

Making Productive Fishing Grounds in the Seas In and Around Coral Reef Areas

All-out development of coastal fishery progresses in subtropical Okinawa Prefecture

The sea around the south sea islands is beautiful with its deep blue color. A ring of white waves induced by coral reefs surrounds the islands and colorful tropical fishes swim through those coral reefs. Sight-seers who come from cities cannot help heaving sighs of admiration at this miracle of nature. On the other hand, for persons concerned in fishery this sea is only eyed as a poor fishing ground of the "oligotrophic areas".

The value placed on the coastal waters in and around the coral reef area has not been very high.

Okinawa Prefecture, consisting of over 60 large and small islands, is located at the southern tip of Japan and belongs to the subtropics. Because of the effect of the Kuroshio Current (Warm Current) in the surrounding sea, changes in climate and water temperature are slight throughout the year and the climate is mild.

The fisheries of Okinawa have long consisted mainly of skipjack and tuna fisheries. Since the latter half of the 1960's, southern sea trawl fishery has been introduced, and mainly offshore and pelagic fisheries have been conducted.

On the other hand, in coastal fishery, although various types of traditional fishing methods have been tried, fishery management remained small in scale for these fishing methods, and production has been stagnant on a low level. This is due to the facts that (1) the sea around Okina-

wa belongs to the subtropics and is an area where productivity of plankton is low, (2) fishing grounds on the continental shelf around the islands are small, and (3) Okinawa is not blessed with good natural fishing ports because the islands are densely surrounded by coral reefs and the coastline is mostly smooth. These conditions have continued to hinder the development of the coastal fishery.

Since the beginning of the 1970's, however, fisheries in Okinawa have reached a serious turning point.

After Okinawa was returned to the mainland*, promotion of fisheries was adopted as one of the means to promote and develop the economy of the Okinawa Prefecture. This task took a much more defined form with the advent of "the age of 200 mile sea limits", and it can be summarized as follows: (1) reduction of pelagic fishery and promotion of offshore fishery in the adjacent seas of Japan, and (2) development of fishery in the shallow coastal waters and of aquaculture.

In this issue, by mainly focusing on the recent changes occurring with the all-out development of the latter coastal fishery, we will introduce the present condition of fishery in Okinawa.

*Okinawa (the Ryukyu islands south of lat. 29°N). was brought under military administration by the occupation army of the United States after Japan's defeat in the Second World War. Moreover, with the effectuation of the "San Francisco Peace Treaty" in April 1952, Okinawa was

brought under the civil administration of the United States. In June 1971, "An Agreement on the Retrocession of Okinawa" was signed between Japan and the United States, and it came into effect in May 1972 resulting in the return of Okinawa to Japan.

Adelántanse Programas de Desarrollo de la Pesca en Aguas Costaneras en la Prefectura de Okinawa

