

# Utilization of Low-Value Fish: A Case from Yawatahama, Japan

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## ABSTRACT

In Japan, wounded, small-sized, or low-profile fish are commonly discarded during distribution. However, this practice is blamed for indiscriminate overfishing of resources, environmental pollution, and adverse effects on ecosystems. Hence, to utilize these fish, these are labeled as low-value fish and processed on a commercial basis for the development of regional specialties that contribute to the local economy.

The study site, Yawatahama city in Ehime prefecture, is a center that specializes in low-value fish. The Yawatahama Chamber of Commerce and Industry plays a key role in promoting low-value fish. Local governments can increase awareness of low-value fish by developing recipes in conjunction with local restaurants, actively promote them, and issue certificates to restaurants handling low-value fish.

**Keywords:** Low-value fish, fishing industry in Japan, local economy

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# 1. Introduction

The supply and demand environment surrounding the fishery industry in Japan has been changing drastically in recent years.

First, in terms of supply, fish catches are decreasing because of stringent environmental regulations on fisheries and increasing imports of marine products. In particular, the production of aquatic products is declining because of indiscriminate overfishing and declining fishery resources due to changes in the marine environment. Meanwhile, distribution systems are changing due to the emergence of large supermarkets and development of the food service industry (Abe, Sato, and Shoki 2007). To provide reliable products to their customers, large supermarkets and restaurants require that producers and wholesalers satisfy four special conditions for the supply of products—maintain the *same amount, same time, same quality and size, and same price*. Due to environmental changes, fishes that are not uniform in size, enjoy low awareness, and have been damaged are losing sales points. Further, fishes that do not meet the above four conditions are called low-value fish. According to a FAO, the term ‘Low-value fish’ is difficult to define as the use of these fish different in many areas in Asia-Pacific. However, in Japan, low-value fish is perceived as low economic value in the market. It is not classified according to its size. Therefore, Low-value fish can be treated as non-edible at the distribution stage or traded at very low prices, but most of them are generally discarded on board or during distribution (Salia 1983). Ultimately, low-value fish are criticized as a waste of fishery resources and increase the burden on fishers (Dayton et al. 1995). Therefore, the impact of low-value fish on marine ecosystems has received considerable research interest, and a variety of ways have been investigated to reduce its severity (Kirby and Ward 2014).

Since the 2000s, fish consumption per person has decreased all over Japan (Hayashi 2011). Consumption per person recorded a maximum, at 40.2 kg, in 2001, but decreased to 25.8 kg in 2015 (WPJF 2016). In addition, fish is difficult to cook, generates a lot of garbage, and smells bad. However, health-conscious Japanese want to increase consumption of fish. Therefore, they purchase seafood that is easy to eat, such as processed fishery products (Ariji 2013).

Meanwhile, the fishes consumed in Japan are limited to some species. It is known that about 3,800 fish species are caught in the offshore area, but only about 300 kinds of fishes are distributed. About 100 popular fish varieties are distributed in large supermarkets and retail stores. In other words, fish consumption in Japan is largely accounted for by popular fish such as red sea bream, mackerel, and pollack, as well as high-quality fish such as whale, bluefin tuna, and eel (WPJF 2016). This rising demand fuels overfishing of fishery resources. Therefore, the International Union for Conservation of Nature (IUCN) has designated bluefin tuna and eel as endangered species, leading to diversification of seafood consumption. In particular, Ehime prefecture, which is one of the largest producers of aquatic products, intends to protect its offshore fishery resources by promoting the consumption of low-value fish as a substitute for the endangered species. Therefore, policymakers should formulate a strategy to expand the supply of low-value fish and develop a local specialty product based on it.

