

Sandfish resource co-management in Akita Prefecture, Japan

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1. INTRODUCTION

This paper studies the case of sandfish (*Aroctodcopus japonicus*) resource management in Akita prefecture. This case can be categorized not so much as pure self-governance but as co-management in which government and research agencies are intensively involved in making decisions with local fishers. Such cooperation is necessary in part because the fishery includes twelve fishery cooperative associations (FCAs) and more than 700 operators along the lengthy Akita coastline. Ongoing, persistent conflicts between various groups of fishers moved the government to intervene. Akita's sandfish co-management case demonstrates how collaboration among fishers, government agencies and researchers was able to overcome such obstacles.

Harvests of sandfish in Akita exceeded 20 000 t in the 1960s but decreased sharply thereafter, falling to 71 t in 1991. Faced with such a drastic decrease in catches, fishers in Akita independently determined and implemented a 3-year moratorium on harvesting of sandfish (1992–1995), with support from the prefectural government. The moratorium remains one of the most drastic measures undertaken so far in a fishery in Japan and yielded reasonably good results due to co-management.

The success of Akita's co-management system was instrumental in shaping Japan's national fishery policies. The Fisheries Agency in Japan has been promoting co-management as a key concept for coastal and offshore fishery management since the early 1980s. After Akita's sandfish moratorium was lifted in 1995 and its results became known, it was promoted as a successful example of fishery co-management in a white paper on the fisheries of Japan in 1998 (Ministry of Agriculture, Forestry and Fisheries, 1998). This eventually led to the creation of a resource recovery plan for management of fishery resources nationwide by the Fisheries Agency in 2002. It may be noted that no fees are imposed on fishing licences issued by the central or local governments.

This paper analyses the socioeconomic factors that enabled Akita sandfish fishers to agree on the moratorium and on new fishery management measures that were enacted after the moratorium. It is no surprise from a biological point of view that a moratorium on fishing would contribute to stock recovery for sandfish. The focus of this paper is thus on the relationships among the stakeholders and their roles in the policy processes, with a particular emphasis on consensus-building.

The study identified several factors that are central to Akita's success. First, co-management decision-making should involve all of the parties to the process, including fishers, who must be allowed to present their concerns and ideas regarding fishery management measures. Better still is a decision-making process that resembles or employs existing, perhaps traditional, ways of negotiating and reaching consensus in a community. Fishers must be well informed, not only about policy options but

PHOTO 1
Harvested sandfish



also about the scientific basis for those options. Translating sophisticated scientific concepts and data for fishermen is not an easy task, but their understanding of that information is crucial to avoiding inappropriate decisions. This is where outside parties such as government agencies and scientists become important. Finally, the involvement of government administrative agencies is indispensable to cooperation in cases such as Akita's, where there are multiple interest groups. However, administrative staff members must be content to offer low-profile assistance in a modest capacity so that fishers do not become overly dependent on government help.

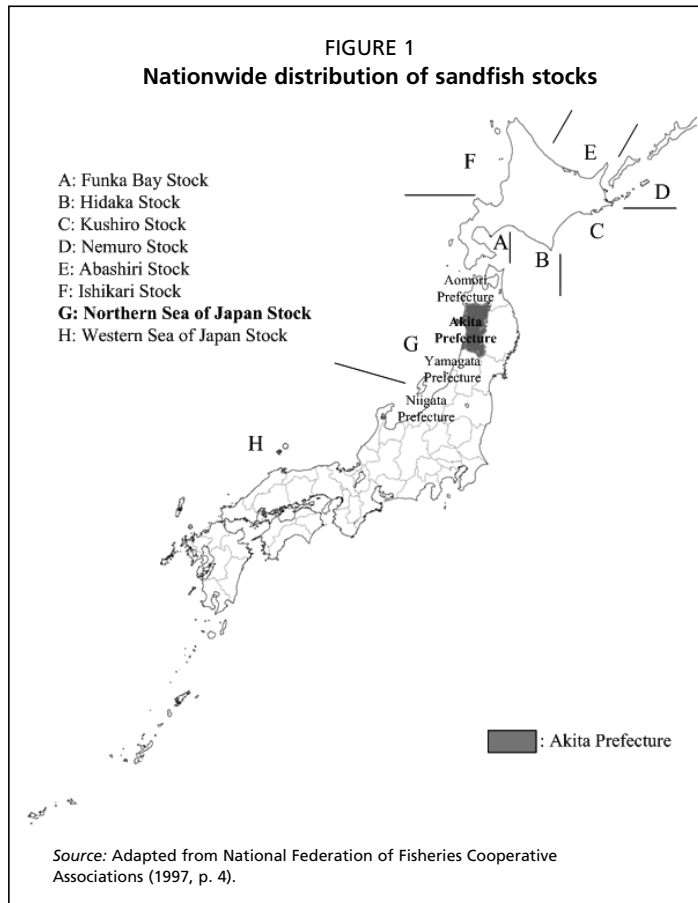
2. THE SANDFISH FISHERY AND THE MORATORIUM

