

# Institutional Changes to Fisheries Management Systems Caused by the TAC in Japan

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**Abstract .** The purpose of this study is to estimate the institutional change to the fisheries management system caused by the TAC system in Japan, referring to the case study of snow crab (*Chionoecetes opilio*) in the western Japan Sea. Snow crab fisheries management in Japan has been carried out based on Japanese original management institution for thirty years. It is characterized by voluntary management by fishermen and input-control such as vessel number limit and fishing gear regulation. This voluntary management system has an ante-monitoring and interim-monitoring function. The TAC system, which was adapted for snow crab fisheries in 1997, adds a post-monitoring function. Consequently, the snow crab fisheries management system constitutes three stages of monitoring. Moreover, this institutional mechanism provides incentives of compliance with regulations to the related fishermen.

**Keywords:** Fisheries management, TAC, monitoring, self-regulation

## 1. Introduction

Snow crab is one of the most representative shellfish of Japan and has a high economic value. It is mainly distributed in the western Japan Sea and caught by offshore trawl fishery. Snow crab fisheries management has been carried out based on Japanese particular self-regulation system for the last thirty years. It is characterized by voluntary self-regulation by fishermen and input-control such as vessel number limit and fishing gear regulation based on the legislative regulation by the government in other words a type of co-management. Especially In this decade, the measure of “resource management oriented fisheries” has been intensively promoted. Moreover, the TAC system, which was initially managed by the government and output control, was introduced to Japan in 1997 and has been adapted to snow crab fisheries.

The Fisheries management system is composed of the complementary combination of various regulations such as statutory regulations, self-regulations and community rules. The existing snow crab fisheries management is mainly constituted of three type of management system. Each management system has different characteristics as far as management function is concerned. Elements of each system are combined and make a complementary structure for fisheries management. The author highlights the three stages of monitoring function established by three management systems.

This study has the following three objectives. Firstly, it is to clarify the institutional characteristics of the three types of fisheries management systems respectively. Secondly, it is to evaluate the current monitoring structure which is in place. Lastly, it aims to clarify the contributing factors to incentives for compliance with regulations.

## 2. Outline of snow crab fisheries

The catch amount of snow crab has fluctuated considerably. Fig.1 shows changes to snow crab catch amount in Japan. The total snow crab catch amount was over 20,000 tons in the 1970s and peaked in 1978. However, after the peak, it dramatically plummeted to a third of that level in 1984 and plunged to the lowest level in 1996. Since then, it has tended to increase slowly.

Table 1 shows the average catch volume and value of the last 5 years according to districts. With regards to catch volume, the districts where the largest amount of snow crab is produced are Hokkaido, Hyogo, Tottori and Ishikawa. In terms of catch value, the districts where the greatest value of snow crab is produced are Hyogo, Fukui, Tottori and Ishikawa. With the exception of Hokkaido, all of these major prefectures are situated in the coast of the western Japan Sea.

Table 2 indicates the average catch amount in relation to fishing gear. Offshore trawl fishery is predominant and small trawl fishery is the next most common. 84 % of the total catch amount is produced by trawl fishery. They are minister-licensed fishery. Consequently, the issues relating to trawl fisheries management are central to snow crab resource management.

### **3. Resource management issues**

#### **1) Over-fishing**

The first issue is over-fishing. As mentioned above, in line with declining snow crab stocks, the catch amount decreased after the 1970s and since then it has remained at much lower levels. Although the catch amounts tend to increase gradually from 1996, the snow crab resource has plunged to such a low level that the resource cannot recover easily. To restore the resource level, it's necessary to control the catch amount and fishing effort properly.

#### **2) Irrational fishing**

The second issue is discarding. As trawl fishery has the lowest net selectivity, smaller snow crabs than the allowable size are a common by-catch. Furthermore, through trawling, snow crabs are caught out of season. The size limit is 9 cm in shell width and the snow crab fishing season is from November 6<sup>th</sup> to March 20<sup>th</sup>. These statutory regulations are applied by the central government.

To comply with these regulations, fishermen have to discard any snow crabs trawled as by-catch. According to research report, the number of discarded bodies is estimated at around 800 per net in the spring fishing season; around 350 in the autumn season and from 140 to 840 under-sized bodies are discarded in the regular snow crab fishing season.

