

Limited-access Privilege Programs in the Mid-Atlantic Fisheries

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Introduction

A catch share program is a generic term associated with fishery management strategies that allocate a specific percentage of the fishery catch to individuals, cooperatives, communities, or other entities. It includes more specific programs such as Limited Access Privilege Programs (LAPP's).

The Fishery Conservation and Management Act of 1976 (later renamed Magnuson Fishery Conservation and Management Act and then Magnuson-Stevens Fishery Conservation and Management Act) created a new national program for the conservation and management of marine fishery resources. Fishery Management Plans (FMP's) were to be developed by eight regional fishery management councils and implemented by NMFS.

In 2006, Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (hereafter referred to as the Reauthorization Act), urged regional councils to use more LAPP's in federal fisheries management (NMFS, 2007). LAPP's had also been speci-

fied as a priority in the U.S. Ocean Action Plan¹ and Executive Order 12866, signed by President William J. Clinton in 1993, which established the guiding principles agencies must follow when developing regulations.

In 2005, under President George W. Bush, NMFS pledged to double the number of fisheries managed under LAPP's (from 8 to 16) by 2010. In 2010, the Obama administration solidified its commitment to catch shares by issuing a Catch Share Policy (NOAA, 2010) to provide guidance and support on the design, implementation, and monitoring of catch share programs. This policy provides a foundation for facilitating the widespread consideration of catch share fishery management plans (FMP's) while enabling local fishermen and communities to be part of the process.

This article explains what LAPP's are, how they work, and what benefits and costs can be expected from their implementation. First, a brief history of fisheries management helps explain how LAPP's evolved. This is followed by an explanation of the economic incentives behind LAPP's, in the context of two fisheries in the U.S. Mid-At-

lantic Region—the Atlantic surfclam/ocean quahog, *Spisula solidissima/Arctica islandica*, fishery and the tilefish (also known as the golden tilefish), *Lopholatilus chamaeleonticeps*, fishery.

Limited-Access Privilege Programs

Prior to 1976, U.S. marine fisheries were managed in a completely open-access environment, with few restrictions placed on foreign or domestic fishermen or their activities. Competition among fishermen under open-access conditions creates incentives for the industry to expand, over-exploit, and eventually deplete the resource (as described by the popular phrase “tragedy of the commons”), resulting in overcapacity and overfishing (Anderson and Holliday, 2007).

With the passage of the Fishery Conservation and Management Act of 1976, fisheries management began to evolve, using various combinations of input and output controls. Input controls were put in place to restrict vessel activity in various manners, by regulating the type and/or amount of gear, or by restricting fishing areas or fishing times.

Output controls were also established that aimed to limit the amount of catch or harvest in a fishery, such as limits on a total allowable catch (TAC) or individual trip catch. These too had a downside. A hard TAC (a predetermined catch level that is paired with a within-season closure provision) implemented for a fishery as a whole often leads to heightened competition to catch as much fish as possible before the annual limit is reached; a “derby fishery” in which there is a “race to fish.” Gear restrictions and trip limits

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¹The plan, subtitled The Bush Administration's Response to the U.S. Commission on Ocean Policy, is available online at http://www.cmts.gov/downloads/US_ocean_action_plan.pdf.

ABSTRACT—The use of limited-access privilege programs (LAPP's) in fisheries management offers an incentive for collaborative management while also addressing economic incentives. This paper provides an overview of the development and use of limited access privilege programs by looking at a review of potential benefits and the arguments against them. It focuses on examining

*the historical context of two specific applications in the Mid-Atlantic—the Atlantic surfclam, *Spisula solidissima*, and ocean quahog, *Arctica islandica*, fishery, and the tilefish, *Lopholatilus chamaeleonticeps*, fishery. Structural components of these programs are presented along with a description of notable changes in these two fisheries since the implementation of LAPP's.*

can lose their effectiveness through technological improvements, and with both output and input controls, there are no incentives for fishermen to delay or abstain from fishing, because “any fish not caught is likely to be taken by someone else” (Anderson and Holliday, 2007).

Councils then turned to limited-access programs, initially with no additional controls. Unfortunately, simply limiting the number of participants (frequently too late for the stock to recover) was not enough to eliminate the race to fish among those allowed in the fishery. Fishermen upgrade vessels, adapt to new technologies, and increase trip length, until very short seasons result.

Acknowledging the failures with traditional open-access and limited-access approaches, managers have looked toward LAPPs², in which individuals are granted the privilege to catch a specified portion of a science-based TAC. The idea behind a rights- or market-based approach is to mimic the characteristics of a property right. One of the central arguments in favor of this approach is that this sets up an efficient market where costs are minimized and economic benefits maximized.