2.1 The fishery

Sandfish, which are called *hata-hata* in Japanese, can be found along the coast of the Sea of Japan (Photo 1). Its winter harvest in the northern Sea of Japan is particularly

well known. Females with eggs (*buriko*) are valued more highly than males. Sandfish are migratory and migration patterns define individual stocks of the fish. In Japan, there are eight sandfish stocks and each stock migrates within a specific and stable range. This case study focuses on the northern Japan Sea stock, which migrates from Aomori prefecture to Niigata prefecture (Figure 1).

Sandfish in Akita are harvested in two distinct fisheries, coastal and offshore. In the coastal fishery, sandfish are caught using small-scale set nets and gill-nets during the spawning season, which lasts for about two weeks in December. The number of fishing days can be further reduced by weather conditions such as winter storms. The offshore fishery harvests sandfish by bottom trawling and functions nearly year-round, from September through June. All twelve of Akita's FCAs are involved in coastal fishing and three engage in offshore harvesting of sandfish.



2.2 Failed attempts at government-led management

Harvest volumes for sandfish began to decrease in the late 1970s due to overfishing. Harvests dropped from more than 20 000 t in the 1960s to a mere 74 t in 1984. Alarmed by the situation, Akita's prefectural government established the Akita Prefectural Fishery Resource Council (APFRC) in 1985. The council was composed of fourteen representatives from fishing operators, four academic experts and one prefectural government representative. However, in an effort to expedite the decision-making process, the prefectural government attempted to control and lead discussions. In 1986, the APFRC decided to establish management measures for seven fish resources, including sandfish. At the same time, the prefectural government asked the APFRC to consider a moratorium on harvesting of sandfish. Such an aggressive move by the government offended the fishers, who felt they had been left out of the decision-making process. Eventually, the fishers rebelled and the APFRC rejected the request for a moratorium on sandfish harvesting. The APFRC dissolved after 1985.

Harvest volumes rebounded to 203 t in 1985 and Akita fishers landed 373 t in 1986. But the improvements were short-lived. In 1987, harvests again declined and in 1991 they reached an all-time low, which forced Akita's fishers to reconsider the moratorium on harvesting of sandfish.