The issues of over-fishing and discarding are linked. To control the catch amount properly and for the resource level to recover, the number of discarded crabs needs to be reduced.

### **4. Outline of fisheries management institutions**

To resolve the above issues, two fisheries management systems - voluntarily carried out by the relevant fishery groups - were introduced in the western Japan Sea. In addition to this, a TAC system was established in 1997. These systems are briefly reviewed...

#### **1) Completely voluntary management system**

The first management system was a completely voluntary one. In the 1970s, to reduce over-fishing and maintain market prices, the union of the trawl fishermen in 6 prefectures (Ishikawa, Fukui, Kyoto, Hyogo, Tottori and Shimane) and each prefecture's organization were established as a management body in the western Japan Sea.

At that time, although there were some limited statutory regulations in place, these regulations were insufficient to control the snow crab fishery and snow crab resource. So the union added some self-regulations in order to make it sufficient in addition to the statutes provided by the central government. This self-management approach was completely voluntary and involved the introduction of management and monitoring procedures. The union members made agreements regarding catch limits of individual fishing vessels, seasonal limits and size limits. Besides those, some agreements have been made between individual fishing organizations concerning the designated fishing grounds in neighboring prefectures.

#### **2) Combination management system (resource management oriented fishery)**

The second system was a combination management approach. In the 1980s, the so-called "resource management oriented fishery" concept was applied to Japanese coastal fisheries. 1983 saw the beginning of government initiatives being applied to fisheries management throughout Japan. Central and prefecture government projects were promoted to target particular species and fisheries in individual prefectures. From this time on, in each prefecture, fisheries management committee, which consists of the relevant fishermen's groups, has been established as management bodies and the prefecture government has become the promoter and adviser for the various projects. This was the first time scientific evidence was applied to coastal fisheries management in Japan on such a large scale.

As for snow crab fishery, the "resource management oriented fishery" concept was introduced to this fishery in 1993. In the 6 prefectures of the western Japan Sea, snow crab fisheries management committee, which composed of trawl fishermen's groups as a main member and the prefecture government as an adviser, have been established. Each committee has made a self-regulation plan for appropriate snow crab fisheries management,

responding to the fishery conditions of each prefecture. The prefecture governments have encouraged such activities through providing some subsidies and giving technical and scientific advice.

The main self-regulation forms of this system were setting spatial closures and releasing under-sized crabs. For an example, in Kyoto prefecture, a seasonal closure round 50 km wide by 30 km long and 6 permanent reserves have been set. In the middle of the permanent closures, artificial reefs have been constructed to prevent trawling. In accordance with self-regulation strategies, all under-sized crabs must be released immediately after capture. These forms of self-regulation were introduced to compliment the former regulations, that is, size limits, seasonal limits and catch limits.

### **3) TAC system**

In 1997, a TAC system was introduced to Japan and applied to snow crab as one of 7 species. In the western Japan Sea, as almost all snow crab fisheries are minister-licensed fisheries, the TAC system is under the jurisdiction of the central government. Snow crab TAC is allocated by the central government to the fishermen's organization, which is the union mentioned at completely voluntary management system. The union and its members have become the management body of the TAC system in accordance with central government policies. The central government initially allocates the TAC and checks the result of the TAC management. Although a small proportion of the TAC is allocated to prefecture governments for the governor-licensed fisheries, it is skipped here for the sake of simplicity.

To comply with the allocated TAC requirement, the union has made an agreement between the members, which are the fishermen's organizations of each prefecture, about snow crab fisheries management. The main forms of the regulation are the management of the TAC and the self-regulation of the fishery.

The snow crab TAC allocated to the union by the central government is divided between the members based on the agreement. The catch amounts of each fisherman are attributed to their regional organization via the fishermen's cooperative association. The organization presumes the divided TAC as a ceiling on the total catch of each prefecture group. The union tallies the total catch amount of the 6 prefectures and lastly reports the total catch amount to the central government. If the total catch amount reaches the allocated TAC, the central government instructs the union to stop the fishery. The central government decides the next year's TAC referring to the actual catch amount and an evaluation of the stock level.