Under this type of access control, the vessel-level incentives are to catch the complete owned share of the TAC at the lowest cost possible and to sell at the highest possible price. According to the Reauthorization Act, limited access privilege programs encompass a range of privileges assigned to entities constituted either by individuals (i.e., individual fishing quotas) or groups (e.g., corporations, cooperatives, and area-based groups).

The total annual harvest quota (or total allowable catch) for a species is divided into quota shares that are then assigned to eligible entities. By using a broad definition of entity, more options are available for the councils to consider. Not every entity in the fish-

ery at the time a LAPP is designed necessarily receives a share, and some entities receive much larger shares than others. The size of the share can be based on landings in specific years (entities with higher landings receiving larger shares) or on many other factors. Each entity’s quota represents the right or privilege to harvest a quantity of fish, usually expressed as a percentage of a fishery’s TAC.

The primary goal in using a LAPP is to correct for the problems resulting from incentives provided by regulated open-access regimes. Without strong enforcement of the TAC, the race to fish and the desire to get around regulations may lead to low stocks and fleets with larger capacity than necessary. A LAPP, on the other hand, creates incentives to harvest quota shares as efficiently as possible and to process the catch to maximize the quota share’s net value to the entity.

One of the key elements of a LAPP is a scientifically determined, fully enforced constraint on the total number of fish caught and landed. Fleet-level benefits may include the efficiency gain in production from fishing capacity reductions; greater rewards for conservation, and stewardship; reduced bycatch (when there is adequate monitoring); and more efficient use of fish products by processors.

When instituted in a derby fishery, a LAPP ends the incentives to race to catch fish. Vessel owners can plan to harvest their quota at any time throughout the year, resulting in safer working conditions and higher-quality products, as well as more flexibility in adjusting to regulations and the ability to participate in other fisheries during appropriate seasons. This leads to more economic certainty for fishermen and a more stable supply of fish.

Supply disruptions are reduced or eliminated when fishermen are no longer faced with closures imposed to prevent an allocated seasonal quota from being exceeded. The incentives under a LAPP tend to maximize the difference between the value of the harvest and the costs of catching those

fish, both for the individual entity and from a national perspective.

A LAPP often allows a quota holder to transfer the harvest privilege, by sale, lease, or other method, to another entity. Such transfers allow for long-term planning and may be expected to reduce the number of firms or fishermen and vessels, and consolidate the quota among the more efficient fishermen, subject to limits on excessive accumulation of shares. Leasing (or the transfer of the annual harvest privilege) allows short-term flexibility to change vessel behavior in response to outside factors.

Unrestricted quota trading promotes economic efficiency, because those willing to pay the highest price for quota would be those expected to use them the most profitably, by catching fish at a lower cost or transforming the fish into a more valuable product (GAO, 2004). Transferability is crucial to letting the market allocate scarce resources in an efficient manner. Transferability allows shares to acquire value as assets, regardless of whether the holder earns income from fishing. Lastly, those wishing to leave the fishery receive compensation for their shares, not simply for the vessel and equipment remaining after a career in an open-access fishery.

To address the initial challenges in designing LAPPs, the NMFS Office of Policy directed the development of a document on LAPPs informed by a steering committee comprised of NOAA, FMC’s, and other personnel experienced with such programs (Anderson and Holliday, 2007). The guidelines evaluate “the relative pros and cons of various approaches and address general questions about the future use” (Anderson and Holliday, 2007:iii) of LAPPs given past experience with domestic and international programs. Since then, NOAA’s Catch Share Policy (2010) further refines a series of guiding principles to follow to ensure the best catch share design, implementation, and outcomes.

These principles include the thorough examination of specific management goals, initial share allocation,

²These have in the past been variously referred to as individual transferable quotas (ITQ’s), individual quotas (IQ’s), individual fishing quotas (IFQ’s), community quotas, etc.

transferability of share, duration, recovery of program cost from its participants, review process, eligibility criteria, and share accumulation. The two LAPP programs described here were designed separately by the Mid-Atlantic Fisheries Management Council (MAFMC), with differing approaches to the set of guiding principles. Not surprisingly, in the design of LAPP's, there are many components to consider which may/may not benefit participants and depend on the specifics of the particular fishery. Some of the more controversial individual criteria will be addressed later for a specific fishery.

There have been ongoing debates about both the effectiveness and the limitations of catch shares as a fisheries management tool. Critics point to some potential drawbacks of LAPP's. The most difficult task in implementing LAPP's involves the allocation of initial quota shares. The Reauthorization Act emphasizes that initial allocations must be "fair and equitable" and consider "current and historical harvests, dependence upon the fishery," and "the current and historical participation of fishing communities" (NMFS, 2007:83). These phrases can be subject to various interpretations and highlight the difficult nature of the decision.

