The Pollock Conservation Cooperative

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I. Introduction

The idea of open access dissipation of resources is surely one of the most powerful insights to emerge out of the social science literature. While the clever choice of the “tragedy of the commons” metaphor often grants Garret Hardin credit for the insight, the notion appeared in various forms much before Hardin’s paper — most comprehensively in an important paper by H.S. Gordon that appeared in the economics literature in 1954. The Gordon paper ranks as one of the most long-lasting and cited papers in the entire field of natural resource economics. Gordon’s description of the process of open access dissipation was also a metaphor that employed simplifications in order to make fundamental points. One of the more important simplifications was the depiction of the open-access harvesting process 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, and academics and managers soon came to interpret the rent dissipation process as one of “too many boats chasing too few fish,” in a quite literal sense. This interpretation of the process, in turn, led early regulators to believe that just controlling the number of vessels through limited entry would be sufficient to rationalize fisheries and eliminate the perverse incentives of open access behavior. But as evidence began to emerge from the first limited entry experiments, it became clear that controlling some dimensions of effort simply encouraged fishermen to expand others and continue to dissipate rents. What had been overlooked in the literal adoption of Gordon’s metaphoric description is that, in real fisheries, there are many ways to expand individual capacity in a “race for fish,” and almost unlimited ways to waste potential rents.

In some ways, the same early failures to fully understand the rent dissipation process have been repeated as fishery managers began to reverse the process and create rents with right-based management schemes. 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 of the likely sources of rent creation by eliminating the “too many boats chasing too many fish” simply projects earlier misunderstandings concerning rent dissipation into the rent creation process, which ought to reflect some kind of symmetries with the more complex rent dissipation process observed under imperfect property rights. The reality has been that as most fisheries have rationalized, new rents have been generated by making the easy adjustments first, and these seldom involve immediate vessel removal and consolidation. More often, the new rents are generated by intensification of strategies to maximize the value of what is caught, instead of the strategies so prevalent under regulated open access to maximize the quantity of what is caught. Increasing net value, in turn, has most often been accomplished by opening up new markets, changing product mix, and substituting capital and labor tasks in ways that preserve the quality of the harvest.

As has been pointed out before, what hasn’t been generally appreciated is that 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. But another aspect of the fishing process that has also been generally under appreciated is that the harvesting or production side of fishing is intimately connected to alternatives that present themselves 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 to be derived by observing the rationalization of fisheries is how important the market is as a source of rents. In many fisheries, the very first sources of rents emerge as a result of changes in raw fish quality and characteristics that are aimed at capturing higher valued markets not previously served under the race for fish. In general, as we are discovering after looking at what has happened under existing right-based systems, there are seemingly endless ways that economic value can be enhanced once proper incentives to capture this value are in place. In the remainder of this paper, we take a closer look at the kinds of changes engendered in the Bering Sea pollock fishery after rationalization and the establishment of the Pollock Conservation Cooperative in the winter of 1998.

II. The Bering Sea Pollock Fishery

The Bering Sea pollock fishery is North America’s largest fishery in terms of total tonnage, with landings recently in the vicinity of 1.5 million metric tones. 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. Harvests are apportioned seasonally, with 40 percent of the total allowable catch (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 fleets in the early 1960s, and during the late 1980s the fishery was “Americanized.” In practical effect, 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 then 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 240-360 feet in length, and represent significant investments, on the order of 30-40 million dollars.¹

Surimi is a primary input used in a broad spectrum of finished and semi-finished fish products in Japan and elsewhere. The process of producing high-quality surimi is complex and requires several steps that must be well managed to achieve process design potentials. First, 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
incoming 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 “paste” of uniform texture and fiber. The frozen paste is then sold to secondary processors, primarily in Japan, who use it to make fish sausage, imitation crab meat, and a wide 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 vessels with licenses to fish in US waters, several Japanese companies established shore-based processing operations to maintain a steady source of surimi to feed the integrated wholesale and retail food production systems developed in Japan. During the 1990s, the inshore sector came to be dominated by two very large Japanese seafood conglomerates and one large and vertically integrated US seafood company. Together, these companies own five groundfish and crab processing plants located on the Alaska Peninsula and 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 outsiders’ disadvantage. Partly as a diversification strategy, the offshore sector also built up processing flexibility during the 1990s in order to produce fillet, deep-skin 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.

