

Cooperative initiatives between the fishing and fish-processing industries and the conditions associated with their implementation: comparison of red snow crab production areas in Japan

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Abstract : The catch has been decreasing owing to problems associated with fishing grounds and fishery resources; thus, the fishing and fish-processing industries have been forced to initiate structural reorganization in production areas that were dependent on offshore fishing. Consequently, the fishing and processing industries have cooperated to remain economically viable in some of these areas. The purpose of this report is to examine the actual circumstances surrounding the establishment of such cooperative initiatives and elucidate conditions for their successful implementation. We compared red snow crab cage fishing activities between the two largest red snow crab production areas in Japan, focusing on changes in the fishing and processing industries before and after the introduction of the resource recovery plan. Our findings revealed the following: (1) because the catch decreased from the end of the 1980s, both production areas implemented the resource recovery plan at the same time, (2) debates about the addition of a fishing suspension period based on differences in the supply of raw materials resulted in the two areas adopting different approaches to resolve the problem, and (3) in Sakaiminato, which established a tripartite relationship between the fishing and processing industries and had the required technical capacity available, new organizations were created to stabilize the supply of raw materials. Very few studies on the actual circumstances of cooperative initiatives between the fishing and the fish-processing industries and conditions for their implementation have been conducted. This study contributes to the accumulation of studies on cooperative initiatives between the fishing and the fish-processing industries.

Key words : Cooperative initiatives, Resource management, Stable supply of raw materials, Comparison of production areas

Introduction

Fishery resources are the focus of economic activities of fishermen at the primary level and seafood processors at the secondary level. In production areas, the fishing and fish-processing industries typically flourish when fishery resources are abundant. These industries also generally develop in tandem based on a supply and demand relationship.

However, because problems associated with fishing grounds and fishery resources have recently occurred in Japan, the extended industrial growth has ended and the fishing and fish-

processing industries have been forced to initiate structural reorganization in production areas that were dependent on offshore fishing. However, these industries have not merely accepted reduction and reorganization one-sidedly. To try to break through the occluded situation, fishermen have tried to reduce their fishing intensity and seafood processors have tried to diversify their suppliers of raw materials. In addition, the industries have cooperated to remain economically viable in some production areas.

In this report, we investigate cooperative initiatives that have been undertaken by the fishing and fish-processing industries in

the towns of Sakaiminato in Tottori Prefecture and Kasumi in Hyogo Prefecture, the two largest red snow crab production areas in Japan. The red snow crab cage fishing and processing industries shared industrial ups and downs from the beginning of operations in these production areas. Although the decrease in fish catch has not stopped, a resource recovery plan has been implemented in both areas since 2005 with the aim of remedying the situation.

We examine the changes that have occurred in the red snow crab cage fishing and processing industries in Sakaiminato and Kasumi and compare the actions of both production areas. By comparing the differences between these two areas, we aim in this report to clarify the actual circumstances of cooperative initiatives between the fishing and fish-processing industries and to elucidate conditions for their implementation.

Changes in the red snow crab cage fishing and processing industries in Sakaiminato

Red snow crab cage fishing employs baited cages to catch red snow crab (*Chionoecetes japonicus*), which live 700 m below the sea surface on the ocean floor. As cages are set for a fixed period of time, this activity is an occupancy-type fishing activity in the fishing grounds where crabs live.

In Sakaiminato, this fishing began in 1969 as a secondary

activity of fishermen who were engaged in offshore squid fishing. However, because the offshore squid fishing collapsed, many fishermen turned to red snow crab cage fishing as a substitute.

When red snow crab cage fishing operations began, the demand for red snow crabs was low as the quality of watery meat of crabs is inferior to that of more common snow crabs and their freshness deteriorates more quickly. However, the situation changed quickly when local processors found that the meat was well suited for use as a raw material in frozen foods. In 1970, full-scale processing began, and most of the red snow crab catches were processed. The infrastructure for these industries was solidified with the establishment of a processing complex constructed by the Fisheries Agency. In addition, large processors began replacing manual crab processing labor with integrated processing lines. By development of new uses and the maintenance of the acceptance system of crabs, red snow crab cage fishing expanded and became one of the main fishing activities in Sakaiminato.

