

## Chapter 17

# The Effect and Problems of Attracting Aquaculture Capital - A Case Study of the Koshiki Islands -

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### 1. Introduction

Japan's territorial area is only of moderate size on a global scale; however due to Japan's geographical nature as a nation with many scattered islands, Japan boasts the world's sixth largest exclusive economic zone. This exclusive economic zone is rich in marine resources and has long supported the coastal and offshore fisheries of Japan. In addition, the presence of rich mineral resources such as oil, natural gas and rare earth has been confirmed within the exclusive economic zone. Focusing on the islands themselves, there are many islands with their own unique culture, landscape and natural environment which are used by people as places for leisure activities. The Ogasawara Islands and Yakushima Is., etc. are also notable for their valuable biota. The importance of Japan's islands has been pointed out from various aspects such as ensuring seafood and seabed mineral resources, national defense, maintaining biodiversity and providing space for leisure activities, etc.

So, what is the situation concerning the social and economic structure of these islands? Let's take a look at the situation of 306 islands amongst the islands specified under various laws such as the Islands Development Act, Act on Special Measures for the Ogasawara Islands Development, Act on Special Measures for the Amami Islands Promotion and Development and Act on Special Measures for the Promotion and Development of Okinawa, etc. in which a resident population has been confirmed by the Basic Resident Register as of April 1, 2008,

According to the 1955 national census, 1.5 % of the Japanese population, or 1.336 million people, lived on Japan's islands in 1955; however this figure had declined to 0.5 % of the Japanese population, or 693,000 people, by 2005. Looking at the age struc-

ture of island residents (2005), we can see that the young population (age 0-14) comprises 14.3 %, the working-age population (age 15-64) comprises 56.0 % and the elderly population (age 65 and over) comprises 29.7 % of residents. Compared to the national average where the young population comprises 13.7 %, the working-age population comprises 65.8 % and the elderly population comprises 20.1 % of the Japanese population, it is clear that the islands have a highly aging population.

Looking at the population of workers classified by industry (2005), we can see that 23.1 % of the 325,000 employed persons in islands are engaged in primary industry, 17.2 % are engaged in secondary industry and 59.7 % are engaged in tertiary industry. When compared with the overall Japanese employment structure (primary industry: 4.8 %, secondary industry: 26.1 %, tertiary industry: 69.1 %), it is clear that there is a high primary industry employment ratio in islands. In addition, the high proportion of employment in fisheries (8.3 %) and agriculture (14.7 %) in islands stands out in comparison to the national averages of 0.4 % and 4.5 % respectively.

However, it has been identified that although island fisheries provide valuable employment opportunities to island residents, they also face severe business challenges. While many islands are blessed with respect to their fishing environment and marine resources, they are also burdened by various unfavorable business conditions that exist. For instance, the high unit price of fuel and materials pushes up business costs on the production side. In terms of sales, the market of each island itself is small and, consequently, outside markets must be relied upon; however transport from the island is expensive and there are also cases where the ferry service timetable dictates the schedule of fishing operations. In addition, there are also cases

where sales prices are marked down due to the possibility of reduced freshness as a consequence of the time-consuming nature of transport to the mainland market. In other words, island fisheries face many disadvantages from production to sales (TORII 2012a, b, KUDO 2012, OHTANI 2012, SASAKI 2012).

So, what possibilities do the weakening of island fisheries bring? The possible points have been organized as follows.

First, a reduction in supply of marine products. The production value of island fisheries accounts for approximately 10 % of fishery production value in Japan - a ratio that has remained almost constant over the past 25 years. However, further decline of island fisheries will choke marine product supply capacity. Substituting this decreased supply from island fisheries with imported marine products cannot necessarily be said to be a stable method as competition concerning food security is becoming increasingly intense along with the increasing global population.

Second, a weakening of the economy of islands. There are many cases of islands where fisheries play a role as the key industry in the absence of other industries. As mentioned earlier, fisheries account for 70 % of primary industry production value in islands. In addition, 11.9 % of employed persons in islands work in fisheries which, along with agriculture, is an important industry that generates employment opportunities. Weakening of fishery production would not only jeopardize the continued existence of fishery households, but would lead to a weakening of related industries such as fish processing, etc. and may ultimately collapse the economies of islands where the fishing industry is the key industry.

