A MARKET CHAIN ANALYSIS OF NORTHERN GULF COD FISHERIES: IMPLICATION FOR RESOURCE SUSTAINABILITY AND ECONOMIC VIABILITY

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ABSTRACT

This contribution employs a 'fish chain' approach or ocean to plate analysis to examine key market drivers affecting Northern Gulf cod fisheries recovery since their collapse in the early 1990s. Drawing upon the backward bending supply model of fisheries; secondary data was compiled and analyzed for the pre- and post-collapse periods focusing on demand and supply factors, predator-prey relationship, catch by key species, landed value, price setting, chain actors, socio-economic networks and trade flows. Using semi-structured interviews, key stakeholders along the supply chain were also asked to draw upon their experiences to inform cod recovery options and the viability of the fishing industry. Preliminary results suggest that the post-collapse operational range of the cod fish chain is shorter, with poor access to raw materials, lower production value due to two moratoria, and reduction in quotas for stock recovery. Cod production has evolved from predominantly producer-driven chains that processed frozen cod blocks destined for US markets, to consumer-driven chains that seek fresh cod and fillets for niche markets and local consumption. In addition, there has been a shift in target species from lower value groundfish species to higher value shellfish species post-collapse. These shifts in production in the absence of sufficiently strong institutional mechanisms for effective fisheries rebuilding have economic implications for backward bending supply and resource sustainability. Hence, future prospects for the Northern Gulf fisheries depend on implementing governance mechanisms to support multispecies rebuilding approaches, stakeholder collaboration on fisheries policies along the fish chain, in addition to marketing initiatives.

Keywords: Northern Gulf Cod, pre- and post-collapse, recovery, backward-bending supply, seafood trade, governance, Newfoundland, Canada.

INTRODUCTION

Northern Gulf cod stocks found in the Gulf of St. Lawrence collapsed in the early 1990s in eastern Canada bordering Quebec and Newfoundland. Following two moratoria for cod fishing between 1994 to1996 and in 2003, a reduction in total allowable catch (TAC), and several federal-provincial recovery efforts; there has been no significant increase in the abundance of these stocks and other eastern Canadian cod stocks [1]. Scientific assessment of the cod stocks continues to show low population viability, with ramifications for resource sustainability and economic viability. Despite the low groundfishery landings in Newfoundland and Labrador (NL) since these stocks collapsed in the early 1990s, landings from pelagics and shellfisheries have increased with totoal production value reaching a billion dollars in 2004 [2]. This gradual shift towards target species with higher production value has not corresponded with any significant increase in employment and average earnings for inshore fishers, crew members and plant workers [3]. Moreover, issues of resource access and on-going changes in fisheries policies continue to impact the economic viability of seafood trade in the region and throughout NL. Related to this is the red listing of Atlantic Canadian cod products by conservation groups such as David Suzuki and Ecology Action Centre on seafood choice menus[i].

Copes (1970) seminal article on the backward bending supply model of the fishing industry is a key contribution by an economist to recognise ecological constraints for resource sustainability and production. He further identified the role of institutional mechanisms for a viable and sustainable fishing industry through conservation incentives, stakeholder collaboration and marketing options. This paper

aims to revisit these arguments to inform cod rebuiding options and the prospect of a long term viable fishing industry.

Seafood is the most traded commodity globally [4], contributing significantly to export earnings, food security, and employment especially in eastern Canada [2]. Concerns about sustaining the historic trade in seafood products in NL have ranged from fluctuating resource supplies to ecosystem dynamics, changes in exchange rates, competition from low cost producers and third party labeling [5]. The key research question addressed in this paper is how changes in marine ecosystems pre- and post-collapse, socioeconomics and fisheries policies have affected recovery of Northern Gulf Cod stocks and the viability of related fisheries?

The paper is divided into four sections: In section one, using the Gordon-Schaefer bioeconomic model, I explore the economics of fishing with particular attention to the backward bending supply, changing ecosystem and target species, overcapacity and overfishing, and the role of institutions[ii]. In section two, I provide a fish chain approach for recovery of collapse fisheries, and two key data collection methods involving both primary and secondary sources. In section three, I undertake an emperical analysis and a discussion of policy options on the marketing of cod and related fisheries. I conclude in section four with key findings and policy implications.

