

## FISHERIES MANAGEMENT OF SANDFISH IN AKITA PREFECTURE

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### ABSTRACT

Fishermen of Akita prefecture of Japan did the prohibition of sandfish fishery for three years independently. After cancel of a ban the coastal fishermen and the offshore fishermen carried out amount management of sandfish cooperated since 1995. This is first example of cooperative amount management, by coastal fishermen and offshore fishermen in Japan. The fishermen used various technique of amount management such as "free competition under amount regulation", "individual quotas system" and "pool quotas system" together. I introduce this example in detail.

**Keywords: Sandfish, Quota allocation, Quota management**

### INTRODUCTION

Total Allowable Catch (TAC)-based fisheries management for seven fish species began in 1997 in compliance with the Law concerning Preservation and Management of Marine Life Resources (hereinafter 'the Law'), newly enacted in 1996. The Law entitles each prefecture to establish its own TAC, in the context of the views of the relevant Sea-area Fisheries Adjustment Commission.

It is important to summarize and study fisheries management based on the allowable catch conducted by Akita Prefecture to provide overall control of fisheries from coastal fishing to offshore fishing and arrive at a method for promote operational improvements. This paper outlines the actual content of management conducted in 1995, summarizes and studies the wide-area fishing ban and fisheries management of fishes based on catch allocation after lifting of the fishing ban.

### The position of sandfish in Akita's fishing industry

The sandfish caught by Akita fishermen belong to the Japan Sea Northern Group and are generally caught by trawl net fishing off the coast of Aomori Prefecture to Niigata Prefecture and by gill nets and small-scale fixed nets in the coastal waters off Akita Prefecture. The Akita sandfish catch peaked at 20,607 tons in 1966. In 1975, when the prefecture saw record-high sea fishery production, the sandfish catch exceeded half of the sea fishery catch and a quarter of the catch's value. Thus, sandfish used to play an important role in the Akita fishery industry. The catch of sandfish, however, began to decrease thereafter, hitting a low of 71 tons in 1991.

Back in 1975, the sandfish catch in Akita Prefecture was mainly from coastal fishing, which at the time accounted for 75% of the total catch. The proportion of catches accounted for by trawl net fishing then gradually increased as a result of the overall decrease in fish catches. From 1982 to 1991, except for 1990 (coastal catch occupying 54%), trawl net fishing accounted for more catches than by coastal fishing (Fig. 1). Sandfish is one of the most important species for trawl fishermen using trawl nets. It accounted for 44% of the total fish catch in 1975 and one fourth of total fish sales. For coastal fishing, the main modes of fishing include small-scale fixed netting and gill netting, which both mainly take place for about a month when sandfish migrate to the coastline to spawn. For coastal fishermen, sandfish is a valuable source of income before the New Year season. These coastal

