

## Evolution of Catch Share Management: Lessons from Catch Share Management in the North Pacific

**Mark Fina**

Senior Economist, North Pacific Fishery Management Council,  
Anchorage, Alaska

*ABSTRACT: Fishery managers, economists, industry advocates, and some environmental public interest groups are currently promoting catch shares (or the allocation of exclusive portions of the total allowable catch) as a means to address both environmental and economic fishery management problems. At the same time, a vocal opposition to catch share management has developed among some industry stakeholders, academics, and other public interest groups. Over the course of the last 20 years, while the debate has percolated, the North Pacific Fishery Management Council (known henceforth as the Council) has incrementally developed and overseen the implementation of five major catch share management programs for the fisheries it governs. This article draws on the experiences in the North Pacific fisheries to shed light on several facets of the debate over the efficacy of catch share management and suggests that catch share management is most effective and beneficial to stakeholders, when used in a measured manner, as part of a management program adapted specifically to a fishery and its stakeholders.*

Fishery managers, economists, industry advocates, and some environmental public interest groups have promoted catch shares (i.e., the allocation of exclusive portions of the total allowable catch) as a means to address both environmental and economic fishery management problems (Grafton et al. 2006). Specifically, these proponents assert that catch shares can prevent stock collapses and promote fishery sustainability (Grafton et al. 2006; Costello et al. 2007).

With access to a specific portion of the resource secured by a catch share, shareholders are said to be able to increase profits by removing vessels and reducing operating expenses formerly needed to maintain their shares of the allowable catch from the fishery. With reduced pressure to compete for a share of the catch, participants are also said to derive additional value through development of higher value products, improvements in product quality, and higher recovery rates (see Leal 2005). Dissenting with these supporters of catch share management is a vocal opposition made up of other industry stakeholders, academics, and some public interest groups (NRC 1999). These critics question whether the allocation of exclusive shares creates the incentives necessary to derive production benefits, as asserted (Bromley 2009). The equity of catch shares, which create long-term exclusive fishing privileges for persons selected to receive an allocation, as well as the resulting distributional effects on fishery participants is also questioned. Vessel owners, who may need to lease or purchase catch shares to maintain

### Lecciones del Manejo por Captura Compartida en el Pacífico Norte

**RESUMEN:** Los administradores pesqueros, economistas, abogados industriales y algunos grupos ambientalistas actualmente están promoviendo la captura compartida (asignación de partes exclusivas de la captura total permitida) como un medio para atender los problemas ambientales y económicos derivados del manejo de pesquerías. Al mismo tiempo, académicos y otros grupos involucrados han desarrollado una postura contraria al manejo basado en captura compartida. En el transcurso de los últimos 20 años, mientras el debate continua, el Consejo de Manejo de Pesquerías del Atlántico Norte (desde ahora llamado El Consejo) ha desarrollado y supervisado la implementación de cinco grandes programas de manejo por captura compartida en las pesquerías que tiene a su cargo. Este artículo expone las experiencias adquiridas en las pesquerías del Pacífico Norte con el fin de aclarar las diferentes facetas en el debate sobre la efectividad del manejo por capturas compartidas y se sugiere que este tipo de manejo es más eficaz y brinda mayores beneficios a los usuarios del recurso cuando se utiliza de forma mesurada, como parte de un programa de manejo especialmente adaptado a una pesquería y sus grupos involucrados.

their operations, and crews, whose compensation may be reduced to cover those lease costs, are said to be disadvantaged by catch share programs (Pinkerton and Edwards 2009). Small coastal communities are also said to suffer, as a result of an influx of outside investors in the fisheries and landings migrating to larger, more efficient ports (Ecotrust and Ecotrust Canada 2004; see also Macinko 2005; Macinko and Whitmore 2009).

In the United States, catch shares have been controversial since their introduction. After being implemented in just four fisheries, congress imposed a moratorium on any additional programs and requested the National Research Council to study their effects (Sustainable Fisheries Act of 1996; NRC 1999). The moratorium was allowed to expire in 2002, after 6 years (which included a 2-year extension; Consolidated Appropriations Act of 2001). The controversy escalated again in June of 2009 when the National Oceanic and Atmospheric Administration announced its intention to develop a catch share policy to “ensure that catch shares are fully considered when [fishery management] councils take up fishery management plan amendments” (NOAA 2009, p. 1). The policy itself

“encourage[s] the voluntary use of well-designed catch share programs in appropriate fisheries to help rebuild and sustain fisheries and support fishermen, communities and vibrant working waterfronts” (NOAA 2010, p. 1). The implementation of comprehensive multispecies catch share programs in New England and in West Coast groundfish fisheries in 2010 and 2011 has further intensified the controversy (NMFS 2010, 2011).

Over the course of the last 20 years, while the debate has percolated, the council has incrementally developed and overseen the implementation of five major catch share management programs in the federal groundfish and shellfish fisheries off Alaska that it governs (see Table 1). This experience sheds light on several facets of the debate over the efficacy of catch share management. Program development has benefited from

the council’s open, public process, which has provided stakeholders with various opportunities to comment on program development and has led to the inclusion of several innovative elements in these programs. Once implemented, the council has openly scrutinized its programs (and been receptive to their scrutiny by others), showing a willingness to amend programs and adopt ancillary measures beyond the scope of the program to address management and stakeholder concerns. The North Pacific experiences suggest that catch share management is most effective, and beneficial to stakeholders, when used in this measured manner, as part of a management program adapted specifically to a fishery.

