

History of Fish Marketing and Trade with Particular Reference to Japan

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Abstract. This paper reviews the history of fish marketing in Japan. The Japanese experience is rich in terms of long history, species handled, products forms, cooking methods, ways of utilization, and interaction with domestic fisheries. Along with the change of people's life style from hunting to farming, marketing and trade have developed. The self-sufficiency rate of fishermen was less than that of farmers, resulting in active fishermen's marketing involvement. Salt has been the basic good among tradable fisheries commodities and enriched human life. Processed fisheries commodities have been used as offerings, tax, and military food due to their scarcity and preservability. Traditional marketing and trade include commercialization of dried, smoked, salted, and fermented seafood; seasonings; seasoned boiled seafood; and organic fertilizer. Modern marketing and trade include commercialization of cultured species, fish paste, canned fish, frozen/fresh/live fish, fish oil/fish meal/fertilizer, and potential resource species. Cultural and food diversity is essential for the human survival in the 21st century. Despite the conventional use of fish, most marine organisms are not utilized yet. As healthy food, drugs, raw materials, ornamental use, and contribution to solving environmental problems, there is a great potential in fisheries and fish trade if the resources are wisely managed under the WTO framework started in 1994.

Key words: Fish marketing, Cultural diversity, Food diversity, Utilization of fisheries resources, and Fisheries management

1. INTRODUCTION

The United States (USA), Europe, and Japan offer the largest fish import markets in the world and China is catching up. Imports of the United States and Europe are, however, rather limited in species and in the form of products such as canned and frozen goods, and fishmeal.

If we look at Chinese seafood trade, dried sea cucumber, shark fin, and abalone have been important import commodities from all over the world. China has been changing from fish exporter to importer recently, regardless of her remarkable fish production in the 1990s. This will definitely affect the world fish trade structure in the future, but how it will affect is uncertain.

On the other hand, Japan used to be a fish exporting country, but now offers the largest single fish market in the world

and imports over 30% of the world fisheries import in value. In 1996, Japan imported 3.45 million mt or US\$17 billion of fisheries products while exported 275 thousand mt or US\$1.5 billion (Anonymous, 1999). The Japanese fish eating habit created a unique culture characterized by long history, varieties of species consumed, product forms, cooking methods, ways of utilization and marketing, and interactions with domestic fisheries. Japanese information on fish marketing and trade has been rarely written in English. Thus, this article mainly deals with the Japanese case.

1.1 The Issues

The current food sufficiency rate of Japan is 40% as compared with 140% of France and 125% of the United

States (Anonymous, 2000). Food security of Japan under the WTO at present is very fragile from the National Security point of view.

In 1991, the world production of grain was 1,884 million metric tons (mt), while production figures were 179 million mt for meat and 100 million mt for fish production. Since then, food production did not increase dramatically. However, world population already reached 5.5 billion in 2000 and has been estimated to 8.5 billion in 2025. There is not much optimism left to feed world population. Average per capita annual grain consumption is now about 340 kg, ranging from 135-200 kg of Asian people to 1,000 kg of the average American.. Maximum populations on earth fed by current level of food production were estimated as 3.4 billion assuming American style by all, while 13.4 billion assuming Indian style by all (Nagasaki, 1999).

By eating habit, countries are classified by 5 types: 1) Meat dominant country; wheat dominant country; rice dominant country; corn & other grain dominant country; and millet, taro, sweet potato dominant country. Along with their historical background, such as religion, colonization and change in life style, people's original food diversity has been limited by taboos pertaining to food intake. Judaism, Islam and Hinduism are such religions which limit food intake. Some prohibits to eat beef or pig and other prohibits to eat fish without scale and fin (Nagasaki, 1999).

Facing on the food security problem, the importance of cultural and food diversities or lifting taboos pertaining to food intake is ever-increasing.

1.2 Shell Mound

Tracing back to the human history, we can easily find shell mounds along the coasts of seas, lakes and rivers all over the world. This indicates people's close association with fisheries in ancient days when people had to live with shells, fish, and seaweed for their hunting life. Of course, the distribution of shell mounds is patchy, not uniform.

In Japan, about 1,900 shell mounds are distributed from Chishima Islands to Ryukyu Islands. Half of them are located in Kanto Region concentrating along Tokyo Bay and Kasumiga-ura. Most of them are found in the Pacific coast and a few in the Japan Sea coast. Most of them were made in the straw-rope pattern era and those made in later years are much less. This indicates that human

dependence on seafood has been decreasing as farming has developed. The development of Agriculture has changed people's taste and preference in terms of food intake from protein rich foods to carbohydrate rich foods.

1.3 Origin of Marketing

Origin of marketing is closely associated with fisheries. Along with the changes of people's life style from hunting to farming, marketing in the form of primitive bazaars based on barter, later monetary trade, were developed. The self-sufficiency rate of fishermen was less than that of farmers, though fishermen eat a lot of seafood. Therefore, it is reasonable to think that fishermen and/or salt traders actively involved in such marketing. They exchanged fisheries commodities for farmed products.

Starting from fresh fish and/or salt trade, fish and salt marketing developed to handle processed ones to preserve fish for a longer period. This primitive processing consists of drying, smoking, salting, and fermenting,. Fresh fish and/or salt as well as those processed ones were frequently used as offerings to gods or super-ordinates. Those preserves were also used as a tax or military food.

In 676, *Nikushoku Kinshirei* (prohibition of eating meat) was at first ordered by Emperor Tenmu. Since then, fisheries products became the major items for offerings. Prohibition of killing animals was repeatedly ordered by succeeded emperors as the buddhism was politically regarded as the national religion.