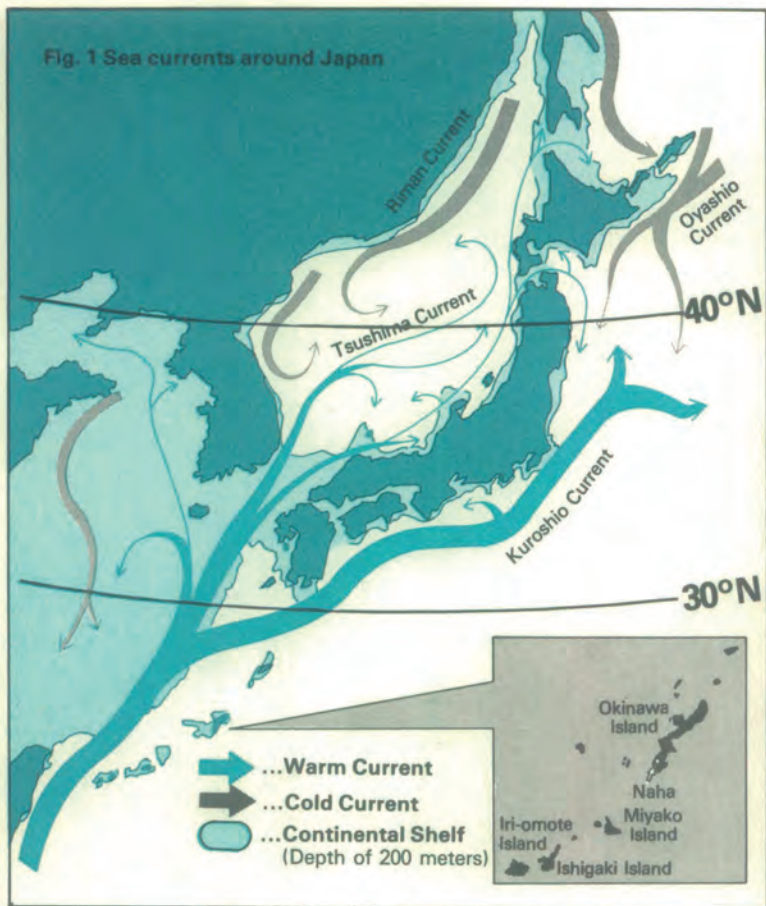
La Prefectura de Okinawa, integrada por más de 60 islas grandes y pequeñas, se halla situada en el extremo meridional del Japón, correspondiente a la zona subtropical. Su clima es templado y los cambios de temperatura ambiental así como de sus aguas son muy reducidos, debido a los efectos de la corriente cálida denominada "Kuroshio" del mar circundante. Desde principios de la década de 1970, la pesca en Okinawa ha venido pasando momentos cruciales.

Después de la devolución de estas islas al Japón, la promoción de la pesca en Okinawa constituyó uno de los pilares del desarrollo económico de esta Prefectura. Con el advenimiento de la 'Era de las Zonas Económicas de 200 millas' dicha tarea empezó a adquirir un aspecto más definido. Los programas propuestos se pueden resumir en los siguientes dos puntos: (1) reducción de la pesca oceánica y promoción de la pesca en los mares adyacentes del Japón, y (2) desarrollo de la pesca en aguas costaneras poco profundas y de la 'acuicultura'.

L'exploitation globale des pêches côtières progresse dans la Préfecture sous-tropicale d'Okinawa.

La Préfecture d'Okinawa, comprenant plus de 60 grandes et petites îles, est située à la pointe méridionale du Japon et appartient aux régions sous-tropicales. Par suite de l'effet du courant Kuroshio (courant chaud) dans la mer alentour, les variations de température de l'eau de mer et du temps sont très faibles pendant toute l'année et le climat est plutôt doux. Depuis le début des années 1970, les pêches d'Okinawa ont pris un essor important.

Après qu'Okinawa ait été retournée au territoire principal, la promotion des pêches fut adoptée comme l'un des moyens de promotion et de développement de l'économie de la Préfecture d'Okinawa. Cette tâche paraît prendre une forme beaucoup plus définie depuis l'avènement de "l'ère du régime des 320km d'eaux territoriales". Elle peut être ainsi résumée suivant les deux points ci-après: (1) réduction des pêches pélagiques et promotion des pêches au large dans les mers adjacentes au Japon, et (2) développement des pêches dans les eaux côtières peu profondes et de l'aquaculture.



Landing of catch by a 19-ton type tuna long-liner

Outline of Fisheries i

Trends in fishery production in Okinawa Prefecture are shown in Fig. 1 and Table 1. The explanation of the outline is as follows:

Fisheries in Okinawa were almost completely destroyed by the Second World War. They, however, later recovered, reaching the pre-war level (annual production level of 12,000 tons) by 1954, and the catch has increased year after year through the development of skipjack and tuna fisheries in the adjacent seas. Further, around 1960, operation of pelagic skipjack and tuna fisheries were started. As a result, the total catch has greatly increased: 17,000 ~ 18,000 tons in 1960 ~ 1963, 22,000 ~ 25,000 tons in 1964 ~ 1966, and 29,000 ~ 36,000 tons in 1967 ~ 1970.

Fishery production in Okinawa in recent years has been supported greatly by skipjack pole-and-line fishing.

Pelagic fishery

Pelagic fishery in Okinawa has continued to decline after the peak reached with 25,000 tons (72 hundred million yen) of

catch in 1973. This decline is symbolized by the dullness in pelagic tuna long line fishery.