Other factors that may cause concern include the possible concentration of wealth in the hands of a few, monopolization, concerns about equity among vessel size classes and communities, and the need for careful monitoring. The Reauthorization Act requires the establishment of limits on acquisition of excessive shares and consideration of small vessels and their crew members. LAPP's create incentives to reduce labor and capital inputs. In so doing, they may cause social disruption during their implementation, as allocations favor some and disfavor others, and while excess harvesting capacity is retired or moved into other fisheries, and processing capacity switches to different products or product forms.

Critics also argue that LAPP's allo-

cate public resource rights to private citizens and that they reduce fishermen's access to a public resource. The NMFS guidelines (NOAA, 2010) suggest that these programs can create privileges with characteristics that provide many of the same positive incentives as traditional property rights. These critical characteristics of property rights include exclusivity (degree of control over right), permanence (duration of the right), security of the right, divisibility, and the transferability of the right (Anderson and Holliday, 2007).

In effect, fish stocks are a publicly owned resource managed by LAPP's. This suggests that the property rights are not to the resource, but to the harvesting of a specified annual amount of the resource. The fish are private property after they are brought on board a vessel. In fact, the Reauthorization Act explicitly states that a LAPP is a permit that can be "revoked, limited, or modified at any time" and does not "confer any right of compensation to the holder" under those circumstance (NMFS, 2007:79).

Apprehension exists in the minds of many people about the potential costs of LAPP's, for example preventing new fishermen from entering the fishery, disruption of fishing communities, and eliminating fishing traditions. Fishery managers face the inherent tension between the economic goal of maximizing efficiency and the social goal of protecting communities or facilitating new entry (GAO, 2004).

In New England, a region adjacent to the Mid-Atlantic Region, managers have instituted an alternative to LAPP's: giving the harvest privilege, or allocation of catch shares, to sectors or subsets of the fleet. A sector, in this context, is a group of persons holding limited access vessel permits who have voluntarily entered into a contract and agreed to certain restrictions for some period and who, as a group, have been granted a TAC.

The contract is used to implement rules that govern harvest of the sector allocation. The fishermen within the sector allocate harvest shares

among themselves and may carry out other functions as well. The allocation to sectors is based on fishing harvests over an agreed-upon set of years. Whereas an individual harvest percentage is calculated for all qualified vessels, only those vessels that are members of a sector can take possession of a sector's share. Non-sector vessels continue to fish in the competitive common pool fishery.

A comparative study on the uses of individual fishing quotas vs. sectors concluded that a combination of the two approaches may work better than either technique alone (GAO, 2004). In general, deciding who should receive a quota and how much they should receive is a controversial and highly political process. In some cases, for example, in the mid-1980's between commercial and recreational Coho salmon, *Oncorhynchus kisutch*, in Oregon, an independent allocation panel, comprised of people from both interest groups, worked well in providing allocation decisions with long-lasting satisfaction (Morrison and Scott, 2014). Additionally, the use of sectors in the U.S. Northeast provides an alternative that keeps this allocation decision outside of the hands of government.

LAPP's in the Mid-Atlantic Region

The Atlantic surfclam/ocean quahog and tilefish fisheries in the Mid-Atlantic region have long benefitted from the fishermen's active involvement in the management process. In addition, both fisheries have characteristics that make them ideal candidates for LAPP's. Positive factors in the case of surfclam/ocean quahog include the lack of substitutes, the small geographic range of the bivalves, manageable number of vessels, small number of landing ports, good historical catch records, no recreational component, and a highly specialized gear type have helped make it a clean (i.e., low bycatch) fishery (NRC, 1999).

Several features of the tilefish fishery also make it an ideal case for LAPP (in this case, individual fishing quotas (IFQ)) management: the geo-

graphic range is restricted to a narrow band of ocean bottom along the outer continental shelf and upper continental slope, the numbers of vessels and vessel owners are very small, the number of landing sites is limited, it is a relatively clean fishery, and a recreational component, though growing, is not significant.

The Atlantic Surfclam/Ocean Quahog Fishery

The surfclam and ocean quahog (SCOQ) fishery off the U.S. Atlantic coast has a considerable history going back at least to the 1960's (Kulka, 2011). It follows quite closely the simplified history of rights-based fisheries management previously described. Demand for commercially harvested surfclams increased markedly in the early 1970's. As surfclams came to represent almost 75% of the U.S. clam market, they became subject to very heavy fishing pressure.

The ocean quahog fishery arose as a substitute when the Atlantic surfclam fishery began to decline in the mid-1970's. While ocean quahogs are found farther off-shore, many of the same vessels are used in both fisheries. The Atlantic surfclam/ocean quahog fishery was the first to be managed under the Magnuson-Stevens Act in 1977, becoming the first limited-access fishery in the U.S. Exclusive Economic Zone (EEZ) established by that legislation. Even though initially the total number of vessels was fixed, total fleet capacity was allowed to expand because there were no constraints placed on vessel size or gear technology. The classic race to fish continued, prompted by drastic declines in the number and length of trips allowed to permitted vessels.