THEORETICAL BACKGROUND

The theoretical foundation for the biological and economic realities of the fishing industry have evolved from a static Gordon-Schaefer model [6]; to include dynamic pool models and multiple species and ecosystem approaches [7]. The key contribution of this model lies in its prediction that in a common pool unregulated fishery and poorly managed fishery, fishing effort will increase to a point where the total cost (TC) will equal to total revenue (TR), at a point called bionomic equilibruim (BE). This point implies both biological overfishing and economic waste; with complete dissipation of rents (Fig. 1 left hand side).

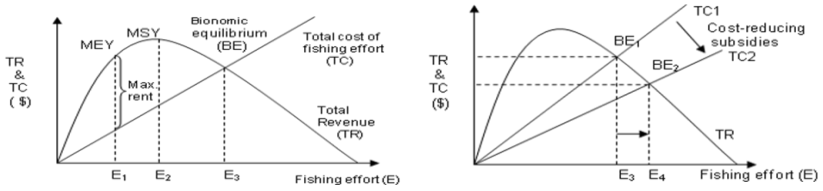

Fig. 1. Gordon Schaefer fisheries bioeconomic model

Moreover, it is assumed that the provision of government subsidies to the fishing industry will lead to higher participation and increasing fishing effort from E_3 to E_4 that corresponds to BE_1 and BE_2, as shown in Fig 1b (right hand side). Subsidies thus have a direct effect on fishing by reducing costs or enhancing revenue to the point of excess capacity and overfishing as shown in Fig 1b.

Copes (1970) built upon this theoretical fisheries model to include decision-making component within the context of supply and demand, and the potential externalities to the environment and production. As shown in Fig 2 (left hand side), as fishing increases because of high demand from D_1 to D_2, the quantiy produced will first increase from Q_1 and then decline to Q_2 as prices increases from P_1 to P_2. The long-run supply curve for fisheries may be backward bending due to biological and ecological constraints, and the common pool nature of fisheries [8]. Copes (1970) argues for institutional mechanisms in avoiding overfishing, restricting fishing effort through taxes and licenses, and policy explorations for price control and marketing initiatives.

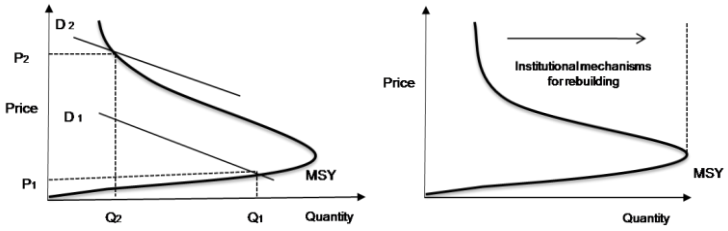

Fig. 2. Backward bending fish supply chains

Fish supply chains are among the most complex commodity chains, the level of complexity increasing with the globalization of seafood markets [9]. The rapid increase in global fish landings and frequent stock collapses have prompted calls for new management approaches as most wild captured fish stocks are fully exploited [4]. This current status of global fisheries raises concerns about biodiversity conservation, seafood trade and food security [10]. Fishing affects marine food webs [11]; especially as large predatory stocks up the food web are fished out, raising the possibility of regime shifts [12]. In this circumstance, demand for crustaceans lower down the food web could affect future resource supply especially in the absence of appropriate policy measures [13]. These concerns have prompted calls for an ecosystem approach to fisheries, by acknowledging the uncertainties, complexities and institutional dynamics for sustainable fisheries [7,14,15].

Most conceptual approaches to marketing and international seafood trade focus primarily on supply chain management and value addition [16-18]. There is little emphasis on the interlinkages between marine ecosystems, resource sustainability, economic viability, and the role of institutions. This contribution aims to fill this research gap by using a 'fish chain' approach. The fish chain acknowledges these interactions across the entire production chain from oceans to plate; focusing on marine ecosystems, resource supply, fishing fleets, stakeholder dynamics, and markets [19].