At the beginning of the 13th century, a famous buddhism priest, Shinran, encouraged to eat fish from the nutritional point of view. This encouraged the Japanese to eat more fish and fish trading. However, commercialization became popular in the middle of the 17th century when money economy developed and merchants dealing with commodities shipped by local loads became active. In 1771, marine transportation developed and an eastern route between Japan Sea coasts and Tokyo was open, while a western route between Japan Sea coast and Osaka as well as *Higaki Kaisen* route and *Taru Kaisen* route between Osaka and Tokyo were open in 1772. Along with the government policy emphasizing commercialization, this triggered the nationwide commercialization in modern times in Japan. Products in Hokkaido were also transported by *Kitamae-sen* not only to Osaka but also to Okinawa. Products of Kagoshima and Okinawa were

exported to Osaka and Tokyo. In addition to dried, smoked, and salted seafood, many species were also preserved as pickles or used as ingredients for soy souses and other processed products such as crackers, mashed fish, mashed and seasoned fish, fish paste, shark and whale ointments. In addition, oils from these fish in particular squid and blue fish were also utilized as liver oils and edible oils.

1.4 Salt Road

World annual consumption of salt is now about 170 million mt and major producing countries are the USA, China, Russia, Germany and India. It is unknown when salt was traded for the first time. However, salt has been an important fisheries product. The name of "rock salt" indicates that there was once sea which was protruded by the earth's crustal change. Although salt has been regarded in many parts of the world as if it is essential for human survival, it is still a question because there are people who did not know salt.

Nevertheless, salt was used to make food's taste better and to preserve food for longer period. Although it is not necessary to take a lot of salt, it is better to take some. However, places of salt production are limited to seacoasts or the area once it was sea.

As a result, salt became an important tradable commodity all over the world and salt road connected people in the mountain with sea. Names of coastal origin are also found in the mountain villages and towns.

The first salt farm recorded in the Japanese history was Oshio Salt Farm in Hyogo prefecture, built in the Nara era (710-794) (Hirashima, 1975). Seto Inland Sea with high difference in tide was suitable to develop salt farms so that this area became the center of salt production in Japan. During the Azuchi/Momoyama era (1568-1600) and the first half of Edo era (1600-1968), many salt farms developed with industrial promotion policies of each fief. Along Seto Inland Sea, developed were the salt farms. These include Oshio and Akaho in Hyogo prefecture; Yuzaki, Akasaki, and Ajimi in Okayama prefecture; Matsunaga and Takehara in Hiroshima prefecture; Hirao, Mitajiri, and Akiho in Yamaguchi prefecture; Muya, Naruto, Takashima and Tokushima in Tokushima prefecture; Sakaide, Yashima and Takuma in Kagawa prefecture; and Takihama and Hatohama in Ehime

prefecture. Salt was also produced in Wakayama, Chiba, Ishikawa, and Fukui prefectures.

Salt was important food for warriors. Rice ball and soy bean soups were essential components of their food: 60 *go* (about 180cc) of rice, 1 *go* of salt and 2 *go* of soy bean paste per 10 warriors per day. Without salt, there is no fight. Therefore, stopping the salt road was also used as a strategy in the civil war time (1491-1568).

On the other hand, salt is heavy. Therefore, people transported it by using waterways as long as possible, then carried it to the mountain villages on the back. They took often short cuts of mountain roads. In Japan, women carried 100-200 kg per person and earned money by this transportation.

2. TRADITIONAL FISH MARKETING AND TRADE

In Japan, commercialization developed very much during the Edo era when the feudal system was completed in Japan. Tokugawa Shogunate took an isolation policy against foreign countries and gave fiefs to feudal lords in such a way that the closer the relationship with the Tokugawa family, the closer the fiefs from Edo (Tokyo now). In order to secure centralization, the *Shogun* stood the top of the people to keep feudal lords as poor as possible. A social class was established in such a way that the highest social class was the warrior's class, followed by the farmer's, the manufacturer's, and the merchant's in order. The taxation was based on rice and severer to the farmers than the others. The lower the social classes, the lower the socio-political freedom but the higher the economic freedom.

At the same time, each feudal lord had to manage a mansion in Edo where his wife and followers stayed there all the time as hostages. In addition, each feudal lord had to visit the Shogunate in Edo once a few years and obeyed the Shogun's order of big public works if it was asked for. Management of these economic burdens to feudal lords was a headache and each feudal lord had to promote economic activities as well as environmental management. As a result, the merchants belonged to the lowest social class was paid much attention and commercialization was rapidly developed. Dealers of fisheries products as well as shipping industry became the leading economic sectors in

the society. Thus, dried local fisheries products were carried to urban centers such as Edo, Osaka and Kyoto and consumed as processed products. Dried fish and seaweed were the popular form and salt was used to make various preserves, and seasonings.

2.1 Dried seafood: *Konbu* (kelp)

Major dried products include squid, abalone, sea cucumber, shark fin, cod, flounder, herring, sardine, saury, horse mackerel, mackerel, flying fish, red sea bream, yellowtail, Ayu, crucian carp, pearl shell, oyster, other shells and various seaweed. Among them, kelp has been the most popular commodity in Japan. In Hakodate, the oldest crockery with shell pattern was found in about 1974 (Oishi, 1987). This indicates that kelp has been eaten by people since 8,000 years ago. However, there is no record of eating kelp until 658. But, before 8th century, dried kelp were already used as a soup essence by people, living in Japan Sea coast of Tohoku Region and Niigata prefecture. Annual production at that time was around 10 mt.

