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Gear sustainability assessment of the Newfoundland inshore northern cod fishery

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ABSTRACT

From an ocean-basin collapse to a limited reopening, the Newfoundland northern cod fishery is challenged by ecological and economic sustainability. Pivotal factors influencing resource sustainability involve the use of gillnets as the main fishing method and the perception of cod as a low value commodity. Considering gillnetting and two other methods used in this fishery, hand-lines and Newfoundland cod pots, we identified and assessed strengths and weaknesses of each as a basis for best practices management decisions. This assessment involved multi-criteria evaluations based on “ideal gear properties” (International Council for the Exploration of the Sea) adapted to incorporate criteria specific to this fishery. An index scoring system involving 20 ecological, economic and social criteria was developed and used to assess the three gears. Catch-related data collected onboard commercial fishing vessels and structured interviews on economic and social criteria assessments with fishers were collected. Literature reviews supplemented these data.

Hand-lining scored the best results on each of the three criteria, with significant advantages (minimal ecosystem impacts; economic and social incentives for an adaptive accessible fishery). Newfoundland cod pots had the second most sustainable results (benefits for cod population, interesting work conditions). Though this gear had economic disadvantages, Newfoundland cod pots ensure best catches for a quality-based fishery. Despite being the fishing gear most commonly used, bottom-set gillnets are the least sustainable method. Catch-related advantages (efficiency, size selectivity) are not adapted to a new quality-based fishery. Restriction of gillnet fishing and promotion of complementary hand-lining and pot fishing would support a best practices more sustainable approach.

1. Introduction

Fishing is a keystone of the culture and economy of Newfoundland and Labrador (NL), where the seafood industry is valued at approximately \$1 billion dollars/annum and employs more than 20,000 people in various sectors (Government of Newfoundland and Labrador, 2016). Fishing constitutes the economic and social backbone for rural communities, and Atlantic cod (*Gadus morhua*) in particular has shaped the history of NL and its inhabitants. Its marine ecosystem once supported the most productive and largest cod fishery in the world (Hutchings and Myers, 1995). Three decades of unsustainable intense over-fishing however drove the stock to commercial extinction (Shelton et al., 2006; Higgins, 2009).

The past decade has seen a small relative recovery of the stock, and since 2006 a perennial small-scale, inshore commercial fishery in the eastern waters of NL has been reopened. This fishery, referred to as the “Northern Cod Stewardship/By-catch Fishery” by the Northwest Atlantic

Fisheries Organization (NAFO) divisions 2J3KL (Fisheries and Oceans Canada [DFO] 2016a), restricts fishing gear (fixed) and vessel sizes (< 20 m). During the past decade, licensed fishers have been authorized to catch increasing cod quotas from 1350 kg in 2006 based on a 3-week season to 900–1360 kg/week during the 2016 September–November fishing season (DFO, 2016b).

Most fishers use bottom-set gillnets as primary gear (J. Diamond, DFO, pers. comm., 2016). Concern has however risen about their well documented collateral effects on marine mammals and seabirds. Thousands of harp seals (*Pagophilus groenlandicus*), harbour porpoises (*Phocoena phocoena*), humpback (*Megaptera novaeangliae*) and other whales and seabirds (e.g., common murre, *Uria aalge*) along with tonnes of cold water corals are entangled in gillnets each year (Lien, 1994; Davoren, 2007; Fuller et al., 2008).

Economic and social concerns have also emerged in relation to gillnet use. Lower quality catches with gillnets compared to other fishing gears and consideration of Atlantic cod as a “global commodity”

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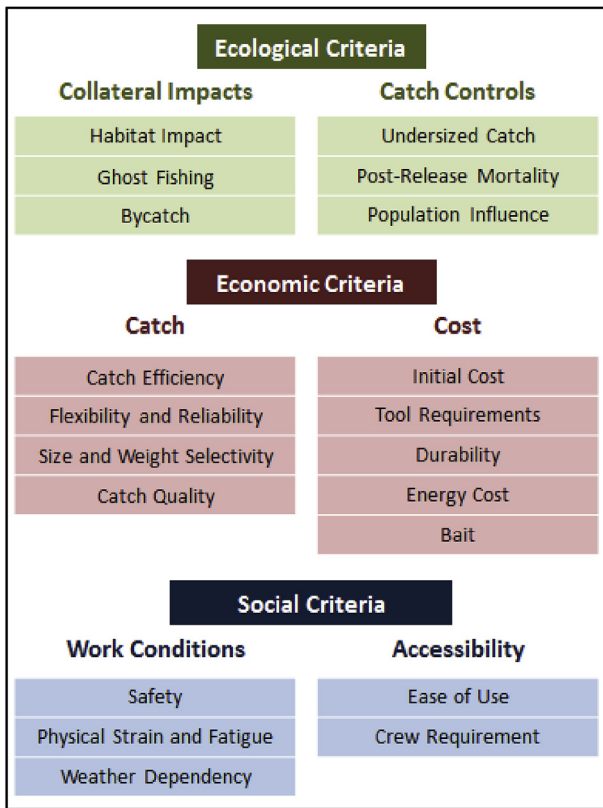


Fig. 1. Individual criteria used in the sustainability assessment.