2.3 Consensus-building to adopt a moratorium

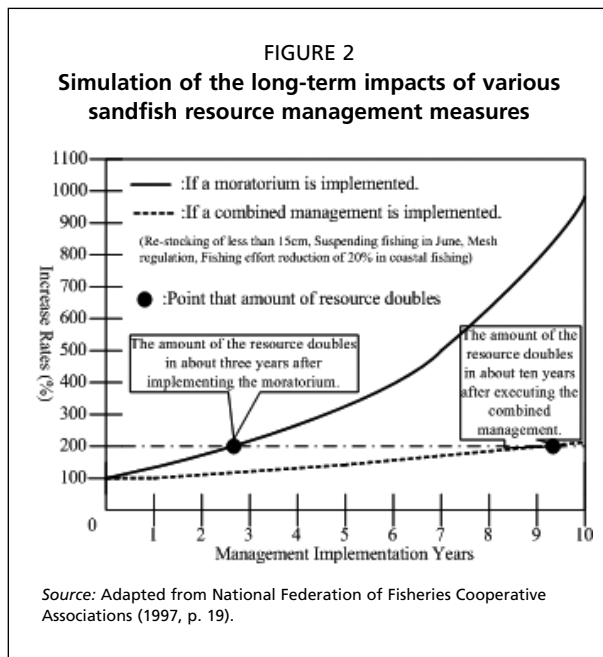
The proposal for a moratorium re-emerged as the Akita sandfish stocks continued to deteriorate. At a board meeting in January 1992, some directors from the Akita Federation of FCAs (the prefecture-wide organization representing all FCAs) expressed their pessimistic view of expected catches and revenue for the coming season. Anticipating a harvest of only 35 t and based on an optimistic price of 3 000 yen a kilogram, the revenue per fisher was expected to be only about 500 000 yen (\$4 170),¹ which was extremely low. Faced with this crisis, the Akita Federation directors in February 1992 proposed and all agreed to take drastic measures to turn the situation around, including the moratorium on sandfish harvesting. The directors felt that, given the minuscule revenue expected, the impact of a moratorium on fishers would be negligible, which would make an agreement possible.

Persuading fishers that the moratorium was necessary and would bring them long-run benefit was no easy task. Fishers knew that the situation was grim. For example, in one FCA, the proportion of income its members earned from sandfish was less than 1 percent (\$8 400) of an operator's total revenue. These fishers were forced to work away from home when sandfish were not in season. Yet many fishers remained convinced that the declines in sandfish were a normal event and that current shortages were simply natural ebbs in the supply and would rebound.

Countless discussions between fishers and prefectural government officials took place. The prefectural government continued to press the idea that resource management was necessary for long-run sustainability. Officials presented simulations of the long-term impacts of various resource management schemes. The simulations showed that it would take about ten years to double the sandfish stock without a moratorium, even if some new management measures were implemented. On the other hand, the simulations showed that the moratorium could potentially achieve the same level of improvement in about three years (Figure 2). In addition, officials presented the results of a survey of how fishers viewed the resource management measures that were presented in the meetings. The survey was conducted by the Akita Federation of FCAs and it helped to inform fishers about the views of their colleagues.

In the end, a majority of Akita sandfish fishers came to realize that it was necessary to conserve sandfish for future generations. The "Agreement for Sandfish Resource

¹ An exchange rate of 120 Japanese yen to 1 dollar US is used throughout the chapter.



Management” was concluded on 1 October 1992 by the directors of all 12 FCAs, the Akita Bottom Trawlers’ Cooperative Association and the chairman of the Akita Federation of FCAs (Table 1). The moratorium went into effect on that date and was in effect until 30 June 1995.

While the efforts of the prefectural government played an important role in reaching this agreement, including their presentation of scientific research in a way that fishers could comprehend, the final decision was made by the fishers themselves. That a consensus was reached makes this a remarkable example of how co-management can succeed. How that consensus was built is discussed in detail in Section 5.

3. DURING THE MORATORIUM

Two major factors supported sandfish fishers

in Akita during the moratorium. One was financial support from the government, both central and prefectural. Second, other fisheries in the prefecture yielded unexpectedly good catches.

On 25 September 1992, just days before the moratorium was to take effect, Akita fishers asked the prefectural government, through the Akita Federation of FCAs, for financial support during the moratorium. The request was accepted and both the Fisheries Agency (central government) and Akita’s prefectural government announced packages of supporting measures on 30 October 1992. The support measures included (a) no-interest loans to replace some of the income lost due to the moratorium; (b) subsidies for reductions in the number of bottom-trawler boats; (c) a buy-back program for excess fishing gear and (d), investigations into the state of the sandfish resource stock and fishery. Representative fishers from each district and FCA were heavily involved in the process of designing these support measures. The total prefectural budget for these supporting measures was about US\$4 160 000.