## 2. Various cases of low-value-fish usage in Japan

Use of low-value fish has the advantage of reducing wastage of resources, but it has a disadvantage as well: it is difficult to find a market for low-value fish because of low awareness about it. However, considering that the Japanese archipelago stretches to the north and south, the fishes caught in each region are different, and the consumer culture is also different. Therefore, each region formulates a commercialization strategy for low-value fish based on their characteristics. In the following subsections, we present successful cases divided into regional and wide-area types. The regional type contributes to stimulating the local economy. For example, fish caught in the area are either developed as a local tourism resource or commercialized as a local specialty product. In the wide-area type, however, low-value fish is, for example, shipped all over Japan. On the other hand, the academic articles on the Japanese case are very small, so we referred to internet materials for the following cases.

### 2.1 Regional type

Onomichi city of Hiroshima prefecture presents an example of the regional type. Onomichi city has a well-developed tourism business and boasts a special product called Onomichi ramen. However, with no special products using regional aquatic products, its fisheries industry is declining. Since 2013, therefore, local governments have started to develop new ideas for the promotion of low-value fishes caught off the Onomichi city coast (Onomichi 2017). First, the Onomichi government issued certificates assuring that low-value fish would be provided throughout the year to restaurants offering these products. It was difficult to appeal to customers visiting restaurants since they were not familiar with low-value fish. However, with the issue of certificates, customers had sufficient information to recognize low-value fish and order appropriate products. With the cooperation of the neighboring fisheries cooperative, low-value fish are supplied smoothly at relatively low prices.

Another example of regional type is Ito city, Shizuoka prefecture. In this case, the Ito city Fisheries Cooperative actively planned the use of low-value fish (Ito 2017). The restaurant managed by Ito city Fisheries Cooperative was opened in September 2010. The fisheries cooperative sells items such as mackerel, squid, yellow tail, and horse mackerel, which are sold by auction and shipped to large cities, while low-value fish are delivered to restaurants directly. The fisheries cooperative developed various recipes and promoted the value of low-value fish through local broadcasting. Although customers came in large numbers, more than expected, right from the opening day, the deficit continued because the restaurant management lacked know-how. However, the restaurant brought in professional managers and developed a menu according to the needs of its customers, turning the deficit into a surplus.

### 2.2 Wide-area type

Pro Spa Co., Ltd., is an example of the wide-area type. Pro Spa, founded in 2002, is a fish-processing company located in Gamagori city, Aichi prefecture. Active

in the sale of low-value fish, the company has often been exposed to media attention. Pro Spa informs fishers in advance of the species they need and buy low-value fish at a price higher than the usual transaction price (PROSPAR 2017). Therefore, fishers feel motivated to work, paying attention to quality control, and supply fresh low-value fish. Pro Spa has also diversified the supply of low-value fish to ensure a stable supply throughout. They also deal with low-value fish in different areas, developing products suitable for each fish. Pro Spa handles remote items such as sailfin sandfish in Ishikawa prefecture and gray rockfish in Hokkaido and ships them to cities. In addition, HACCP certification is obtained and sanitary management is thoroughly monitored to produce low-value fish products. Lastly, Pro Spa shares its recipes with restaurants, and accept orders for less than a kilogram to promote low-value fish.

These cases can be divided into supply, demand, and administration. Low-value fish can be harvested from the area or obtained from other areas to assure regular supply. It is also necessary to develop products that can take advantage of local characteristics. Transactions with a large supermarket or restaurant in the region are important to establish a firm customer base. Finally, local governments can consider certification to develop tourism resources.