(Chapman, 2015) led to low prices (DFO, 2016c). Top quality cod can be sold \$1.72/kg or more, though in 2015 inshore fishers sold their catches on average for \$1.17/kg (DFO, 2016c; Government of Newfoundland and Labrador, 2016). Hence about a third of the cod's commercial value is currently lost by NL inshore fishers. Consequently, a scarce resource is fished for a low price leading to an absence of attractiveness and dynamism in the fishery. In Iceland, where Atlantic cod has similarly provided the historic backbone of the fishing industry, the mostly trawl-gillnet fishery switched to a trawl-hook/line fishery during the last two decades (Global Trust, 2014). In the meantime, Icelandic cod has increased in value, notably for exported high quality fresh-chilled products (Hreinsson and Bender, 2015). Due to its catching process that ensures better quality, Icelandic cod is for example sold for about 25% more than Norwegian cod on the British market (Forberg, 2013; Watson, 2016).

With a modest relative recovery of the northern cod stock, the fishing industry is pushing for significantly increased quotas (Roberts, 2017). Assessments indicate that the stock grew by approximately 7% per year between 2014 and 2016 (DFO, 2016a). Such increases must be considered with extreme caution as the stock is only at 34% of the lower “critical zone” threshold defined by the Precautionary Approach framework (DFO, 2009; Rowe and Rose, 2017).

Recent actions by private organisations through the Fisheries Improvement Project (WWF, 2015) and by the recommendations of the federal Standing Committee on Fisheries and Oceans (Barry, 2017) advocate for a rebuilding plan. To date however and despite the Canadian Sustainable Fisheries Framework guidance, 25 years after the commercial cod moratorium, there is still no fully developed rebuilding strategy for northern cod (DFO, 2013; Barry, 2017). Harvest of a species considered endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2010) requires strict regulation and long-term management perspective.

A full commercial scale cod fishery could reopen soon in eastern NL.

Several fishery stakeholders are preparing and promoting a cod fishery that would move from past practices to a fishery based on quality rather than quantity through alternative catching methods (Roberts, 2016; Smellie, 2017a). Whichever scenario materialises, it will determine the consequences for fishing communities and the marine environment for decades. Therefore it is essential to provide the best information on options in the current fishery. Though targeting the same species, different fishing gear can lead to very different environmental and socio-economic impact. Here, we evaluate the overall sustainability of gillnets, hand-lines and cod pots to promote discussions about shifting to more profitable, more sustainable lower-impact fishing practices to ensure a resilient marine ecosystem (Chuenpagdee et al., 2003; Fuller et al., 2008).

2. Methodology

This assessment involved multi-criteria evaluations based on “ideal gear properties” identified by the International Council for the Exploration of the Sea (Polet and Depestele, 2010) that were adapted to data specific to this fishery and harvesting methods. An index scoring system involving 20 ecological, economic and social criteria (Fig. 1) was developed and used to assess: bottom-set gillnets, Newfoundland cod pots (from here on NL cod pots) and hand-lines.

Separate analysis of criteria was conducted to identify specific issues and areas of improvement for each gear. Some criteria are inter-dependent, and we present our results as a “catalogue” to facilitate fuller consideration by fishery stakeholders and to help identify the advantages and disadvantages of each gear. The ranking system and the evaluations of overall sustainability were based on a three-step scoring assessment: from criterion level, to category and finally scaling up to the sustainability assessment (Fig. 2). Owing to difficulties in quantifying many criteria, this ranking system provides a qualitative ordinal comparison of different gears.

When all criteria of each category were assessed, the modal value was calculated for each gear (Fig. 2), providing a categorical rank (from

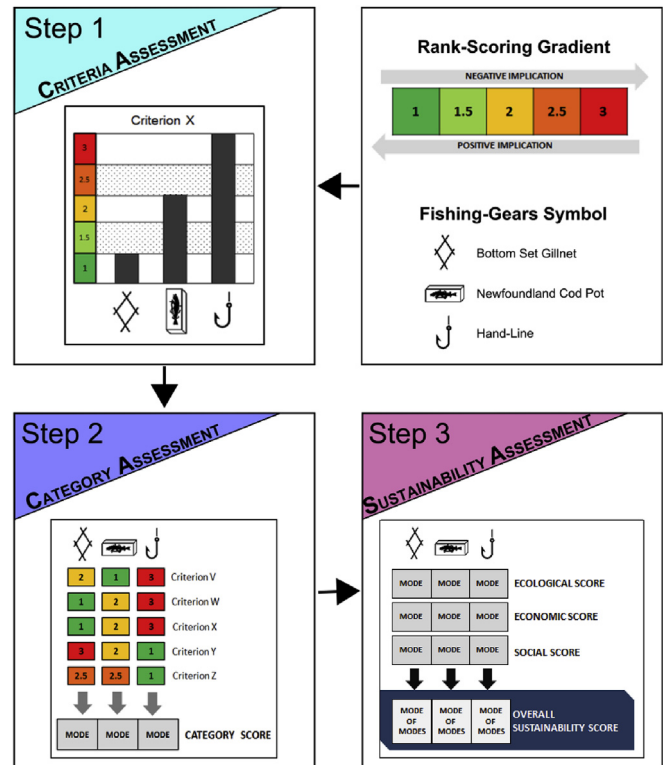


Fig. 2. Index assessment scoring system.

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