As a result, the number of offshore trawlers has decreased from 57 to 38 vessels and for the coastal fishery there was a reduction of 20 percent of fixed net and 40 percent of gill-nets through the buy-back program. These reductions of fishing effort were

TABLE 1
Contents of “The Agreement for Sandfish Resource Management”

1. Sea area covered under the agreement	All areas under jurisdiction of Akita Prefecture
2. Targeted fish under the agreement	Sandfish
3. Targeted fishery under the agreement	Offshore trawl fisheries; small steam-scale trawl fisheries; set net fisheries; gill net fisheries; beach seine fisheries; dip net fisheries; and other fisheries that target sandfish
4. Method of managing the fishery resource (sandfish)	Moratorium of sandfish fishery (except capturing adult female sandfish for its roe by the Akita Federation of FCAs)
5. Duration of the agreement	From 1 October 1992 to 30 June 1995
6. Penalties for violation of the agreement	(1) Fine of 100 000 yen (2) Violators suspended from fishing for 10 days. (3) Fish caught in violation and fishing gear used will be seized.
7. Entry and exit from the agreement	Application for entry or secession must be submitted to Akita Federation of FCAs.
8. Procedure to modify or abolish the agreement	Consensus of all participants in this agreement is needed.
9. Procedure when mediation to administrative agency is requested	Consensus of all participants in this agreement is needed.

aimed to lower the fraction of the biomass to be harvested (number of harvest divided by estimated targeted stock) from a pre-moratorium level of 0.8 to 0.5. The TAC was thus set at half of estimated targeted stock level. The actual harvest volume (coastal plus offshore) after the moratorium ranged from 72–125 percent of the TAC (Table 4).

Even with financial support from the government, Akita fishers had to continue to harvest other species to earn a living during the moratorium. This was challenging because fishers had to change fishing grounds and fishing methods to avoid bycatches of sandfish. However, both the coastal and the offshore fisheries experienced an unexpected benefit from these changes. For example, coastal fishers in the Northern Akita FCA tentatively implemented a long-line fishing for tiger puffer (*Takibugu rubripes*) in the fall of 1992, just as the sandfish moratorium began. Those fishers, like everyone else in Akita, had rarely fished for tiger puffer prior to 1992. Surprisingly, tiger puffer harvests generated \$333 000 in revenue in 1992, \$775 000 in 1993 and \$500 000 in 1994 (National Federation of Fisheries Cooperative Associations, 1997). Likewise, offshore fishers successfully targeted blackmouth angler fish (*Lophiomus setigerus*). During the moratorium, 200 t or more of blackmouth angler fish were caught annually. As with the tiger puffer, fewer than 50 t of this fish had been harvested prior to the moratorium. The income from these fisheries helped both coastal and offshore sandfish operators.

4. POST-MORATORIUM PERIOD: NEW MANAGEMENT MEASURES

Discussions of resource management measures to be implemented after the moratorium began in July 1993, two years prior to its termination. Again, many meetings were held by fishers and between fishers and prefectural government officials. Five months later, the Sandfish Resource Measures Council (SRMC) was established as the official decision-making body and many items on the parties' agendas were discussed during its meetings.

SRMC had a hierarchical structure, as shown in Figure 3, that was divided into two main groups – coastal fishers and offshore fishers. Additional local discussion groups were set up within each subdivision. Fishers in each local discussion group drew up a post-moratorium management plan for their area's sandfish fishery.

Their failed negotiations with the APFRC (discussed above) convinced prefectural government staff not to take the lead in these meetings. Instead, they participated as observers. They intervened when necessary, as when they separated coastal and offshore fishers within the SRMC (Figure 3). Conflicts between the two types of fishers developed because they were targeting the same sandfish stock in different sea areas. Each side suspected that the decline of their own catches prior to the moratorium had been caused by overfishing by the other side. Regardless of whether there was any truth to the claims, such negative attitudes would have undermined any attempt at self-governance. The government's intervention

