Chapter 11.

Community-based management for sustainable fishery:

Lessons from Japan

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Abstract

Management of Japanese coastal fisheries is often characterized as co-management—local fishermen assume a large portion of management responsibility and self-regulate their activities while government agencies provide scientific information and legal backup. While many past studies have attributed the success of Japanese fishery co-management to fishery cooperative associations (FCAs) and legally defined fishing rights, this chapter argues that the key to success is not these institutions per se but the functions they perform, which can be generalized to any fishery.

Based on the conceptual framework of the theory of clubs, the chapter points out that three conditions are necessary for successful co-management: well-defined boundaries, an affordable exclusion mechanism, and a condition of "privileged." FCAs and defined fishing rights provide the first two. The third condition is related to enhanced profitability as a result of co-management and the question is how to achieve it. Based on a qualitative analysis of Japanese fishery co-management cases, the chapter suggests that coordinating fishing efforts and maintaining fairness are the key components. Lastly, it is important to note that rebuilding fish stocks and enhancing profitability of the fishery are interrelated and mutually dependent. That a fishery cannot be profitable without a healthy fish stock is obvious. Less obvious is the fact that without tangible rewards, such as more profits, fishermen will not be interested in or sustain their interest in stock-rebuilding efforts.

Introduction

The co-management approach in fishery management is garnering much attention in both the developing world and developed countries. Given developing countries' typically limited capacity of the government to monitor and enforce regulations as well as weak institutional infrastructures for market-based approaches, co-management is seen as one of a developing country's few viable options (Cancino, Uchida and Wilen 2007). Many case studies from developing countries have indeed being documented (e.g., Cunningham and Bostock 2005 and Wilson, Nielsen and Dengbol 2003). In developed countries, a recent trend in the U.S. provides a good example of the directions they are heading. Measures that are similar in concept to co-management, such as harvester cooperatives (e.g., the Alaskan Pollock Conservation Cooperative) and sector allocation are being proposed and promoted (Johnston and Sutinen 2009). However, the fundamental question is not how cooperatives or co-management groups should be set up but what they should do to be successful (or to avoid failure) in terms of stock rebuilding and improving profitability.

The management of Japanese coastal fisheries is characterized as co-management—local fishermen assume a large portion of responsibility for management and regulate themselves while government agencies provide scientific information and legal support.[1] The degree to which government agencies are involved varies from case to case; in general, local fishermen have greater involvement in and responsibility for devising regulations and monitoring compliance. Giving a larger stake in management to local fishermen has a positive impact because they develop a sense of ownership of the problem (Yamamoto 1995), but there are also weaknesses (Uchida and Makino 2008).[2] Japanese experiences are thus a mix of successes and failures. The abundance of co-managed fisheries in Japan—there were 1,608 co-management organizations in 2003 and the number continues to increase (MAFF (Ministry of Agriculture, Forestry and Fisheries) 2006)—offers numerous useful examples.

The foundation of Japanese fishery co-management is the combination of fishery cooperative association (FCAs) and defined fishing rights, which are analogous to territorial use rights for fishing. These two institutions are well-established in Japan and the history of their evolution and consequent administrative structures is well-documented in the literature (e.g., Asada, Hirasawa and Nagasaki 1983; Makino and Matsuda 2005; Makino and Sakamoto 2002; Ruddle 1987; Yamamoto 1995). However, there seems to be too much emphasis in the literature on historical background and the tradition of FCAs and fishing rights and less focus on the fundamental functions that these institutions provide. My claim is that these fundamental functions are universal to fisheries throughout the world and thus applicable to regions outside of Japan.

The chapter is organized as follows. The next section provides some background information on Japanese coastal fisheries and co-management. I then explain the functions of FCAs and fishing rights using the theory of clubs (Buchanan 1965) to make a case that these are universal and necessary (but not sufficient) conditions for successful co-management. I then examine Japanese fishery co-management cases, focusing on their key features: effort coordination, maintaining fairness, and rebuilding stocks. The concluding section discusses the lessons that the Japanese experiences provide.

Background of Japanese coastal fisheries and co-management

The coastal and offshore fisheries in which most co-management regimes have arisen are important sectors in Japan's fishing industry. While the volume landed from coastal fisheries is consistently less than that of offshore fisheries, the converse is true in terms of landed value (Table 11.1). For example, in 2005 coastal fisheries landed 1 465 000 tonnes (25.8%) of marine fish while offshore fisheries landed 2 444 000 tonnes (43.1%). In terms of value, however, coastal fisheries generated USD 4.2 billion (34.0%) of total marine fishing revenue and offshore fisheries earned USD 3.2 billion (25.9%). These figures imply that coastal fisheries harvest relatively higher-valued species.