All federal fisheries off Alaska are managed under annual catch limits and some type of limited access program. Over time, the council has adopted a variety of management mea-

**TABLE 1. Summary of Catch Share Programs in the North Pacific**

	<b>Halibut and sablefish IFQ</b>	<b>Bering Sea and Aleutian Islands crab rationalization</b>	<b>AFA Bering Sea and Aleutian Islands pollock</b>	<b>Amendment 80 Bering Sea nonpollock groundfish trawl fishery</b>	<b>Central Gulf of Alaska rockfish pilot program (5-year program)</b>
<b>Type of allocations</b>	Individual fishing quotas	Individual fishing quotas with cooperative option	Cooperatives with limited access option	Cooperatives with limited access option	Cooperatives with limited access option
<b>Year implemented</b>	1995	2005–2006 season	1999 and 2000	2008	2007
<b>Catalyst for program</b>	Derby fishery Short seasons Loss of product quality Safety Overcapitalization	Derby fishery Short seasons Overcapitalization Safety	Allocation dispute between inshore and offshore sectors.	Bycatch reduction Individual bycatch accountability	Derby fishery Short seasons Loss of product quality Conflicts with other fisheries (salmon processing)
<b>Program development</b>	Council program under MSA	Council program under specific Congressional authority	Congressionally developed program with some council-developed components	Council program under MSA authority	Congressionally mandated program developed by the council
<b>Harvester initial allocation</b>	Vessel owners (based on catch histories)	97% to limited entry license holders; 3% to captains (based on catch histories)	Vessel owners (based on catch histories)	Vessel owners (based on catch histories)	Limited entry license holders (based on catch histories)
<b>Processor component</b>	None	Processor quota shares and price arbitration	Severable processor/cooperative associations	N/A	Inseverable processor/cooperative associations based on landings histories
<b>Gear type</b>	Bottom longline	Pot	Mid-water trawl	Pelagic and bottom trawl	Bottom and semipelagic trawl
<b>Area/species allocations</b>	14 allocations	9 allocations	2 allocations	10 allocations plus; 5 bycatch allocations	8 allocations plus; 1 bycatch allocation

*Continued on next page*

TABLE 1. (continued)

	Halibut and sablefish IFQ	Bering Sea and Aleutian Islands crab rationalization	AFA Bering Sea and Aleutian Islands pollock	Amendment 80 Bering Sea nonpollock groundfish trawl fishery	Central Gulf of Alaska rockfish pilot program (5-year program)
Number of vessels in season prior to program implementation	3,450 halibut; 1,196 sablefish	167 Bering Sea <i>C. opilio</i> ; 251 Bristol Bay red king crab; 20 Aleutian Island golden king crab	38 catcher processors; 113 catcher vessels	22	6 catcher processors; 25 catcher vessels
Number of vessels in most recent season	1,156 halibut; 362 sablefish (black cod)	78 Bering Sea <i>C. opilio</i> ; 74 Bristol Bay red king crab; 4 Aleutian Is. golden king crab	20 catcher processors; 91 catcher vessels	22	4 catcher processors; 25 catcher vessels
Observers	No halibut; No sablefish under 60 feet; 30% sablefish 60 feet and over; 100% sablefish over 125 feet*	100% catcher processors; 20%–50% catcher vessels (varies by fishery)	200% catcher processors; 100% catcher vessels	200%	200% catcher processors; 100% catcher vessels
Cap on individual share holdings/use	1%	1%–10% (varies by fishery)	17.5%	30% of aggregate quota	5% catcher vessels; 20% catcher processors
Vessel use cap	1%	None in cooperative; 2%–20% if outside cooperative (varies by fishery)	17.5%	20% of aggregate quota	60% for catcher processors
Cooperative use cap	N/A	None	None	None	30% for catcher vessels
Processing cap	None	30% of processor shares by fishery	30%	N/A	30%
Share classes	Vessel size and operation type (CV/CP)	Operation type (CV/CP) and Owner share/Crew share	Operation type (CV shoreside/CP/CV mothership)	No	Operation type (CV/CP)
Owner-on-board/active participation requirements	Owner-on-board requirement (with some exemptions)	Active participation requirement for C shares	None	None	None
Eligibility to acquire shares	Sea time requirement	Sea time requirement for all shares; active participation for C shares	None	None	None
Community provisions	Community quota purchase program (CQE)	2-year port-specific landing requirement; regional landing requirements; community right of first refusal on processor quota	None	N/A	None (processor component may bring some community benefit)
Elements to improve entry opportunities	Limited consolidation of small blocks of quota; loan program	C share QS requires active participation for acquisition and retention; loan program (yet to be implemented)	None	None	5% set aside for ineligible license holders

\*Observer regulations are currently being modified to require 100 percent observer coverage on halibut catcher processors and include coverage on a portion of the halibut catcher vessel fleet.

asures to address specific, relevant issues that have arisen in particular fisheries. These measures address a range of concerns from social and economic issues, such as those addressed by the Community Development Quota program, to environmental issues, such as area closures to protect habitat (NPFMC 2010a). As a part of the evolution of its management, the council has adopted individual fishing quotas (IFQs), community quotas, fishery cooperatives, and rationalization programs—all of which allocate portions of the total allowable catch to fishery participants—in several of its fisheries. These programs (which now might be characterized as catch shares or limited access privilege programs) were adopted for a variety of reasons; each is tailored to the specific needs and circumstances of the fishery, its participants, and stakeholders. Each program was developed through years of council deliberation, supported by hundreds of pages of analysis. Stakeholders and the public had several opportunities for input throughout the council's development of these programs, often resulting in the inclusion and revision of important elements. This open, deliberative process is critical to both stakeholder acceptance of a program and achieving an appropriate balance among often divergent interests.

### HALIBUT AND SABLEFISH IFQ PROGRAM

The halibut (*Hippoglossus stenolepis*) and sablefish (*Anoplopoma fimbria*) fisheries have historically supported a large number of small vessels, many of which have strong ties to coastal communities in Alaska. These two fisheries are similar in many respects. Both species are targeted with fixed gear, primarily longlines, and command a relatively high ex-vessel price. Prior to implementation of the halibut and sablefish IFQ program, the fisheries were open access, regulated by managers monitoring catch in-season with closures timed to coincide with harvest of the total allowable catch. The catching power of this fleet posed several management challenges. To limit total catch to the level needed to protect stocks, managers progressively shortened fishing seasons, creating a derby as fishermen raced to obtain a share of the fishery. At the extreme, in some regulatory areas, halibut seasons were reduced to 24-hour derby openings. Managers had difficulty regulating harvests, because harvest levels could not be accurately gauged for these very short openings. Gear losses were believed to be excessive, estimated to have resulted in almost 2,000,000 pounds of halibut mortality in 1990, as unretrieved gear continued to catch fish. Safety was compromised, because owners of smaller vessels felt compelled to fish, regardless of the weather, to maintain their participation. Catch quality suffered as some



Bering Sea crab boats

(Photo credit: Mark Fina)



Pollock cod end

(Photo credit: Diana Stram)



Groundfish trawl catcher processor

(Photo credit: Waterfront Associates)

vessels queued at processing plants for up to a week waiting to offload. The IFQ program—the result of years of council deliberations—was largely intended to control expansive growth in participation in the fisheries and end the derby (see NPFMC/NMFS 1992; Pautzke and Oliver 1997).

