industry can be found in NL and elsewhere (Pomeroy and Andrew 2011). Almost a hundred and fifty years ago, William Whiteley invented the cod trap, the most labour and cost efficient method for the cod fishery. In recent years, investment in innovation in the commercial fishing industry has taken place across

the province, for example, innovative work took place under the Fisheries Diversification Program, 1999-2002 (Department of Fisheries and Aquaculture 2013c). However, there was no specific funding program focused on innovation in the industry until 2007.

The Province of NL launched an innovation strategy in March 2006, with the goals of increasing collaboration, creating an innovative culture, fostering research and development, enhancing education and skills and increasing economic competitiveness in all sectors. The Department of Innovation, Business and Rural Development (IBRD) has taken a lead role in implementing the strategy. Through the Business Investment Corporation, IBRD makes investments through the Small and Medium-sized Enterprise (SME) fund, the Business and Market Development program (BMD), and a Fisheries Loan Guarantee Program (FLGP), that support the fish harvesting sector by providing loan guarantees of up to $2 million for the purchase of new or used fishing vessels and new equipment. The provincial Research and Development Corporation (RDC) also provides funding to businesses and researchers to enhance the province's innovative capacity and applied projects in high-technology fields such as oil and gas and ocean technology (White et al. 2013).

On 25 October 2007, Tom Rideout, former Minister of Fisheries and Aquaculture in Newfoundland and Labrador, announced the creation of the Fisheries Technology and New Opportunities Program (FTNOP) (Department of Fisheries and Aquaculture 2007). The FTNOP is a grant program designed under the Fishing Industry Renewal Strategy to foster innovation and diversification in harvesting, processing, and marketing initiatives. The program invites grant applications from processors, fish harvesters, researchers, fishing organizations and others. Industry-led projects are expected to contribute towards project costs while those initiated by non-profit institutions, associations or community groups might receive complete funding (Department of Fisheries and Aquaculture 2013b).

The Advisory Committee on Measuring Innovation in the 21st Century (2008) suggests that the number of applications directed towards funding agencies is an indicator of the level of innovation within a region, or a province. As of 31 October 2013, six years after the announcement of the program, over $9.8 million dollars have been invested or approved for 219 projects in Newfoundland and Labrador through the FTNOP. These grants were awarded to 53 proponents, with the largest number of approved applications coming from the Canadian Centre for Fisheries Innovation (CCFI), Memorial University (MUN), and two large scale processing companies, namely, Ocean Choice International, Inc., and Quinlan Brothers Ltd. Table 1 below summarizes the FTNOP project investments for these major proponents.

Successful grantsmanship require capacities that are usually present in larger organizations whose staff possess various skills in proposal writing, project planning, and budgeting. These

organizations are able to commit the time needed to develop proposals, to contribute shared investment funds required by the funding agency, and, in the case of CCFI, the mandate to work in partnership with industry groups. Consequently, the evidence is that smaller organizations in the sector have reduced FTNOP funding, as noted in Table 1. Other approved FTNOP applicants include the FFAW Union, other processing firms including secondary food processors, industry associations, the NL Department of Fisheries and Aquaculture, fish harvesters, and the Nunatsiavut government. Twenty four of the total of 53 proponents received funding for one project.(See also Appendix B – Fisheries Technology and New Opportunities Program, for further information.)

Only a small group of licensed processors have participated in the program. In 2012, there were 86 processors licensed by the province, and only nine (10%) had received FTNOP funds in either fiscal year 2011-12 or 2012-13. Similar low participation data are implied by other groups such as inshore harvesters who may not have the resources that are needed to apply for the program.

Table 1. FTNOP Grants Analysis*. (Source: Department of Fisheries and Aquaculture 2013b, 2013d. See also Appendix B.)

	No. of Project Grants	% of Total No. Grants	Total Grants ($) Awarded	% of Grants ($) Awarded	Average Grant Amount ($)
CCFI	40	18 %	$1,696,660	17%	$42,416.50
MUN Schools, Faculties and Centres	34	16%	$1,490,697	15%	$43,844.02
OCI	15	7%	$1,243,286	13%	$82,885.73
Quinlan Brothers	11	5%	$602,673	6%	$54,788.45
Total Above	**100**	**46%**	**$5,033,316**	**51%**	$50,333.16
All remaining grants	119	54%	$4,852,735	49%	$40,779.28
Total All Projects	**219**	**100%**	**$9, 886,051**	**100%**	$45,141.78

* This analysis includes projects from 2008 to October 31, 2013. It is anticipated additional projects will be funded in the 2013-2014 fiscal year.

Complete information is not yet available for all FTNOP projects. In this exploratory phase of the research there is therefore no conclusive evidence that the FTNOP program has provided equal benefit to the majority of boats in the inshore fishery sector. Undoubtedly some projects directly benefitted the under 35' commercial fleet. The FFAW Union concentrated some of their project efforts on the lobster industry, and in a current project, are targeting Marine Stewardship Council

(MSC) certification for the species. One of the case studies included in this report documents how applied research contributed to the sustainability of the crab resource for all fish harvesters. Other projects may offer indirect benefits. For example, any expansion in markets can have a positive impact on fish harvesters. Future studies will examine how well the FTNOP serves all the NL fleet.

The Atlantic Canada Opportunities Agency (ACOA) oversees the provision of federal funding and knowledge partnerships in Atlantic Canada. The Agency's overarching programs (Atlantic Innovation Fund, Business Development Program, Young Entrepreneur Development Initiative, and Innovative Communities Fund) include multiple sub-programs that have supported innovation within fisheries enterprises. Under its Emerging Fisheries Development Program, for example, ACOA support the initiatives that produce better results in processing, extraction, and sale of fisheries products. Examples include recovering crab liver from waste streams, studying sea urchin biomass, and designing a mechanical seaweed dryer. ACOA market intelligence and trade development programming has also been used to explore exporting opportunities for seal skins and to develop a website for fisheries diversification. Through the Ocean Technology Contract Fund, ACOA has supported technological advancements that include development of a selective harvesting system and a mobile gear positioning system. Programming in productivity and product enhancement has supported a cod grading pilot project, to develop breaded and stuffed squid products, and to host a cod quality workshop. The National Research Council (NRC) also provides federal funding to firms, helping put Allen's Fisheries Ltd. in Benoit's Cove, for example, in touch with Memorial University's Fisheries and Marine Institute. With NRC-IRAP funding support, they developed a system that allowed Allen's to pursue a year-round North American market for their cultivated mussels (NRC 2010).

This context represents the starting point for the current study on innovation in the NL inshore fisheries. The following section outlines the purpose of the project.

2. Project Purpose and Methodology

The purpose of this project is:

i. to gather examples of innovation from the harvesting and processing sectors of the fishery in Newfoundland and Labrador, and
ii. to share this work with fisheries organisations, community networks, and the public to help facilitate and stimulate innovation.

This study was undertaken between the Fall 2012 and the Winter of 2013. The resulting innovative case studies, including 2 harvesting and 1 processing plant, provide examples of innovation. These case studies were developed using the following steps:

1. Selection of representative case studies for harvesting and processing
2. Semi-structured interviews of the key proponents of innovation, and reviews of related documentation (e.g. corporate and government websites and reports
3. Analysis of data and compilation of the case studies
4. Review and feedback by researchers and by the interviewees of the drafted case studies and final report
5. Communication of the results (this report).

The text below describes the step-by-step processes of the project in further detail.

2.1. Cases Selection and Interview Process

The project timeline and financial limitations of the project meant that only a limited number of cases were feasible, e.g., two from each of the harvesting and processing sectors. To choose these cases, the Newfoundland and Labrador Department of Fisheries and Aquaculture (NLDFA) field and headquarters staff were consulted, as well as the Fish, Food, and Allied Workers (FFAW) Union and colleagues in the province. The selection of cases was intended to reflect regional diversity as well as known exemplary innovation examples within the industry. Further, participation required a willingness to share potential proprietary information with the researchers. Accordingly, one of the two processing plants selected chose to withdraw from the study in order to avoid any possible conflict among industry, union, and government members. The two harvesting cases were conducted with fish harvesters from White Bay on the northeast coast of Newfoundland, and from the Avalon Peninsula.

Researchers conducted semi-structured interviews that took place with the fish harvesters and plant owner or their representatives, to establish details on innovation in the inshore fishery. Each interview took place on site, either within the respective community or at the fish plant offices. With the permission of the interviewee, the three case interviews were recorded. The voice recordings were used in the analysis of the interviews in order to maintain the integrity of the reports. The goals of the interviews were:

- to identify the innovative initiatives;
- to understand the environment and challenges in which the innovation took place (i.e., the forces that fostered or hindered the innovation within the governments, the communities and organizational settings);
- to clarify the process of how the innovation was implemented;
- to highlight the successes and shortcomings of the innovation; and
- to point out the potential impacts of the innovation on the fishery and fisheries policy.

2.2. Analysis and compilation of the semi-structured interviews

Once an interview was complete, it was transcribed by the interviewer/researcher. The text of the case interview analysis included two parts:

(1) the “innovation text” report to be used in the overall project report; and
(2) a compilation of the “interview text”.

These texts were analysed critically by the researchers and prepared according to the report template to ensure comparability and continuity among the three cases. As far as possible, the “innovation report” maintained a balanced and unbiased view of the innovation process and results. Similarly, the “interview text” report, on which the “innovation report” was derived, provided a truer reflection of the interview with the participant. The “interview text” report was prepared for the sole review of the interviewee to ensure interview validity.

2.3. Review and feedback by the interviewees of the drafted text

After the review and acceptance of the two draft reports for each case study, the respective reports were returned to the individual interviewees for their editing, correction, and acceptance. Once each of the case studies was verified and edited by the interviewee, the researchers

incorporated the interviewee's comments and arranged a mutually acceptable date for a conference call. During the conference call, the focus of the discussion was on:

(i) lessons learned through the innovation process;
(ii) challenges to fisheries innovation in the inshore sector; and
(iii) issues and challenges within the province or industry that foster and promote or deter and inhibit innovation.

Researchers prepared the project report encapsulating the results of the edited case study "innovation report", and notified the interviewees of the draft final report for their further review and commentary. This final report presents the culmination of the commentaries by all participants.

2.4. Communicating Innovation

The compiled case studies and the summary final report are provided to the project contributors, namely, the Telfer School of Management of the University of Ottawa, the Canadian Fisheries, Oceans and Management Research (C-FOAM), the Faculty of Business Administration at Memorial University Newfoundland, the Department of Fisheries and Aquaculture of the Government of Newfoundland and Labrador, the Food Fish and Allied Workers Union of Newfoundland and Labrador, Stages and Stores Heritage Foundation (Change Islands, NL), and Educational Planning and Design Associates.

