Chapter V

RELATION BETWEEN AQUA-SPHERE AND HUMAN LIFE

Hisashi KUROKURA, Hirohide MATSUSHIMA, Shingo KUROHAGI, Haruko YAMASHITA, Akinori HINO, Kazumasa IKUTA, Satoquo SEINO, Masahiko ARIJI, Ken FURUYA, Junichiro OKAMOTO and Nobuyuki YAGI

The relationship between humans and other life forms is closely interlinked. Among aquatic organisms, relating with our life are the ones which contribute to the sustained fisheries. Human life has various impacts on aquatic organisms and aquatic environment. In this chapter, the history and institutions of fisheries which are deeply related with aquatic organisms are outlined. Issues on utilization of aquatic organisms and aquatic environment including fisheries are also summarized. Further, several opinions, hints and suggestions for the solution of the issues are described.

(Hisashi Kurokura)

1. FISHERIES INDUSTRIES IN JAPAN

1.1 Modern and contemporary history of fisheries in Japan

1) Conflicts arising due to development of fisheries technology

In the early Edo period (1603–1867), fishermen who lived in east Seto Inland Sea of Japan and Kinki Area dispersed and settled along various coastal locations in Japan and practised their advanced fisheries technology using net. For example, Tsukuda jima (Tsukuda Island) in Tokyo is a reclaimed land produced by immigrant in the early Edo period from Tsukuda mura (Tsukuda village) in Settsu (old name of Osaka). They implemented fishing in Tokyo Bay after obtaining the fishing rights from Tokugawa Government. Although the immigrants carried advanced technologies to Edo (old name of Tokyo), there were several conflicts between the immigrant and local fishers who implement fisheries from olden times in Tokyo Bay. Advancement of fisheries technology continued throughout the Edo period. In addition to development of each individual technology, highly organized collective fisheries were also born in this period. Collective fisheries of whale by spearfishing seemed to have started in the early 17th century around Taichi, Wakayama and well organized net-fishing of whale was formulated by

Kakuemon Taichi in Taichi in 1677 to increase the efficiency and safety. The technologies and systems were widely accepted rapidly in west Japan. Beach seine in Kujukuri beach, Chiba, was developed from 17th century and reached peak in the Edo period due to the demand of dried sardine as fertilizer for agriculture in backland. It is said that the seine net technology came from Kinki.

Modernized fisheries using large scale fishing gear and engine rapidly developed during the Meiji period (1868–1912). The first fisheries exposition was held in 1883 and mechanical knitting machine was set up in that year. The machine enabled production of large size nets. A new type of purse seine net was introduced by the United States and tried in Iwate Prefecture in 1889. After that, encircle net technology such as improved sardine seine net have been improved and new technologies were popularized rapidly at various locations because of high fishing efficiency. The development of new technologies caused conflict between fishers using new technology and classic technology. In 1892, a conflict between beach seine fishers and purse seine fishers took place in Kujukuri Beach, and the use of beach seine in Kujukuri Beach declined after that. Conflict also occurred between the net fishers in Hiroshima and line fishers in Ehime in the Seto Inland Sea of Japan in 1893.

Fishing area also expanded with the improvement in fishing technology. The Japanese and Korean fishers fought in Jeju Island in 1891 and Japanese fishers were attacked on the Korean peninsula in 1895 killing five fishermen. Traditionally, vessel seine fishing such as bottom trawling have often caused serious conflicts with the other fishing. Previously, Wakayama Prefecture restricted sail trawl in 1982. In the same year, steamship trawl was introduced in the United Kingdom and research for trawl fishing started in Japan, though the vessel was burned down in an arson attack in 1908. A test cruise of the sail trawl vessel, Kaikoumaru, was implemented in 1904. In 1907, trawl fishery was performed in Hokkaido after which it became popular in various locations. Objections to trawl fisheries were strong and alliance for ostracism of trawl fishing was established in Fukuoka in 1908. After these social actions, regulations for engine boat trawl were established. Also, an amendment of fishing law came into being in 1919. License system was introduced for engine boat trawl. However, the conflict between engine boat trawl and other fisheries was not resolved. Enforcement of regulation was petitioned in 1910 and campaign for abolishment of engine boat trawl was launched in Kochi in 1929 that led to violence in Chosi in 1932. The developments in fishing technologies and expansion of the fishing areas led to various conflicts. These negative sides must be remembered when we look back at the history of fisheries in Japan.

It is the highest-priority issue in fisheries policy today to realize sustainable fisheries, solving the problem of excessive pressure caused as the result of improvement of fishing efficiency by modernization of fisheries related technology. In the long history of fisheries, control of fishing pressure have often been issued and discussed. The cause for the conflicts among fishermen described above was the depletion of fish stock. After recommendation of whale moratorium in UN Conference on Human Environment, whale stock issue have been seriously

discussed Japan. However, this issue had been a source of conflict in the early history of modern whaling technology. Norwegian harpoon gun whaling started in mid 19th century. When floating factory ship for whale appeared, Paul Sarasin warned against depletion of whale stock in 1910 and anti-whaling movement began in France. In 1930, the International Whaling Convention was signed. It is said that the convention was not only aimed at conservation of stock but also at the production kartell of whale oil. However, the Convention was the pioneer of multilateral fisheries regulation in high sea. When crab cannery boat fishing started in Japan in 1921, stock depletion soon became an issue within a short period, and the Crab Cannery Boat Fisheries Regulation Law was announced officially in 1923. In 1929, Depot Ship Salmon and Trout Fisheries Regulation Law was enacted. This was introduced to prevent and warn about the depletion of salmon and trout stock caused by popularization of efficient fishing methods. In 1937, Seto Inland Sea of Japan Fishing Regulation Rule was published.

2) Development of fishing technology and scaling up/expansion of fishing area

Not limited to encircling net and trawl net, modernization of fishing technology progressed after the Meiji period. Hidaka, Ueno, and Tosa type set nets were devised in 1910, 1912 and 1919, respectively. Fish gathering lights were tested in 1890 at the Misaki Marine Biological Station of The University of Tokyo. Fish-finder was devised in Norway in 1935. In addition to the improvement of fisheries technology, major factor in the development of fisheries was the development in other related engineering technology such as mechanization and growth in the size of ship, navigation and communication technology. With the motorization of fishing vessel and test operation of the oil engine boat performed in 1894, the Shizuoka Fisheries Experimental Station constructed an oil engine boat, Fuji-maru in 1906 and diesel boat was used for skipjack fishing in 1920. In 1912, the Manila Fiber Spinning Company was established. In 1914, test operation of floating cannery was implemented for salmon and crab fisheries. Net hauler for bottom trawl was devised in 1917. Steel vessel for skipjack fishing and diesel trawling vessel were constructed in 1921 and 1927, respectively. Radio telegraph equipped vessel was constructed in 1918 and radio telegraph equipment was installed in the trawl vessel.

The fishers expanded their fishing area even before the development of structural strength of vessel, telecommunication and navigation technologies. As a result, many distressful marine accidents took place. The notorious mass destruction of whale fishers in Taichi occurred in 1878. In 1892, mass destruction of saury fisheries occurred in Kumano coastal sea. The number of deaths and disappearances was 229. After that, mass scale deaths and disappearances occurred in 1895 (551 in Kagoshima), 1905 (skipjack fishery in Kagoshima, more than 300), 1906 (886 in Nagasaki and Kagoshima), 1909 (224 in offshore Kochi), 1910 (1,106 in offshore Bouso), 1911 (skipjack fishery in Yaizu, 114), 1921 (115 in Toyama), etc.

Sizing up of vessel and modernization of navigation and communication technology saved fishermen from deaths, reduced marine accidents, and

simultaneously enabled the expansion of fishing areas and hours of fishing operation. As a result, large scale fishery companies appeared and industrialized fisheries were enabled. As early as in 1897, Distant Water Fisheries Fosterage Law was published. The Japan Distant Water Fisheries Company was established in 1899 and the company succeeded in Norwegian whaling. In the following year, the company was given special permission by the Empire of Korea for whaling in coastal waters of Korea. In 1904, Japanese fishing vessel went to Alaska for fishing. The largest four whaling companies in Japan merged in 1909 to form the Oriental Whaling Company Limited. In 1911, Tamura Engine Boat Fisheries Division (a core of the present Nissui Co. Ltd.) was established. In 1912, Japanese vessel began fishing in Singapore waters. Nichiro fishery company (one of the roots of Maruha Nichiro Holdings) was established in 1914. In 1920, Hayatomo Fishery Study Group (the root of Central Research Laboratory of Nissui Co. Ltd.) was established. The Crab cannery boat fishery started in 1921. Hyashikane store (a root of Maruha Corporation) was incorporated in 1924. In 1928, Japan and USSR fisheries treaty was signed. In 1931, pearl oyster culture started in Arafura Sea. First whaling in Antarctic Ocean by Japanese vessel was performed in 1934 and the first domestic whaling mother ship, Nisshin-Maru, was launched in 1936. In the same year, trawling vessel, Himezi-Maru, was operated offshore of Argentina by Kyodo-Gyogyo Co. Ltd., the company recomposed from Tamura Engine Boat Fisheries Division in 1919. In 1937, Kyodo-Gyogyo incorporated with Japan Food Engineering Co. Ltd. and was named Nihon Suisan Co. Ltd. This was the birth of the first all-round fishery company in Japan, which had industrialized fisheries, processing and trading division. Kyokuyo whaling company was established the same year. Tuna fishing in tropical area started and first 1,000 t class trawling vessel, Suruga-Maru (991 t) was launched in 1938. The late Meiji to the early Showa was the period of establishment of modern fisheries industry, expansion of fishing area and expansion of fisheries operations overseas.

Advancement of fishing technology and expansion to distant seas continued till the 1960s, except for the stagnation period after defeat in the second world war. Technological improvements in the period from the second world war and after, were focused on material and information sector and improvement of fish finders. The Toyo Rayon Co. Ltd. started the sale of synthetic fishing line in 1942. Test operation of radio buoy was successfully conducted in 1947. Use of fish finder began in 1948. Test for practical use of synthetic fishing net was performed in 1949 and radio stations were constructed in Tago and Shimizu. Radio transmission systems were used on fishing vessel in the same year. Continuous automatic squid angler was devised in 1951. Power block was devised in the United States in 1952. At this time, antibiotics were popularized and usage of tetracycline on fishing vessel was approved in Canada for maintenance of freshness. This was the origin of the future problem. In 1954, stern trawl vessel was developed in the United Kingdom and safety of fishing operation increased. In Japan, synthetic buoy was released in the market. By 1956, use of synthetic nets was popularized. In 1957, use of tetracycline was approved also in Japan for trawl fishing in east China Sea. Stern trawl vessel was constructed in Japan after 1957.

In 1965, the first fiber reinforced polymer (FRP) vessel was constructed. Sizing up of the vessels progressed continuously, and in 1966, 4000 t class trawl vessel was constructed. In 1968, the 1,000 t class purse seine vessel was constructed. At the time, use of reel for long line was popularized and automatic skipjack angler was devised.

Depending on these developments in technology, fishing operation area of Japanese vessels expanded all over the world. In 1951, the Taiyo Gyogyo Co. Ltd. (former Maruha Co. Ltd.) began fishing in the Arabian Sea. This operation was performed as technology cooperation with India. Japanese government supported shift of coastal fishing to tuna and skipjack fishery in distant sea. The catchword of the movement was "from coast to offshore and from offshore to distant sea". Under these circumstances, Myojin-Maru, a distant sea fishing vessel found Myojin reef in 1952 and Fukuryu-Maru V, a distant water tuna fishing vessel, was exposed to radiation of the hydrogen bomb tested by USA in Bikini Atoll in 1954. In the same year, the Mitsubishi Trading Co. Ltd. operated fisheries using the port of Samoa as their base. This is the beginning of tuna fisheries basing their ports in foreign countries. In 1956, the Fishery Agency of Japan sent a research vessel to Latin America. Taiyo Gyogyo Co. Ltd. bought the whaling fleets in foreign countries in 1957 and 1961, and the Kyokuyo Whaling Co. Ltd. bought a whaling fleet from UK in 1960. Japan's whaling activity peaked in 1962. Tuna fishing in Atlantic Ocean by Japan achieved full commercial level after 1957. Kyokuyo Whaling Co. Ltd. succeeded in long line fishing of sea bream in waters off New Zealand and implemented shrimp fishing on the northern coast of Australia in 1964. Taiyo Gyogyo Co. Ltd. performed trawl fishery in the North Atlantic Ocean in 1967.

Innovations in food processing and distribution technologies were the other important factors for increased consumption of fisheries products. Particularly, onboard processing and preservation technology became indispensable for the development of distant sea fisheries. Onboard-quick freezing method was studied during relatively early phase of development of distant sea fishing. Hayatomo Fisheries Research Institute constructed trawl vessel which had onboard quick freezing facility in 1930 itself and in the same year fish meal factory ship was constructed. Technologies for distribution were also important for increase and popularization of consumption of fisheries products. Foreign sales of canned salmon started in 1910 and canned tuna was exported to USA in 1929. Ministry of railroad made live fish cars in 1931. Fisheries by boat with freezing facilities started in 1940. After second world war, in particular from 1954, fish sausages were prepared and sold. Frozen minced fish flesh technique was developed by Hokkaido Fisheries Experimental Station in 1960. At that time, production of frozen meal exceeded 1,000,000 t. "Kani-Kama" is commonly consumed food now. The first "Kani-Kama" was produced by Sugiyo, a food processing company in Nanao, Ishikawa, as "delicacy Kamaboko, crab feet" from cuts of stained and flavored Kamaboko.

3) Impact of society on fisheries

As described above, the development and propagation of fisheries technology

strongly related to developments in agriculture and transportation. Increase of purchasing power and development of market were also necessary for the development of fisheries, which strongly influenced the development of other industries and changes in life style of ordinary people. The conflicts between fishermen and people involved in marine tourism such as fishing and diving sometimes continue even today. However, fishermen also sometimes enjoy fishing and diving and economic effects on local community cannot be neglected. It can be said that fisheries and marine tourism are mutually supportive in several ways. For example, angling as a hobby was popularized in the Edo period, and several books on angling were published. Uneme Tsugaru published "*Kasen-Roku*", a technological guide book for angling and fishing goods, in 1723. This is only less than 100 years after publishing of "*The Compleat Angler*" written by Izaak Walton in England in 1653. Before that, fishing gears such as line and hook had been made by fishermen. Craftsmen who produced fishing gears such as hook and pole appeared in various locations sharing the information of fishing tools. New devices for improvement of hook, float, rod and other fishing tackle had the influence on gears for commercial fisheries. On the other hand, existence of recreational fishers is an obstruction to fishery business. The conflict between fishermen and recreational fishers already existed even before the Second World War. National Convention of Japan Fisheries Cooperative discussed restriction of recreational fisheries in 1934 and fishermen in Chiba fought against fishermen whose vessels left from Kanagawa with recreational fishers in the next year.

Fisheries are strongly influenced by activities of the other industries. Among them, industrial effluents have caused heavy damage to fisheries. Laver (Nori) culture suffered a heavy damage by effluent from a British vessel in 1928. In 1935, law for protection of Tokyo Bay was discussed and a dispute for landfill of laver culture ground was legally settled. In 1938, Tokyo Bay Water Quality Conservation Association was established by fisheries related groups to fight against factories in the area. Inspite of the efforts, pollution of the seas and its damage on fisheries continued after the Second World War. In 1955, prefectures around Ariake Bay made a petition to government for damage control of agricultural chemicals. As is well known, 1956 is the year of Minamata Disease Outbreak, and the fishermen in Minamata broke into the Minamata factory in 1959. In 1958, Honshu Paper Company caused pollution in the Edo River and fishermen in Urayasu fought against police. In the same year, the National Convention of Fishermen for Prevention of Water Pollution was held. Fishermen in Mie Prefecture objected to the construction of atomic power plant in 1966. Fishermen also objected the rocket launching experiment in Tanega-shima in 1967. Awareness of the seawater pollution problem in the Japanese society started with pulp waste pollution in Tagonoura and National Fishermen Indignation Meeting for Prevention of Pollution was held in 1970. The Water Pollution Prevention Act and Laws Relating to Prevention of Marine Pollution and Maritime Disaster were enacted in the year. In the same year, mercury pollution of canned tuna came to light in USA. In 1972, PCB pollution was discovered in fish and fish pollution became social issue in various locations in Japan. The accident involving

the atomic ship, Mutsu caused leakage of nuclear radiation and heavy fuel oil spill in Mizushima in 1974. Despite the large scale oil spill from tanker in France in 1978, oil spill accidents from tankers have continued even after causing serious impact on fisheries. In 1979, a Russian tanker was stranded in Japan and serious damages were caused by oil spill on the coast of Hokuriku.

Fisheries are often influenced by diplomacy and international economy. The allied occupation force of USA laid down antisubmarine net in Tokyo Bay and the fisheries suffered serious damage caused by the net in 1950. Japanese Government provided consolation payment to fishermen. In the same year, Japanese fishing vessel was seized by China shocking the trawl fisheries related parties in East China Sea. Seugman Rhee, the first president of the Republic of Korea declared the so called Rhee Seugman line in 1952. The first Japan and Korea meeting could not make any agreement because of the Rhee Seugman line and the Claim of Right conflict. After the meeting, many Japanese fishing vessel were seized by Korea and many fishermen were detained. In 1959 many detainees escaped from the camp. A Japanese fishing vessel was overwhelmed by Korean patrol boat in 1960. Korean government claimed that the vessel was scuttled by herself. In this year, all detainees were released. However, Japanese fishermen had to wait until the conclusion of Japan-Korea basic treaty in 1965 for the establishment of fisheries agreement between the two countries. During the 13 years for the establishment the agreement, 3929 Japanese were detained, 328 vessels seized and 44 fishermen killed and injured by Korea. Even after the agreement, fisheries vessels were not operated around Takeshima. Northern Territories problem was also a diplomatic issue which had a deep impact on fisheries in Japan. General Head Quarter of the Allied Force (GHQ) prohibited operations of Japanese fishing vessel in distant waters. The recovery of independence of Japan by The Peace Treaty with Japan in San Francisco reopened the distant water fisheries of Japan in 1952. After this, Japan started fishery negotiations with Soviet Union, and following serious negotiations about the Northern Territories problem, Ichiro Kohno, Minister of Agriculture signed the Japan-Soviet Fisheries Treaty with Prime Minister Bulganin, on 15 May 1956. This agreement declared on 9 October 1956 pushed the negotiation for diplomatic relation between Japan and Soviet Union and restored the relations between Japan and Soviet Union. By the declaration, the fisheries treaty became effective. The operation in Bering Sea restarted in 1957. However, the restarted north-sea fisheries were always faced with the tight fishing quota and frequent seizures by the border control of Soviet Union. Detentions by Soviet Union were sometimes protracted and fishing vessels were often confiscated. In 2001, Russia opened coasts of four islands in The Northern Territories and permitted the Korean fishing vessels to carry out saury fishing. From the standpoint of Japanese government, it meant that fishing license in EEZ of one's own country was issued by another country neglecting Japan's claim. The Japanese government was shocked and protested to Russia and Korea, and canceled the quota of saury fishery to Korea in the Sanriku coast. The cancellation stimulated anti-Japan sentiments in Korea. This is an example of impact by diplomatic issue and border disputes on fisheries.

4) Globalism and international fisheries

International fisheries in the period of rebuilding after the Second World War

United Nations was established just after the Second World War by the victorious nations. First largest concerns of United Nations in the period were rebuilding of war damaged European and Asian countries and reduction of starved and malnourished people. After the establishment in 1945, the United Nations first established the Food and Agriculture Organization (FAO). The FAO was to first tackle the issue of how to distribute food to starving countries. Possibility of increase of fisheries production for increased food security received attentions. Fish was the main food item in Asian countries where people suffered serious food insufficiency and it was thought that fishery was one of the most easy to develop industry. At that time, the high seas did not belong to anyone and contained unlimited fish stocks. In the general assembly of FAO in 1946, it was said that "Fishing grounds all over the world are filled with various kinds of fish. Fish are international stock. Particularly in developing countries, fish are waiting to be caught". However in reality, signs of over fishing already appeared in several parts in the northern hemisphere such as the North Sea and coast of Britain. Twelve countries in Europe, such as the United Kingdom, Belgium, Denmark, etc., held a over-fishing conference in London in 1956. They could not agree on the total catch amount, although they adopted the London Convention's minimum mesh size, applicable fish species and body length, minimum body length for landing and sale. The Convention regulated fisheries in northeast Atlantic Ocean until the establishment of North East Atlantic Fisheries Commission (NEAFC) in 1959. FAO recommended establishment of local council in each locality for fisheries stock development dividing the global ocean into Northwest Atlantic, Southwest Pacific and Indian Ocean, Mediterranean Sea, Northeast Pacific, Southeast Pacific, Southwest Atlantic, Southeast Atlantic and Indian Ocean. Indo-Pacific Fish Conference (IPFC), General Fisheries Commission for the Mediterranean (GFCM), and the International Commission for the Northwest Atlantic Fisheries (ICNAF) were established in 1948, 1949 and 1949, respectively.

The recovery efforts including the activities of FAO helped recover the per capita agriculture and food production in the world in 1952 to the level before The Second World War. After that, surplus production issues have attracted global interest. FAO shifted their activities to the prevention of surplus production as antirecession policy with the distribution of surplus food. In the fisheries sector, total catch yield of reported countries in the 1950 increased 9% from its 1949 level and attributed 14% increase from the 1938 level. In the Sixth General Assembly in 1950, FAO expressed an opinion that total fish catch in the world could be doubled without damaging the stock conditions. At that time, FAO believed that space for increase of fisheries production was still remained. However, total fish catch in the world was forecasted to stay in the existing level because of low effective demand of fish, and due to decrease in recovery aid, as predicted growth of fish catch stagnated through the 1950s. However, fishing related technologies continuously developed. As described previously, the fishing

effort by Japan from 1940 to 1960 still continued to expand. Not only in Japan, the geographical expansion and increase of fish catch were realized in many countries during the 1960s and 1970s. Simultaneously, the development caused over-fishing. In that period, the activities of FAO focused on technological issues directly relating to development of fishery resources and increase of food production.