The Mid-Atlantic Fishery Management Council (under Amendment 8 to the Fishery Management Plan for the Atlantic Surfclam and Ocean Quahog Fisheries) established individual transferable quotas (ITQ's) in 1990 (MAFMC, 1988). Access under Amendment 8 was limited to those who owned a vessel that was either fishing in 1978 or being built in 1977.

The Reauthorization Act was designed with specific objectives to protect fishing communities while facilitating some new entry.

In contrast, the Atlantic surfclam/ocean quahog ITQ program was designed simply to help stabilize the fishery and reduce excessive investment in fishing capacity. Eighty percent of the initial allocation of Atlantic surfclam quota shares was based on vessel catch history from 1979 through 1988, with the remaining 20% based on vessel capacity. Ocean quahog shares were based solely on landings history. Amendment 8 included no specific and measurable limits on how much quota an individual could accumulate. Quota could be sold and leased which provided entry opportunities into the fishery.

There were few constraints on ownership eligibility, transfer, and other features. Shortly after implementation, the buying and selling of quota yielded quickly to a market based primarily on leasing. Some of the firms gave up harvesting in favor of generating income through leasing their quota to other harvesters. This created a unique situation where it is no longer necessary or perhaps desirable to own a vessel in order to own some quota. There are various types of ITQ transactions that occur frequently, including permanent transfers or sales, relatively long-term leases (e.g., five or more years), and transfers of bushel tags.

Concentration and Market Power

Under the ITQ system, increased concentration of shares in the hands of one or a few entities can be a concern to policymakers, providing companies with market power and enabling them to influence prices in input and output markets. The Reauthorization Act (NMFS, 2007) states that ITQ privilege programs should ensure that limited access privilege holders do not acquire an excessive share of the total limited access privileges in the program. The National Standard 4 of the Reauthorization Act requires that fishing privilege allocations be carried out so that "no particular individual, cor-

poration, or other entity acquires an excessive share of such privileges."

The current level of concentration in the industry can be measured by the Herfindahl-Hirschmann index (HHI) (Hirschman, 1945; Herfindahl³). According to U.S. government Horizontal Merger Guidelines. (USDOJ and FTC, 2010), agencies generally classify markets into three types: "Unconcentrated Markets" (HHI below 1500), "Moderately Concentrated Markets" (HHI between 1500 and 2500), and "Highly Concentrated Markets (HHI above 2500).

Since it was not entirely clear what constitutes an "excessive share" in this context, a technical group of experts was asked to give independent advice on determining how to set an "excessive share" limit in any ITQ fishery and, in particular, for the SCOQ fishery (Mitchell et al., 2011).

As can be identified by a quick look at the data, concentration has occurred in the fishery with respect to the number of active fishing vessels and the number of processing companies. There also seems to have been a certain concentration in quota ownership although, apparently, to a lesser degree (Mitchell et al., 2011; NMFS, 2010). The Technical Group Report (Mitchell et al., 2011), states the number of processing plants was reduced from 44 in 1979 to 12 in 2011. In terms of purchases, the HHI for surfclams grew from 2,068 in 2003 to 3,134 in 2008, and, for ocean quahogs, from 3,431 to 4,369. Similar statistics for the development of concentration in quota holdings and harvesting are not available. However, in 2009, the combined (both species) HHI for quota holdings was 993 and for the harvesting activity was 2,890 (Mitchell et al., 2011).

Mitchell et al. (2011) addresses the question of whether market power can be exercised in this fishery through the ownership and withholding of quota. The exercise of market power in an ITQ-regulated fishery can occur when a quota owner has the ability and the

³Herfindahl, O. 1950. Concentration in the U.S. steel industry. Unpubl. Ph.D. dissert., Columbia Univ., N.Y.

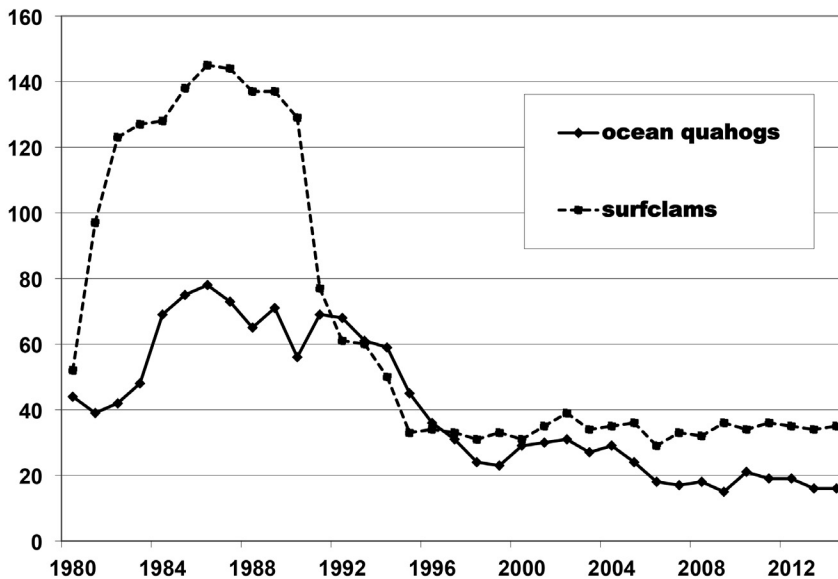


Figure 1.—Number of vessels in the surfclam and ocean quahog fisheries in the U.S. Exclusive Economic Zone, 1980–2014.