Around 1220, Hokkaido was included in the Japanese jurisdiction. Kelp was harvested in the eastward of Hakodate and consumed by people living in all over Japan Sea coast. Kelp was first exported to China in 1225. Annual production at that time was about 100 mt. There are *Nho* dramas of "*Konbu-uri* (kelp peddler)" written in the 13-14th centuries.

Around 1639, kelp was first carried to Osaka and then processed as *Tsukudani*. Annual production at that time was around 1,000 mt. In 1799, Takadaya Kahei found long kelp in Etorofu and exported to Kyushu and Okinawa. These kelp were directly consumed by people. Annual production at that time was around 10,000 mt.

2.2 Smoked seafood: *Katsuobushi* (smoke-dried skipjack)

Smoked seafood include skipjack, turtle, yellowfin tuna, mackerel, yellowtail, sardine, eel, salmon, herring, and scallop. Among them, *Katsuobushi* is the most popular commodity and initially called as *Katauo* (Hard dried fish) which was first recorded in *Kojiki* written in 712 (Yamamoto, 1987). Most of smoke-dried fish such as mackerel, yellowtail, and sardine were also called as

Katauo. This *Katauo* was later called as *Katsuobushi*. The processing methods also changed from directly dried one to boiled-then-dried one. *Taihourei* written in 701 described both and tax for boiled-then-dried one was 40% higher than these of directly dried one. In the Nara era, a basket of *Katsuobushi* was bartered with 37 bundles of rice in *Kyoto*. *Katsuobushi* has been commonly used as a soup essence since the prohibition of eating meat ordered by the Emperor Shirakawa in the late 11th century in order to promote Buddhism in Japan. *Katsuobushi* was also conveniently used as military foods since the civil war period (1467-1573).

Commercialization of *Katsuobushi* was highlighted in the Edo era because the word *Katsuo* was regarded as fish bringing victory. Smoked-dried one was first produced Usa-ura, Kochi prefecture by *Jintaro Kishu* in the 1730s. This improved method was long prohibited to transfer, but extended by *Yoichi Tosa* to Anbo, Chiba prefecture in the 1830s; and Izu and Yaizu, Shizuoka prefecture in the 1840s. Due to the high capability for preservation, *Katsuobushi* was treated as one of general merchandise goods. The important markets were Tokyo, Osaka, and Kyoto. However, Osaka was the center of commerce in Japan. *Katsuobushi* wholesalers started in Osaka in the Edo era. *Katsuobushi* was the major commercial item of Kochi and Kagoshima prefectures. From the warehouses of Kochi and Kagoshima prefectures *Katsuobushi* was transferred to and the sale was consigned to the designated wholesalers, then their sub-wholesalers and distributed to the Osaka Wholesale Market as well as other parts of Japan.

The major *Katsuobushi* market in Osaka was *Roku Kisanbutsu* (fisheries product) Market, the predecessor of Osaka City Central Wholesale Market, developed in the 1620s. The market handled fresh fish as well as salted and dried fish at the beginning, but later concentrated to salted and dried fish. However, *Katsuobushi* wholesalers had a special position at the market because no one at the Roku Market could not deal with *Katsuobushi* from outsiders except for the designated wholesalers. In addition, there was an independent marketing route from the designated wholesalers and middlemen.

In Edo, there were 4 *Katsuobushi* wholesalers in the 1790s. Along with the development of marine transportation, *Katsuobushi* became an important item at Edo port near Nihonbashi on Sumida River. The *Kobune-cho Gumi*, the predecessor of Tokyo *Katsuobushi* Wholesalers'

Association, was established in 1797.

Between Osaka and Edo, *Higaki Kaisen* (marine transportation) played an important role in the *Katsuobushi* shipment. Later, *Taru Kaisen* was also used. *Katsuobushi* was transported inside *Taru* (barrel), *Kago* (basket), *Kamasu* (straw bag), *Mushiro Tsutsumi* (straw mat lapping), and *Hako* (wooden box). There was no standard packing. Direct sale of *Katsuobushi* from producing districts started in 1902 after the railroad transportation network was established.

2.3 Salted seafood: Salmon

Salted seafood include salmon, trout, loach, cod, red sea bream, skipjack, yellowfin tuna, yellowtail, herring, sardine, mackerel, horse mackerel, mackerel pike, whale, Ayu, shrimp, hair-tail, eel, abalone, and octopus. Among them, salted salmon called *Akijai* is the most popular form in Japan. People enjoy *Akijai* during the new year holidays season, particularly in eastern Japan.

Since ancient days, salmon has been popular foods for people including Ainu tribe in northern Japan. In 713, *Fudokis* (descriptions of natural features of various regions in Japan) were completed, but only 5 of them exist at present. Among them, there are descriptions of salmon in three *Fudokis*. These are related to Hitachi (Ibaragi prefecture), Izumo (Shimane prefecture), and Higo (Kumamoto prefecture). In *Engishiki* (Action plan for Code of Conduct: *Ritsuryo* System) published in the early 10th century, salmon was treated as a tax..

Salmon was caught in rivers called as *Sake-gawa* (salmon spawning river) by *Takeda Shingen* in 1547. He treated these rivers as same as rice paddies. Since then the similar treatment became popular all over Japan. Further, fresh or salted salmon were also used as offerings. During Edo era, salted salmon was exported to Tokyo and other prefectures.

Since 1888, Japan has practiced salmon ranching programs and the ranching is one of few successful cases in the Japanese experience in marine ranching. Ironically, the success of the marine ranching together with bulk imports of cultured salmon resulted in extremely low prices under a glut situation in the market.