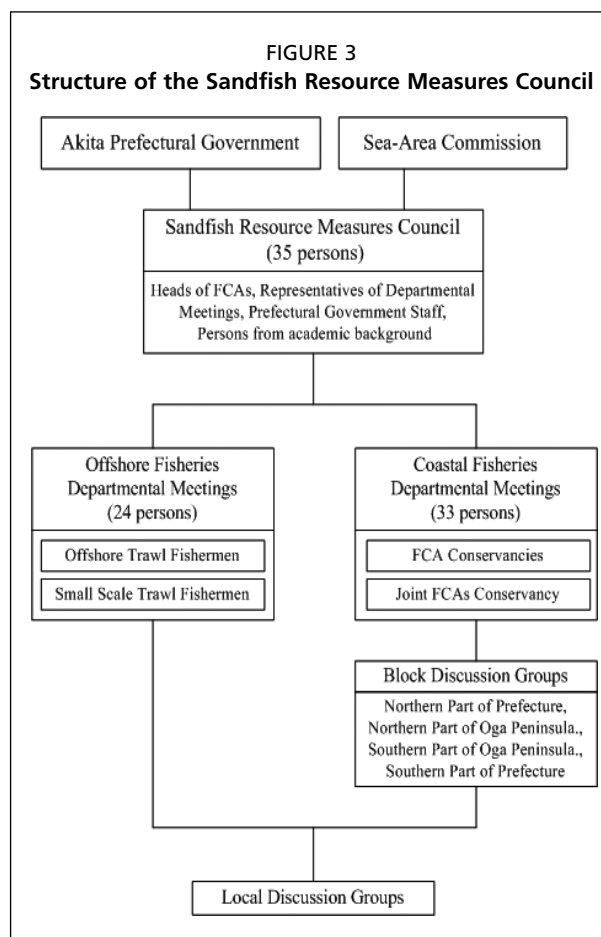


TABLE 2
Self-imposed measures implemented by SRMC after moratorium

Offshore sector	Coastal sector
	Vessel size (length)
Minimum fish size (length)	Season closure
Season closure	TAC
TAC	No-fishing zone
No fishing day	Mesh size enlargement
Number of operating vessels	Gill and set nets reduction
Fishing hours	Gear control
	Fishing effort coordination

in this case was effective in circumventing this obstacle and bringing the two sides together.

The SRMC opted for post-moratorium regulations that controlled both inputs and outputs (Table 2). The reduction in the number of boats and modifications to fishing gear, such as enlarging the size of the nets' mesh, were among the new resource management measures aimed at reducing fishing effort. As mentioned in Section 3, these effort reduction measures were based on fishers' inputs, coupled with recommendations from local government and were decided at the SRMC. At the same time,

the SRMC agreed to implement a total allowable catch system, ultimately administered by the central government, to limit overall harvest levels. Its target was to lower the catch rate, defined as the ratio of harvest to estimated biomass, from 0.8 to 0.5. The TAC limit was set at half of the estimated biomass (stock level) of sandfish.

Although the overall TAC level was set by the government, the details of how the system was administered at the local level varied with the FCA. Government intervention in the TAC system consisted of setting the catch/biomass ratio and the proportion of the total catch allotted to offshore and coastal fishers. Originally divided equally between coastal and offshore fisheries, the allocation ratio was later changed to allot 60 percent of the TAC to the coastal fishery and 40 percent to the offshore fishery. Within each fishery type, a share of the catch is then allocated by the SRMC to individual FCAs based on factors such as the number of registered vessels and its harvest history.

How individual FCAs managed their allotted TACs varied widely. Among the 3 FCAs with offshore fisheries, one FCA opted for collective use of its share while the other two allocated quota to individual vessels. Among the 12 FCAs with coastal fisheries, eight FCAs allowed derby fishing within their shares, three FCAs assigned shares to individual vessels and one FCA opted for collective use of its share. None of the individually allocated shares were transferable. Collective use of the TAC usually took the form of joint fishing operations by some sub-set of fishers. For example, in fixed net fisheries, a minimum number of fishers of four to six (differs by locale) might be required to operate a net. For gill-net fisheries, some FCAs implemented rotation of fishing among fishers, while others implemented rules similar to the fixed net fishery.