incentive to affect the price of the regulated harvest or of the quota through its use or suppression of use of quota. The authors argue that the evidence does not support a conclusion that market power is being exercised. In particular, processors report that well before the end of the season, it is clear to them that excess quota will be available, leaving sufficient opportunity to continue to harvest if sufficient demand is shown, and leaving the price of quota low.

Using the Herfindahl-Hirschman index, it is found that the levels of concentration vary in the different sectors of the SCOQ industry: quota ownership, harvesting, and processing. The ownership of quota in the SCOQ fisheries is unconcentrated, but the use of quota is highly concentrated, for both harvesting and processing.

The advice from the technical group was evaluated further by the Center for Independent Experts (CIE), upon request by NMFS during a public review in June 2011 (Walden⁴). Unfortunately, given the complexity in

the subject, rather than one summary document, this resulted in individual reports submitted by the three CIE reviewers. They agreed that the HHI method is valid for measuring potential market power, but also that additional data is needed, as well as more transparency around ownership, transfers, and contracts for quotas. Studies need to be conducted to determine the appropriate mechanism for revealing quota prices in this fishery. The analysis was focused on the output markets as opposed to the input markets. Since this approach is applied to a vertically-integrated industry with a small number of processors and vessels predominantly controlled by the processors, the exercise of monopsony power (the ability of processors to exert market power on the harvesting sector) is of primary interest. Currently, eight processing firms purchase catch from the SCOQ fisheries.

In competition theory (Anderson and Holliday, 2007), market power refers to the company's ability to manipulate price to its benefit by influencing an item's supply, demand, or both.

Individual firms should have no control over prices when other firms sell identical or nearly identical products. Due to the complexity of ITQ fisheries (quota holdings, quota trading, and the dynamic nature of the fishery), the determination of market power in an ITQ fishery is much more involved than for standard industries. In the SCOQ fishery, the main participants are 1) quota holders, 2) fishing companies, and 3) processing companies. Further, processors and wholesale distributors may also play a role in exerting market power on the harvesting sector. Some companies may be involved as one or more of these basic participants.

Some processors have developed quota ownership through either the acquisition of vessels and the accompanying quota or the acquisition of quota directly, and it is common for processors to enter into long-term contracts to lease quota from quota holders. Virtually all clams are sold under contract between processors and harvesters or are harvested by processor-affiliated vessels.

Having recognized the need for better transparency and having heard the advice from the CIE review, NMFS implemented additional data collection on ITQ allocation ownership and control for the surfclam and ocean quahog fishery in 2015. Its goal is to better identify the specific individuals who hold or control ITQ allocation in these fisheries, providing additional detail that the Council may utilize when developing an excessive shares cap.

Management

The Atlantic surfclam fishery is a good example of the success of fisheries management in terms of maintaining or restoring stocks. Since the implementation of ITQ's, the goal of consolidation and reduction of capacity in the fishery has been attained (Fig. 1). The number of vessels was initially quite high, because of grandfathered vessels when the moratorium was established.

Initially, no one wanted to exit the fishery because they knew their share would soon have value. The value of

⁴Walden J. 2011. Summary of findings by the Center for Independent Experts regarding setting excessive share limits for ITQ fisheries. U.S. Dep. Commer., Northeast Fish. Sci. Cent.

Ref. Doc. 11-22, 104 p. (online at <http://www.nefsc.noaa.gov/nefsc/publications/>).

tradable ITQ's helps to explain the rapid consolidation that was able to take place after their introduction. The decline in the number of vessels was also due to market factors and use of larger and more efficient vessels. In 1990, 128 vessels participated in the U.S. EEZ fishery for surfclams; numbers declined to 75 in 1991, after implementation of ITQ management.

A significant portion of the reduction in active vessels was due to firms deciding to consolidate harvesting onto fewer of their own vessels. Profitability in the harvesting sector increased substantially (NRC, 1999). Within two years of implementation, the number of vessels harvesting surfclams in federal waters had been cut in half, and the average annual catch per boat doubled. Between 1995 and 2014, the number of vessels harvesting surfclams has varied somewhat, ranging between 29 and 43 vessels.