Development of developing countries and expansion of fishing ground

After the late 1940s, many Asian and African countries consistently gained independence from colonial powers. Asia Africa Conference (Bandung Conference) was held in 1955. 1960 was called the Year of Africa. Aids for developing countries gradually increased in the 1950s. Specialized organizations in United Nations commenced with FAO implemented technical assistance in various sectors for economic development of developing countries, though the scale was too small to respond to various request from developing countries. The World Bank gradually shifted its focus from aid for rebuilding to aid for development in the 1950s. Despite various aids in the 1950s, economic disparity between developed countries and developing countries increased. Therefore, solution to North-South problem was recognized as an important issue in the 1960s. In the agriculture sector too, solution to the North-South problem was important in the 1960s. Excess production and piling up of surplus products were a problem in developed countries and, on the other hand, starvation and malnutrition caused by underproduction existed in the developing countries. In addition to the underproduction, downslide of the prices of agricultural products encumbered the developing countries, where primary products were the main export items. As a countermeasure for the problem, FAO started anti-starvation campaign from 1960. World Food Plan, originally called the Surplus Food Utilization Fund, was jointly started by FAO and UN in 1961. World Food Conference was held in 1963. FAO/the International Bank for Reconstruction and Development (IBRD)'s collaborative planning was started in 1964 to accelerate the money flow for agricultural development. FAO strived positively to find a solution to the North-South problem.

The First (1958) and the Second (1960) United Nation Conference on the Law of the Seas were held. The discussions in the conferences stimulated the countries to enlarge their maritime borders and fisheries zone. In order to compensate for the decrease of the fishing ground by the restriction of coastal countries, the FAO performed researches for the development of new fishing grounds. In the western world, decrease of fish stock in traditional fishing grounds occurred in addition to the decrease of fishing ground. Many countries encouraged distant water fisheries to compensate for the decrease of fish catch, and construction and modernization of large fishing vessels was implemented. As a result, fishing activities assumed international character. Fish catch increased rapidly in the 1960s because of development of fishing technologies, discovery of new fishing grounds supported by modernized large vessels, and increase of catch of anchovy off the coast of Peru. Also in developing countries, fishing activities were mechanized and catches increased. The growth was extremely

rapid compared to the growth in population and other agricultural production. Contribution of fisheries products to animal protein supply became more important than before. Not only the importance as supply of protein sources, but also the developments of fisheries industries were considered as the measure for acquisition of foreign currency. As a result, world trade value of fisheries products increased twice during the decade of 1960s. Export values of developing countries expanded far more rapidly than those of developed countries, particularly in Latin America, Oceania and Far East countries.

International environment conservation and stock management

With the expansion of fishing grounds, international regulations for fisheries activities were required. In order to carry out their responsibility as global center of rational utilization of fisheries resources, the FAO established the new regional fisheries organizations and Committee of Fisheries (COFI) in 1965 as an umbrella organization for regional organizations.

Beside the North-South problem, environmental awareness also increased during this time. A symbolic event of the trend was UN Conference on the Human Environment in 1972, which was held under the slogan of "irreplaceable earth". The background of the conference were the global environmental issues caused by rapid economic development in developed countries in the 1950s and the 1960s such as acid rain, and limitation of environmental resources such as air and water, which were previously thought as limitless. Just before the Conference, "*The Limits to Growth*" published by Rome Club created deep shocks all around the world. In the conference, UN declaration on the human environment issued in Stockholm in 1972 declared that environmental issue was a threat to human being and international working for the solution of the issue was necessary. Thus International Environmental Action Plan was adopted. Following the declaration, United Nations Environmental Programme (UNEP) was established in the same year and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, Washington Treaty) was established in the next year. Also, in the fisheries sector, increase of fish catch due to the expansion of fisheries ground, degradation of fish stock and necessity of regulation were pointed out in various fishing grounds around the world including the developing countries. The FAO pointed out in 1967 that undeveloped fish species which could be caught by fishing method at that time would survive for 20 years. If the development of new fish species continued at the speed, the development would affect the ratio of species which would need proper regulation. It further concluded that compensation of decrease in catch of developed fish by increase in catch of newly developed fish would increasingly become difficult and the development of proper fishery management was necessary. Another important event in the conference was adoption of recommendation of whaling moratorium proposed to International Whaling Commission (IWC) by the United States. The moratorium was voted down in the commission in the same year. However, this was the opening of the trend in which outside voices became stronger in places of international policy decision on fisheries. It was the time of change from expansion to rapid decrease for distant water fisheries. Following this event, relative importance of offshore

and coastal fisheries increased in Japan. In the same year, COFI strongly claimed that FAO should take leadership for the technological issues for preservation and management of global fisheries stocks.

World total fish catch increased more rapidly than production of the other agricultural products throughout the 1960s. The average annual increase reached 6.6%. However, with the stagnancy of fish catch after 1971, deficiency in supply became prominent. As reasons for the stagnancy, deep curtailment of anchovy fishing in Peru, expansion of fishing restraining area, depletion of resources caused by overfishing, and impact of oil shock to distant water fisheries could be listed. Under these conditions, FAO hosted International Technical Conference for Fisheries Management and Development in 1973 with participation from 70 countries and international organizations. In this conference, the relation of excess investment, subsidies and open access to stock depletion was discussed and it was recognized that fisheries resources were not unlimited and countermeasures for resource conservation were often too late. It also recommended that measures for resource management should be taken as soon as possible, even if inclusive scientific and economical information were lacking. In the same year, Rules for Conservation of Important Fisheries Resources on the coast of North America was adopted in the International Commission for the Northwest Atlantic Fisheries (ICNAF), and North East Atlantic Fisheries Commission (NEAFC) introduced country quota system for each species. However, many fishing countries were still opposed to resource management. With the increasing demand and decreasing supply of fish, inflation after 1971 caused by finance and economic policy of USA pushed up the fish price by a large margin. The increase in fish price created global interest not only for management of excessively utilized fish stock but also catch and utilization of unutilized fish species, utilization of trash fish species and decrease of losses in processing and transportation. In addition to these trends, the possibility of increase of production by aquaculture gradually became global interest.

United Nations Convention on the Law of the Sea and Exclusive Economic Zone

On the last day of the third term of the third United Nations Ocean Law Conference in 1975, unofficial draft regarding the 200 nautical miles exclusive economic zone (EEZ) was distributed. This triggered the trend of 200 miles EEZ. Many countries including United States and Soviet Union established the 200 miles EEZ and practically the age of 200 miles EEZ started. Two main impacts were expected by the establishment of the EEZs. One was redistribution of fish stocks from maritime states which had highly developed distant water fisheries industries to coastal countries. Back then, fisheries products were important food source which contributed 40% of animal protein source in developing countries, and the redistribution provided large benefits to developing countries. The other one was the worldwide incentives for fish stock managements. Exclusive rights would provide incentives to coastal countries for management of fisheries stock in order to maximize the benefit including possible future benefits. Establishment of EEZ was expected to trigger the improvement of fish stock management. FAO

started the Program for Assistance in the Development and Management of Fisheries in their Exclusive Economic Zone (EEZ Program) in 1979. The objectives of this EEZ Program were capacity improvement for stock development and management in coastal countries, acceleration of rational utilization of fisheries resources in developing countries, and support to developing countries for keeping larger benefit from fisheries resources. The other role expected with the establishment of FAO was the management of the high sea fisheries resources which straddled EEZ of several countries, migrate into high seas or among several EEZs. The importance was also recognized by COFI which discussed about the management of high sea fisheries resources in 1981 and 1983, though tangible countermeasures were not implemented and the discussion was not placed on the agenda after that for a while.

After a long discussion for nearly 10 years, the United Nations Convention on the Law of the Sea (UNCLOS) was finally adopted in 1982. Following the Convention, FAO held the World Fisheries Conference for Fisheries Management and Development in 1984. About 1,500 people from 147 countries, more than 60 international organizations and NGOs participated in the conference. The conference made a record in history of world fisheries due to its number of participants and social status. Major purpose of the Conferences was to review the problems in fisheries management and development in order to accelerate optimal utilization of fisheries resources from the view points of economy, commonwealth and nutrition, contribution of fisheries to world food security, self-reliance of developing countries in fish resource management and development as well as international cooperation between the developed and developing countries or among developing countries for fish resource management and development. The conference adopted action plans to address five areas namely, Planning, management and development in fisheries, Development of small scale fisheries, Trade of fisheries products, Development of aquaculture, and Implementation of fisheries for solutions to nutrient deficiency.

In the late 1970s, it was forecasted that the world fish catch would be stable and its increase would be lesser than the increase in human populations. However, actually world fish production increased with the increase of aquaculture production continuously through the 1980s. The early 1970s saw a decline in marine fish catches and aquaculture came under the spotlight as a measure to increase the supply. Prospective increase of EEZ in which many countries would lose approaches to fisheries resources increased the expectancy for future possibility of aquaculture. The FAO held a technical conference for aquaculture in Kyoto in 1976. Purpose of the conference was consolidation of achievements of a series of meetings held in various locations in the world. The conference predicted that food obtained from aquaculture would increase twice in the next 10 years and 5 times within 30 years with sufficient support funds. After that, one third of the fund accumulated for fisheries from Asian Development Bank was provided to aquaculture. Aids for aquaculture development increased four times from 1978 to 1984 and aquaculture production increased 42% during 1975 to 1980.

World fisheries products trade increased throughout the 1980s and the share of developing countries in it also increased. Sub-Committee on Trade (COFI/FT) was established in 1985 under COFI in order to cope with structural changes after UNCLOS and to increase trade from developing countries. The increase in supply and trade of fishery products was the single bright spot in agricultural sector at that time.

Global discussion concerning utilization of fisheries resources

As described above, moratorium of whaling was recommended in the UN Conference on Human Environment in 1972. The recommendation was voted down in IWC in the same year, though discussions over the pros and cons continued. Because of ecology movements, boycotting of products from whaling countries and accession of unit-whaling countries in IWC, General assembly of IWC decided in 1982 a moratorium on commercial whaling from 1986 without any support from scientific committee. Whaling countries including Japan voiced opposition to the decision. However, United States claimed they would cut down the catch quota of Japan in EEZ of United States if the commercial whaling by Japan continued and Japan withdrew the claim. As a result, commercial whaling by Japan discontinued after 1988. Despite the agreement between Japan and United States, catch quota of Japan in EEZ of United States was canceled for the cultivation of fisheries industries in United States. All along, COFI had discussions mainly on the conservation of marine mammals. The 15th COFI (1983) discussed FAO/UNEP Global Program for conservation, management and utilization of marine mammals and agenda of the World Conference for Fisheries Management and Development in 1984 when COFI confirmed the cooperation to activities for conservation of marine mammals. However, duplication of the activities with other international organizations such as IWC and priority of the activity in FAO remained as future problems. The Program was adopted in 1985 after several modifications in UNEP. In 1985, during the 16th COFI meeting, problems related with entanglement of marine mammals and other living organisms in fishing net and waste was discussed. This issue was propounded by the United States report in the workshop on "Destiny and impact of waste in ocean" held in Hawaii in 1984. The background of the proposal from United States was to increase the interest of the environment conservation groups in the country towards the death of marine mammals and sea birds by entanglement with fishing net and plastic products. However, the discussion was postponed to next COFI (1987) because of insufficient information and lack of the cost problem for the countermeasure. The 17th COFI Conference in 1987 concluded that it was unrealistic to prohibit relevant fisheries for the reasons of by-catch caused by normal operation of the fisheries, and it is proper for the regional fisheries organizations to deal with such issues. In the conference, several developing countries remarked that it is important to secure coexistence of conservation of marine mammals and fisheries which are the necessary resources of fishermen and the discussion of the by-catch problem from radical animal protection should be avoided. As a result, problem concerning marine mammals was not discussed in the 18th COFI (April, 1987). However, 8 months after that, prohibition of large scale pelagic drift net on the

high sea was proposed and adopted in UN general assembly mainly for prevention of entanglement of marine mammals and sea birds. Fisheries problems had been rarely picked up as priority issue in international organization except the FAO, the major organization for discussion of fisheries related issues. It was a surprise that UN general assembly picked up the floating net problems as a global priority problem and that such an important issue could be concluded easily by non-professional group without any scientific discussion. The background for the proposal was two conflicts in the North Pacific and West and Southwest Pacific. In the former region, floating net had been used for long period for salmon fisheries. Japan, Taiwan and Korea started red squid (*Ommastrephes bartrami*) fisheries in 1979. Fishers in United States and Canada were apprehended by the catch of salmons from North America by squid floating nets, while the environment group claimed that marine mammals such as seal and dolphin entangled in and died due to the floating net. The problems of salmon catches from North America on high sea had been serious conflicts between Japan and United States and Canada from the beginning of Japan's salmon fisheries in the high seas of north Pacific before the Second World War. After the war, with the abolishment of MacArthur line, Japan, United States and Canada signed the North Pacific Sea Fisheries Treaty in 1952 and some degree of management was possible. The appearance of squid fisheries deepened the conflicts. In the latter region, fleet of surface trawls targeting albacore tuna and floating net entered in the region rapidly from 1987. The South Pacific Fisheries Forum Agency (FFA) concerned with the impact on the albacore tuna resources facilitated the regulation of the fisheries from autumn of 1988 and a treaty for prohibition of fisheries using long distant floating net in South Pacific Ocean (called the Wellington Treaty) including United States was adopted. After this, the United States proposed the resolution to the UN General Assembly with Australia and New Zealand, and the resolution was adopted without any scientific discussion. The resolution requested the moratorium of large scale floating net fisheries not only in the two regions but in every regions of the high sea by 30 June 1992. On the other hand, the resolution assumed the continuance of floating net in cases when effective conservation measures based on scientific finding were introduced. All the organizations of UN, particularly the FAO, were requested to survey the floating net fisheries and their impacts on marine biological resources and submit their opinion to UN secretary general. The FAO held an Expert Consultation on Large-Scale Pelagic Driftnet Fishing in 1990 and an international symposium in 1991. They could not conclude that large-scale pelagic driftnet made any impact or threatened the conservation and sustainable management of marine bio-resources. The resolution was readopted in the general assembly in 1991 and large scale pelagic driftnet on the high sea disappeared at the end of 1992. Different from the resolution in 1989, the resolution in 1991 did not keep any space for the revival of pelagic driftnet on the high seas. Remarkable points of the resolution in 1991 are that the resolution shifted the burden of proof of scientific acceptability of conservation operation from regulators side to regulated side (fishers) and that the resolution is requesting the introduction of conservation operation based on science before start of the

operation of the fisheries (precautionary principle). It is impossible to prove the complete absence of risks before implementation of fisheries. It was apprehended that the resource development in high seas became impractical by application of precautionary principle. In fact, precautionary approach which is more flexible than precautionary principle and fit for the management of reversible phenomena such as fisheries have been widely adopted in various issues. Precautionary approach was adopted in the Rio Declaration on Environment and Development by United Nations Conference on Environment and Development (UNCED) and Code of Conduct for Responsible Fisheries were introduced. With the resolution of the UN general assembly, international environment management organization such as Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979) and CITES picked up problems of the by-catch as their target of activities through treaties for conservation of seals and dolphins. In addition to the activities outside of FAO, a feature article by FAO on "Marine fisheries and the law of the sea: a decade of change" published in The State of Food and Agriculture 1992 caused serious discussions. When many countries expanded their fishing zones in the 1970s, it was anticipated that large scale cut down of fishing fleets would happen mainly by the high sea fisheries countries and reduce the fisheries activity in the high seas, a free zone. However, the investments to large-scale high sea fisheries have actually continued. In the 1980s, increase of fish catch in their own EEZ by high sea fisheries countries was observed, and their operation grounds expanded not only to the EEZ of coastal country which have surplus fisheries resources but also to the high seas. As a result, share of fish catch from the high seas increased from 5% in the 1970s to 8 to 10% during 10 years after the adoption of UNCLOS. In addition, the total operation cost for marine fisheries in 1989 was estimated at 22 billion US dollars much higher than the total gross income. Economic waste itself was not negligible and, moreover, it was apprehended that the increase of fishing capacity by subsidies caused the depletion of fisheries resources in high seas.

Impacts of fisheries on marine bio-resources and problems caused by fisheries in high seas were often discussed as general issues from 1980s to early 1990s. These concerns pushed up the progress of international management of fisheries leading to the International Conference for Responsible Fisheries at Cancun in 1992, the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas in 1993, the United Nations Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks, Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea on 10 December 1982 relating to the conservation and management of straddling fish stocks and highly migratory fish stocks (UNFSA) in 1995, and adoption of Code of Conduct for Responsible Fisheries in FAO in 1995.

Primary issue in the 19th COFI in 1991 was the effectiveness of resolution concerning large-scale pelagic driftnet on the high seas in 1989. United States and Canada insisted on the participation of the FAO in pelagic driftnet problem because it was a matter of the UN general assembly. Japan and other countries

claimed the importance and necessity of scientific background for the decision of management activities. The contents of the discussion were technological problems such as selectivity of fishing gear. Practically the inception of the discussion for responsible fisheries was the Cancun Declaration in the International Conference for Responsible Fisheries in 1992. In east Pacific, large scale purse seine net fisheries targeted the yellow fin tuna which migrated following the dolphins. In December 1990, United States banned the import of yellow fin tuna from Mexico as the country which caught excess number of dolphins than the standards of the United States by applying their domestic law "Marine Mammals Protection Act" (MMPA) to inhibit by-catch of dolphins. Moreover, in May 1991, United States prohibited the import of yellow fin tuna products from the countries which imported yellow fin tuna from Mexico. In response, Mexico filed a lawsuit in February 1992 charging the United States with violating rules of GATT, and won the case in September 1992. However, Mexico passed on the application of result of the judgement considering negative impact to the North American Free Trade Agreement (NAFTA). With such background information, Mexico held the International Conference for Responsible Fisheries in Cancun one month before UNCED cooperated with FAO in gathering the top fisheries management officials from all over the world. Mexico's aim was to denounce the unilateral trade sanction by United States, and to fairly discuss the terms for internationally acceptable fishery. In other words, what was responsible fishery? The result was the Cancun Declaration which stated "responsible fisheries" as integrated concept of 1. Sustainable utilization of fisheries resources harmonized with environment, 2. Catch fisheries and aquaculture which made no impact on ecosystem and resources and their quality, 3. Improvement of additives during processing through fulfilled sanitation requirement, 4. Implementation of commercial activities through which consumer can get high quality fisheries products. The declaration integrated whole fisheries activities including aquaculture, processing, trade and distribution as well as fisheries management and fishing technologies in EEZ and high seas. In the UNCED held once a month after the conference in Cancun, Rio declaration was stated in which fundamental principle included precautionary approach. Agenda 21 was adopted, and fisheries related items were described in chapter 17 "Protection of Ocean, All Kind of Seas, Including Enclosed and Semi-Enclosed sea, and Coastal Area and the Protection, Rational Use and Development of Their Living Resources". This chapter included the seven action plans. For the roles of science and technology in the action plan, positive participation of FAO as singular international specialized organization for fisheries was kept as a priority reflecting the insufficient scientific discussion in UN General Assembly. The action plan in the agenda "Sustainable utilization and conservation of marine bio-resources on the high seas", recommended holding of UN conference for management and conservation of resources in the high seas, particularly for the straddling fish species (species with distribution area in and out of the EEZ) and highly migratory species. Depletion of stock in the high seas was progressing, though tangible countermeasures had not been agreed except for the obligation of cooperation. It was an established rule that

vessels on the high seas were under exclusive jurisdiction of the flag state and there was no definite rule how and when other countries can invoke the jurisdiction to the vessels of flag state for regulation. After the recommendation in UNCED, UN General Assembly formally called a conference in the year, which began in 1993 and finished in 1995 adopting the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the conservation and management of straddling fish stocks and highly migratory fish stocks (UNFSA). The agreement was the first global agreement to allow countries other than the flag states to board the fishing vessel, make inspections and lay down the protocol of the inspections. Countries in the world agreed to allow inspection of their flag ship concerning compliance with international law by other contracting country on the high seas in case they were not the member country of regional fisheries management organization.

Before the adoption of the UNFSA, another important agreement was adopted in the FAO. That was the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas. This was the agreement of the obligations of the flag states. With the shutting out of the fisheries grounds by establishment of EEZ, so called "flag of convenience vessel" had been increased after the mid 1980s. They shifted the nationality of their vessels from member country of regional fisheries management organization to nonmember country or country which had low management ability. This problem was a high priority issue in Cancun conference and UNCED. Administrative board of FAO requested FAO to draft an agreement in 1992. The agreement was adopted in general assembly of FAO in November of the year at an exceptional speed. The agreement obligates flag states license system of fisheries on the high sea and exchange of information on the fishing vessels through FAO.

International affairs in fisheries and fisheries system in Japan

The countermeasures taken by Japanese fishing company to the shut out from coast of other countries was the establishment of corporate joint venture with companies in the coastal countries and import of fisheries products. After 1971, amount of import of fisheries product have exceeded those of export. This trend has gradually increased and the self sufficiency ratio of fisheries product in Japan rapidly decreased. In addition, the world demand of fisheries products increased recently and import of fisheries products are not easy as in the past (kaimake, see Subsection 2.1). It may be true that the shut out of Japanese fishing vessels was first priority in the early phase of discussion of UNCLOS. The anti-whaling groups often have biased views, incomprehension of other cultures and racism. However, it was the same among all countries that we need to cooperate to utilize the sea for multiple purposes with other users in the economic development and globalism of industries. Particularly for the utilization of straddling fish resources we have to consider proper conservation and utilization in a cooperative manner. Sea is used by various users for various purposes. It is thus impossible to divide the rights of utilization spatially as in terrestrial society and industry. If we did such separation, many important function of the sea would be lost. These

days, various resources are utilized simultaneously in various ways and regulation of utilization among users is often a serious issue. CO_2 emission and environmental right are concrete examples. It is not unique phenomena of fisheries that the necessity of regulation is increasing for proper utilization of international common property. Similarly, this question is not related only to Japan. When we look back at the history of Japan, it is noteworthy that similar problems and adjustment processes that led to domestic problems existed even before the Second World War. It is true that all of the problems could not be solved completely, though fisheries industries in Japan actually existing now have overcome the problems. It is said the fisheries system which supports the development of fisheries in Japan is prominently unique in the world. There are many opinions for the evaluation of Japanese system. Japanese fisheries systems including fishing rights and fishing systems were produced from common practice in local society based on the premise that fishermen maintain, manage, utilize and share the benefit from the products themselves through a bottom up system. The Fishing Rights System superficially appears unreasonable and unfair because beneficiaries (fishermen) administrate their right through fishermen's cooperatives. However, in the system, fishermen in the local community shares management goals and adjust the interests by themselves, and have an advantage as participatory resource managers. In addition, it saves the cost for the resource management by government or independent organizations. On the other hand, fishermen's cooperation is also a group business. The system has weakness in the stability of administrations. For example, in case when the cooperative business faltered, administration of fishing right and resource management became cursory. However, fisheries in Japan have overcome various conflicts and problems in the system and have formed the consensus in the community for the utilization of fisheries resources. The history of fisheries in Japan can provide useful lesson to the global consensus building for the optimal utilization of fisheries resources.