The report is also provided to the Association of Seafood Producers and the Seafood Producers of Newfoundland and Labrador, and will be uploaded to various websites to be identified as part of the project and circulated to both fisheries' and communities' websites to ensure maximum knowledge transfer. In addition, researchers plan to prepare a peer-reviewed article for submission to an academic journal for publication.

The following section of this report present the three case studies including discussion of background, innovation and impacts.

3. Case Study 1 – Automatic Jigger

3.1. Interview Summary

This section of the report summarizes the interview that took place Friday, 18 January 2013 in the residence of Albert Wells, a fish harvester in Wild Cove on the province's Baie Verte Peninsula. Wild Cove is situated in the Northwest Atlantic Fisheries Organization's (NAFO) subarea 3K. The interview was conducted and the case study compiled by Erika Parrill, MA candidate supervised by project researcher, Dr. Kelly Vodden in the Environmental Policy program at Memorial University's Grenfell Campus in Corner Brook, NL. The following presents a structured summary of Albert Wells' interview on his innovative design and implementation of the automatic jigger (Francis 2013).

3.2. Background Information

3.2.1. History of Fishing

Albert Wells has a long-history of fishing in both the inshore and offshore sectors. Although the son of a miner, Wells started fishing in a small wooden boat during his free summers in high school. After graduating from Grade 11, Wells attended college in Baie Verte to study marine mechanics. However, after working in the marine mechanics industry for seven to eight months and clocking 13-hour workdays that occurred seven days a week, Wells concluded that, "This is not for me. I gotta go back fishing."

3.2.2. Licenses Held Over the Years

In the beginning, Wells' main fishery was the harp seal. It was only after he had established himself as a sealer that he became heavily involved in the lobster, lump, capelin, mackerel, and cod fisheries. Wells often fished using a variety of methods. He fished cod using a mixture of gill netting, trapping, jigging and trawling. Post-moratorium (July 1992), Wells was confronted with the alternatives to either leave his house and move, or stay and continue fishing. When confronted with the option to move, Wells concluded that, "I've been doing a lot of thinking about this and I'm going offshore." He stated that his peers thought he was "crazy," but he saw an opportunity to stay and fish crab that he figured, "was coming back on track." Wells decided to purchase a small longliner vessel and to continue fishing for seals and crab. However, on the maiden voyage of his new boat, "she went to the bottom" 156 miles off Cape John.

3.2.3. History of 'Tinkering"

Not conceding defeat, Wells travelled to Nova Scotia and purchased another boat. After working on the boat for two weeks, Wells set sail for Newfoundland. Unfortunately, enroute the "pump gave out" and Wells had to contact the Canadian Coast Guard yet again. Wells' experience in marine mechanics helped him fix the pump and continue the 90-hour trip back to Wild Cove. After fishing in that boat for two years, Wells ordered a new 45-foot dragger*, Midnight Shadow*, to be built. After many drawing consultations, the new boat was launched in 1998. Wells has built, tinkered, rigged boats over his many years in the fishing industry.

However, boat building is not the only skill Wells has acquired throughout his life in the fishery. For example, in 1991 Wells created his own 'Japanese cod trap.' Described by Wells as "a huge step up from the old-fashioned cod trap", the Japanese cod trap was located underwater and had a closed-roof. By being situated in deeper water and covering the top of the trap with a series of rings that enabled a fish harvester to pull a rope through and therefore entrap the codfish, the Japanese cod trap did not place depth restrictions on the placement of cod traps. Experiments with the Japanese cod trap began in Newfoundland in the 1960s and the traps have been employed and modified by harvesters since this time (Wilson 1968). Approximately eight to nine years after the 1992 cod-moratorium, Wells decided to destroy his traps after concluding that his current low inshore cod quotas could not sufficiently support a decision to fish primarily for cod, or therefore the continued use of Japanese cod traps.

3.2.4. The Cost of Fishing

Wells decided to make the switch back to inshore fishing in 2003 for several reasons that ranged from the increased costs to the larger risks associated with fishing offshore. In Wells' opinion, the costs of fishing both inshore and offshore have increased significantly since he started fishing in high school. For example, Wells stated that an outboard motor "has pretty much gone up three times." Wells also suggested that when looking at the costs of fishing over the years, one must also consider the landing price of fish. With fish harvesters "getting as much for codfish now as when the moratorium was called," the low rise in price has fish harvesters comparing the liabilities and risk associated with a particular fishery to its landing price. When considering the costs of inshore fishing, Wells stated that mackerel has been "the saviour, no doubt."

3.3. The Innovation

The following subsections describe Well's innovation of the automatic jigger.

3.3.1. Adopting Innovation

Over the years, Wells had to adopt various technologies in his fishing enterprise. From hardcopy charts to GPS, Wells insists that fish harvesters have to incorporate the use of different types of gears and technologies in their daily operations. He suggested that with years of experience with technology, there's "nothing to it." Clearly portraying his high competence with technology, Wells further proposed that manuals are not needed as frequently in today's society, as a piece of technology might be a different name brand than the manual in question, but it "pretty well has the same functions."

3.3.2. From Idea Generation to Realization

After conducting research on automatic jiggers online, Wells had the opportunity to meet a man from Norway who was in Gander as a broker for fishing boats. During the initial meeting, Wells inquired about matters such as what type of electronic jigging equipment was best, whether it worked well in rough weather, and how many years he could expect the technology to last. After the meeting, Wells made the decision to purchase an electronic component and its blueprints from DNG, an Icelandic company. After altering his fishing boat to accommodate the European automatic jigger, and creating the pulleys and stripper system, Wells and his dependable crewmember were ready to put the innovation into operation.

Figure 3.1: Albert Wells' Electronic Jigger. (Photo Source: Erika Parrill)

3.3.3. The Automatic Jigger

Although the idea of an automatic cod jigger was introduced to Newfoundland in the 1970s, Wells has modernized the technology.

Figure 3.2: Fishing Boat with Pulley and Stripper Systems. (Photo Source: Albert Wells)

Launched initially decades ago as automatic mackerel reels, Wells' innovation has eliminated its predecessor's need of a "button and also stopping to pick the mackerel off." Due to the creation of a stripper system and a series of pulleys, the automatic jigger is able to jig automatically, without stopping, for species such as herring, squid and mackerel. Wells states that with the automatic jigger, he is able to "sit down and watch the boat fill up." Figure 3.1 is a photo of the Wells' purchased Icelandic' electronic jigger. Figures 3.2-3.3 show the pulley and stripper systems Wells created and the modifications he made to his boat.

Altogether, the creation of an automatic cod jigger cost Wells an estimated $35,000-$36,000. While the technology had a substantial upfront cost, Wells insisted that the innovation has enabled him to now jig mackerel at a rate of approximately 60 per second and decrease his crew size from five to two fish harvesters. Although Wells and his crew member considered the innovation beneficial, Wells believed that processors would also find the automatic jiggers beneficial due to the top quality fish it catches. Wells also believed that if the innovation has a widespread adoption, processors could see their fish being "singled out and getting a better price in the market."

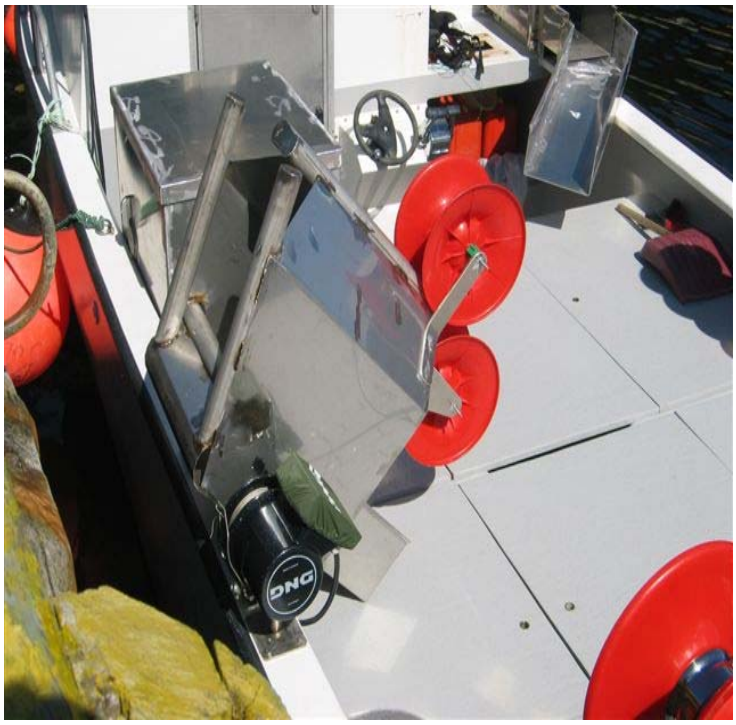

Figure 3.3: Fishing Boat with Pulley and Stripper Systems. (Photo Source: Albert Wells)

3.4. Innovation & Its Challenges

3.4.1. Miles Ahead

As per Wells' recent innovation, the automatic jigger, he stated that, "It's no different than equipment that everyone is using in boats" (in Europe). The main difference Wells noted about his innovation with other similar advances was that the manual was in Icelandic. The automatic jigger is new to the shores of Newfoundland, as its origins and main customers reside in Iceland, Norway, Portugal, Denmark and Ireland. Wells stated that while North America has made technological advancements, "we are playing with the same bubble we were playing with 40 years ago when it comes to fishing gears."

When asked about why European countries are "miles and miles ahead of North America" in terms of fishing gear technology, Wells responded that for example, in Norway, "the royalties the country received from oil went into new technologies." He further commented that he is unaware of significant "new money going into technology here."

3.4.2. Major Obstacles

Wells recalled the primary obstacle to developing his innovation as being the technology's "holdup in customs for two and a half weeks." Due to its late arrival, as of January 2013 Wells had not yet had the chance to employ it during the cod fishery.

When asked if he was given any help to develop his innovation by any department, organization, or community, Wells stated, "nobody." Wells had submitted a proposal to the Fisheries Technology and New Opportunities Program of the Department of Fisheries and Aquaculture in 2012 but was deemed ineligible for assistance. Although Wells' innovation has helped his own fishing enterprise, the Department stated that he was ineligible for assistance from the program due to, "automatic mackerel reels not being considered to be innovative technology as they have been tested in this province previously and past efforts to use the technology demonstrated unfavourable results." Wells' rejection however has not dampened his spirits. He suggested that in 2013 the automatic jigger would show him a return on his entire investment in the innovation.

3.4.3. What is Meant by 'Innovation'

According to Wells, when he started fishing 'innovation' had a very different meaning than it does to today's modern fish harvesters. He suggested that due to the large fish populations and competitive nature of the fishery in the past, 'innovation' "didn't mean a big lot." However, as challenges in the inshore fishery mount, 'innovation' now means 'survival.' Wells clearly stated that, "Without new innovation, I think you might as well pack up your bags and move on."