In recent years the combined harvest in federal waters has been almost 6 million bushels with a landed value between \$50 and 60 million (for 2014, \$30 million for surfclam and \$24 million for ocean quahog). Total landings (the amount of catch that is brought to port and sold to a federally permitted dealer) of both stocks from the EEZ have been less than the quota, due to market factors, especially in recent years (Fig. 2).

Beginning in 2005, a large percentage (between 33 and 45%) of ocean quahog allocation tags were allowed to expire, and the quota left unharvested. In contrast to the ocean quahog harvest, the surfclam fishery harvested almost all available quota each year beginning in 1980, until the last decade, when in some years, quota was left unharvested. Leaving quota unharvested is not an indication of poor management, but it is a factor of interest.

The number of ITQ allocation owners has also decreased from 154 in 1990 to 70 in 2014 for surfclams and from 117 to 41 for ocean quahogs over the same period. Originally, these allocations corresponded to the allocation shares given to each vessel owner

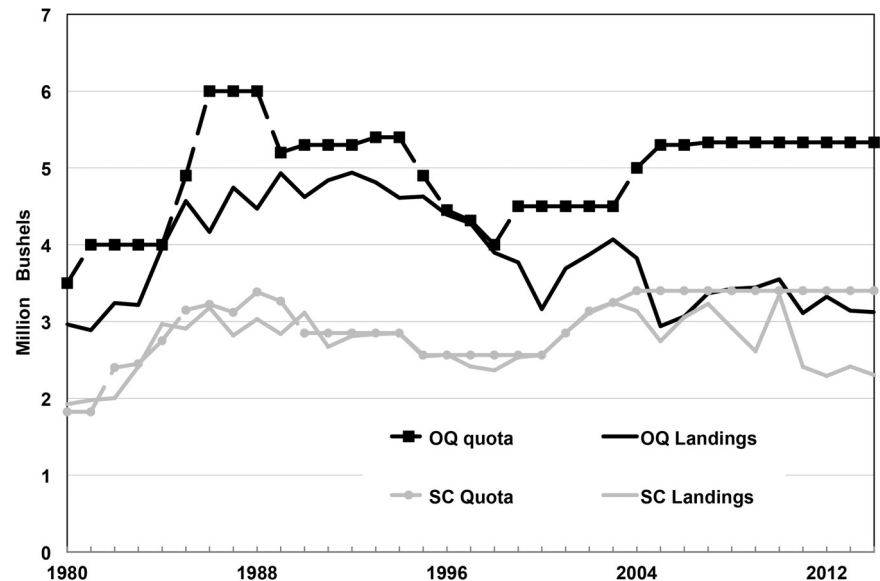


Figure 2.—Landings and quota for surfclams (SC) and ocean quahog (OQ) in the U.S. Exclusive Economic Zone, 1980–2014.

when the ITQ system was first implemented. Over time, they have been sold and combined with others, thereby reducing the number of allocation owners. A large number of allocation owners are either corporations or banking institutions holding the allocation permits in their names as collateral. A single individual could potentially own or control many of these individual share allocations. Similarly, a number of banks listed as allocation holders could have a single borrower under multiple loans. Because of these situations, policy makers have no ability to discern if a single individual is a shareholder in many of the corporations. Beginning in 2005, the industry experienced layoffs, especially among ocean quahog vessels. The difference between numbers of allocation holders and active vessels has narrowed, but it remains significant, especially among surfclam allocation holders, where 39 vessels were active out of 70 entities holding share for 2014 (Fig. 3).

The surfclam/ocean quahog fishery consists of a mixture of independent (owner/operator) fishermen, small processors, and a few large vertically integrated companies. After an extensive

study of the number of firms (rather than vessels), Brandt (2005) concluded that ITQ's in the clam fishery did not harm small fishermen or force them out of the fishery to the benefit of larger, vertically integrated processors, indicating that the decline in the number of vessels in the fishery masks the fact that far fewer firms left the industry.

The Tilefish Fishery

Beginning in the 1980's, there was recognition that the tilefish resource was over-exploited and that there was more capacity in the fishery than was needed. Many years later a limited-access system was established, primarily due to the participation and encouragement of active vessel owners. The tilefish FMP established (beginning 1 Nov. 2001) a total allowable landings (TAL) system as the primary control on fishing mortality (MAFMC, 2000). The FMP also implemented a limited-entry program and a tiered commercial quota allocation of the TAL. Each of three defined categories (full-time tier 1, full-time tier 2, and part-time vessels) is allocated a percentage of the overall TAL.