CONCEPTUAL AND METHODOLOGICAL APPROACHES

Fish chain approach: The fish supply chain is defined as a "set of interdependent agents involving fishers, processors, distributors and retailers that work together consciously or unconsciously to convey a fish derived product to the eventual consumer" [17]. The fish chain approach is useful for identifying rebuilding options and viable seafood trade by integrating ecosytstem approaches, supply chain management, and institutional mechanisms. As shown in Fig. 3, it focuses on three production stages and their interactions: pre-harvest (marine ecosystems), harvest (fishing operations), and post-harvest (processing, marketing and consumption). The three production stages do not operate in isolation; they are interconnected through formal and informal institutions as well as through stakeholder networks, and consumer needs [9, 19].

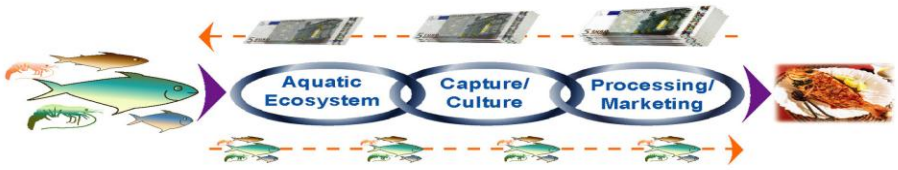

Fig. 3. Schematic diagram of the fish production chain (Source: Bavinck et al. 2005)

The market chain analysis in this paper focuses on the harvest and post-harvest stages of the fish chain, with particular attention to interactions with the pre-harvest stage for resource sustainability. The analysis was conducted in two time periods, a pre- and post-collapse era in order to identify governing limitations and opportunities for a sustained and viable seafood trade.

Archival document analysis: For the first step of this analysis, an archival document analysis was undertaken, in addition to an extensive literature review drawing upon existing documents such as legal and policy statutes, statistical information, scientific research, and government commissioned reports spanning four decades[iii]. The review and synthesis focuse on changes in fisheries policies, amount of landings by major species, predator-prey relationships, fleet size and fishing operations, cost and earnings, price-setting mechanisms, consumer preference, markets, and trade flows.

Key informant interviews: Following the document analysis above, insights from semi-structured interviews with sixty key stakeholders were conducted. The key informants were identified through the secondary literature and a snow ball sampling technique. Unlike other interview techniques that rely on statistical significance and inference, the key informant interviews in this study focus on understanding the policy process, institutional mechanisms, and decision-making approaches on recovery challenges and rebuilding opportunities. The questions focused on issues relating to markets, supply chain, stakeholder interactions, and markets. The interviewees include fishers (n=14), buyers and processors (n=8), distributors and retailers (n=4), plant workers (n=2), distributors and brokers (n=2), managers (n=7), research scientists (n=5), policy makers (n=10), and community planners (n=5).

EMPIRICAL ANALYSIS

The results of the market chain analysis for Northern Gulf cod and related fisheries for the pre- and post-collapse periods are provided, followed by a discussion of policy options. This section is organized under the two broad themes of resource sustainability and economic viability, underscoring the backward bending nature of supply fish chains and the role of institutions. It is argued that ecological viability is necessary to attain economic viability, which can be achieved through effective governance mechanisms involving the state, the private sector, and civil society.

Resource sustainability

Raw material supply: A review and assessments of fisheries policy and stock assessment data in the Northern Gulf region pre- and post-collapse identified ecological constraints for cod population viability and governance challenges for recovery [20,21]. Recruitment rates for Northern Gulf cod stocks for 3+ age year cohorts have decreased from a historical high in 1980 from 206,000 metric tonnes to about 13,000 metric tonnes in 2008 [1]. A small-scale commercial fishery was authorized post-collapse, with modest TACs as shown in Fig. 4, limiting raw material access across the supply chain.