The IFQ program, approved by the council in 1992 and implemented in 1995, is designed to balance a number of goals and interests. To reflect historic participation and fishery dependence, the initial allocation of shares was based on catches from the fishery over three years. Over 4,800 persons received initial allocations in the halibut fishery that drew approximately 3,500 participating vessels annually in the years leading up to implementation of the IFQ program. To maintain fleet composition, shares are classified for use by vessel type (catcher processor or catcher vessel) and length, with limits on the use of shares outside of their designated vessel type and size class. Most shares are divisible and transferable subject to consolidation limits. To maintain the small-vessel, owner-operator character of the fleet, catcher vessel shares carry owner-on-board requirements, limits on the use of hired skippers, and leasing prohibitions and may be transferred only to individuals (not corporations or partnerships). In addition, only persons able to demonstrate active time as crew in commercial fisheries are permitted to acquire shares. To provide entry opportunities, consolidation of small blocks (or allocations) of quota is limited and loans are available to aid newcomers and small-vessel operators. Seasons extend several months allowing shareholders to time their harvests to avoid poor weather and sell to desired markets.

Since implementation of the program, several changes have been observed in the fisheries. The number of shareholders and number of vessels in both the halibut and sablefish fisheries have declined substantially. A new type of cooperation has developed as shareholders consolidate their holdings and fish them off fewer vessels to reduce costs. This tendency is borne out as the number of active shareholders substantially exceeds the number of vessels. This practice is significant, because it demonstrates that the program provides an alternative, more gradual, means of entry, through acquisition of small amounts of quota, compared to purchasing a license and vessel to enter a limited entry fishery. In the halibut fishery, in particular, product quality has improved dramatically with a substantially larger share of the catch being sold to fresh fish markets. Gear losses and associated mortality are believed to be inconsequential under IFQ management. In addition, safety improvements in the fishery have been documented through declining fatalities and U.S. Coast Guard search-and-rescue missions (Hartley and Fina 2001).

Despite these benefits, not all stakeholders are satisfied with the outcome of the IFQ program. In many cases, the council has amended the program to address these concerns. The first amendments to the program, intended to improve entry opportunities, were implemented simultaneously with the IFQ program itself. In addition, many quota holders in Alaska's smaller coastal communities have chosen to transfer their quota to others or have moved out of these communities. As a result, the number of residents of small communities holding quota and the total amount of quota that they hold have substantially

declined since the implementation of the IFQ program. In response, 10 years after the original implementation, the council revised the IFQ program to authorize certain remote coastal communities with few economic alternatives to purchase and hold shares to ensure their access to, and sustained participation in, the IFQ fisheries (NPFMC 2003). The council is currently conducting a 5-year review of this community purchase program, giving particular attention to program elements and market factors that might contribute to a dearth of community purchases to date (NPFMC 2010d). While some may suggest that a redistribution of shares to communities might address this issue, such a redistribution might be viewed as inequitable by persons who purchased shares, on the expectation of receiving returns from those purchases for several years.

## BERING SEA POLLOCK COOPERATIVES (UNDER THE AMERICAN FISHERIES ACT)

The Bering Sea walleye pollock (*Theragra chalcogramma*) fishery is a high-volume industrial fishery, with large-scale shore-based and at-sea processing sectors. In 1998, congress adopted a cooperative management program for the Bering Sea pollock fisheries contemporaneously with a federally funded vessel buyback program that removed capacity from the fishery. This congressional action followed a prolonged, contentious allocation debate between the inshore sector (who deliver their harvests to shore-based plants for processing) and the offshore sectors (who process their catch at sea). The program divides the total allowable catch among the sectors, with 50% allocated to the inshore sector, 40% to the catcher processor sector (including the catcher vessels that deliver to catcher processors), and 10% to the mothership sector (floating processors that receive deliveries from catcher vessels at sea).

Although an allocation dispute was the catalyst for the development of the program, the cooperative structure is intended to address a variety of interests and issues. Allocations are made to vessels based on historic catches. Eligible vessels may then join a cooperative to access exclusive annual allocations. Management burdens are reduced as NOAA Fisheries monitors catch at the cooperative level, with all members of a cooperative jointly and severally liable for violations of their cooperative. Under the system, cooperatives distribute allocations among member vessels and oversee individual vessel harvests with contractually defined and privately administered penalties for violations of the cooperative agreement. In part due to processor-voiced concerns about the redistribution of landings under the halibut and sablefish IFQ program, the catcher vessel program creates a closed class of shore-based processors. To access an exclusive allocation, a catcher vessel must join a cooperative in association with one of the shore-based processors. Vessels that elect not to enter such a cooperative may

fish a limited access fishery, without the benefit of an exclusive allocation. The program also recognizes potential spillover effects on other fisheries that could arise if vessels consolidate harvests or time harvests to allow for greater participation in other fisheries. To prevent encroachment of pollock vessels and processors in these other fisheries, “sideboards” limit pollock fishery participant catches and processing in these other fisheries (NPFMC 2002).