2.4 Fermented seafood: Sushi

Among fermented seafood, *Sushi* is the most popular form in Japan. *Sushi* means *Nare-zushi* (salted-then-fermented fish) or *Nigiri-zushi* (rice ball with vinegar and raw fish). *Sushi* in Japan is rooted from Chinese pickles developed among the mountain tribe, Myao, in Unnan province (Nakayama, 1998). A large amount of salted freshwater fish such as carps were got pickled in boiled millet and rice and fermented, resulting in *Nare-zushi*. This kind of food is available in Thailand, and Taiwan in the Southeast Asia. In China, *Nare-zushi* was popular during the 11th century, but it was disappeared after the So Dynasty was conquered by the Gen Dynasty. However, when it was brought to Japan is unknown.

The first record regarding *Nare-zushi* in Japan was *Yoro-ritsuryo* written in 718. It was used as a tax at that time. Shells were also used in this record. Ayu fish, crucian carp, catfish, and loach among freshwater species; and red sea bream and various shells among marine species were popular.

Nigiri-zushi first appeared in the early 19th century. There was an evolution from *Nare-zushi* to *Nigiri-zushi* in Japan. Among *Nigiri-zushi*, there are two distinct types: Kansai type (one with jinger) and *Edomae* type (one with *Wasabi*). Although both use a lot of rice and much shorter time for fermentation than *Nare-zushi* and are relatively instant food, Kansai type such as *Oshi-zushi*, *Hako-zushi*, and *Battera* (*Saba-zushi*) spends more time for fermentation than *Edomae* type.

Kansai type was first introduced to Edo in 1680 and simple *Sushi* restaurants developed in Asakusa area in the 1680s. The first restaurant was open in Tokyo in 1687 and several *Sushi* stands were opened in *Ryogoku* and *Asakusa* areas in 1750. Around 1772, many *Sushi* stands opened and *Norimaki-zushi* (rice bar with vinegar rounded by dried seaweed) first appeared in Tokyo in 1779.

Yohei, opened in 1810, and *Matsunosu* were famous *Sushi* restaurants in Tokyo in the Edo era. But once *Yohei* developed *Edomae-zushi*, all *Sushi* stands and restaurants in Tokyo abandoned the Kansai type and followed the *Edomae-zushi*. However, their prosperity was not normal and *Yohei* and *Matsunosu* were arrested in 1842 because of their extravagance.

2.5 Seasonings: Miso (soybean paste), Shoyu (soy sauce) and Gyoshoyu (fish sauce)

Miso and *Shoyu* made of soybean and salt are the basic seasonings in Japanese dishes. Gyotoku in Chiba prefecture was famous for salt production in Kanto. It supplies salt to Edo as well as Noda and Choshi famous for dark *Shoyu* production. Dark *Shoyu* is popular in eastern Japan. The brewing industry of *Shoyu* in *Noda* started in as early as the 1560s. People involved in *Shoyu* production were involved in *Miso* production at the beginning, then involved in *Shoyu* production when marine transportation of Edo river became easier. In 1891, Tone Canal between Tone river and Edo river was completed and saved the distance about 50km. At present, Noda's production share of *Shoyu* is one forth of total consumption in Japan.

On the other hand, Takino in Hyogo prefecture is famous for *Amakuchi* (light) *Shoyu* which is popular in western Japan. This has developed in the 1570s taking advantage of water of Ibo river, salt in Banshu (Hyogo prefecture), and Mt. Keiro which stops the north wind.

Gyoshoyu is a kind of sauce made of fish or shells with malted rice and salt, and used just like *Shoyu*, in particular, making dish served in the pot. Popular materials used for *Gyoshoyu* include *Hatahata* (Sandfish, *Aretoscopus Japonicus* S.), sand lance (*Ammodytes personatus* G.), crab, sardine, bonito, mackerel, squid, and oyster. This kind of sauce was usually made and distributed locally, though the origin of marketing was unknown.

2.6 Seasoned boiled seafood: *Tsukudani*

Tsukudani is a Japanese favorite preserve seasoned by soy sauce, salt and sugar. Whole body of small fish or seaweed is boiled dry with low heat for a long time until all bones became soft. In Kyoto, they have developed *Kaiseki* dish using fresh water fish from Lake Biwa and other rivers. *Asakusanori* (seaweed) developed in Tokyo and Konbu (kelp) in Osaka are other famous products of *Tsukudani*. These were developed in Edo era and succeeded today. Varieties of *Tsukudani* using different species are available today all over Japan, though those are comparatively rather expensive than before.

2.7 Fisheries products for fertilizer

In the 16th century, herring fishery developed in Matsumae coast, Hokkaido, and sardine fishery developed in the late

18th century. These fish are mainly used as fertilizer.

Around 1745, there were about 1,000 merchants in Murotsu (Hyogo prefecture) under the jurisdiction of *Himeji* load. At that time, Murotsu had a good natural port with about 5,000 people. This port was used for both fishing and commerce as a center of gathering commodities from Hokkaido, Japan Sea coasts and western Japan to the Osaka market.

These merchants had to handle all commodities which local loads wanted to sell. Among them, there were whale oil and lees, dried sardine as well as fresh, salted and dried fish. Dried sardine was a good organic fertilizer. In 1653, the dried fish fertilizer market became independent from other salted and dried fish trade in Osaka. At the same time, a similar market was also developed in Tokyo beginning at Uraga, Kanagawa prefecture. In 1735, those markets developed to 4, but sardine catches fluctuated largely, the rise and fall of these marketing activities were associated with this fluctuation. Good years were from the late 17th century to the early 18th century, from the late 18th century to the early 19th century, and from the early 20th century to 1940. Herring and seaweed were also used as fertilizer. Although seaweed was mainly used locally, but herring caught in Hokkaido were exported to Osaka and Edo and marketed to farmers.