The TAC was enforced at each FCA level. That is, if an FCA reached its allotted TAC, all fishers in that FCA were required to terminate their operations for that year. There were cases where the total TAC was not reached, while several FCAs reached their limits. Table 3 shows the allocated TACs and actual harvest volume during the first year of post-moratorium (i.e. 1995). Some FCAs, for example Northern Akita and Funakawa Port, did not reach their TAC while the Oga City and Southern Akita FCAs exceeded theirs by more than 50 percent. Also, in terms of offshore and coastal sandfish fisheries, the former only caught 63 percent of its allocated TAC and the latter over-harvested slightly in taking 104 percent of TAC. Overall, the actual catch was 83 percent of the total TAC that year (Table 4).

The effect of the TAC system on stock recovery seems to have been largely successful. In 1995, when the sandfish fishery reopened, the TAC was set at 170 t and was allocated to coastal and offshore fisheries at 85 t each. The actual harvest was 142.5 t – coastal fishers caught 88.7 t and offshore fishers caught 53.8 t (Table 4). As the stocks increased, so did offshore harvest volumes. To accommodate the change, the prefectural government discontinued its equal distribution of the quota to coastal and offshore fisheries in 1999. In subsequent years, estimates of the sandfish biomass

TABLE 3
TAC allocation among FCAs and between offshore and coastal fisheries in 1995

Name of FCAs	Offshore fisheries			Coastal fisheries		
	Quota (t)	Catch (t)	Results (%)	Quota (t)	Catch (t)	Results (%)
Northern Akita	23.9	10.1	42.3	32.0	20.6	64.4
Noishi	-	-	-	3.0	2.0	66.7
Oga-City	-	-	-	36.0	55.8	155.0
Funakawa Port	14.4	9.6	66.7	2.0	0.8	40.0
Southern Akita	46.7	34.1	73.0	5.0	8.0	160.0
Others (7 FCAs)	-	-	-	7.0	1.5	21.4
Total	85.0	53.8	63.3	85.0	88.7	104.4

Source: Akita Prefectural Fisheries Research and Management Center (2006).

increased from 360 t in 1995 to 5 100 t in 2005 and the TAC was increased accordingly, from 170 t in 1995 to 2 500 t in 2005.

The last post-moratorium measure was to bring neighbouring prefectures into Akita's management efforts. As previously mentioned, Akita fishers harvest a sandfish stock that migrates from Aomori to Niigata prefecture. If the sandfish resource is to be managed effectively, cooperation among all four prefectures (Akita, Aomori, Yamagata and Niigata) that target the same stock is necessary. Akita fishers began advocating for cooperation with the other prefectures before the moratorium was implemented. Finally, on 29 March 1999, FCAs in the four prefectures concluded "The Agreement of Sandfish Resource Management" for the northern Sea of Japan under the supervision of the central government's Fisheries Agency. However, the extent of cooperative management has been limited. The four prefectures, for example, only agreed to a minimum fish length harvest size of 15 cm.

5. UNDERSTANDING THE SANDFISH DECISION MAKING PROCESS

5.1 Challenges

Sandfish management measures had to be comprehensive to succeed. Most, if not all, of the fishing operators involved had to comply and cooperate for the measures to be effective. At a minimum, all 733 sandfish fishers in Akita prefecture had to be involved. Ideally, fishers in all four of the prefectures that target the same stock would take part in a collective management effort. The trade-off in participatory fishery management is between its potential effectiveness and the increased transaction costs associated with

TABLE 4
Changes in sandfish harvests

Year	Offshore fisheries			Coastal fisheries			Total		
	Quota (t)	Catch (t)	Results (%)	Quota (t)	Catch (t)	Results (%)	Quota (t)	Catch (t)	Results (%)
1991	-	55.5	-	-	16.6	-	-	72.1	-
1995	85	53.8	63.3	85	88.7	104.4	170	142.5	83.8
1996	110	86.1	78.3	110	157.2	142.9	220	243.3	110.6
1997	180	161.2	89.6	180	290.8	161.6	360	452.0	125.6
1998	300	178.4	59.5	300	436.8	145.6	600	615.2	102.5
1999	400	143.0	35.8	600	579.1	96.5	1 000	722.1	72.2
2000	400	265.7	66.4	600	901.8	150.3	1 000	1 167.5	116.7
2001	520	547.8	105.3	780	986.2	126.4	1 300	1 534.0	118.0
2002	680	380.1	55.9	1 020	1 570.1	153.9	1 700	1 950.2	114.7
2003	960	903.9	94.2	1 440	2 058.6	143.0	2 400	2 962.5	123.4
2004	1 000	787.7	78.8	1 500	2 348.7	156.6	2 500	3 136.4	125.5
2005	1 000	488.2	48.8	1 500	1 866.6	124.4	2 500	2 354.8	94.2

Source: Akita Prefectural Fisheries Research and Management Center (2006).

