Journal of Environmental Management 210 (2018) 338–348

Contents lists available at ScienceDirect

Journal of Environmental Management

journal homepage: www.elsevier.com/locate/jenvman

Research article

A case for the commons: The Snow Crab in the Barents

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ARTICLE INFO

Article history:
Received 19 July 2017
Received in revised form
26 December 2017
Accepted 3 January 2018

Keywords:
Economics of invasive species
Property rights regimes
Open access fisheries
Snow Crab (*C. opilio*)
Fisheries economics
Svalbard fisheries protection zone

ABSTRACT

Closing of the marine commons increases economic returns and slows depletion of valuable ocean resources. Rights-based management is widely used for fisheries rationalization. Regulators with sound biological and economic information can in theory set overall harvest control rules that protect the fish stocks, and manage for external costs and benefits from harvest. These may include ecosystem damages, overcapitalization in the fishery, and/or equity concerns. Regulatory efforts and related rights-based management instruments may increase the returns to fishery stakeholders but miss important challenges that are increasing under climate change. These include transboundary resource management and tradeoffs between local economic returns and Total Economic Value. The case of the valuable, yet invasive, crab species, *Chionoecetes Opilio* (Snow Crab) in the Barents Sea illustrates the concerns. The spread of the crab has known and unknown ecosystem and commercial fishery risks, particularly to uncertain ecosystem values. We show how the progression of the biological invasion interacts with human strategic behavior to identify limitations of management options. Open access harvesting of the species in international waters has generated a positive spillover effect by slowing the westward spread of the species to sensitive benthic ecosystems. This benefit is threatened by reclassification of the crab as a "sedentary species" (one which is not capable of leaving the seabed when harvestable (UNCLOS, 1982, article 77, part VI)). This shifts the regulatory environment for the crab in ways that exacerbate the invasion in exchange for protection of local gains. Such problems will increase in magnitude and impact as climate changes increasingly affect species' ranges. Optimal decision-making regarding profitable species in new ecosystems must incorporate how strategic institutional shifts occurring in response to the economic incentives asymmetrically affect local and global stakeholders in addition to standard concerns over ecological and economic damages.

1. Introduction

The global fishing commons has shrunk and become increasingly overtaxed in the past half century (Jasper, 2010). This general trend has led to recommendations and actions that promote limited access through sovereign claims in the world's fisheries. It is well established in the fisheries economics literature that closing the commons produces a clear economic boon (Birkenbach et al., 2017; Munro and Scott, 1985), when utilized with private, decentralized, or common property management regimes (Ostrom et al., 1999). When concerns have been raised in the literature, they have generally focused on shifts in equality and distribution of benefits rather than overall benefit levels (Da-Rocha and Sempere, 2015). Here, we argue that the details of the ecological process matter significantly in determining the net benefits, further mitigating the realized economic gains. This is particularly true in cases of invasive species and species range expansions, which will continue to increase in frequency and extent under current climate change projections (Perry et al., 2005). We examine this complex story through the case of the Snow Crab (*Chionoecetes opilio*) invasion in the Barents Sea in order to bring awareness to important dimensions of commons management that the literature has missed.

The Snow Crab's recent introduction and spread in the Barents Sea is a harbinger of expected marine impacts from climate change. The biological invasion of this profitable species reflects the limitations of political, economic and ecological management of fisheries and transboundary marine resources that become more salient as climate change shifts habitat ranges for commercial

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https://doi.org/10.1016/j.jenvman.2018.01.007
0301-4797/

species. We provide a framework for understanding how the shifts in incentives initiated by such species movements may be integrated with biological factors, climate factors, and economics to inform policy analyses and decisions for improved outcomes. Multiple spatially differentiated property rights regimes affect the Barents' Snow Crab fishery. These provide comparative evidence from which we draw to illustrate the limitations of applying conventional wisdom regarding how to maximize benefits of marine resources, particularly in the case of invasive species.

The expanding presence of the Snow Crab in the Barents Sea has become a topic of growing interest for political analysts and scientific experts. The biological invasion has political, economic and ecological ramifications that extend far beyond the typical case of an introduced species. Political scientists have pointed out some of the existing challenges. These include the applicability of international invasive species agreements to a case with significant potential economic benefits, behavior of different stakeholders in international waters in the Barents, and the complex and disputed property rights surrounding Svalbard, into which waters the invasion is heading (Hansen, 2016; Tiller and Nyman, 2017). They rightly surmise that the stakes for Norway are higher than the value of the fishery alone. Norway is acting as though the Snow Crab's classification as a sedentary species creates a test case for cementing property rights to the Svalbard Continental Shelf (CS).

What the approaches of these papers have missed are the connected shifts in incentives that illustrate the importance of fully integrating biology, climate factors, and economics into policy analyses and decisions. Two property rights issues are at play in the Barents that affect the overall net benefit of the crabs' presence in the region. We examine economic incentives under these rights, and their biologically imposed constraints and spillovers, to explain how strategic regional decisions to conserve the crab stocks in the Barents may reduce global social welfare outcomes, and how maintaining uncertainty about these reductions increases the ability of local stakeholders to benefit at global expense.