Third, a weakening of multiple functions. If the island fishery business and the local economy are weakened, the multiple functions achieved through the fishery industry and the local economy may also be lost. In addition to the intrinsic function of food supply, the multiple functions of the fishing industry and fishing villages including preserving lives and property of citizens through border surveillance and marine salvage, etc., preserving the natural environment through

conserving ecosystems and complementing matter cycling, etc., and forming and maintaining local communities through the creation of jobs, etc. have been identified (YAMAOKA *et al.* 2009). As these multiple functions are functions exhibited together with fishery production activities, the weakening of fisheries and fishing villages may lead to a decline of multiple functions. As there are currently tensions between Japan and neighboring countries revolving around territorial land and water, the decline of multiple functions of fisheries and fishing villages such as border surveillance, etc. is a problem that cannot be overlooked.

As evidenced above, island fisheries and fishing villages do not only have a food supply function, but are an industry/region with important functions and roles. The examination of methods aimed at maintaining and continuing these functions and roles is also essential from a social aspect.

Of course, various efforts have already been made aimed at the maintenance and development of island fisheries. Let's take a look at some initiatives in the islands of Kagoshima Prefecture.

First, there are initiatives taken by fishermen themselves to improve business. Examples of this include resource recovery through the creation of seaweed beds and the discharge of Tokobushi (*Haliotis japonica*) hatchlings (Tanegashima Is.), methods of processing aimed at retaining the freshness of the southern mackerel (Yakushima Is.), improvement of the market price through management of outlets by fishery cooperatives association (FCA) (Amami-Oshima Is.), payao installation to increase the catch of yellowfin tuna, etc. (Yoronjima Is.) and a processing business by FCA aimed to improve the added value of banded blue-sprat (Koshiki Islands).

Other initiatives involve economic benefits provided by other parties which are expected to improve the management of fisheries and FCA. For example, Amami-Oshima Is. has attracted capital for pearl farming and fish aquaculture since the 1960s and FCA business has been maintained thanks to these economic benefits. A similar approach can also be seen in the Koshiki Islands in recent years (TORII 2008, 2011).

There are already numerous reports of initiatives taken by fishermen themselves to improve management. Accordingly, this paper will focus on efforts to promote islands through attracting external capital using the Koshikijima FCA (Satsuma-Sendai City, Kagoshima Prefecture) as a case study. Through this case study, we wish to look at the effect of attracting aquaculture capital on the local economy, the fishing industry and the FCA business and related issues.

## 2. The entry of bluefin tuna aquaculture business entities to the Koshikijima FCA and impact on production areas

### 2.1. Overview of the regional fishery industry

The Koshiki Islands are made up of three islands, Kami-Koshikijima Is., Naka-Koshikijima Is. and Shimo-Koshikijima Is., with Kami-Koshikijima Is., the island on which tuna aquaculture is carried out, located approximately 50 minutes by high-speed ferry, or 70 minutes by regular ferry, from Kushikino Harbor.

There were once a number of FCA operating in the Koshiki Islands, however they merged in October 2003 to form the “Koshikijima Fishery Cooperative Association.” The Koshikijima FCA consists of 1,612 total members - 318 full members and 1,294 associate members. Their total catch in

2010 was worth approximately JPY ¥2.34 billion. The main fishery industries include tuna-focused fish aquaculture (¥1.61 billion), banded blue-sprat gillnetting (¥300 million) and fixed netting (¥160 million).

### 2.2. The process of capital entry and subsequent expansion

The entry of capital to the Koshiki Islands for the purpose of tuna aquaculture began with the installation of a breakwater in the Kuratsuma water. At the time, fixed netting fishermen were installing fish preserves in the Kuratsuma water for the purpose of adjusting shipments (Fig. 1). However, as these waters become extremely choppy during typhoons, a breakwater aimed at ensuring calm waters was constructed as a national project. The breakwater was completed in 1998, however the fixed netting business deteriorated around this time and fixed netting fisheries went out of business one after another. There were plans for 30 fish preserves to be installed, however as a result of fixed netting fisheries going out of business, the actual number of fish preserves was expected to be significantly less than planned. As well as questions being raised about the cost-effectiveness of the public works project, attracting capital to be used in the Kuratsuma water was examined as a method to respond to the deteriorating FCA fixed netting business.

