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Economic characteristics and management challenges of the Hawaii pelagic longline fisheries: Will a catch share program help?

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ABSTRACT

To date, none of the fisheries in the U.S. Pacific Islands Region is managed under a catch share program. In light of the NOAA policy to encourage the use of catch shares as a fishery management tool, the Western Pacific Fishery Management Council (WPFMC) listed six commercial fisheries, including the Hawaii pelagic longline fishery, the largest in the region, as potential candidates for catch share programs. This study examines the baseline economic characteristics and the main challenges facing the Hawaii pelagic longline fishery and evaluates the impact of these on the desirability and feasibility of a catch share program for this particular fishery.

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1. Introduction and purpose

Open-access fisheries are well-known examples of common property resource exploitation. The modern theory of fisheries economics, introduced by Gordon [1], showed that the common property nature of fisheries can result in unfeterred competition, which can ultimately lead to overexploitation of fisheries resources and economic inefficiency [1,2]. An FAO report on the state of world fisheries in 2006 indicated about 25% of world fish stocks were overexploited or fully depleted [3]. In the United States, various forms of management have been undertaken to limit and control fishing mortality, especially since the Magnuson-Stevens Fishery Conservation and Management Act was established in 1976. However, a number of U.S. fisheries are under-performing biologically and economically. Recent stock assessments indicated that overfishing is occurring in 10% of fish stocks, and 19% of the fish stocks were classified as overfished in the U.S. [5]. The present productivity of U.S. fishery resources is 24% below long-term sustainable yield [6].

To improve fisheries management, NOAA released a policy in 2010 to encourage the consideration and use of catch shares as a fishery management tool. It stated: "The purpose of this policy is to provide a strong foundation for the widespread consideration of catch shares, which have proven to be an effective tool to help rebuild fisheries [6]". 'Catch shares' is a generic term used for fishery management systems that dedicate to individuals, communities, or associations a secure privilege to harvest a specific area or percentage of a fishery's total allowable catch (TAC). Catch shares are a rights-based management tool including individual transferable quotas (ITQs), individual fishing quotas (IFQs), territorial use rights fisheries (TURFs), limited access privileges (LAPs), etc. [6]. Theoretically, catch shares mitigate the problems associated with the common property nature of a fishery by providing security and exclusivity to the resource, hence providing an incentive for efficient and sustainable use of fish stocks [7]. The global expansion of the adoption of catch share management started around the 1970s [4]. Some countries, such as Iceland, New Zealand, and Australia, have made catch share programs their default management system. In the United States, the first catch share program was implemented in 1990. Up to 2010, when the NOAA catch share policy was published, catch share programs were adopted in 14 fisheries [6].

Research has found that the outcomes of existing catch share programs in terms of ecological, economic, and social impacts are varied [4,8,9]. Careful design and evaluation is required to ensure the success of a catch share program [9,10]. The NOAA catch share policy requires that the eight Regional Fishery Management Councils address the allocation of shares prior to the implementation of any catch share system, and that conservation, economic, and social criteria all be used in an allocation process.

In support of this requirement, this paper describes the detailed economic and operational characteristics of, and management issues facing, a high-value western Pacific fishery, the Hawaii pelagic longline fishery that targets tuna and swordfish. This fishery has faced several challenges (including catch limits on bigeye tuna to conserve the bigeye stock and regulations to limit interactions with protected species) and is not managed via catch shares. The question is whether, given the economic and

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operational characteristics of this fishery, a catch share regime would effectively address these management issues.

2. Background and context

The U.S. Pacific Islands Region extends from on the Hawaiian Archipelago in the north, to American Samoa in the south, includes the U.S. Pacific Remote Island Areas (PRIAs), and extends westward to the Mariana Archipelago, including Guam. The U.S. exclusive economic zone (EEZ) within this Region is an area of nearly 388 million square kilometers (150 million square miles), comprising 48% of the total U.S. EEZ in all regions [11]. Fisheries in the U.S. Pacific Islands Region EEZ are economically and culturally important to the people of the region. The total value of the U.S. commercial fisheries landings from the region, (including the high seas, but excluding the U.S. purse seine fishery) was nearly $101 million in 2011. The largest of these fisheries is the pelagic longline fishery of which Hawaii accounts for approximately 66% of landings. Even though the landings by weight are relatively low compared to other ports in the nation, Honolulu has ranked in the nation′s top ten fishing ports in terms of value of landings for many years. It ranked fifth in the nation in 2008 and accounted for nearly three-quarters of the total value of the U.S. Pacific Islands Region fisheries, excluding the purse seine fishery [12].

None of the fisheries in the Pacific Islands Region operates under a catch share program. In response to the NOAA catch share policy, the Western Pacific Regional Fishery Management Council (WPRFMC) identified six commercial fisheries as potential candidates for catch share programs. One of the identified fisheries, the Hawaii pelagic longline fishery, is the largest commercial fishery in Hawaii and also the largest commercial fishery managed by the WPRFMC. The two sectors of the fishery target different species, bigeye tuna (*Thunnus obesus*, using deep-set gear) and swordfish (*Xiphias gladius*, using shallow-set gear), and also take and retain a variety of other pelagic species.