3. MODERN FISH MARKETING AND TRADE

Although traditional fisheries products have been refined and added values, new commodities have been developed in modern times. Along with these development, the structure of fish marketing and trade has been changing.

3.1 Ornamental fish and pearl

Gold fish, fancy carp, and tropical fish are popular ornamental fish with high economic value. Varieties of gold fish used now as aquarium fish are mutations and/or hybrids rooted to crucian carp and were first developed in southern China, Sekko and Kosei provinces in the 12th century. Gold fish were first imported to Japan from China in the 14th century, and markedly commercialized in Edo in the late 17th century. As a part-time job for farmers, gold fish have been cultured in Yamato Koriyama in Nara

prefecture, Edo river in Tokyo, and Yatomi in Aichi prefecture. In the 18th century, there were many gold fish wholesalers and peddlers in Edo and Osaka. Peddling of gold fish became features in summer, and gold fish became popular items in fete day and night street stalls in spring, summer, and fall.

Improving the mutation of common carp, fancy carp were developed in Niigata Prefecture in the early 19th century. Fancy carp are suitable to ponds in Japanese gardens, rather than small aquariums. Unlike gold fish, fancy carp became popular among rich people and/or public yards.

Culture of tropical fish was started in France in 1868. Cultured tropical fish as pet fish became popular in the late 19th century in Europe and the United States. Tropical fish were personally brought back to Japan from the United States in the early 20th century and gained popularity among people in the upper class. Around 1935, pet shops handling tropical fish appeared. It became very popular after World War II, especially after 1950. The use of marine species as home pet started after 1964, owing to the development of air transportation as well as improvement of home aquarium facilities and mass production in captivity.

Pearl has been traded as personal ornaments since the ancient days due to its beauty. Westerners have been fond of it along with the development of wars against Persia and India, and of western civilization. In the 13-14th centuries, it became very popular in Europe, then its popularity was escalated in the 15-16th centuries. Due to wars and others, its popularity was declined in the 17-18th centuries, but it became popular again in the 19th century along with the development of new fishing grounds in southern islands and Australia.

According to the development of capitalistic economy, people's life style and preferences have changed from quantity to quality. As a result, pearl was regarded as one of the most precious jewels. From 1910 to 1930, prices of pearl were steadily increased because of short supply. Although cultured pearl were developed by Mikimoto in 1894 (semicircular pearl) and 1896 (circular pearl) and his successor, Nishikawa, those were regarded as low quality as compared with natural ones at the beginning, but soon attracted consumers as cheap but high quality commodities. But, this pearl trade was interrupted during World War II. After the war, the western markets shifted from Paris and London to the USA, Switzerland, and Germany. Japan developed mass production of cultured pearl. As a result,

world share of Persian Gulf pearl reduced from 60-70% to 6-7% in 1949 and cultured pearl became a dominant world commodity in pearl trade. Cultured pearl is mainly exported to the USA, Hong Kong, Switzerland, Germany, Taiwan, Korea, Italy and Spain. In 1998, pearl export amounted to US\$ 408 million, 35.6% of total fisheries export in Japan, though Japan imported US\$ 260 million of pearl from French Polynesia, Australia, Indonesia, Hong Kong, China and others. Recently, production of cultured pearl in Japan has been decreased due to environmental problem and disease problem. Besides, direct marketing routes, not depending on Japan, have been developing.

3.2 Fish paste

Kamaboko, *Chikuwa*, *Hanpen*, and *Satsumaage* are popular fish pastes in Japan. These are steamed or broiled or fried products after kneading seasoned mashed fish meat. The word of *Kamaboko* was recorded in the 12th century, but this meant broiled *Chikuwa* with hole in it. In the late 16th century, *Kamaboko* on the wooden plate was made and distinguished from *Chikuwa*. Steamed and handworked *Kamaboko* for ceremonies developed in the middle of 17th century. Although these are made all over Japan at present, Odawara, Osaka, Uwajima, Senzaki, Wakayama, and Tohoku are famous for these fish paste production, but their ingredients and cooking methods are slightly different.

Along with the development of Alaskan pollack fishery in the north Pacific, massive production of frozen *Surimi* (minced fish) triggered massive production of *Chikuwa* in Tohoku and Hokkaido regions in the 1960s. According to the ingredients and cooking methods, two types of fish paste developed: one is high quality products using lizard fish, croaker, toothed eel, sand borer, flounder, and cod with traditional ways of cooking; and other is low quality products using Alaskan pollack using mechanical cooking. Fall of north Pacific fishery resulted in the severe competition for the search of ingredients such as shark since the 1980s.

Fried *Hanpen* and *Satsumaage* have been developed in the western Japan. *Hanpen* is popular at home consumption while *Satsumaage* are served at restaurants or handled as gift.

3.3 Canned fish

Although canned goods have not been popular in Japan, canned fish produced in Japan was largely used as war supplies and/or exported to the USA and Europe. These export markets really enhanced Japanese fisheries. Major markets were England, followed by France, Australia, Holland, Belgium, Italy, Germany, and Sweden for salmon; the USA, followed by England, France, Australia, Germany, Belgium, Manchuria, Denmark, Hawaii, Canada, Holland, Africa, Sweden, Greece, Latin America, and South Pacific for crab; the USA for tuna; and South Pacific for sardine.