After the Second World War, the productivity of pelagic tuna long line fishery improved with the adoption of large fishing

boats and introduction of new fishing methods in the 1960's. In 1968, tuna fishing boats numbered 51 for those over 100 tons and 7 for those of 50 ~ 100 tons.

With the increased productivity of pelagic tuna long line fishery by the introduction of new methods etc., during the years from 1965 to 1972, 40 ~ 50% of the total fishery catch had been dominated by this one fishery, and thus tuna was the nucleus of Okinawa's exportable marine products; however, since this fishery was managed mostly by small scale shipowners having 2 ~ 3 tuna long line fishing boats and there were various factors hindering the smooth management of them, such as the beginning of forced operation in distant fishing grounds since 1972, changes in the international fishing environment and shortage of manpower, this fishery has continued to be dull.

Luckily, after its return to Japan, 19-ton

type tuna long line fishing boats (fishery permitted by the governor) became the focus of attention. During the years from 1977 to 1978, the number of operating boats of this size increased rapidly and at present there are over 70 boats.

Skipjack fishery is another key fishery of Okinawa, and especially skipjack fishery in the South Seas which started in 1970 shows a tendency toward increased catch as a whole, although annual fluctuations are large. Thus from 1974 on, over 90% of the total catch (20 ~ 50 thousand tons) of skipjack have been brought in by skipjack fishery in the South Seas.

Offshore fishery



Vegetables of the Sea

Another type of "green revolution" is spreading in the shallow sea areas of Japan

Japanese people frequently eat seaweeds. Laver, kelp, Undaria, and the like are representative edible species. These seaweeds are eaten in various styles such as (1) salad (Undaria and Mozuku: brown algae of the Spermatochnaceae family), (2) an ingredient of miso soup (Undaria), (3) in stews (kelp), (4) delicacies (laver, kelp, Undaria and Mozuku), (5) Tsukudani: food boiled down in soy sauce (laver, kelp and Undaria), and (6) dried and processed seasonings (kelp). This shows that seaweeds are as useful and important as vegetables cultivated on the land.

Table 1. Yield of edible seaweeds (1977)

	Natural (raw weight)	Cultured (raw weight)
Laver	*	279,000 tons
Kelp	133,000 tons	27,000 tons
Undaria	20,000 tons	126,000 tons
Mozuku	4,000 tons	100 tons

*In some districts, rock laver (seaweeds of genus Porphyra) is produced as "a special product", but it accounts for only a small amount of the total yield of seaweeds.

tion of mass production by culture. The spread of seaweed culture exerted an important influence on the coastal fishery of Japan after the Second World War. Many small-scale fishermen who had been making a living by half agriculture and half fishery up to that time became full-time culturers of seaweeds, or else primarily engaged in it and brought it up into an industry which could bring them large fishery income.

As a result, economic activity in the coastal fishing village was greatly stimulated. Mozuku is not as familiar a food as laver, kelp or Undaria. Raw Mozuku is preserved with salt, and eaten by taking out a small amount at a time. It is a delicacy having an image of "a relish with sake".

The different species of edible Mozuku are as follows: (a) Mozuku (*Nemacystus decipiens*), (b) Ishi-mozuku (*Sphaerotrichia divaricata*), (c) Okinawa-mozuku

(*Cladosiphon okamuranus*), (d) Matsumo (*Heterochordaria abierina*), (e) Futo-mozuku (*Tinocladia crassa*), and (f) Kuro-mozuku. The three species, (a), (b) and (c), are collected in large quantities because of their nationwide consumption. Habitats of Mozuku seaweeds are distributed in almost all areas around the Japanese Islands, but the main producing areas are limited to some specific regions such as: (1) from the Nansei Islands to Okinawa, (2) western part of Kyushu, and (3) the Noto Peninsula located on the Sea of Japan.

The species collected most abundantly among those naturally grown is Okinawamozuku which is distributed in regions from the Nansei Islands to Okinawa (annual yield is about 2,000 tons). However, new techniques of artificial culture were developed several years ago as a result of research carried out by Mr. Iwao Niimura, a technical expert, and collaborators at the Fisheries Experimental Station of Kagoshima Prefecture. At present, about 10 tons of cultured Mozuku are produced in Amami-Oshima of Kagoshima Prefecture, and 130 tons in Okinawa.