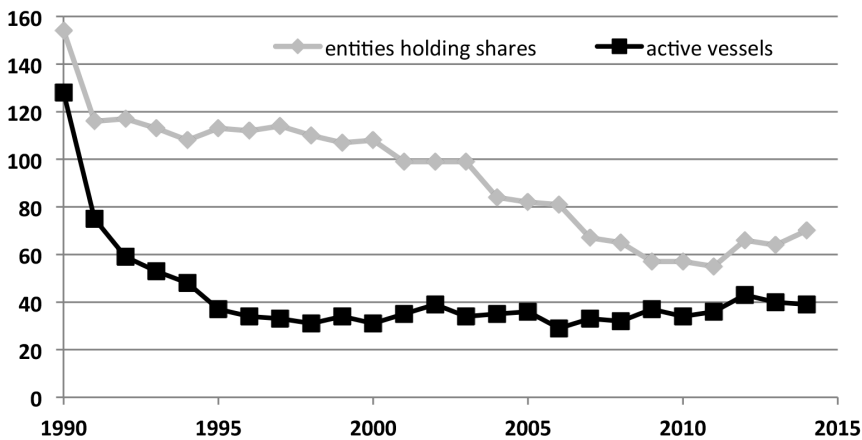


Figure 3.—Surfclam allocation holders and active vessels in the U.S. Exclusive Economic Zone, 1990–2014.

This particular quota management approach for tilefish has some unusual features. Beginning with the FMP, tier 1 members participated in group management and behaved as if they already had an IFQ (Kitts et al., 2007). The four tier 1 members have been able to cooperate because, after lobbying the Council during the management process to be in a separate permit category with their own group allocation, they divided the group TAC among themselves. More specifically, even though ITQ's were not yet implemented, under a cooperative understanding tier 1 participants have been coordinating their landings throughout the year and avoiding landing during the same time as participants in other categories. They received higher prices due to their coordinated behavior, something the members of other tiers now benefit from as well (Rountree et al., 2008).

Industry participants had been in favor of instituting IFQ's during the FMP design process, but were not able to follow through on the concept because of a moratorium that the U.S. Congress placed on instituting new rights-based programs from 1996 to 2002. After the ban was lifted, industry members encouraged the Council to reconsider so that tier 1 participants could codify their own agreement. This resulted in Amendment 1 to the tilefish FMP, which implement-

ed an individual fishing quota (IFQ), a traditional form of LAPP, for each of the three defined categories beginning 1 November 2009 (MAFMC, 2007). The IFQ program in the tilefish fishery simply regulates how catch is distributed among eligible vessel owners.

The requirement in the Reauthorization Act to consider “current and historical harvests” (NMFS, 2007:83) has particular relevance for the tilefish fishery. Historically, two distinct areas have been active in the fishery: one centered on Barnegat Light, N.J., and the other around Montauk, N.Y. The longline tilefish fishery was developed in New Jersey during the late 1970's, but by the 1980's, many of those vessels had diversified into other more economically viable fisheries.

An open-access commercial permit is available for commercial and incidental landings and charter party vessels. For any vessel to possess or land more than the incidental trip limit (currently 500 lb), the vessel must also fish under the authorization of an IFQ allocation permit. The IFQ allocation permit shall specify the quota share percentage held by the IFQ allocation permit holder and the total pounds of tilefish that the IFQ allocation permit holder is authorized to harvest.

Vessels with tilefish limited-access permits are still primarily from Bar-

negat Light (12 vessels), and Montauk (4 vessel permits with the largest recent landings). Many of the New Jersey tilefish vessel owners have now lost or severely lowered their claim to quota, given their landing history of diversification. Those who were not assigned an allocation of quota in Amendment 1 had ceased fishing for tilefish and had no recent landing history. However, all or part of the allocation specified in the IFQ allocation permit may be transferred on a temporary or permanent basis to any entity owning a documented vessel.

There were several IFQ alternatives considered in Amendment 1 to the tilefish FMP. They varied by degree of inclusion of all categories, and the means of allocating initial harvesting quotas or privileges. Expected disagreements on initial allocations focused on the choice between three proposed historical periods, as each fisherman favored their most active years in the fishery.

A compromise to a similar dilemma was reached in the wreckfish, *Polyprion americanus*, ITQ in the U.S. South Atlantic region, which allocated half of the available shares on an equal basis and half based on historical catch (Gauvin et al., 1994).

Tilefish prices have increased and been very strong since implementation of the IFQ program. A major reason for this is that the tilefish industry is able to coordinate times of landings to avoid market gluts and spread tilefish landings throughout the year. Prices vary by size, although all sizes are kept, since survival rates are low.

A rapid increase in the harvest of unregulated blueline tilefish, *Caulolatilus microps*, forced NMFS to implement temporary regulations (commercial and recreational possession limits) through an emergency action and further interim measures beginning in 2015. Prior to these measures, the price for golden tilefish would be negatively affected a few months of the year if/when fish landed in the South Atlantic derby fishery entered the New York market. The interim measures will be superseded by the Mid-Atlantic Fishery Management

Council's approved amendment to the golden tilefish FMP which will incorporate blue-line tilefish as a managed species in the existing Tilefish Fishery Management Plan.