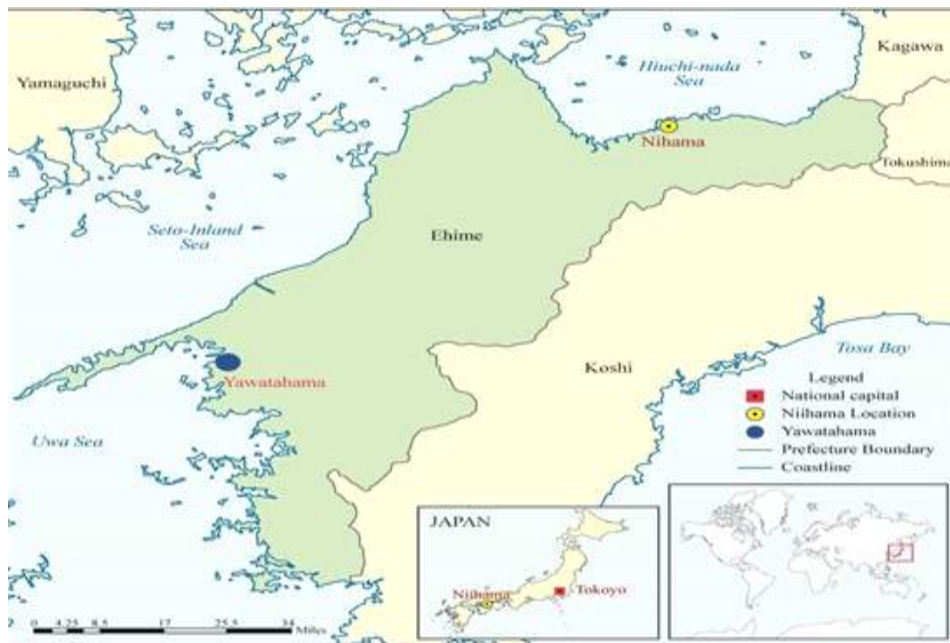
### **3. Research location and site selection**

This research was conducted in Yawatahama city, Ehime prefecture. Ehime is located in the northwest of Shikoku, which is the smallest of the four main islands of Japan. Ehime boasts clean, uncontaminated resources. The western coastline of Ehime touches the Uwa Sea, while the northern part faces the Seto-Inland Sea. Various abundant aquatic products are harvested and cultivated here. Red sea bream, yellow tail, and pearl lacquer are cultivated in the Uwa Sea and boast the highest production and quality in Japan. The fisheries industry in the Seto-Inland Sea has more catch fisheries than aquaculture. However, the fisheries industry in Ehime faces a major crisis due to the decrease in the number of fishers and the aging workforce. The number of fishers decreased from 18,920 in 1985 to only 9,317 in 2010, of whom 59.2% were over 60 years and 41.7% over 65 years. This trend is especially remarkable in Yawatahama. The total population of the city is 35,643, with 16,666 males and 18,977 females. Of this total, 13,232 are aged 65 or older. The number of fishers has fallen from 450 in 2003 to 205 in 2015, of whom 51.2% are over 60 and 38.5% over 65 years. The elderly fishers are often called “pension fishers.” The pension fishers have almost zero income as fishery producers, so they do not have the tools, ice, icebox, or storage to maintain freshness (Mihara et al. 2004). The decline in the number and increase in the age of fishers influence brokers. Brokers are middlemen who sell fish that are auctioned off to retail stores or restaurants. Falling fishery catches have reduced the number of brokers, affecting the vitality of wholesale markets and auctions. Thus, pension fishers concentrate on popular fish and discarded low-value fish due to the difficulties of distribution. As a result, a large amount of low-value

fish were disposed of, which led to criticism about environmental deterioration.

To solve this problem, the Yawatahama Chamber of Commerce and Industry (YCCI) decided to commercialize low-value fish in 2014. The goal was to raise awareness of the low-value fish in the area and to develop special products and tourism resources based on low-value fish. It is a project to highlight the charm of the fish caught in the area but not consumed and to create added value. In November 2015, the project began with the tasting of dishes of low-value fish. The low-value fish were prepared in various ways—sushi, tempura, and boiled. The event was well received by the participants. YCCI plans to grow low-value fish into a brand representing the region. This initiative faces the problem of ensuring a smooth supply and building awareness of low-value fish. Therefore, YCCI needs to develop a strategy to solve this problem.