Table 11.1. Fishery harvest (volume and catch) of Japan, 2001–2005

					2001	2002	2003	2004	2005
Volume (thousand tons)	Total				6,126	5,879	6,083	5,776	5,765
		Marine			6,009	5,766	5,973	5,670	5,669
			Catch		4,753	4,433	4,722	4,455	4,457
				Coastal	**1,545**	**1,489**	**1,577**	**1,514**	**1,465**
				Offshore	**2,459**	**2,258**	**2,543**	**2,406**	**2,444**
				High seas	749	686	602	535	548
			Aquaculture		1,256	1,333	1,251	1,215	1,212
		Fresh Water			117	113	110	106	96
Value (million US dollars)	Total				14,836	14,357	13,257	13,363	13,339
		Marine			13,905	13,458	12,373	12,502	12,488
			Catch		9,714	9,470	8,643	8,879	8,828
				Coastal	**4,529**	**4,513**	**4,174**	**4,170**	**4,245**
				Offshore	**3,505**	**3,442**	**3,077**	**3,300**	**3,230**
				High seas	1,674	1,511	1,388	1,409	1,350
			Aquaculture		4,191	3,988	3,730	3,619	3,660
		Fresh Water			930	899	883	862	852

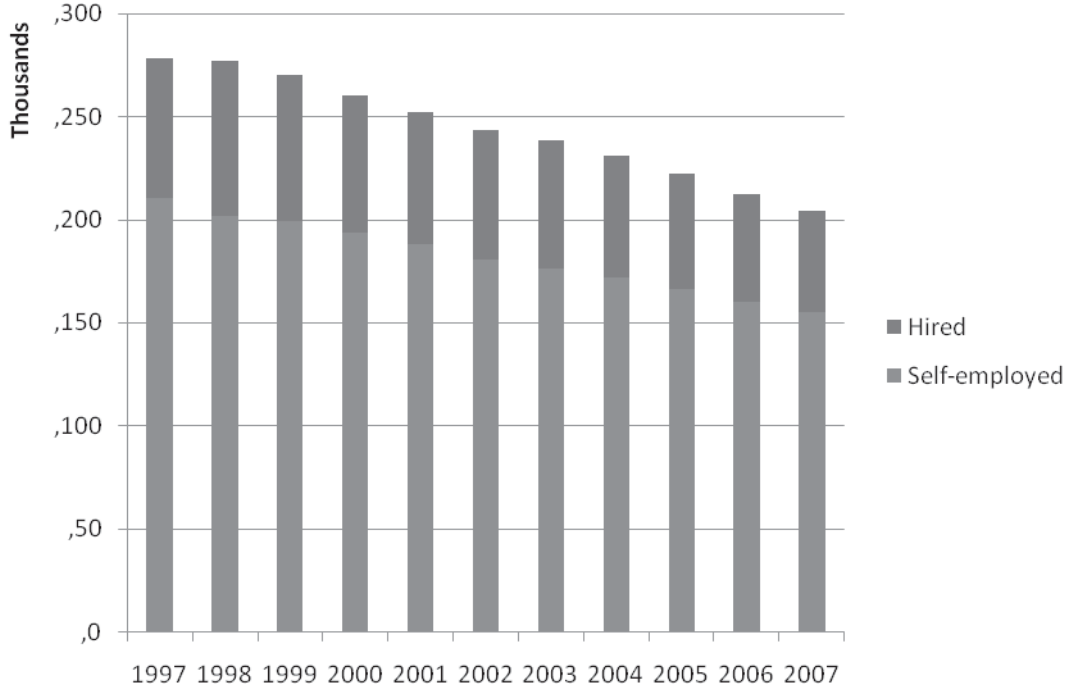
Source: MAFF 2007. Note: USD 1=120 yen.

Despite their importance, coastal and offshore fisheries have been faced with difficulties for quite some time. Based on a stock assessment by the government in 2008 for 83 fish stocks (52 fish species) caught in the waters surrounding Japan, stock levels for 50.6% of these stocks were considered low while levels for only 19.3% were considered high (Fisheries Agency 2009).[3] Of those same stocks, 22.9% showed an increasing trend but 20.5% were declining.[4] The fishermen's profitability is generally low after they deduct loan and insurance payments for their vessels. As a result, employment in the fishing industry—the sum of self-employed and hired crew members—has been steadily declining since 1997 (Figure 11.1). Numerous anecdotes suggest that the average age of fishermen is rising and that successors are very difficult to find.

For most of their history, Japan's coastal fisheries have been managed by local fishermen's groups known as fishery cooperative associations (FCAs). Members of FCAs are mostly fishing households and "small" companies, as defined by the number of employees and gross tonnage of the vessels owned. The conventional functions of FCAs are similar to those of other harvester cooperatives and include joint purchases of inputs (*e.g.,* fuel, ice, and boxes), administration of ex-vessel markets, and provision of

insurance and credit to members. FCAs are usually associated with specific coastal communities that historically have depended on fisheries resources. Each FCA typically encompasses all of the fisheries within that community or communities, so a number of diverse fisheries—both in terms of targeted species and gear used—are under the auspices of a single FCA.