The Bering Sea pollock fishery has been a source of contentious allocation disputes ever since its Americanization was completed. The main issue has been one of how much of the TAC to allocate to the offshore sector as opposed to the inshore sector. Between 1992-1998, the offshore sector was allowed to harvest 65 percent of the Bering Sea and Aleutian Islands (BSAI) pollock TAC. During the most recent allocation dispute in 1998, often referred to as Inshore/Offshore III, the Alaska-dominated North Pacific Fisheries Management Council (NPFMC) reduced the offshore sector TAC allocation from 65 percent to 61 percent. 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. After a contentious process of political logrolling and back-room politics that went all the way to Washington D.C., 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. Two important preconditions were necessary for the PCC to spontaneously form. First, it was important that a secure allocation be granted to the group of catcher-processor companies that comprised the prospective members, and the AFA provided this exclusive allocation. Second, the group required the legal blessing of the Department of Justice 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 as a means 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.

A. Expected Sources of Rents

What kinds of activities were responsible for rent dissipation prior to the formation of the Pollock Conservation Cooperative? One might have suspected that the fishery was close to operating as a rationalized fishery, since the fishery was prosecuted by only a small number of companies, with several operating multiple vessels. There were, in fact, only seven independent companies in the catcher-processor segment of the offshore sector prior to 1998. It is straightforward to develop a simple model of such a scenario, based on Nash equilibrium-like concepts of implicit collusion, to arrive at the conclusion that the bulk of potential rents ought to have been realized. Nevertheless, it was apparent that there was a significant amount of wasteful open access competition occurring. One way this occurred was a result of the fundamental conflict within catcher-processor companies between the catching and the processing parts of their integrated operations. Consider the harvesting part of the operation first. The offshore sector was allocated a fraction of the TAC in the aggregate, and harvests were monitored by recording accumulated catches and closing the season once the allocation was reached. But this created an “Olympic” style fishery in which the catching part of each operation raced to maximize its share of the resource before the aggregate offshore quota was met. At the same time, the processing part of each operation would have preferred a slow and even supply of raw fish of relatively uniform size and condition. With surimi processing lines, there is an optimal throughput that maximizes processing line efficiency in the sense of recovering the largest amount of salable products from the raw fish inputs. If processing line throughput is too fast, then wastage occurs because cutting operations can’t be optimized. Further waste occurs because there is less time and space available to efficiently operate secondary and tertiary recovery processes that convert primary-product wastes into salable products.

Throughput can also be too slow, leading to the under-use of processing capital and higher unit production costs. If the fishing and processing operations can’t be carefully coordinated, then process throughput may be halted for an extended time due to a lack of round pollock available for processing. When this occurs, the entire processing line must be emptied and sanitized, and then the lines must be restarted and retuned to bring system performance back to prior levels. The interesting point is that even within an integrated catcher-processor operation owned by a single company in a sector with few competitors, the race to catch fish still impacts the value of the production from the integrated operation. Prior to forming the harvesting cooperative, each vessel needed to harvest fish before they were taken by competing vessels. But this meant a compressed harvesting season, with too many fish being run through the onboard processing plants. The compromise reached on integrated operations inevitably meant less than efficient processing line operation, with lower physical and economic recovery of primary and secondary products of lower quality, as well as an inability to match processing to changing market conditions for the range of products.
possible with the raw pollock. Most knowledgeable individuals involved in the catcher-processor segment of the fishery believed that they could earn more profits in a fishery with a slower pace of harvesting. Skippers realized that if they were not forced to compete with other vessels for a share of the offshore quota, then they could slow down the fishing process and feed optimal flows of raw fish into the processing lines in a continuous manner that allowed line efficiencies to be captured. A few vessel fish masters also spoke of the ability to fish large schools of pollock in ways that generated more profitable returns, e.g., by targeting larger roe-laden females on the leading edge of the moving school during the period when roe condition and recovery were optimal. Skippers believed that they could not only generate more roe value under rationalization, but that they could also deliver more uniform sized fish to the processing lines in a more consistent manner.

Prior to rationalization, factory managers also talked about the ability to improve coordination between harvesting and processing and thereby optimize the value of yield. The most important opportunities they anticipated were via slowing the processing down in order to increase marketable yields from fish caught. Beginning in 1998, the pollock fishery has been required by law to achieve “full retention and utilization,” which means that each pollock harvested must be converted into a primary product, and the weight of the primary products obtained must exceed 15 percent by weight of the round pollock processed. An important statistic that is monitored by both regulators and the industry is the total product recovery, which is measured as the tonnage of salable products per ton of round pollock input. Net value can be created in the processing line in at least three ways. First, net value can be created by shifting the portfolio of finished and semi-finished product to higher valued markets. One hope that most factory managers saw in a rationalized fishery was an improved ability to tailor processing operations to the market. For example, when fillet prices are relatively high compared with surimi prices, it would be desirable to shift some raw product to fillets and away from surimi in order to increase revenues.