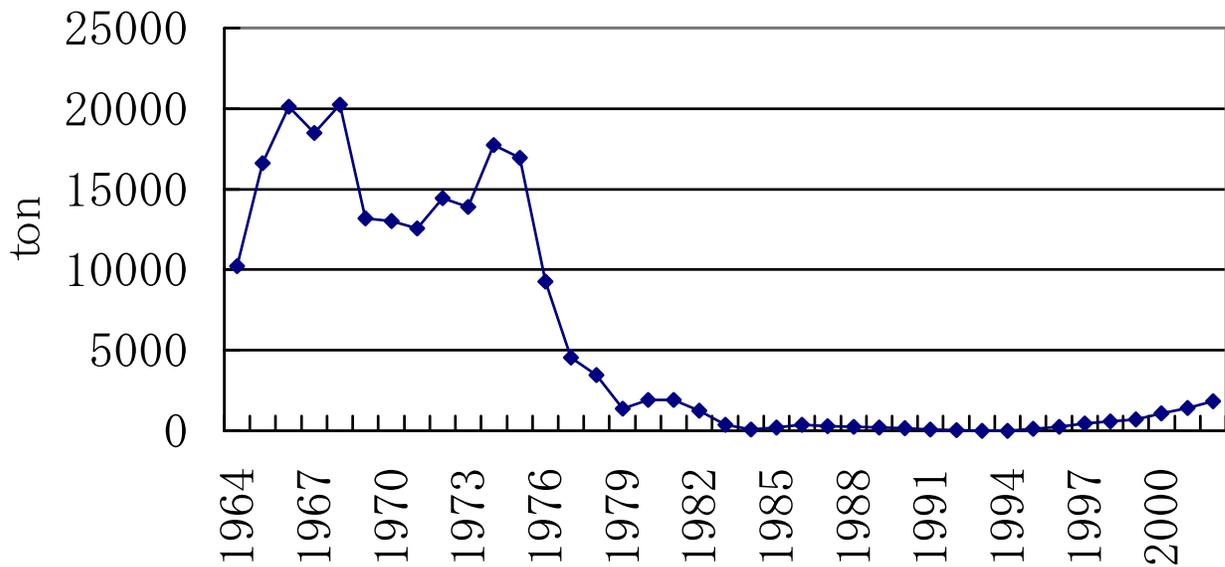


Fig.1 Sandfish catch of Akita prefecture

fishermen use a variety of fishing methods to gain their income, including angling, gill nets, and gathering of seashells and algae. The annual catch income per operating entity from sandfish-based fishing varies greatly from 900,000 to 20,800,000 yen (in 1989), since the numbers of fish that migrate to the coast vary greatly depending on the area (Japan Sea North Block Resource Management Type Fisheries Promotion Council, 1992). Hence, the importance of sandfish varies markedly from area to area. In some areas, the sandfish catch can account for a large percentage of annual income.

### The fishing ban

The idea of a fishing ban was triggered by the feeling of a sense of crisis among fishing people as a result of the all-time low 71-ton sandfish catch in 1991. Participants at the Board Meeting of the Akita Prefectural Federation of Fisheries Co-operative Associations (hereinafter the APFFCA), held in January 1992, expressed their concern that sandfish would face extinction unless action was taken and that it was a case of "Now or never." In response to these views, an Ad-hoc Prefecture-wide Meeting of Association Leaders was held in February 1992, where the participants decided to take concrete action, including a total sandfish fishing ban, to prevent the disappearance of sandfish resources.

A series of programs were then initiated, including simulation-based predictions at the Akita Prefecture Institute for Fisheries and Fisheries Management (APIFFM) in March and the holding of local briefings to members of local fisheries co-operative associations (FCAs) in April and May. Partly because of the large number of respondents to a questionnaire survey given to fishing people, held jointly by the APFFCA and the prefectural government in June 1992 (National Federation of Fisheries Co-operative Associations, 1997), a total of 15 extension programs, including local workshops and trade-specific briefings, were held starting in July with the prefecture taking the initiative to promote support for the fishing ban among fishing people. Initial responses were mainly against a total fishing ban, since its implementation was considered to be virtually impossible, but the fishermen's strong concern about the

depletion of sandfish resources gradually convinced the people to accept, albeit unwillingly, a total ban. No briefing was held with both trawl net fishermen and coastal fishermen jointly present, but each group was briefed independently, which seems to be one of the main factors that helped build consensus among different trades and areas on a fishing ban. Coastal fishermen blame the drop in sandfish catch on trawl nets being used over a long period, and the trawl net fishermen blame the coastal fishermen who catch large numbers of spawning sandfish during a short period of time, so there was an atmosphere of mutual recrimination. If these two groups with differing interests met together, they would have inevitably guarded their own interests instead of working to build a consensus. The Sea Fisheries Co-operative Associations Summit Talk determined the implementation of a total sandfish fishing ban, and the Sandfish Resource Management Accord was signed by all fishing groups involved on October 1, 1992, to implement a total ban on sandfish catching from October 1, 1992 to June 30, 1995. The Accord specifies the banning of sandfish catching during the closed season and strictly penalizes violators by imposing a 100,000-yen fine, suspending their fishing operations for 10 days and confiscating their catch and fishing gear.

As earlier mentioned, sandfish are not only caught by fishermen in Akita but by those from three other prefectures: Aomori, Yamagata and Niigata, and it is true that people originally doubted the effectiveness of a fishing ban that would apply solely to Akita fishermen. According to statistics compiled by the four prefectures, changes in sandfish catch reveal no major difference in the total catch of the fish between the closed period of 1992 to 1994 and the pre-ban year of 1991, seemingly justifying these doubts (Fig. 2). The intended significance