In 2002, it became clear that company “A” was seeking new fishing grounds and thus methods to attract company “A” to Kuratsuma water were considered. FCA workers, etc. visited Amami-Oshima is., etc., which has a long history of tuna aquaculture, and confirmed the economic effects on local FCA and the region in general as well as the impact on the fishing environment resulting from the entry of capital. The conclusion was reached that attracting company “A” to Kuratsuma waters would facilitate effective use of the sea, create employment opportunities and improve the business of fishery households. The issue was subsequently raised at a general meeting of the FCA; however fishermen using the surrounding fishing grounds expressed concern at the narrowing of the fishing grounds, the fact that lighting the surrounding waters at

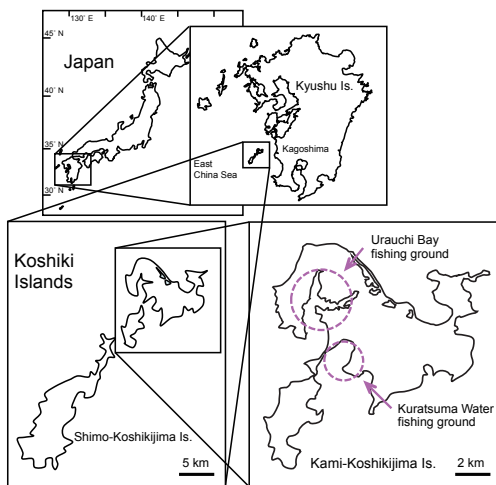


Fig. 1. The location of the Koshiki Islands and aquaculture fishing grounds.

night would be impossible and the narrowing of sea routes. These dissenting views were dealt with individually and the decision to attract company “A” to Kuratsuma waters was reached. Company “A” entered these waters in 2003 and commenced tuna aquaculture.

From 2003, company “A” engaged in tuna aquaculture in the Kuratsuma waters. However, as a result of heavy losses sustained in 2004 and 2005 due to typhoons, they made an application to expand their fishing grounds to Urauchi Bay where typhoon damage was expected to be less severe. Urauchi Bay had previously been utilized for *Takifugu rubripes* (Japanese pufferfish) aquaculture and pearl farming; however these operations had been discontinued due to a decline in business, etc. and the specific demarcated fishery rights associated with Urauchi Bay were not being exercised at the time. Fishermen voiced dissenting opinions in relation to Company “A”’s proposal to expand their fishing grounds arising from concerns of conflict with the fishing grounds of banded blue-sprat fisheries and pole-and-line fisheries, navigation failure, environmental pollution of the fishing grounds caused by feeding and adverse effects on pearl farming. However, in reality, Urauchi Bay was primarily used by pole-and-line fishermen for the catch of bigfin reef squid for self-consumption, by banded blue-sprat fishermen in winter and by leisure fishing boat operators. As the catch amount from Urauchi Bay waters was limited and the FCA determined these fishing grounds had not been used effectively, Company “A” was granted permission to expand their fishing grounds to

Urauchi Bay from 2007.

The FCA requested that company “A” carry out business under the same conditions as general cooperative members, in other words, that this new capital be used to pay fees to exercise fishery rights similarly to general cooperative members with the exception of expensive materials such as fishing nets, etc., and that company “A” utilize FCA businesses (such as procurement, sales and ice making operations). In addition to this, arrangements are in place whereby company “A” shall submit a production plan by the end of February each year, sediment and water quality testing shall be conducted at least twice a year and company “A” shall not leave or dispose of dead fish in the sea, etc.

### 2.3. The current production system

#### 2.3.1. Fishing grounds and labor force

At present, company “A” engages in tuna aquaculture in Urauchi Bay and the Kuratsuma waters; however the waters of Urauchi Bay are the primary area of production. 18 large fish preserves of 70 m x 40 m have been installed in the waters of Urauchi Bay (Fig. 2). Approximately 30 people are employed in this project, of which 27 are from the Koshiki Islands (Fig. 3). Many of these workers are aged in their 20s and 30s. This is because company “A” gave word to the FCA that they would provide preferential employment opportunities to local residents when they started this project, and parents, upon hearing of this news, summoned their sons back to the island. Although workers begin early in the morning, their finishing time is also early. Multiple young people in their 20s and 30s



Fig. 2. Tuna aquaculture grounds.