Second, factory managers anticipated an improved ability to optimize the initial cutting operations within a process line in order to increase the primary-product yield per ton of raw fish, regardless of which final product the round pollock was destined to create. In particular, if the harvesting part of the operation can increase the uniformity of fish landed, then filleting operations can be more precisely adjusted to the average size of incoming fish. With fillet products, saving even small percentages of flesh enables more round pollock to be converted into high-quality primary consumer products rather than recovered as a secondary product, and this raises profits considerably. Similarly, even with surimi lines, if the cutting operations can be optimized to squeeze even small amounts of higher valued primary end products out of the flesh, more rents are created. Third, factory managers anticipated being able to improve the recovery and quality of secondary products with a slower, optimized line. A considerable amount of pollock ends up as industrial products such as fish oil and fish meal. Even though these products have low unit values, the large amounts of pollock harvested implies that improving the recovery of these items can increase rents considerably. Prior to the actual creation of the harvester cooperative in 1998, most factory managers estimated that if the fishery were rationalized, then total product recovery would increase from its 1998 level of about 18 percent to about 22 percent.
B. Changes Under Rationalization

The Inshore/Offshore III allocation decision was superseded by the American Fisheries Act, and its revised allocation structure provided the regulatory framework required to establish the offshore Pollock Conservation Cooperative. The American Fisheries Act contained a complex set of provisions that transformed the offshore sector in a major way. An important component of the Act was an “Americanization” provision that forced the large Norwegian firm to divest itself of nine vessels and sell a majority of its harvesting operations to US interests. Under the AFA agreement, the Bering Sea pollock Community Development Quota (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, whose Norwegian owner was compensated with $20 million of US Treasury receipts and a $75 million US government-backed loan to be repaid via a $0.06 per pound levy on pollock landings inshore. The uncompensated third of the inshore transfer reflected approximately the prior Inshore/Offshore III allocation decision. For the purposes of this paper, the most important part of the American Fisheries Act was the allocation framework that allowed the remaining offshore catcher-processor companies. That is to say, the Act gave a group of seven firms the legislative blessing to operate 20 catcher-processor vessels in a coordinated fashion. The group of prospective coop participants rapidly reached agreement on a division of the catcher-processor allocation, based primarily on historical catches.

While the Pollock Conservation Cooperative is not an individual transferable quota (ITQ) system, it operates in a manner that generates incentives similar to those that might be generated under ITQs or other property-rights-based systems. Since each firm holds a negotiated share of the catcher-processor allocation, incentives exist at the company level to maximize value by increasing revenues and reducing costs. The cooperative has been remarkably successful on several fronts since its inception in 1998. New profits have been generated in several ways. First, several of the most inefficient vessels were removed from fishing, since the harvesting capacity present in the Olympic-style fishery was no longer needed after rationalization. For example, only 14 of the 20 eligible vessels fished during the first year, thus saving the operating costs of these vessels that would have fished had the cooperative not formed. Second, the process of fishing was significantly slowed. Slower fishing stretched out the season and allowed factory managers to concentrate on increasing the value obtained from each ton of pollock harvested. 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. Catches per haul was 27 percent lower, the number of hauls per day dropped by 45 percent, and the length of 1999 A-season was doubled compared with the 1998 season. All of these changes indicating a slower-paced fishing process emerged even though the total amount of pollock available to the fleet was almost cut in half due to the American Fisheries Act reallocation and a small 1999 BSAI TAC.

The most important effects of the ability to slow the pace of fishing have been, as expected, an increase in the value produced per ton of raw pollock. Figure 1 shows that before cooperative fishing was implemented, total product recovery rates averaged 19.5 percent under the race-for-fish conditions of regulated open access. 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 two percent in the second year, and another three percent in the third year, peaking at 29 percent in 2001.

Figure 2 shows the product mix that provided the increased product recoveries. Much of the yield increase in the first two years emerged out of being able to fine-tune slower processing lines to squeeze more surimi paste out of the raw pollock inputs. From a pre-cooperative average production of a bit over 8 tons of surimi per ton of raw pollock, surimi production rose in the first two years to more than 13 tons per ton of round pollock. Some of this occurred in response to market conditions that favored surimi during the first two years, but a significant amount of the yield increase was a net gain in marketable material from the same raw input. In the last few years, recoveries continued to increases even as the product mix shifted to serve the relatively more lucrative US and European fillet markets.