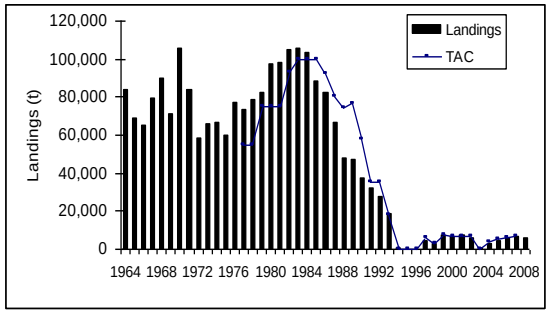

Fig. 4. Trend in landings and TAC for Northern Gulf cod (source: DFO)

Trophic changes and targeted species: Three key ecosystem changes and trophic interactions have been reported [21,22,23]: i) an increase in marine mammals - mostly seals that prey on cod; ii) a decrease in

large predatory fishes; and iii) a sharp increase in invertebrates mostly shrimps, as shown in Fig. 5. The shifts to high value shellfisheries without a rebuilding plan and strategies for cod have economic implications for backward bending supply and successful recovery. Often, as fishing intensity increases because of higher production value, or as acute environmental change exacerbate population viability, fish stocks decline beyond MSY prompting lower TACs and closures [7]. For instance, the dramatic decline in crab landings in Western Newfounland (crab fishing area 12) has led to voluntary closures by fishers in agreement with management authorities. This initiative highlights management options with stakeholders in addressing resource decline, future tenure and market access[iv].

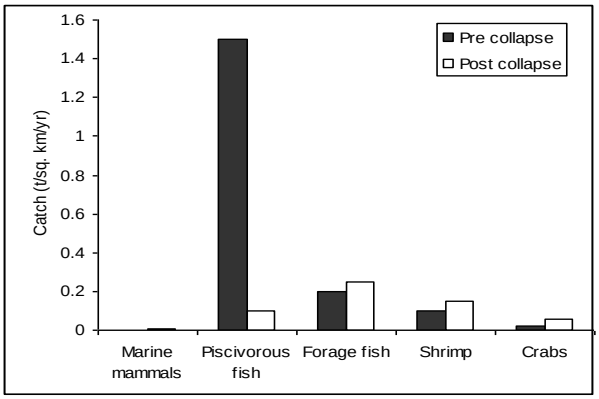

Fig. 5. Changes in landings for major fish groups (source: Savenkoff et al. 2007)

By-catch and multispecies considerations: By-catch issues remain by far one of the most difficult in groundfisheries management and for cod recovery [1]. Management regimes and by-catch measures vary by gear types and species targeted in various Northwest Atlantic Fishery Organization (NAFO) regions especially in region 4RS3Pn in the Gulf of St. Lawrence. Because of the strict rules in regions such as in NAFO 4R, fishers are forced to discard, with strict penalties on landing. In NAFO region 3Pn in South Western Newfoundland, where hook and line is the acceptable fishing gear, the maximum percentage of by-catch permitted is 20% for American Plaice and White Hake, and 10% for Greenland Halibut. Interviews with fishers on by-catch policies revealed that conservation incentives are lacking for dockside landing, with little consideration to multispecie strategies and incentives for compliance. The fish harvesters interviewed proposed a trust fund for by-catch utilization, by-catch quota trading, and compulsory or voluntary disclosures for accurate catch reporting and in sustaining the resource.

Policy initiatives in the current harvesting and processing sectors: Some key policy initiatives towards resource sustainability and a viable indutry have been proposed following federal and provincial agreements [24,25]. These include: i) Vessel monitoring and data logging systems; ii) new access and allocation policies; iii) enterprise combining policies; iv) fleet rationalization and separation policies; v) sentinel fishery and shared stewardship; vi) by-catch reduction; and vii) and adjacency principle and community quotas. Although some of the policy initiatives are already implemented such as the dockside monitoring and the fisher stock assessment program (sentinel fishery), others are being developed such as the fleet separation policy and rationalization of the fishing industry[v].