Figure 11.1. Employment trend in Japan's fishing industry (excluding corporate and aquaculture)



Source: MAFF 2008.

In addition, FCAs provide one unconventional function—managing fishing rights. Fishing rights are typically defined for a parcel of coastal water that borders the FCA's community. The borders often are defined by extending the municipal boundaries a certain distance from the shore; how far they extend depends partly on the topology of the ocean floor and partly on characteristics of neighbouring communities. Fishing rights are protected by law and granted to FCAs as an organization and not to individual FCA members; commercial fishing within the fishing rights area is only allowed to FCA members. In this sense, defined fishing rights are analogous to territorial use rights for fishing (TURFs) (Christy 1982).[5]

Co-management of coastal fisheries is carried out by fishery management organizations (FMOs). An FMO is defined by the Ministry of Agriculture, Forestry, and Fisheries (MAFF) as a group of fishers who share the same fishing ground and/or operate in the same fishery and are collectively engaged in resource and/or harvest management according to mutually agreed rules. FMOs are autonomous organizations and some of Japan's FMOs have been in operation for decades. Since the FMO was placed at the centre of national fishery management policy in the early 1980s, the number of FMOs has

steadily grown, arriving at 1,608 FMOs nationwide by 2003 (MAFF 2006). FMOs and FCAs are interrelated in a number of ways: nearly 95% of FMOs are operated by a parent FCA or its affiliate organization. As such, the operation of FMOs is supported utilizing the institutional infrastructures of FCAs and fishing rights.

Functions of FCAs and fishing rights

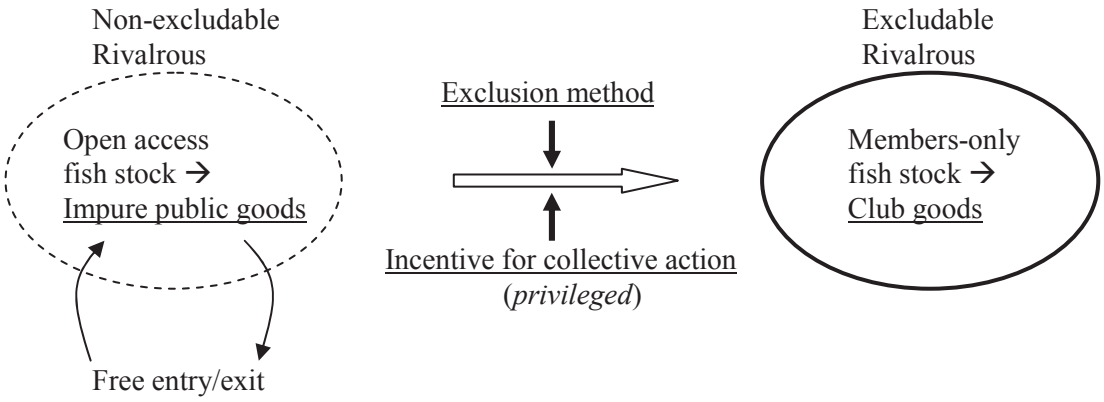
Fish stocks targeted for fishing can be viewed as impure public goods; subject to rivalry but non-excludable.[6] This is certainly true for open access fisheries but also applies to limited access fisheries, such as those governed by a license system, if eligibility to gain access is not regulated (*i.e.*, free or at very low cost). Non-excludability induces incentives to race for fish and capital stuffing. Rivalry implies that crowding or congestion becomes a problem. The result is dissipated rent.

A club good is a converted impure public good where its benefit is now made to be excludable (Sandler 1992). A club is thus an institution that converts an impure public good into a club good. Because consumers of these goods share the supply, it is important that there exists an affordable method of exclusion to keep non-club members from free-riding.

It has been established that club goods can be effectively provided by properly designed clubs. In summary, two variables must be considered: the amount (or size) of the club good and the size of the club's membership. A larger quantity of a club good provides greater benefits but at decreasing rate, while the cost of providing a club good increases exponentially with its quantity/size. A larger membership size reduces the per-member cost but increases congestion. The theory of clubs shows that there is an optimal membership fee (toll) that balances these trade-offs, thereby enabling the club to privately provide an impure public good (now converted into a club good) to a limited number of beneficiaries (club members). In other words, a club is an institutional solution to the collective-action problem that internalizes an externality through tolls (Sandler 1992).

Can fish be converted into a club good—that is, an excludable impure public good? There are three necessary conditions that must be met and they are derived from the theory of clubs: clearly defined boundaries, an affordable exclusion method, and members are privileged. The first two conditions relate to excludability while the third is related to profitability—an incentive-compatibility constraint of forming a club (Figure 11.2). The conditions are interrelated: whether a group is privileged or not depends on how well the benefits are made exclusive to its members.