(Hisashi Kurokura and Hirohide Matsushima)

1.2 Fisheries institutions in Japan

1) Composition of fisheries institution

Fisheries institution is a set of rules for order of utilization of fisheries ground and it was composed of following laws, cabinet orders, ordinance of ministry and so on.

i) The Fisheries Law (Law No. 267, 1949)

The Fisheries Law is fundamental of Japanese fishing institution. It is establishing Fishery Right, Common-of-Piscary Right, Designated Fisheries, Fisheries Adjustment Commission and Institution of Inland Water Fisheries.

ii) Act on Protection of Fishery Resources (Act No. 313, 1951)

This Act was established to ensure the protection and culture of fishery resources, to maintain the advantages for future, and to contribute to the development of fisheries. The Act regulates capture and exploitation of fisheries of animals and plants.

iii) Cabinet orders based on The Fisheries Law

Cabinet order defines the Designated Fisheries in The Fisheries Law, Article 52, Paragraph 1 (Cabinet order No. 6, 1963), Fisheries Registration Order (Cabinet order No. 292, 1951) etc.

iv) Ordinances of Ministry based on Act for Protection of Fishery Resources

Ministerial ordinance for license, regulation etc. of Designated Fisheries (Ministerial ordinance No. 5, 1963), Ministerial ordinance for regulation of specified minister licensed fisheries etc. (Ministerial ordinance No. 54, 2004.)

v) Prefectural regulations for Fisheries Adjustment

Rules based on the Fisheries Law and Act for Protection of Fishery Resources, laid down by the prefectural governor under the permission of the Ministry of Agriculture, Forestry and Fisheries. These rules provide guidelines to the prefecture's coastal and inland fisheries, protection and propagation of fishery resources and regulation of fisheries.

2) History of fishery institution

In 701, Taihoritsuryo, the formal law of ancient Japan, established that products from mountains, rivers, bushes and shallow waters are common possession in the chapter of miscellaneous provisions. This is the prototype of Japanese institution (principle of freedom of fisheries) which was popularized during the Edo period in various locations along the coast of Japan where fisheries were implemented.

The Edo Government ordained that shore was common for the coastal community and offshore was open for all people. This rule was applied in every clan. This was the prototype of fisheries institution during the Meiji period (1868–1912) when coastal areas were managed under fishery right system and offshore areas were managed by license system. Under this principle, fishers in the coastal community implemented fisheries in the coast by making management rules by themselves that they can use exclusively the fishing ground of their community. On the other hand, privatization of fishing ground and means of production progressed in the region where large scale fisheries such as large scale set net and whaling developed.

In 1875, the new Meiji Government declared that sea was state owned. In this new system, the government was aiming at extinction of right of use by coastal community and all the people who wanted to implement fisheries had to submit a request for tenancy of fishing ground to the government. The declaration caused serious confusion in various locations, because many people tried to get the tenancy ahead of others. The government revoked the declaration as a matter of practice in the next year. As a result, it was decided that order in fishery was maintained by ordinances for regulation of fisheries in each prefecture based on the existing common practices. These ordinances are prototypes of prefectural regulations for fisheries adjustment today. However the confusion continued after that and the government established the Fisheries Cooperative Rules in 1886, in which modern theory for judicial personality was constructively applied for coastal fisheries group, and the existing fisher's group in the coastal community composed fisheries cooperatives to confirm and maintain the existing common

practices autonomously by themselves.

The Fisheries Law in Meiji was established in 1901 and was fully revised in 1910. The law shifted fisheries performed in the coastal exclusive fishing ground of a community under traditional customary law to fisheries which were allowed to operate under exclusive fishery rights in site water of the community, and it gave fixed-net fishery right to fisheries which had traditionally utilized fishery ground monopolistically and personally. On the other hand, the law categorized the fisheries which could not occupy exclusive fishing ground such as fisheries operated in the offshore, as outside the fishery right institution, and regulated it as licensed fisheries by minister or local governors depending on the needs.

The Fisheries Law in Meiji had functioned as basic rule for the maintenance of fishery order until the establishment of present Fisheries Law in 1949.

3) The Fisheries Law

The Fisheries Law is the basic institution of fisheries production. It is a law stipulating rules for preserving public order in fisheries ground targeting fisheries production sector which caught or cultured fish and shellfish in the fisheries ground. Therefore, the law is not applied for privately owned water bodies.

4) Fisheries adjustment

Fisheries adjustment is a concept representing the purpose of The Fisheries Law. It is performed in order to improve the capacity of fisheries production making proper condition from the standpoint of holistic benefits without entrusting various procedures to private parties for utilization of fishing grounds for catch or culture fisheries of animals and/or plants.

5) Fishery right

Fishery right is a right established by license from prefectural governor to implement a particular fishery in specific water body for a defined period.

i) Right to implement fisheries

Fishery right is the right to harvest or culture marine animals or plant. It is not the right to utilize water body indiscriminately for any purpose.

ii) Right to implement in defined water body

Fishery right is not the right implemented in every water body. But this right qualifies the implementation of fisheries or aquaculture activities in defined water body (licensed fishing ground).

iii) Right to implement defined fisheries for defined period

Fisheries right is not the right to catch or culture any animal or plant by any possible means and methods for an indefinite period. However, this qualified the use of a defined gear, method, and product at a given time. The licensed period is established by rules (5 or 10 years or shorter than that depending on the needs).

iv) Right to exclusively implement fisheries

Fishery right eliminates and prevents others from interfering in the catch and aquaculture, and legally protects the licensed rights. To obtain this right requires registration at the prefecture.

v) Established right by license

Fishery right is established by public notice of contents of license by the governor of prefecture (plan of fisheries ground), call for application, investigation

of eligibility and priority, determination of license and issue of license by the governor. It is not obtained by prescription, preoccupancy and custom. Alienation and lending of fishery rights is principally ineffective. The governor can revoke the right for public interest or violation.

6) Categories of fishery right

Fishery rights implied in The Fisheries Law are the Fixed-net, demarcated and common fishery right. The target fisheries for each of these rights are legally defined as follows.

i) Fixed-net fisheries

Fixed-net fisheries means fisheries which are operated by fixed fishing gears including fisheries operated over 27 meters deep at the highest tide, and set net targeting chum salmon in Hokkaido and so on. Any fixed-net fishery shall not be operated unless it is based on fishery right because fixed-net fishery uses large water body for long period exclusively.

ii) Demarcated fishery right

Demarcated fishery right is the right for implementation of aquaculture and is classified into following three types based on the method for retention of target species in defined area. Any aquaculture shall also not be operated unless based on fishery right because aquaculture uses large water body for long period exclusively by facilities and equipment and interferes with the freedom of fisheries in the area.

(1) Type 1 demarcated fisheries: Culture industry operated by submerging stones, tiles, bamboos or trees in specified area. In concrete terms, edible oyster and pearl oyster culture systems which hang the oyster from raft, cage culture of fish, laver (Nori) culture which use hanging net in the sea as substrata of laver etc. are Type 1 demarcated fisheries. All these aquaculture activities use the aquaculture area exclusively by separating it from other area by constructing facilities.

(2) Type 2 demarcated fisheries: Culture industry operated in specified areas surrounded by barriers of soils, stones, bamboos or trees. Embanked kuruma prawn culture is a typical Type 2 demarcated fishery activity.

(3) Type 3 demarcated fisheries: Culture industry operated in areas other than those in the above two types. For example, culture of low mobility shellfish in unenclosed beach is Type 3 demarcated fisheries because it is implemented in specified area without facilities using nature of target species.

iii) Common fishery right

Common fisheries means fisheries operated by common use of specified waters and are divided into following five types

(1) Type 1 common fishery: Fisheries operated to collect seaweeds, shellfishes or sedentary aquatic animals such as spiny lobster, sea urchin, sea cucumber, octopus etc.

(2) Type 2 common fishery: Fisheries operated by submerging net gears, which are immobile during operation (except fixed-net fisheries and Type 5 common fishery).

(3) Type 3 common fishery: Beach seine fishery, hand operated trawl fishing by boat, fisheries after gathering target species by feeding or providing shelter.

(4) Type 4 common fishery: Wintering mullet fishery (Yoriuo fishery), or angling of red sea bream under sea bird flock (Abi fishery) in Seto Inland Sea of Japan and other area.

(5) Type 5 common fishery: Fisheries operated in inland waters (excluding those in lakes designated by the concerned Ministry) and in the waters designated by competent Minister (except Type 1 common fishery).

7) Common of piscary right (right to perform fishery in fisheries ground belonging to others)

Common of piscary right is a right to operate the whole or part of fisheries constituting that fishery in the fishing ground of another person's common fishery right or such demarcated fishery right. Common of piscary right is deemed to be a real right. Common of piscary right cannot be established by license from prefectural governors. It is established by agreement between fisheries cooperative which have the license of fishing right in the fishing ground and fisheries cooperative who intend to have common piscary right in the fisheries ground.

8) Fishery right given to private enterprise and fisheries cooperative

Fishery right given to private enterprise

Fisheries by fixed-net fishery right and usual demarcated fishery right are performed by holders of the right. These rights are called fishery right given to private enterprise.

Fishery right given to fisheries cooperative

In common fishery right, specified demarcated fishery right and common of piscary right, licensed cooperative does not directly perform fisheries. The role of the cooperative is management of the right. The members of the cooperative actually perform fisheries licensed by fishery right following regulation for exertion of fisheries right or common of piscary right. These rights are called fishery right given to fisheries cooperative. (Specified demarcated fisheries are aquaculture culture using spat or spore collectors, seaweed culture, hanging culture, cage culture and shell culture consisting Type 3 demarcated fishery.)

Regulations for exertion of fishery right are defining competency of user of the right and rules for operation. Special action set by Fisheries Cooperative Association Law is needed for establishment, revision or abolition of the regulations, and written agreements from two third of cooperative members in the area of target fishing ground are needed before the action of general assembly for establishment, revision or abolition of the regulations Type I common fishery right and specified demarcated fishery right. Same procedure is needed for separation, revision and waiver of fishery right given to fisheries cooperation.

9) License for fisheries

General nations can perform fisheries freely by right. However, The Fisheries Law establishes license system for specified fisheries, in which the Minister of Agriculture, Forestry and Fisheries or prefectural governor regulate number of fishermen or fishing vessels which can implement the fishery for adjustment of fisheries and permit fisheries after investigation of the applicants. Only those who get the license can have the freedom for implementation of the specified fishery.

i) Designated fisheries

Designated fisheries are fisheries using vessel. Designated fisheries are prescribed in a cabinet order for adherence of intergovernmental agreements and adjustment of location of fishing ground among different fisheries. Vessels are classified by gross ton of vessel in the license system. The effective period for the license is 5 years as a fundamental rule. The Ministry of Agriculture, Forestry and Fisheries shall determine (a) the number of the licenses in each gross tonnage vessel class, (b) the number of vessels in each gross tonnage class in each fishery ground, or (c) the number of vessels in each gross tonnage class in each fishing period considering propagation and conservation of animals and plants, fisheries adjustment and other public interest and give public notice in advance before period of acceptance of application. The minister investigates the qualification of applicants and vessels. In the granting of licenses, past records are given priority.

The reason why number of vessels should be determined for each gross tonnage class is that the law treats the gross tonnage as a major factor of catch effort, and total catch effort should be controlled for fisheries adjustment. The system is managed to adjust the total gross tonnage by controlling number of vessel in each gross tonnage class.

Special case of license (license in the licensed period)

As a special case of the license in designated fisheries, following permission of the license is allowed within the effective period of the license: (a) License for substituting the lost or sunk licensed vessel, (b) transfer of license when owner of the licensed vessel changes. In such cases, the existing license is abolished by the permission of new license.

For increase of gross tonnage, alteration of fishing ground or duration, permission from the Ministry of Agriculture, Forestry and Fisheries is needed.

Loss of validity of the license

The license for the designated fisheries becomes invalid when the operation of the designated fishery by the licensed vessel is abandoned. The Ministry of Agriculture, Forestry and Fisheries can revoke the license depending on the need for fisheries adjustment or other public interest, violation of fisheries related laws or long term suspension of operation.

Following activities are specified as designated fisheries:

1. Offshore trawl fishery using trawl net by engine boat larger than 15 gross ton operated in the offshore areas of Japan
2. Trawl fishery in the East China Sea using trawl net by engine boat larger than 15 ton operated in the offshore areas of Japan
3. Distant water trawl fishery using trawl net by engine boat larger than 15 gross ton operated in the marine areas other than those listed in items 1 and 2
4. Large and medium type purse seine fishery using surrounding net by engine boat larger than 40 gross ton or 15 ton operated in specified areas in the North Pacific Ocean
5. Large scale whaling of baleen whale (except mink whale) and sperm whale using whaling harpoon by engine boat

6. Small scale whaling of mink whale and toothed whale (except sperm whale) using whaling harpoon by engine boat
7. Mother ship type whaling using whaling harpoon
8. Pelagic skipjack and tuna fishery targeting skipjack, tuna, marlin and shark using floating long line or angling gears by engine boat larger than 120 gross ton
9. Adjacent sea skipjack and tuna fishery targeting skipjack, tuna, marlin and shark using floating long line or angling gears by engine boat smaller than 120 gross ton and larger than 10 gross ton (in the EEZ except specified area larger than 20 gross ton)
10. Medium type salmon drift net fishery targeting salmon using drift net by engine boat larger than 30 gross ton
11. North Pacific saury fishery targeting saury using stick-held dip net by engine boat larger than 10 gross ton in specified area of North Pacific
12. Japan Sea queen crab fishery targeting queen crab using basket nets operated in specified area in Japan Sea
13. Squid angling fishery targeting squids using angling gears by engine boat larger than 30 gross ton

ii) Specified minister licensed fisheries

Fisheries which do not implement the prescription of designated fisheries for which unified regulation by national government is needed for conservation and propagation of fisheries resource or for adjustment of interest among different fisheries, are specified as minister licensed fisheries. Such fisheries cannot be operated without obtaining permission from the Ministry of Agriculture, Forestry and Fisheries. The license must be renewed for individual vessel every year following the Ministerial Order for Regulation of Specified Minister Licensed Fisheries. The rules for the license within the period, invalidation and revocation are same as the ones for designated fisheries.

Following activities are termed as specified minister licensed fisheries:

1. Snow crab fisheries targeting snow crabs by engine boat larger than 10 gross ton except the fisheries included in "offshore trawl fishery" or "small scale trawl fishery"
2. East China Sea marlin drift net fishery targeting marlin, skipjack or tuna using drift net by engine boat larger than 10 gross ton operated in East China Sea
3. East China Sea long line fishery using long line by engine boat larger than 10 gross ton operated in East China Sea except fisheries included in "coastal tuna long line fishery (notification fishery)", "distant water skipjack and tuna fishery", and "adjacent sea skipjack or tuna fishery"
4. Long line fisheries in Atlantic Ocean and other seas performed using long line, gill net or basket net by engine boat except fisheries included in "drifting net marlin fishery (notification fishery)", "adjacent sea tuna long line fishery", "distant water skipjack and tuna fishery" and "adjacent water

skipjack and tuna fishery"

5. Pacific Ocean bottom gill net fishery using long line or bottom gill net by engine boat operated in Pacific Ocean except fisheries included in "snow crab fishery", "adjacent water tuna long line fishery", "distant water skipjack and tuna fishery" and "adjacent water skipjack and tuna fishery"

iii) Legal governor licensed fisheries

It is proper to commit fisheries performed along prefectural coasts of which operation scale are small to administration of governor of prefecture, because the Ministry of Agriculture, Forestry and Fisheries does not have detailed information of local circumstances for judgment of qualification. However, several fisheries need inter-prefectural fisheries adjustment and cannot be left to the decision of the governor of the prefecture. For these fisheries, the Minister of Agriculture, Forestry and Fisheries determines number of vessels and total gross tonnage which governor of each prefecture can permit, and the licenses are issued from governor of each prefecture. These fisheries are called legal governor licensed fisheries.

Following fisheries are legal governor licensed fisheries:

1. Medium type purse seine fisheries using surrounding net by engine boat smaller than 40 gross ton except fisheries included in "large and medium type purse seine fishery"
2. Small scale trawl fishery using trawl net by engine boat smaller than 15 gross ton
3. Trawl fisheries in Seto Inland Sea of Japan using trawl net by engine boats larger than 5 gross ton operated in the Seto Inland Sea of Japan
4. Small scale salmon drifting net fisheries targeting salmons using drift net by engine boats smaller than 30 gross ton

iv) Ordinary governor licensed fishery

Ordinary governor licensed fisheries are licensed by the governor. Following the Fisheries Law and the Act on Protection of Fishery Resources, governor of the prefecture set up regulation for fisheries adjustment. Ordinary governor licensed fisheries are prescribed in the regulations. Some ordinary governor licensed fisheries do not need license for each boat because of operation style such as beach seine.

Following fisheries are exemplified in example of prefectural rules for fisheries adjustment (message from director of fisheries agency in 2000):

Yellowtail larva fishery, coral fishery and small scale surrounding net fishery using vessel smaller than 5 gross ton, trawl fishery, sea bream surrounding net fishery, gill net fishery, fixed gill net fishery, harpoon fishery of dolphin, salmons long line fishery using engine boat smaller than 10 gross ton, shelter fishery, octopus pot fishery, diving fishery including the one carried out with scuba, beach seine and small set net

10) Fisheries adjustment commission

Fisheries adjustment commission includes the marine fisheries adjustment commission, united sea area fisheries adjustment commission and central fisheries adjustment commission. Fisheries adjustment commission deals with fisheries related matters of an assigned sea areas or zones. For inland fisheries, inland water fisheries management commission deal with fisheries related matters.

i) Authorities of the sea area fisheries adjustment commission

a) Provide opinion to governor of prefecture

Governor of prefecture hears the opinion of sea area fisheries adjustment commission for improvement or elimination of fisheries adjustment rules and determination of content of license of fishery right.

b) Invocation of direction

The commission can invocate direction for restriction and inhabitation of catch of fisheries animals and plants and other necessary edict, when the direction is needed. The direction itself has no enforcement, though it can be obtained by mandate from governor.

c) Installation, alteration, cessation of common of piscary right and adjudication of use of land and fixtures on the land, collection of report and investigation for processing of matters under the authority.

ii) Establishment of sea area fisheries adjustment commission

Sea area fisheries adjustment commission is the enforcement office (administrative commission) in prefecture ordained in The Local Autonomy Law. The Sea area fisheries adjustment commissions are set in 64 sea areas including lakes appointed as sea area by the Ministry of Agriculture, Forestry and Fisheries such as Lake Biwa and Kasumigaura.

iii) Composition of sea area fisheries adjustment commission

Number of commissioners: 15 (specified sea area 10)

Composition:

9 persons elected from fishermen having the right to vote (specifies sea area 6)

4 persons appointed by the governor of prefecture (specified sea area 3) from among persons of learning and experience and 2 persons appointed by the governor of prefecture (specified sea area 1) from persons deemed to represent public interest

iv) United sea area fisheries adjustment commission

United sea area fisheries adjustment of commission was established on demand by combining more than two sea areas. Commissioners of the commission are composed of commissioners selected from each sea area adjustment commission.

The authority of the commission is to provide instruction that help the smooth functioning of sea area fisheries adjustment commission.

v) Central fisheries adjustment commission

Central fisheries adjustment commission was established for conservation and propagation of fisheries animals and plants which are distributed nationwide. Central fisheries adjustment commission of Seto Inland Sea of Japan, Central

fisheries adjustment commission of Pacific Ocean central fisheries commission, Japan sea, and Central fisheries adjustment commission of west Kyushu central fisheries commission exist now.

The authority of the commission is to provide instructions aimed at helping proper functioning of the sea area and united sea area fisheries adjustment commissions.

11) Type 5 common fishery right in inland waters

This fishery right is licensed for the conservation of fisheries resources and maintenance of sport fishing as recreation for public at large. Requirements of the license are that the area is appropriate for propagation and that licensed fisheries cooperatives implement actions to propagate fisheries resources. In case governor of prefecture has found that any person licensed for Type 5 fishery in inland water is negligent in protection of aquatic resources, the governor may draw up a plan and order the person to execute the plan accordingly. In case the order is not obeyed, the governor shall revoke the fishery right.

Regulation for sport fishing

Fisheries Cooperatives which hold Type 5 common fishery right in inland waters have the obligation to administrate sport fishing by public at large and implement propagation on their payment. In exchange of the obligation, fisheries cooperatives can stipulate regulation for sport fishing with the approval of governor and collect sport fishing fare for administration of fishing sport and propagation.

(Shingo Kurohagi)

2. ISSUES CONCERNING FISHERIES IN MODERN TIMES

2.1 Management

Fisheries industries in Japan today appear to have lost their dynamism. It is haunted by inflation of fuel oil price in 2008 and a flurry of suspensions of fishery operations for cost reduction thereafter. Following is a list of present fisheries-related issues in Japan organized from the fishermen's point of view.