The catch of red snow crab in Sakaiminato is shown in Fig. 1. It increased from 1980 to 1984, exceeding 30,000 tons in 1984. But the situation changed after 1985, and the catch decreased steadily. The reasons were the withdrawal of Japanese fishing vessels from North Korean waters, the loss of main fishing

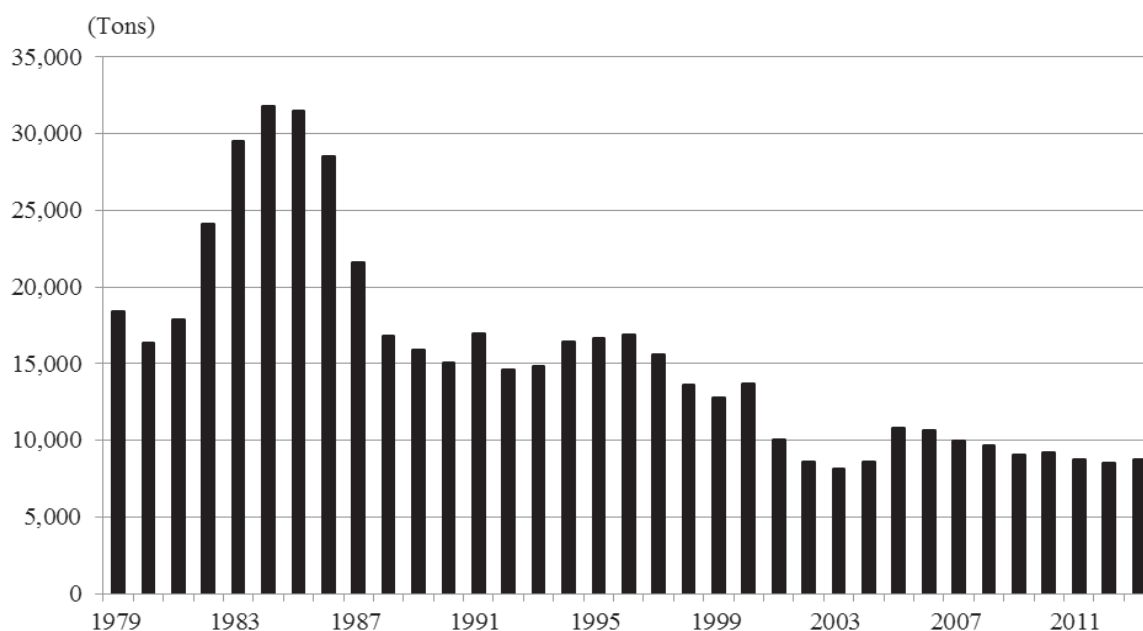


Fig.1 The catch of red snow crab in Sakaiminato

Source: Based on materials from the Tottori Prefectural Fisheries Experimental Station

grounds with the increase in fishing vessels from South Korea, and the drain of resources. In addition, the water under temporary joint control by Japan and South Korea was set with taking in a main fishing ground of Japanese fishing vessels in 1999, and this water was occupied almost entirely by fishing vessels of South Korea. The Japanese fishing vessels that had earlier lost their main fishing grounds in the western Sea of Japan again lost fishing grounds. Consequently, the catch decreased further and reached an all-time low of 8,000 tons in 2003.

The red snow crab stock appears to have recovered in recent years, possibly due to the successes of the resource recovery initiatives discussed below. Nonetheless, the catch has stabilized at around 9,000 tons and the catch that greatly decreased has not yet recovered. As a result, the number of fishing vessels has also decreased considerably from its peak, and only 11 vessels have operated in recent years.