Institutional and governing challenges for recovery: The Species of Risk Act (SARA) is the key legal tool for recovery of endangered species in addition to the Fisheries and Oceans Act. For a species to be recovered under the SARA mandate, the species has to be listed based upon recommendations on vulnerability level by an independent panel of experts - the Committee on Status of Endangered Wildlife in Canada (COSEWIC). In 2006, COSEWIC assessed Northern Gulf cod stocks to be threatened, but the listing did not pass the cost-benefit analysis [26], which is a criterion for listing under SARA and for establishing rebuilding plans and targets. Cod listing would have management implications for fish

stocks, could result in foregone revenue and negative consequences for coastal livelihoods. For instance, cod listing could affect the eligibility for employment insurance of seasonal workers, particularly in the harvesting and processing sectors [26]. Not listing cod as an endangered species on the otherhand also has consequences for the livelihoods of cod-dependent coastal communities and for long-term recovery prospects. Moreover, there are other concerns about cod recovery such as stakeholder buy-in for multispecies by-catch limitations, and reduction in TACs that may affect short term profit margins. Governance mechanisms and institutional innovation such as public-private partnerships along the fish chain, in addition to strenthening stewardship roles for civil society groups are necessary for fisheries rebuilding and in reversing the backward bending supply curve to sustainable levels (as shown in Fig. 2).

Economic viability

Profitability of the fishing industry: Economic viability in terms of operational profits is assessed based on the difference between total costs and total revenues. The cost structure of fishing operations varies by type of fishing enterprise, capital availability, fleet sector (inshore or offshore), vessel characteristics, and number and types fishing licenses. Both the revenue and profit obtained from a fishing enterprise are constrained by low resource supply and raw material access, and other key drivers such as poor fish price, high interest and exchange rates.

For fish harvesters who targeted cod and other species such as lobsters, herring and capelin with medium boats of 35-60 feet in length for the year 2004; about 60% of the operating costs are towards labor ($102,000 CAD), next to fuel, gear and insurance [27]. Net income for this vessel category was about $97,000 CAD before taxes, which is about 33% of fishing revenues. For smaller vessel categories of less than 25feet in length, labor and fuel accounts for about 60% of total operating and maintenance cost ($17,000 CAD), with depreciation cost about $2,263 CAD, and license fees of about $372 CAD. For this smaller boat category, net income was about $7,000 CAD before taxes, with total revenue about $27,000 CAD. Interview responses from cod fishers on fishing enterprises in 2009 reflect similar minimal earnings for small and medium inshore boat owners and crew; often supplemented by government transfers [3]. On the otherhand, the cost and earnings for inshore shellfishery in NL showed that labor and fuel accounted for over 50% of total operating costs in 2004 [27]. Net income for small boat less than 25feet in length was about $12,000 CAD for crab boats and about $51,000 CAD for shrimp boats.

According to Moore et al. (1993), "the industry's ability to control costs, in response to changing prices, is the most important factor inn achieving sustained profitability". For the years 1981 to 1991, reasonable operating profits were obtained in the fish processing industry for only two years, with a similar trend for return on assets [28]. During stakeholder interviews, the increasing parity towards of the Canadian dollar to the US was raised as a key concern for economic vaiability. According to DFO (2008), the depreciation of the US dollar to the Canadian currency affected seafood exports by about 25% in 2005, leading to an increase in trade with EU markets [2]. The following key concerns were also identified by industry stakeholders: uncertainties in resouce supply, poor fish prices, global recession, competition from low cost fish producers, and seafood eco-certification. There are further concerns of corporate concentration of ownership of quotas and of wealth in the hands of offshore fleets and corporations to the detriment of owner-operator inshore fishers and viability of fishing-dependent coastal communities [29].

In the early 1980s in the pre-collapse periods, raw materials (cod fish landed) contributed to about 62% of plant operating cost, next to labor at 22%, energy at 3%, and projected profit margins around 13% [30]. Key informant revealed similar cost structure in the current cod fish chain especially for raw material and labor cost. In the post-collapse era, there is an increase in quality control measures and packaging requirement costs, as well as associated costs of distribution and wholesale inventories to international markets. In 2009, a pound of cod at dockside price of 62 cents CAD purchased from fish harvesters

eventually cost about $6 to 8 CAD at the retail store; after including the processor's 'flesh cost' (0.33% processing yield), transportation and distribution cost, storage and inventory, as shown in Fig. 6.

Fish harvesters are by law, not permitted to sell their fish directly to consumers in NL. This is partly due to quality control issues, protecting seafood processing jobs, and for accurate catch reporting. This creates value-addition and marketing opportunities for processors, distributors and brokers for both local and international seafood markets. The market chain for cod involves four to seven key stakeholders for both the pre- and post-collapse periods. The number of chain actors however depends on the region of production, market destination, and consumer demands. The key chain players include the fish harvester, buyer/processor, broker/distributor, wholesaler/retailer and final consumer.