1) Issues related to consumption, production, and management

When we ask the fishers about their problems today, the answers may be "no catch of fish", "low price of fish" "scarcity of worker" etc. Figure 5.1 is a schematic structure of these issues. The problems are classified into issues in consumption, production, and management problems caused by these two issues.

In the consumption sector, basic tone of yen's appreciation against US dollar after the Plaza accord (1985) changed Japan's position from large exporting country to large importing country of fisheries products today. Influx of large amount of cheaper fishery products from all over the world suppresses the demand for domestic fishery products and the prices hover at low level. Decrease in the preference to seafood further accelerates the price slump. Because of the worldwide economic expansion and increased health consciousness, the demand in the world for fisheries products has increased from 2004. Until then, products

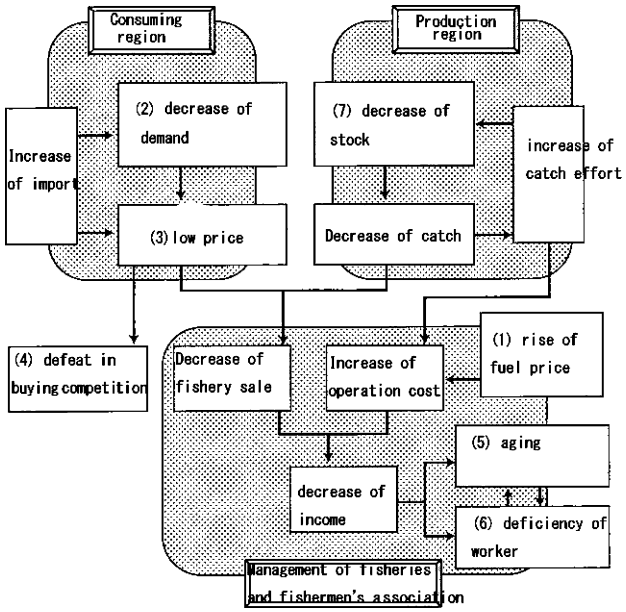

Fig. 5.1. Difficulties faced by fisheries industry today in Japan.

such as tuna and salmon caviar were only bought by Japan. However, as a result of the increase in demand for these products by the United States and Europe, buyers for Japan sometimes cannot buy required quantity of the preferred products. This is called “Kaimake” (defeat in buying competition).

In the production sector, fish catch decreased after 1989. One of the major causes was the decrease of sardine stock and the decline in the catch of other fish lower than that of sardine. However, on the long term, the decline of catch of other fish cannot be denied, which enforces an increase of catch effort such as enhancement of equipments and increased number of operations that in turn becomes a pressure on the stock. As a result, stock condition is aggravated and fish catch further decreased. This is the negative spiral of fisheries.

Fishers earn their daily living by harvesting and selling wild or cultured fish. Their income is a residual after subtracting the amount of cost from the amount of sales.

Here,

$$\text{Amount of sales of fish} = \text{price of fish} \times \text{fish catch}.$$

As described before, the unit price of fisheries products has remained stagnant. Fish catch is continuing to decline excluding several exceptional species. Cost reduction is a possible countermeasure for the present trend. As a result, energy-saving fishing vessels have been developed with the support of fisheries agency.

In spite of these efforts, operation cost actually increases with the increase of catch effort. The steep rise of fuel price that peaked in the summer of 2008 accelerated the increase of operation cost. Fishers could not get enough income because of increased operation cost and decrease in the amount of fish sales. Prolongation of such conditions discourages the children of the fishers from succeeding the fisheries activity and only aged people remain in the fishing villages. Conclusively, the management of fisheries cooperative gets difficult.

2) 7 Ks (K = Konnan = difficulty) faced by the fisheries industry

Workplaces where a few applicants applied for the job were labeled as 3 Ks, namely Kitsui (hard), Kitanai (dirty) and Kiken (dangerous). Fisheries industries are not the exception of 3 Ks, though causes for the shortage of applicants in fisheries industry are not only because of 3 Ks. Instead, there are seven Ks. Here the author will express the difficulties of fisheries, as described in Fig. 5.1 with numbers from i) to vii).

i) Rise in fuel prices: Koto

Increase in fuel price in 2008 was the most serious obstacle for fisheries industries in Japan. Price of Bunker A, the most common fuel oil for fisheries, was 42,000 Yen/kl in March 2004 and exceeded 120,000 Yen/kl in August 2008. The fuel oil cost accounted for 23.3% of total cost in 2005, and rose to as much as 30.5% in 2007. Increase in the price of petroleum products caused by speculative increase of crude oil price pushed up not only the price of fuel oil for fisheries but also triggered the price hike of all oil based energy sources such as gasoline and naphtha. However it was easily understood from the intensity of lobbying campaigns with coordinated stoppage of fisheries work in July 15, 2008 that the damages on fisheries were more serious than that on other industries. Three causes responsible for the serious damage are as follows:

First, the fisheries industry does not have well developed energy saving technologies. Fuel oil is used not only as energy source for driving power, but is used in hauling the net and illumination for night operations. Much more than essential amount of fuel oil is consumed for fishing operations to sustain the competition with other vessels or other companies to reach the best fishery ground and to win the fish collection race.

Second, the development and utilization of alternative energy source is delayed in fisheries industry than in other industry. Since petroleum is sourced about 13% in power production, shore-based industries, which can utilize electric power provided by power-generating company, could fend direct impact of the runaway cost of fuel oil. In addition, alternative energy sources such as bio-ethanol, solar energy and wind power were developed for shore-based industries and utilized in unit businesses or offices.

Third, the changes in balance sheet of fisheries industry in recent years made the impact of price hike of fuel oil more serious than before. Figure 5.2 represents the change in various economic indexes. In the figure, the price of Bunker A increased after 2006. However, when we focus on the long term trend, we can notice that the price of Bunker A in 1980–1985 was the same level with the price after 2006. Actually, after the second energy crisis in 1979, the price of Bunker

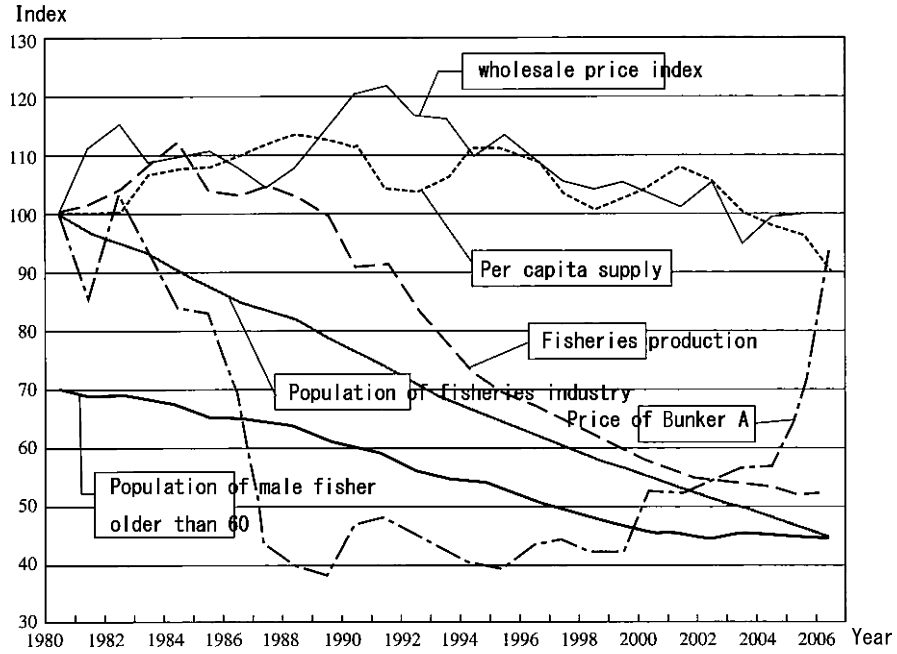

Fig. 5.2. Changes in various index relating to fisheries. Relative values to the values of 1980 expressing the value of 1980 as 100 except population of male fisher older than 60. The value of male fisher older than 60 is actual value. Fisheries production is the value of moving average for three years. Data source: annual statistic report of fisheries by MAFF for fisheries production, food demand and supply table by MAFF. Fisheries census by MAFF for age structure, annual statistic report of fish trade by MAFF for price, JFA web site for oil price increase for Bunker A price.

A exceeded 60,000 Yen/kl for extended time of six years. During that period, stock condition was relatively better and CPUE (catch per unit effort) was high. In addition, it was possible to pass the increase of the cost to retail price (see later paragraph). Because of these reasons, the impact at that time was not as serious as that in 2008.

Through these analyses of the impact of price hike of fuel oil, future countermeasures required are discussed below in Section 3.

ii) Drop in the consumer's appetite for fishery products: Kirai

The fact that the drop in appetite of consumer for fishery products was published in the "*2006 White Paper on Fisheries in Japan*" (2007) and reported in several national newspapers. The per capita supply of fish and shellfish in year 2006 was 57.6 kg (gross weight). The decrease is clear when we compare the value with that of 64 kg in 1980 or that of 72 kg (the peak value) in 1989. The cause of the decrease stated in the white paper was that younger generation opted out from eating fish and that so called aging effect, implying that consumption of fish

increased with age, was weakened. These data is discomforting and makes one fear that fisheries in Japan will vanish without increase in consumption. However, we need a cool-headed approach to solve the problem.

There is a limitation of fisheries stock in Japan as in other countries. Domestic fisheries production cannot supply all of the required amount of fish, when all Japanese people could eat 72 kg of fish per year as that during the peak year. When we calculate the per capita supply of fisheries products as a desirable consumption to fit the capacity of fisheries production in Japan from the data in the Basic Plan for Fisheries published by Fisheries Agency, the value is 61 kg. When we compare the global average per capita consumption value of 16.4 kg, we can understand that Japanese people consume much larger amount of fish and shellfish. Actually, Japanese are the top consumers of fish and shellfish in the world. As an industry, we do not want further decrease of fish consumption in Japan. However, we also need to be careful as to not create a negative impression of Japanese among the international society as people who eat up all the fisheries products in the world. We have to recognize from Fig. 5.2 that the decrease in the per capita consumption (per capita supply) is more gradual than decrease of total production.

iii) Price slump of fisheries products: Kikaku

We still consider the price slump by separating the problem into long term and short term issues. As shown in Fig. 5.2, fish prices have been stable on the long term scale. However, wholesale prices were stable not only in fisheries products. Inflation had progressed in the Japanese economy by 1991 and total wholesale price increased by 2.8% for 12 years from 1980 to 1991. On the other hand, the wholesale price of fisheries products increased by 21%. The extent of the up-surge was far larger in fisheries products. After 1992, the Japanese economy entered a deflation trend. Total wholesale price (integration of corporate good price index after 1996) decreased by 11% for 13 years until 2005. On the other hand, the decrease of wholesale price of fisheries products was 18%, which was larger than average decrease of wholesale price. It can be seen in Fig. 5.2 that the gradual decrease of per capita supply of fisheries products led to the drop in the price of fisheries products.

In the short term trend, consumers generally reduce the amount of purchase when the price of goods increases. Wholesale price of fisheries products increased after 2004 with the global increase of demand, and the per capita consumption of fisheries products decreased as if in response to the increase in price. Another importance is the relation between wholesale price of fisheries products and price of Bunker A. In spite of price increase of Bunker A, the wholesale price of fisheries products decreased after 2004. Fishers suffered this double blow—decreased income and increased cost. The trend of wholesale price of fisheries products synchronized with trend of price of Bunker A by 1988. In that period, the increase in cost could be compensated by increase of price of fisheries products. The fact that increased cost could not be passed on to price led to the serious problems of price slump today.

Another important problem related with fish price is the disjunction of price

in market at production sites and retail price. According to the survey by Fisheries Agency, production cost was 96 yen, distribution cost was 64 yen and retail cost was 240 yen in retail price of fisheries product (401 yen/200 g). This means that the cost for production is only 24% of retail price. One of the solutions for the difficulty of fisheries is to increase the share of the income of producer in the retail price without increase of retail price.

iv) Defeat in buying competition: Kaimake

Kaimake is a phenomenon in which buyers for markets outside Japan buy fisheries product at higher price than the price proposed by buyers for Japanese market. Thus buyers for Japanese market cannot get the originally intended amount of fisheries products. This phenomenon has often occurred since 2004 and the new word "Kaimake" was coined. This is a serious problem relating to fisheries and distribution of fisheries products, though it should be noted that this is not a problem encountered directly by the fisheries industries. It may be disadvantageous for distributors, as they cannot deliver commercial goods as scheduled. However, for fishers in Japan, it is a good chance to expand the supply of domestic fish. Actually, export of fisheries products to Korea and China has been implemented from 2001 and quality cooking ingredients for Sushi have been exported to the United States and Europe. Localities exporting such ingredients are vitalized. Some have negative opinion about exporting domestic fish rather than consuming it in Japan. There are various reasons for such negative opinions as it breaks the principle of local production for local consumption (shortening of food mileage) and inherent nature of instability of exporting business. Some may worry over increase of import, others over decrease of import and some over increase of export. Reasonable and acceptable policy guidance is needed.

v) Aging of fishers population: Koreika

Share of male worker under 60 years in the fishers population was 70% in 1980, although it shifted to 45% in 2006 (see Fig. 5.2). The reminder, 55%, includes 34,000 female workers in all ages. The ratio of male workers older than 60 in total male workers is 47%. The ratio has been stable for these years and it is not predicted that the share of workers older than 60 will exceed 50% in the near future. However, the fact that 83,000 male workers out of 178,000 are older than 60 is nothing but aging of worker population in fisheries industries. It is not a problem in itself that an industry has many aged individuals, but this has some merits and demerits. It is difficult for businessman working in urban community to find another job after retirement. Income source other than pension may be closed and he may not find new role or motivation in life after retirement. On the contrary, fisherman can work at his discretion without worrying about his age. This is the merit of fisheries in both revenue side and mental side. The negative impact of aging is when many aged persons stay in decision making positions in fisheries community. Reforming plan posed by young generation or newcomers may not be accepted because of inferiority in number and politics. The position for cultivation of leadership cannot be given to middle ages who could have taken administrative positions in common company. Work site (fishing ground) is close to the place for daily life and dissatisfaction for human relation at work place

cannot be separated from private life in primary industry such as fisheries. Aging population is one of the reasons for the problem related with deficiency of successors.

Aged fishermen without successor would pay less attention to the conservation of fish stock than those who are relatively young and going to utilize the stock for many years. Near-sighted behavior of aged fishermen on the fishing ground or at the decision making process in the community could accelerate the deterioration of the environment of fishing ground.

vi) Deficiency of succeeding workers: Kokeisha

The number of workers engaged in fisheries industries have decreased to less than half of the number in 1980 with the aging of the population (Fig. 5.2). The number of fishers in Japan was 480,000 in 1980 and reduced to 210,000 in 2006. The number of retirement has not increased but the number of newcomers has prominently decreased. This is the characteristics of fisheries today in Japan. The number of newcomers was only 788 in 2003, and 56 were older than 60. The number of newcomers was less than the number in forestry (1,022).

The newcomers are composed of fisher's children and entrants from outside of fisheries industry. The fisher's children work to assist their parent's business, get membership of fisheries cooperative and start right-based fishery with the retirement of their parents in case of coastal fisheries. For offshore fisheries, fisher's children inherit the representation right of the company. Decrease of the number of children, expansion of employment opportunities to other industries, and most of all, decrease of earning from fisheries make the inheritance from parent unattractive. Many salaried employees working in other business want either to come back to their hometown or to move to some seaside village shifting their business to fisheries. Hundreds of career changers participate in job-hunting fairs that provides opportunities for vocational training and career service programs which are held in various locations in Japan every year. However, only tens of people can actually enter and a few among them can stay in fisheries for long period, because of disagreement of condition for employment and conflicts during probationary employment periods. On the other hand, foreign workers called interns or trainees are the necessary labor force at the job sites of offshore fisheries and fish processing industries. Thus employment mismatches are taking place.

There are several different opinions for necessary working population of fisheries in Japan. In comparison of the per capita annual production amount and turnout among OECD countries, the figures for Japan are 19 ton and 48,000 US dollar, much less than Korea (23 ton, 36,000 US dollar). Japan is far behind Norway (151 ton, 67,000 US dollar) and Iceland (441 ton, 160,000 US dollar). We have to accept the differences in production amount with North European countries which catch abundant fish, though we cannot overlook the large differences in turnover. It is time to revise the management scale of fisheries in Japan.

vii) Decrease of stock and fisheries: Kokatsu

Stock depletion is finally the most serious issue. Fisheries Research Agency

reported in their report of stock evaluation that 43 among 90 stocks investigated by the agency are at lower than adequate level. Fisheries Agency mentioned that the degradation of sea's production capacity is also indicated by the decrease of catch amount of large scale fixed and bottom trawl nets. Various factors operate in the background of this trend and some of them are external factors such as land based coastal water pollution and climate change. Some factors such as resource fluctuation of sardine (regime shift) cannot be controlled by efforts of the fisheries industries. However, there are many factors which are theoretically controllable by this industry's effort though the control mechanisms do not work sufficiently or countermeasures taken are inappropriate. Production of fisheries in 2006 was 52% of that in 1980. The trend does not change even after removal of the trend in distant water and sardine fishery.

3) Capability of fisheries: Aiming for an advanced fishery country

Issues faced today by the fisheries industry in Japan are listed in the previous part of this chapter. These issues include things that can and cannot be controlled internally by the industry. Even for issues that cannot be controlled internally, measures to reduce the external impact will be found.

Firstly, as can be seen in Fig. 5.1, most of the issues in production sector are controlled internally by fisheries industries. We have to implement measures to recover resources and appropriate management of resources, and control the catch amount according to appropriate program. These countermeasures have not been sufficiently implemented. One important cause of the failure is the fisheries system in Japan which induces competition of fish catch among fishers. Reconstruction of fisheries system to suit an advanced fishery country is needed.

Among the issues facing the consumption sector are the changes in taste preferences of citizens. Taste preference cannot be easily controlled. However, demands for fisheries products are growing in foreign countries because of the fitness boom. It is thus natural for the enterprises to hike the prices of fisheries products. Future fishers will be required to have business capacities for marketing and survey of foreign and domestic demand trends. There are also possibilities of an increase in the share of earning by fishers in retail prices by shortening the time and geographic distance between production and final consumption.

The management of fisheries industry should be aimed first at restoring the income levels of the fishers comparable to other industries. This will reduce the disparity in income of fishers with those in other developed countries. Within the fisheries community, adverse effects of aging should be reduced and resourceful leaders should be trained. Breaking away from traditional fisheries as family business, increase of business scale, and collaboration of business in the community will lead to an increase of income of individual fisher and community. Fisheries cooperatives are expected to play a leading role in the management of industrialized fisheries. Strong business strategies should be established in fisheries which can tolerate external disturbances such as fuel price hike. It cannot be allowed to dissipate energy for competition of fisheries under the circumstances where the global environment issue is a worldwide concern. Ensuring alternate energy and development of more cost effective fishing methods are expected. However, the

best remedy to external disturbance is to maintain sufficient amount of resources on a continuous basis. It is difficult to pursue the ideals mentioned above in fisheries in developing countries where maintenance of daily life of fishers should come before sustainability of resources. We cannot find any impossibility for realization of the ideals in Japan where abundant fishing grounds, excellent technical capability and talented human resources are abundant. We have to recognize the abnormality of fisheries in Japan, which is losing vitality because of several difficulties. Having potentials of development, what is needed is an intention to revive Japan's fisheries industries similar to that of the developed country.

(Haruko Yamashita)

2.2 Aquatic environment

1) History of major water pollutions

After 250 years' closure of the country, Japan underwent the Meiji Restoration in 1868. After that, Japanese government emphasized on the importance of modernization of the production sector, particularly the expansion of mining and manufacturing sectors under the slogans of "wealthy nation and strong army" and "encouragement of new industry" in order to make up for the backwardness so far. Behind the activities for the modernization of industry, countermeasures to environmental load such as wastewater, waste materials, smoke etc. were ignored. First and symbolic serious accident of those days is the mineral poisoning accident in Ashio. Copper Mining in Ashio started in the age of provincial wars (1467–1573) and was controlled by the government in Edo period. After Meiji Restoration the mines were privatized. Furukawa mining company bought the mine in 1877. After that, the mine grew up to be proud of the overwhelming production in Japan with excellent smelting technology using hydroelectric power and modernization of facilities. On the other hand, vegetation was blighted by sulfurous acid gas in the smoke, and mountains lost water retaining capacity with the cutting of trees for fuel and reinforcing of mines. As a result, flow of arsenic and other heavy metals into Watarase River increased. Shozo Tanaka, elected as a member of House of Representative in the first general election, took up the pollution problem in the Imperial Diet to appeal the distressed condition of farmers by large scale pollution of agricultural land. Finally, he planned a direct appeal to the Emperor and was arrested. This created an awareness of the mineral poisoning. However, no effective countermeasure was taken after that and the mine was abandoned in 1973. Serious suffering by smoke eliminating from smelting in Besshi (Niihama-shi, Ehime) and Hitachi (Hitachi-shi, Ibaraki) copper mines occurred during the same period. However, the idea of public hazard, in which man-caused interference to healthy environment which should be given equally to whole nations is considered to be public issue, was not born in Japan in those days. Such pollution cases have usually been handled as a civil case between a company and inhabitants, and solved by payment of compensation from the company. Mining and manufacturing of Japan which accomplished

astonishing development within only 60–70 years after Meiji Restoration were supported by such social background. Whole industries in Japan were nearly wiped out by the Second World War (1939–1945). Mining and manufacturing industries in Japan revitalized by military procurement of US Army for Korean War (1950–1953), and recovered to the same level of production as that before the Second World War. After this, Japan's economy grew continuously and reached the second best position in GNP (1968). This age (1955–1973) is called the high economic growth period. The repetition of asthma patients occurred in Kawasaki and Yokkaichi in the period. The rapid economic growth was achieved at the cost of various environments including aquatic environment. Four major diseases caused by pollution in Japan are the Minamata disease, Itai-Itai (ouch-ouch) disease, Niigata-Minamata disease and Yokkaichi asthma. Excepting Yokkaichi asthma, all these pollutions occurred in the aquatic environment.