Tilefish landings are in alignment with the TAL specified for the fishery; for the 2015 FY (1 Nov. 2014–31 Oct. 2015) landings were well under the quota limit of 1.667 million lb at 1.33 million lb. For 2016 and 2017, the council has set the quota at 1.793 million pounds. According to vessel trip reports, the length of a fishing trip has been very stable over the last 3 years (ranging from 6 to 7 days) and shorter than several years before that (7–10 days), reflecting higher catch rates.

Extending the length of the fishing season is often an objective associated with the transition to catch shares and is an indicator used in program performance. Season length is often associated with economic factors allowing improved timing of harvesting with market opportunities as well as improving vessel safety as fishermen may choose when and where to fish as weather conditions allow. Recent research on the U.S. west coast showed that catch share management significantly reduced risk-taking and improved safety in the fixed gear sablefish, *Anoplopoma fimbria*, fisheries (Pfeiffer and Gratz, 2016).

The implementation of the IFQ system has particularly benefited those in the former "Part-time" and "tier 2" vessel categories of the old limited access program. These vessels can plan their fishing activities throughout the year, rather than being forced into a derby fishery on 1 Nov. (start of the fishing year) if they plan to harvest tilefish in a given year. These vessels participate in a number of other fisheries (e.g., goosefish (monkfish), *Lophius americanus*; sea scallop, *Placopecten magellanicus*; and swordfish, *Xiphias gladius*) and the IFQ system allows them to fish for tilefish when it works best for them.

Economic Performance

To determine whether a program is meeting its goals and objectives, it

is necessary to track economic performance. It is challenging to measure the economic performance of catch share programs because they are so diverse in terms of target species, location, and size. A group of NMFS employees has developed an initial set of standard performance indicators specific and relevant to catch shares (Clay et al., 2014) that measure the economic performance of national catch share programs, regardless of their design. Indicators such as catch and landings, effort, revenue, accumulation limits, and cost recovery are used as standard performance measures over time.

NOAA has become very involved, through the Catch Share Task Force, in coordinated performance monitoring of 17 current programs in the nation. The application of those indicators highlights the economic performance of all U.S. catch share programs. (Brinson and Thunberg, 2013). As they discussed, catch share programs are typically implemented coincident with enhanced catch accounting and monitoring requirements, which can reduce management uncertainty and scientific uncertainty. They found these programs were successful in having fishermen observe quota limits, reducing fishing capacity, and improving overall economic benefits and efficiency. Some distributional consequences have occurred due to reductions in the number of active vessels along with decreases in entities holding shares. In the future, some of these, and additional, performance measures will be used to review non-catch share programs as well on a periodic basis.

As the tilefish IFQ passes the 6-year anniversary of implementation of the program, the MSA requirement for periodic review of all LAPP programs in Section 303A (a) (1) (G) will ensure that a detailed and formal review take place regarding progress in meeting the goals of the program. Plans are currently underway to start the same review process for the surfclam and ocean quahog fishery. Guidance on the content and extent of these reviews is currently being re-examined.

Conclusions

Economic incentives must be aligned with society's conservation goals to create an effective policy outcome. One emerging trend is the introduction of ecosystem-based management to better address resource sustainability. Another is the growing interest in collaborative approaches to management, which provide greater opportunities for stakeholder groups to participate in the process. The use of LAPP's offers an incentive for collaborative management while also addressing economic incentives. The ability to allocate limited access privileges to fishing communities and regional groups is another use for LAPP's to help ensure economic and cultural sustainability.

While ITQ's produce gains in the aggregate, implementing them is complicated by debates over the distribution of gains among current and historical participants, and of losses from restructuring. Initial quota allocations have a significant impact on the economic well-being of fishermen. The fairness of the initial allocation to tilefish permit holders, along with transferability and accumulation of shares, were some of the most contentious issues in the tilefish FMP. Since the LAPP has been enacted, consolidation of tilefish vessels has not occurred, but vessels have gained flexibility and no vessel has an incentive to derby fish. In the surfclam and ocean quahog fishery, and in the tilefish fishery, profitability and efficiency have been enhanced.

The use of LAPP's can be effective through the continued collaboration of industry, management, scientists, and the public. Future implementation of LAPP's should be able to address many of the negative points mentioned earlier through careful planning and design, and consideration of the needs of the specific fishery.

Rapid changes have occurred under rights-based management since the idea was first identified as being a factor in the overexploitation of fishery resources, through Gordon's

(1954) seminal paper on open access exploitation.

Benefits of catch share programs can exhibit through three areas: biological stock, decrease in costs, or increase in revenue. The most notable change exhibited in these two fisheries has been on the market side, via higher ex-vessel prices due to better timing, product quality, and longer seasons.

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