Figure 11.2. Conceptual framework: transforming impure public goods to club goods



How do FCAs and fishing rights function to meet the first two excludability conditions? It is clear that fishing right boundaries define a geographical area and, thereby, a supply of fish that is exclusively accessible to member fishers. Areas defined by fishing rights do not necessarily match that of the fish's ecology, especially for migratory species. Some FMOs mitigate this deficiency by forming an alliance with neighbouring FCAs; as of 2003 there were 109 such alliances in Japan (MAFF 2006).7

The method of exclusion is more challenging and subtle. Since commercial fishing within an area defined by fishing rights is restricted only to FCA members, the exclusion method works by controlling membership. To be more specific, it is control over allowing non-members to become *eligible* to apply for FCA membership (Uchida 2004). The Fishery Cooperative Law defines eligibility conditions for becoming an FCA member, including local residency and a minimum number of commercial fishing days per year. The law prohibits FCAs from refusing the request of an entrant who meets the eligibility conditions without legitimate reasons and from imposing more stringent conditions on new members than on current ones. Thus, the goal is to prevent an outsider from freely gaining eligibility to entering the FCAs.

The mechanism of membership control is as follows. To become eligible to be an FCA member, one must be engaged in commercial fishing in that local region for more than a certain number of days in any given year. However, non-members are not allowed to commercially fish in areas with defined fishing rights. The only legitimate way to accrue fishing days, then, is to be hired as a crew member by an FCA-member fisherman, a business decision made solely by individuals. Thus, if consensus is built among member fishermen that they do not want new members, no one will hire a non-member, effectively excluding anyone from joining. Note that the majority of FMOs are controlled by FCAs so FCA membership control effectively extends to the FMOs.

In sum, while FCAs and fishing rights have a long and unique history that is not readily available in other parts of the world, the functions these institutions perform are universal to fisheries worldwide. It is the functions that are essential for successful co-management of fisheries, not the FCAs and defined fishing rights per se. There could be other forms of institutions that fit the cultural and traditional background of a particular region while providing these necessary functions.

While the theory of clubs provides a useful framework for understanding co-management, there is one important constraint that typical fishery co-managing groups face—the inability to flexibly adjust the club's membership size. Particularly in the case of small-scale community-based fisheries, fishermen often are not comfortable driving some of their fishing colleagues out of business. This means that these fishermen, as a group, have an objective function other than simple profit maximization. It also implies that success in fishery co-management is more challenging. According to the theory, if the benefit level is low, one way to adjust is to curtail the number of members so that per-member benefits increase (so does the cost per member, however, which defines a new equilibrium). If adjustment of membership size is not an option, the benefit level must be increased.

This leads to the challenge of meeting the third condition—members must be privileged. The privilege condition states that the benefit to the members from collective action must exceed the associated costs even if those costs are borne solely by the members (Sandler 1992). Otherwise, no member would be interested in maintaining the club. The next section presents examples of how FMOs have endeavoured to meet the privilege condition by enhancing the profitability of the fisheries they manage.

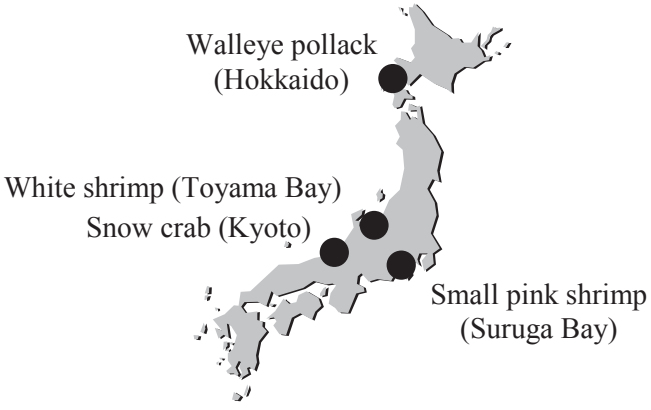
Rebuilding fisheries: the Japanese experience

Whether employed for resource stock recovery or to revitalize the fishing industry, the co-management approach has been the fundamental philosophy of Japanese national fishery policies. In 2001, along with enacting the revised Fisheries Law and associated registration requirements, the national government ramped up its resource stock rebuilding effort by launching the Resource Recovery Plan (RRP). The RRP was designed as a collaborative approach between the government and local fishermen. Local government agencies and fishermen discuss the need for resource recovery efforts and, if determined necessary, submit a request to the government. The government then presents a master plan for those efforts. Depending on the geographical coverage of the fish species and its importance, plans are developed at national and local government levels. Implementation of RRPs then becomes the responsibility of local FCAs with guidance and support from government agencies. There are currently 63 RRPs nationwide—17 set by the national government and 46 by local (prefectural) governments.[8]