3.5. Innovation Impacts & Fisheries Policy

The following is a brief discussion of the implications of innovation for Wells and other fishing enterprises, for the industry and for fisheries policy.

3.5.1. Innovation & its Future Impacts

Although Wells suggested that innovation to him means "survival for the future," he ensured that he is not "painting a bleak picture." By looking at and learning from the past, Wells articulated that the future could be changed. He suggested that in his locality, fish harvesters "were burned out as the years went by." Wells claimed that investments made in new fishing gears were poorly selected and managed, as he'd seen new gears being "carried to the dump" from lack of use. By investing in new technologies similar to the automatic jigger, Wells concluded that the fishery will attract "new blood," help fish harvesters "think outside the box," and will lessen the issues of "too many fish harvesters fishing too few fish."

3.5.2. Innovation & Fisheries Policy

While "being burned by some department that wouldn't give funding" may bother some innovators, Wells was not discouraged. Nevertheless, Wells still believed that it is essential for people in the inshore fishery to "share the ideas." Implying that a more collaborative approach system is necessary to foster innovation, Wells stated, "the technology is out there" and that "it's just for government to implement certain policies," such as pilot projects that fund innovative technologies, for fisheries policies to truly be "thinking ahead." Wells also suggested that innovation could be enhanced in Newfoundland and Labrador through decision makers conducting research on "what's going on in other countries." By looking at what fishing gears and technologies other countries such as Iceland are currently using, Wells implied that Newfoundland could mimic those advances and invest a quantity of its oil revenues into fishery innovation. "You've got to have imagination, and you got to be thinking ahead."

4. Case Study 2 –Biodegradable Twine in the Newfoundland and Labrador Crab Fishery

4.1. Interview

This section summarizes the interview that took place at the home of fish harvester Tony Doyle on 16 October 2012. After forwarding the transcript and a draft of the interview summary by email, a second meeting was scheduled to finalize the text in December 2012. Tony Doyle spearheaded the use of biodegradable twine in the Newfoundland and Labrador crab fishery and he led others to study and test this known but ignored innovation. He fishes in NAFO Division 3L in Conception Bay.

4.2. Background Information

Adopting biodegradable twine was a co-operative effort involving inshore fish harvesters, the Fish, Food and Allied Workers Union (FFAW) and the Marine Institute with funding from the Fisheries Technology and New Opportunities Program (FTNOP) of the provincial Department of Fisheries and Aquaculture (DFA). Two projects were funded. The Canadian Centre for Fisheries Innovation investigated suitable twines for use in crab pots and the Centre for Sustainable Aquatic Resources at the Marine Institute received financial support to conduct commercial trials of the pots. A report on the work is available from the Department of Fisheries and Aquaculture of the Province of Newfoundland and Labrador (Department Fisheries and Aquaculture 2012d).

Inshore fish harvester Tony Doyle lives in Bay de Verde, Conception Bay North (Figures 4.1 and 4.2). When Tony is not busy at the fishery, he's busy with his family. The documentation in this case study reveals a history of change occurring long before the development of the commercial crab fishery. It reveals new identities on the water and a new discourse on the industry.

Figure 4.1: Tony Doyle aboard his boat. (Photo Source: Doyle Family)

4.2.1. History of Fishing

The Doyles have been fishing from the community of Bay de Verde since the 1850s. Traditional crews were composed of male family members who caught cod. With the help of their families, the fish was processed into a salted product until the introduction of freezing technology. Cod remained the primary commercial species throughout Newfoundland and Labrador until the groundfish moratorium in 1992. Fish harvesters used a variety of gear: jiggers, handlines, traps, and by the 1960s, gill nets. In this environment, generations of crews developed a deep knowledge of their fishing grounds. The Doyle grounds were off Baccalieu Island, and Tony is the last of his family to hold that indigenous knowledge. He is saddened that his son, 11 at the time of the closure in 1992, and now fishing on an offshore boat in Nova Scotian waters, will never have an opportunity to pass on that unique family history to his children.

4.2.2. Changes in the Fishery

Like other fish harvesters of his age cohort, Tony first went aboard his father's boat in the summers beginning at the age of 12, and entered the fishery in 1975 when he graduated from high school. He married a few years later, and became an equal partner with his father, Ron, and his Uncle Ned. In those days, the coastal economy did not offer much return to harvesters. People didn't fish for dollars. "It would always be pounds," Tony said. "Never say how much money they made because they never made none to speak of." Now fish harvesters have become marine stewards. The application of fish finding and labour reduction technologies, so prevalent in the industry in the 1970s and 1980s, has been replaced by the search for sustainable fishing approaches in the marine environment.

4.2.3. Fisheries Regulations Brought New Demands

Tony describes other changes in the industry. He echoes the rhetorical style of Joey Smallwood as he describes the exponential growth of regulations and "the pages and pages, and pages, and more pages" of paperwork now expected of fish harvesters. Now younger men and women buy licenses, paying close to $150,000 for "paper" before investing in the necessary boats, gear, and safety equipment. These changes aren't just affecting those close to the water. In other Canadian jurisdictions, people in tall office towers now play a major, though less visible, role in the Canadian fishing industry. In British Columbia, businessmen buy quotas from governments on behalf of their investors,

Figure 4.2: Tony Doyle reads the literature on crab management. (Photo Source: Helen Woodrow)

who lease them to skippers in the fishing fleet. On the east coast, inshore fish harvesters in the under 65' boat class have sought to maintain the owner-operator policy which prevents third parties from gaining access to fish quotas.

4.3. The Innovation

In 1995, the FFAW initiated the Fisheries Stewardship Program to unite the Union, Fisheries and Oceans Canada (DFO), the Newfoundland and Labrador Department of Fisheries and Aquaculture (DFA), and the Professional Fish Harvesters Certification Board (PFHCB), in a partnership focused on shared stewardship within the Newfoundland and Labrador fishery. Fish harvesters like Tony have adopted their new identity. Though he was never keen about classrooms, Tony uses every opportunity to learn about fisheries science and management. He is a member of the Bay de Verde Harbour Authority, an executive member of the FFAW, and the chair of the Crab Committee for Conception Bay. As a member of the DFO advisory committee on crab quotas in Conception Bay, he examines the findings of fisheries scientists and makes annual recommendations on quota levels to DFO resource managers. Tony was also involved in promoting an earlier innovation that reduced juvenile crab mortality through the use of escape mechanisms in pots. Like crab committees in other bays, he helped establish no fishing zones in the inshore so that stocks could mature. Work was also undertaken to end bottom dragging in the inshore zones to preserve the natural habitat of the ocean floor and protect the stock.

4.3.1 Learning about Biodegradable Twine

Tony's interest in the management of the most valuable species in the inshore fishery led him to a crab seminar in Moncton in 2005. The session included a demonstration of the gear used in the southern Gulf region (Figure 4.3). It wasn't the shape of the round pot that captured Tony's interest – it was the type of twine. Since pots get lost on the seabed, they can ghost fish for years. In 2011, in all NAFO divisions excluding 4R and 3P, there were 601, 350 crab pots licensed for use by all fleets (Fisheries and Oceans, Canada 2013c). It is not unusual to lose a few pots or even a full fleet of pots, and each lost pot continues to fish. The cannibalistic crabs enter the pot, becoming bait for other crab, and the cycle continues until the pot is retrieved or collapses in the water. That is why southern

Figure 4.3: A crab pot fitted with biodegradable twine. Note the W shape of the white twine. (Photo Source: Helen Woodrow)

Gulf fish harvesters have used a biodegradable twine insert in their pots since 1994. In Alaska, biodegradable twine has been regulated for use since the 1970s.

4.4. Innovation & Its Challenges

When Tony returned from Moncton, he initiated discussions about the twine with local fish harvesters, the Union and managers in DFO: "Crab is the mainstay inside 25 miles. That's the boundary for our inshore fishery. A number of fish harvesters have told me every time they pull up a crab pot that's been lost, even for a number of years, there's always crab in them." Tony is ever mindful of the responsibility fish harvesters have to protect and enhance the resource, and the Conception Bay Crab Committee asked the Marine Institute whether they could recommend a suitable biodegradable twine for use in Conception Bay waters. Eventually the Canadian Centre for Fisheries Innovation (CCFI) at the Institute received financial support from the Fisheries Technology and New Opportunities Program to conduct a study to determine the twines suitable for use in the snow crab fishery in Newfoundland and Labrador (Department of Fisheries and Aquaculture 2012d).

4.4.1. Innovation Trials

The study consisted of field trials of five possible twines in Conception Bay in 2009. A soft laid, untreated 96-thread cotton twine was selected as the best biodegradable performer for Newfoundland and Labrador. Sea trials took place during the 2010 and 2011 season with inshore crab fish harvesters in Bonavista, Trinity and Conception Bays, as well as offshore enterprises in 3Ps and 3L. Fish harvesters involved with the sea trials participated in a post-season evaluation by phone, and their feedback was positive.

It is a simple innovation. The selected twine is knitted into the crab pot across three meshes, two vertical meshes up from the lower portion of the trap, creating a configuration that looks like the letter "W." Newfoundland fish harvesters have extensive experience with cotton twine: "Wet cotton twine rots fast," says Tony, "Years ago you always had to keep your trap twine dry when it was on land so it would last longer." The study found that the twine insert should break down within a year of use. "In 12 months the crab can crawl out. No odds how long the pot is in the water then, if there's no crab in him, he's not doing no damage to the fishery. I think it will be a benefit to all fleet sectors, to the fish harvesters and to the crab. It won't be there lying on the bottom, waiting for another crab to eat it."

4.5. Innovation Impacts & Fisheries Policy

The innovation has implications beyond ending ghost fishing by the crab traps. Biodegradable twine is a requirement for Marine Stewardship certification. The Marine Stewardship Council (MSC) is an organization promoting sustainable fisheries throughout the world (MSC 2013). Products identified by their label help processors access new markets and maintain prices.

When Tony first began thinking about other ways to conserve crab stocks, he was interested in using the twine in the inshore fishing zones. In 2013, the use of biodegradable twine in all snow crab traps was made mandatory by Fisheries and Oceans, Canada (Fisheries and Oceans, Canada, 2013). Some crabbers from other sectors are not pleased with the new regulation and are critical of DFO for not attending to more significant issues in the industry. In an interview on the CBC's Fisheries Broadcast in 2012, Tony said if fish harvesters want someone to criticize about the innovation, they can lay the blame on his lap: "There's no reason to thumb your nose at the stuff that we are doing." He reminds fish harvesters to take responsibility for the pressing problems they feel need attention, "Get the ball rolling. It doesn't happen overnight but over time you can make changes for the positive" (CBC 2012).