Fig. 3. Workers.

have returned to the islands to work for company “A” as they are affiliated with a company listed on the first section of the Tokyo Stock exchange and provide solid welfare benefits.

There are also four employees who are former construction workers and around seven employees who were re-employed following their retirement. In addition, banded blue-sprat fishermen who lost their fishing grounds as a result of the newly established tuna aquaculture project in Urauchi Bay are employed temporarily during the peak season when shipping operations are in full swing and for diving activities such as the confirmation of feeding, etc. The banded blue-sprat fishermen form a rotation with around three workers at a time engaged in tasks such as diving work, thawing and packing of bait, and feeding, etc.

Salary levels are set in accordance with the wages of those self-employed as members of the FCA and the wages of those engaged in civil engineering work, etc. Full time employees earn between JPY ¥180,000 and 280,000 per month while temporary workers earn ¥7,000-8,000 per day which works out to around ¥150,000-160,000 per month. The daily wage for fishermen engaged in diving work is ¥12,000. Full time employees are also paid bonuses and their salaries have been deemed sufficient for life on the Koshiki Islands.

### 2.3.2. The process from securing juveniles to shipping

Initially, there was a plan for the bluefin tuna juveniles to be supplied by fisherman from the Koshiki Islands. It is possible to catch bluefin tuna in the waters surrounding the Koshiki Islands from around July to September. The fishing season for the banded blue-sprat, the islands’ main fishing industry, lasts until mid-July while marlin fisheries begin operating from mid-September. It was determined that fitting bluefin tuna fishing into this timeframe would be able to improve the income of fishery households. It was proposed that company “A” would bear all the costs for fuel, etc. and pay an additional JPY ¥2,000 for each bluefin tuna caught. FCA staff, together with around 12 fishermen, visited nearby FCA where they repeatedly boarded towrope fishing boats and carried

out training aimed at catching bluefin tuna. Local fisherman made attempts to catch bluefin tuna but were unable to provide a supply due to their fishing boats being too small to reach the bluefin tuna migratory waters, their lack of fish landing techniques and the lack of facilities to utilize on board their boats, etc. Consequently, bluefin tuna caught by purse seine vessels in the waters of Nagasaki Prefecture were used for hatchlings. Initially, fish preserves were towed, however now live fish transport vessels are used as the method of transportation. In the event of shortfall, additional bluefin tuna are procured from Kochi Prefecture and Kagoshima Prefecture.

Feed is purchased from fishing companies in Kagoshima Prefecture, with sand eel and mackerel, etc. used in accordance with the stage of growth. Squid is also used to improve meat quality prior to shipping. This feed was originally transported by truck; however, these days, a cargo ship is chartered and feed is transported in refrigerated containers every 10 days. This change was brought about as a result of cases where it was impossible to transport feed by truck frequently arising as a consequence of ferries being canceled due to bad weather or the booking of vehicles that exceeded the load capacity of the ferry, etc. Container transport using chartered vessels is somewhat expensive when compared to truck transportation; however it not only ensures a stable supply, but the refrigerated containers can be conveniently used as storage warehouses by connecting them to a power supply.

The shipping plan is devised by the parent company of company “A.” Until 2007, a Kanto-centric shipping system was used, but shipping to Kansai has also been implemented since 2008. Customers visit the island together with sales staff of the parent company about two to three times a month to confirm the status of the aquaculture grounds and the products. Products are loaded into 10-ton trucks and transported to Kushikino Harbor via ferry after which they are flown from Kagoshima Airport. In the event the ferry is cancelled, products are transported to Kushikino Harbor using a chartered fishing boat (Fig. 4).

The production value has grown from approximately JPY ¥67 million in 2007 to ¥1.4 billion in

2010.

### 3. The effect of capital introduction on areas of production and related issues

The business expansion of company “A” has affected the FCA and the region in general in a variety of ways. First, let’s look at the economic benefits to the FCA.