The results of implementation of the recovery plans remain to be seen as most of them call for a planning period that ends in 2011 or later. However, there is a structural concern that could compromise the effectiveness and sustainability of the RRPs: more than half (58.7% for local plans and 82.4% of national plans) of the RRPs have explicit provisions for subsidies and/or compensations for potential loss of fishery revenue due to implementing an RRP. There is some rationale for such provisions—most efforts to rebuild fisheries involve reducing harvests and additional costs of management, thus decreasing profits in the short run. But the plans could be costly in the long-run as well if they do not include profit-improving efforts. Without improved profitability, collective efforts to recover stock levels are not sustainable after the subsidies lapse. This implies that even when the primary objective is biological (stock recovery) the plan's success hinges at least partially on economic (profitability) benefits from such efforts. The biological and economic goals are thus interrelated and the importance of combining the two cannot be overemphasized.[9]

So how do FMOs achieve the privileged condition—improving profitability—while rebuilding the resource stocks? There are two fronts to pursue in enhancing profits: increasing revenue and reducing costs. In comparing co-management to individual quota systems, the comparative advantages of co-management include (i) the ability to coordinate the harvest's timing and location and (ii) collective marketing (Johnston and Sutinen 2009). These lead to the first keyword: **effort coordination**. As presented hereafter, various methods of effort coordination can be observed among Japan's FMOs. The second keyword is **fairness**, which is an important component to supporting and maintaining effort coordination. I introduce some examples of efforts by FMOs on these fronts. The examples are mostly drawn from fisheries for small pink shrimp (Uchida and Baba 2008), walleye pollack roe (Uchida and Watanobe 2008), white shrimp (Platteau and Seki 2001), and snow crab (Makino 2008).

Figure 11.3: Location of the fisheries used as examples in this section



Effort coordination

One form of effort coordination is timing the harvest. The first, more common objective of timing the harvest is associated with cost reduction: avoiding congestion at the fishing grounds and mitigating the race to fish. In the white shrimp fishery, an FMO implemented a daily fishing ground rotation scheme. FMO members were put into three groups and known fishing grounds were divided into three areas. Each group was then assigned to one of the areas and they rotated between areas on days they went out fishing. If the group size is appropriately determined, congestion in each fishing area will be mitigated, if not eliminated. And because there is no need to compete to secure better fishing grounds, there is considerably less incentive to race to fish. The cost savings come from slower steaming speeds, which increase fuel efficiency, and less damage to fishing gear due to reduced congestion.

Fishing ground rotation has also been implemented in the walleye fishery with the same purposes but across multiple (former) FCAs.[10] Three groups that consist of members from each FCA work within three defined ocean areas (north, middle, and south) and they rotate on daily basis. Their coordination goes further still, reflecting the fact that they use longlines to catch pollack. As vessels arrive at their designated fishing grounds, they take a position and wait for the signal from the group leaders. Once the signal has been sent, they begin dropping lines and towing in the same direction away from shore. This additional step minimizes damage to gear; with all vessels towing in one

direction and at the same time, lines are less likely to tangle even if the lines drifted with the current while in the water.

In the small pink shrimp fishery, fishing grounds are not rotated; rather they are assigned by a "fishing committee" that meets every day during the season. This shrimp is a small zooplankton-like species. Individual shrimp concentrate together each evening as they rise toward the surface but the locations where those clumps of shrimp appear vary. A rigid rotation system could be ill-suited in such conditions—one group might find near-empty fishing grounds while another might find an overwhelming amount of shrimp. In fact, it often happens that some vessels with large catches radio the leader for help and the leader will direct low-catch vessels to the location to help haul the harvest or make additional tows nearby. This location assignment system allows for needed flexibility that is not possible in a rigid rotation scheme.

The second objective of harvest timing is to enhance revenue by deliberately avoiding the flooding of local markets. In the small pink shrimp fishery, one of the variables discussed in the committee in deciding whether to go out to fish and how much to harvest is the inventory level of local dealers/processors. They constantly contact the dealers regarding their inventories and when inventories are high the committee can opt not go out even when all other conditions are favourable for fishing. Another factor that the committee considers is weather—not the weather the day they go fishing but weather for the following day when they will be landing and auctioning their harvest.[11] Since the main processing of this shrimp is sun drying, if the weather is poor processors cannot sundry the shrimp and that weakens the auctioning price. Knowing this, fishermen sometimes decide to stay ashore when rain or dense overcast is forecasted for the following day.

Apart from coordinating the harvest, collective marketing is potentially an effective way to increase revenue and it is becoming increasingly popular among FMOs. Development of a private brand that can be defined by something as simple as the geographic origin of the fish is common. Other collective marketing efforts, particularly the more successful ones, involve more coordinated effort in quality control and targeted marketing.

