Rent generation in the Alaskan pollock conservation cooperative

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1. INTRODUCTION

The idea of open access dissipation of resource rent is surely one of the most powerful insights from the social science literature. While the clever "tragedy of the commons" metaphor often grants Hardin (1968) credit for the insight, the concept appeared in various forms much before Hardin – most comprehensively in Gordon (1954). The Gordon paper ranks as one of the most enduring and most cited papers in natural resource economics. Gordon's description of the process of open access dissipation was also a metaphor that simplified to make fundamental points. An important simplification was the depiction of open-access harvesting in terms of a composite "effort" index. Gordon proposed that readers interpret effort as boats for pedagogical purposes, but as the paper's influence spread, the pedagogical substitution of boats for all dimensions of fishing effort took on a life of its own. Academics and managers came to interpret the rent dissipation process as "too many boats chasing too few fish" in a quite literal sense. This interpretation led early regulators to believe that controlling the number of vessels through limited entry would be sufficient to rationalize fisheries and eliminate the perverse incentives of open access. But evidence from the first limited entry experiments made clear that controlling some dimensions of effort encouraged fishermen to expand others and continue to dissipate rents (Wilen, 1988). The literal adoption of Gordon's metaphor overlooked that there are many ways to expand individual capacity in a race for fish and almost unlimited ways to waste potential rents.

It is probably not exaggerating too much to claim that most fisheries economists anticipated that, with secure use rights, the main adjustment would be a reduction in the number of vessels and the consolidation of catch-history. But this simplified expectation projects earlier misunderstandings concerning rent dissipation onto the rent creation process. In reality, as many fisheries have rationalized, new rents have been generated by making the easy adjustments first, and these often do not involve immediate vessel removal and consolidation. The new rents are generated by maximizing the value of what is caught, reversing regulated open-access incentives to maximize the quantity of what is caught. Increasing net value has been accomplished by opening up new markets, by changing product mix, and by substituting capital and labor tasks in ways that preserve the quality of the harvest.

Rent generation in real fisheries has much more texture, with rents produced by complex input combinations such as crew coordination and communication, skipper fish-finding skills, and subtle differences in vessel design, gear efficiency, and travel and search times on the harvesting side of the operation (Wilen, 2004). But the harvesting or production side of fishing is intimately connected to alternatives in the market. And the alternatives presented by the market are not exogenous but instead reflect the fishing process itself. One of the most important lessons in the rationalization of fisheries is how important the market is as a source of rents (Homans and Wilen, 2005). There are seemingly endless ways that economic value can be enhanced once proper incentives to capture this value are in place. In this paper, we look at the changes in the Alaskan Bering Sea pollock fishery after rationalization and the establishment of the Pollock Conservation Cooperative in the winter of 1998.

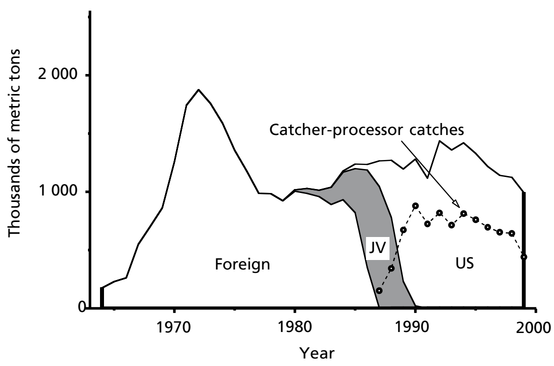
2. THE BERING SEA POLLOCK FISHERY

With landings on the order of 1.5 million tons, the Bering Sea pollock fishery is North America's largest fishery in total tonnage. Pollock aggregate in large spawning concentrations off the Aleutian Islands and along the southeastern Bering Sea shelf and slope during late winter and early spring. The fishery targets highly-valued roe-bearing pollock during this winter, or "A-season", fishery. In the late summer and fall, the stock is dispersed along the outer Bering Sea shelf and slope from the US-Russian convention line south and east to the Alaska Peninsula. The industry generally begins its "B-season" fishery during July and harvesting generally continues through October. Total allowable catch regulation (TACs) currently apportions harvests seasonally, with 40 percent of the TAC available during the A-season and the remainder available for the B-season.