Figure 1. Map of the study area—Yawatahama city, Ehime prefecture



## 4. Discussion

### 4.1 Results of interviews with fishers and related persons

In order to establish a strategy for the utilization of low-value fish, interviews were conducted with various stakeholders from all sides, including supply, demand, and administration. The preliminary work involved understanding the stance of stakeholders in the low-value fish sector and laying the foundation for future development strategies. The following subsections summarize the interviews with several persons.

On June 20, 2016, depth interview was conducted in the YCCI on the project. Interview was implemented on the motivation, budget and direction of the project. Data were collected in middle 2016. Follow-up field work was conducted in late 2016 to clarify and supplement the data.

A survey was conducted using semi-structured questionnaires. It was facilitated that gathering of supplementary information such as mentions from respondents. 81 respondents were implemented face to face on November 19, 2016.

The scale used in this study was reconstructed appropriately in the previous study. The items of each variable are as follows.

First, the low price assumes 100 yen per 100 grams. Is the price of the product cheap? Is it cheaper than other popular fish? What is the maximum amount you are willing to pay? As for the quality, is it delicious? Is the cooking method right? Does it match rice? The survey items of diversity are as follows. Do you feel seasonal? Do you feel the local characteristic? Can it be made into a variety of products? In this chapter, positioning of Low-value fish will be analyzed based on price and diversity.

#### 4.1.1 Supply

Interviews were conducted with fishers and fisheries cooperatives in Yawatahama to find out how to recognize and distribute low-value fish. First, the fisheries cooperatives did not recognize the existence of low-value fish. Aquatic products that are not related to fisheries cooperatives, such as low-value fish, are not circulated. The scale and number of items handled in the fisheries cooperatives have fallen. Therefore, the cooperatives were reluctant to expand the distribution business. Low-value fish were considered as the problems of fishers and wholesalers. Most of the wholesalers are small-scale operators and participate in the auctions for only popular fishes. They were reluctant to deal with low-value fish, which they thought were not sold in the market or were sold at low prices. Ultimately, low-value fish had to be supplied through out-of-market distribution channels rather than the formal market.

#### 4.1.2 Demand

The main demand for low-value fish is limited to restaurants, supermarkets, and general consumers in the city. Low-value fish were not distributed for a long time, so their cooking methods were unknown, and recipes using low-value fish were not developed. Therefore, few restaurants offered dishes of low-value-fish, and consumers had no opportunity to savor such dishes.

Consumers are still reluctant to buy low-value fish because of their low awareness level. They prefer popular fishes. Supermarket purchasing personnel also show this tendency. They think consumers will not buy low-value fish because consumers do not know how to cook or consume low-value fish. Meanwhile, the salesperson may not have enough knowledge to answer customer queries about how to cook the ordinary fish. In a retail store that only sells fish, however, the merchant would describe the characteristics of the fish and advise the customer how to cook it. However, due to changes in consumption patterns, such stores are not common. Moreover, consumers are less likely to cook fish because they buy fully cooked food in supermarkets.

Therefore, it is technically difficult to cook live fish. Supermarkets should sell cooked rather than live low-value fish.

#### 4.1.3 Administration

Ehime prefecture mainly produces red sea breams, flatfish, and yellow tail, and their consumption is high. They are also seeking to brand them, for example, by improving the aquaculture environment and raising special feeds. To increase profitability, Ehime prefecture aims to increase its supply to the major cities, Tokyo and Osaka, through branding. Therefore branding of low-value fish is not in line with the current Ehime strategy. However, Yawatahama hopes to contribute to the local economy through low-value fish. In particular, the YCCI is actively involved in public relations activities in cooperation with public organizations, for example, by planning events using low-value fish.

### 4.2 *Low-value fish utilization strategy of Yawatahama city*

Yawatahama should set a correct strategy to promote low-value fish as a local specialty. The Japanese value fresh fish. Therefore, sales to local residents and local restaurants, rather than shipments to big cities, should be expanded. In addition, YCCI should strive to develop products for tourists visiting Yawatahama. In the following subsections, we explain the strategies for utilizing low-value fish.