5 Case Study 3 - Newfoundland and Labrador Fish Company Limited

5.1. Interview Summary

This section of the report presents a summary of an interview with a representative of the fish processing sector in Newfoundland and Labrador. In order to provide the anonymity requested by the respondent, the processor is referred to as NL Fish Company Limited. J. E. Murphy is a pseudonym for the corporate executive who participated in the interview. The interview took place at the offices of NL Fish Company Limited on January 8, 2013. Additional information was extracted from a variety of secondary sources including government documents, and local media coverage. The transcript and edited case study were returned by email and finalized on April 22, 2013.

5.2. Background Information

In the late 1960s, a local entrepreneur from the Central Newfoundland region, in partnership with a St. John's business firm, established the NL Fish Co. Ltd. The company immediately leased, and later purchased, an experimental plant from the federal government. About fifty people were employed at the plant, processing salted and frozen cod. In their early years, a government representative noted that NL Fish Limited had a "good reputation for putting up a quality product" (Decks Awash, 1976, pp.29-30). They were also known for paying their own way, and investing company profits in the operation.

Employment grew as the company diversified to process various crab, pelagic species, and groundfish products, and by the early 1980s, the company was classified as an operator of an important medium-sized plant (Encyclopedia of Newfoundland and Labrador, 1988, p.124). By that time, the company had constructed a modern cold storage facility, and blast freezers were installed. In 1991, it was one of 281 fish processing plants in the province (Fisheries and Oceans, Canada 1993, p.50). Twenty-one years later 60% of licensed processing plants had closed and 112 plants remained in operation (Department of Fisheries and Aquaculture 2012a).

At present, the NL Fish Company has approximately 35 full-time employees and 450 seasonal production staff. They source raw material from about 700 harvesters, in both inshore and far-shore boats. Their target markets are in Canada, the United States, Europe, and the Asian-Pacific rim. Over fifty million dollars of products are sold each year.

NL Fish Co. Ltd, was among one of the first fish plants to be unionized in the province and relationships between the company and union are cordial. The overall corporate culture, Murphy commented, is that the workers are very much part of the success of the company. An employee with a 22-year history of work at the plant remarked: "If there's fish in the sea, [our plant] will be opened. We're one of the best." (Woodrow, 1996).

5.2.1 A Changing Fishery

J. E. Murphy went to work with the company almost 20 years ago and describes the "explosion in shellfish and decline in groundfish" as the biggest change he has seen in the industry. By 1995, total groundfish landings for Newfoundland and Labrador had fallen from 336,588 tonnes in 1990 to 19,590 tonnes. In the same period, queen crab landings had almost tripled from 11,054 tonnes to 32,375 tonnes (Beaudin, 2001, pp.208-9, 218-19). The Provincial Department of Fisheries and Aquaculture viewed crab and shrimp as major contributors to the economic strength of the fishing industry in 2000 (Department of Fisheries and Aquaculture, 2000). According to Murphy, this trend will change as the groundfish comes back.

"Operating in the Newfoundland fishery is like driving in the fog. You have to have faith you're not going to hit a brick wall. It's very risky. If we had all the groundfish that we used to have and shellfish went back to its' traditional quota levels, most of us would be out of business. We're not geared to handle groundfish like we used to be, the market has changed, and it's not as lucrative as crab. In today's market, cod is just another whitefish and a lot of that is farmed now."

"It's a tiring business but it's very exciting once it gets into your system. If you're not prepared to work the long hours, things will start to fail. You have to sleep with one eye opened all the time. That's the way it is. There are all kinds of fighting over raw material between processors, over prices with fish harvesters, and arguments with plant workers because they don't have enough work. Ultimately it comes down to the structure of the industry. Until that changes, it's the environment we have to work in."

5.3. The Innovation

NL Fish Ltd is seen as an innovation leader by industry insiders. Politicians, fisheries bureaucrats and other industry players point to their history in fisheries research and innovation. That history continues. In the current FFAW contract, a strategic planning committee consisting of employees and company representatives was established to explore and review business opportunities for new species and initiatives focused on research and development. Murphy is grateful for that interest and support.

5.3.1 What Innovation Means

"At our plant, innovation is a necessity. What it means to us is cost reduction and new business development. It could be both. You have to stay ahead. We do whatever we can to increase throughput and reduce cost. It could be a yield improvement. If you're doing a significant volume, every 1% you can squeeze out of crab, for example, has a significant impact on your bottom line."

"We spend a vast amount of money and time on innovations for the species that creates the greatest wealth for the company. We have also spent a lot of money on the development of other species but you wouldn't operate a company on that. It requires innovative marketing but does allow harvesters to sell the product they catch (St. Anthony Basin Resources, 2002,4). Asian sales of crab primarily go to Japanese companies and they have it reprocessed elsewhere. For example, our Japanese buyers may reprocess in Vietnam where the meat is handpicked and extracted with tweezers. We couldn't do that here because of the cost. We have also been innovative in establishing production processes for other species, and have been approached by processors from other countries in the North Atlantic to help them get started."

"If we can't do a particular product because it's too inefficient to produce but you can get the proper equipment in place, it can open up a whole new market. You can't always buy technology off the shelf so you have to know what you're doing. It's very expensive. We have to go to a think tank or get an engineer involved. We'll tell them what the problem is, what we want to do, and the engineer goes ahead and designs something. You have to have experts if you're going to spend that kind of money."

"We have also bought technology off the shelf. You can get equipment now that automatically cuts the top off the claw on a crab rather than cutting it with a knife when it's frozen. It's very complicated machinery that you can't easily develop in-house. Another machine is deadly accurate for separating male and female capelin, and size grading the fish. It sorts faster than we can freeze. We might have been the second or third plant in the province to invest in that technology."

"We were the first ones to bring in very innovative equipment for whelk. It was extremely efficient at removing the shell from the meat but we couldn't get sufficient raw material. In the meantime other people found significant quantities of whelk. We sold our equipment to them and they are now in production."

5.3.2 Funding Supports

Government has helped out with different projects. “In recent years we’ve received funds from the Fisheries Technology and New Opportunities Program (FTNOP) and the Fisheries Diversification Agreement to develop new products and investigate new markets. The National Research Council, expertise from the Canadian Centre for Fisheries Innovation (CCFI) at the Marine Institute, and funding from the Atlantic Canada Opportunities Agency (ACOA) have also helped”.

5.4. Innovation & Its Challenges

There are huge challenges, Murphy says. “Something always gets in the way. It could be something simple, like increasing freezing capacity. If the engine room is at capacity, and you can’t put in any more compressors, you can install the biggest freezer you want but you can’t operate it. Or you may not have space to put in more freezers. Perhaps you come up with a perfect design but the cost is prohibitive.”

Murphy identifies the greatest challenge as the structure of the industry. “It’s stifling innovations. It seems that we’re focused on in-fighting. I think a lot of people are getting sick and tired of the in-fighting and internal focusing when there’s a huge market out there and we’re hardly doing anything compared to what we could be doing. It’s very dysfunctional how the system works. Everyone is getting marginalized. There are still good things going on but not to where they should be. Something has got to change.”

“Generally speaking, a lot of innovation has been toned down in the industry in the last few years. The industry is looking to do something that’s less risky. We’ve had people say to us: why don’t you do this? For us, it might be okay. Most of the smaller guys wouldn’t touch it. It’s too expensive and too risky. What makes it somewhat easier for us is the scale of the company. We depend on outside consultants, whether they’re engineering consultants or marketing consultants. We admit we don’t know it all. We don’t just get an engineer; we get a food-processing engineer.”

5.5. Innovation Impacts & Fisheries Policy

The company has also investigated producing other food products “We hoped to extend our production activity by engaging in primary processing of an agricultural item in the off-season. Government said no because of environmental concerns. If there was more flexibility, there could be more employment.”

"Right now, there's a lot of people who are marginalized and dependent on employment insurance (EI) and I would argue the processors themselves are just as dependent on EI as their workers. Without it, we wouldn't have any workers. I don't think it's a sustainable structure for the long term."

"Structurally some things have got to change. Other countries and industries have different ways of doing things but it seems we are a lot less progressive here. It's stifling innovation. In every other jurisdiction you can have a large vessel; you can process on land and at sea. You can harvest when you feel it's best for the market or the workers. There has to be more coordination between harvesting, processing and marketing."

"All government listens to is complaints from processors, harvesters and the union. It appears that the union is the archenemy of the processing group. Is that necessary? Sometimes I wonder if the Middle East crisis is easier to solve than working things out here. You have to be on top of this all the time. It's a complex game."

"When the fish processing industry starts to operate as a business, that's when you'll start to see true innovation. It would be a big plus. "

6 Discussion

This section identifies the key issues uncovered in the analyses of the case studies with respect to innovation in the inshore fishery in NL. The facilitators and the barriers to successful innovation in the inshore fisheries are discussed below toward enabling future positive innovation in the sector.

6.1. Key Issues

The analysis of the case studies provided a selection of feedback from the participants to identify the important issues they highlight in their interviews. The following table itemizes those issues identified in the case reports as "facilitators" to innovation, and "barriers" to enhanced innovative activity. Other observations, including the characterizations of the case innovation are also itemized in Table 2 below.

