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The role of property rights in bycatch reduction: Evidence from the British Columbia Groundfish fishery

Tonya Edinger, Jungho Baek*

Department of Economics, School of Management, University of Alaska, Fairbanks, United States

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ABSTRACT

We seek to contribute to the literature by examining the effectiveness of the individual vessel bycatch quota (IVBQ) system as an incentive structure for the mitigation of halibut bycatch in the British Columbia Groundfish fishery. An autoregressive distributed lag (ARDL) approach to cointegration is used as the empirical method. We find that the IVBQ system has proven to be highly effective, confirming the significance of private property rights as a tool for the reduction of bycatch within British Columbia. Policy makers can utilize the information provided in this paper to design more feasible and effective policy options to promote the preservation of ecological balance in the management of marine resources.

1. Introduction

Oceans cover the majority of the Earth (71%) and are considered to be a common pool resource (Pinkerton, 2009). The oceans' fisheries provide a vital protein source for the world's population. Yet when a resource belongs to everyone, it belongs to no one. The implications of common pool resources are widespread and are particularly applicable to the world's fisheries. The simplest fishery model is that of open-access, containing no barriers to entry or fishing effort restrictions. The open-access model suggests that lucrative fisheries will attract increased fishing pressure until stocks are depleted and profit levels are similar to alternative opportunities. Without supplemental incentives, fishermen have little motivation for long-term investment in the fishery (Schlager and Ostrom, 1999). The incentive structure is such that the fishermen will increase fishing effort and continue to reap the benefits while the negative consequences of the resource depletion are dispersed amongst all stakeholders. Various marine policies have responded in attempts to avoid this tragedy of the commons scenario (Hardin, 1968).

Initially proposed by Moloney and Pearse (1979), market-based tools and privatization of access and withdrawal rights were first implemented in New Zealand and Iceland in the 1970s. Individual Transferable Quotas (ITQs) are used to establish a maximum limit on the quantity of fish that can be withdrawn by each vessel. This transferable economic tool creates a market for the quotas and is specifically intended to internalize the negative externality of resource exploitation and degradation. ITQs are utilized as a tool to increase economic rents, increase safety due to increased flexibility, reduce overcapitalization and provide better product quality. The use of ITQs has become increasingly prevalent within present-day marine resource management regimes and the quota system has proven to be largely effective in providing an incentive framework to promote sustainable management of single species fisheries (Costello et al., 2008). Yet these advantages are paired with tradeoffs. The basic ITQ incentive structure tends to promote stewardship of a single-species at the expense of multi-species interactions; the ITQ system does not necessarily encourage fishermen to attend to habitat linkages (Pinkerton, 2009). Despite the proven effectiveness of ITQs for managing single-species fisheries, previous empirical studies have not yet reached a definite consensus specifying the ecosystem impact of an ITQ system. The quotas themselves are often criticized for their neglect of these complex multi-species interactions. In some cases, an increase in discarding and illegal fishing has been reported. Despite various theoretical claims, the complexity of the interactions has caused the relationship between ITQs and the broader ecosystem to remain relatively ambiguous.

Our empirical analysis will focus on the British Columbia Trawling Groundfish fishery, Area 2B, and the innovative implementation of an individual vessel bycatch quota system to manage incidental catch (Fig. 1). Incidental catch or bycatch (hereafter bycatch) is defined as "fish which are harvested in a fishery, but

* Corresponding author. Tel.: +1 907 474 2754; fax: +1 907 474 5219.
E-mail addresses: tmedinger@alaska.edu (T. Edinger), jbaek3@alaska.edu (J. Baek).

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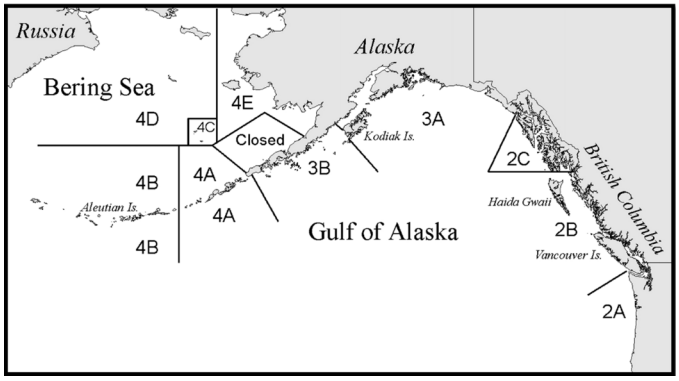