The first canned fish production in Japan was canned salmon made in west Kamchatka by *Tsuzumi Shokai* in 1910 (Okamoto, 1984). However, at that time better machine made in Sweden was already used in Russia. Japan bought better machine from the USA in 1913. Production increased drastically from 704 boxes (8 dozen of half pound before the war; and 4 dozen after the war) in 1910, to 1,250,000 boxes in 1928. These products were mainly exported to the USA.

King crab canning by Japanese started in Hokkaido in 1905 and in Sakhalin in 1906. Canned king crabs were exported to the USA and Europe. However, over-fishing resulted in decrease in production from 175,000 boxes in 1917 to 85,000 boxes in 1919. In 1919, the first private king crab factory ship was operated off Sakhalin. In 1926, 230,000 boxes were produced on 11 factory ships.

Tuna canning started in 1910 and the production increased from 28,500 boxes in 1931 to 488,300 boxes in 1940 with the peak production of 849,700 boxes in 1937. Sardine canning started in 1915, and the export increased from 7,000 boxes in 1917 to 1,300,000 boxes in 1937.

This rapid expansion of the Japanese fish export along with the Japanese territorial expansion began to be regarded as social dumping since 1927. It led the boycotting movement against Japanese goods in the USA, England, France, China and Russia.

During the war, the fishing industry lost almost everything. However, immediately after the war, food production and export earnings became one of the most important objectives in the occupation policy of General MacArthur. With the government support, the tuna and skipjack fisheries recovered quickly. Canned fish was first exported to the USA: tuna in 1948, salmon in 1949 and crab in 1953. Since then, canned albacore and yellowfin tuna were exported to the United States. By 1959, half of salmon catch in the North Pacific were exported to the

United States, then export was reduced due to the reduction of catch under the Russia-Japan and Japan-USA-Canada fisheries agreements. In 1959, about 90,000 mt of canned salmon were exported. As frozen fish trade became popular, canned goods export has stagnated.

3.4 Frozen, fresh, and live fish and shrimp

No matter how people wanted or not, prices of fisheries commodities in Japan were largely influenced by international trade and economic situation.

A structural change in Japanese seafood trade started in 1973 when imports exceeded exports. Since then Japan experienced 3 stages. The first stage is from the 1970s to the middle 1980s. It is characterized by rapid increases in frozen fish imports such as shrimp, salmon, and tuna. These are associated not only with the development of super-market, refrigerators, fishing vessels, freezer carriers and cold storage, but also Tokyo round of GATT (1973-79), oil crises, and the development of the 3rd Law of the Sea Conference. The change in taste and preference of people from whole fish to ready-to-cook or ready-to-eat fish and from home cooking to eating out due to the increased income supported by the economic growth also contributed to this trend.

The 2nd stage is from the middle 1980s to the early 1990s. It is characterized by the decrease in imported prices due to yen appreciation. Overseas fisheries investment for fisheries product imports drastically increased since 1985 when the Plaza agreement became effective. Cases of fisheries related overseas investment increased from 130 before 1970 to 287 in the 1970s, and to 328 in the 1980s. The amount of total investment was US\$49 million before 1970, US\$252 million in the 1970s, and US\$377 million in the 1980s. During this period, imports of lower priced fish increased remarkably and the fish processing industry increased its dependency on imported fish.

The 3rd stage is from the early 1990s to present and characterized by diversification of import species and an increase in value-added commodities. During this period, processing technology for export in developing countries developed drastically. However, due to the *Heisei* economic crisis, the amount of fisheries import to Japan decreased from 1994 to 1998, except for tuna and prepared fish. These were from 320,000 mt to 282,000 mt for shrimp and from 243,000 mt to 224,000 mt for salmon,

while tuna imports increased from 350,000 mt to 372,000 mt..

Now Japan imports from 148 countries 184 fisheries items from live fish to frozen fish. By both air and sea, these include eggs, fingerlings, ornamental species, seaweed, fishmeal and oil, bulk species such as mackerel, high priced fish such as tuna and shrimp; in the forms of live, fresh, dried, salted, smoked, frozen, filleted, other value-added forms. Narita Airport near Tokyo is also called as Narita Fishing Port because of the popularity of receiving air cargo with fisheries commodities. After oil, fisheries commodities are the second important import item in Japan. Thus, fish imports are characterized by that lots are much smaller and varieties are much larger than agricultural commodities.

Domestic market has also changed. After World War II, the Central Fish Wholesale Market in Japan developed to deal with fresh fish marketing characterized by the speedy, stable, safe and fair transaction of bulk and varieties of fisheries commodities. However, the strength of this system has been heavily eroded by the inclusion of frozen fish in fish marketing. The Central Fish Wholesale Market system now faces with restructure problems.

Live fish market in Japan and Korea, where live fish are brought to the retail store or restaurant level, developed along with high economic growth, but is still very limited to fancy retail stores or restaurants. For tourism, this type has been popular all over the world. Apart from *sashimi* and *Sushi*, oyster is eaten raw, but other species are not popular to eat raw in the western countries.

Consumers' awareness on safety food has developed. Fisheries commodities were adopted at first by both EU and the USA when they implemented their new legal framework of HACCP (Hazard Analysis Critical Control Point). FDA's reasons for this were associated problems of food poisoning such as botulism and others caused by bacteria, parasites, virus, and shells; perishables themselves; contamination of heavy metals, PCB and agricultural chemicals; and mal-sanitation of small-scale seafood processors.

Since 1996, the Japan's tuna market faced with problems of oil contaminated bluefin tuna import from Turkey in winter 1996; the E. coli O-157 epidemics, a food poisoning problem, which broke out in the summer 1996; and CO (carbon mono-oxide) tuna import from Indonesia and the Philippines in May 1997. Use of CO for making fish

meat good looking for a long time has been intentionally practiced to attract consumers, though it was illegal. Tilapia culture in Japan suffered from such a commodity from Taiwan in the 1980s.