Health hazards

(1) Minamata disease

Minamata disease is globally well known as the most cruel case of water pollution which occurred during the high economic growth period. The disease was first recognized in 1956 by the report from a medical doctor of Minamata Health Center, which mentioned the hospitalization of brain damaged patient with unknown etiology and the occurrences of similar symptoms around Minamata since 1953 (official website of the municipality of Kumamoto Prefecture). It was clarified by subsequent researches that the disease was caused by organic mercury (methyl mercury) accumulated in fish and shellfishes. The origin of organic mercury was identified as the wastewater from Minamata plant of New Japan Nitrogen Fertilizer Company Ltd. (presently the Chisso Company Ltd.). The methyl mercury was produced by the methylation of mercury used as catalyst for synthesis of acetaldehyde from acetylene. The methylation reaction was not theoretically proven at the time when the disease was discovered, and long and complicated efforts and discussions were needed for clarification of causal connection. The time consumed for the elucidation of the mechanism delayed the actions for prevention of the damage. During this long discussion period, new victims were added due to consumption of polluted fish. The fatal Minamata disease symptoms were inborn paralysis of all limbs and brain disorders. It is said that the number of victims of Minamata disease is over 3000. The exact number of victims still remains unclear because of the high barrier of accreditation criteria which required onset of all defined symptoms. More than 300 persons were killed by Minamata diseases. This can be pointed out as the most important direct cause of the tragedy that the company had continued the discharge of wastewater even after identification of etiological agent and worked to solve the case only by paying compensation, though we also should know that there existed a tendency of politics to prioritize advantages of industries. This tendency subsequently incurred the Itai-Itai disease and Niigata-Minamata disease.

(2) Itai-Itai disease

This disease was caused by accumulation of cadmium in human body. Cadmium contained in wastewater discharged from zinc refinery in Kamioka

Mine, Mitsui Mining and Smelting Co. Ltd. (Gifu) reached the paddy field zone in Toyama plain through Zinzuu River. Cadmium was consumed directly along with drinking water or through eating contaminated rice. The reduction of calcium density in bone caused by accumulation of cadmium weakened the bones that would be broken by even slight movement. Itai-Itai, the name of the disease, was the scream of victims when their bones were broken. Kidneys were damaged and many patients died. The first report of the disease to academic society was in 1955, though the disease itself was known in Taisho period (1912–1926) as a puzzling disease or a type of vitamin D deficiency.

(3) Niigata-Minamata disease

This disease is also called Second Minamata disease because the causative agent was organic mercury occurred in the lower Agano River region (Niigata). Patients developed palsy in their legs and arms and nervous symptoms and died similarly as in Minamata disease. The disease was caused by intake of methyl mercury contained in wastewater discharged from synthetic process of acetaldehyde in Kanose Plant of Showa Denko Co. Ltd. The disease was reported as mercury poisoning in the academic society in 1965, though the company insisted that pollutant was the pesticide (most of them were phenyl mercury) which had leaked from the warehouse during the Niigata earthquake in 1964.

Fisheries hazard

Fishery as an industry depends on the basis of natural bio-resources. When wastewater or materials discharged from land cause damages to existence, reproduction or migration of aquatic animals and plants, the resource will disappear and/or its density decrease to the level at which fishing cannot be operational. Stagnate consumption and regulation of shipping of the products will also cause economic damage to fisheries industries.

Pollution and contamination of the coast and rivers in Japan peaked in the late 1950s and 1960s, the high economic growth period. Rivers in urban and industrial areas received untreated sewage and lost the transparency completely. The river bottoms were black because of reducing conditions and released hydrogen sulfide smell. Coastal areas where these rivers discharged, particularly the inner bays were also completely polluted. Organic substances from inflowing rivers and sludge piled up on the bottom producing anoxic waters in bottom layer during summer stratification. Not only fish, but even benthic animals such as sandworms and bivalves could not live in the environment. The awful situations in innermost parts of Tokyo Bay, Ise Bay Osaka Bay and Doukai Bay are now considered as legends of worst pollution. A direct protest by fishers towards the expansion of pollution over their fishing ground was “the matter of Honsyu Paper Company in Edogawa”. The affair was a riot by fishers, which occurred at the Edogawa plant of the Honsyu Paper Company Ltd., located in Urayasu, the inner most part of Tokyo Bay, and many people were injured in the clash with riot police. The riot originated from mass mortality of fish and shellfish in the area from Urayasu (Chiba) to offshore of Kasai caused by wastewater discharged from the plant through the Edogawa River in 1958 (the area has now disappeared due to the landfill). The company had continued operation of the plant neglecting the

result of negotiation with fishers and recommendation of closedown by competent authorities. As the company rejected to meet, more than 800 angry people, mainly fishers, broke into the plant. As many as 105 people were injured and eight were arrested in the clash with riot police (data obtained from the Urayasu City website). Other than this, stinking fish in Ise Bay (1960) and mass mortality of fish in Tama River in 1962 caused by the wastewater from plating plant containing cyanogens were the famous cases of fisheries hazard in the period. Small scale injuries are supposed to have occurred then on daily basis judging from the poor regulations and legal system.

2) Efforts by government

Balefulness and seriousness of cases such as "water contamination and pollution" and "health and fisheries hazards" which frequently occurred during the high economic growth period were caused by inadequacy of legal system which left such cases in civil courts between private company and citizen or fishers as before the Second World War. Liaison Council for Water Pollution was established among ministries in 1953, and outline of countermeasure for prevention of water pollution was decided in the Cabinet Meeting in 1958. Laws concerning conservation of water quality in public water area and Laws concerning regulation of wastewater from factories were established in the same year. Those laws were called the "two old laws for water quality", which formally mentioned that the national government shall lay down water quality criteria for areas designated by the government and shall regulate compliance of the criteria. Although the laws were superficially revolutionary as compared with the prior legal system, they could not prevent water pollution, because the regulative areas by the law were limited and few.

Constitution of standard for water environment

In 1967, Basic Law for Environmental Pollution was constituted and standards for the control of air, water, soil and noise pollution were established as desirable standards for protection of human health and conservation of living environment. The law had no punitive clause and only instituted nonbinding targets, although it has worked as governing law for the establishment of subsequent laws. For example, Environmental Quality Standards for Water which was instituted in the Basic Law as the target of water quality control worked as the basis in the establishment of Water Pollution Control Law which set regulation limits of wastewater from business institutions. Also, the objective of the establishment of Special Measure Law for Conservation of Lake Water Quality and Special Measure Law for Conservation of Environment in Seto Inland Sea of Japan was to make a breakthrough for accomplishment of the target values.

The Environmental Quality Standards for Water contains two major categories, one is the standards for the protection of human health, which is commonly called "Health Standards" and the other is for conservation of living environment, commonly called the "Living Environment Standards". These standards were made public on the home page of the Ministry of Environment. Health Standards, consisted of 26 items including cadmium, cyanogens, lead, hexavalent chromium, arsenic, mercury, polychlorinated biphenyl (PCB), organic

solvents etc. These substances cause serious health hazard such as acute toxicity, carcinogenicity, reproductive toxicity and teratogenic activity, and pose health risk on being ingested by human being through drinking water or eating fish and shellfish. For this reason, both items and values in health standards are set without exception to all public water areas. Meanwhile, Living Environment Standards are set for each category such as river, lake and sea, and for each objective of utilization of water such as natural environment conservation, drinking water, fisheries, industrial water, agricultural water etc.

Establishment of Water Pollution Control Law and its impacts

The year 1970 should be named as the year of great change in environment policy in Japan. A total of 14 laws including the new and amended ones were passed in the 64th Extraordinary Diet which was convened for radical improvement of legal structure of pollution control laws in Japan related to air, soil, noise, water etc. Accordingly, the Diet was called the "Pollution Diet". The most important differences of the laws compared to the previous ones were complete deletion of articles for harmonization which laid down the regulation on emission source of pollutants. From the 64th Extraordinary Diet, we can recognize the changes of orientation in Water Pollution Control Law. For example: i) Concretization of responsibility of enterprising body: One who discharges wastewater shall prevent pollution on its own account. ii) Tightening of regulation: All wastewater discharged to common water area shall be regulated regardless of the existence of the fact of pollution. iii) Direct punishment: Criminal punishment shall apply to violator without procedure for consideration of reason. iv) Clause for raise up: Local government can set harder standards than the law.

The objective of establishment of Water Pollution Control Law was to improve the aquatic environment by regulating the concentration of substances in wastewater from business institutions. The regulated items by the Law are nearly the same as The Environmental Quality Standard for Water. The standards for hazardous substances are applied to all categories of businesses prescribed in the Law as "specially designated industry". On the contrary, the standards for the items in Living Environment Standards are applied for the specially designated industry which discharges more than 50 m^3 wastewater per day. Actually harder standards can be set by local government, which are stipulated in the Law and released to public through home pages of the local government or through other media.

After the enforcement of Water Pollution Control Law in 1971, wastewater from businesses which have been practically unregulated before, were strictly regulated and the number of water area exceeding the standard in hazardous substances dramatically decreased within several years. This fact indicates that hazardous substances mainly originated from industries such as factory, and the impact of the enforcement of the Law was easily apparent. On the other hand, improvement of achievement rates of BOD or COD standards, used as indicators of organic pollution in Living Environment Standards was extremely slow. Particularly in sea area, the condition was becoming worse. Internal production of BOD or COD, which means new production of organic substances almost by

phytoplankton, may be the cause of difficulty of the improvement. As the source of nutrients for phytoplankton such as nitrogen and phosphorus, domestic wastewater and decomposition of organisms accumulated in the bottom were suspected.

Total pollutant load control of wastewater

Wastewater standard in Water Pollution Control Law is regulation by concentration, which means that the total amount of pollutant increases in cases where the volume of wastewater increases. In situations where the achievement rate of environment standard on COD could not be improved, basic strategy of total emission reduction was advised by the government in 1978. Total load control of COD was introduced for Seto Inland Sea of Japan, Ise Bay and Tokyo Bay in 1979. The COD levels were regulated by the total amount per day in addition to the previous concentrations. In the control, prefectures relating to above described three water areas requested the industries to optimize their performance, to set tangible limits to achieve the targets set by the Standards. On the other hand, the prefectures were advised to improve sewage network to reduce load from domestic wastewater and to supervise and recommend small industries not regulated by the Law. In 2002, nitrogen and phosphorous were added to the list of total load control.

Water pollution by domestic wastewater

In addition to human waste, low concentrations of miscellaneous drainages are discharged from living activities of human being such as cooking, washing, and bathing. Domestic wastewater is a combined term for both drainages. In cases when sewage system is developed, drainages flow into sewage treatment plant and are discharged to river or sea after the treatment. For instance, in the pollution load (BOD) into the Sumida River, which flows into Tokyo Bay, wastewater from businesses had occupied 68% of total load before the enforcement of Water Pollution Control Law, and, alternatively, the domestic wastewater (including treated water) became 99% after enforcement of the law (Fig. 5.3). Total load was decreased to 8% by the enforcement, although it is obvious that major cause of organic pollution is the domestic wastewater. The changes in sea areas are similar and it is said that half of the organic pollution in inland seas and inner bays of Japan is derived from domestic wastewater.

Most common water processing technique used in sewage treatment plant is "activated sludge treatment" in which sewage is inoculated with activated sludge (mixture of bacteria and protista), and after propagation and deposition of the organisms, the supernatant fluid is discharged into public waters. By this treatment, component of propagated activated sludge is removed from the sewage. As a result, 90–98% of BOD and COD are removed, though the elimination efficiencies of nitrogen and phosphorous are low and only 60% of them can be removed by the treatment (calculated from the data in the website of Tokyo Water Reclamation Center, Bureau of Sewage, Tokyo Metro). Recently, technologies for the removal of nitrogen and phosphorous with activated sludge treatment have been developed. In this system, activated sludge treatment is called lower treatment and removal of nitrogen and phosphorous is called higher treatment. Most of the sewage

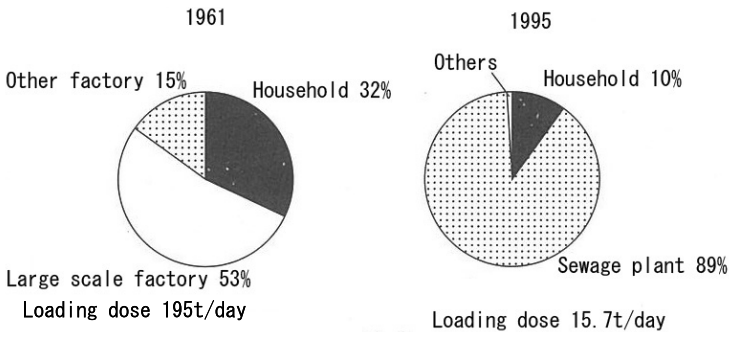

Fig. 5.3. Comparison in BOD loading between before and after enforcement of Water Pollution Control Law. Revised from "Water Environment Administration in Japan" (1999). Japan Society of Water Environment.

treatment plants, however, are composed only of lower treatment system and some plants closed the operation of higher treatment system because of higher operation cost. Per capita adoption rate of higher treatment was only 14% in 2006. The load of nitrogen and phosphorous from domestic wastewater is still large (from website of Japan Sewage Works Association).

One other cause of the stagnation in cut down of load to water shed areas is the structure of sewage line. The local communities which constructed sewerage network in early phase used combined sewer system in which rainwater combined with domestic wastewater from households. When the flow volume exceeded the capacity of sewage-treatment-plant due to heavy rainfall there was no other way than to drain the untreated discharge into the water shed area. This was an urgent treatment called the overflow, and the untreated human wastes loaded the aquatic environments resulting in hygiene related concerns. Improvements to separate the sewer systems in which domestic wastewater and rain water are carried separately are under progress.

3) Modification of the coast and its impact on the structure and function of ecosystem

In the 5th National Survey on the Natural Environment/Green Census (1996) performed by Nature Conservation Bureau of Ministry of the Environment, it was reported that 33% of Japan's coast line was altered by human activities, 13% was semi-altered, thus leaving only 55% of the coast in its natural condition (Ministry of Environment, 2004). Particularly, the coast of inland seas and inner bays were easily and continuously altered during the high economic growth period, due to their calm and shallow nature. Taking the case of Tokyo Bay for instance, only 5% has remained as natural coast and 95% of the tidal flat which existed in the Edo period is lost. Such a drastic decrease of intertidal zone is similar also in other places. Coasts along the industrial and densely populated areas, such as the Seto Inland Sea of Japan, Osaka Bay, Ise Bay etc. were also altered. Most of the coast lines in these areas have turned into sheer banks, and the biomass and bio-

diversity in such areas are generally poor compared to sandy beaches and tidal flats formed by natural deposition. It is suspected that deprivation of inter tidal zones which contributed to the purification of water is another important cause for the non-attainment of environmental water quality standards in addition to the influence of huge load from domestic wastewater. Mangrove forests are flourishing on tidal flat of estuaries in southern temperate, semitropical and tropical zones. Mangrove forests facilitate the material circulation by their characteristic ecosystems. Mangrove areas are also on the decline due to cutting of trees for fuel wood and construction of shrimp farms.

4) Fisheries and aquatic environment

Impacts on aquatic environment from fisheries and countermeasures

Fishing catches wild organisms living in natural aquatic environments, and aquaculture fattens organisms using those environments or getting water from there. Accordingly, both these activities presume that aquatic environments are healthy and stable. Formerly, it was said that fisheries were the first victims of water pollution. However, it has been clarified that fisheries also damage aquatic environment in some cases. Residual food and feces from fish culture facilities consume oxygen during the decomposing process, and nitrogen and phosphorous produced by biodegradation of organic substances are considered as causative agents for red tide. In case of stock enhancement through release of fish seed, genetic diversity of artificially produced seed lowers when the number of parental stock is few. Also in case the parental stock comes from other population, the possibility of genetic disturbance cannot be overlooked. For the progress of fisheries henceforth, careful considerations and technology development becomes all the more necessary for balancing sustainable utilization of natural stock and conservation of biodiversity. In order to decrease the load from aquaculture, many countermeasures are proposed and implemented such as prevention of stagnant area, steps to reduce sedimentation of residual foods and feces at the bottom, using buoyant food pellets to prevent sedimentation, shifting of cages every year etc. These countermeasures are actually effective. Now it is studied that the culture of edible seaweed such as Wakame (*Undaria pinnatifida*) or Aosa (*Ulva* spp.) in the vicinity of fish culture cages may contribute to the assimilation of nitrogen and phosphorous released from the decomposition process of residual foods and feces. For understanding impact of stock enhancement on genetic diversity of natural stock, the possibilities of genetic disturbance and countermeasures need to be studied by DNA sequencing using advanced technology.

Function of fisheries for conservation of aquatic ecosystem

(1) Monitoring of aquatic environment

Fisheries targeting wild organisms directly or indirectly in natural environment mean that fishermen know the changes and incident of both water area and resources faster than anyone else. Actually, the incident appeared at first in decrease of fish and shellfish in past water pollution cases such as Ashio mineral poisoning case and Minamata disease. In the Edo period (1603–1868), records of catch volume and amount of business have been kept in Hamacho

(notebook of fish on landing) under Amimoto system (proprietor system in community fisheries). For example, the fishing records of sardine in Kujyukuri Beach from the Edo period are used for monitoring data to recognize long term fluctuations of fish stock, marine environment and climate. Monitoring the function of fisheries cannot be replaced by other technology, because it does not need any special instrument and has global commonality and length of the record.

(2) Material circulation and conservation of aquatic environment

When we look at the fisheries from the view point of biological production, it implies an action to obtain biomass as fish, shellfishes and seaweed from the water body. It contributes to the conservation of aquatic environment by transporting materials suspended or dissolved in water to the land through food chain. When we evaluate the function of fisheries by calculating equivalent amount of annual total catch of coastal fisheries of Japan (1,400,000 ton) to per capita human excretion in carbon (C), nitrogen (N) and phosphorous (P) (Maruyama, 1999), coastal fisheries circulate C, N, P excreted from 21,000,000, 10,000,000 and 17,000,000 people, respectively. Actually, the whole of nutrients in coastal areas of Japan do not originate in Japan. If there are no fisheries in the inland seas, inner bays and lakes, we cannot pull out nutrients from surrounding area, and the eutrophication will accelerate leading to the decay of the water body. In Isshiki tidal flat in Mikawa Bay (ca. 10 km^2), benthic organisms (mainly Japanese littleneck, *Ruditapes philippinarum*) have the capacity to remove suspended matter sufficient enough to build a sewage treatment plant for 100,000 people, construction cost of which amounts to 88.8 billion yen including the sewer network. Furthermore it is clarified numerically that nitrogen and phosphorous can be removed like advanced sewage treatment through fishing of Japanese littleneck (Hiroaki Aoyama *et al*., 1996).

(3) Conservation of endangered and rare species

Artificial seed production is a technology to foster larvae after hatching to the stage able to live in natural environment, which is a basic technology of stock enhancement (Chapter III, Subsection 4.5). After the success of artificial seed production of marine fish in 1960, Japan has actually achieved artificial seed production in more than 200 species of fish and shellfish and is taking the global leadership. The experiences can be applied to most aquatic animals with varied life cycles. The population size of endangered species can be increased in natural environment by artificial seed production. Even after the extinction of a regional population in an area, it may be possible to recover it through stocking of artificially produced seed of another population having identical gene pool, which can contribute to the conservation of biodiversity.

(Akinori Hino)

2.3 Multiple utilization of aqua sphere and fisheries

Aqua sphere is used for a variety of purposes, and the major industry utilizing it is the fisheries industry. With the increasing interest in utilization of the aqua sphere, relations between fisheries and other utilizations are improving.

Fig. 5.4. A direct sale shop (Nagai, Yokosuka, Kanagawa) (photo provided by Kagari Umesawa).

In such a trend, it is being commonly recognized that scientific evaluation of social and economic importance of fisheries from various aspects is necessary. In 2003, the Ministry of Agriculture, Forestry and Fisheries consulted the chairperson of Science Council of Japan on evaluation and contents of multifunctional role of fisheries and fishing community relating to global environment and human life. In the report in 2004, multifunctional role of fisheries and fishing community was summarized into following five categories. 1. Supply of food and resource (original role), 2. Conservation of natural environment, 3. Maintenance of local community, 4. Conservation of life and assets, and 5. Provision of a place for life and communication. In the following part, multifunctional roles of aqua sphere and competition with its utilization focusing on the role to provide a place for the general public to experience the relationship with aqua sphere such as game fishing, marine sports and sightseeing included in category 5.

1) Utilization as the place of sightseeing and recreation

Fisheries are strongly connected with local history and natural condition. The value of fisheries as tourist resources is being acknowledged because of this strong connection. Particularly, special local fisheries products produced in the area are strongly attractive for tourists (Fig. 5.4). For the differentiation of special local products, raising brand awareness of the Seki horse mackerel and Seki mackerel are active advertising campaigns to appeal about the quality of the products. In 2002, the Ministry of Agriculture, Forestry and Fisheries started the "Brand Nippon" strategy for promoting the local production for local consumption activities (consume locally produced goods), conservation of local food culture, improvement of production, and sales and transportation aimed at producing brand local products is implemented.

Eco tourism, sightseeing in tune with the nature, is becoming popular with the increasing awareness of people to natural environment. Responding to the trend, the Ministry of Environment established tourist centers and nominated

Fig. 5.5. A whale watching vessel observing sperm whale in offshore of Nachikatsuura, Wakayama (photo provided by Motoi Yoshioka).

park volunteers as tour guides in natural parks at various locations in Japan. Fisheries Agency termed the new industry of marine tourism in fisheries communities as "Blue Tourism" and is pushing ahead comprehensively not only for fisheries businesses such as eating fish and on site learning of fishery by children, but also for recreations such as game fishing, ecotourism, marine sports and experiences based learning on fishery community for children aimed at connecting the urbanites and fishers community. Facilitating the coexistence and mutual understanding between fishers and tourists are required for multipurpose utilization of the place, though the new industries are expected to contribute to local economy, produce new motivation in the lives of local people, activation of local community, and contribute to the solution of decreasing of successors.