Fig. 1. Migratory span of Pacific Halibut in the Pacific Northwest.
Source: NOAA Fisheries, http://alaskafisheries.noaa.gov/maps/iphc/areas_lrg.gif

which are not sold or kept for personal use, and includes economic discards and regulatory discards" (Devido, 2006). Groundfish trawling is a nonselective harvesting technique and, due to ecological interdependence, fishermen are likely to harvest Pacific Halibut (*Hippoglossus stenolepis*) although Groundfish are the targeted species catch. Joint harvesting presents fishermen with a complex set of trade-offs as the optimal exploitation of one stock will rarely result in the optimal harvesting of another. Abundant species are inevitably found to be mixed with overfished species presenting significant challenges to fishing vessels. Pacific Halibut weigh in at an average of five hundred pounds and can measure nearly eight feet in length. The Pacific Halibut are migratory in nature and span the Pacific coast as seen in Fig. 2. When halibut are incidentally harvested in the Groundfish fishery, they do not have an economic value although the species is quite valuable elsewhere. As retention of the Pacific Halibut has been prohibited in the trawl fisheries, the bycatch must be discarded and cannot be sold at market value. The trawling industry in general is a low value, high volume fishery with limited capability for adaptation to higher costs or lower prices. Moreover, the trawl sector is the largest fishing sector in the province of British Columbia in terms of catches, revenues, and employment on boats and within processing plants. British Columbia's coastal communities are becoming increasingly dependent on Groundfish trawling operations. Correspondingly, any decreases in total allowable catch (TAC) for the purpose of reduced bycatch tend to put the communities at financial risk (GSGislason, 2010). As a result of the previously mentioned factors, the bycatch problem is both economic and ecological in nature.

An ITQ system was implemented within the British Columbia Groundfish fishery in the year 1990. The ITQ system establishes quasi-property rights and the quotas are designated as a percentage of the variable total allowable catch. The ITQs were based 70% on catch history and 30% on vessel length. The British

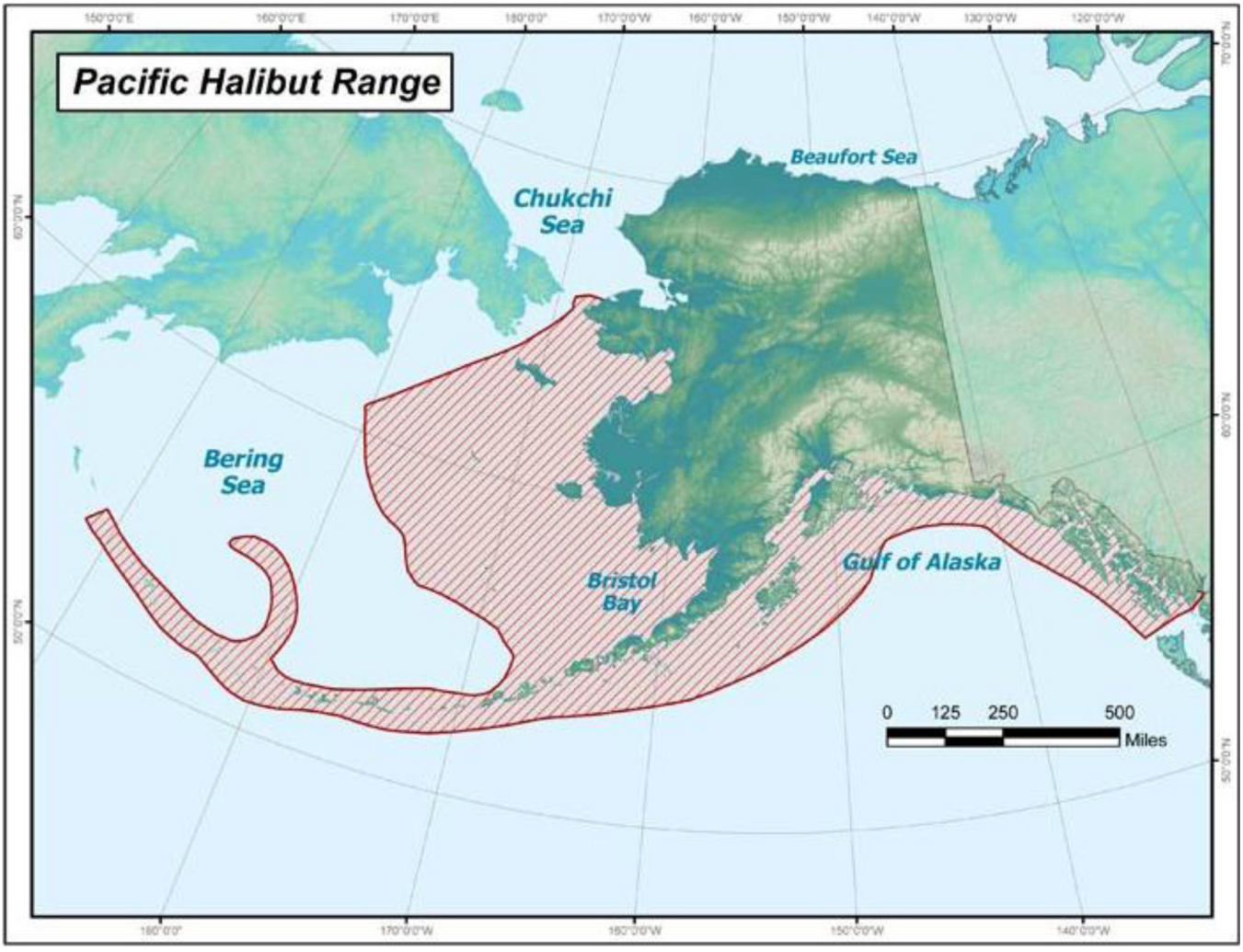

Fig. 2. Fishery regulatory areas of the Pacific Northwest.