According to Mr. Niimura, as regards Okinawamozuku, the technique of artificial seed collection is nearly completed; however, problems of perfecting the work process and reducing labor remain to be solved. Moreover, elucidation of the optimum culture conditions and development of cultivating and controlling techniques based on the results are also future problems remaining to be solved. Lastly, although the processing technique is not developed yet, its develop-

ment should be carried out after mass production is realized.

Mozuku culture in Okinawa Prefecture is now well established, and, as will be mentioned later, it is exerting a considerable effect upon the economy of certain districts. Whether or not Mozuku culture can continue to grow and develop as have the cultures of laver, Undaria and Kelp is one of the important indices to the future development of coastal fishery in Okinawa Prefecture.

'Verduras Marinas'

Las algas marinas son unos de los alimentos más populares entre los japoneses. Entre las variedades comestibles más típicas se pueden mencionar la ova, el kelp y la "undaria". Estas algas marinas se consumen en diferentes formas, como (1) ensalada ("undaria" y "Mozuku": alga de la familia de las espermatonáceas), (2) ingredientes de sopa de "miso" ("undaria"), (3) estofados (kelp), (4) delicadezas (ova, kelp, "undaria" y "Mozuku"), (5) "Tsukudani": alimento cocido a fuego lento con salsa de soja (ova, kelp y "undaria"), y (6) condimentos secos y elaborados (kelp). Este hecho indica que las algas marinas tienen una utilidad similar a la de las verduras que se cultivan en la tierra.

Plantes marines comestibles

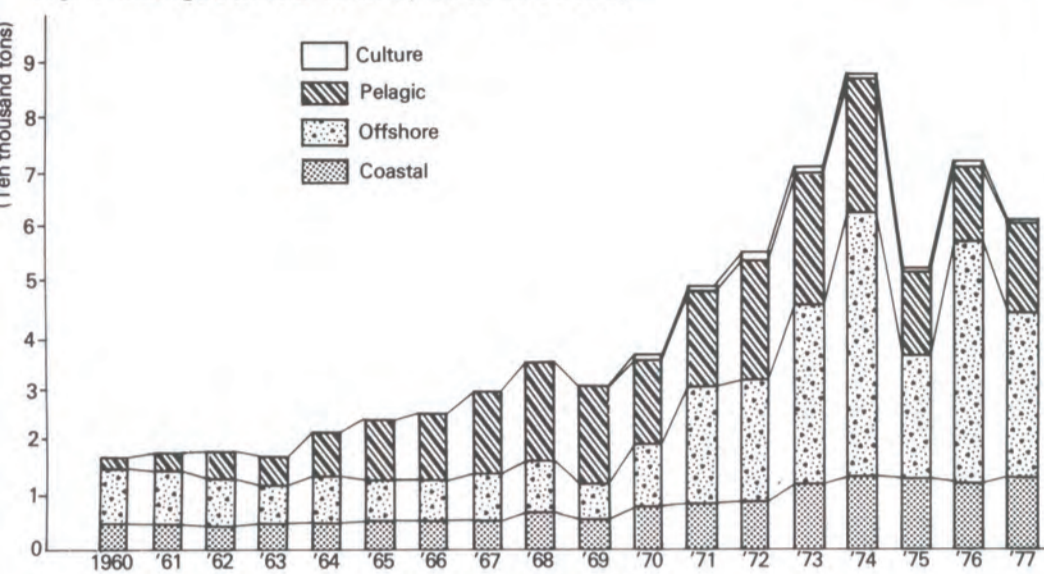
Les algues constituent une des denrées populaires du peuple japonais. Le varech, le goémon, l'undaria, et autres algues du même genre sont les espèces comestibles représentatives. Ces algues sont mangées selon divers modes comme (1) la salade (undaria et Mozuku: algue brune de la famille des spermatochneaceae), (2) en ingrédients de la soupe au miso (undaria), (3) dans les ragoûts (goémon), (4) en friandises de table (varech, goémon, undaria et Mozuku), (5) Tsukudani: mets cuits en ragoût dans la sauce de soja (varech, goémon et undaria), et (6) assaisonnements séchés et traités (varech). Ces faits indiquent bien que les algues sont utiles aux hommes au même titre que les légumes cultivés au sol ferme.