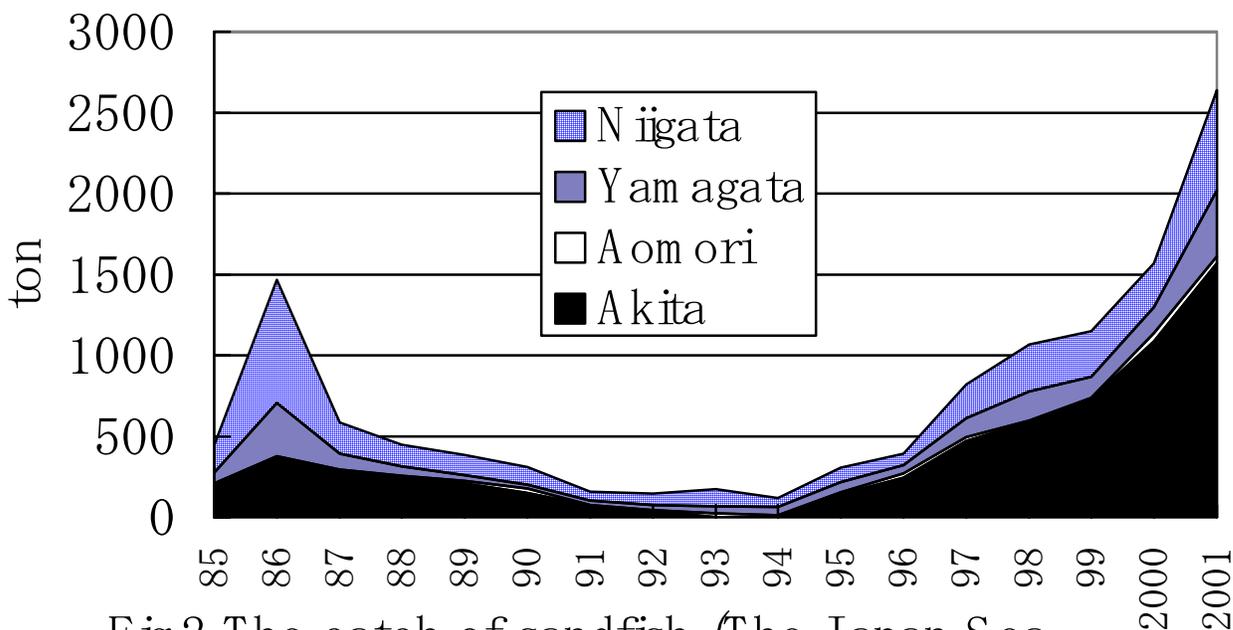


Fig.2 The catch of sandfish (The Japan Sea Northern group) Data source: Fishery Statistic of Japan

of Akita's fishing ban, however, is total protection of sandfish near the coast while spawning, which is cited as one of the three most important elements of sandfish resource management, or (1) protection of small fish, (2) reduction in intensive fishing, and (3) protection of parent fish (Japan Sea North Block Resource Management Type Fisheries Promotion Council, 1992). Thus, according to the estimation of resource management effectiveness based on the KAFS Model \*1, a combination of measures of "re-release of fish smaller than 15 cm, no fishing in June, expansion of the mesh of the trawl net to seven

nodes, and reduction in the coastal fish catch by 20%" would lead to "an increase in the resources in the total Japan Sea North Group to 2.2 times the present level in the 10th year of management," while a total sandfish ban by Akita Prefecture would result in "about double the present level of resources in the third year of the total ban" (Sato, 1993) and a ten-fold increase in 10 years. The latter estimate corroborates the significance of the outcome of Akita's total ban. The total catches by four prefectures showed a gradual increase thereafter, reaching about 27.7 times the catch of the 1991 level in 2003. This is clear evidence proving the prediction was correct.

Since the total sandfish fishing ban was expected to seriously affect the business operations of fishermen, fishermen's groups made requests to the prefecture for various forms of support, and a budget was newly set aside in 1992 for 8 projects. The budgets for these came to 626 million yen (including 472 million yen from the prefecture and 154 million yen from the national government) from 1992 to 1994 in terms of the actual budgets spent. The prefecture was able to provide budgets of this size for the sandfish issue alone probably because the sandfish is the fish that represents Akita Prefecture: in December 2002, the sandfish was officially established as the Fish of the Prefecture.

The budgets include loans to compensate for the reduced income of sandfish fishermen due to the sandfish ban, loans to compensate for the reduced income of FCAs due to the sandfish ban, financial grants for the residual values of fishing boats and fishing gear rendered useless due to the decrease in the number of trawl net boats, financial grants for purchase by FCAs of unused fishing gear as a result of reductions in the total number of small fixed nets and gill nets in the coastal waters, expenses for investigations of the status of sandfish migrating to the coast for spawning during the prohibition period and to ensure the presence of parent fish for spawning, the budget for developing technologies for fostering seaweed beds that serve as sandfish spawning grounds, and the budget to produce and release sandfish seeds.