Whale watching

Whale watching is marine ecotourism in which tourist observe whales or dolphins from a boat. It is said that whale watching originated from observation of gray whales in the surrounding area of San-Diego, California, USA, in the 1950s. After that, whale watching became popular on the East coast of USA, Canada and other places in the world. Presently, whale watching activity has spread to 87 countries. More than 10,000,000 people enjoy whale watching leading to a business of more than 1.5 billion US dollars in a year.

Whale watching in Japan started at Ogasawara, Tokyo in 1988. Conflicts between whale hunters and whale watchers existed in the early days of whale watching in Japan because Japan is a proponent of whaling. However, the demand for whale watching is high in Japan and is carried out all over the country from Hokkaido to Okinawa. It is performed by fishers also in the former whaling areas, such as Taichi (Wakayama) and Tosa Bay (Fig. 5.5). In the economic evaluation of resort fishing by Nakajima *et al*. (1999), social utility of whale and dolphin watching was estimated to be from 46,080,000 Yen to 102,450,000 Yen. In the blue tourism campaign by the Fisheries Agency, whale watching is one of the important marine recreations.

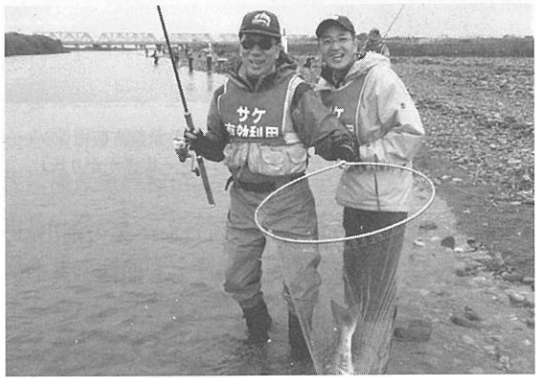

Fig. 5.6. Sports fishers enjoying salmon fishing in Tedori River in Ishikawa (photo provided by the Agriculture, Forestry and Fisheries Department, Ishikawa prefecture).

Inland water sport fishing

Inland water sport fishing in lakes and rivers is defined in article 129, chapter 8 inland fisheries in Fisheries Law. Inland water fisheries cooperative licensed Type 5 common fishery right in inland waters is obliged propagation of fisheries resources for exclusive use of the water body. In exchange, when the person who is not the member of the cooperative catches fish (sport fishing) in the area, the fisheries cooperative can collect sport fishing fare from him or her. The person should abide with the fisheries adjustment regulations issued by the governor of the prefecture. In USA, Canada, Australia, and Europe etc., inland waters are managed directly by the national or local government. Anglers should obtain license directly from the government paying license fee. Anadromous fish that migrate from sea to river for spawning like salmon, are protected by section 3 (Protection and culture of anadromous fish), as described in chapter II. Harvesting of salmon in river except by the licensed people is prohibited by article 25 (Prohibition of harvest of salmon in freshwater surface) in the Act, because the river is site for reproduction. However, request from anglers in Japan, and the increase in multipurpose use of salmon resources after the success of stock enhancement activities are changing the response of the governors. Fishing of salmon by common anglers is allowed in Churui river (Hokkaido), Oirase river (Aomori), Tetori river (Ishikawa) and in a few other rivers (Fig. 5.6).

Type 5 common right fishery involves obligation of propagation. Stock enhancements are implemented in various locations by fisheries cooperatives managing the fishing ground. Anglers are strongly interested in the amount of fish released to get a better success with angling. However, unregulated stock enhancement to increase the production caused various problems. After signing the Convention of Biological Diversity in 1992, Japan implemented stock enhancement considering the impact on biodiversity in the national strategy for biodiversity. As most inland waters are closed water bodies, there are greater

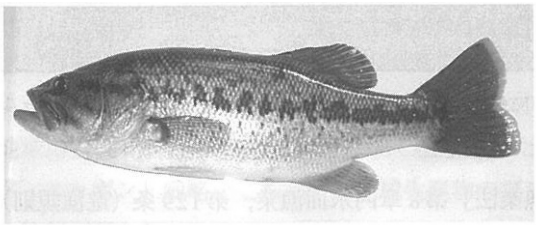

Fig. 5.7. Large mouth bass, *Micropterus salmoides* (photo provided by Osamu Katano).

possibilities that organisms in each river system are differentiated into indigenous population of each river system. It is desirable to use parental stocks obtained from same river system to release the offspring. Unregulated stock enhancement has risk of epidemic of serious diseases. Act on Maintenance of Sustainable Aquaculture Production laid down prevention of infectious diseases. Transfer of carp from water body where Koi herpes virus (KHV) disease occurred is prohibited, after mass mortality of cultured carps in Kasumigaura (Ibaraki) by this virus in 2003.

Expansion of distribution area of black bass by illegal release of exogenous species caused social issues in the popularization of sport fishing in Japan. Black bass is the collective term for species in genus *Micropterus*, family Centrarchidae which originated in North America. Large mouth bass (*M. salmoides*, Fig. 5.7), small mouth bass (*M. dolomieu*), and Florida bass (*M. floridanus*) are now found in Japan. Black bass is strongly carnivorous, eating fish and making serious impact on domestic ecosystem. First transplantation of black bass was in 1925 by Tetuma Akaboshi. He introduced the black bass to Lake Ashinoko (Kanagawa) for eating and sport fishing. After that, black bass transplanted to other lakes in Kanagawa prefecture, and also to the Kawaguchi, Yamanaka and Saiko lakes. After popularization of lure fishing from 1970, the black bass spread to other lakes where black bass had not existed earlier. It was thus distributed all over Japan except for Okinawa. After 1990, small bass which can survive in cold water and rivers were reported from various locations. Fishers of sweet fish and trout fish felt a sense of crisis, as the rapid expansion is considered to be caused by illegal transplantation by the bass angling fans. In many lakes including Lake Biwa, local species, especially the cyprinid fish such as Crucian carp and bitterling rapidly decreased causing serious impacts on local fisheries. Each prefecture is aggressively implementing the extermination of black bass. Transplantation of black bass is prohibited by the Fisheries Adjustment Regulation or Inland Water Fisheries Adjustment Regulation in all provinces except Okinawa and release of black bass after catch is also prohibited in various areas. Invasive Alien Species Act was promulgated in 2004 for prevention of damage by exogenous species. Large mouth bass, small mouth bass and blue gill (*Lepomis macrochirus*) were included in the first list of specified alien species. A serious

controversy arose between proponents of bass fishing, who positively evaluated the contribution of bass fishing to local economy and recreation of people, and opponents, who negatively evaluated the impacts on biodiversity and local fisheries. It is important for the multipurpose utilization of aqua sphere to make rules after discussion and adjustment among users who have various purposes.

Marine sport fishing

There is no regulation for sport fishing in the seas unlike that in the inland waters, because fish swimming freely in the sea, public water body, is defined as *bona vacantia* (object without owner) in customary law. Everyone can catch fish if he or she does not use fishing gears prohibited by the governor of the prefecture. As a result, sport fishing lovers compete against fishers. For example, it was clarified that sport fishers caught more sea bream than professional fishers in Kanagawa. In 2001, the Kanagawa Sea Farming Association, which implemented stock enhancement of sea bream by releasing artificially produced seeds, began collection of charitable contributions from the sport fishers boarding on sea bream game fishing boats. On the other hand, most of the game-fishing boats, which are common in suburban fishing ports, are operated by professional fishers and economic effects on the locality produced by visit of sport fishers to fishing communities are not negligible.

Digging of clams such as Japanese littleneck is a violation of Type 1 common fishery right. Fisheries cooperatives opened their fishing grounds for digging after receiving money as compensation for permission. Many fisheries cooperatives transplant Japanese littleneck and other clams and attract tourist for clam digging. This may have a large beneficial effect on the local economy. However, genetic disturbances and invasions by bladder moon shells (*Glossaulax didyma*), a predator of Japanese littleneck, occurs when the transplanted shells are introduced from other areas or countries. Proper management of transplantation of shells is therefore needed.

For the adjustment of utilizations of sport fishers and regular fishers, "Department of Resource Management" for utilization of sea and sport fishing was established on the coast and offshore sections of the Fisheries Agency. Collision accident between a large sport fishing boat and a submarine of the Maritime Self Defense Force, Nadashio occurred in July 1988. This triggered the constitution of "Act on Regulation of Sportfishing Boat Services" in 1989 aimed at ensuring the safety of anglers and to maintain the order of the fishing ground. The business of sportfishing boat service is defined as a business to guide the passengers to fishing ground by vessel and let them catch aquatic animals and plants by methods allowed in the ordinances of the Ministry of Agriculture, Forestry and Fisheries. The registration system for business of sport fishing boat service is under consideration.

Fishing ground under human control

Fishing ground under human control such as fishing pond is a place to enjoy casual fishing. In addition to the traditional crucian carp fishing pond, many fishing grounds of rainbow trout using ponds and partitioned rivers exist in mountainous areas. Some of them are exclusive areas for fly and lure fishing. This

Fig. 5.8. "Fish arena" constructed in a fishing port. Misaki, Miura-shi, Kanagawa (photo provided by Akira Saitoh).

type of fishing ground is an important resource to accelerate the contacts between urban and mountainous areas and contribute to the local economy. Recently these fishing grounds using culture cages in the sea are increasingly becoming popular in fisheries community around big cities such as Mie and Wakayama. Sea bream and yellowtail cultures are common in these areas, although the price slump is worrying the aquaculturists. They can expect stable income from the fishing grounds without transportation costs. That is the merit for aquaculturists and effects on acceleration of human contact between urban and fishing communities and on the local economy can be expected.

Marine sports

The aqua sphere is a place for various sports such as surfing, pleasure boat, diving etc., and also a place for fisheries. Surfing was a traditional culture in Polynesia, popularized in USA after the Second World War and introduced to Japan. Fishers hated surfing as interference of fisheries in the early days. In the process of countrywide popularization, accommodation facilities, service shops and restaurants for surfers were constructed, and surfing came to be recognized for its contribution to local economy. Pleasure boats such as sailing boats, motorboats and personal watercrafts increased with the economic development. The boats competed with fishers in utilization of aquatic resource and water surface and fishers hated them. Different from the USA and Europe where marine sport is popular, facilities for marine sports are insufficient in Japan and conflicts between marine sports and fisheries such as illegal mooring of pleasure boats prevail. However, several pioneering activities have begun to accept the pleasure boat businesses in the local community and coexist with them for improving local economy. Fisheries Agency also began maintenance of fishing ports which have multipurpose functions and 30 fishing ports in various locations have fish arenas as mooring facilities for pleasure boats (Fig. 5.8).

Scuba diving with instructors coordinated by diving service shops has no problem. However, private diving and diving in fishery grounds sometimes

Fig. 5.9. People enjoying scuba diving in Miura peninsula (photo provided by Tomomi Katoh).

creates trouble with local fishers who misunderstood the divers as poachers of abalone or other valuable fisheries products. Divers should take care not to create such troubles (Fig. 5.9). Some divers enjoy shooting fish by spear or spear gun. Such fishing by diving is prohibited by the Fishery Adjustment Regulation in many prefectures.

2) Evaluation of economic impacts

It can be concluded that multiple utilization of aqua sphere will accelerate mutual contact between the urbanites and fisheries communities and will vitalize local community with well coordinated coexistence with fisheries and fishing communities. It is required to evaluate the economic values of each activity objectively and properly for adequate implementation of the policy. It is relatively easy to evaluate activities which have profit performance, though evaluation of activities related with traditional culture, natural environment and amenities is complicated and difficult. For the evaluation of the activities without monetary profits, calculating the virtual market (CVM) is a useful method. In this, subjects of the research are interviewed about how much they would want to pay to protect the phenomenon or environment. In another alternate method, operation cost of the human activities when the natural function is substituted with human activity is worked out. Travel cost method is another method to evaluate the height of motivation from the cost to go there. Various evaluations were tried for the function of multiple utilization of aqua sphere using these methods though many aspects of fisheries and fishing communities still remain to be evaluated and integrated in a holistic way.

(Kazumasa Ikuta)

2.4 Consensus building in abandonment of fishery grounds and conservation of water body

Development including public work projects such as construction of dams

for improvement of aquatic system and reclamation alters the aquatic environment. The alteration touches interests of various stake holders because of overlapping utilization for multiple purposes. Development itself is not automatically approved without any objection today. Public opinion is often divided into supporters and opponents. Administrative organizations, companies and citizens have connections to both side and fisheries related persons are also included in them, thus complicating the relationship at times. The rights to implement fisheries in the water body, namely fishery right, common of piscary right and other rights and compensation of the rights often cause serious social disputes. It is quite natural in a country ruled by law that users of the water body have the right to be compensated when the alteration of the water body affects its utilization. The development cannot be implemented without consensus of all users. However, it is sometimes considered that compensation for fishery right was the sole problem for the solution of the conflict in the process of consensus building and permission of development. This is partially because fishery right in Japan originated from right for implementation of fishery by community in the coastal local area (common of piscary right). The other reason is that fishery right was actually the sole largest object of compensation. Sea is not under the ownership of national government but under public ownership and its utilization should be determined by local community in Japan. Actually, fisheries cooperatives, as administrative bodies for fisheries by local community, have controlled the fishery rights. From this background, compensation of fishery rights was the core of the discussion. However, some aspects of the rights made the supporters of development to think of fisheries as interfering with development, and the opponents to think of fisheries as a major power resisting development. It is quite natural that some fishers want to get compensation for their career change, while others want to continue fisheries. Compensations to fishery were often big problems for both side of development and conservation. An example of such a case is the reclamation and compensation problem in Sanbanze (No. 3 shallow in Tokyo Bay, Chiba) described below:

1) History of Sanbanze (No. 3 shallow in Tokyo Bay)

Sanbanze is the shallow tidal flat sea area near the mouth of Arakawa discharge channel in the inner part of Tokyo Bay (Fig. 5.10). Before reclamation, the tidal flat swept west to the mouth of Edogawa River. Present Sanbanze is a remainder of the tidal flat formed with the sediment leaching out from the landfill. Sanbanze covers 5,700 m in east-west direction and 4,000 m in north-south direction and the area shallower than 1 m in average water depth is 1,200 ha. The bottom gently inclines towards the center of the bay with 1/1000 slope. Several tidal flats and water parks are located around Sanbanze. The area was specified as harvesting area for fish and shellfish to present to the Shoguns in the Edo period. It is thought that the area was exclusively used by fishermen immigrated from Kishu (present Mie Prefecture). Sanbanze area is a very rich fisheries ground and several conflicts with other neighboring fishermen took place over its exclusive use. Aquaculture of laver (Nori), Japanese littleneck and hard clam in this area began towards the end of the Edo period or the early Meiji period. After

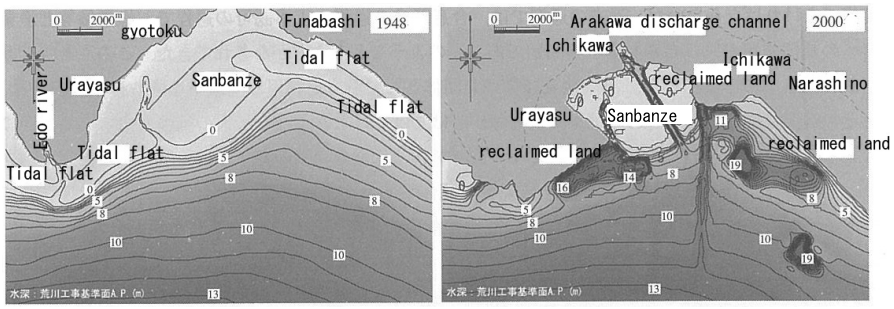

Fig. 5.10. Changes of Sanbanze from 1949 to 2000.

the Meiji period, the Sanbanze area was rapidly changed by landfill and environmental deterioration. In 1958, fishermen battled with police over the water discharged from Honsyu Seishi Co. Ltd. The numbers of injured, arrested and slightly injured were 105, 8 and 36, respectively. Fishers led the campaign opposing the environmental deterioration and landfill in the period during the high growth period. Urayasu Fisheries Cooperative disclaimed a portion of their fishery right and reclamation started in the 1960s. The cooperative disclaimed full part of the fishery right in the 1970s and the reclamation from the mouth of Edogawa River to the boundary of Ichikawa-shi was completed in the 1980s. However, further reclamation plan was frozen because of two energy crisis in the 1970s, and the heightened interest for nature conservation helped to retain. The frozen plan was revoked for another purpose in the 1980s. Opposition to the new plan was launched on a nationwide scale, because the importance of tidal flat in efficient functioning of the ecosystem was commonly accepted in Japan and information on the reality of reclamation project in Isahaya Bay had an impact on grass root opinion. The plan was minimized from the original 740 ha to 101 ha, although the project was not finally implemented. The reclamation plan was called off in 2001 and Investigation Commission for Regeneration of Sanbanze (round table meeting) was established in principal to disclose the information and citizen participation.

2) Reclamation of Sanbanze and compensation of fishery right

The history of the reclamation of Sanbanze can be divided into three periods, namely, the period from reclamation to conservation from 1950 to 1979, period from revival of reclamation plan from 1979 to 2001, and the period of activity of regeneration after 2001. The relationships among fishers, local government and citizen groups have changed intricately through the history.

In effect, the fisheries ground remained and fisheries can be continued in Sanbanze due to the call off of reclamation plan. It looks like a complete success of fishers, although serious social issues took place. In 1982, before the call off, Public Enterprise Agency of the Chiba Prefectural Government concluded an arrangement of trilateral agreement with financial institutions and Gyotoku

Fisheries Cooperative in Ichikawa-shi. In the agreement it was agreed that the Agency will pay compensation when the plan was implemented. The Chiba Joint Association of Cooperative Bank of Fisheries and Chiba Bank lend loans of 4.3 billion yen to fishers. Grantees of the loans were future compensation money for landfill and the prefecture contracted to assume the payment of the interest instead of fishers. The possibility of discontinuation of fisheries was high for fishers at that time. The agency offered facilities to fishers with fishery right in the planning area for preparation of vocational change such as job training, education of children and relocations. That was a policy to minimize the impact to the people who would be annoyed by coastal development performed as public utility service and to ease up the anxiety about future in the political scenario at the time. However, that was a de facto compensation for fishery. Natural conservation group center on coastal inhabitants took legal action against the concerned parties at that time claiming that the agreement was a policy to cut the line of retreat from reclamation. Economic disparity between fishers who wanted to continue fisheries and those who wanted to retire from fisheries had a negative impact on human relationship in the fisheries community. The relation among local government, fishers and natural conservation groups was stalemated. As a result, the interest reached 5.6 billion yen by 1999. The local government factored the payment of interest in budget, though details of the process were not explained to residents of the prefecture. Suspension of payment of the interest was claimed. Chiba district court pointed out that there were serious defects in the trilateral agreements and the agreement was illegal. Though the claim to suspension of payment itself was rejected in October 2005, the assumption of the payment of interest is at the discretion of the Agency. After several mediations, it was concluded that Chiba prefecture would defray 6.6 billion yen for satisfaction of debt without request of repayment from fishers. However, the argument for and against the payment from prefectural inhabitant tax still remains.

3) Relationship between the utilization of sea by the fishers and citizens

Yatsu tidal flat situated next to Sanbanze is registered as a wet land in Ramsar convention. Several groups were aiming for registration of Sanbanze in Ramsar convention, which would be a big support for people who wanted to conserve Sanbanze. However, the Fisheries Cooperative of Funabashi-city carried out a signature collecting campaign for objecting the registration of Sanbanze in Ramsar convention. Following objections were listed up in the campaign document: i) Registration will interfere with the maintenance of fisheries related facilities by regulating new construction, extension and reconstruction of building and other facilities. ii) It should be clarified that fisheries activities such as setting of substrate for laver culture or gill net are out of the regulation. iii) Activities for maintenance and enhancement of fisheries resources such as sand cover and improvement of coastal environment may be control subjects. iv) Feeding damage to fish larvae, Japanese littleneck, laver and other organisms living in Sanbanze by aquatic birds will increase. v) Economic damage by contamination of feather of aquatic birds to laver will increase. Opposition of fishers to registration under the Ramsar convention may make the registration impossible.

Many future efforts at creating mutual understanding among the concerned parties are needed. On the other hand, activities for coordination of fishers and citizen also simultaneously exist. Because of the joint hosting of events, those who were critical about lending money for vocational purposes became conciliatory to understand the lives and thinking of the fishers. Several citizens took active part in the advertisement of products of Sanbanze. The changes in citizens caused changes in the fishers and some became positive about the citizen's activities. Reassurances for the continuation of fisheries in Sanbanze made fishers to realize that they co-exist with coastal citizens. The experiences of Sanbanze issue may be a lesson to support urban fisheries by many citizens. Fisheries Cooperative of Funabashi-city changed their policy and agreed with the registration of Sanbanze under Ramsar convention. Other fisheries cooperatives which implemented fisheries in Sanbanze had not expressed their opinions on the registration of Sanbanze until 2008.

We can point out following three issues from the history of Sanbanze. i. There is no social rule for the call off of the development in Japan, because most systems were established during the period of development. ii. The system for the compensation of fisheries is a priority and the compensation is paid out from the tax money. The compensation should be paid back with the call off of the project. The possibility of post-fact compensations should be considered. iii. There is no system for compensation of mental agony caused to the fishers due to deprivation of fishing grounds and business. There is incomprehension of the nature of biological production in aqua sphere as well as a misunderstanding of the Fisheries Laws and the system. Sea areas are connected with each other and the environment does not exist in isolation. Aquatic organisms, from highly migratory fish to sessile organisms, use aquatic environment multilaterally. Human beings also use the aquatic environment and its resources multilaterally. It is an obligation of the coastal countries to conserve and utilize the coastal environment properly. We cannot manage specified sea area independently without any impact to the other area. Irrespective of holding the fishery right, all related bodies including public and private ones are obliged to properly conserve, utilize and manage all water areas. Compensation of fisheries is not same as the compensation of fishery right. It is not meaningful to discuss the right and wrong of development only from the fisheries point of view. The government's misunderstanding that development would be automatically possible only by compensation of fisheries is an important lesson in history. Citizen groups who appealed for conservation should not consider the fishery right only as the base of their claim and should consider sympathizing with the fishers who actually live near the sea. As future is not completely predictable scientifically and reasonably, we have to consider that predictable things are limited. It is one of the important functions of aquatic biologists to consider how we can provide useful information to contribute to the evolution of consensus among various interested citizen group.