Figures are in calendar year for 1991–97 and in fishing season (September to following June) for 1998–2005 (e.g., "1998" refers to September 1998–June 1999).

establishing such a regime. The higher cost can result from the involvement of many fishing groups that have conflicting interests and agendas.

The high transaction cost generated by participatory fishery management when the number of fishers is large calls for intervention by the government and/or outside experts. However, such intervention, if done in a top-down manner, is no different in practice from conventional regulation and thus is likely to fail. This was the case when Akita's prefectural government first attempted to impose a moratorium in 1986 through the APFRC (see Section 2.2). The important question is how the government should intervene to avoid disenfranchising fishers and consequently destroying their willingness to manage the resource. The sandfish fishery co-management case offers three general lessons.

5.2 Participatory procedures and consensus-building

The first lesson from Akita's experience is that fishers must be involved in the entire process of planning, negotiating and executing the management measures. Such participatory procedures often require a greater investment of time and consensus among all the stakeholders is essential to their acceptance of the resulting measures as legitimate actions.

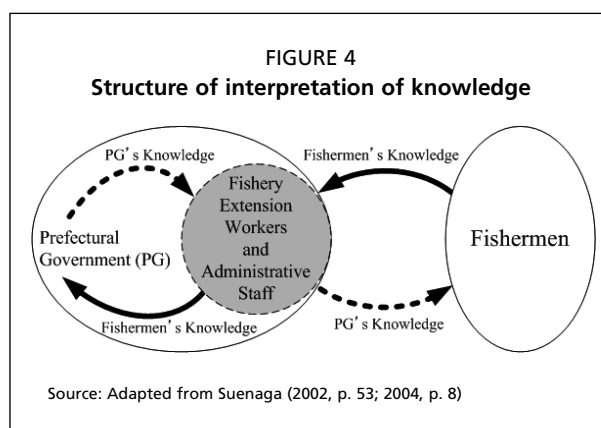
This participatory process is much easier said than done. While one can attempt to create an institution for such processes, another option is to use an existing process. In the Akita sandfish case, that process is called *yoriai*, which means "gathering" and it is one of Japan's traditional decision-making styles. *Yoriai* is a typical form of neighbourhood meeting and occurs in many parts of rural Japan today. An interesting characteristic of *yoriai* is that it is not a venue for discussion, but rather a place to allow each and every member to express their views on items on the agenda, i.e. a place to exchange and present each member's view to others. The discussions take place outside of *yoriai* in the form of informal communications. *Yoriai* is repeated, along with the informal discussions in between, until unanimous agreement is reached.

The Sandfish Resource Measures Council (SRMC) and its local discussion groups (Figure 5) were administered in a *yoriai* style. For example, representatives in discussion groups came from a geographic area typical of participants in a *yoriai* (Suenaga, 2000). Through participation in local discussion groups and opportunities to express their opinions about items on the agenda, fishers gained a sense of involvement in the decisions made. That sense of satisfaction, even when it was subtly felt, played an important role in the consensus-building process. In the end, the SRMC successfully facilitated consensus-building among the Akita fishers as they forged a resource management plan by ensuring that the fishers affected by it were leading the process.