The eastern Bering Sea pollock stock was initially exploited by distant-water foreign fleets in the early 1960s (Figure 1). During the late 1980s, the fishery was americanized, which involved joint ventures during a transition period and then full development of domestic capacity. Americanization provided new opportunities for US-based surimi and fillet producers to supply world markets. Today, two primary groups of vessels and plants – the inshore and the offshore sectors – participate in the fishery. The inshore sector employs catching-only vessels that harvest pollock using large mid-water trawls and transport the raw fish to onshore processing facilities. The offshore sector, which is the focus of this paper, employs mainly integrated catching and processing vessels that harvest pollock and then process it using machinery installed below deck. Catcher-processor vessels are large, ranging from 70-110 meters in length, and represent significant investments, on the order of US$30-40 million. The offshore sector also includes three floating processors (so-called "motherships") that receive deliveries from a dedicated fleet of catcher vessels.

Surimi is a primary input into a broad spectrum of finished and semi-finished fish products. To produce high-quality surimi is complex and requires several steps that must be well managed. After holding raw fish for a period during which they firm up, the fish are filleted using special cutting machines adjusted for the average size of fish. The fillets and other recovered flesh are minced and the protein fibers washed, aligned, dried, and then mixed with ingredients which preserve product quality during freezing. The resulting product is a versatile fish

FIGURE 1
Bering Sea and Aleutian Island pollock catches, 1964–1999



paste of uniform texture and fiber. The frozen paste is sold to secondary processors, primarily in Japan, who use it to make fish sausage, imitation crabmeat, and an array of other, traditional shaped and molded products. Because surimi is an intermediate commodity product that has not been highly valued, the pollock fishery has operated as an industrial fishery with profits flowing mainly from capital investments that provide economies of scale in harvesting and processing.

The inshore sector was developed on Alaskan soils in the early 1990s by many of the same Japanese firms that had pioneered the offshore fishery prior to its Americanization. As harvest opportunities were transferred to US vessels, several Japanese companies established shore-based processing operations to maintain a steady source of surimi. During the 1990s, the inshore sector came to be dominated by two large Japanese seafood conglomerates and one large and vertically integrated US seafood company. These three companies own five groundfish and crab processing plants on the Alaska Peninsula and in the eastern Aleutian Islands, and the inshore harvest is split roughly equally among the companies. Prior to the restructuring of the pollock fishery by the 1998 American Fisheries Act, the offshore sector was dominated by a large Norwegian firm and several US companies headquartered in the State of Washington. These companies operated about 30 catching and processing vessels and sold surimi into the Japanese market in competition with the Japanese-owned inshore plants, but at an outsider's disadvantage. Partly as a diversification strategy, the offshore sector also built up processing flexibility during the 1990s to produce fillet, deep-skinned fillet, and minced pollock products from their integrated operations. These fillet and mince products are sold into the international whitefish markets, in competition with other firm-fleshed species such as cod, hake and haddock.

3. THE POLLOCK CONSERVATION COOPERATIVE

3.1 Events leading to formation

The parallel development of offshore and inshore sectors led to high-stakes allocation disputes over sectoral allocations of the total pollock TAC. During the 1992–1998 period following the so-called Inshore/Offshore Decision, the offshore sector was allocated 65 percent of the Bering Sea and Aleutian Islands (BSAI) pollock TAC (Herrick et al., 1994). Inshore/offshore sector TACs were determined by subtracting bycatch allowances of 4–6 percent and a 7.5 percent community development quota (CDQ) from total allowable catch, and then allocating the remainder with a 65/35 percent split of the commercial catch. The CDQ quota program was established in 1992 to catalyze increased participation of western Alaskan coastal communities in the Bering Sea groundfish fisheries (National Research Council, 1999).