Finally, factory managers have also recovered increased amounts of secondary products such as fish meal, minced pollock, and roe. For roe, finished product production during 1999-2002 (years when 40 percent of the fishery occurred during the roe season) increased from about 1.4 to about 1.8 tons per 100 tons of round pollock, or about 28 percent. In 1998, when the A-season fishery contributed a higher fraction (45 percent) of catches, roe production per 100 tons of catch, at 1.15 tons, was lower than for 1999 when the winter-season catch fraction was reduced to 40 percent. 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 remarkable.

III. Summary and Conclusions

The management innovations that are emerging right now will determine not only whether the marine resources of the world can produce more fish, but also the levels of economic values derived from them. It is easy to make the case that very little of the ocean’s potential for generating economic return has been realized to date. 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 H.S. Gordon first described. Yet the vast majority of 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 thus being squandered at this point.

An important point of this paper and other papers in this conference is that rents in fisheries have “texture” in the sense that the rent generation process is significantly more complex than depicted in the stylized Gordon model. We believe that as evidence of different rationalization schemes accumulates, we will find that there are many
different avenues by which rents are generated. This suggests the converse, that there are many different ways to dissipate rents. We also believe that the focus on the cost and production input side of the story is likely to miss a significant part of the process of rent dissipation and rent generation. We know this because some of the most spectacular recent gains from rationalization have emerged in the market side rather than cost side of the ledger. In the pollock fishery case study, many of the fishing practice changes that were undertaken required increased investments and were done so to vary the product mix to better meet market demands and to squeeze more salable products out of the raw pollock inputs.

IV. Notes

1. The offshore sector also includes three floating “mothership” processors which receive pollock deliveries from a dedicated fleet of catching-only vessels.

2. In the end, the Inshore/Offshore III allocation decision did not apportion the TAC among the catcher-processor and mothership segments of the offshore sector, in effect blocking the ability of the catcher-processor companies to establish a harvesters’ cooperative.

3. Pollock products are classified as primary and secondary products. Primary products are made out of flesh obtained from whole fish, and include surimi and fillets as well as mince and meal from whole fish. Secondary products are made from processed fish, and include roe as well as fish mince and meal from fillet trimmings and filleted carcasses.

4. Secondary and tertiary recovery processes include specialized cutting machines that remove head-meat from filleted carcasses and process-water decanters that scavenge protein fibers from the wash-water stream. These machines require space to install and are time and labor intensive to operate. In the Olympic fishery, the focus is on cut-fish throughput and the factory is configured to maximize the number of filleting machines.

5. In the rationalized fishery, it is common for a few vessels to carefully “work” a single school of pollock in ways that allow the vessels to remain above a large school for extended periods of relatively slow and continuous harvesting. In the Olympic fishery, it was common for too many vessels to begin fishing on the same school of pollock, with the result that the school would often disperse unexpectedly or be harvested very rapidly, thus forcing all of the vessels to quickly begin searching for another school. If another school cannot be found quickly, then the process “flow” may be interrupted.

6. Compared with the production of surimi, fillet production is more time and labor intensive. Thus, in the Olympic fishery, catch maximization favors the production of surimi over fillets.

7. The CDQ quota program was established in 1992 as a means to catalyze increased participation of western Alaska coastal communities in the BSAI groundfish fisheries.
8. Bering Sea pollock allocations are calculated by first subtracting the ten percent CDQ quota from the TAC, and then an incidental catch allowance (ICA) from the remainder. The ICA depends on the size of the TAC and has recently ranged from three-five percent of the non-CDQ quota. What remains is called the directed fishing allowance, and is divided 50 percent to inshore catcher vessels, 40 percent to offshore catcher-processors (Pollock Conservation Cooperative vessels); and 10 percent to offshore mothership catcher vessels.

9. At the time of the passage of the American Fisheries Act, the development of new US ITQ fishery management programs was prohibited.
Figure 1. Total Product Recovery.

Source: SeaState, Inc. PCC and CDQ catch per haul, 1998-2002; NMFS AK Region Pacific cod and pollock products by processing mode, 1998-2002, BSAI groundfish quotas and preliminary catch in round metric tons, 1999-2002, and CDQ participation and catch by gear, 1999-2002. 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 2. Total Product Recovery and Mix.

During 2002 total product recovery is estimated to have increased by 44% over the 1998 open-access "race-for-fish" baseline.

Source: SeaState, Inc. PCC and CDQ catch per haul, 1998-2002; NMFS AK Region Pacific cod and pollock products by processing mode, 1998-2002, BSAI groundfish quotas and preliminary catch in round metric tons, 1999-2002, and CDQ participation and catch by gear, 1999-2002. Note that this figure does not show individual product recovery rates, but instead the average product mix that was produced from the total amount of pollock harvested throughout the entire year.