The decline in fishing has also negatively influenced the processing industry, which had developed additional facilities in response to the rapidly increasing supply. The decrease in the catch hindered the procurement of raw materials for processing. Therefore, the marketing of imported red snow crabs started in 1987, through an agreement between fishermen, wholesalers, processors, and importers.

The volume of imported red snow crab handled by the Sakaiminato fishery district wholesale market from 1992 is shown in Fig. 2. Since the meat of red snow crab is too watery to be frozen, all imported meat was refrigerated. As shown in the Fig. 2, the annual amounts of red snow crab imported from North Korea and Russia have been between 4,000 and 9,000 tons from 1992 through 2004. But the total supply, consisting of imports and catch, fell below 20,000 tons starting in 1998. Furthermore, the import of red snow crab stopped after 2007. The import of red snow crabs had been introduced to compensate for the shortage of raw materials. However, as the catch continued to decline, imports could not completely offset the decline.

Ultimately, some processors reduced the volumes of red snow crabs that they processed, and others closed down as the catch followed a declining course after 1985. In other words, the decrease in the catch resulted in the unavoidable reduction and restructuring of the fishing and fish-processing industries in this area.

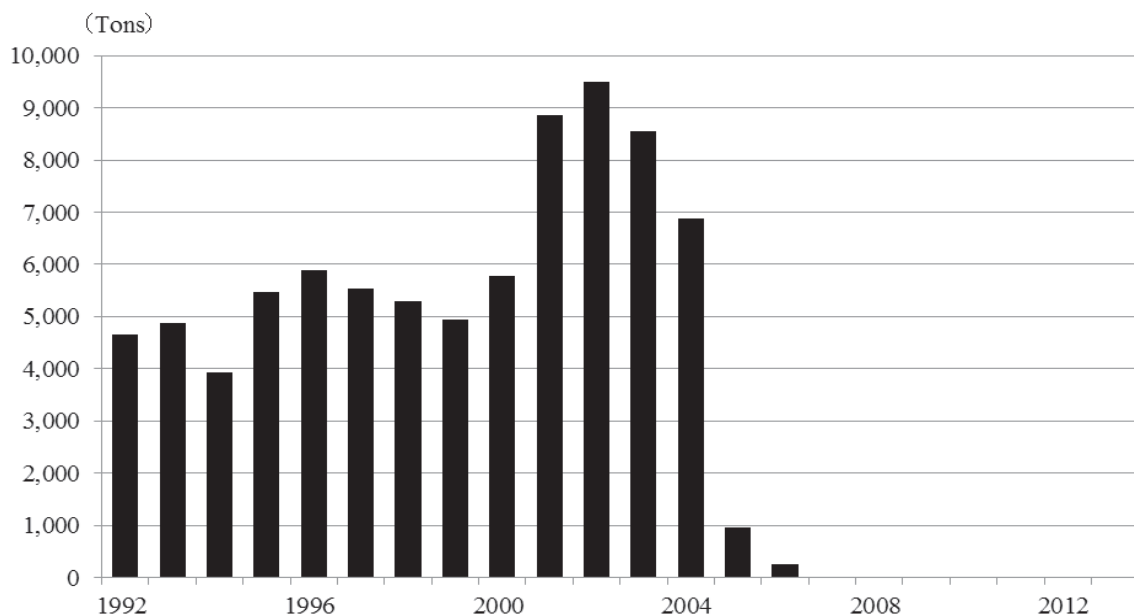


Fig.2 Volume of imported red snow crab handled by the Sakaiminato fishery district wholesale market

Source: Based on data from the Tottori Prefectural Sakaiminato Fishery Office

Changes in the red snow crab cage fishing and processing industries in Kasumi

Red snow crab cage fishing was introduced in Kasumi in the 1960s. It began with trial operations offshore by Toyama fisherman that showed potential for good harvests.