In 1998, the North Pacific Fisheries Management Council (NPFMC), a majority of whose members represent Alaska, reduced the offshore sector TAC allocation from 65 percent to 61 percent as part of the so-called Inshore/Offshore III decision. The offshore sector argued that they could absorb this reallocation only if the NPFMC agreed to allow the offshore sector to set up a harvesters' cooperative. But the NPFMC effectively blocked the formation of a harvesters' cooperative by failing to apportion the offshore TAC between the catcher processor and mothership fleets. After a contentious process of political logrolling, a complicated piece of national legislation called the American Fisheries Act (AFA) cleared the way for the Pollock Conservation Cooperative (PCC) to form during the winter of 1998. The AFA further reduced the offshore allocation from 61 to 50 percent, increased allocations to the Community Development Quota program to 10 percent and removed foreign flagged vessels from the offshore sector. (Figure 2 summarizes the history of allocations.) The 50 percent offshore allocation was divided up between the catcher/processor fleet (CP), a group of catcher vessels delivering to catcher processors (CP CV), and the small group of motherships and their catcher vessels (MSCV).

FIGURE 2
Bering Sea and Aleutian Islands pollock allocation history

	I-O II	I-O III	AFA
CDQ	7.5%	7.5%	10%
Bycatch	4–6%	4–6%	4–6%
–	–	–	–
Inshore (SP CVs)	35%	39%	50%
Offshore	65%	61%	
MS CVs			10%
CPs			36.6%
CP CVs			3.4%

Two legal preconditions were necessary to support the formation of the PCC. First, a secure allocation to the catcher-processor companies was required and the AFA provided this exclusive allocation. Second, the group required the legal blessing of the Department of Justice that it was not violating antitrust regulations, as well as the development of an elaborate set of "sideboard" regulations by the NPFMC. The AFA required the NPFMC to develop these sideboard regulations to protect non-pollock groundfish harvesters from excess effort that may have been released from the pollock fishery due to rationalization. The Pollock Conservation Cooperative first began to fish cooperatively with the start of the 1999 season.

3.2 Expected sources of rents

With only seven independent companies in the catcher-processor segment of the offshore sector prior to 1998, one might have expected that the bulk of potential rents would have been realized. But the offshore sector was allocated its TAC as a common pool quota; the season was closed once the allocation was reached. This created a derby fishery. The processing operations would have preferred a slow and even supply of raw fish of relatively uniform size and condition. This would enable an optimal throughput that maximized processing line efficiency by recovering the largest amount of salable product value. Pollock products include roe (during the A-season), primary products made of flesh from the whole fish (surimi, fillets, mince and meal from whole fish), and secondary products made from processed fish (mince and meal from fillet trimmings and carcasses). But because the catching operation was under a race to fish, cutting, processing, and extraction operations could not be optimized. There was also less time and space available to operate secondary recovery processes efficiently. These recovery processes include specialized machines that remove head meat from filleted carcasses and process-water decanters that scavenge protein fibers from wash-water streams. These machines require space and are time- and labor-intensive. In a derby fishery, the focus is on cut-fish throughput, and the factory is configured with the maximum number of filleting machines. Moreover, since fillet production is time- and labor-intensive, the derby fishery biases product mix toward surimi products rather than fillet products.

Throughput can also be too slow, which leads to the under-use of processing capital and higher unit production costs. If the fishing and processing operations can not be carefully coordinated, then process throughput may be halted due to a lack of pollock. When this occurs, the processing line must be emptied and sanitized, and then restarted and retuned. Prior to the harvesting cooperative, each vessel raced to harvest fish, which resulted in a compressed season with too many fish being run through the onboard processing plants in the time available.

Knowledgeable individuals in the catcher-processor sector believed that they could earn more profits with a slower pace of harvesting. Skippers realized that they could slow down fishing and feed optimal flows of raw fish into the processing lines. Vessel fish masters also spoke of the ability to fish large schools of pollock in ways that generated more returns, *e.g.*, by targeting larger roe-laden females on the leading edge of the moving school when roe condition was optimal. Under the derby fishery, it was common for too many vessels to fish the same school of pollock, which resulted in unnecessary dispersal of the fish. This caused frequent movement and disruption of the flow of fish into the processing operation. Skippers also believed that they could deliver more uniform sized fish to the processing lines.