### **Post-ban Management**

Two of the major points to determine in implementing fisheries management based on the TAC are (1) how to allocate the TAC and (2) how to manage the TAC. As sandfish management implemented in Akita was not something imposed by higher up but a joint responsibility of the fishermen, based on a consensus among themselves and the administration, the allocation and management methods were discussed in full and finalized by the members of the Council.

The allocation method is tripartite, consisting of "even allocation," "allocation by the number of boats (fishermen)," and "allocation by performance" according to type of fishing business, FCA/area, and fishermen. The management method consists of three types for each FCA/area, "the Olympic system," "the pool system," and "the individual quota (IQ) system."

Concerning lifting the sandfish fishing ban, the APIFFM estimated that resources would amount to some 1000 ton, twice that before the ban, and that of these, the resource of two years old or older fish, which would be allowed to be caught, would be 360 ton (Resource Department, APIFFM, 1996). The APIFFM recommended, based on their simulation, that the catch rate should be limited to 0.5 with various resource management measures taken to stop depletion. Based on these values, the Sandfish Resource Measures Council, a voluntary group formed by the relevant fishermen, (herein the SRMC) discussed the issue of catch restriction regulations. At the SRMC meeting held in July 1995, the APFFCA proposed a TAC of 170 ton and even allocation between offshore and coastal fishermen. These proposals were discussed by both the Offshore and Coastal Fishing Subcommittee, under the SRMC, and local review commissions, under each Subcommittee. Their discussions were very heated. For the ratio between offshore and coastal, offshore fishing would come to have a higher ratio if the TAC were allocated based on recent

performance, but the members in the areas in the Oga City FCA, which is one of the coastal fishing areas with a particularly large number of fishermen and higher fish catches in the past, strongly demanded a 7:3 or 6:4 ratio, with the higher proportion given to coastal fishing, because the ratio of coastal fishing catch had been higher in the past and coastal fishing has a higher ratio in terms of the number of fishermen. But there was no clear evidence to justify an uneven allocation, and trawl net fishermen, who would start operation ahead of coastal fishermen, would catch a lot of sandfish if the allocation ratio were not determined. Offshore and coastal fishermen therefore agreed to an even allocation, and the proposals of the APFFCA were approved as they were at the Council meeting in September 1995. In addition to the management of quantity, measures to reduce intensive fishing through minimum capture length control, fishing season restriction, and reduction in the number of fishing boats were also implemented as other resource management measures. In the ensuing years an increase in the catch was seen in the coastal waters, which led to agreement among the relevant fishermen that the quota distribution ratio would be 6 for coastal fishing and 4 for offshore fishing after 1999.

1) Offshore (small-scale trawl net fishing and offshore trawl net fishing) management (Fig. 3)

Quota of offshore fisheries 85 ton (catch 53.8 ton)