Self-regulation of fishery consists of voluntary management rules of the union such as seasonal limits and size limits and combination management rules of each prefecture such as spatial closures. That is, the previous two voluntary systems are combined here. In each prefecture, individual fisheries are carried out under the self-regulation rules and oversee each other mutually.

## **5. Evaluation of the institutions of snow crab fisheries management systems**

As mentioned above, snow crab fisheries management as a whole is connected with three different management systems. In this chapter, after evaluating each system respectively, the total system will be evaluated.

### **1) Completely voluntary management system**

The initial voluntary management system has two main advantages – encouraging cooperation within the industry and stimulating self-regulation. A union agreement was made which provided a basic framework. In accordance with this, a common standard of regulation was applied to all union members. Furthermore, under the agreement, some contracts were made between individual fishermen's organizations. The union as a management body not only made self-imposed regulations in line with government legislation, but also enforced the regulations upon the member fishermen through the mutual oversee and original penalty code. Unfortunately, these management provisions were not sufficient to halt the decline of the snow crab population in the western Japan Sea.

Despite the limited success of this system, it is thought that insider-control by fishermen's groups has an important role to play in interim monitoring of both fisheries and management practices. In summary, this system has two positive points: strengthening the coalition between the 6 fishermen's organizations and establishing interim monitoring procedures.

### **2) Combination management system (resource management oriented fishery)**

The second system has two advantages – expanding the scope of management initiatives and allowing the prefecture government to participate in snow crab management. This approach is characterized by individual management activities in each prefecture particularly regarding spatial closures. The use of extensive spatial closures is the most effective way to reduce the discarding of small snow crabs. It is because of self-regulation responding to the conditions of each prefecture that spatial closures could be so widely established in the fishing grounds and that all fishermen respect these boundaries.

Another benefit of this system is that with the participation of the prefecture government, it is easier for the fishermen's organizations to make a rational management plan based on scientific evidence. That is, the prefecture government facilitates the implementation of a management plan; provides the fishermen's organization with scientific data and checks the plan. Furthermore, the government makes it easier for the organization to hold meetings to make a plan through subsidies. This role of the prefecture government is thought of as an ante-monitoring one.

### **3) TAC system**

The third model is the TAC system, which allows for the allocation of fixed TAC quotas to the fishermen's organizations and for the checking of management results by the central government. Allocated TAC is voluntarily managed by each individual prefecture organization in accordance with the self-regulation rules of voluntary management system and combination management system. The output of TAC management is lastly checked by the central government.

In other words, the TAC system links the two previous management systems and makes the overall management more effective. The final check means that the central government can confirm the result of several regulations as a whole through monitoring the total catch amount and the condition of the stock. If a management approach is not effective, the central government can amend the allocation of TAC. This amounts to a post monitoring of the management system.

### **4) Overall evaluation of snow crab monitoring systems**

As explained previously, the current snow crab fisheries management system is a combination of three management models. Each system provides different avenues for monitoring and through the combination of the three systems, the following three monitoring stages are achieved.

The first stage is ante-monitoring. A management plan is made by the fishermen's organizations of each prefecture in accordance with the current union agreement. During the initial negotiation process, the plan is checked and advice is provided by the prefecture government. This is a form of the self-regulation based on government statutes and scientific data provided by the government. The plan is amended where necessary.

The second stage is interim-monitoring. Observation of management practices is mutually carried out by the fishermen's organization members because the management plan is mainly composed of self-regulation measures. This mutual observation is more effective in the enforcement of wide spatial closures and ensuring the release of small crabs than overseeing by coast guards. In addition to this observation system, TAC requirements make it possible for the fishermen's group and the prefecture government to collect catch data in the middle of the fishing season through the reporting of the catch amount which is an obligation enforced by the TAC system. This is one element of interim-monitoring.

The last stage is post-monitoring. The results achieved by the regulation practices are assessed by examining the catch data collected through the TAC system and evaluating. The central government can also monitor the effectiveness of the management plan and practices through the evaluation of the resource condition to decide the next year's TAC. If a management approach is not effective, the central government can order the management body to amend its plan and the government can change the allocation of TAC.

In the case of snow crab fisheries in the western Japan Sea, the implementation of these monitoring stages has been achieved as a natural consequence of the combining of the three management systems over the last 30 years of the industry's development.