Net value of final product can be created in at least three ways. First, net value can be created by altering the portfolio of finished and semi-finished products toward higher-valued products. When fillet prices are high relative to surimi prices, it would be profitable to shift some raw product to fillets and away from surimi. Factory managers also expected to fine tune the cutting line to salvage more quantity of high valued primary-product yield per ton of raw fish, regardless of the final product. Cutting line efficiencies could be improved by increasing the uniformity of fish landed, which allows cutting operations to be more precisely tailored to the average size of incoming fish. Saving even small percentages of flesh enables more pollock to be converted into high-quality primary consumer products rather than recovered as a secondary product, raising profits considerably. Processing line managers also expected to improve the recovery and quality of secondary products. A significant amount of pollock ends up as industrial products, including fish oil and fishmeal. Although these products have low unit values, the high volumes of pollock harvested suggests that improving the recovery of these items can increase rents considerably. Prior to 1998, factory managers suggested that total product recovery was about 18 percent. They expected that under the rationalized cooperative, that product recovery might increase to as much as 22 percent. This estimate turned out to be a substantial underestimate.

3.3 Changes under rationalization

The Inshore/Offshore III allocation was superseded by the AFA. The AFA contained a complex set of provisions that transformed the offshore sector in a major way. An Americanization provision forced the large Norwegian firm to divest itself of nine vessels and sell a majority of its harvesting operations to US interests. The Bering Sea pollock CDQ allocation was increased to ten percent from seven percent, and 15 percent of the non-CDQ TAC was transferred from the offshore sector to the inshore sector. Two-thirds of the increased inshore allocation was generated out of the catch history of the divested vessels. The Norwegian owner was compensated $95 million ($20 million from a federal grant and $75 million from a US government-backed loan to be repaid via a $0.006 per pound levy on pollock landings to inshore processors). The uncompensated third of the inshore transfer reflected approximately the prior Inshore/Offshore III allocation. For the purposes of this chapter, the most important part of the AFA was the allocation framework that allowed the offshore catcher-processor companies to form a closed class with a specific allocation. The AFA gave seven firms the legislative blessing to operate 20 catcher-processor vessels in a coordinated fashion. The prospective coop participants reached agreement on a division of the catcher-processor allocation.

The Pollock Conservation Cooperative is not an individual transferable quota (ITQ) system *per se,* since the offshore allocation was not legally parceled out to individual firms or vessels. In fact, at the time of passage of the AFA, the development of new federal ITQ programs was prohibited by law. But, incentives to cooperate exist because the coop members have been allocated a TAC share as a group. The internal incentives are similar to those under other property-rights-based systems, such as territorial use rights in fisheries (TURFs) discussed elsewhere in this volume. Within the cooperative, each firm holds a negotiated share of the catcher-processor allocation, based mostly on historical harvest shares within the group. For each firm, incentives exist at the company level to maximize the value of that negotiated share by increasing revenues and reducing costs.

Since its inception in 1998, the Pollock Conservation Cooperative has successfully generated new profits and efficiencies in several ways. First, a number of the most inefficient vessels were removed from fishing. Of the 29 vessels that fished before