(Satoquo Seino and Hisashi Kurokura)

3. SUGGESTED SOLUTIONS

3.1 Pricing of aquatic products

1) Importance of knowledge of pricing mechanism

The most important information required in evolving medium to long-term strategies in management of fisheries business is to realize how the market will change. Management bodies are expected to forecast the market, prepare management strategies, formulate objectives and operate the business depending on the strategy in order to achieve the objectives.

Some advanced fisheries cooperative, federations of fisheries cooperative and business enterprises operate their businesses based on their marketing strategies. However, some fisheries businesses lack a proper marketing strategy.

It is necessary to answer the question of possibility of forecasting future market from the general trend. It is the obligation of business executive officer to determine strategy considering the prevailing business conditions and understanding of the general trend. Executive officer is the person in charge of management, and may be the top of fisheries cooperative, owner of the fishing company or owner of the fishing vessel.

Major importance in management strategy of fisheries business is stressed on how to achieve sustainability. For sustainability of fisheries business management, it is necessary to obtain profit making resource condition at a higher level. To obtain the profit, it is necessary to invest optimum efforts by getting insights into market trends. Particularly, restraint of cost for same input of effort (minimizing cost) and increase of sales are necessary. For restraining administrative expenses, rationalization is needed. For the increase of sales, stabilization of price at high level is important.

In comparison with the same catch volume, sales proceeds will be higher with higher price. From the view point of sustainable use of resources, strategies to maintain constant higher price in order to increase sales proceeds by managing resource is better than strategies to increase catch volume. For price increase, we have to know the mechanisms and nature of pricing or the nature of markets.

The knowledge of price formation enables evolving optimum management strategies to realize sustainable fisheries management.

2) Pricing mechanism of aquatic products

Nature of price determining factors

Price determination is influenced by various factors. Knowing the mechanism of pricing is most important for fetching higher price for the products in the market. Nature of pricing can be summarized as follows:

1) Prices of the products increase when production decreases and vice-versa.

2) Prices increase when consumer income increases and vice-versa.

3) Consumption and price of products increase when price of competing goods increase and vice-versa.

4) Even for the same product, prices are influenced by prices of other markets.

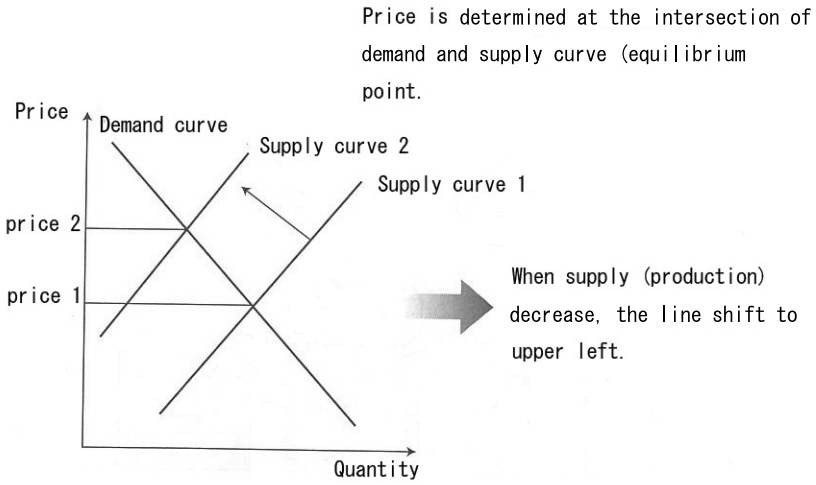

Fig. 5.11. Price and balance of supply and demand.

5) Prices increase when the products fit the needs of the consumers (actual demander) and decrease when the products are not suitable for the consumer's needs.

6) The difference between farm price and retail price decrease when distribution system is rational and increases when the system is irrational.

Statement 1 expresses the forces of supply and demand. Price of commercial goods in same quality is determined by the balance of supply and demand (Fig. 5.11).

Statement 2 is the influence of the consumer's income level. In relation to statement 1, demand curve goes up or down depending on the consumer's income.

Statement 3 expresses the substitution and complementary relationship. When substitute goods are provided at a cheap price, the goods will be fast selling and the price of relevant goods decrease. It is important to analyze the influence of competitor addition to the force of supply and demand in pricing.

Statement 4 is an interaction of markets. When a fish is harvested in the producing region and same fish is dealt in low price in another market, the price in the local market in the producing region is lowered by the influence of another market. It is important to predict the influence of conjunct markets in addition to understanding the movement of relevant markets.

Statement 5 is the influence of quality on price. Demand and price of commercial goods which the consumers want to buy increase while the price of goods consumers do not want to buy decreases. It is important in management strategy to organize goods in response to the needs of the consumers.

Statement 6 is about efficiency of the distribution system. Losses and prolonged stocking enlarges the difference between retail price and price in the producing region. Actually, various costs in distribution process are to be

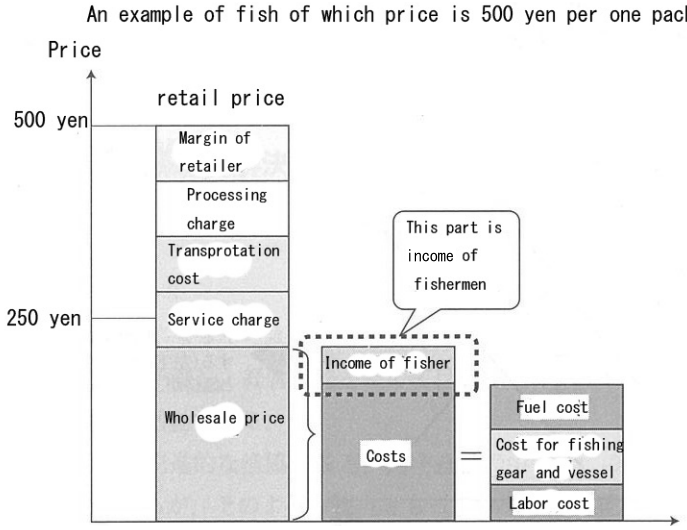

Fig. 5.12. Component of retail price.

included in the price. It is necessary to check the efficiency and advantages at each step of the distribution process (Fig. 5.12).

In case the harvested products have added value by processing or through any other means in the producing region, the local price increases. An important aspect is not to curtail the distribution process simply but to find more efficient ways after investigating the needs.

In short, it is obvious that price is determined by various factors. However we should not neglect the influences of relevant factors because of the complexity. It is necessary to evaluate the influence of each factor for sustainable management of fisheries business in highly developed and globalized markets.

Long term resource management and price of fisheries products

For long term strategy statement 1 is the most important one because long term price fluctuation is mainly determined by the balance of supply and demand, and supply is clearly determined in relation with resource management. Figure 5.13 shows the relationship between price of fisheries products and resource management.

When long term supply curve (SL), short term supply curve (SS1), and short term demand curve reach short term equilibration at E1, catch volume and price is Q1 and P1. If the demand increases because of some unknown reason, the demand curve shifts from D1 to D2. Increase of demand may be due to an increase of population, consumer's income (statement 2) and price of replacing goods (statement 3). In such case supply reacts in short run and catch volume increases. As a result, short term supply curve SS1 and short term demand curve D1 reach equilibrium at E2. At that time, catch volume is Q2 and price is P2. Q2 exceed the

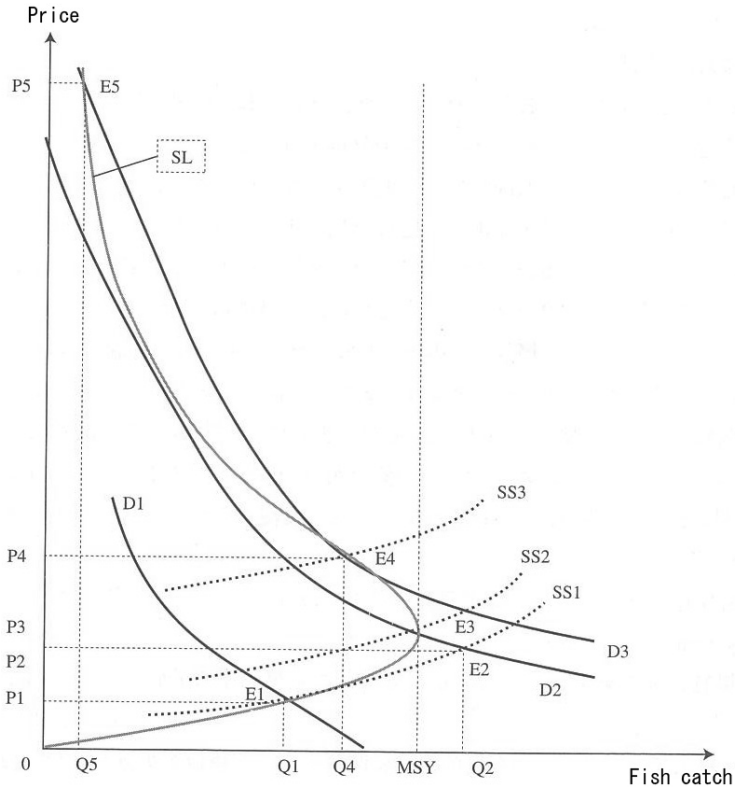

Fig. 5.13. Demand and supply model of fisheries products.

sustainable yield (SY) and the stock decreases. As a result of stock decrease, short term supply curve shifts to SS2, and SL, SS2 and D2 reach equilibrium at E3. As the catch volume is kept at maximum sustainable yield (MSY) it is desirable if the equilibrium can be maintained in this condition. Market equilibrium is ideal when kept at E3 for resource management. On the contrary, target of resource management should be determined to make equilibrium between supply and stock.

However, in actual market, when the resource management is not properly operated, such an ideal equilibrium is not attainable. When the value of the fish increases, the demand for it also increases. As a result of this increase, the demand curve shifts to D3 and the equilibrium point is shifted to the intersecting point of SS2 and D3. In this condition, minimum required stock amount to keep sustainable stock level cannot be kept because of increasing demand and stock amount decreases. In this scenario, the short run supply curve shift to SS3. As a result, equilibrium is reached at E4, the intersecting point of SL, SS3 and D3. In such a condition, the stock amount is obviously smaller than MSY. For fishers, the

demand is larger than before and price is increased. Larger incentives for supply, though decrease in stock, catch amount is smaller than the previous phase. Price increase but welfare economics are reduced. When the demand increases beyond D3 in this condition, the equilibration point rapidly moves to E5 and the stock collapses.

Thus, stock management and long term price fluctuations of fisheries products are closely related. It is important to control the economic process for better stock management.

3) Analytical methods for pricing fisheries products

Models:

Methods for analyzing the mechanisms of the processes and prediction of future movements described here are quantitative methods. In economic analysis, however, analyses of such phenomena either descriptively or through comparative statistics of the data obtained by interview or trends in published data is qualitative in nature, and important for clarification of structure and direction of the pricing phenomena. Without qualitative analysis, proper quantitative analysis is difficult. Accordingly, reference literature and data are collected, hypotheses drawn, and interviews performed to know the economic framework. The model for qualitative analysis (mainly econometrical analysis) is built based on the qualitative analysis. Types of models commonly used in price analysis are as follows:

Statements 1 and 2 are about relationship between demand and supply. Demand-supply analysis is used for this relationship. In demand-supply model analysis, actual data is applied to market models such as demand and supply functions to estimate relevant parameters. For understanding the relation with stock condition, long and short term biological resource economy model (supply function derived from reproductive stock production function) is used.

Demand system analysis is used for the analysis of the function in statement 3. Most commonly used model in demand system analysis is the Almost Ideal Demand System (AIDS) model.

For statement 4, market integration analysis is used. Slightly higher analytical technique in econometrics is needed for market integration analysis.

Statement 5 is related to the need, which is qualitative information. Discrete choice model analysis and spatially conjoint analysis are commonly used.

For statement 6, the above mentioned analyses are integrated and a combination of demand-supply analysis and market integration analysis is popularly used.

Methods for data collection:

Survey for price analysis is performed aiming to: i. Understand the reality, background and current status, ii. Understand the economic structure as base of economic model building and iii. Confirm data source and data collection, iv. Acquire collaboration from concerned bodies. Collection of references, implementation of questionnaire and hearing are popularly used survey methods.

Data collection for functions in statements 1 and 2 is always a difficult task. Collection of misleading data far removed from the reality may happen because

of exclusive and asymmetric possession of data, misunderstanding of objective of the interview, misunderstanding and arbitrary falsification of the data by researchers etc. In order to prevent misleading data, implementation of research by multiple researchers who have different views, selection of targets with different stand points, and replication of research are important.

Quantitative analysis is impossible without data. Particularly, major data for demand system analysis and market integration analysis are closely related to the interests of various people. Authorities concerned often do not open certain data considering advantages of stakeholders (interested parties). Analyzer needs device and capacities. Some research can be performed only by using published data, while other researches need further data such as on management and distribution. As a countermeasure in such case, researcher should survey data alternatively by cross sectional analysis or through alternate relevant data obtained by approaching the concerned authorities.

(Masahiko Ariji)

3.2 Function of ecosystem (ecosystem service)

Our life is supported by materials and environment provided by the ecosystem, which include various essential blessings of nature for human beings such as oxygen. Ecological service is a term to comprehensively express benefits from ecosystem. The term "ecological service" was used by Wilson and Mathews (1970) for the first time. However, the idea that human life is supported by ecosystem emerged from the time when human beings obtained foods by hunting and gathering. The importance of material circulation function of ecosystem was widely recognized in the mid 20th century. Degradation of environment and ecosystem combined with deprivation of ecosystem caused by adverse practices became prominent in the late 20th century. The change progressed more rapidly than ever before, and, as a result led to the deprivation of ecosystem services, increase of ecosystem risks, poverty and widening of inequality. Degradation of ecosystem services is anticipated to accelerate further in the early half of 21st century. The fact that direct causes contributing to the degradation of ecosystem will continue or increase is now recognized. Therefore, it is necessary to reduce the degradation of ecosystem by responding to the demand for ecosystem services necessary for the existence of human beings. It is commonly recognized that innovative changes in social system, social habits and policy are crucial. An international collaborative research "The Millennium Assessment (MA)" was launched under the initiatives of the United Nations Environment Plan (UNEP) from 2001 to 2005 aimed at forecasting the influence of human activities on ecosystem. The findings were published in 2006 in 10 separate volumes (Guide to the Millennium Assessment Report), which covered wide fields from natural sciences to policy recommendations from the stand point that conservation of ecosystem and maintenance of ecosystem service need inter-government conventions and political strategies by each country.

1) Ecosystem service

In the MA report, ecological services were classified into following categories.

i) Provisioning service

This service means supply of materials essential for human life such as food, water, wood, fiber, medicine etc. This service includes not only the supply of materials which have economical values but also future supply of materials which are not discovered, or which have not yet proven their economic value but may be of value in future. Materials or products from the ocean listed in the report are food and raw material, bioactive substances including medical materials, genetic resources, nutrient and inorganic salts-rich deep sea water.

ii) Regulating services

Regulating services are the function for controlling the environment. Characteristic of this service is the huge estimated cost when the function strategy is substituted by human activity. The services include control of climate, control of chemical composition of air and ocean, gas metabolism, mineralization of organic substances. Stability of components of seawater is maintained by this service and the strategies are important for maintenance of the aquaculture environment.

iii) Cultural service

Provision of places for spiritual comfort, aesthetic experience, base for religious and art activities, recreation etc. are the cultural services. Local inherent cultures are based deeply on local ecosystem and biota. It is widely accepted that biodiversity is the base for richness of culture.

iv) Supporting service

The above described services composed of strategies for ecosystem management such as circulation of nutrients, primary production, soil formation etc. are termed as basic services.

Each of the above described service contributes to the welfare of human life. When we separate factors composing welfare to safety, resources for life, health and social network, provisioning service and regulating service mainly have deep relation to safety, resources of life and health. Cultural services support health and social network. However, the relations between each services and welfare are not simple. Human being has the freedom of selection and acts based on individual values. This is the primordial factor composing human welfare. Each service has relation to each action of each individuals having different importance in multiple levels. This means that value of ecosystem service are different among people and the evaluation of value of ecosystem service is complicated.

2) Social and economic evaluation for value of marine ecosystem services

Fisheries production as target of fisheries, regulation of composition of air (oxygen and carbon dioxide), circulation of nutrient salts and treatment of waste materials, recreation, culture, control of soil erosion by mangroves can be listed as important marine ecosystem services today. Among these, fisheries production and recreation directly connected with ecotourism are recognized for their economic value in society. In other word, monetary compensation for loss and damage in these sections are socially legislated. However, the economic values

of other function are rarely recognized. Social consensus for validation of mangrove and tidal flat is still not established. Further, economical evaluation of regulatory function of air composition has not even been discussed. Social consensus, used in this chapter, is the institutional protocol to adjust interest oppositions concerning the right to share the bounty of ecosystem service.

Costanza *et al*. (1997) classified ecosystems on the earth into 16 systems and evaluated economic value of 17 categories of ecosystem services in each system. As a result, annual global production by ecosystem service ranged from 16–54 trillion US dollars with an average estimate of 33 trillion US dollars. Most of the values exist out of existing market economy. The value produced from global ocean was 21 trillion US dollars. Function of nutrient circulation and waste treatment was the highest in value per unit area. Value for fisheries production was estimated lower than other values, and reached less than 10% of the total value in any marine area. Several defects are pointed out for the calculation of the value. Firstly, adequacy of conservation factor for the calculation of economic value caused several discussions, because unverifiable hypotheses were used for the estimation of the factors. For the solution of this problem, reliable scientific information should be used as basic hypothesis. Updating of factors reflecting changes of society is necessary and inter disciplinary approach is important. Secondly, as a more serious problem, these estimations depend on present values and future values are not included. For example, social value of gas regulation by the ocean hardly attracted social interest before popularization of global climate change problem. However, carbon dioxide absorption capacity of the ocean is not solely an issue of oceanography but is a kind of social concern today. Thirdly, ecosystem is a circulating system and estimation of its value is difficult. Particularly, major functions of marine ecosystem such as biological production and material cycle are circulation of materials.

3) Comparison of biological production in terrestrial and marine ecosystems

Turnover rate (P:B ratio) of ecosystem can be obtained from division of primary production by biomass (see Chapter I, Subsection 5.2). In the ocean where phytoplankton is the primary producer, biomass is replaced 40 times a year. On the contrary, in the sea grass bed, the biomass only doubles in one year. Photosynthetic organisms float in the surface layer to obtain light. Smaller individuals can float more easily than larger individuals. Therefore, individual size of phytoplankton is small. As a result generation time of phytoplankton is short and their P:B ratio is far larger than macro algae and terrestrial plants. In pelagic ecosystem, "Large eat small" food web is common and body size of herbivorous and carnivorous organisms is larger at higher trophic level. As a result, alteration of generation is more rapid in lower nutritional level and slower in higher level. On an average, P:B ratio of marine animal is about 3 times larger than that of terrestrial animal. The relation between individual body size and generation time in aquatic ecosystem is prominently different from that in the terrestrial ecosystem, where relatively larger primary producers such as trees and grasses are eaten by smaller consumers.

The difference in production system is apparent in the difference in material

circulation. The difference can be simplified as "Stock is dominant in the terrestrial ecosystem and flow is dominant in the marine ecosystem". The difference between land and sea is important in utilization of ecosystem services. In marine ecosystems, small biomass drives large flow and small loss of biomass causes large damage in flow. Inversely, large benefit is obtained by controlling small amount of biomass. Fisheries resource management is aimed at proper utilization of this mechanism which is systematically implemented with institutional support in the ocean. Extinction or loss of ecosystem such as land reclamation causes huge loss of the ecosystem's inherent material circulation function. Values of flow are more important than those of stock in marine ecosystem compared to terrestrial ecosystem.

4) Revision of social and economic evaluation for value of marine ecosystem

The methods for evaluation of ecosystem services based on the characteristics of the marine ecosystem are essential. Firstly, evaluation of each function of ecosystem is possible, though the evaluation of ecosystem itself is hardly possible. Ecosystem is the driving force for material circulation, which will be affected by the disappearance of the ecosystem. Utilization of fisheries resource is utilization of reproductive function of the ecosystem. It is very difficult to artificially produce cost effective and perfectly functioning ecosystem. Trials of artificial production of ecosystem are limited only in artificial beaches. Secondly, evaluation based on the linkage between marine and terrestrial ecosystem is important. A typical example is the problem of nitrogen fertilizer used in arable land (Seizinger *et al*., 2005). Nitrogen compounds flow into the coastal area causing eutrophication, the formation of anoxic waters and production of nitrous oxide (laughing gas), thus accelerating climate change. Thirdly, acceleration of tradeoff among ecosystem services should be taken care of. An example is the carbon dioxide credit business among private companies using the geo-engineering technique (Gilbert *et al*., 2008). The existence of tradeoff relations means necessity of adjustment of conflicting interest among stake holders. What is most important is the relation among interested parties, government, academia and international organizations. Social consensus for utilization of fisheries resources is relatively well established, though conflicts prevail. Various discussions for marine protected areas may contribute to the construction of future social consensus about utilization of marine ecosystem services. In addition to the development of international distribution of goods including fisheries products, globalization of services such as carbon dioxide credit business need to be accelerated. International organization should establish mechanisms to form and maintain global social consensus. Consensus formations are needed on wide ranging issues from small scale such as local community to global mass scale.