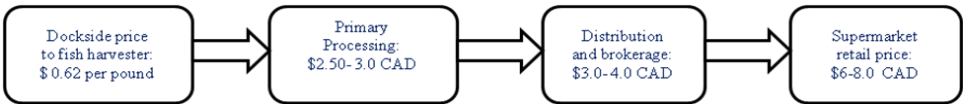

Fig. 6. Distribution of retail value across the current market chain for cod fillet

Economic viability for the fishing industry implies strong coordination amongst chain players towards value addition and marketing strategies, as well as resiliency to market fluctuations. According to key informants in the harvesting sector, the cost and benefits across the market chain are not fair and just; raising concerns about trust, social relationships, and stakeholder coordination on marketing initiatives.

Mis-match in the timing of fish harvesting, processing and consumer needs are hardly in synergy, resulting to supply gluts and lower profit margins. Acording to one major cod processor, cod fish caught in the summer in places such as western Newfoundland are full of capelin as they stocks are on their feeding migration. This affects processing quality, prices, and consumer needs, as the sale of fish products also decline in the summer months [30]. These mismatches between the harvesting, processing, and retail sectors have often led to supply gluts and 'distress selling' by processors [30], due to financial constraints for seafood inventory especailly to international seafood markets. These concerns in supply chain coordination highlight the need for inclusive decision-making and effective management policies that supports viable fisheries.

Restructuring and vertical integration: One of the biggest challenges identified for resource sustainability since the collapse of the fishery (and even before the collapse) is the level of harvesting and processing capacity [30,31]. Capacity is defined within the context of inputs to fishing effort relative to the resource abundance, measured in terms of capital investments, total revenues, and technological efficiency in the harvesting and processing sectors. Despite some capacity reduction and adjustment programs in the fishing industry post-collapse [32], the fishery is still considered overcapatalised [3]. These combined outcomes of overcapacity, poor resource supply amidst industry restructuring, equity and wealth distribution concerns, as well as power relations raise persisting questions about effective and equitable models for rationalization.

Rationalization might encourage vertical integration of the harvesting and processing sectors. Such integration may however impact the price of fish and encourage bonus payments for 'high liners' [33]. Further, the proposed fleet separation policy between harvesters and processors under the federal-provincial initiatives has been identified as complex and challenging to implement [3,5]. This is partly because most processors fund fish harvesters through 'trust agreements' due to the demise of the fishermen's loan board [33]. The prominence of these trust agreements suppresses fishers' income, and presents an imbalance in negotiation power during collective bargaining. These disagreements between fishers and processors have been identified as a key reason for the rejection of alternative price setting mechanisms such as auctions [33]. Efforts to establish a fish marketing council as recommended under

the Fishing Industry Renewal initiative was voted against by a majority of processors in the Province[vi]. According to one small-scale processor who voted against the marketing council "the marketing is not for us, it is for the big processors to inventory their fish in the US". These on-going governance challenges in the supply chain are under review by a working group based on a Memorandum of Understanding (MOU) between fish harvesters, processors and the NL provincial government.

Supply chain organization and markets: In the pre- collapse period, the cod fish chain was producer-driven characterized by high volume, lower value cod blocks exported primarily to US markets [34]. The current operational range of the post-collapse cod fish chain is shorter, and characterized by poor access to raw materials, lower TACs, caused by resource collapse. The cod fish chain has reversed into a more consumer-driven chain that produces high-value cod fillets and cod by-products (e.g. cod tongues) for regional and niche markets. Alaskan Pollock and New Zealand Hoki have replaced the high-volume cod block from Newfoundland, with further competition with hake, tilapia and carp [34]. Moreover, the collapse of the cod fishery is highly related to coastal community vulnerability, as processing plants are the highest employer, especially for women, whose income complements the household economy [35].