In the catcher processor and mothership sectors, ending the derby fishery has allowed for greater attention to production costs and product quality and the development of a broader range of products and higher utilization rates (Wilén and Richardson 2008). In the inshore sector, the cooperative/processor structure has induced similar gains. Landings are coordinated by cooperatives to avoid gaps in processing and offload delays that might compromise product quality and increase processing costs. Many participants in the fishery use revenue sharing arrangements, under which both catcher vessels and the processors that they deliver their catch to share gains from additional product revenues (NPFMC 2002). In addition, the



Gulf of Alaska rockfish cod end  
(Photo credit: Alaska Groundfish Data Bank)

**The fleet implemented an industry managed system of “rolling hot spot closures,” which rely on real-time bycatch information to close areas of high chinook salmon bycatch, as an alternative to a less flexible, regimented system of area closures that had an unacceptable effect on chinook salmon bycatch rates (NPFMC 2005b).**

exclusive allocations under the program gave participants a secure interest that facilitated improved cooperative efforts to pursue added value for the fishery as a whole through Marine Stewardship Council certification.

While the pollock cooperative program, in and of itself, is considered a success by many stakeholders, some of the greatest effects of the program have arisen through ancillary management measures that are not directly part of the cooperative program. Almost simultaneously, with the implementation of the cooperative program, NOAA Fisheries introduced area closures and measures to spatially and temporally disperse pollock catch to protect Steller sea lions (*Eumetopias jubatus*). While these measures clearly impinged on fishing activity, participants were able to comply more readily and effectively through coordination of fishing in cooperatives using their exclusive allocations under the program (NMFS 2001). For example, rather than a concentrated derby developing in areas from which a limited portion of the allowable catch could be harvested, vessels coordinated harvests from those areas distributing catches over a greater period of time. More recently, a series of Chinook salmon (*Onchorynchus tshawytscha*) bycatch measures that require extensive fleet coordination have been adopted. First, the fleet implemented an industry managed system of “rolling hot spot closures,” which rely on real-time bycatch information to close areas of high chinook salmon bycatch, as an alternative to a less flexible, regimented system of area closures that had an unacceptable effect on chinook salmon bycatch rates (NPFMC 2005b). To further chinook salmon avoidance, the council recently adopted an incentive program, under which participants who enter contractual agreements that contain incentives for chinook salmon avoidance at all bycatch levels will be subject to a higher chinook salmon bycatch cap. A performance standard requires that participants in this incentive program maintain bycatch well below the elevated cap in a majority of years to continue to receive the benefits of the elevated cap. The program is intended to accommodate uncertainties in chinook salmon bycatch rates by creating incentives for chinook salmon avoidance in years of low bycatch that would not exist under simple fixed quantity bycatch limits. Both the “rolling hot spot closures” and the proposed incentive agreements depend heavily on fleet sharing of catch and effort information that would likely have been inaccessible prior to implementation of the cooperative program (NPFMC/NMFS 2009).

## BERING SEA AND ALEUTIAN ISLAND CRAB RATIONALIZATION PROGRAM

Since their inception, the Bering Sea and Aleutian Islands crab fisheries attracted participants willing to undertake great financial and personal risks. This large-vessel, industrial fishery has a large-scale onshore processing sector with strong community dependence. Notwithstanding the adoption of measures to limit entry, several of these crab fisheries attracted excess capital with overcapacity resulting in a race for crab. In each of the last four Bristol Bay red king crab (*Paralithodes camtschaticus*) fishery derby seasons, the entire season’s allowable catch (between 8,000,000 and 14,000,000 pounds of crab) was harvested in five or fewer days; in each of the last three Bering Sea *Chionoecetes opilio* (snow crab) derby seasons, the season’s allowable catch (in excess of 20 million pounds of crab) was harvested in fewer than 2 weeks. This derby management compromised safety as crews worked around the clock to maximize catch; economic returns were sacrificed by this race; and management and conservation of the resource was complicated as managers attempted to time each fishery’s closing to avoid overruns of the allowable catch (NPFMC/NMFS 2004). In response to these concerns, congress directed the council to consider “rationalization” alternatives for these fisheries, despite congress’s contemporaneous extension of a moratorium on new IFQ programs (Consolidated Appropriations Act of 2001; see also Sustainable Fisheries Act of 1996). In response, the council developed its Bering Sea and Aleutian Islands (BSAI) crab rationalization program, which congress later authorized (NPFMC/NMFS 2004).

The council’s rationalization program reflects its desire to accommodate the interests of several groups dependent on these fisheries—vessel owners, processors, captains and crew, and communities. Under the program, 97% of the harvest share pool was initially issued to limited access license holders based on catch histories. The remaining 3% of that pool was allocated to captains, based on their fishing histories, for exclusive use by persons active in the fisheries. Processors were issued processing quota shares based on their processing histories in the fisheries. Under these allocations, 90% of the catcher vessel owner harvest shares are designated for delivery to holders of corresponding processing shares. Shares are divisible and transferable subject to limits. Shareholders are permitted to form cooperatives to aid in the coordination of harvests. Community interests are protected through several measures, including community landing requirements that maintained the historic distribution of landings in the first 2 years of the program, a regionalization program that requires that catch made with certain shares be landed and processed in designated regions, and community rights of first refusal on transfers of processing shares. An arbitration system is included in the program to resolve price disputes that could arise because of the constraints on markets created by the dual harvester/processor share allocations (Fina 2005).



Gulf of Alaska trawler

(Photo credit: Alaska Groundfish Data Bank)

Many harvesters were concerned about the price effects of the market restrictions of processor shares. Yet, in the first few years of the program, the arbitration program has effectively ensured that harvesters have continued to receive an ex-vessel price that reflects their historic division of first wholesale revenues for landings, in lieu of a competitive price. In addition, the processor share component of the program has limited redistribution of landings from historic processing plants, which have substantial investments in the fisheries (NPFMC 2008c, 2010b). Regional landing requirements have been important in maintaining the distribution of landings to remote communities, particularly the community of St. Paul in the Pribilof Islands. St. Paul is home to one of the largest crab processing plants and derives a notable share of its annual tax revenues from the Bering Sea *C. opilio* (snow crab) fishery (Downs and Weidlich 2010). The rationalization program, together with a progression of U.S. Coast Guard safety measures, is believed to have improved safety in the fisheries by allowing captains to remain in harbors or stop fishing in inclement weather and take time to service vessels in-season without risking loss of catch (Lincoln and Woodley 2010). Some participants have also credited the program with allowing vessels to slow operations, resulting in significant fuel savings (NPFMC 2008c).