First, the payment of fees to exercise fishery rights. Company “A” paid fees of JPY ¥6 million in 2007, ¥8 million in 2008 and ¥10 million from 2009 onwards to exercise fishery rights in Urauchi Bay. No fees to exercise fishery rights in the Kuratsuma waters have been set. Company “A”’s fees accounted for 61 % of the JPY ¥16.4 million in fishery fees received by the Koshikijima FCA in FY 2010.

Second, the use of sales operations. Generally, Koshikijima FCA earns 5-7 % consignment sales commission. However, as company “A” performs all the shipping operations with respect to their tuna aquaculture business, Koshikijima FCA’s consignment sales commission is set at 3 % for products company “A” ships from the Kuratsuma waters and 0.1 % for products shipped from Urauchi Bay. The value of company “A”’s FY 2010 shipments was approximately JPY ¥1.58 billion and almost ¥1.6 million sales commission was paid to the Koshikijima FCA. This ¥1.6 million paid from company “A” accounted for approximately 16 % of Koshikijima FCA’s ¥8.84 million commission from consignment sales in 2010.

Third, the use of ice making facilities. A large amount of ice is used in shipments of farmed tuna and company “A” paid about JPY ¥16 million in FY 2010 for the use of ice. This ¥16 million paid from company “A” accounted for approximately 42 % of the ¥38.09 million Koshikijima FCA earned from their ice making and refrigeration business during FY 2010.

Fourth, the use of purchasing operations. Company “A” use materials and heavy oil, etc. for which they pay about ¥2.5 million per month and close to ¥30 million per year. The money paid by company “A” accounts for around 7 % of the approximately ¥419.47 million Koshikijima FCA earned from purchasing operations during the



Fig. 4. Shipping situation.

same period.

In addition to this, the FCA also receives fees and commissions from company “A”’s use of warehouses, processing plants, and from their construction of the tuna processing plant on FCA-owned land. As the catch of the Koshikijima FCA is declining and use of their purchasing operations is also decreasing as a consequence of the shrinking number of fishermen on the islands and aging of those who remain, the economic contribution from company “A”’s tuna aquaculture business will continue to grow as a proportion of Koshikijima FCA’s total income.

In addition, company “A” offers employment opportunities for the local community and currently employs 27 Koshiki Islands natives. The creation of employment by company “A” is invaluable for this island that is bereft of employment opportunities. In addition, the director of company “A” is a full FCA member and several employees are associate FCA members which can be seen as a contribution from the perspective of maintaining the FCA organization.

However, some problems associated with the capital introduction from company “A” have become apparent. Changes in water quality as well as the generation of odor and wastewater due to the economic activities of company “A” have been identified. As company “A” thaws their bait outdoors, complaints have been received from residents and fishermen as a result of the accompanying wastewater and odor. Until now, Company “A” has thawed bait in a facility consisting of little more than a simple enclosure; however they are

planning to develop a facility to suppress the generation of wastewater and odor in the future. FCA staff plan to continue sampling twice a year for water quality and sediment testing.

Company “A” aims to continue expanding its aquaculture operations and has applied to the FCA to expand their fishing grounds once again. However, they are not expected to achieve further expansion as a result of the relationship between sea routes. Additionally, expansion of tuna aquaculture in the Koshiki Islands has just about plateaued as there are no additional fishing grounds that are suitable for tuna aquaculture.

#### 4. Conclusion

The tuna aquaculture capital attracted to the Koshiki Islands has brought about significant economic benefits to the business of the FCA and the local economy and the Koshiki Islands have achieved their goal of “attracting capital to improve fishing cooperative business.” As long as income continues to be generated from tuna aquaculture operations in the future and demarcated fishery rights continue to be FCA-managed fishery rights, the fishing cooperative will continue to receive economic benefits from the attracted capital.

One issue for the future is how the fishing cooperative will put the fees and commissions from attracted capital to use. At present the fishing cooperative is using this money to pay back debt and to cover personnel expenses. Although the repayment of debt is an unavoidable obligation, it is important for the fishing cooperative to utilize the economic benefits from the attracted capital as well as their relationship with this capital after they have completed paying off their debts and use profits

towards efforts to establish a self-sustaining FCA business.

#### 5. Notes

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