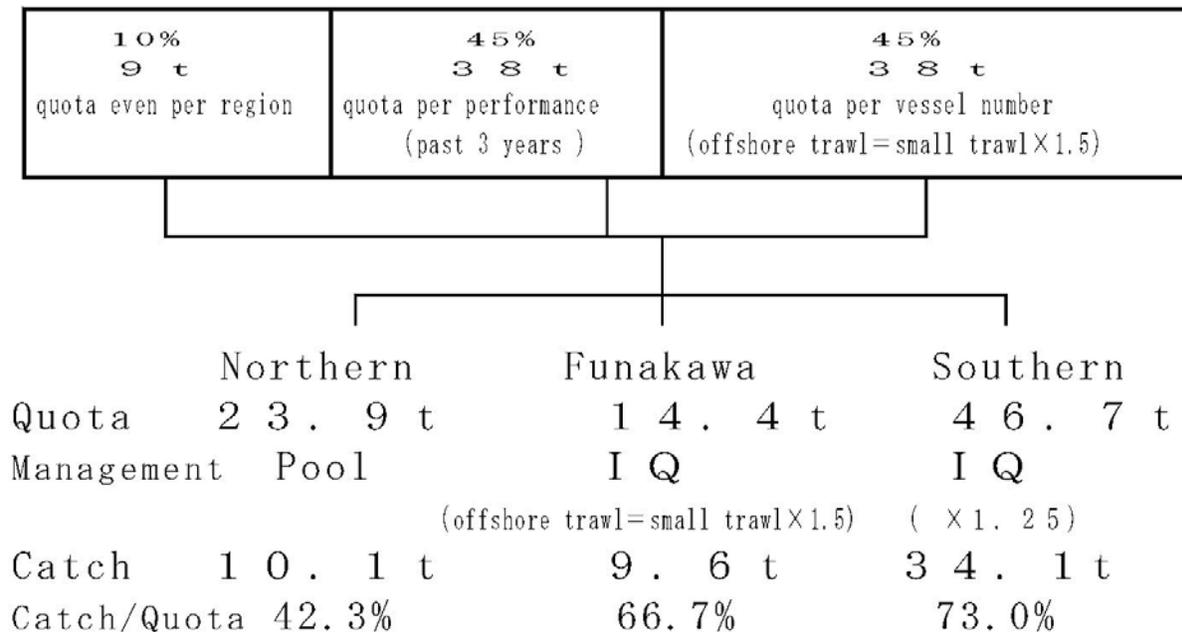


Fig.3 Quota allocation of offshore fisheries(1995)  
data source : Akita prefecture

The Offshore Subcommittee of the Council discussed the need to allocate the offshore quota among FCAs. Since trawling with dragnets selectively nets fish in sandfish grounds, the Olympic system was expected to arouse a heated race for fishing grounds. Aware of this obvious outcome, the members unanimously went for area-based allocation. Three associations under which trawling boats were operated: the Northern Akita FCA, Funakawa Port FCA, and Southern Akita FCA, decided to share the quota as follows: 9 ton, or 10% of the TAC of 85 ton, to be divided equally among the three; 38 ton, or 45%, to be divided based on the actual catch over the past three years; and 38 ton, or the remaining 45%, to be divided based on the number of fishing boats owned. They also decided in September to agree to the proposal of the Secretariat to allocate the quota based on the assumption that each offshore trawling boat would be counted as 1.5 small trawling boats. Of the three associations, the Northern Akita FCA, which

carried out joint operations and used the pool system in January and February before the lifting of the ban, decided to extend the joint operation period from October to February; and the TAC of sandfish was calculated using the pool system, while IQ (individual quota per boat) was adopted for the other two. Of the associations that adopted the IQ system, Funakawa Port FCA counted one offshore trawling boat as 1.5 small trawling boats for allocation purposes, while the Southern Akita FCA calculated one offshore trawling boat as 1.25 small trawling boats. The conversion method of offshore trawling boats is different for these two FCAs, but this is because the Funakawa Port FCA followed the allocation method adopted for the entire prefecture and the Southern Akita FCA adjusted the conversion rate since small trawling boats far outnumber offshore trawling boats.

2) Coastal (small fixed-net fishing and gill netting) management (Fig. 4)