FIGURE 3
Relative fishing power (B-season) of AFA catcher-processors, 1995–1998

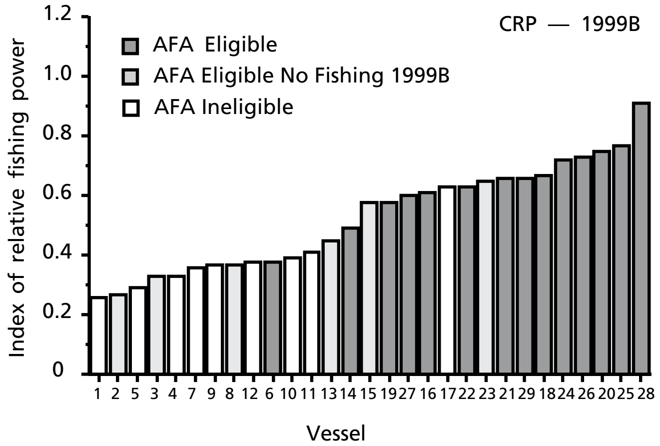


FIGURE 4
Average daily catch of AFA catcher-processors, 1995–1999

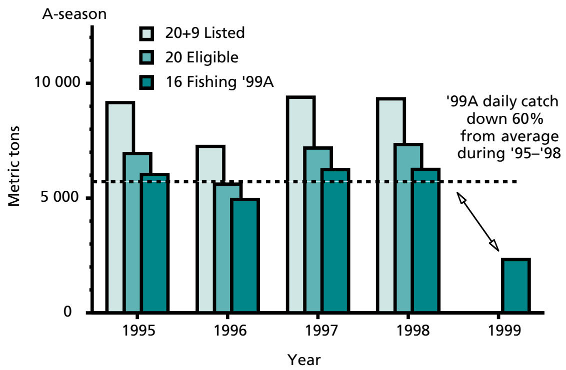
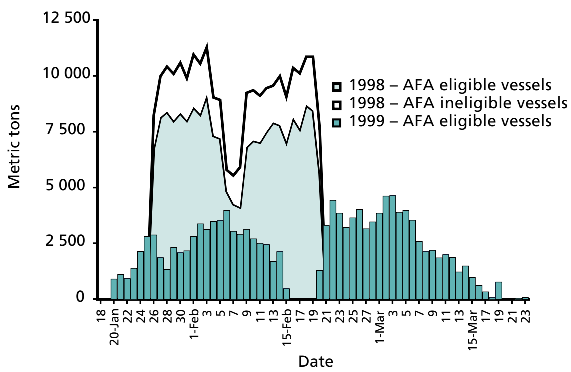


FIGURE 5
Daily A-season catches of AFA catcher-processors (excluding CDQ), 1998 and 1999



At-sea Processors Association, 1 April 1999.
Source: NMFS AKFSC - SeaState, Inc.

the AFA, 9 were removed with the buyout, which left 20 eligible vessels. These 9 vessels tended to be less efficient vessels (see Figure 3). The coop retired an additional 6 vessels, leaving only 14 of the 20 eligible vessels to fish during the first year. The operating costs of these 6 vessels were saved. In addition, the coop acquired the catch shares allocated to the high seas catcher vessels that had previously delivered pollock to offshore catcher processor vessels.

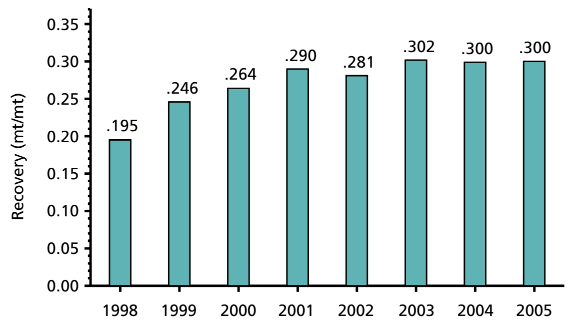
New rents were generated by fine-tuning the fishing operations and coordinating harvesting operations with the onboard processing plants. In the initial year of cooperative fishing, daily catch rates were only 40 percent of those recorded by the same vessels over the 1995-1998 seasons (Figure 4). Catch per haul was 27 percent lower and the number of hauls per day dropped by 45 percent. The length of the 1999 A-season was doubled compared with the 1998 season because of these substantial reductions in daily catch (see Figure 5). Note that CDQ catches are excluded from this data for both 1998 and 1999. Vessel catcher/processor operations are now able to optimize the quality of raw fish harvested by slowing catching operations, while maximizing the value derived from fish landed by improving operations in the processing lines.

As expected, the value produced a ton of raw pollock increased. Figure 6 shows that before cooperative fishing, total product recovery rates averaged 19.5 percent. In the first year of cooperative fishing, total product recovery shot up to 24.6 percent, exceeding the increases anticipated by most knowledgeable factory managers. The recovery rate jumped another 2 percent in the second year and another 3 percent in the third year, reaching a plateau of a bit over 30 percent in 2003.

Figure 7 shows how total product mix has changed. Some of the yield increase in the first two years emerged by squeezing more surimi paste from the raw pollock. From a pre-cooperative average of slightly over 8 tons of surimi per 100 tons of raw pollock, surimi production rose in the first two years to more than 13 tons per 100 tons of round pollock. The fleet was also developed capacity to shift product mix to adjust to market conditions. In response to market conditions that favored deep skin fillets during the first two years, a significant amount of that product was generated (Figure 7). This pattern of shifting to more valuable fillets and deep skin fillets has continued, along with substantial increases in recovery rates of both fillet types.