Crabs that were caught at the beginning were poorly regarded by processors because the quality of meat was inferior to that of snow crab (*Chionoecetes opilio*). However, research on the use of crabs was conducted and local processors commenced meat-removal processing and commercialization. Given that the catch of snow crab was decreasing quickly at that time, companies that had been using snow crabs showed interest in using red snow crabs as a substitute. Processors' evaluation of the crab changed and the demand for red snow crab as a raw material increased.

The growth of demand increased the profitability of red snow crab cage fishing, leading to an influx of newcomers to this industry. As a result, red snow crab cage fishing expanded and became one of the main fishing activities in Kasumi.

The catch of red snow crab in Kasumi is shown in Fig. 3. The catch increased considerably from 1975 to 1988, reaching approximately 6,000 tons by the end of that period. However, the catch decreased steadily from 1989 mainly due to overfishing. Furthermore, the water under temporary joint control by Japan and South Korea was set with taking in the

fishing grounds used by fishing vessels in Kasumi in 1999. The fishing grounds that were taken in this water accounted for approximately 20% of all fishing grounds and were very productive. These grounds were occupied almost completely by South Korean fishing vessels, forcing Japanese vessels to withdraw. Circumstances subsequently worsened, and the catch decreased further.

In recent years, the red snow crab stock appears to have recovered, owing to the successes of the resource recovery initiatives discussed below. Nevertheless, the catch has remained constant at about 2,500 tons and has not yet recovered. As a result, the number of fishing vessels, which was 18 in the peak period, has decreased to nine.

Meanwhile, the decline in fishing has negatively influenced the processing industries. The decrease in the catch hindered the procurement of raw materials by processors, forcing the processors to import snow crabs as a substitute or close down. In Kasumi, the decrease of the catch resulted in the unavoidable reduction and restructuring of the processing industries in addition to fishing.