Gaining differentiated treatment in the market based on quality requires a great deal of joint effort. The snow crab fishery offers a good example. Several FCAs along the coast of Kyoto prefecture facing the Sea of Japan harvest snow crabs but one FCA called Taiza was famous for premium quality crabs. Taiza harvesters took extra effort in careful handling of crabs when releasing them from the trawl net and invested in equipment to bring the crabs back alive. As a result, Taiza snow crab consistently fetched nearly USD 100 more per kilo in the ex-vessel market than crabs landed by neighbouring FCAs. Harvesters in these neighbouring FCAs did not necessarily handled the crabs poorly but they did tend to "hide" damaged crabs at the bottom of a packaged box since buyers bid on a per-box basis (and are not allowed to touch the merchandise prior to bidding). Consequently, buyers bidding on crabs landed by these fishermen had factored in this risk while Taiza fishermen successfully built the reputation for robust quality control. This also allowed Taiza buyers to market the crab to a particular market segment, namely the high-end restaurants in Kyoto area. This helped increase the ex-vessel price and raised the Taiza crab's reputation still higher.

Walleye pollack fishermen in the Hiyama FCA also engage in marketing that differentiates their product, pollack roe, from the same product coming from other regions near and far. Their strategy is first to advertise that their fishing method, the

longline, is, de facto, capable of maintaining a high quality of harvested fish compared to the trawl net, a conventional method used in other places.[12] They also have implemented methods that further enhance their products' quality. For example, it was long known that over-ripened roe, which is considered as lower in quality, appears later in the season so Hiyama fishermen decided to voluntarily cut the fishing season short. Note that this decision also has a positive impact on rebuilding the pollack stock even though it is driven by a market incentive—evidence that the two concerns are interrelated and need not be addressed separately.

Importance of maintaining fairness

The importance of fairness seems obvious but there are two things worth pointing out regarding fairness because they have an important policy implication: fairness does *not* necessarily imply equity and the definition of fairness is case-specific.

Coordination of fishing locations, as previously described, is effective in reducing vessel congestion and gear damage but can lead to unfair advantage. What if my group was sent to a low-producing fishing ground and was able to harvest only a few fish while another group was sent to a so-called "hot spot" and took in a large catch? What prevents me from ignoring the rotation or assignment and starting to fish in the hot spot as well? The fairness issue is apparent in location assignment systems such as that used by the small pink shrimp fishermen but it can also occur with rotation systems because the location of hot spots can vary significantly on a daily basis.

One method for dealing with this problem—and thereby acting as a support mechanism for effort coordination—is pooling arrangements.[13] The basis of a pooling arrangement is that the revenue from a group's harvest is pooled together and distributed back to each member uniformly or according to some weighting rule. Some costs are sometimes deducted before the distribution but typically the costs are not pooled. A pooling arrangement had been implemented by 12% of Japan's FMOs in 2003, including those for the small pink shrimp and white shrimp fisheries, and use of these arrangements is increasing (MAFF 2006).

How the FMOs use pooling arrangements varies. In the case of the white shrimp fishery, revenues are pooled until one full rotation has been completed (three fishing days). The FMO for the small pink shrimp fishery, on the other hand, pools and distributes revenue daily and those who did not fish are also paid a share. Other FMOs pay only those who actually participated in fishing.[14] The small pink shrimp FMO distributes pooled revenue equally among its 120 members, in part because most of the equipment, vessels in particular, is nearly identical in size and the type of onboard gear. The walleye pollack FMO, on the other hand, involves three different vessel sizes so the distribution is weighted accordingly.[15]

In summary, a pooling arrangement is one method that can restore equality in response to unfair advantages inherent to effort coordination, especially location assignments, after the fish have been harvested. It is quasi-synonymous to equity.

The walleye pollack FMO used a very different method for restoring fairness prior to its implementation of a pooling arrangement in 2005. Rather than equating the results of the harvest (revenue), the FMO had opted to equate the *opportunity* of harvesting. As discussed earlier, the walleye pollack FMO used a fishing ground rotation system in which three groups rotated through three ocean areas. In actuality, this was called the "big" rotation and there were two smaller rotations in a hierarchal structure. This layered

rotation system aimed to equalize fishing opportunities at the vessel level over the course of the season. Even when the opportunity to harvest is equalized, however, actual harvests at any one location will differ depending on when one fishes, the level of skill, and other exogenous factors. Walleye pollack FMO members have long regarded such stochastic fluctuations, or luck, as part of fishing's nature. Thus, these fishermen did not regard ex-post equity as fair but guaranteed equal opportunity was important to them.[16]

Resource rebuilding effort

Well-maintained efforts by FMOs to conserve fish stock are often linked to the prospect of higher economic returns. This link is an important and effective way to encourage fishermen to take part in conservation and rebuilding efforts. If fishermen have a personal interest in conserving the resource, rebuilding efforts are more likely to succeed and require less monitoring and enforcement.