Table 2. Case Reports Summary of Key Issues

Case 1. Albert Wells			
Case Characteristics	**Facilitators to Innovate**	**Barriers to Innovate**	**Other Observations**
Fish harvester Innovation as adapted invention Automated mackerel jigger Long-term development Unfunded initiative $40,000 personal investment Improved harvest efficiency	*Individual leader as entrepreneur*: tenacity, persistence, lifetime learner *Build on experience*: international connections and partnerships *Strong and diverse skills*: technology, mechanics applied to harvesting *Diverse approach*: mackerel as saviour to declines in traditional groundfish harvest quotas *Optimistic perspective*: willing to make personal investment amid not so promising future	*Erosion of tradition*: declines in fish quotas, lack of industry input, external quota control *Economic hardship*: increasing costs, declining real prices *Resistance to change*: traditional practice including shifting into other species *Insufficient financial support*: little investment in innovative harvest technologies *Pessimistic attitude*: negative history of innovation, i.e., "does not work"	*Market edge*: improved margins, higher quality product, lower operating costs *Wasteful attempts*: new technology not sufficiently tested *Idea sharing*: important to share ideas locally and to be aware of international initiatives

Case 2. Tony Doyle			
Case Characteristics	**Facilitators to Innovate**	**Barriers to Innovate**	**Other Observations**
Fish harvester Innovation as implementation Biodegradable twine for crab traps Short-term implementation Partnerships Shared investment (FTNOP) Policy change for sustainability	*Leaders of existing practice*: Sustainable fisheries and use and testing of biodegradable twine *Partnerships*: FFAW, CCFI, MI, DFA, DFO *Build on experience*: seminar in Moncton, southern Gulf experience since 1994; USA use; *Regulatory change*: Government support for wider application	*Erosion of tradition*: declines in fish quotas, lack of industry input, external quota control *Economic hardship*: increasing costs, declining real prices *Resistance to change*: traditional practice including shifting into other species	*Market edge*: improved margins, higher quality product, lower operating costs *Certification*: enhanced opportunities *Idea sharing*: important to share ideas locally and to be aware of international initiatives
Case 3. NL Fish Co.			
Case Characteristics	**Facilitators to Innovate**	**Barriers to Innovate**	**Other Observations**
Fish processing Innovation as new processing opportunities (through R&D, new species) to manage shift from grdfish to shellfish Ongoing implementation through Continuous Improvement Improve profitability and sustainability of the firm	*Leadership for experimentation*: explore partnerships, and location options for testing opportunities *Plan strategically*: planning committee to review costs, labour resources, and funding *Optimistic perspective*: willing to make personal investment, attention to quality, take risks *Diverse approach*: continuous improvement, learn from history of innovation	*Resistance to change*: traditional practice including shifting from groundfish to shellfish *Erosion of tradition*: declines in fish quotas, reduced access to raw material *Implementation problems*: In-fighting among players; lack of coordination in industry structure *Lack of creativity*: inflexibility in traditional delivery of seafood products; less progressive *Reduced incentives*: public welfare dependency, EI fallback	*Market edge*: improved margins, higher quality product and productivity, lower operating costs *Proactive policy*: Engage in buying, adopting and adapting new technology and create own for local contexts *Diversify opportunities*: innovation not just in technology, but also in markets, marketing and product diversification

The case study feedback presented in the itemized form of Table 2, reveals that there are particular similarities across the cases. These similarities arise despite the key differences that define the characteristics of the cases. For example, the two fisheries cases are characteristically different in that the Wells' innovation is described as an individual adapted invention learned from international experience. Further, this innovation requires a significant amount of individual effort and resources, trial and error to demonstrate the advantages of the initiative. On the other hand, the Doyle case demonstrates innovative leadership by applying a known approach and developing it as sustainable practice across the industry to become common practice and policy.

In both cases, innovation facilitators are marked by: (i) leadership (either individual and/or collective); (ii) experience that engenders contacts locally and broadens international awareness; (iii) diversity in skillsets and experience; and (iv) an optimistic attitude to move the innovation forward. These facilitators are also reflected in the processor case study that adds the need for continuous improvement and a trend toward ongoing search for new opportunities to innovate in the volatile and competitive global marketplace, that includes the importance of planning strategically, i.e., with a sustainable, log-term perspective.

With regard to barriers to innovation, several common items are also revealed in the comparison of the case study feedback. These common barriers include: (i) resistance to change in harvesting or processing that makes innovation more difficult until critical levels forcing change are achieved; (ii) the erosion of traditional practices, like change, reinforce attitudes to correct the situation rather than "going with the flow"; (iii) economic hardships are common barriers in that business parameters reflect viability and threaten virtual survivability of more than a job, but of lifestyle; (iv) insufficient support both financially and politically are provided as a significant barrier to innovation in all cases; and (v) pessimistic attitudes heightened by fallback support effectively provide incentives to withdraw rather than to react to change. These barriers are generally felt to be pervasive such that they overcome the facilitators of innovation thereby causing more of a malaise to innovation rather than an opportunity for progressive change.

Finally, all the cases by innovators are noted for the proactive position and action of the participants in harvesting and processing. As innovators, these individuals are remarkable for their ability to overcome the disincentives (or reverse incentives/barriers) in favour of the improved opportunities and expected rewards to their business by being successful risk-takers.

The facilitators and barriers identified in the case studies and captured in Table 2 above are consolidated in the detailed discussions sections that follow.

6.2. Facilitators to Successful Inshore Fisheries Innovation

Successful innovation is a function of "facilitators" attributed to harvesting and processing sector that enable the implementation and practice of new products, processes, and organizations. Using the case studies as a guide, the following six facilitators to successful innovation in the inshore fishing sector are presented:

1) Necessity Drives Innovation
2) Partnerships and Collaboration
3) Financial Investment and Support
4) Building on Diverse Skills and Experience
5) Leadership, Communication, Tenacity and Tinkering
6) Entrepreneurial Optimism and Risk-taking

These facilitators to effective innovation are discussed in more detail below.

6.2.1 Necessity Drives Innovation

Changes in marine resources and the demise of groundfish stocks in the 1990s have required massive shifts in the inshore fish harvesting and processing sectors. These critical changes include the necessary switch from declining groundfish resources, to shellfish (crab) that may necessitate decisions to change location, and change fishing gears and vessels. Other changes include: (i) changes to identities for fish harvesters who must take on an enhanced role as marine stewards; (ii) changes in species processed by fish plants; and (iii) changes in fisheries management conditions for license, and operating regulations, e.g., gear use, etc. All these changes require innovative responses from the NL fisheries, but, in fact, yield varying responses. The actual changes depend on the attitude of the participant, their ability to adapt, and the incentives (and disincentives) to change.

6.2.2 Partnerships and Collaboration

Partnerships between all players in the NL inshore fishing industry are vital facilitators to innovation and suggest the need for more cooperation among fish harvesters, fish processors, managers, governments, the Union, and clients. More partnerships require more collaboration that enhance the opportunities to learn and innovate.

6.2.3 Financial Investment in Innovation

The availability of government-led, or non-governmental (e.g., foundation) funding support programs, and the ability of firms to apply for such funds, are necessary to support innovative endeavours. Financial support, for example through the FTNOP, has made many NL fisheries innovations possible, including those specific projects that are directed at inshore fishery applications. The availability of financial aid for specific innovation projects heightens the decision maker's belief in the planned innovation and reduces the personal risk of the venture.

6.2.4 Building on Diverse Skills and Experience

Innovations often occur as a consequence of a broad systems view that results in an alternative perspective on the problem at hand. In turn, developing such perspectives stem from the innovator applying a diverse set of skills to a traditional problem. A diverse skillset, e.g., experience in the inshore and offshore fisheries, alternative targeting of groundfish, pelagics, and shellfish, and the use of alternative fishing gear, permits a new approach to old problems viewed in a different and new way leading ultimately to the innovation.

Recent literature questions the idea of innovation emerging from the lone inventor or even entirely internally within a firm or organization (Amara et al 2003, Wolfe 2009, Johnson 2011). Knowledge-based transformations are no longer understood as a consequence of the characteristics and actions of entrepreneurs and creators alone, "but as a structural characteristic of knowledge-based economies" (Leydesdorff 2010, p.10) and "a social process that depends on interaction and learning" (Hall 2010, p.14). Thus, popular writer Stephen Johnson (2011) suggests the most effective way to increase the chances of innovation is to encourage openness and expand the possibility by exposing one's self, organization or community to more ideas, which can in turn be combined in new ways for new purposes.

6.2.5 Leadership, Communication, Tenacity and Tinkering

Sharing of new knowledge and ideas are facilitated through communication and regular interaction between individuals and organizations. One formulation of this is the Triple Helix of government (providers of supportive policy and programming), firms (engaged in research and development activities) and research, education and training institutions (typically post-secondary) (Etzkowitz 2008). The mandate of the CCFI, federal government support for innovation, and individual entrepreneurial leadership in NL combine as a strong facilitator for innovation.

6.2.6 Entrepreneurial Optimism and Risk-taking

To be successful, running the risk of developing innovation must be seen in an optimistic light. Willingness to permit failure, and to seek the expertise or experience of others are also noted by Johnson (2011) and many entrepreneurship scholars before him as conditions that support innovation. In this context, Schumpeter's (1950) processes of '*creative destruction'*, where new products or structures displace older ones as a critical component of innovation, need to be carefully thought through as they relate not only to the more familiar explanations of entrepreneurial innovation, but also to other social processes.

6.3. Barriers to Successful Inshore Fisheries Innovation

The barriers to innovation come from a number of sources that surround the NL fishery. The following are examples that are informed from the cases and attributed to the harvesting and processing sectors. Barriers to innovation include:

1) Limited Innovation funding opportunities
2) Lack of Leadership and Communication
3) Implementation Problems and Resistance to Change
4) Erosion of Traditions and Economic Hardship
5) Regulatory Barriers and Lack of Autonomy

These barriers to effective innovation are discussed in more detail below.

6.3.1 Limited innovation fund opportunities

Many industry players do not have access to external sources of funding. Therefore, the capacity to design, develop, and test potential innovations that would otherwise require access to extensive capital and committed time is limited and not part of the typical options available to harvester or processor.

The Fisheries Technology and New Opportunities Program (FTNOP) was designed to provide support to those wishing to engage in innovation efforts. However, the funding opportunities that require shared investment are judged to be biased towards those with the capital means (cash, labour, and time) to carry out the innovation, i.e., typically the larger fish harvesting and processing operations. Few inshore fish harvesters received access to direct funding, and there was limited participation of processors among awarded applications in the program (see also Table 1 and Appendix B – FTNOP).

The FTNOP program was designed to serve all fishing industry players in NL. The program literature states "the level of contribution for industry led-projects does not normally exceed a maximum of 60% of eligible expenses" (Department of Fisheries and Aquaculture 2013b), although projects initiated by non-profit institutions, associations, or community groups may receive up to 100% of costs. In reality, the NL Department of Fisheries and Aquaculture prefers to award grants to applicants whose budgets include cash investments or in kind contributions (although this may exclude CCFI and other post-secondary applicants).

6.3.2 Lack of leadership

It has become clear in the analyses of the cases that the risky action associated with innovative activity is looked upon as a disincentive and a costly process. Under the harsh environment of the inshore sector operating in the competitive global marketplace, participant support programs for inaction, e.g., withdrawal of fishing effort, retirement buyback, retraining, discourage innovations. Nevertheless, the evidence shows that single-minded and individual innovators are able to overcome the disincentives to develop effective and sustainable business solutions for continuing the lifestyle. This leadership in innovation needs to be developed and incentivized locally as well as regionally. Examples of best practices and demonstrated payoffs to innovators need to be highlighted and encouraged through industry, government, and the union by offering innovation leadership workshops, exposing fish harvesters and processors to new ideas, and rewarding innovative activity among entrepreneurs in the inshore.

6.3.3 Implementation problems and Resistance to Change

The changing fisheries environment has created conflict among government, industry, and union players. And, consequently, there is a distinct lack of coordination among the large-scale and offshore harvesting and processing participants and the inshore industry sector.
These conflicts, amid change, reduce the focus on the changing marketplace and the urgent need to adapt in a timely fashion for the betterment of the industry as a whole. As such, the industry among the different fish harvesting fleets in NL, and the two primary allied processing groups has been described as "dysfunctional".