The first property rights issue is the contention and uncertainty surrounding the extent of Norway's sovereignty over the Svalbard CS. Both the water column and the continental shelf of the Svalbard Fisheries Protection Zone (FPZ) have provided controversy for years. While Norway asserts the Svalbard CS and the Svalbard FPZ are theirs to manage and benefit from (Ministry of Foreign Affairs, 2009), Russia and others contest this view through the 1920 Svalbard Treaty, with the unique *terra nullius* arrangement on land extending to the continental shelf (Rossi, 2016; Thomassen, 2013). The Treaty recognizes Norwegian sovereignty over the area, while it simultaneously assures equal access and treatment of the signatory parties for commercial activities and natural resource extraction. The intensity of this controversy is increasing as resource pressures mount around the world.

The second property rights issue stems from changes involving the international waters of the Loophole between Russia and Norway. Fishing activity in the international waters of the Loophole, which is outside the Russian and Norwegian Exclusive Economic Zones (EEZs), is formally under the jurisdiction of the North-East Atlantic Fisheries Commission (Ebbin et al., 2005), but the new Snow Crab fishery there began with open access harvesting in 2012. At that time, both Norway and Russia had been studying the Snow Crab invasion and had yet to open fisheries inside their EEZs. In Norway, this is because there is little Snow Crab population in the EEZ; in Russia, this is because they wish the stock to support a long-term fishery.

During the 20th North Atlantic Fisheries Ministers' Conference (Valletta, Malta, 16–17 July 2015), Norway and Russia agreed on the designation of the crab as a sedentary species. This decision transferred its status from a water column species to a continental shelf resource (Joint Norwegian Russian Fisheries Commission, 2015). Tiller and Nyman (2017) point out that there is a general disagreement among states on whether the Snow Crab is sedentary or not, but Hansen (2016) notes that no countries have directly questioned its sedentary status in the Barents and therefore it falls under full sovereignty of Russia and Norway. Formal EU recognition of this designation remains part of the currently-defunct negotiations between Norway and the EU, with a proposed July 2017 statement confirming such recognition going unsigned (Council of the European Union, 2017). In the meantime, its designation as a sedentary species has shifted the crab from being a fishery resource in the international waters of the Loophole to a shelf resource that is Russian and Norwegian property on their respective portions of the continental shelf. These rights extend beyond the 200 nautical miles of both the Russian and the Norwegian EEZ. This closes the Loophole, placing about 85% of it on Russian CS and the rest on Norwegian CS.

The provisions of the United Nations Convention on the Law of the Sea (UNCLOS) allow the two countries to exercise sovereign rights over their extended continental shelves and therefore to explore and to exploit the natural resources lying on the shelf, one of which is now the Snow Crab. Furthermore, the designation of the species as sedentary implies that there is also no requirement by the UN Fish Stocks Agreement for managing the species in cooperation. This is not undisputed. The North-East Atlantic Fisheries Commission (NEAFC) has the responsibility to "ensure the long-term conservation and optimum utilization of the fishery resources in its Convention Area, providing sustainable economic, environmental and social benefits," within the international waters of the NEAFC Convention, which includes the Barents Sea Loophole (NEAFC, 2017). This organization tracks licenses issued by the European Commission to vessels for Snow Crab fishing in the Loophole. In fact, NEAFC's authority to track European Commission licenses in the Loophole stems from earlier disagreements over cod fishing that began when climatic changes increased cod in the Loophole (Stokke, 2001), serving as another precedent for the challenges ahead.

The sedentary species designation increases the potential Russian stake in the Barents Snow Crab by increasing their control of the fishery asset. The extent to which they exercise control over this area will be a function of the incentives to spend on enforcement of their fishery regulations. Russian and Norwegian incentives and management of the crab before and since the designation mean that the positive externality generated by the open access harvesting in the Loophole (67,100 km^2 on the invasion's frontier) is disappearing as the Russians extend enforcement outside their EEZ. We argue that, as the Russians have so far maintained a closed and limited experimental, and now TAC controlled commercial, fishery for *C. Opilio* in the Barents, such extension of the enforcement is expected to continue. Russian enforcement may also help Norway more than it helps Russia itself; Russian closures increase the probability of more and longer term crab stock in Norwegian waters. Thus Norway may have more incentive to close their portion of the commons and to encourage the Russians to do the same.

Should both Russia and Norway successfully close the commons and manage the areas for maximum economic yield, the question of whether the capture of these resource rents is greater than global losses from the spread of the invasion westward is still an open one. Concerns about uncertain damages remain unalleviated. Potential externalities from a spread of the crab beyond Norwegian and Russian jurisdictions present additional, though uncertain, costs.

Finally, lessons from dynamics of Snow Crab populations in Canada, Greenland and the Pacific may be pertinent to the management in the Barents. Evolving climatic conditions may have