Multi-species fishing licenses such as crab and shrimp tend to be more profitable and risk-averse compared to single specie license such as cod [2]. Single species license are more susceptible to market and price fluctuations. In the pre-collapse era, larger processing plants with multispecies licenses especially for groundfish, pelagics and shellfish were economically more successful [30]. Fishing firms with stronger marketing wings and branding such as the former Fisheries Product International and National Sea Product (Highliner) were more successful in acquiring global market share [29]. Small processing plants are more vulnerable to insolvency because of debt to equity concerns, in addition to poor asset utilization strategies [28]. In the post-collapse era, larger companies were able to keep their market share by importing groundfishery from the Barents Sea to keep their processing operations on-going [3]. Currently, most of the secondary processing for groundfisheries including cod is done in low cost countries especially China [2]. Key informants interviewed in the fishing industry, in addition to policy analysts, maintained that these financial indicators were key concerns during the post-collapse period, with the cost-price squeeze affecting profit margins for fish harvesters, small-scale processors, brokers and distributors in diverse ways.

In the event of cod recovery, other structural challenges are evident for the processing industry as most of the plants are equiped for shellfisheries only, with few cod processing infrastructure remaining. Cod products may also require diversification and secondary processing for niche markets, and white table-cloth restaurants, to be profitable. Stakeholder responses towards marketing options include direct wharf sales especially to local consumers, the formation of cooperatives for high end sales to retaurants, auctions and direct bidding. Branding and eco-certification were also mentioned by key informants as key for future economic opportunities, considering the role of third party labelling such as Marine Stewardship Council (MSC). Eco-certification initiatives for Pacific cod by the MSC in the Gulf of Alaska also raise questions about market access for Canadian cod products upon full recovery. Current challenges with fish price setting and social relations between the harvesting and processing sectors pose concerns for marketing initiatives and economic viability of seafood trade.

The *Fishing Industry Collective Bargaining Act* of 1971 governs fish price setting between fish harvesters and processors in NL. Following disputes in the early 1990s regarding dockside price for shrimp, binding arbitration was put in place and an amendment to institute a Fish Price Setting Panel (for details see the 2005 Cashin Report and the 1998 Vardy Report[vii]). Both the harvesters (Fish, Food and Allied Workers-FFAW) and processors (formerly Fisheries Association of Newfoundland and Labrador) work in union and alliances to lobby and bargain fish price for their entire memberships. According to the Standing Fish Price-Setting Panel Report for 2008/09 on collective bargaining on fish prices, out of ten key species targeted in the province, agreement was reached for only five[viii]. Similar disagreements on price setting

were evident for the 2010 year especially for crab[ix]. Proposals for government intervention through subsidies in settling fish price disputes may run afoul of international trade rules especially under the Doha Rounds of the World Trade Organization and on the *Agreement on Subsidies and Countervailing Measures.*

Schelling (1960) refers to such fisheries collective bargaining acts as 'tacit', implying common interests amongst stakeholder groups but with anticipated expectations that mostly deal with distributional concerns. Such collective bargaining approaches can be beneficial in providing lobbying power for groups but can also become a 'closed shop', as agreement for large groups can be difficult and often leading to internal dissents especially in the absence of non-collective gains [36]. A review of the resource governance and political economy literature underscores four related options in dealing with stakeholder groups and collective social dilemmas in policy decision-making. These include: 'selective incentives' for persuasion of smaller groups or coercion from powerful groups [36]; building social capital through trust, reciprocity, common values and social norms [37]; arbitration agreements that are enforceable and binding to the parties [38]; and initiating policy entrepreneurship and power brokerage between politically powerful groups or coalitions [39]. These options were well echoed by several key informants regarding the fisheries production chain; in addition to good leadership, credible labor relations, and better interactions between policy makers in all levels of government.

CONCLUSION

In this contribution, a fish chain approach is employed to understand market drivers for sustainable seafood trade for cod and related fisheries in the Northern Gulf of St. Lawrence for the pre- and post-collapse priods. Drawing upon the backward bending supply model of fisheries [8], these analyses provide the case for effective institutional mechanisms and comprehensive fisheries policies across the entire fish chain for recovery and a viable industry. As theoretically argued by Copes (1970), and from the emperical findings on the pre- and pos-collapse analysis of Northern Gulf cod fisheries, there is a need to closely align policy instruments to changing ecosystems, resource supply, fleet and processing capacity, stakeholder dynamics, marketing and consumer needs. Market considerations in fisheries need to transcend traditional constant supply chain assumptions [6] to encompass ecosystem dynamics especially in the Northern Gulf where some stocks have collapsed and others are lucrative. Fish supply chains are also very complex and dynamic as most seafood products are traded globally, and that seafood products are easily substituted and masks resource supply constraints. This underscores stronger governing interaction amongst the harvesting, processing and marketing sectors, as well as institutional arrangements for multispecies approaches, stakeholder collaboration for price setting, value addition, and marketing initiatives for a viable fishery.