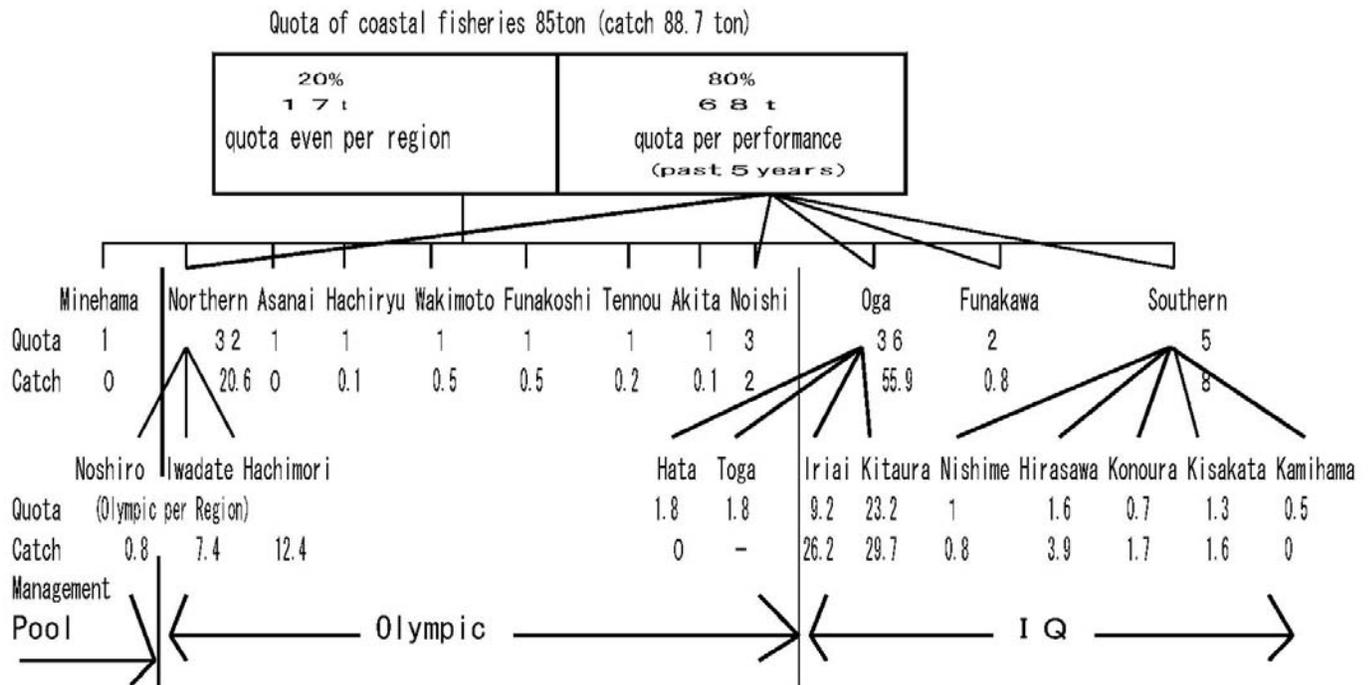


Fig.4 Quota and management system of coastal fisheries (1995)

Data source :Akita Prefecture

The Coastal Subcommittee of the Council decided to evenly allocate 20%, or 17 ton, to 17 areas in 12 FCAs and allocate the remaining 68 tons to 12 FCAs based on their performance in the past five years. During the discussion, one idea proposed was to allocate the TAC to each FCA; its opposite proposal was to go with the Olympic system without allocation. The members supporting each side held four meetings before reaching agreement. The Olympic system was mainly proposed by FCAs in areas where the sandfish migrate earlier to the coast, giving a high catch. They claimed that even if the catch was allocated to all FCAs, those FCAs in which fewer sandfish migrated to the coast would be unable to take advantage of their allocated catch, which could eventually cause the FCA members in the Coastal Subcommittee to fail to reach the allocated catch overall. Some strongly expressed concern was that since the timing of the sandfish migration to the coast for spawning varies depending on the area, it would be a problem if the fishermen in such areas where the migration was earlier would use up all the allocation.

Heated discussions continued in the Subcommittee, but they finally reached a consensus, which is that a certain quota was to be determined for each FCA before December 26 and that the unused part of the TAC of the coastal FCAs should be allocated using the Olympic system for all FCAs in the coastal area after that date. For the allocation of the catch to each FCA based on their past catch performance, taking into account the fact that fixed-net fishermen need a higher capital outlay and need more workers than gill net fishermen, the catch performance of fixed-net fishermen was counted as double that of gill net fishermen. Although the period for which the catch performance is to be calculated was set as the past five years, fishermen in the Southern Akita FCA and the Funakawa Port FCA fervently wanted to extend the period farther back, because their catch in the past five years was smaller than that in the years before that. In addition, the Funakawa Port FCA, which has a large number (115) of fixed-net sets, requested appropriate allocation to allow for such a large number of sets. As mentioned above, concerning the catch of sandfish fishing in the coastal waters, both the timing of the sandfish migration and the number of sandfish migrating vary greatly year by year, which made introduction of the resource management method by means of catch management extremely difficult. For internal allocation of the quota provided to each FCA, the Olympic system was adopted for 8 FCAs out of 12, the pool system for one FCA and mainly the IQ system for three FCAs.

Concerning the major characteristics of the FCAs that adopted the Olympic system, six out of eight had smaller catches in the past, with the catch quota being one ton only as a result of even allocation. If the small quota were further subdivided, they would likely either fail to reach the quota or exceed the quota. This may be why they insisted on adopting the Olympic system. For the Noishi FCA, whose quota based on the past performance was only 2 tons, the same failure could result from dividing 3 tons by 26 nets. This is probably why they chose the Olympic system. For the Hata area and Toga area, in the Oga City FCA, which were only given a quota based on even allocation, the Olympic system was their choice. For the Northern Akita FCA, they chose the Olympic system despite their relatively large quota of 32 tons for various reasons: the migration timing did not vary among the three areas in the past; if they opted for the Olympic system, there would be only seven fixed-net sets, where a smaller number of fishermen would likely use up their quota due to a bountiful one-time catch; whereas there are many gill net sets (107) where the catch per time is small; and many member fishermen have a fatalistic attitude of "catching the fish where they come, but surviving somehow in spite of no catches when they don't come" or a free-for-all idea that "it is unfair if the old and the young the share the same IQ, since the more energetic the fisherman, the more catch quota should be allowed them."