As expected, the program, aided by a contemporaneously implemented, federally funded vessel buyback, facilitated the removal of a substantial number of vessels from the fleet in the

first year of the program, reducing the Bristol Bay red king crab fleet from approximately 250 vessels to fewer than 100 vessels and the Bering Sea *C. opilio* (snow crab) fleet from approximately 175 vessels to fewer than 80 vessels. This removal of capacity is believed to have provided a substantial return to those vessel owners who leased or sold their shares and retired their vessels or deployed them in other fisheries. Most of these vessel owners used these revenues to pay outstanding vessel mortgages or other vessel related costs, with any remaining amounts being profits (NPFMC, 2008c).

Although this reduction in capacity was intended and expected, its immediacy and magnitude were not. The effect was a dramatic change in the number and nature of crew positions in the fisheries. With each vessel employing approximately six crew members, under the rationalization program the Bristol Bay red king crab fishery employs approximately 975 fewer crew, while the Bering Sea *C. opilio* (snow crab) fishery employs approximately 675 fewer crew. Because of the relatively small allowable catches in the fisheries in years leading up to the rationalization program, most crew worked only a month or so in the crab fisheries. Crews typically worked other jobs (including crew jobs in other fisheries) throughout the remainder of the year. In addition, in the derby fishery, crew pay was subject to risk. Since crew pay is typically based on vessel revenues, vessel breakdowns or poor catches could leave a crew with little or no compensation. The relatively short tenure of crab crew jobs





Riding crab pots

(Photo credit: Alaska Seafood Marketing Institute)

was attractive to many crew members, particularly those with other employment who were able to take short periods away from that other employment to fish crab. Notwithstanding their relatively short term, these crab fishing jobs were reported to have provided important contributions to annual income. Particularly in the case of crew from remote Alaska communities with few job opportunities, replacing income from lost crab crew jobs is reported to be problematic (NPFMC 2009).

Overall, data and anecdotal reports suggest that the crew positions remaining in the crab fisheries are more stable and pay more annually under the rationalization program. Crew typically know the amount of shares that will be harvested and terms of payment prior to beginning fishing, allowing them to project income for a season. Prior to implementation of the rationalization program, compensation hinged entirely on success in the limited access derby fishery. The consolidation of catch under the rationalization program has reportedly allowed some crew to rely exclusively on crab fishing for their incomes. Other crews are reported to work on the crab vessel in other fisheries or tender catches from catcher vessels to processors, relying on employment from their crab fishing vessels for all of their income. Vessel owners hiring crew generally give priority to crew willing to work in all crab fisheries that the vessel par-

ticipates in (and non-crab fisheries or tendering, if the vessel engages in those activities). Maintaining a steady crew, however, can greatly simplify vessel management, reduce hiring costs arising from high turnover, and improve efficiency and safety, as crew become more familiar with the vessel's operation and fellow crew. These preferences have led to changes in crew composition, as some former crewmembers are unwilling to give up other employment to work exclusively for a crab vessel (NPFMC 2009).

While the consolidation of quota on fewer vessels has increased average vessel revenues and total crew pay, vessel owners typically deduct share lease payments from vessel revenues prior to computing crew pay, which are typically a percentage of a vessel's net revenues. Although the specific amounts of these deductions are not known, crew pay declined from an average of approximately 35% of gross vessel revenues prior to the program to approximately 23% of gross vessel revenues in the first 5 years of the program. In addition, in the Bristol Bay red king crab fishery, average crew compensation (as a percentage of gross vessel revenues) has declined from approximately 25% of gross revenues in the first year of the program to approximately 20% of gross vessel revenues in the fifth year (NPFMC 2010b). In response, the council has suggested that



Trawler deck

(Photo credit: Waterfront Associates)

industry should explore measures to address this concern, while it considers whether a program modification should be adopted (NPFMC 2010c).

**The intended outcome is a system in which all vessels have an incentive for retention improvements. The exclusive share allocations under the cooperative program allow participants to slow fishing effort without losing a share of the allowable catch, refocusing that effort toward retention improvement. Exclusive share allocations also provide an opportunity for improved production efficiency, which should ease the cost burden associated with complying with the retention standard.**

The council undertook three reviews of the program in its first 5 years and has adopted several amendments to address concerns that have arisen. One amendment frees shares initially allocated to captains from the landings limitations of processing shares, to increase harvest flexibility and allow active crew to receive greater value for their share holdings. Amendment packages have also been initiated to consider measures to

strengthen community protections and increase the portion of the harvest share pool available only to active crew. Although these reviews and modifications may not allay concerns of all stakeholders, they demonstrate the council's receptiveness, willingness, and commitment to consider changes to address program shortcomings.

### **BERING SEA AND ALEUTIAN ISLANDS NON-POLLOCK GROUND FISH TRAWL CATCHER PROCESSOR COOPERATIVES (AMENDMENT 80)**

In 2008, NOAA Fisheries implemented a council-approved cooperative program for the Bering Sea and Aleutian Island non-pollock groundfish trawl catcher processor sector, commonly known as Amendment 80. The fleet governed by this program participates in a variety of multispecies groundfish fisheries. Most vessels in the fishery have limited factory space and processing capability, producing only whole and "headed and gutted" frozen fish. These factors, in concert, led to disproportionately high discard rates in this fleet, as vessels discarded fish that were deemed to have no or very limited market value, given the processing constraints. To address this discard problem, the Council developed a "groundfish retention standard," which imposed stepwise increases in required retention over a period of years. In tandem with this retention



**Halibut longlining**  
(Photo credit: Julianne Curry)

standard, the Council developed the Amendment 80 cooperative program. The program allocates shares to vessels, which can then access exclusive annual allocations by joining a cooperative. Although the retention standard has been removed from regulation because of administrative complexities, the Council monitors retention through fleet annual reports. The cooperative program is intended to allow vessels to manage retention requirements in the aggregate at the cooperative level. Cooperative management typically increases communication among members, which should facilitate the exchange of information concerning fishing patterns and practices and their effects on catch composition, and consequently retention. In addition, assessing retention at the cooperative level is intended to increase social pressures among members of a cooperative to create incentives for retention improvements on all vessels. The exclusive share allocations under the cooperative program allow participants to slow fishing effort without losing a share of the allowable catch, refocusing some of that effort toward retention improvement. Exclusive share allocations also provide an opportunity for improved production efficiency, which should ease the cost burden associated with complying with the retention standard (NPFMC, 2007b).