#### 4.2.1 Strengthen the food culture of low-value fish through food education

Japanese fish consumption continues to decline. In the past, the intake of fish was low when most Japanese were young, but fish intake increase with grow old. (Ishibashi 2000). In recent years, however, fish consumption in the elderly has decreased, and the industry is in a great crisis (WPJF 2016). In line with this tendency, the entire fisheries industry is declining. If the decline in the fishery industry continues, the Japanese food culture based on fish consumption will also decline. Therefore, students need to be educated, before their taste matures (i.e., until 7–10 years of age), to consume fish. Dietary education is intended to equip human beings with knowledge of “food” and the ability to make the right choice through various experiences and practices (Shimada et al. 2015). It is not mere cooking education, but comprehensive education about attitudes towards food, nutrition, and the traditional food culture. Yawatahama’s schools should educate students about the benefits of resource conservation and nutrition associated with the consumption of low-value fish. School food service centers should undertake food-processing functions to provide a stable supply of low-value fish. In addition, recipes for low-value fish need to be developed.

#### 4.2.2 Linkages with local restaurants and promotion by the local government

According to an interview, local restaurants are reluctant to buy low-value fish because they do not know how to care for and cook low-value fish. Since low-value fish have not been distributed so far, only a few fishers and the elderly know how to cook and care for them. Therefore, it is important that culinary techniques should

be disseminated among the chefs of the local restaurants that wish to handle low-value fish. At the same time, they should be apprised of the important role of low-value fish in protecting the environment and resources of the area and advised not to waste the fish. To this end, YCCI proposes to hold a recipe research meeting using low-value fish, where cooks and fishers can gather together to share ideas and develop new menus.

It is not known whether such research meetings will be held periodically, but it is significant that the YCCI is intent on providing opportunities for producers and consumers to share their ideas.

#### 4.2.3 Benchmarking the Japanese roadside station mall (Michi-no-Eki)

The Japanese roadside station mall, Michi-no-Eki, is the government-designated rest area found along roads and highways. Roadside station malls are set up by the local government in collaboration with the Ministry of Land, Infrastructure, Transport and Tourism in Japan. A parking facility, a break facility, and a local promotion facility are combined in a station mall. The local promotion facility has recently been spotlighted. A typical roadside station mall targets agricultural products. However, a roadside station mall sells produce harvested by surrounding farmers on consignment. Detailed information on who has grown the produce and where it was grown is provided. Since visitors trust producers and are willing to buy their produce, the number of malls is increasing (Yamamoto and Yuzawa 2012).

On the other hand, many tourists visit Yawatahama because the ferry connecting Shikoku and Oita of Kyushu runs daily. The local government operates a marine wholesale market in the port. However, there are no organizations and facilities such as a roadside station mall, but a few small retail stores exist. Therefore, one can consider the Japanese port mall (Michi-no-Minato) found along ports as a government-designated rest area.