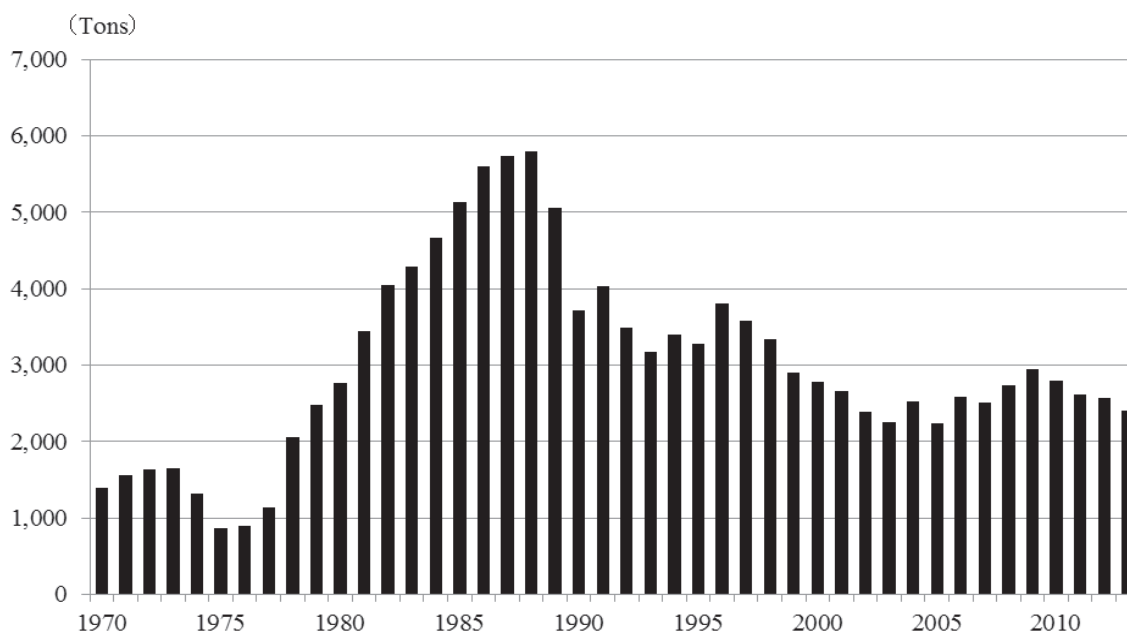


Fig.3 The catch of red snow crab in Kasumi

Source: Based on data from Kami-cho

Changes in management of the red snow crab cage fishing

Red snow crab cage fishing began in the 1960s in Sakaiminato and Kasumi, and the red snow crab processing industry was established shortly thereafter. At that time, prefectural governments, not the national government, were responsible for red snow crab cage fishing. Red snow crab cage fishing was managed as governor-licensed fishing in each prefecture, but the scope of prefectural management was unclear in offshore zones. The highly efficient monopoly-style fishing that proliferated across the Sea of Japan caused operating problems in other fishing activities, and overfishing resulted in a gradual decrease of resources and smaller catch. Fishermen and prefectural government agencies both petitioned the national government to establish a standardized fishery management system for red snow crab cage fishing. As a result, management of offshore red snow crab cage fishing was transferred to the national

government in 1990.

Today, red snow crab cage fishing is managed by either the national or local government, depending on the water area. Breakdowns of minister-licensed and governor-licensed fishing in Sakaiminato and Kasumi are as follows.

In November 2013, 11 red snow crab cage fishing vessels operated out of Sakaiminato. All of these vessels were managed by the national government and operated under minister-licensed fishing. In contrast, in November 2013, nine red snow crab cage fishing vessels operated out of Kasumi. One was managed by the national government and the remaining eight were managed by Hyogo Prefecture. Thus, minister-licensed and governor-licensed fishing coexisted, and each vessel operated under conditions established by the national and prefectural governments (see Table 1).

Comparison of the regulations reveals that operation period,

Table 1 Main regulations for minister-licensed fishing and governor-licensed fishing

		Details
Operation period	Minister-licensed fishing	From September 1 to June 30
	Governor-licensed fishing	
Prohibitions on harvest	Minister-licensed fishing	Female crabs and male crabs which are less than 9 cm
	Governor-licensed fishing	
Tonnage of fishing vessel	Minister-licensed fishing	Less than 200 tons
	Governor-licensed fishing	Less than 20 tons
Water depth	Minister-licensed fishing	Prohibition on operation in the sea of depth less than 800 m
	Governor-licensed fishing	

Source: Based on materials from the Fisheries Agency

prohibitions on harvest, and water depth are the same. However, the tonnage of minister-licensed fishing vessels operating offshore is considerably greater than that of governor-licensed vessels.

In addition to these official regulations, there were also voluntary regulations established by the fishermen themselves. For example, independently established regulations specified the total allowable annual catch of each vessel in Sakaiminato and the number of cages that governor-licensed fishing vessels could retrieve on operating days in Kasumi.

Thus, in both Sakaiminato and Kasumi, red snow crab cage

fishing interests abided by both official and voluntary regulations.

Formulation and implementation of the resource recovery plan

Although the fishing interests operated under a variety of regulations, the decline of the catch from the end of the 1980s continued. In fact, the national government estimated that red snow crab resources were likely to fall to a low level after 2002. This assessment prompted the national government to take the lead and formulate a resource recovery plan for the red snow

crab.

The resource recovery plan was a new resource management strategy to be implemented based on the Fisheries Basic Act, which was enacted in 2001. The strategy involved persuading the relevant fishermen and national and prefectural governments to work together as a single entity that would plan initiatives for recovery of fishery resources that were under threat. Specifically, the plan included setting numerical targets for resource recovery, measures to reduce fishing effort, measures to cultivate resources, and measures to protect fishing grounds. The resource

recovery plan represented a policy that advanced resource management more than before, while many fishery resources in the country were actually decreasing.