Two years into this program, most participants believe that the program has provided much of the expected benefits (L. Swanson, Groundfish Forum, personal communication, 2010; M. Szymanski, Fishing Company of Alaska, personal communication, 2010). Despite this consensus, the council has adopted two amendments to further improve the program. One amendment would modify cooperative formation standards (i.e., minimum membership requirements for cooperative formation) to more equitably distribute negotiating leverage. The second amendment would allow for vessel replacement, which could improve safety, retention capability, and economic efficiency in the fleet.

### CENTRAL GULF OF ALASKA ROCKFISH PILOT PROGRAM

The council developed the Central Gulf of Alaska rockfish pilot program after the secretary of commerce received a directive from congress to establish, in consultation with the North Pacific Council, a 2-year pilot program for management of the directed fisheries for three rockfish species in the Central Gulf of Alaska: Pacific ocean perch (*Sebastes alutus*), northern rockfish (*Sebastes polyspinis*), and pelagic shelf rockfish (*Sebastes spp.*). Congress later extended the program's duration to 5 years. Prior to implementation of the pilot program, these rockfish fisheries were prosecuted by trawl catcher vessels and catcher processors as a derby fishery during the first few weeks of July. Landings from the rockfish fisheries often conflicted with landings from the summer salmon fisheries that are prosecuted at the same time. This conflict often led to delays in offloading, resulting in a decline in the quality of products. The program is intended to eliminate the race for fish and also allow participants to time fishing effort to avoid processing conflicts with other fisheries. These changes were intended to achieve improvements in product quality and value, provide stability to processing labor force, reduce bycatch, and improve habitat protections (NPFMC/NMFS 2006).

Based on the congressional directive, stakeholder input, and public testimony, the council developed a cooperative management program under which historic participants receive allocations of those three rockfish species, along with allocations of other important species typically harvested in these directed rockfish fisheries (including Pacific cod [*Gadus macrocephalus*] and sablefish; Consolidated Appropriations Act of 2004). Shares are allocated to licenses, holders of which may access exclusive annual allocations by joining cooperatives. In the catcher vessel sector, each harvester is eligible for a single cooperative that must associate with the processor to which the harvester delivered the most landings to during a specific time period. Eligible vessels that choose not to join a cooperative may fish in a limited access fishery without an exclusive allocation. Although this constraint on cooperative membership choices is very rigid, the council believed that the cooperative/proces-

processor associations that would arise would achieve the program's objective of reducing processing conflicts with other fisheries and that, given the limited life of the program and potential for future modification, any competitive advantage arising under the structure would not be unduly exploited (NPFMC/NMFS 2006). The distribution of landings across several months in each of the first 3 years of the program suggests that the structure has facilitated the redistribution of landings to avoid those processing conflicts. Anecdotal reports also suggest that this redistribution has been used to reduce downtime at processing plants, allowing for steadier employment of processing crews. Although processors made efforts to expand markets for higher value products in the first year of the program, product prices have not risen appreciably. While some in the catcher vessel sector have been quick to suggest that the cooperative/processor associations of the program have diminished any incentive for quality improvements, the challenges associated with the development of new product markets in a down economy should not be overlooked (NPFMC/NMFS 2010).

Improved habitat protection and reductions in bycatch under the program are also notable. Since implementation of the program, habitat protection improvements have arisen as a substantially greater share of the fishery is prosecuted with "semi-pelagic" gear, which has less (and less forceful) contact with the seabed than the bottom trawl gear traditionally used in the fishery. In addition, bycatch reductions are achieved through a few aspects of the program's design. Discards are prohibited for all allocated species (with the important exception of halibut, because halibut retention is not permitted in any trawl fishery). Allocations of halibut under the program strictly limit the catch of halibut. Any cooperative that has fully caught its allocation of halibut is required to stop fishing. To create an incentive for greater reductions of halibut catch in the fishery, halibut remaining at the end of the rockfish fishery in November is reallocated to other trawl limited access fisheries. Under this system of binding halibut allocations, accompanied by the incentive of the reallocation, the fishery has cut halibut mortality per ton of directed rockfish to less than half the level of the best year preceding program implementation (NPFMC 2008a; NPFMC/NMFS 2010).

The overall structure of the program has led some fishermen to acknowledge a wholesale change in their fishing objectives under the pilot program. With limited access management, their objective was simply to "out-fish" others in the fishery to maximize catches of the three directed species, while supplementing their income with allowable retention of other valuable non-directed species (such as Pacific cod and sablefish). Under the pilot program, their primary objective is to time fishing to accommodate both processor delivery schedules and personal time demands. When fishing, their objective is to fully harvest the various retainable species allocations as agreed

with the cooperative and scheduled with the processor with minimal halibut bycatch (NPFMC/NMFS 2010).

Because the pilot program is scheduled to expire at the end of the 2011 season, the council has developed a new program to perpetuate catch share management of the fishery. The new program reduces the allocation of halibut to the rockfish fishery to 87.5% of historic halibut usage (with the remaining 13.5% to remain unavailable for any use). In addition, only 55% of the unused halibut allocation would be available for use in other trawl fisheries after the rockfish season ends (NPFMC 2010e). These reductions are intended to maintain the incentive to avoid halibut bycatch, while reducing total trawl fishery halibut mortality.