For the Minehama FCA that opted the pool system, ten fishermen jointly operated four gill net sets. For the Noshiro area, in the Northern Akita FCA, which has smaller past catches, fixed nets and gill nets in the coastal waters were combined in the pool system to allow equal sharing.

Of the three FCAs that selected the IQ system, the Funakawa Port FCA and the Southern Akita FCA were allocated one ton and four tons, respectively, as their performance-based quota, but opted for the IQ system for reasons of their own. For example, trawl net fishermen in both FCAs had already used the IQ system for quota allocation, so the same system was adopted FCA-wide. For the Southern Akita FCA, since the timing of the sandfish migration had varied according to area in past years, it was very likely that only a small number of fishermen would use up the entire quota if the Olympic system were adopted for such a small quota. Many fishermen, therefore, wanted to evenly share the hardships that resulted from the fishing ban. In fact, there was a four-day difference in the migration timing among the areas during the 1995 fishing season. The Funakawa Port FCA, which had only fixed-net fishermen and no gill operators, allocated the quota equally to each individual operator, but after December 21, the residual portion of the quota was allocated within the association according to the Olympic system. For the Southern Akita FCA, 20%, or 1 ton, of the quota was evenly distributed over five areas, at 200 kg each, and 80%, or 4 tons, was distributed according to the number of fishermen in each of the four areas, each of which allocated their quota by the number of fishermen within each area. The quota was allocated in

each area by the number of fishermen, not by the number of operators, to change the quota for one-man gill net operations, with operation of one fixed net set with six or more fishermen adopted as the chief mode of operation. There are also fishermen who engaged in both fixed-net and gill net fishing; they were given the quota not for the two sets, but only to one set so as to avoid concentrated allotment. These appear to be their reasons for adopting the above system. Of the FCAs that mainly opted for the IQ system, the Oga City FCA, which was given the largest quota, distributed 7.2 tons, or 20%, evenly to four areas, making 1.8 ton each, and allocated the remaining 28.8 ton according to catch performance over the past five years. As a result, two areas out of the four selected the Olympic system, since their quota was only 1.8 ton, while the other two areas used the IQ system within their own areas. When allocating the IQ in an area, the Iriai area, which has both fixed-net and gill net fishermen, equally allocated 20% between 17 operators, and the remaining 80% was allotted based on the past five-year performance (with the performance of fixed-net catch calculated as double that of gill net fishing operations in compliance with the Association-wide method). In the Kitaura area, the quota was uniformly distributed to 25 operators who were solely fixed-net fishermen.

### **Results after Lifting the Fishing Ban**

Sandfish were caught according to the various allocations explained above. By the end of December, the total catch was 142.5 ton, slightly under the TAC. The catch from coastal fishing was 88.7 ton, 4% above the quota, whereas the catch from offshore fishing was 53.8 ton, 37% below quota. Two FCAs, or Oga City and Southern Akita, were the only FCAs whose coastal fishing exceeded the quota. No other FCAs reached the allotted catch. For the last catch that reached the individual quota, all the catch was allowed to be landed, which resulted in the two FCAs exceeding the quota. One of the major reasons offshore fishing did not reach the quota was bad weather in November that confined the offshore fishing boats to port for many days.

### **Demerit of allocation method of T A C and case study of Akita**

#### Even allocation

It is apt to failure to reach the quota or lack of the quota. When a difference of the performance was big, an agreement of fishermen with many performances is hard to be provided. There were not the performance, and there were 11 areas no catch in 1995, that were not able to reach the quota among districts only of even allocation among areas of the coast in Akita.

#### Allocation by the number of boats (fishermen)

When a quantity of fishery does not set different conversion rate by a fishing method, it becomes unfair. Akita set conversion rate with offshore troll and small troll.

#### Allocation by performance

When a change is big year by year, it is apt to failure to reach the quota or lack of the quota.

### **Demerit of management method of T A C and case study of Akita**

#### Olympic system

It is apt to occur the excessive competition or the surplus equipment. In Akita, fishing effort was regulated together, so such a problem did not happen.