5.3 Avoidance of overdependence on government intervention

The second lesson from the Akita sandfish case is to avoid letting fishers become overly dependent on government intervention. For example, sandfish fishers received support, but not compensation, from the prefectural and central governments during the moratorium. It is not just that government spending on them was labelled as "support" or that it would have been labelled as "compensation" had the moratorium been imposed by the government. The level of assistance provided had a subtle but important impact on fishery co-management. Had the government given financial compensation – essentially a gift – to fishers when they asked for it, the fishers could have come to depend on government money and stopped putting their own efforts into fishery co-management. Instead, the government provided no-interest loans to fishing operators affected by the moratorium. The loans helped the Akita fishers by supplementing their incomes during the moratorium, but because they had to repay the loans, they remained focused on creating a sandfish management plan that would generate enough income to make repayment possible.

Government took other steps to support the process. For example, the prefectural government held informational conferences and meetings 150 times or more during and after the moratorium period. The labour and associated costs incurred by the prefectural government for the meetings were substantial. In addition, the prefectural government managed tasks such as press reports. These organizational costs are often not obvious to the public, but these government investments are important support for co-management.



5.4 The role and importance of scientific knowledge

The sandfish case demonstrates that scientific research is indispensable in establishing and maintaining a participatory fishery management regime. In the case of Akita's co-management of sandfish, a forecast-simulation model was used in designing the management measures. Fishers witnessed that the simulation results presented prior to the moratorium (e.g. Figure 4) quite accurately predicted how sandfish resources would respond. The process not only improved the fishers' trust in the research but also allowed them to recognize the importance of resource management.

That said, explaining complex scientific knowledge to fishers, let alone ensuring that they understand it, is no easy task. Without such translation of the knowledge, trust cannot develop and no fisher would seriously consider the knowledge as valuable. Government administrative staffs and fishery extension workers (including scientists), who have the most frequent contact with fishers, played an important role in this respect. The roles played by administrative staff members and fishery extension workers exceeded the typical roles of "bridge" and "liaison". (In the communication studies literature, Rogers and Agarwala-Rogers [1976] illustrate the role of a person acting as a *bridge* in which the person belongs to a certain *clique* and facilitates human networks and connections between cliques. There also can be persons who act as *liaisons* and serve to connect cliques, but a liaison does not belong to one of the cliques [Schwartz, 1977].) Administrative staff members and fishery extension workers did more than simply bridge the gap between fishers' knowledge and the prefectural government's knowledge. They also interpreted the knowledge through dialogue with the fishers (Figure 4). Administrative staff members attended most of the conferences and meetings of local fisher groups and patiently explained relevant scientific knowledge. Fishery extension workers used their closer relationships with fishers to follow up on the fishers' understanding of the knowledge presented by the administrative staff. The two typically played a complementary role in the relationship between fishers and the administration.

6. CONCLUSION

This chapter described the case of fishery co-management of sandfish in the Akita prefecture and the highly publicized moratorium on harvesting. Akita's sandfish fishery co-management experience provides several valuable lessons about fishery management regimes for migratory fish species. The transaction costs of establishing an effective self-management regime are inevitably high, not only because of the sheer number of stakeholders but also because there will always be conflicts of interest among them. Establishing such a participatory fishery co-management regime is inherently difficult and therefore calls for involvement by the government.

In Akita's sandfish fishery, involvement of the prefectural government was an important factor. As a consequence, this case is best described as co-management rather

than self-management. Note, however, that a system in which the government took the lead would in principle be no different from traditional ‘command-and-control’ regulatory regimes. The leading role was always kept in the hands of fishers and their organizations, but at the same time government intervened to foster self-management when necessary, as was the case of separating coastal and offshore fishers in the SRMC (see Section 4). What is special about this case is the delicate balance struck between government intervention and self-management by fishers, which prevented fishers affected by the plan from becoming dependent on government.

The case of Akita’s sandfish measures identifies some elements that are critical for successful co-management. The first is a participatory process of negotiation and consensus-building. Such a process facilitates a sense of ownership of the management effort – as opposed to “being told what to do” by an authority – and generates outcomes that are viewed as legitimate. The second element is a set of government policies that facilitate fishers’ independence. One example previously noted is the system of no-interest loans that required fishers to repay the money. Government also intervened at a critical point to define a decision-making structure with separate fora for coastal and offshore fishers. Finally, this case demonstrates the value of scientific research in guiding decisions and the importance of interpreting that knowledge into terms fishers can understand.

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