The walleye pollack FMO, for example, has taken the advice of a fishery biologist and established a marine protected area (MPA) at the major spawning ground within their fishing area. Recall that their main target is the pollack roe, so the major spawning ground is where the fishing would be most productive. Yet they have self-imposed an MPA in their hope to maintain the fishery sustainably. Since walleye pollack is a highly migratory species, it is unclear whether such efforts have had a sufficiently large positive impact on the walleye pollack stock. However, landing volumes for the Hiyama FCA where this FMO is located have, on average, maintained 1979 levels while landings by other regions have monotonically decreased over time (Figure 11.4).

The snow crab fishery FMO also has established a seasonal MPA during the crab spawning period. This was particularly difficult initially because the crabs' spawning ground overlapped with that of flounder, which was the main targeted species for crab fishermen when the crab fishery was closed. Their hard work was recently rewarded by the fishery's being designated as Asia's first Marine Stewardship Council (MSC) certified fishery (snow crab and flounder using bottom trawling).

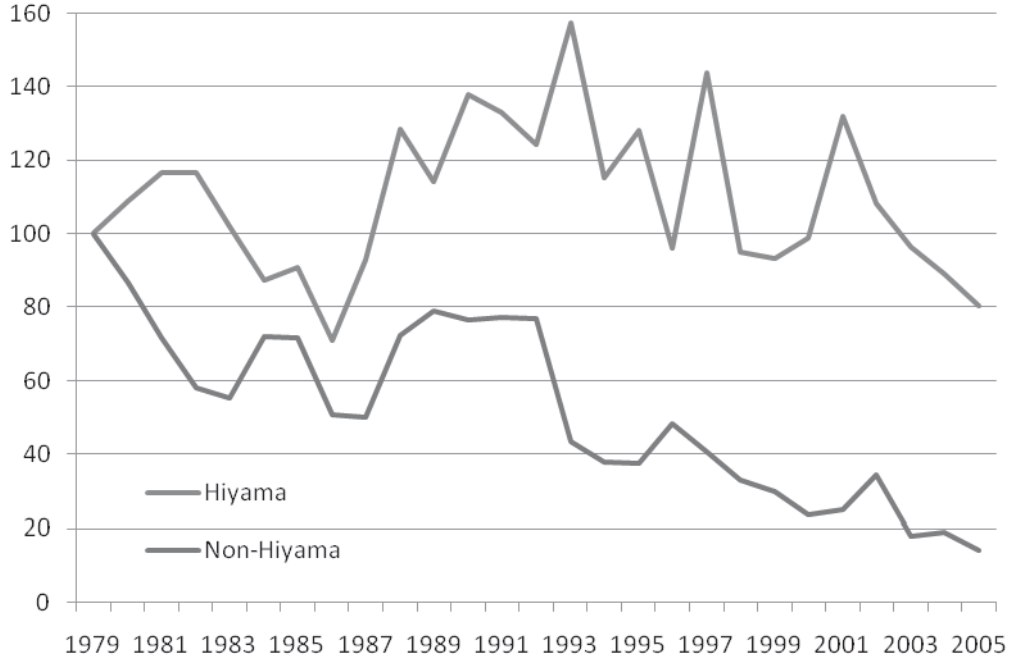
In the small pink shrimp fishery, the FMO sets a targeted annual landing volume based on an assessment of the stock and advice from the local fishery experimental station. It is effectively imposing on itself a total allowable catch limit. The limit suggested by the biologists at the experimental station was significantly lower than what it has been historically and many fishermen were initially sceptical. However, it turned out that the ex-vessel price increased as a result of fewer landings and benefited fishermen more than they had expected. Today, all of the FMO's members are firmly engaged in sustainable fishing by observing the targeted landing volume each day.

Small pink shrimp FMO is also actively conserving juvenile shrimp by preventing them from being harvested. The fishery has two distinct seasons, spring and fall, and the fall season is a mix of adult and juvenile (born over the summer) shrimp. The fishermen used to put the same amount of effort into harvesting during both seasons, but for the past decade or so they have shifted more of their efforts to the spring and less to the fall, avoiding harvesting the clump of juveniles in the fall.

The success of these efforts has been mixed, partly because external conditions have a significant impact on zooplankton-like species like the small pink shrimp. However, many fishermen agree that the situation would have been much worse in the absence of these efforts. Note that, once again, the firm commitment of fishermen to sustainable

fishery management is backed not only by their good will but also by increased economic returns.

Figure 11.4. Landing volumes of pollack relative to 1979 levels (=100)



Source: Uchida and Watanobe (2008).