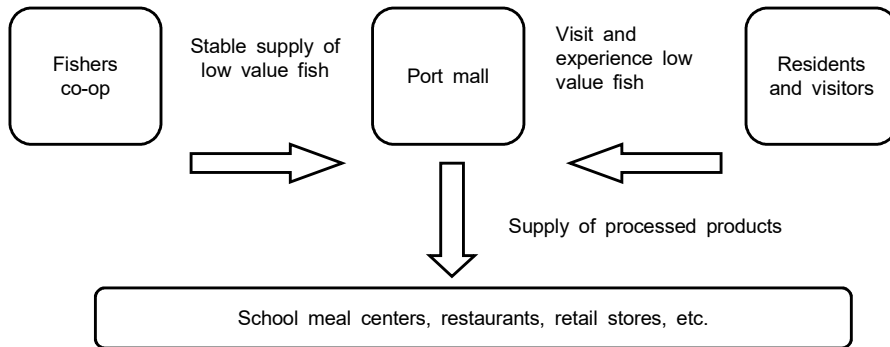
The port mall focuses on aquatic products and sells low-value fishes. A mall consists of restaurants, shops, and food-processing centers. The restaurants promote awareness by deliciously cooking dishes of low-value fish for consumers. Customers are primarily local residents, local businesses, and tourists. The restaurant is responsible for the promotion of low-value fish. Customers can enjoy the fish dishes at the restaurant and then recommend its services to their families and acquaintances. The shop department sells low-value fish and provides information on cooking and storage methods. The sales sector sells fresh low-value fish and processed products such as bento and broadcasts information on low-value fish. The shop sector trains salespersons to provide correct information on low-value fish to customers and distributes low-value-fish recipes at the floor. The food-processing sector turns unused fish into easy-to-eat products. However, low-value fish have some problems as well: they are small in size and difficult to process, and their skin is difficult to peel. Therefore, it is difficult to cook low-value fish at home, restaurants, schools, etc. This problem should be solved through sale of primary and secondary processed products or final products rather than live fish. This is the role of food processing.

By organically linking these three sectors, port malls encourage consumers to feel a close affinity for low-value fish, leading to a buying momentum. Utilization



of low-value fish requires a place where consumers have easy access to low-value fish. Consumers can eat, appreciate, and increase the social awareness of low-value fish.

**Figure 2.** Relationship diagram of a port mall



#### 4.2.4 Challenge to B-grade gourmet

B-grade gourmet is a cheap and common but delicious and reputable dish. The term or the concept behind it has been used from around 1985. Since 2005, the term B-grade gourmet has been used as an attempt to promote the local economy by promoting local food. Okonomiyaki of Hiroshima and Monjyaki of Tokyo are examples of B-grade gourmet dishes. In particular, tourists search for the area they intend to visit and the B-grade gourmet restaurant in the area. In other words, B-grade gourmet has turned into a food for tourists rather than local residents.

On the other hand, the Yawatahama city government actively promotes Yawatahama jjamppong (Chinese-style noodles with vegetables and seafood) using shrimp and squid caught off the nearby coast. The homepage of the city records the history and characteristics of Yawatahama jjamppong in detail, and everyone can also identify the location of the restaurant that serves jjamppong. Eventually, it has become famous, at least in the Kansai region, as the B-grade gourmet restaurant of this region. Based on this experience, local governments can identify B-grade gourmets to promote the use of low-value fish. The B-grade Gourmet Grand Prix is an event held every year to explore B-grade gourmets in Japan and introduce their characteristics. Developing food products based on low-value fish to participate in the competition is a useful endeavor.

## 5. Conclusion

This paper examined the status of fisheries in Japan, the changes in distribution systems, and the status of fisheries in Ehime prefecture and Yawatahama city. Methods to improve the utilization of low-value fish in Yawatahama city were then explored

after analyses of various case studies. In recent years, the problems of fishers and fisheries cooperatives have become difficult to resolve. With the uncertain management outlook, the exploitation of low-value fish presents a new challenge in a not so bright future. However, without major changes, the low-value-fish business is difficult to break up. Therefore, the creation of added value through low-value fish has a great significance for fishers in a declining fisheries industry. Fishers have a great motivation to expand the low-value-fish sector, develop local specialties from low-value fish, and thereby contribute to the local economy.

The agriculture and fisheries industry in Japan has witnessed a rising trend over the years. Local production and consumption in the 1980s (Ikegami 2003), production of high-quality branded products in the 1990s (Niiyama 2000), and becoming the sixth-largest industry in the 2000s (Ohashi 2015) are typical examples. Circulation of the economy and regional revitalization through recycling of regional resources have been gathering attention recently. Creation of added value for unutilized fish is a topic relevant to the latest circulating-economy and regional revitalization trends. Therefore, if the stakeholders of the low-value-fish sector cooperate with each other, the outcome can be considered a successful business model for Ehime prefecture and Japan.

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