## **6. Incentives to encourage compliance**

To achieve management goals effectively, incentives for fishermen are required to encourage compliance with current regulations. Statutory regulation alone is not enough to ensure compliance, because the discard amount

would not be reduced because of “social dilemmas”, especially regarding the principle of the “free-rider”. The main incentives are successful management outcomes and both increased and sustainable catch amounts. In order to gain these incentives, there are two institutional factors: mutual overseeing and the guaranteed TAC. In addition to these, the nature of the snow crab population is also a contributing factor.

The first factor is mutual overseeing by the members of the fishermen’s organization. As previously mentioned, mutual overseeing is more effective than statutory overseeing by the government. The fishermen’s organizations of each prefecture have considerable power to enforce compliance with the management plan based on community rule and the contract which exists between members. Two types of voluntary regulation ensure that this enforcement power becomes more effective. Such enforcement power makes almost all fishermen comply with the rules and reduces “free-rider”.

The second factor is the guaranteed TACs. As mentioned above, the TAC is allocated to the union and divided between each fishermen’s organization. Each organization carries out the management referring to the provided TAC. Such guaranteed TAC by the government, almost amounts to “property rights” for the organization. In practice, these fishing rights do not mature to “property rights” institutionally, but become guaranteed “profit a prendre”.

The final contributing factor is the inherent nature of the snow crab population. Although the species inhabits an extensive area offshore from western Japan, its migration is limited. Moreover, as a general rule, trawl fishermen tend to use the fishing grounds offshore from their prefecture. Therefore, the outcomes of the management tend to directly benefit the fishermen who participate in the management. The prefecture government provides scientific evidence to illustrate this benefit to the fishermen.

## **7. Conclusion and suggestion**

It has been clarified that the snow crab management system in the western Japan Sea has three monitoring stages: ante, interim and post monitoring. The fisheries management body is made up of the trawl fishermen’s organizations of each prefecture and their union. In each stage, the central and prefecture governments participate in the management process in the role of monitor. The prefecture government plays a role of ante-monitoring and the central government carries out a role of post-monitoring. With regards to interim monitoring, the fishermen’s organization provides insider-control. In order to sustain successful management outcomes, all of these three monitoring stages are essential in any fisheries management system. In the case of snow crab fishery, they have been gradually formed through the combination of the three different management systems over the last 30 years.

In addition to an effective monitoring process, incentives are required to encourage compliance with regulations. The main incentives are successful management outcomes and both increased and sustainable catch amounts. There are both institutional and bionomic factors affecting the fishermen’s ability to benefit from these incentives. The institutional factors are internalized within the management system.

As the final element of this study, two possible improvements to snow crab fisheries management are suggested. The first is with regards to post-monitoring. If a management system consisting of mainly self-regulation is effective and fish stock maintains A high level, the need for post-monitoring may decrease. However, if such a management system is not successful and stock levels decline to a critical extent, post-monitoring should be strengthened and compulsory regulation by the government should be applied. Most importantly, post-monitoring mechanisms must be flexible to allow for every possible contingency.

My second proposal would be to introduce a regional ITQ system. Although the TAC is allocated to the union, the management body is actually the fishermen’s organization of each prefecture. For the benefit of providing incentives, the TAC should be allocated directly to the prefecture organizations. Moreover, the transferability of TAC between the prefecture organizations in the western Japan Sea should be introduced. Through doing this, some inefficiencies, which result in inequities of the allocated TAC between prefectures, would be reduced. In short, the introduction of a regional ITQ system would be of great benefit to the region.