Despite the implementation of policy measures such as reduction in fishing quotas, vessel buybacks, and income support programs in the Northern Gulf fisheries, there is slow progress for cod recovery as evident by poor stock abundance [1]. Governance mechanisms are key tools to achieve fisheries recovery, compliance to regulations, and cooperation amongst stakeholder groups for a viable fishing industry [40]. These mechanisms may include conservation incentives, community involvement in policy development, and exploring diverse policy options and solutions with stakeholder groups along the fish chain [41]. The SARA policy process seems unsuitable to respond to resource sustainability concerns for commercial fisheries [42]. The current recovery prospects for Northern Gulf cod stocks are constrained by the lack of rebuilding targets and implementation measures. There is yet a holistic and integrated approach for fisheries rebuilding that considers supply chain management concerns, multispecies approaches, in addition to marine spatial planning and integrated management.

To date, the recovery success and viability of several commercial species in the US reflects on three critical features of institutional mechanisms [43]. These include: (i) the 1973 Endangered Species Act, which deals specifically with conservation measures and recovery mandates, (ii) the 1996 Sustainable Fisheries Act that deals with implementing these measures and a rebuilding process to previous MSY levels, and (iii) regional fisheries management councils that coordinates with key stakeholders and agencies regarding policy development [44].

Based on these findings, I conclude that the future economic viability of the Northern Gulf fisheries depends on the implementation of effective governance mechanisms for multispecies approaches to rebuilding, appropriate policy instruments along the fish chain for stakeholder collaboration, shared stewardship, marketing initiatives and value-addition for greater profit margins.

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ENDNOTES

[i] Seafood choice redlisting of Atlantic Canadian cod products: http://www.seafoodsource.com/newsarticledetail.aspx?id=4294990365 accessed June 1, 2010.

[ii] Although the terms recovery and rebuilding are often used interchangeably in the fisheries literature, the term recovery in this study refers to increase in stock biomass from collapse state to historical sustainable levels or target reference points. Rebuilding signifies the policy process and institutional mechanisms essential for successful recovery of stocks and sustaining fishing-dependent livelihoods (for details see Khan and Neis, 2010).

[iii] Archival materials and policy documents were located at the The Centre for Newfoundland Studies and Maritime History Archives both at Memorial University of Newfoundland, as well as local Newspaper depositories.

[iv] Western Shorefast Newsletter, Spring 2009: http://www.curra.ca/documents/CURRA%20Newsletter%20-%20Spring%202009.pdf accessed June 2, 2010.

[v] Government of NL, Department of Fisheries and Aquaculture News Release and update on MOU: http://www.releases.gov.nl.ca/releases/2010/fishaq/0715n01.htm accessed July 16, 2010

[vi] Department of Fisheries and Aquaculture Press Release: http://www.releases.gov.nl.ca/releases/2009/fishaq/0212n06.htm accessed May 4, 2010.

[vii] See Cashin, R. 2005. Report of the Chairman on the Raw Material Sharing Review Committee. Vardy and Team Report, 1998. New Beginnings: Bringing Stability and Structure to Price Determination in the Fishing Industry. Taskforce on Fish/Crab Price Settlement Mechanisms in the Fishing Industry Collective Bargaining Act.

[viii] Standing Fish Price-Setting Panel Annual Report 2008/09: http://www.hrle.gov.nl.ca/fishpanel/pdf/FishPanelAnnualReport0809.pdf accessed May 4, 2010.

[ix] Standing Fish Price Settling Panel official website: http://www.hrle.gov.nl.ca/fishpanel/ accessed July 30, 2010.