Conclusion

This chapter reviewed a number of Japanese coastal fisheries' co-management experiences in order to determine whether co-management approaches can be effective in rebuilding fisheries, in terms of both resource stocks and profitability. As a prerequisite, the chapter explained the fundamental necessary conditions for co-management to function using the conceptual framework of the theory of clubs. In doing so, the chapter argued that fishery cooperative associations (FCAs) and defined fishing rights, institutions with an extensive historical background that are often identified as the source of co-management successes, are not the necessity but merely provide some of the fundamental conditions. The third piece needed is the privileged condition—that individual fishermen are better off when they join a fishery management organization (FMO) that co-manages the fishery. An important claim of this chapter is that direct translation of the privileged condition is improved profitability for FMO members but that resource recovery and sustainability are indispensable components of enhancing profitability so the two should not be separately considered.

For FMOs to endure and yield tangible positive impacts, two factors are important: coordinating efforts and maintaining fairness. Effort coordination ranges from fishing ground rotation schemes to collective marketing that aims to differentiate a product so it can fetch a higher price or increase demand. However, effort coordination often involves restrictions on individual decision making, such as choosing the location at which to fish.

This can generate a sense that the effort coordination system unfairly gives advantages to some fishermen over others. One solution to the problem of fairness is to equate the opportunity to fish; another is to equate the benefits of fishing through revenue pooling arrangements. These additional measures for increasing fairness do not necessarily result in monetary equity and the very definition of fairness is strongly case-specific.

The three necessary conditions for successful fishery co-management—clearly defined fishing-area boundaries, an affordable exclusion method, and members being privileged—are clearly not Japan-specific but rather are universal in nature. This is the basis of my argument that there is much to be learned from the Japanese experience in considering how fishery co-management can best be carried out in other regions of the world. For example, in the New England region of the United States a new management regime called sector allocation is being considered. It is effectively a group-based fishing quota; fishermen form a group (a "sector") that receives a share of the overall total allowable catch. The question then becomes how the sector should manage its allocated quota? Some existing sectors simply allocate the group's quota to individual members. However, Japanese co-management experience suggests that coordinated group effort can enhance fishermen's profitability and sustainable use of the resource.

Notes

1. I use the term "co-management" rather loosely here as no single agreed-on definition exists (Jentoft 2003). Generally speaking, Japanese co-management cases share common characteristics that include significant involvement and responsibility assumed by fishermen and co-management group members are mostly local fishermen. As such, they are also referred to as "self-governance" and "community-based management."

2. For example, multispecies and multi-region (for pelagic species) management, which typically involves more fishermen, thus making it more difficult for such groups to reach consensus and effectively monitor compliance, is rarely implemented.

3. Stock-level categorizations are based on the average harvest for the preceding 20 or more years (Fisheries Agency 2009).

4. Stock-trend categorizations are based on the average harvest volume for the preceding five years (Fisheries Agency 2009).

5. The fishing rights apply only to coastal fisheries. There are three types of fishing rights—common, demarcated, and large fixed net. In the context of this paper, common fishing rights are the only relevant category; demarcated fishing rights apply to aquaculture and large fixed net fishing rights apply to specific fishing gear.

6. Conventional examples of impure public goods include highways, golf courses, national parks, and parking lots.

7. Examples include the small pink shrimp fishery in Suruga Bay facing the Pacific Ocean (Uchida and Baba 2008) and the snow crab fishery off the Kyoto coast in the Sea of Japan (Makino 2008). There are also some efforts to establish an ecosystem-based management scheme that relies on the co-management concept (Makino 2005).

8. See http://www.jfa.maff.go.jp/j/suisin/s_keikaku/index.html (in Japanese; accessed on May 9, 2009).

9. A handful of RRPs developed at the prefectural level did not include subsidies and compensations. They specifically cited that the effort would be spent on new product development and enhanced quality control, which were expected to bring higher revenue and compensate for the short-term loss. Such is the approach that must be sought.

10. These are former FCAs that are now merged into one large FCA, a trend promoted by the national government. The former FCAs are converted into branch offices and for daily operations they are mostly independent of each other.

11. Fishing for small pink shrimp takes place from dusk to midnight and vessels land their harvests during the night to be ready for the auction starting early the following morning.

12. Longlines produce high-quality catches but at the cost of a smaller catch per unit of effort. The pluses and minuses for trawl nets are the opposite: the race-to-fish incentive is in place so it is no mystery that other pollack fishermen have opted for volume over quality by using the trawl net.

13. It is also referred to as a sharing rule in other studies (e.g., Gaspart and Seki (2003) and Platteau and Seki (2001)).

14. An example is a surf clam fishery FMO on the northern Pacific coast (personal communication).

15. Specifically, the distribution is uniform per unit of longline (e.g., per meter). Since larger vessels carry longer lines, it effectively adjusts for the difference in vessel size.

16. The walleye pollack fishermen implemented the pooling arrangement not because their perceptions of fairness changed but because it was necessary to break the rotation pattern to further save operational costs in the face of rising fuel costs (Uchida and Watanobe 2008).

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