## CONCLUSION

The experience in the North Pacific indicates that catch share management should be undertaken only as specific fishery and management needs dictate, rather than mandated through sweeping and general initiatives. In each case in which the North Pacific Council has advanced catch share management, the program was shaped through an arduous, protracted process, to serve the specific needs of the fishery and the council's management objectives for that fishery. Each program was developed against the backdrop of existing annual catch limits. In one case in particular—the development of a comprehensive "rationalization" program for all Gulf of Alaska groundfish fisheries—the council determined after preliminary analysis and deliberations that its efforts to develop this comprehensive catch share program should be abandoned for a variety of practical, social, and other reasons (NPFMC 2006b). These fisheries all continue to be managed under strict catch limits, with a variety of other management measures, including sector allocations for some species. The council similarly retracted its decision to advance a catch share program for the halibut charter fishery it manages and has instead advanced a variety of other management measures in that fishery, including separate commercial and charter annual catch limits, a moratorium on entry to the charter sector, bag limits, and limited opportunities for charter operators to acquire IFQ from the commercial sector (NPFMC 2005a, 2008b). The council is also considering a variety of other long-term measures for the charter halibut fishery (NPFMC 2006a). The council's decision to pursue management measures other than catch shares in these fisheries reflects its view that some fisheries may not lend themselves to catch share management.

When considering a catch share program, the stakeholder, administrative, management, and monitoring burdens should not be overlooked. Stakeholders' and managers' time is greatly taxed by the extensive stakeholder and public input, alternative analysis and review, and council deliberations associated with development of a catch share program. The time for rule

making and implementation of catch share programs after council action has in some cases exceeded 2 years. Care must be taken to ensure that these council and staff time commitments do not constrain the ability to address other pressing management needs. Additional monitoring and observer coverage may also be necessary to oversee catches and landings of exclusive allocations, particularly in multispecies fisheries where catch shares may allow a vessel to improve returns by discarding less valuable catch. Enforcement burdens may also rise, because each permit represents a privilege to harvest a certain quantity of fish, rather than the general privilege to participate represented by a limited entry license. These added costs and burdens are an important consideration for both fishery managers and stakeholders when considering whether to advance a catch share management program in a fishery. Despite these caveats, the experience in the North Pacific Council suggests that, when appropriate for a fishery and carefully designed, catch shares are an effective management measure.

In all of the catch share programs in the North Pacific, program elements reflect a balance of competing interests of those who rely on the fisheries, including vessel owners, processors, crew, communities, environmental interests, and the public. The resulting programs establish a balance of conservation and social goals with economic efficiency gains. Beyond the implementation of program allocations and mechanical regulations governing their use, monitoring and enforcement measures were adapted with the change to catch share management.

Even applying an abundance of care, indirect and unanticipated effects arose in all of these programs. Consequently, the council has attended to and must continue to attend to unanticipated effects and adopt mitigating measures. In addition, several important management concerns (such as habitat and endangered species protections) are unlikely to be directly addressed by catch share management and require independent management measures. Catch shares management of a fishery may allow for new adaptive management measures that might be unworkable under other management programs. In addition, the flexibility provided to participants by catch share management may ease the burden associated with complying with those management measures. Over the past 15 years, catch share programs have become an important part of the fishery management regime in the North Pacific. By using the authority to establish catch share programs with discretion, the North Pacific Council has developed an array of programs that serve a variety of interests in the fisheries it manages.

## REFERENCES

- Bromley, D. W. 2009. Abdicating responsibility: the deceptions of fisheries policy. *Fisheries* 34(6):280–290.
- Consolidated Appropriations Act (CAA) of 2001. Public Law 106-554. 106th Congress, 2nd Session, 21 December 2000.
- Consolidated Appropriations Act (CAA) of 2004. Public Law 108-199. 108th Congress, 2nd Session, 23 January 2004.
- Costello, C., S.D. Gaines, and J. Lynham. 2008. Can catch shares prevent fisheries collapse? *Science* 321: 1678-1681.
- Downs, M., and S. Weidlich. 2010. Bering Sea and Aleutian Islands Crab Rationalization Program five-year review social impact assessment, Appendix A to five-year review of the Crab Rationalization Management Program for the Bering Sea and Aleutian Islands Crab Fisheries. AECOM, Inc., San Diego, California.
- Ecotrust and Ecotrust Canada. 2004. Catch-22: conversation, communities, and the privatization of B.C. fisheries: an economic, social and ecological impact study. Vancouver, British Columbia.
- Fina, M. 2005. Rationalization of the Bering Sea and Aleutian Islands crab fisheries. *Marine Policy* 29:311–322.
- Grafton, Q. R., R. Arnason, T. Bjørndal, T. D. Campbell, H. F. Campbell, C. W. Clark, R. Connor, D. P. Dupont, R. Hannesson, R. Hilborn, J. E. Kirkley, T. Kompas, D. E. Lane, G. R. Munro, S. Pascoe, D. Squires, S. I. Steinhilber, B. R. Turrill, and Q. Weninger. 2006. Incentive-based approaches to sustainable fisheries. *Canadian Journal of Fisheries and Aquatic Sciences* 63(3):699–710.
- Hartley, M., and M. Fina. 2001. Changes in fleet capacity following the introduction of individual quotas in the Alaskan Pacific halibut and sablefish fishery. pp. 186–207 in R. Shotton, editor. *Case studies on the effects of transferable fishing rights on fleet capacity and concentration of quota ownership*. FAO Fisheries Technical Paper 412, Rome.
- Leal, D., editor. 2005. *Evolving property rights in marine fisheries*. Rowman & Littlefield Publishers, Lanham, Maryland.
- Lincoln, J., and C. Woodley, 2010. Review of safety under the Crab Rationalization Management Program for Bering Sea and Aleutian Islands Crab Fisheries, Appendix B to five-year review of the Crab Rationalization Management Program for the Bering Sea and Aleutian Islands Crab Fisheries. North Pacific Fishery Management Council, Anchorage, Alaska.
- Macinko, S. 2005. In search of transition, community and a new federalism: 6 questions to confront on the road towards a national policy on dedicated access privileges. in D. Witherell, editor. *Proceedings of Managing Our Nation's Fisheries II*. North Pacific Fishery Management Council, Washington, DC.
- Macinko, S., and W. Whitmore, 2009. *A New England dilemma: thinking sectors through*. Report to Massachusetts Division of Marine Fisheries, Rhode Island.
- NMFS (National Marine Fisheries Service). 2001. Steller sea lion protection measures, supplemental environmental impact statement. National Marine Fisheries Service, Juneau, Alaska.
- . 2010. NOAA announces new northeast groundfish management measures. Gloucester, Massachusetts.
- . 2011. Media advisory, NOAA inaugurates innovative catch shares management for Pacific Coast groundfish. Seattle, Washington.
- NOAA (National Oceanic and Atmospheric Administration). 2009. NOAA announces catch share task force members. Silver Spring, Maryland.