In the resource recovery plan for red snow crabs, the red snow crab cage fishing industries in both Sakaiminato and Kasumi were required to add a period of fishing suspension, reduce the number of fishing vessels, and introduce improved fishing gear as measures to reduce fishing efforts in order to stop the decline of the resource (see Table 2).

Table 2 The status of measures to reduce fishing effort in the resource recovery plan

	Sakaiminato	Kasumi
Addition of period of fishing suspension	In 2006	From 2005
Introduction of an individual quota system	From 2007	No
Reduction in the number of fishing vessels	In 2011	In 2006
Introduction of improved fishing gear	From 2009	From 2009

Source: Based on materials from the Fisheries Agency

The resource recovery plans were launched in 2005, and although the year of implementation differed, the number of fishing vessels in both Sakaiminato and Kasumi was reduced by one. Improved fishing gear with escape mechanisms to prevent catching small crabs was introduced in both Sakaiminato and Kasumi in 2009.

Although both production areas planned to add a period of fishing suspension in 2005, only Kasumi adopted the plan. In addition, an individual quota system was introduced instead of the addition of a fishing suspension period in Sakaiminato in 2007. The addition of the suspension period was canceled in Sakaiminato for the reasons discussed in the following section.

Thus, although both areas launched resource recovery plans to halt the decline in red snow crab resources, the measures associated with the addition of period of fishing suspension were very different.

Comparison of production areas and examination of differences

The growth and decline of the fishing and processing industries in Sakaiminato and Kasumi occurred at approximately the same time. However, differences arose in the resource recovery plans

adopted by the two areas, particularly in the activities associated with the addition of a fishing suspension period. The following section compares the supply chain structure and relationship between the fishing and processing industries.

We also consider conditions required for the implementation of cooperative initiatives by the fishing and processing industries based on a comparison of these two areas.

1. The supply structure of raw materials and the relationship between the fishing and processing industries in Sakaiminato

As mentioned above, industries in Sakaiminato began importing red snow crab from North Korea and Russia in 1987. Moreover, until 2005, three fishing vessels were operating in North Korean waters that were not managed according to the resource recovery plan, and landed their catch in Sakaiminato. In addition, although the volume was small, some processors were bringing in raw materials from other domestic production areas. In other words, there were several supply routes of raw materials in Sakaiminato in addition to offshore catch, and these routes had no connection with the resource recovery plan. If red snow crab cage fishing was suspended for certain periods, processors planned to use raw

materials supplied by these routes during those periods to survive.

However, an unexpected revision to the law in 2005 meant that fishing vessels without protection and indemnity insurance could not enter Japanese ports, meaning that the importation of raw materials from North Korea and Russia ceased in 2006. In addition, in 2006, the three fishing vessels operating in North Korean waters were removed as a part of economic sanctions on North Korea. These measures resulted in the loss of over half of the supply on which processors were relying. Processors that were unable to obtain sufficient supply of crabs had no choice but to request reconsideration of the addition of a period of fishing suspension. The addition of suspension period was accordingly revised through conference among fishermen, processors, and wholesalers.

It should be noted that the formulation of the resource recovery plan was preceded by the establishment of a Sakaiminato Red Snow Crab Industry Tripartite Council. The aim of this council was to restructure the entire red snow crab industry, and for this purpose the council set up a platform for dialog among fishermen, processors, and wholesalers. The council convened numerous discussions on the call to revise the addition of a fishing suspension period.

In revising the addition of this suspension period, the tripartite council sought ways not only to reduce fishing effort but also to help processors procure raw materials. The council met several times a month in its busiest period, and repeated discussions resulted in the decision to abort the addition of a fishing suspension period in 2005 and introduce an individual quota system as an alternative measure in 2007. The decision of the council made it easier for processors to procure raw materials stably while resource recovery measures also continued. This decision was the result of a common understanding among the three parties of the importance of maintaining processing capacity in production areas that had reached a leading level in Japan, responsible for about 80% of domestic production.