Management of the bigeye tuna stock in the Pacific Ocean has become a complex task. Bigeye tuna are a transboundary resource. Bigeye catch limits imposed on the Hawaii longline fishery are determined by two Regional Fisheries Management Organizations (RFMOs): the Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC). Each RFMO allocates a region-specific bigeye quota to the U.S. pelagic longline fishery operating in its area of jurisdiction.

3. Economic and operational characteristics

3.1. Development and effort trends

There were 128 active fishing vessels in the Hawaii pelagic longline fleet in 2011. These vessels landed 11.7 million kilograms (25.7 million pounds) of pelagic fish valued at $75.9 million in 2011 [14]. The average vessel length was about 24 m (80 ft), but some were as small as 15 m (48 ft) or as large as 30 m (98 ft). Bigeye tuna and swordfish, both high value products, are the main species caught in this fishery. Since 1992, the number of active vessels had been steady but the actual fishing effort (number of hooks employed) continued to increase.

Pelagic longline fishing has been conducted for a century from Hawaiian ports [15]. Prior to the late 1980s, the fleet consisted of wooden sampans, many of which had switched from pole-and-line gear to rope longlines. At that time, fishing was mainly conducted within 37 km (20 nm) of the coast. Participation in the fishery increased dramatically in the late 1980s, both in terms of number of vessels and their size and horsepower. Fig. 1

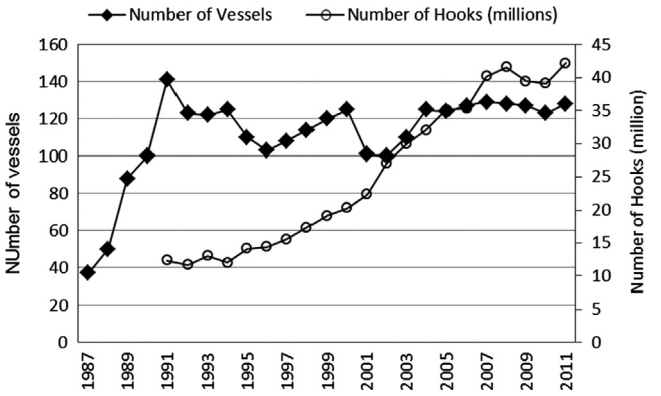

Fig. 1. Number of vessels and hooks in the Hawaii longline fleet, 1987–2011 [17].

illustrates the trends in fishing effort by the Hawaii longline fleet from 1987 to 2011. The number of vessels in 1987 was 37; by 1991, the number of vessels had increased to 156. Concern about the rapid growth in vessel numbers and the even greater increase in fishing effort motivated the implementation of a limited entry program in 1991, with a cap of 164 vessels and a vessel size limit of 101 ft. Under this program, permits are annually renewable and freely transferable, but no new permits can be issued. Since implementation, the number of active vessels has stabilized; over a recent eight year period (2004–2011), the number of active vessels ranged from 124 to 129. The annual average number of trips per vessel has also remained nearly constant at around 12 trips per vessel. However, over the same time period, the total number of hooks deployed by the fleet has steadily increased. The total number of hooks deployed in 2011 was 42.2 million, which was more than three times the number deployed in 1991[1], while during the same time the number of active vessels declined from 141 to 129. That is, the number of hooks deployed per vessel increased even more dramatically than did the total number of hooks deployed.

Results of a 2004 survey of trends in the adoption of technological improvements in the Hawaii longline fleet indicated that advances in technology have facilitated the increase in fishing intensity (number of hooks per vessel) in the Hawaii pelagic longline fleet [16]. The adoption of and improvement in monofilament fishing line made it possible to deploy a longer main line with more hooks. Before the mid-1990s, monofilament main lines were limited to 1000 to 2000 hooks; current monofilament gear now allows 2000 to 3000 hooks per spool. The increasing number of hooks contributed to the improvement of productivity of each fishing set (usually one set for one fishing day). Data from the 2004 survey [16] and catch data were used to estimate the parameters of a Cobb–Douglas production function that describes the impact of variable inputs, capital stock, and technological factors on the productivity of longline vessels. The estimates suggest that the number of hooks per set (per fishing day), vessel speed, and fishing days per trip had significant positive contributions to productivity. These results suggest that fishermen had a strong incentive to invest in newer monofilament line and, in turn, increase the number of hooks they could deploy. As a result, the limited entry program, which capped the growth of the number, and size, of vessels, did not prevent the increase of active fishing efforts in the fishery.

In the meantime, the fishery expanded its fishing grounds mainly from the EEZ toward the high seas. By the early 1990s, the

[1] The data for the number of hooks are not available before the logbook reporting system was implemented in 1991.