- . 2010. NOAA catch share policy. Silver Spring, Maryland.
- NPFMC (North Pacific Fishery Management Council). 2002. Impacts of the American Fisheries Act. Report to the U.S. Congress and Secretary of Commerce, Anchorage, Alaska.
- . 2003. Final environmental assessment/regulatory impact review/initial regulatory flexibility act analysis for proposed Amendment 66 to the Fishery Management Plan for Gulf of Alaska Groundfish, to allow eligible Gulf of Alaska communities to hold commercial halibut and sablefish quota share for lease to community residents. North Pacific Fishery Management Council, Anchorage, Alaska.
- . 2005a. Charter halibut IFQ motion. North Pacific Fishery Management Council. Anchorage, Alaska.
- . 2005b. Environmental assessment/regulatory impact review/initial regulatory flexibility assessment for modifying existing measures for chinook and chum salmon savings areas for Amendment 84 to the BSAI Groundfish FMP. Anchorage, AK.
- . 2006a. Allocation/share-based alternatives and options. North Pacific Fishery Management Council, Anchorage, Alaska.
- . 2006b. Minutes of the North Pacific Fishery Management Council. Anchorage, Alaska.
- . 2007a. 18-Month review of Bering Sea and Aleutian Islands crab management. North Pacific Fishery Management Council, Anchorage, Alaska.
- . 2007b. Allocation of non-pollock groundfish and development of a cooperative program for the head and gut trawl catcher processor sector, environmental assessment/regulatory impact review/initial regulatory flexibility act analysis. North Pacific Fishery Management Council, Anchorage, Alaska.
- . 2008a. Gulf of Alaska rockfish pilot program review. North Pacific Fishery Management Council, Anchorage, Alaska.
- . 2008b. Motion on Area 2C/3A catch sharing plan. North Pacific Fishery Management Council, Anchorage, Alaska.
- . 2008c. Three-year review of the Crab Rationalization Management Program for the Bering Sea and Aleutian Islands crab fisheries. North Pacific Fishery Management Council, Anchorage, Alaska.
- . 2009. Leasing practices in North Pacific fisheries. North Pacific Fishery Management Council, Anchorage, Alaska.
- . 2010a. Current issues. North Pacific Fishery Management Council, Anchorage, Alaska.
- . 2010b. Five-year review of the Crab Rationalization Management Program for the Bering Sea and Aleutian Islands crab fisheries. North Pacific Fishery Management Council, Anchorage, Alaska.
- . 2010c. Motion on the five-year review of the Crab Rationalization Management Program for the Bering Sea and Aleutian Islands crab fisheries. North Pacific Fishery Management Council, Anchorage, Alaska.
- . 2010d. Review of the Community Quota Entity Program under the Halibut/Sablefish IFQ Program. North Pacific Fishery Management Council, Anchorage, Alaska.
- . 2010e. Rockfish Program motion. North Pacific Fishery Management Council, Anchorage, Alaska.
- NPFMC/NMFS (North Pacific Fishery Management Council/National Marine Fisheries Service). 1992. Final supplemental environmental impact statement for the individual fishing quota management alternative for fixed gear sablefish and halibut fisheries. National Marine Fisheries Service, Juneau, Alaska.
- . 2004. Bering Sea/Aleutian Islands crab fisheries, programmatic environmental impact statement/regulatory impact review/initial regulatory flexibility act analysis. National Marine Fisheries Service, Juneau, Alaska.
- . 2006. Central Gulf of Alaska Rockfish Demonstration Program, environmental assessment/regulatory impact review/initial regulatory flexibility act analysis. National Marine Fisheries Service, Juneau, Alaska.
- . 2009. Bering Sea chinook salmon bycatch management. Final environmental impact statement. National Marine Fisheries Service, Juneau, Alaska.
- . 2010. Central Gulf of Alaska Rockfish Program, public review draft environmental assessment/regulatory impact review/initial regulatory flexibility act analysis. National Marine Fisheries Service, Juneau, Alaska.
- NRC (National Research Council). 1999. Sharing the fish, toward a national policy on individual fishing quotas. National Academy Press, Washington, D.C.
- Pautzke, C., and C. Oliver. 1997. Development of the Individual Fishing Quota Program for sablefish and halibut longline fisheries off Alaska presented to the National Research Council's Committee to Review Individual Fishing Quotas. Anchorage, Alaska.
- Pinkerton, E., and D. Edwards. 2009. The elephant in the room: the hidden costs of leasing individual transferable quotas. *Marine Policy* 33(4):707–713.
- Sustainable Fisheries Act (SFA) of 1996. Public Law 94-265. 104th Congress, 2nd Session, 11 October 1996.
- Wilén, J. E., and E. J. Richardson. 2008. Rent generation in the Alaskan pollock conservation cooperative. *in* R. Townsend and R. Shotton editors. Case studies in fisheries self governance. FAO Fisheries Technical Paper 504, Rome.

### FROM THE ARCHIVES

*“The key to successful stocking of our waters with fish, is in putting the right kind in their respective waters -- those that are suitable for them. There would be quite as much sense in sowing wheat on the bare shingles on the top of your house as to put fish in waters that are not suitable for them.”*

Seth Green, Fifth Annual Meeting, Transactions of the American Fish Culturists' Association, 1876