The individual quota system was introduced in 2007; however, it was not sufficient to restore the stability of both the supply and demand of raw materials, which was greatly impaired by the loss of imported supplies and other factors. The tripartite council held repeated discussions to coordinate the port entry of fishing vessels in mid-2009 as a way to equalize the number of vessels bringing in hauls on a given day. The aim was to ensure a stable

supply of raw materials for processors.

At the time, each of the 12 red snow crab cage fishing vessels operating in Sakaiminato were departing and returning to the port according to their own schedules, staying out at sea for about a week at a time. As a result, on some days, as many as five or six fishing vessels would return on the same day and their catch would exceed the processing capacity of processors for that day. Because the meat of red snow crab does not freeze well owing to its physical properties, the portion of crabs that exceeded the processing capacity for that day was, while not entirely wasted, much less valuable as raw material. In other words, although a stable daily supply of red snow crabs was being planned for, in reality, the supply of crabs was highly variable.

Therefore, it was proposed that wholesalers act as mediators, checking the scheduled haul dates of each fishing vessels in advance and coordinating their return to ensure that the number of vessels returning each day remained stable. Controlling the number of vessels bringing in their daily catch made it possible to manage indirectly the amount of crabs coming in to be close to the processing capacity of processors.

In this manner, fishermen, processors, and wholesalers in Sakaiminato continued their efforts to stabilize the supply and demand relationship that had changed markedly.

2. The supply structure of raw materials and the relationship between the fishing and processing industries in Kasumi

The supply of red snow crabs in Kasumi differed markedly from that in Sakaiminato. In Kasumi, there was little influx of red snow crabs from other areas of domestic production, with no imports of red snow crabs from North Korea and Russia or fishing vessels operating in North Korean waters. Thus, local catch accounted for almost all of the crabs required by local processors. As a result, no drastic changes in the supply structure of raw materials were experienced when red snow crab imports ceased, and processors did not need to struggle to procure raw materials. The implementation of the addition of a fishing suspension period as part of the resource recovery plan thus did not cause a great disturbance, and the measure was implemented continuously from 2005.

During the suspension period, processors continued their operations by using privately stocked red snow crabs, bringing

in red snow crabs from other domestic production areas, and using snow crabs that they imported independently. Such strategies to remain operational during the suspension period were possible probably only because the scale of processing was not large.

Moreover, there was no organization in Kasumi like the tripartite council in Sakaiminato. There was only one opportunity for discussion, and that was a meeting set up before and after the fishing season for dialog between representatives of fishermen

and processors. These meetings were also used to exchange opinions about the addition of a suspension period as part of the resource recovery plan. However, the final decision to add the suspension period was made only by fishermen.

Thus, the supply of raw materials did not change drastically in Kasumi after the introduction of the resource recovery plan, and there was no need to orchestrate the activities of fishermen and processors to stabilize the supply and demand relationship.

Table 3 Comparison of Sakaiminato and Kasumi

	Sakaiminato	Kasumi
Supply structure of processing raw materials		
Import of red snow crabs from North Korea and Russia	Yes (ceased in 2006)	No
Fishing vessels operating in the sea area of North Korea	Yes (reduced vessels in 2006)	No
Transfer of crabs from other domestic production areas	Yes	Yes
Relationship between the fishing and processing industries		
Establishment of a council and periodic dialog	Yes	No
Addition of period of fishing suspension	In 2006	From 2005
Introduction of an individual quota system	From 2007	No
Coordination of the number of daily landing vessels	From 2009	No

Source: Newly created in this study

3. Conditions associated with implementation of cooperative initiatives as seen from the differences between the two production areas

In the above section, we examined the supply structure of raw materials and the relationship between the fishing and processing industries in each production area. In contrast, Table 3 shows the differences between two production areas.