6.3.4 Erosion of Traditions and Economic Hardship

Despite the history of unanticipated market impacts, e.g., rising costs of operations led by increasing fuel costs, and "soft" world prices for fish, these economic shocks have particular and immediate impacts to small operators in the inshore. As such, these shocks have immediate and

direct impacts on traditional fishery operations. Moreover, the competitive and non-integrated harvesting and processing activities of the fisheries sector are not inclined to cooperate and participate jointly toward maintaining overall sector business activity and sharing of the ensuing economic hardship. Similarly, other businesses external to the fisheries, e.g., oil and gas, do not seek to moderate the shocks which may be to their advantage.

6.3.5 Regulatory Barriers and Lack of autonomy

In the tradition of command and control fisheries management, the government annual quota setting exercise makes it difficult for fisheries operations, and the small-scale inshore fisheries in particular, to manage their businesses in a strategic manner. Thus, year-over-year, quotas may change abruptly and significantly making it difficult for harvesters and processors to maintain stable markets and to grow their operations. This lack of flexibility and the inability to manage over a longer time horizon puts further stress on investment decision making and opportunities to innovate.

The facilitators and barriers discussed above provide the rationale for the study recommendations presented below.

6.4 Benefits of Innovation in the Inshore Fishery

Innovation in the NL inshore fishery has been effectively practised by fish harvesters and processors, however, it has been not been well-documented nor attributed to enhanced value in the fishery. In fact, the changes in the commercial fisheries in NL in recent years have required massive shifts in identity of fish harvesters from pure resource exploiters to active marine stewards, changes in the importance of available commercial species, and changes in fisheries management regulations and conditions of license. As noted above, these changes have engendered innovative responses.

It is important to note that successful innovation brings considerable benefits to inshore fish harvesters and processors. Table 3 below summarizes these observed benefits and highlights these as the potential gains from further innovative implementation.

Table 3. Potential Opportunities and Benefits of Innovation Among Harvesters and Processors

Category	Harvesters	Processors
Environment	More control of sustainable fishing operations; decreased fishing effort required, greater stewardship, e.g., less ghost-fishing	Increasingly competition pushing firms to be highly efficient in their operations
Economic	Added value in support of innovation to individual's own time and funds, and partnership; improved profitability	Requires self-financing with support of governments; greater profit through innovative technology; more market exposure and market flexibility
Organization/ individual driving project	Improved operational efficiency and sustainability	Plant owners own initiative to improve viability and efficiency
Partnerships	Encourages and often requires partnering	Permits connecting with governments, and open to involvement from processing workers
Implementation	Tends to be local and derived from leadership, but may be applied across harvesting sectors by region through imitation of improvements	Engineering and management process innovation retained in the firm, highly competitive, not generally passed along to industry competitors

As noted in Table 3, the uptake of successful innovation by fish harvesters promises improved viability, enhanced sustainability. It also follows that innovation fosters communication, exposure of news ideas and partnerships based on shared learning. For inshore harvesters, innovation tends to be embraced by individual leaders and entrepreneurs who are driven to adapt their livelihoods to survive in a low margin, competitive business.

In the processing sector, innovations are more closely held by the innovating organization in the competitive environment. However, the opportunities for economic gain may greatly augment margins in value-added activities. Important innovation in processing is most often related to market growth, stability of product supply, and security.

The following section concludes this report with itemized recommendations toward improving the opportunities and the spirit of innovation in the inshore fishery in NL.

7. Conclusions and Recommendations

This analysis of innovation in the inshore fishery in NL depends largely on the context in which innovation can occur. This context is riddled with barriers to innovation characterized by insufficient funding, disincentives for risk-taking due to government support programs, and a sense that entrepreneurship is not encouraged or facilitated among all industry players operating in a global marketplace.

The following recommendations are designed to refocus the business sense in the inshore sector in order to foster new business development opportunities, improve viability, and maintain a sustainable livelihood. It is noted that examples of innovation in the NL inshore fishery sector are broad and involves not just new technology, but also in new markets, and marketing and product diversification. Individual "tinkering" that includes both buying and adopting or adapting new technologies and creating own modifications for their local context also characterize innovation in the inshore.

Recommendation 1. Develop a market support group for the advancement of NL fisheries in the global marketplace.

Rationale:

Current marketing strategies in the global seafood industry focus on the relationship between consumers and harvesters. This recommendation calls for an industry-led and government supported program for the advancement of international markets, the generic promotion of NL seafood products, encouragement for certification of products, and the lobbying of new and secure customers around the world. This recommendation echoes that of earlier influential reports, namely Dunne's 2003 NL Commission report on fish processing, Roche's 2008 seafood marketing review panel, and the 2011 MOU on fishing industry rationalization and restructuring.

Recommendation 2. Develop integrated and shared business support programs designed to maintain markets and continue business development and activity in downturns.

Rationale:

Take advantage of the spectrum of economic activity in NL to maintain business activity through shared support among businesses, e.g., in the event of rising oil and gas, provide a shared business model that would assist fish harvesters and processors to maintain market development through the shared gains in the NL oil and gas industry. This also entails the strict application of integrated business activity of the "oceans to plate" initiative that would break down the current destructive links within the industry, and take up the recognized need for provincial-wide seafood marketing board in support of the whole fishery. This recommendation is also compatible with

those of the Fishing Industry Renewal Discussion (2006), and the Seafood Marketing Review Panel Report (Roche 2008).

Recommendation 3. Extend non-cash contribution to support innovation projects especially for the inshore fishery sector.

Rationale:

The Department of Fisheries and Aquaculture should place more value on the non-cash contributions of those who work outside large corporate or institutional structures. The Fisheries Technology and New Opportunities Program brochure suggests the contribution for industry led projects vary, but do not normally exceed a maximum of 60% of eligible expenses (Department of Fisheries and Aquaculture 2013b). These projects are designed to improve the economic prospects of the company or corporation. Projects initiated by non-profit institutions may be funded up to 100% of cost (depending on partnership contributions from other funding agencies) inclusive of contracted labour, material and supplies (Department of Fisheries and Aquaculture 2013b). More weight should be placed on applications from less than 35' harvesting sector may primarily reflect non-cash contributions. It is more likely that their efforts will not result in any personal or corporate financial gain.

Recommendation 4. Showcase and incentivize innovation among the inshore fishery sector.

Rationale:

In order to encourage innovation as a way of doing business, develop an industry-led merit process whereby innovators are profiled and rewarded for their activity in the inshore fishery sector. This includes developing a business association that uniquely monitors the costs and values of innovation among all inshore participants toward making the practice of innovation a regularly accepted and expected business process. Encourage a wider affiliation with national and international innovation groups and support the building of partnerships beyond the NL inshore sector. The establishment of an innovative association would develop the process of innovation among inshore entrepreneurs and include opportunities of market out-reach, and partnership development.

Under 35' vessels continue to represent the largest sector in the NL fishery by a wide margin. Therefore, there needs to be special consideration to encourage direct involvement from people operating in this vessel class. This could be done, for example, by encouraging or mandating partnerships with this sector toward innovation or designating ongoing innovative programs for harvesting and processing toward making continuous improvement the norm among inshore sector participants. This shift toward efficiency is directed at moving committed fish harvesters and processors out of a social support image attached to the fishery and into an entrepreneurial, viable, and progressive activity.

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Appendix A – NL Harvesting and Processing Statistics

This appendix presents statistics on the harvesting and processing sector as well as commercial fishing vessels by size in NL in selected years over the period since 1990.

Figure A.1 below shows the total fisheries sector employment of individuals in the harvesting and processing sectors in Newfoundland and Labrador for pre-moratorium levels (1990) and levels for the period 2001 to 2012. This period is marked by the significant difference in the pre-moratorium levels of total employment)on the order of 55 thousand workers), and the relative stability since 2001. The total numbers of individuals in the fishery in 2012 have declined by over 15% since 2004 (30,000 workers) to approximately 20,000 total individuals, or 10,000 workers in each of the harvesting and processing sectors.

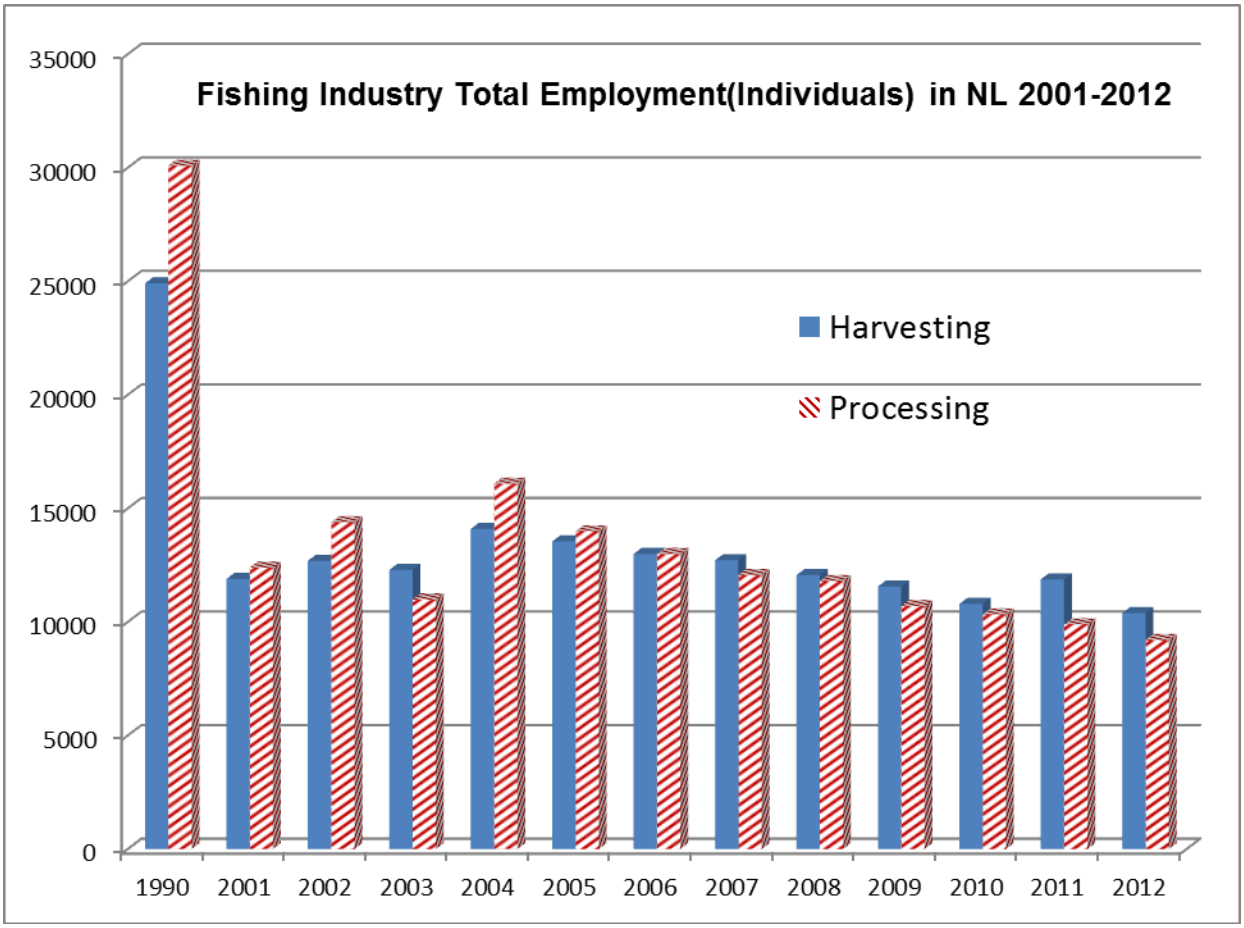

Figure A.1: Total Employment (Individuals) in the Fishing Industry in Newfoundland and Labrador 2001-2012. (Source: Fisheries and Oceans, Canada 1993, p.40, 2013b.)