Japan also started adopting the HACCP system, but this is still a long way to solve the problems of imported fish safety, because of long transportation time, perishability, use of antiseptics and/or food annexes, uncertainty of the production processes and its surrounding environment, and the Japanese inspection system itself. The current checking system does not include measures against problems associated with hormone disturbing substance and dyoxyne.

FAO is now asking the world for issuing the disease free certificate whenever they export live fish such as eggs, fingerlings, ornamental fish, and aquarium species. However, it might be easy to issue the certificate, but difficult to prevent disease transmission actually because fish disease problem is not so simple.

3.5 Fish-oil, fishmeal, and fertilizer

Whaling in the traditional ways was popular among Eskimo, American Indians, and Ainu tribes. They consumed meat, oil, bones and almost everything. However, an industrial whaling for lamp oil and mustache started in Bask Region in France in the 14th century. In the 17th century, European countries involved in whaling in the Arctic circle. However, this whaling terminated in 1913.

On the other hand, an industrial whaling targeting sperm whales for kerosene oil in New England in the United States began in 1712. The sailing mothership was a factory ship to dress the body and extract kerosene oil on board. The operation covered all over the world and was highlighted in the middle of 19th century. After the discovery of oil in the West, this industry declined and terminated in 1925.

Norwegian whaling with steamship also developed in 1864 and targeted fin whale. In 1924, mothership developed. This Norwegian whaling method was imported to Japan in 1899. Japan dispatched the first whaling fleet to the Antarctic Ocean in 1939.

In Japan, meat and skin are used as food. Oil from sperm whale is used for edible oil, while oil from fin whale is used for industrial use (Sato, 1983). Bones and mustaches are used for handcrafts. Extracts from various internal organs

are used as drugs, and the rest produces meal and fertilizer. Fish oil extracted from livers of shark, cod, Alaskan pollack, halibut, tuna, skipjack, and whale contains a lot of Vitamin A and D. As a result, these are used as drugs.

Around 1935, Japan produced 610,000 mt of fishmeal and fertilizer, equivalent to 3 million mt or 64.5% of total fish production of 4.75 million mt in Japan, if we converted the weight to the whole fish. In Japan, dried sardine and herring were used long as fertilizer, but in western countries there were some demand for fishmeal as feeds for livestock and poultry. It was first exported to the USA and Europe in 1930 when the price decreased drastically.

Menhaden was used as fertilizer in corn crop lands by native Indians, before white people settled in the North America. Then, fish oil was removed and the lees were used as fertilizer. In the late 19th century, they already developed fishmeal factory. In 1898, Mr. Mori also developed the first fishmeal factory in the west coast of the USA and used sardine. In Canada, Mr. Ikeda started herring fishmeal production in 1905, but such non-food production was prohibited after several-years operation. In England, non-edible portion of fish were used for fishmeal production and used domestically as well as exported to Germany. In Russia, fishmeal was produced in the late 19 century and exported to Germany since 1910. In Germany, there was no fishmeal production but the country imported a lot of fishmeal for feeds.

As livestock, poultry, and fish culture industries developed, demand for fishmeal increased. In 1972, anchovy catch off Peru decreased drastically due to *El Nino* and overfishing. As a result, fishmeal import from Peru to the United States was not expected, resulting in soybean embargo by the US government. Consequently, *Tofu* (soybean curd) price in Japan increased 3-4 times. Japan imported 432,032 mt or US\$ 296 million of fishmeal in 1997. Major exporting countries were Chile, Peru, Ecuador, Russia and the United States. However, these supplies are greatly influenced by *El Nino* in case of sardine and mackerel based brown fishmeal and over-fishing in case of Alaskan pollack and founder based white fishmeal.

The rise of fish culture in Japan is also associated with the rise of sardine catch in the 1970s and 1980s. This is because sardine and other small pelagic species are directly used as their feeds. Decline in sardine catch hit Japanese fish culture hard in the 1990s.

As people's life style change since the 1960s, pet food became another market opportunity for fish. This is a higher value-added opportunity than ordinary fishmeal.

3.6 Kelp as drugs and resource enhancement

Many marine species are sources of drugs, but kelp is unique in terms of many other contributions. Kelp (*Laminaria* sp.) contained a lot of iodine. It was essential to prevent iodine deficiency disease in China. Accordingly, dried kelp was used as drugs for a long time in China. Japan exported dried kelp to China since 1821. Although kelp export to China stopped after World War II, China became a largest kelp producing country. In 1969, kelp culture was developed in both China and Japan. In 1972, Japan first imported kelp from China. At present, China produced 400,000-500,000 mt (dry weight) of kelp. This amount is more than 10 times higher than that of Japan. This is because kelp is used in many ways such as drugs, foods, industrial resources as compared with the use as special foods in Japan. In addition, kelp was used in China not only for drugs but also for spawning and nursing beds as well as prevention of eutrophication, red tide and blue tide, resulting in fisheries resource enhancement

China's fisheries production rapidly increased from about 10 million mt in 1987 to 39 million mt by 1998 of which more than 10 million mt were from East China Sea. In the same sea, Japan exploited in the post-war period with the peak of less than one million mt of fish production excluding pelagic species such as sardine. There is no reason of this increase in fisheries production in East China Sea except for the cultured kelp bed stretching for 1,300 km from Tairen (north) to Fukken province (south) (Sakai, 1997). This provided a non-intended man-made marine forest, largest in the world. They plant seeds every December, let them grow from January to June, spawning and nursing periods of all varieties of fish and marine organisms, and harvest them in April through June.