The primary factor in the different implementations of the addition of a fishing suspension period in Sakaiminato and Kasumi was the presence or absence of dramatic changes in the supply structure of raw materials. But beyond this factor was the relationship between the fishing and processing industries.

In Sakaiminato, cooperation between fishermen, processors, and wholesalers mediated by the tripartite council made it possible to achieve these aims and remain economically viable. The tripartite council convened numerous meetings and

implemented initiatives, such as the individual quota system and coordinating the number of landing vessels, in order to stabilize supply and demand.

However, it is important to note that the required technical conditions were in place to carry out these measures. By focusing on the technology employed by fishermen in Sakaiminato, because all of the fishing vessels were large steel vessels (total tonnage of ≥ 75 tons) they could stay out at sea longer and thus the timing of their return could be managed more effectively than that of smaller vessels. Moreover, operation cycles were established for the semi-fixed fishing grounds of each vessel. In short, the industry had the technical conditions required to easily achieve a stable daily landing.

In other words, although industries in Sakaiminato faced serious challenges to the supply of crabs, fishermen, processors, and wholesalers worked together to ensure that fishery production

under a supply-centered mass production model could be switched to fishery production under a demand-centered coordination model based on technical conditions, thereby stabilizing the supply of raw materials.

Fishermen, processors, and wholesalers in Kasumi also shared a common awareness of the need for recovery of resources. Like the Sakaiminato processors, Kasumi processors also desired a stable supply of crab.

However, the fishing industry in Kasumi did not have the same technical capacity as that in Sakaiminato; the eight governor-licensed fishing vessels were smaller (total tonnage of <20 tons), and were made of fiber-glass reinforced plastic which is highly vulnerable to weathering and sea damage, making it impossible to stabilize daily operations. In contrast, the minister-licensed fishing vessels were large vessels (total tonnage of >80 tons), and could accordingly achieve relatively stable operations; however, there was only one such vessel in Kasumi. Although the minister-licensed fishing vessel established an operation cycle for semi-fixed landing, the governor-licensed fishing vessels were unable to set their return dates and lacked a coordinated schedule for their operations, causing marked variation in the daily landing volumes. In short, the industry did not have the technical conditions required to ensure a stable supply of crabs.

Thus, the situation in Kasumi contrasted markedly with that in Sakaiminato; the industries in Kasumi were not faced with drastic changes in the supply of crab and also did not have the technical conditions for changing their production model. As a result, fishery production under the fisherman-centered mass-production model was adopted in Kasumi.

Conclusions

In this report, we compared the red snow crab cage fishing and processing industries in Sakaiminato and Kasumi to identify the circumstances and conditions associated with the cooperative initiatives adopted by both industries.

We found the following: (1) because the catch decreased from the end of the 1980s, both production areas implemented resource recovery plans at the same time, (2) debates about addition of a period of fishing suspension based on differences in the supply of raw materials resulted in the two areas adopting different approaches to resolve the problem, and (3) in Sakaiminato, which established a tripartite relationship between

the fishing and processing industries and had the required technical capacity available, new organizations were created to stabilize the supply of raw materials.

Implementing new measures in fishery management, such as reducing the number of fishing vessels and addition of a fishing suspension period, would adversely affect the supply of raw materials to the processing industries. In this case, if the processing industries diversified their procurement routes to reduce their dependence on local raw materials, the economic impact on the fishing industry would be large. To avoid these problems, it is necessary to reduce the fishing effort and establish a stable supply of raw materials.

However, the fishing and processing industries generally have opposing business interests. Consequently, implementing cooperative initiatives to reduce the fishing effort and stabilize the supply of raw materials is not an easy task. Nevertheless, the example discussed here shows that cooperative initiatives can be pursued when conditions are favorable.

Sustainable and economically viable use of fishery resources requires that fishermen and processors identify potential common benefits and then coordinate their activities to maximize those benefits. Because fishing and related industries in production areas continue to downsize and restructure, creating organizations and mechanisms to prevent those changes will become even more critical.

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