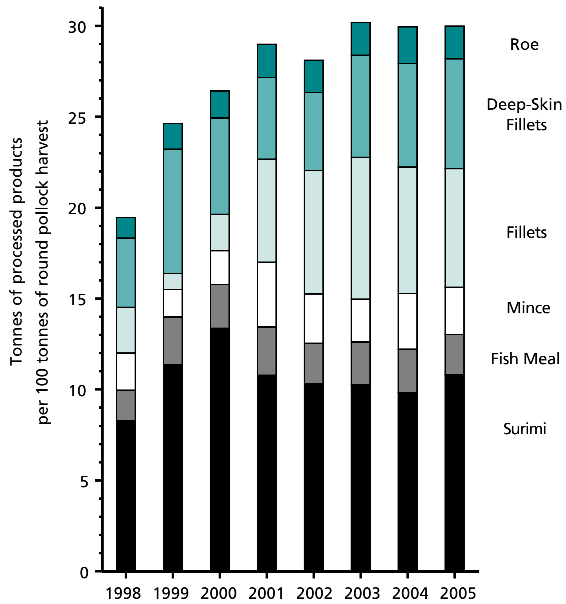
Changes also increased high-valued roe recovery during the A-season. Prior to 1998, the A-season fishery that targets fish for roe contributed 45 percent of the total A- and B-season catch. In the first years of coop operations during 1999-2002, the A-season catch fraction was reduced to 40 percent. But finished roe product increased from roughly 1.4 to about 1.8 tons per 100 tons of round pollock, about a 28 percent increase in efficiency in the very valuable roe. Factory managers have also recovered increased amounts of secondary products such as fishmeal and minced pollock. Beginning in 2001, the recovery of minced pollock secondary products increased substantially (Figure 7). Minced pollock and meal production increased both from a better matching of offal flows to meal-plant capacities, and because most of the idled vessels did not possess meal plants. Overall, the pollock case illustrates that even in a fundamentally high-volume industrial fishery, the opportunities for increasing value that are unleashed by creating proper incentives are significant.

FIGURE 6
Total product recovery of AFA catcher-processors, 1998–2005



Source: SeaState, Inc. PCC and CDQ catch per haul, 1998-2005; NMFS AK Region Pacific cod and pollock products by processing mode, 1998-2005, BSAI groundfish quotas and preliminary catch in round metric tons, 1999-2005, and CDQ participation and catch by gear, 1999–2005. Total product recovery estimates include both directed-fishing and CDQ pollock harvests, and are calculated as the weight of all products produced divided by the weight of the round pollock used to obtain the products.

FIGURE 7
Total product recovery and mix of AFA catcher-processors, 1998–2005



During 2001-2005 total product recovery is estimated to have increased by 50% over the 1998 open-access "race-for-fish" baseline. Note that this figure does not show product recovery rates, but instead the average product mix produced from the total amount of pollock harvested throughout the entire year by all PCC member vessels.
Source: SeaState, Inc. PCC and CDQ catch per haul, 1998-2005; NMFS AK Region Pacific cod and pollock products by processing mode, 1998-2005, BSAI groundfish quotas and preliminary catch in round metric tons, 1999-2005, and CDQ participation and catch by gear, 1999-2005.

4. SUMMARY AND CONCLUSIONS

Emerging management innovations will determine not only whether the marine resources of the world can produce more fish, but also the economic values derived from them. It is easy to argue that little of the ocean's potential for generating economic return has been realized. Most fisheries are dramatically overcapitalized, and most of the overcapitalization is a hangover of the open access period prior to extension of nation-state ocean jurisdiction during the 1970s. Since the formation of national Exclusive Economic Zones and the potential for control over effort, some fisheries have adopted schemes that partially mitigate the conditions that Gordon described. Yet most fisheries regulations focus on biological indicators and stock safety goals, rather than rent generation. Most of the wealth-generating potential of the world's fishery resources is still being squandered.

The rent generation process is significantly more complex than might be inferred from the stylized Gordon model. As information about various rationalization schemes around the world accumulates, we will no doubt find that new rents are generated across many margins. This suggests that the rent dissipation process itself must have originally been multi-faceted and spread across multiple margins. We have probably not paid enough attention to how the market side of fisheries is distorted by the race to fish. While some cost-savings gains have clearly emerged in the PCC from retiring excess vessels, significant gains have also emerged from the market side. Many of the process changes that were undertaken were done to vary the product mix to better meet market demands and to squeeze more salable product from the raw pollock.

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