Figure A.2 presents the numbers of registered commercial fishing vessels in Newfoundland and Labrador by size (less than and greater than 35' LOA) for selected years over the period from 1990 to 2010. This figure demonstrates that although the numbers of individuals in the commercial fishing industry has decreased in numbers (Figure A.1), the numbers of fishing vessels associated with inshore fishery activity, i.e., less than 35' LOA, remains significant – even relative to the pre-moratorium levels of 1990 (12,000 vessels). Boats registered as less than 35' LOA represent over 85% of all vessels in the Newfoundland and Labrador commercial fishing fleet since 2000.

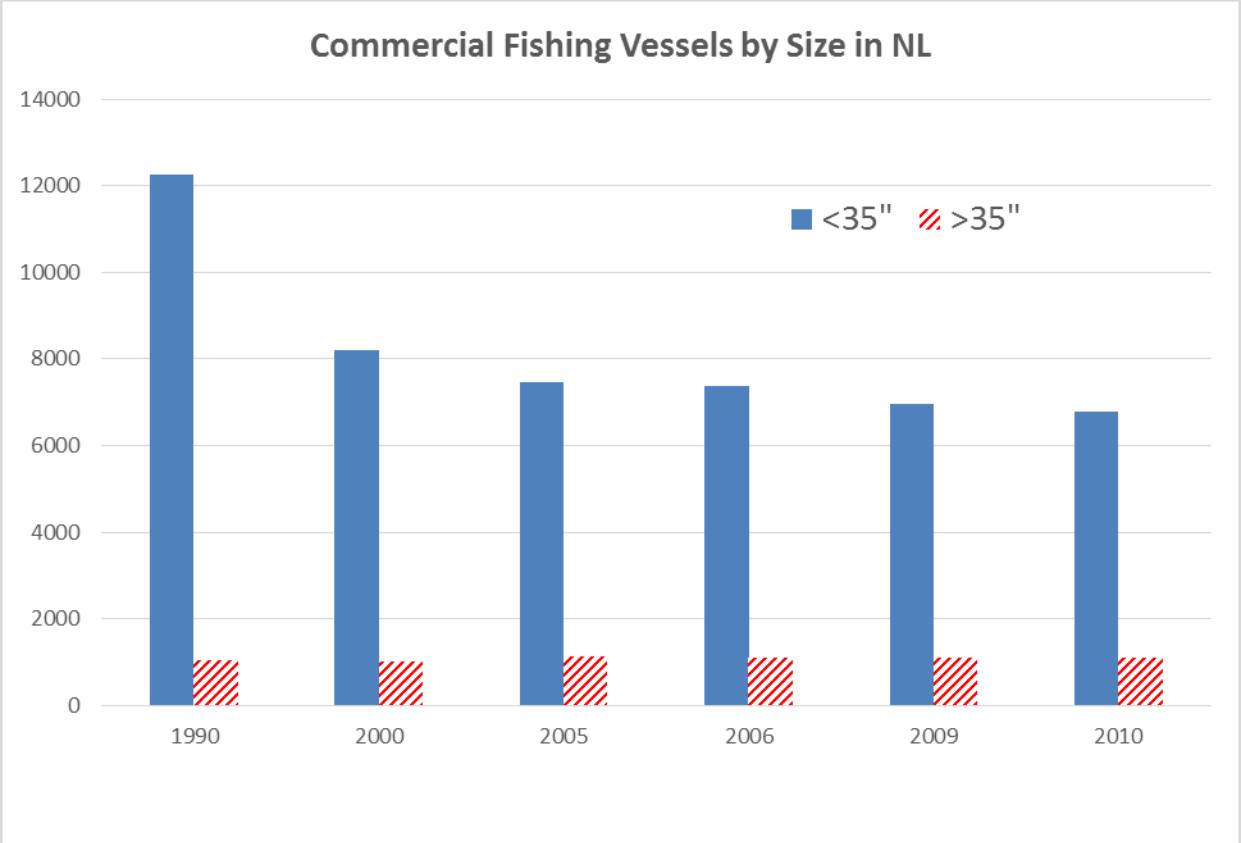

Figure A.2: Commercial Fishing Vessels by Size in NL since 1990 (selected years). (Source: Fisheries and Oceans, Canada 2013b.)

Figure A.3 below displays the primary processing licenses issues in select years in the 1990s and from 2001-2012. The 1990 (pre-Northern cod moratorium) and the 1997 values provide a contrast to the evolved primary fishery processing sector in the first decade of the 21st century where processing plant capacity is reduced by over 50% compared to the 1990s.

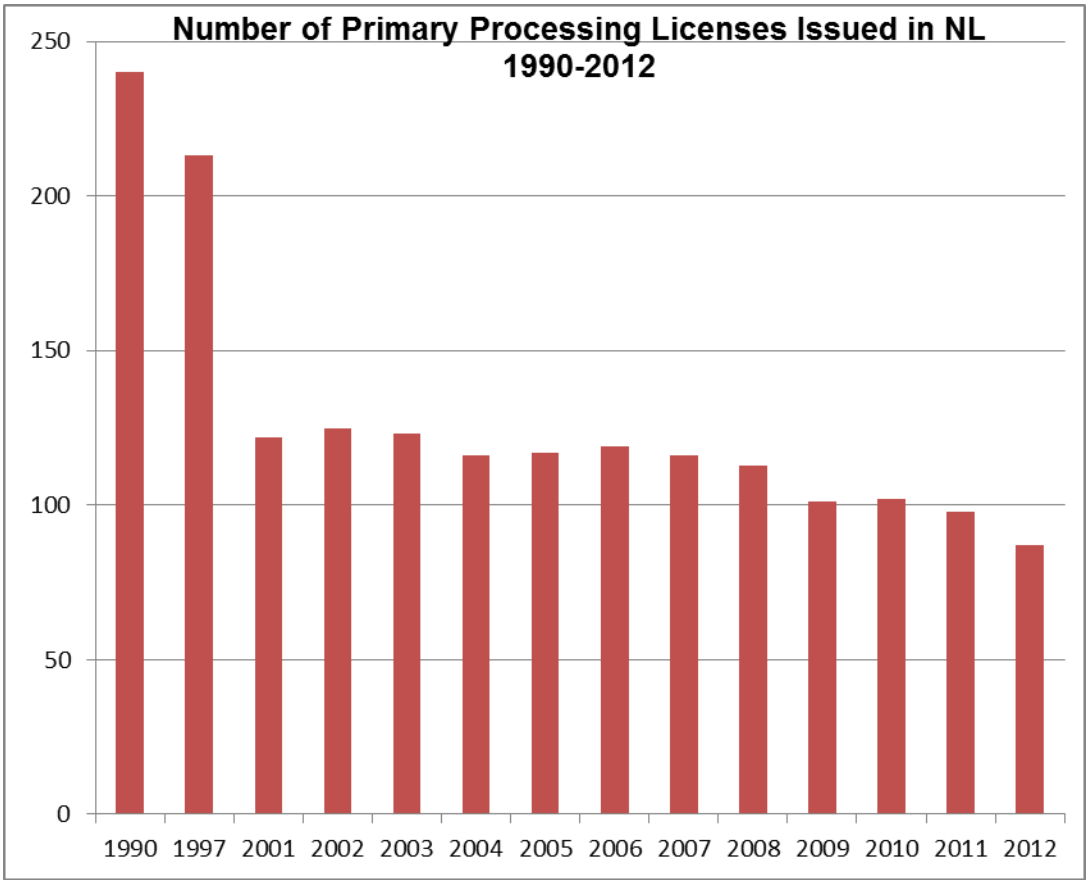

Figure A.3: Number of Primary Processing Licenses Issued in NL 1990-2012. (Source: Department of Fisheries and Aquaculture 2012a.)

Appendix B – Fisheries Technology and New Opportunities Program

This appendix presents information on projects and funding under the NL government Fisheries Technology and New Opportunities Program (FTNOP) innovation project (Department of Fisheries and Aquaculture 2013b).

The Fisheries Technology and New Opportunities Program (FTNOP) grant program was announced in October 2007. It was designed under the Fishing Industry Renewal Strategy to foster innovation and diversification in harvesting, processing, and marketing initiatives. The program invites grant applications from processors, fishers, researchers, fishing organizations and others. Industry-led projects are expected to contribute up to a maximum of 60% of eligible expenses. Projects initiated by non-profit institutions, associations or community groups may be funded up to 100% of costs, though projects that include partial funding or in-kind contributions are preferred (Department of Fisheries and Aquaculture 2013b).

The key components of the FTNOP program are: resource assessments; harvesting technology and innovation; processing technology and innovation; product development; market development; and aquaculture development.

Under the FTNOP, the NL government defined innovation as something that is new to the province, even if it has been used elsewhere. All efforts are expected to take place within a sustainable fisheries framework, and enhance the value of fishery resources. Emphasis is also placed on reducing raw material waste and discards as well as research on ways to improve quality and reduce operating expenditures such as energy costs.

Over 9.8 million dollars has been invested or approved for 219 projects as of October 31, 2013. Grants have been awarded to 53 proponents, with the largest number of approved applications (defined as over 10 grants) coming from the Canadian Centre for Fisheries Innovation, schools, faculties, and centres at Memorial University, and Ocean Choice International and Quinlan Brothers, two processing companies. The total investments in these projects were more than half of the total program funds.

Project investments are included for these proponents in Table B.1: Approved Proponents with Largest Numbers of Grants from 2007-2014. Successful grantsmanship requires capacities that are usually present in larger organizations whose staff have the time and skills needed to develop proposals, and the resources to implement them.