From resource enhancement and environmental impact points of view, mangroves and coral reefs in the tropics have the same functions as kelp in the temperate zone.

3.7 Marine organisms as potential resources

Seaweed has commonly been used as food, drugs, fertilizer and other industrial use (Ochi, 1996). As foods, Kelp

(*Laminaria* sp.), *Asakusanori* (*Porphyra* sp.), *Aonori* (*Enteromorpha* sp.), *Wakame* (*Undaria* sp.), *Hijiki* (*Hijikia* sp.), and *Mozuku* (*Nemacystus* sp.) have been important. *Asakusanori* culture has more than 500 years history, and *Mozuku* culture developed in Okinawa in the 1980s. *Makuri* (*Digenea* sp.) is used to use as santonin while *Funori* (*Gloiopeltis* sp.) is a raw material for textile binder. However, their functions have been recognized more than their traditional use. As a healthy food, dried seaweed salad was first sold in Japan in 1983 and the industry is now about to reach US\$100 million business, seeking for *Wakame* (*Undaria* sp.), *Aosa* (*Ulva* sp.), *Tosakanori* (*Meristotheca* sp.), *Kirinsai* (*Eucheuma* sp.), *Iwazuta* (*Caulerpa* sp.), *Suginori* (*Gigartina* sp.) all over the world. Seaweed contains high vegetable fibers, minerals, and vitamins. These have special value to human nutrition and health. Agar made of *Tengusa* (*Gelidium* sp.) has been traditionally eaten as agar. The agar production method was imported from China to Japan in the 8th century. Dried agar was invented in Japan in the 1660s and massively produced in the 1780s and exported to China. In Ireland, agar has been used to produce fruit pudding and emigrants from Ireland to America expanded the market for agar.

Until World War II, Japan produced 95% of agar in the world, but the agar became widely used as raw materials not only for food, but also for beauty aids, medical and other industrial use. World production of agar has increased from 2,800mt in 1939 to 7,000mt at present and Chile now produces 80% of agar. Spain, Turkey, Korea, Taiwan and China also produce agar using *Ogonori* (*Garacilaria* sp.) and *Tengusa*.

Carrageenan extracted from *Kirinsai* (*Eucheuma* sp.) and *Tsunomata* (*Chondrus* sp.), and *Suginori*, is another important source of raw materials for a jelly; stabilizer for ice cream, chocolate, juice, ham and sausage, yogurt and cheese; emulsion; binder; beauty aids; tooth paste; textile size; and capsule of medicines.

Seaweed has potentials for producing pulp, paper, and plastic as chemicals; fertilizer particularly for citrus fruits, apple, cabbage, potato, tomato, strawberry, cucumber, egg plant, melon, water melon, spinach, lettuce, herbs, and rose; feeds; anti-oxidizers of foods; medical use such as sex attractant, agglutinins, antibiotics, and anti-tumor substance. Many marine organisms such as puffer fish, sea urchin, and lion fish contain high levels of toxin which may be used as

medicines. On the other hand, some species become toxic and cause food poisoning when people eat fish during spawning season such as oyster, early spring such as clams and scallop, and in tropical regions such as cigatera fish eating toxic organisms. Thus, marine organisms require special care if we wish to utilize wisely.

Since the effects of EPA in the 1960s and DHA in 1989 in unsaturated fish oil were reported, fish has been paid much attention as a healthy food (Suzuki, 1992). EPA prevents or cures circulatory organs' troubles such as arteriosclerosis and myocardial infraction while DHA promotes one's memory by activating activities of brain and retina. These EPA and DHA are also paid much attention because of their effects as carcinostatic substance and anti-allergic substance.

Amino acid such as Taurine, Peptide, and Protein contained in fish are also contributing to the maintenance of health without causing serious secondary effects. Search for drugs curing incurable diseases such as cancer and AIDS caused by HIV, and keeping young is just starting. Sponge, shark, horseshoe crab, and Coelenterata are paid much attention as candidates for such drugs recently (Anonymous, 1998).

Marine organisms also contain much higher level of organic arsenic than land organisms, though the lower trophic level is, the higher the level of organic arsenic. Most of organic arsenic contained in marine organisms are alsenobetain and not toxic. Thus, marine organisms organize arsenic, resulting in removal of toxin of inorganic arsenic. This finding has an implication for preventing pollution from high technology industries using arsenic.

4•CONCLUSIONS AND RECOMMENDATIONS

Food security of any nation will be increased by food diversity, including varieties of fisheries species in the people's diet. However, it is a difficult task to increase fisheries production without risk of depletion. Past lessons should be learned. Resource impacts of each action and fare share of responsibility by each actor must be taken into consideration in the management for responsible fishing, marketing and consumption of fisheries commodities.

In addition to the conventional use of fish as food, drugs, and raw materials, most marine organisms are not utilized

yet. New utilization will be expected in all areas. Seaweed, coral reefs, and mangroves absorb carbon dioxide, nitrogen and phosphate; prevent eutrophication, red tide, and blue tide; and enhance fisheries resources.

In conclusion, cultural and food diversities are essential for the human survival in the 21st century. As healthy food, drugs, raw materials, ornamental use, and contribution to solutions for environmental problems, there is a great potential in fisheries and fish trade if the resources are wisely managed under the WTO framework.

For further information, it is recommendable to subscribe FAO's INFOFISH and glance at FAO Fisheries Circular No.817, Revision 1 (Marketing in Fisheries: A Selective Annotated Bibliography) (Anonymous, 1995).

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