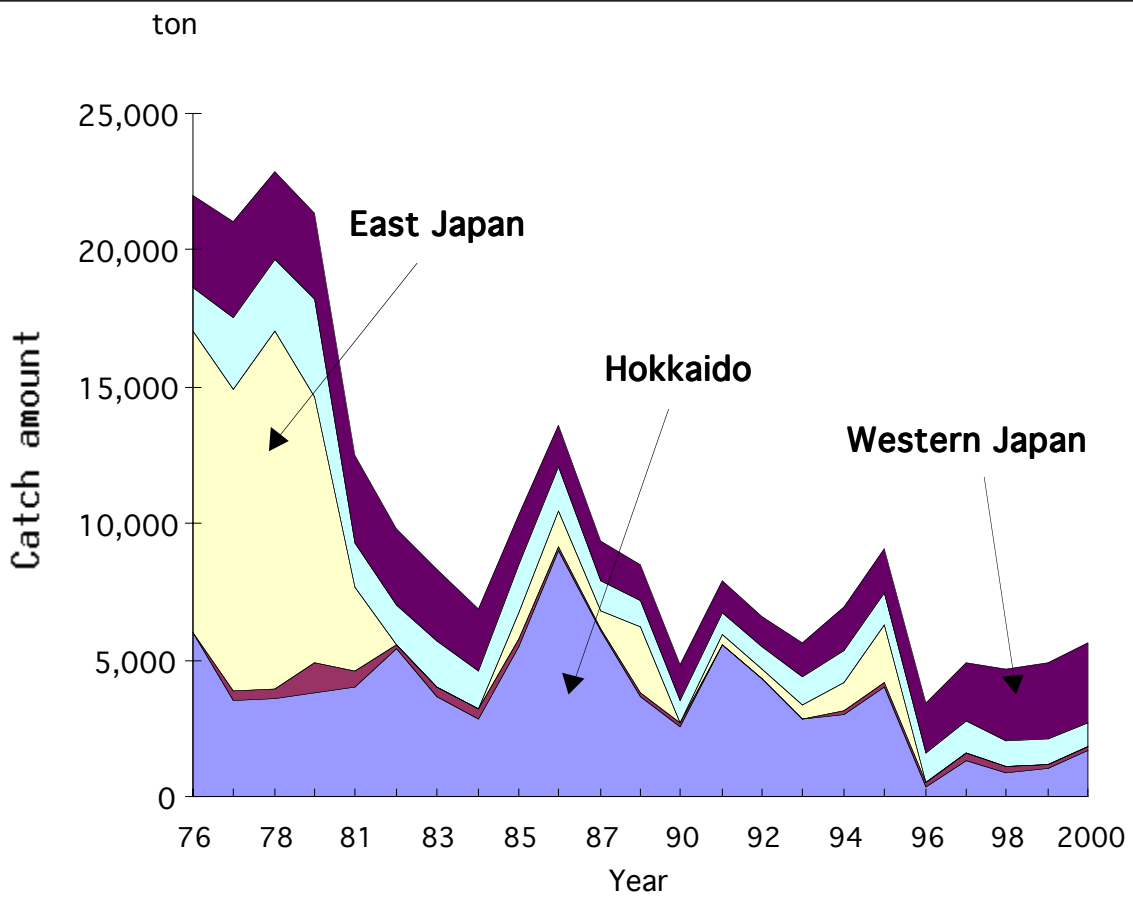


Fig. 1 Changed to snow crab catch amount  
 source: The Annual Statistics of Fishery and Aquaculture

**Table 1 Snow crab catch amount by prefectures**

Prefecture	Catch amount(ton)		Catch value(million yen)	
	average	composition	average	composition
Hokkaido	887	19.8%	694	7.5%
Miyagi	12	0.3%	13	0.1%
Akita	28	0.6%	43	0.5%
Yamagata	27	0.6%	45	0.5%
Fukushima	205	4.6%	233	2.5%
Niigata	246	5.5%	238	2.6%
Toyama	46	1.0%	124	1.3%
Ishikawa	698	15.6%	1,440	15.6%
Fukui	468	10.5%	1,485	16.1%
Kyoto	151	3.4%	375	4.1%
Hyogo	810	18.1%	2,816	30.6%
Torroti	773	17.3%	1,464	15.9%
Shimane	121	2.7%	244	2.6%
Total	4473	100.0%	9,212	100.0%

**Table 2. Snow crab catch amount in relation to fishing gear**

fishing gear	average(ton)	composition
Offshore Trawl net	3,004	63.9%
Small trawl net	957	20.3%
Other trawl net	17	0.4%
Boat seine	2	0.0%
Gill net	353	7.5%
Others	373	7.9%
Total	4,705	100.0%

source: The Annual Statistics of Fishery and Aquaculture in 2000