Pool system

It is apt to happen the loss of worth doing. In 1995, Quota digest rate of Northern Akita FCA, which used pool system, was most low. But this is according with the migration of sandfish. In 1997, quota digest rate of Northern Akita FCA was most high, in reverse of 1995.

Individual quota (IQ) system

It is apt to failure to reach the quota or lack of the quota. It is apt to make high grading. Because they accepted over of quota by the last fishery to reach quota in Akita, the fishermen did not do high grading.

**Summary**

The background of fishermen in Akita Prefecture that led to implementation of sandfish catch control was studied, and the following findings were revealed:

- (1) The sandfish resource was extremely depleted, which made the fishermen realize the importance of resource management.
- (2) The APIFFM conducted simulation and predicted that a three-year fishing ban would allow the sandfish resource to twice in quantity. The results of the resource investigation prove their simulation to have been correct. The researchers therefore won the confidence of the fishermen.
- (3) The APIFFM recommended a catch ceiling of 180 ton to help increase the resource. The fishermen tried to carry out the recommendation by quantity control through catch restrictions.
- (4) The expected challenge in the effort to build consensus among fishermen and their associations was how to find middle ground among fishermen whose interests conflicted because they used different types of fishing methods. The solution to the challenge was that the section responsible at the Akita Prefectural Government served as the secretariat for the Sandfish Resource Measures Council and arranged meetings of the Council, its Subcommittees and local briefing meetings so that all the people concerned could talk it out until everybody agreed.
- (5) For the allocation method at the Subcommittees, the plan proposed by the members turned out to be difficult to achieve. The secretariat then put forth a proposal, based on which the final plan was developed.

The sandfish quantity management results in Akita Prefecture in 1995 revealed that not all the results were successful, including failure to reach the quota or premature fulfillment of the quota due to weather conditions or differences in conditions of fishing grounds. It is, however, reasonable to conclude that the quantity management of fish resources based on the quota system is a more reliable approach to resource protection than single implementation of fishing effort restrictions. Fishing operators also seemed to enjoy the benefits of avoiding excessive competition by joint operations or individual allocation, that is, an improved working environment and enhanced work safety. Where the Olympic system was selected in coastal waters, no excessive installation of fishing gear or excessive competition took place due to the subsequent implementation of fishing restrictions, such as control of the number of gill nets. Given these positive results, the fishermen were highly satisfied with the 1995 resource management system and decided to continue it in 1996 and subsequently.

Reduction in the number of trawlers, implemented before shifting to quantity management, was estimated to provide positive effects, or an increase in per boat income of 610,000 to 3,340,000 yen due to the increase in the catch allotment, eventually promoting improved operation of trawl net fishing (Tamaki &

Kudou, 1998). These results indicate that an appropriate reduction in the number of fishing boats, combined with resource management and quantity management is, and continues to be, the pivotal strategy for improvement of fishery operations. Reduction in the number of trawlers in Aomori and Akita Prefectures was planned to start in fiscal year of 2003 as part of the resource recovery project for small-mouthed sole and sandfish in the northern part of the Japan Sea, envisaged in 2003.

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## **ENDNOTES**

1) KAFS, as in the KAFS Model, stands for Kinetic Analysis of Fisheries System. This is based on a model developed for two projects conducted by Niigata Prefecture, the Research for Development of Appropriate Fisheries Management Methods in the Coastal Waters off Niigata Prefecture, and the Research for Development of Appropriate Fisheries Advanced Management Method for Coastal Waters off Niigata Prefecture. The model is divided into three models: resources, fisheries, and operation.

"The resource model is designed to gain an understanding of the amount of resources and the use status of the resource and predicts how the resource will change in the future. The fisheries model reproduces the current catch status from the amount of resource estimated by the resource model, and estimates changes in the catch when fisheries management is undertaken. The operation model calculates the present and future fish landing value based on the catch calculated by the fisheries model, estimates the expenses based on the catch effort and other data, and predicts the income of operator entities." (Separate Volume, Contract-based Service Report on Japan Sea North Block and Akita Prefecture Resource Culture Management Measures Promotion Project, p.1, Japan N.U.S. Co., Ltd.) For the details of the model, refer to the Final Report (Coastal Waters off Niigata Prefecture) for the Research for Development of Appropriate Fisheries Advanced Management Methods, System Specifications and Operation Specifications, Niigata Prefecture, 1990.