Table B-1: Approved Proponents with Largest Numbers of FTNOP Grants from 2007-2014 (as of Oct 31, 2013, includes proponents with more than 10 projects). (Source: Department of FIsheries and Aquaculture 2013b, 2013d.)

	No. of Project Grants	% of Total No. Grants	Total Grants ($) Awarded	% of Grants ($) Awarded	Average Grant Amount ($)
CCFI	40	18 %	$1,696,660	17%	$42,416.50
MUN Schools, Faculties and Centres	34	16%	$1,490,697	15%	$43,844.02
OCI	15	7%	$1,243,286	13%	$82,885.73
Quinlan Brothers	11	5%	$602,673	6%	$54,788.45
Totals	**100**	**46 %**	**$5,033,316**	**51%**	$50,333.16

Other FTNOP approved applicants include processing firms, industry associations, the FFAW Union, the Department of Fisheries and Aquaculture, individual fish harvesters, and the Nunatsiavut government. Twenty-four or 45% of all approved applicants were approved for one project, and 15% received funding for two projects (see also Table B-2: All Proponents by Number of Approved Applications, 2007-2014).

Since the program was initiated in 2007, successful processing sector applicants have purchased new technology, developed and marketed new products, and upgraded their web sites. Participation in seafood shows and educational opportunities outside the province have also been supported. Industry associations have designed promotional campaigns, and written information packages and booklets. Various proponents have participated in surveys and assessments of such species as whelk, hagfish, sea cucumber and turbot in particular zones.

In the harvesting sector, research has occurred on 90’ boat designs, the energy efficiency of 65’ shrimp vessels, and the design of 65’ deck ramps. One project conducted test fishing on a 65’ boat. Mid water-trawling gear was tested, hook and line gear was evaluated for the turbot fishery, and suitable biodegradable twine has undergone commercial trials. One of the case studies you will read in this document reveals how applied research was used to contribute to the sustainability of the crab resource.

Table B-2. All Proponents by Number of Approved Applications, 2007-2014. (Source: Department of Fisheries and Aquaculture 2013b, 2013d.)

No. of Approved Applications submitted by Proponent	No. of Proponents	As % of all Approved Proponents
1	24	45.3%
2	8	15.1%
3	6	11.3%
4	4	7.5%
5	3	5.7%
6	2	3.8%
9	2	3.8%
>10	4	7.5%
Totals	**53**	**100%**

Complete information is not available on all funded FTNOP projects to date. There is therefore no conclusive evidence that the program has provided equal opportunities to the less than 35' boats, the largest fleet sector in the NL fishery. There is, however, ample evidence that there are some benefits to that sector. For example, new commercial species and markets assist both harvesters and processors. Other projects, such as those undertaken by the FFAW Union on the lobster fishery, were directly focused on inshore fish harvesters. However, given the lack of comprehensive data, one could only speculate about how well the FTNOP program serves the entire fishing industry. Future studies may be able to conduct a comprehensive study of the FTNOP program and the strength of its relationship to all aspects of the fish harvesting and processing industry of Newfoundland and Labrador.

Appendix C - Project Proposal and Questions

This appendix presents the original project proposal presented to the Telfer School of Management Research Fund (SMRF), University of Ottawa competition in May 2013. The text of this appendix presents an abridged version of the full proposal. For further details, please contact the authors.

Title:
Innovations in the Inshore Fishery Sector

Rational:
Most known innovations in the fishery are designed for large-scale application or result from the needs of larger business enterprises. These innovations may require extensive investment of funds and other supports from governments or institutions. These innovations receive press attention and are more obvious to interested members of the general public. By contrast, little attention and research has been given to the innovations in the small-scale, inshore fishing sector.

Objective:
The first objective of this research project is to focus exclusively on the small-scale fishery and to gather examples of innovations from the inshore fishing sector of Newfoundland, in particular. The term 'innovation' in this context is defined as 'doing things differently' and can include, for example, different approaches to marketing or harvesting.

The second objective is to transfer the knowledge acquired through this research project. This will occur through key contacts in fisheries organizations, community networks and the public media. Please see knowledge transfer section for more details.

Methodology:

The project will proceed in the following manner:

1. Contact key players in the fishing industry by telephone to identify possible innovators. The objective is to identify at least four innovators.
2. Establish a list of innovative fish harvesters (sample of five to eight) to contact for telephone interviews.
3. Conduct semi-structured telephone interviews to establish details on the innovation. The goal of the interviews will be to identify individuals who foster a positive environment for the innovator and will determine:
    a. if the innovation worked or not,
    b. if the initiative has been applied in other settings, and
    c. the forces that fostered or hindered the innovation within the regulatory, community, and organizational settings.

Once interviews are complete and the data reviewed, we will analyze the elements of innovation and what they reveal about how innovations are stifled or supported. We will present a case study on each innovation identified, and circulate material back to each of the individuals/communities profiled for their review and verification.

The case studies will be uploaded to various websites to be identified as part of the project and circulated to both fisheries' and communities' websites to ensure maximum knowledge transfer.

Questions

An example of the questions identified for the interviews are listed below:

1. How would you describe your innovation?
2. Who was it designed to benefit?
3. Tell me more about the innovation.
4. Did it work?
5. What elements/factors made it work? (organizational, community, regulatory, leadership qualities, etc.)
6. What difference has it made? (economic, ecological, etc.)
7. What elements/factors made it difficult to achieve success? (organizational, community, regulatory, leadership qualities)
8. Were there particular individuals who were instrumental in shaping or promoting the innovation or encourage you with your initiatives, even if you didn't meet the success you had envisioned?
9. Why was the innovation important to you?

Outcomes and Knowledge Mobilization

Little is known about innovation in the inshore fishery. The four or five case studies that will result from this research will serve as guidelines for future initiatives to assist in the sustainable management of the resource in rural coastal communities of Newfoundland and Labrador. Each case study will focus on how the cases contribute to sustainability of the resource and, in turn, the communities who derive their livelihoods from the fishery. The cases will be developed and published using 'plain' English to ensure maximum access. Once reviewed by the participants, the cases will be sent to the public media. Most regional newspapers will incorporate the text into their local coverage of the industry. The 'Fisheries Broadcast', a CBC radio program dedicated to covering stories about the fishing industry in Newfoundland and Labrador, and the people and communities that depend on the sea for their livelihood, will be encouraged to follow up with broadcast interviews related to this project. We also hope to widely circulate the case studies to various government departments and agencies, and various groups in the community: the Fisheries Food and Allied Workers Union; The Marine Institute; Zonal Boards; and others with an interest in the inshore fishery. Our goal is to encourage discussion and further innovation on sustainable management practices of the coastal fisheries resources.

The researchers propose to present their findings in a research seminar at Telfer in the Research Seminar Series and in the C-FOAM Best Practices Series on rural resource based sustainable fisheries management practices and how these practices will contribute in turn to community sustainability.

Following the completion of the case studies, an analytic article will be prepared on the factors and conditions of successful innovation and will be submitted for publication in a peer-reviewed journal. Targeted journals for the analytic article include:

- *Journal of Sustainable Development*
- *Community Development Journal*
- *Journal of Rural and Community Development*
- *Society and Natural Resources*
- *Journal of Small Business Management*
- *Marine and Coastal Fisheries*

Appendix D - Participant Consent Form

This appendix presents the participant consent form designed for this project as presented to and approved by the University of Ottawa Research Ethics Board in May 2013. The full text of the Consent Form is provided below. As per ethical standards, all participants in this project were asked to read, agree, and sign the Consent Form.

Title: Innovations in the Inshore Fishery in Newfoundland and Labrador

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I, _____ (name), agree to participate in a Telfer School of Management Project at the University of Ottawa and entitled Innovations in the Inshore Fisheries Sector. Dan Lane, a professor in the School of Management is the principal investigator and Kelly Vodden, an associate research professor of Grenfell Campus of Memorial University and Maureen Woodrow an adjunct Professor at Telfer are Co-investigators. I have been provided the contact information for the three researchers.
I understand that this research project is funded by the Canadian Fisheries, Oceans and Aquaculture Management Network, the Telfer School of Management Research Fund both located within the Telfer School of Management and Stages and Stores Foundation based in Change Islands, NL, Faculty of Business at memorial University and the Department of Fisheries and Aquaculture of the government of Newfoundland and Labrador. I am aware that the main goal of this study is to understand innovations in the inshore fisheries sector, how these innovations are initiated and what are the factors for successful innovations that contribute to the sustainable management of the coastal fishery and, in turn, the sustainability of the community.

I agree to participate in the interview and have the interview recorded. The transcript of the interview will be returned to me for review and the report on the innovations selected for the project will be made available to me for review. before they are distributed more broadly to the fishing community. I agree to participate in a meeting via conference call with the three other innovators and the researchers. This meeting/conference call will discuss the innovations and the conditions for their success. The transcripts of the each case study

will be made available to me and the three other innovators participating prior to this conference call for review. I understand that the call will be recorded but once the report on the meeting is reviewed the recording of both the individual interview and the group interview will be held in the locked cabinet in a locked office of the principal Investigator.

Although anonymity cannot be ensured (i.e. other people may find out about the your innovation through your website) during the research process due to the small size of, and limited resources within the community, all names and descriptors will be removed from the write-up. This means that although information and comments provided may be made public, nobody will know exactly who gave what information.

A report will be prepared integrating the interviews and the meeting of innovators. A copy of the report will be left with each participant and relevant fisheries organisations. The research findings will be included in a project research report to the partners and funding bodies, and will, therefore, be made available to the general public in Canada through the C-FOAM website (www.c-foam.management.uottawa.ca). Research findings may also be used in other publications (i.e., journal articles) and presented at academic conferences once the study is completed. All data will be stored with Professor Dan Lane at the University of Ottawa until the termination of the project. Audio recordings will then be destroyed. The final report will be on public record.

I, _____ (name), agree to voluntarily participate in this study, and although there is no foreseen risk to myself as a participant in this study, I may withdraw from the study or withhold information at any time during the research process without penalty. Also, if I choose to end my involvement with the research project, I may decide whether or not to give the researcher permission to use data and information that I have given up to that point.

If I have any further questions or concerns, I will not hesitate to contact the appropriate researchers whose names and contact information are provided below.

If I have any questions regarding the ethical conduct of this study, I may contact the Protocol Officer for Ethics in Research, University of Ottawa, Tabaret Hall, 550 Cumberland Street, Room 154, Ottawa, ON K1N 6N5; Tel.: (613) 562-5387; Email: ethics@uottawa.ca).

There are two copies of the consent form, one of which is mine to keep.

Signature or initials of participant: _____

Name (printed): _____

Date: _____

Signature of witness: _____

Date: _____

Signature of researcher: _____

Date: _____