(Ken Furuya)

3.3 Debates over coastal fishery right (from a notebook of retired administrative officer)

Fishers sometimes think that a fishery right is the right to dominate sea or

claim ownership of fisheries related organisms. However, Fisheries Law defines fishery right as a definitive and exclusive right to engage in specified fisheries in specified area. There is no need to discuss principal of fishery rights among researchers and administrative officers, because they share a clear understanding. However, misunderstandings actually can occur between fisheries and non-fisheries communities. Most common misunderstanding is that fishery right is the jurisdiction (custodial right) or domination of fisheries cooperative (FC) over the specified area. Regardless of clear legal description, several authorities on fishery right often insist that FCs as representative of local fishers have the right to control and dominate an area based on historical origin of fishery right. It is true that fishery right originated from proprietary fishery grounds of coastal villages in the Edo period. One may say that a custodial right which is not stated by the Fisheries Law is legally valid based on the historical background as long as it fits for public order and morality. The other may say that custodial right is not legally valid unless positive law inclusive of Fisheries Law clearly endorses it. Sometime in heated debate, people forget the important fundamental principle that social order and legal order have no meaning without the assent of citizens in the society. Social regime is subject to changes of society in history and changes are to be accepted by the society. People also expect the legal system to address such changes. It is impossible to transfer the social system today to the one in the Edo period.

1) Background of establishment of fishery right system

In Ritsuryoyouryaku (legal interpretation of formal law) in the Edo period, it is often noted that fisheries system was managed by the general rule that idiomatically expressed "Shore is common for coastal community and offshore is general commons for all people". Some researchers reported that the shallow coastal area where an oar or paddle could touch the bottom was considered part of the fisheries village and the animals and plants in the area were for exclusive use by the coastal villagers. This is a kind of sole possession of sea area by villagers. However, after Meiji Restoration, a fundamental principle was introduced stating that the sea has no owner and belongs to the public (public water body). Possession or domination of a specified sea area by a specified body was not allowed in Japan. According to an ancient law in Japan, Taihoritsuryo (A.D. 701), a famous rule also stated that products from mountains, rivers, bushes and shallow waters are common possession. The rule did not basically allow the possession, control and use by a specific person. But such rules did not deny control of the sea area by specified fisheries village. When we consider the mobility of people and influence of the government in the Nara period (710–794), the use of the sea area was supposed to be limited to the villagers concerned. People outside of the village rarely used the fishing ground, and the rules were considered to be a kind of endorsement of common right for villagers. As shown in the declaration of state ownership of sea in 1875, the Meiji government clearly had no idea to allow the ownership of the sea area to anyone other than national government, and even denied the ownership by the local community. After encountering serious conflicts among fisheries communities caused by the

declaration, in the process of modernization of legal system the Meiji government had to allow the control of the sea area by coastal community in the form of fishery right of the coastal community. However, a "coastal community" was a vague unit and it was not an element of local government unit, such as village or town. Meiji government thus encouraged to set up the fishers' organization as a body which had the ownership of right of common.

It is understandable that some fishers may feel that a coastal area is "our own sea" and consider that a fishery right supports ownership of the coastal area. However, fishery right clearly became a right to implement specified fisheries by a specified group (fishers' group living in the community) by improvement of legal system in the Meiji period. As the name suggested, in the Meiji period, fisheries village was a community of fishers. It was easily accepted by inhabitants of fisheries village to nominate a fishers' group as a right holder of local fisheries. Increasing interest and claim for access to sea by non-fishing members of the society, and a decrease of population ratio of fishers in fisheries village have changed the situation of fishers today. Claim of exclusive use of the sea area by fishers based on the feeling of "our own sea" will definitely cause conflict with non-fishers. For the prevention of the conflict, fishers should sort out the issue of fishery right and custodial right of the sea by themselves and consider how they can claim their right. Fishery right in the Fisheries Law and custodial right for implementation of fisheries in the sea area should be discussed separately. Fishers' view on "our own sea" and right in the Fisheries Law should be considered separately.

2) Fishery right

General meaning of fishery right is legally clear and there is no need to explain the meaning. However, claim of fishery right based on the "our own sea" feeling may lead to unexpected criticisms on the fishery right system. When we re-consider that social and legal order can be accepted by common people and social regime changes with changes of society, allegations not accepted by members of general public will be denied sooner or later.

In a perfect legal discussion on fishery right based on the history, fishery right is the right to collect fisheries related animals and plants by inhabitants of the community. For the use of common goods such as animals and plants, rules for use among the users are needed, and the existence of such rules in communities was well known. With the professionalization of harvesting fisheries resources in the Edo period, fisheries were differentiated from other business and dependence on fisheries of fishers increased. These changes induced the establishment of rules for fisheries resource management and use of fisheries grounds. When many in a community were fishers, the rules benefited them. But, if the fishers were a minority and they had no political force, the right for harvesting did not fulfill the fishers' needs and the right was managed as right for sharing the use among community members. This is obvious from the reports of management system in villages in Okinawa where dominant farmer had force in the management of the sea area in the past. It is probably difficult to make people accept the allegation that right to collect fisheries related organisms belongs solely to the right of

fishers only based on the historical background.

Following are list of reason why right to collect fisheries animals and plants to fishers or fisher's group today;

i. The right to collect animals and plants in the sea area should be granted equally among inhabitants in a community. This is especially so, when we consider that the right is formed for a village community. However, the concept of a coastal community such as hamlet has collapsed today. It is difficult to make legally clear relation between local community and main constituent of right and obligation of conservation and management of fisheries resources. As administrative units, a city, town and village can represent the inhabitants of a community. However, the unit is too large and sometimes they are not suitable to represent or protect fishers' need.

ii. Fishers are the largest stakeholders in the harvest of fisheries resources. Even though sport fishers and users for recreation are also stakeholders, those who have the greatest interest in the fluctuation of resources and who are affected by resource fluctuation are the fishers. They are the ones most strongly affected by resource management and conservation.

iii. On discussion of who is responsible for conservation and management (management of collection and use), organizations that represent the intention of the inhabitants such as a city, town, village and local assembly should legally have the responsibility as long as the right of the collection is provided equally to the members of community. However, administrative units and local assembly today have expanded over the boundary of coastal communities and the representativeness of local coastal communities has been weakened. Even if the administrative unit represents local coastal community, it is practically and financially impossible for the unspecified inhabitants to take responsibility for resource conservation and control of fisheries resource collection. On the other hand, harvesting of fisheries resource without control by inhabitants cannot be neglected and establishment of an appropriate organization for control will be necessary. When we consider who will make the most serious efforts to conserve fisheries resources and control of collection, fishers will make the most earnest efforts because they work in the sea area every day for their living. Sport fishers may also have interest for the conservation of fisheries resources, but, it is not expected that they will work for conservation of resource every day.

iv. Based on the above discussions, it is natural and appropriate to assign responsibility for resource conservation and harvest to fisheries cooperatives FCs in local areas as the group of largest stakeholder of the use of resources from the sea. However, even if the management by an FC is considered to be appropriate and realistic, the relevance of the management by an FC is not derived from legal ownership and exclusive use of the sea area by the FC and the right to appropriate harvesting of fisheries resources by other inhabitants is not denied. A fisheries cooperative is a kind of steward (experienced administrative person) committed to the right of inhabitants of the local society for control and conservation of fisheries resources. It could be most acceptable and rational explanation to general public why fisheries cooperative have to be entitled so that fishers can

work as stewards that guard the sea area.

v. The above mentioned situation leads to the question of, how often should fisheries cooperative accept requests of harvesting sea resources by people outside the FC. To address this question, as long as fisheries cooperative is responsible for the adjustment of interest of stakeholders, it can and should be decided on its own the frequency and scale of use of the sea area by FC. However, narrow-minded attitude that will not allow people outside the FC to catch a single fish under the fishery right will interfere with the understanding and support of the inhabitants in the local community with legitimacy of fishery rights entitled to the FC, and will weaken the basis of fishery right system in current law. It is therefore better to open the collection of target species of fishery right once or twice in a year within the level that will not affect living of fishers as service to inhabitants. Effectively, it is to obtain the understanding and support from local community on the legitimacy of fishery right entitled to the FC.

vi. In this connection, fisheries cooperative association should open up to the participation of inhabitants in the local community as wide as possible in the limits allowed by the system through associate membership or any other strategy. Enlargement of fisheries cooperative such as one cooperative per prefecture is carried out politically for precise qualification of membership. In addition, it is also implicit in this practice to bring improvement of efficiency in financial business of the cooperative. Accordingly, the relationship between fisheries cooperative and inhabitants in local community is being alienated. Several measures are taken to remove the barrier for the expansion of fisheries cooperative or consolidation of cooperative. These are devices for preservation of prioritized right of members of previous cooperative. In addition to such a device in fishery right system, devices or countermeasure are needed to maintain open relationship between inhabitants in local community and expanded cooperatives. Without these devices, establishment of good relationship between local inhabitants and fisheries cooperative concerning fishery right could be difficult. Accordingly, there would be a risk of losing the basic fishery right system on which fisheries cooperative associations depend.

3) Use of sea for purposes other than fisheries

Conflicts also occur concerning the use of sea areas for activities other than fisheries. With the development of marine leisure industry which is not directly involved in fishing in the coastal area, diving and use of personal watercrafts are causing conflicts with fishers. In this conflict, the attitude of fishers is still “our own sea”. In this situation, criticism arises from non-fishers. Why can fishers exclude non-fishers who are not harvesting any animal and plant as if they have ownership of the sea area. This also raises the question about what jurisdiction allows fishers to behave like owners of the sea who can insist their custodial right of the sea. Fisheries Law establishes solely fishery right as positive law, but cannot be a basis of the right of a sea area. One possible answer for this question is customary standard. Customary standards shall, if not disagreeing with public order or morality, have the same effect as a law, as far as the case is approved by the provisions of law or applies to matters not provided for in any laws (the article

2 in Principles Act for Law Application). The article 2 was amended as article 3 in the General Act for Application of Law in 2006. This allegation by FC about the right of sea area is based on the idea that unwritten commandment actually accepted as historical convention can justify the right for "our own sea" as living law. Can the allegation assure the fisheries cooperative of the future custodial right of coastal waters?

In fact, fishers have considered the coastal water as "our own sea" based on historical convention and such convention has been accepted in various localities without objection. Though the past convention can be the customary standard that is not disagreeing with public order or morality that is written in the Principles Act for Law Application, can it be possible to continue to justify the exclusive custodial right for minority (fishers) in the trend of increase in invasion of non-fishers to coastal water? It is obvious that we have to separate the right and private request. For the legal establishment of the right, opponent party (society at large) has to agree to accept the request from other party and accept the legitimacy of the right. Therefore, someone may think that new legal management system acceptable for both sides should be formed. However, in case of how to adjust to the use of a specified sea area, the new legal system has to work for adjustment with existing fishery right related to fisheries resource management. As a result, a multifaceted organization for addressing different interests is needed. We can entrust the function of adjustment to administrative government agency, when we consider the function of the management system as a body only allowing the use of the sea for harmonization of utilizations of the sea. Actually, management of the sea is not limited only to the adjustment of interest. It also needs to look at restructuring its functioning. On the other hand, the right on the sea area which fishers are claiming can be explained as a kind of environmental right in modern legal system. That is, the right of inhabitants of a local community to prevent degradation of the living environment including safety, order, calmness and beauty of the sea area caused by unregulated use of the area. In this idea, the right is not possessed by business body like fishers and is originated from inherent right of local coastal community similar to the fishery right. When we accept the legally established right for management of sea area to local community, similar problem as in fishery right may arise. General inhabitants in the community who are not fishers cannot exert the right of management which does not produce any benefit like collection of fisheries resources appropriately. This is a serious practical problem. It is practical and reasonable to commit the jurisdiction of the sea area to fisheries cooperative association in local community which actually works on the sea area as marine steward. In this case, it is very important as well as difficult to establish good relationship between fisheries cooperative and non-fisher members of the community to implement actions for jurisdiction of the sea area. We have to consider establishment of a new system to evolve better relationships among different interest groups.

(Jun-ichiro Okamoto)

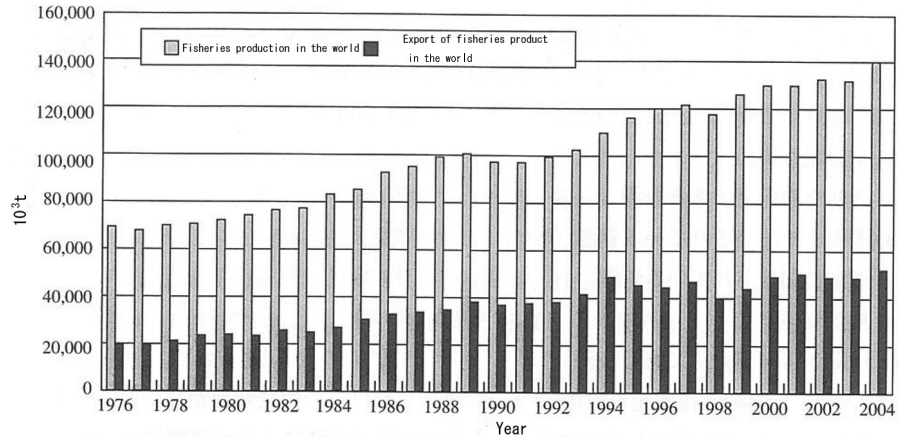

Fig. 5.14. Fisheries production and export of fisheries products in the world (FAO, 2007).

3.4 International trade and fisheries resource conservation

1) Present status of the global trade of fisheries products

International trade in fisheries products is very active. Statistics by the FAO shows an increase of trade volume of fisheries products in the world with the increase of production after 1970 (Fig. 5.14). About 38% of the products in the world are not consumed in the producing country and are exported to other countries (FAO, 2007). In the export of fisheries products, more than half of the exported volume (57%) is from developing countries. In the developing countries, net exported amount (export–import) is more than 20 billion US dollars in a year. This amount is far larger than that of agricultural products such as coffee, rubber, banana and sugar (FAO, 2007).

Nearly 80% of fisheries products exported from developing countries are consumed in developed countries (FAO, 2007). This is partly because large demands of fisheries products exist in developed countries, and also because import tariff rates for fisheries products in developed countries are very low. Average tariff rates for EU, Japan and USA are 4.2%, 4.0% and 0.2%, respectively (weighted average: OECD, 2003a), meanwhile many developing countries are collecting several dozens of tariff.

2) Position of Japan in the world trade in fisheries products

Japan is the largest importer of fisheries products in the world, with an import total of 14.6 billion US dollars in 2004. This amount constitutes about 20% of the total transaction in the world (75.3 billion US dollars) (FAO, 2007). However, the share is decreasing recently as increase in consumption of fisheries products slumped after 1980. In addition to this, international price of several fish species increased recently and buyers for Japanese market sometimes cannot get intended amount of fisheries products. This phenomenon is called Kaimake (defeat in buying competition) (Fisheries white book 2007). On the other hand,

consumption of fisheries products in the rest of the world is increasing, including the EU, USA, China and Korea.

3) Economic benefits and externalities of fisheries products trade

Economic benefits of international trade in goods, including fisheries products can be explained as follows using the supply and demand curves of market in text books of economics (Mankiw, 2005).

• With international trade of a commodity, its price increases in the exporting country and consumer surplus (remaining balance after deduction of paid money from possible amount by the buyer) decreases. However, the increase of producer surplus (remaining balance after deduction of cost for production from amount received by the producer) happens in larger scale than the decrease of consumer surplus. Thus the total social welfare increases in the exporting country.

• In importing country, producer surplus decreases with decrease of price of the item. However, consumer surplus increases in larger scale than the decrease of producer surplus. As a result, the total social welfare also increases in importing country.

• Therefore, specialization in production of goods which have comparative advantages to each country, and exporting them to other countries contributes to economic expansion of total production in the world and contribute to the improvement of living standards in all countries.

International trade in fisheries products is in fact on the rise as described before. This increase is supposed to lead to economic benefits. Undoubtedly, international trade in fisheries product follows the text book theory.

However, it should be remembered that international trade may produce negative externalities (production of negative impacts to surrounding people without compensation) as discussed below:

4) Present status of fisheries resources in the world

At first we have to recognize the present status of fisheries resources, which are the target of international trade. FAO has been monitoring the fisheries resource from 1974, and the resource exploitations have progressed year by year. Resource status at 2005 was as follows (FAO, 2007)

Under-exploited resources	3%
Moderately exploited resources	20%
Fully exploited resources	52%
Overexploited resources	17%
Depleted resources	7%
Recovering from the depletion	1%

In other words, 77% of resources are utilized to their maximum level and have no room for additional harnessing. No analysis exists on the contribution of increase of demand by the development of international trade to the decrease of resources. However, when we consider the fact that about 40% of the world fisheries products are exported, we cannot underestimate the impact of the international trade. There are several reports indicating that free trade creates negative impacts on fisheries resources, when performed without proper resource management (Brander and Taylor, 1998; OECD, 2003a; Roheim, 2005).

5) International trade of fisheries products and sustainability

All traded fisheries products are exhaustible natural resources. For this reason, depletion of resource will happen and the long-term sustainability of the resources as well as the trade itself will be undermined. This is particularly so when the international trade is expanded without restrictions. When we recognize the present status that 77% of marine fisheries resources has no room for further exploitation, production control is the most important issue for the international trade of fisheries products. That supply cannot be increased without limit is similar in aquaculture to some extent. Aquaculture provides materials for feed from fisheries. In case when seeds are obtained from wild environment, the supply of seeds cannot be increased without limitation.

6) Roles of government in conservation of resources

Sometimes it is not appropriate to leave all functions to the market system, where the production volume is determined only by market equilibrium. To ensure sustainable utilization of exhaustible natural resources intervention of government agencies is mandatory. In the markets where consumers have no information about biologically allowable amount or cost for the conservation of the resources, supply and demand may wrongfully balance at a cheaper price. This would accelerate overfishing. Role of government is therefore important to correct such market practices and achieve optimum utilization of resources on a long term basis.

Intervention of government is generally implemented by regulatory action for production such as restriction on exploitation of vulnerable fisheries stocks. However, in reality, effective regulation is not always implemented to all resources including those of developing countries.

7) Management cost of fisheries resources

Lack of financial resources can be the limiting factor for many countries to implement and execute sufficient resource management plans. The OECD reported that 2.5 billion US dollars were used for fisheries management activities by member countries in 1999. Most of them were used for enforcement and research (OECD, 2003b). The OECD is composed of members from 30 developed countries. If we calculate the total cost for fisheries management in the world including developing countries, the amount will be huge. In addition to the cost in public sector, private sector should pay for acceptance of observer, license fee, registration fee of vessels and other cost for compliance of regulation.

In order to prevent the race to the bottom of the environment conservation in the global market, introducing a mechanism which internalizes the cost of the resource management is critically important. If two similar goods exist in the same market, and one includes the resource management costs in its price and the other does not, the latter goods is stronger in the price competition and the former goods may be expelled from the market. When some countries implement resource management and the other countries do not, only fishing industries in the countries where resource managements are not implemented may remain the market. In such a case, depletion of resource will progress and the race to the bottom persists. This is very serious and realistic concern. This concern also

exists at the level of individual vessel. Unregulated operation of fisheries neglecting international rules is called IUU fisheries from the initial of Illegal, Unreported and Unregulated. Control of IUU fisheries is one of the most serious subjects in regional fisheries management bodies, FAO and OECD.

8) Solutions to the problem

For the solution of the above described problems, economic approach is a useful countermeasure in addition to the regulatory measures. Brander and Taylor (1998) suggest creation of ownership of resources and tax by importing countries as useful countermeasures. Creation of ownership is also suggested as a useful countermeasure for conservation of common resources. However, it is difficult in reality to set up ownership on the fisheries resources which exist in the boundless sea. For taxing, it is useful as a method to take external cost into account for pricing (internalization). However, to take cost as custom duty does not suit the present scheme of the World Trade Organization (WTO). Member countries of WTO cannot haul up the custom duty higher than the bound (promised) upper limit because of the restriction of the WTO.

One realistic approach is to implement international resource management by regional resource management organizations and to construct trading system which does not undermine the effects of international resource management system. In fact, several regional fisheries management organizations, such as Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and International Commission for the Conservation of Atlantic Tunas (ICCAT), implement systems to prevent international trade in fish originated from the IUU operations. Such systems should be maintained.

Systems to distinguish articles produced under sufficient resource management system from the ones produced under insufficient resource management system to consumers are considered to be effective. Such system is called "eco-label". Committee of Fisheries (COFI) in FAO adopted guideline of eco-label in 2005 (FAO 2005) and some private bodies started activities for popularization of eco-label. The eco-label systems are developing in the world. Future popularization and response of consumers are attracting interest of like-minded citizens.

9) Impact of the international trade in fisheries products on human society

Impacts on the human society caused by international trade in fisheries products are significant. It should be noted that the groups which receive the benefit of international trade and the groups which suffer damage from international trade exist in both exporting and importing countries. The benefitted and suffered people belong to different social sectors, even though the international trade provides an overall net benefit to exporting and importing countries.

Those who suffer the damage in exporting countries are consumers who are influenced by the increase of price of fisheries products. As a result of export in extreme cases, consumers in exporting country cannot obtain the desired products, which were once cheap and important food items in the local coastal community. It is important to consider measures to compensate or alleviate the damage of injured party such as transfer of benefit from producers who become better-off by trade.

In importing countries, producer suffers damage. In case of Japan, nearly half of the fish and fishery products are imported. It is important for Japanese consumer that they can obtain imported fisheries products easily at a cheap price. However, producer of fisheries products in Japan encounter the serious problems such as decrease of income level, decrease of management bodies and aging of workers. Import of fisheries product is one of the major factor causing difficulty of fisheries in Japan. Ariji (2006) implemented market analysis of salmon and concluded that price of imported salmon is a major factor which determines price of domestic salmon. This conclusion means that import of fisheries products decreases the price of domestically produced fisheries products.

If there is a complete labor market, labor forces move rapidly to depressed industry to other new industry. However, labor market in Japan is incomplete. In case of fisheries, producers are living in coastal local community. It is difficult to move to new place to get job opportunities.

Not only fishers, but also local coastal community is influenced. In most coastal communities, fisheries are major industry. Fisheries activities have various functions other than production such as inheritance of culture. Social and economic impacts as well as impacts on fisheries resource by fisheries trade needs future discussions and appropriate solutions.

(Nobuyuki Yagi)

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