Table 1. Statistics of production in 1977

	Amount, tons (%)	Value, million yen (%)
Coastal fishery	13,214 (22)	7,819 (39)
Sea culture	71 (0.1)	369 (2)
Offshore fishery	34,122 (55)	5,174 (25)
Pelagic fishery	13,438 (22)	5,445 (27)
Inland water culture	824 (1)	1,444 (7)
Total	61,669	20,251

Source: Data before 1971 are from "Fisheries of Okinawa" compiled by the Ryukyu Government, and data from 1972 onwards are from "Statistical Research on Sea Fishery Production" and "Statistical Research on Inland Water Fishery Production".

Fig. 1 Changes in the Yield by Kind of Fishery



n Okinawa

Since mass-catch type fishes such as horse mackerel, mackerel and sardine are not abundant in the adjacent seas of Okinawa, offshore net fishery did not develop as in other prefectures. Offshore fishery in Okinawa is comprised mainly of tuna long line and skipjack pole-and-line. Tuna long line fishery recorded a catch of some 4,000 tons in 1968. After that, however, the number of managing bodies decreased because of a weak management base. At present, the annual catch remains at the level of about 2,000 tons. As mentioned above, with the transfer of the fishing grounds from the adjacent seas to the South Seas, skipjack pole-and-line fishery has developed greatly. However, since most skipjacks caught are exported to foreign countries or sold to companies having motherships (major fishing companies of other prefectures), the amount of skipjack landed in this prefecture is less than 10,000 tons.

Coastal fishery

Catch by coastal fisheries fluctuated between 4,000 and 6,000 tons until 1969 and maintained a level of 8,000 tons for the period from '70 to '72. Catch has increased now to a level of 12,000 - 13,000 tons since '73. The increase in production in recent years is largely due to the active gathering of seaweeds and the introduction of new fishing methods such as fixed shore net. Moreover, this increase in production was realized also by the fact that fishermen engaging in fishing such as pole-and-line and long line were stimulated to catch more fishes by the completion of local distribution facilities, as will be mentioned later.

Aquaculture

In Okinawa's seawaters, black pearl and prawn are cultivated. In the past, black pearl culture was carried out by the method of transplanting a pearl nucleus, with only natural black lip (*Pinctada margaritifera*) being used as mother shells. Recently, however, with success in the artificial insemination of mother shells and raising of larvae, new methods of artificial seed collection have been established. In Okinawa, prawn can be raised even in the winter season because of the mild winter climate. Therefore, prawn is shipped

deliberately during the off-season for the shipment of natural and cultured prawns in other prefectures, and sold at a high price, thus achieving good commercial results. As will be mentioned later, the culture of Mozuku is expected to develop greatly in Okinawa in the future. In inland waters, culture of carp and Japanese eel are carried out, but the yield of these fisheries is small.

La Pesca en Okinawa a Grandes Rasgos

La pesca en Okinawa quedó prácticamente aniquilada a raíz de la Segunda Guerra Mundial. Sin embargo, en 1954 se logró registrar el nivel alcanzado antes de la guerra (con una producción anual de doce mil toneladas), y con el desarrollo de la pesca de bonitos y atunes en los mares adyacentes su volumen de captura ha venido incrementándose año tras año. Hacia 1960, se iniciaron las operaciones de pesca oceánica de bonitos y atunes. La producción pesquera de Okinawa en los años recientes ha estado respaldada por la pesca de bonitos por el método de vara y cuerda.

La pesca en aguas costaneras registró un nivel de producción de 4.000 ~ 6.000 toneladas hasta 1969, de 8.000 toneladas entre 1970 y 1972, y de 12.000 ~ 13.000 toneladas desde 1973. El incremento de la producción en los últimos años se debe principalmente a la recolección activa de algas marinas y la introducción de nuevos métodos de pesca como el uso de redes fijas en la costa.

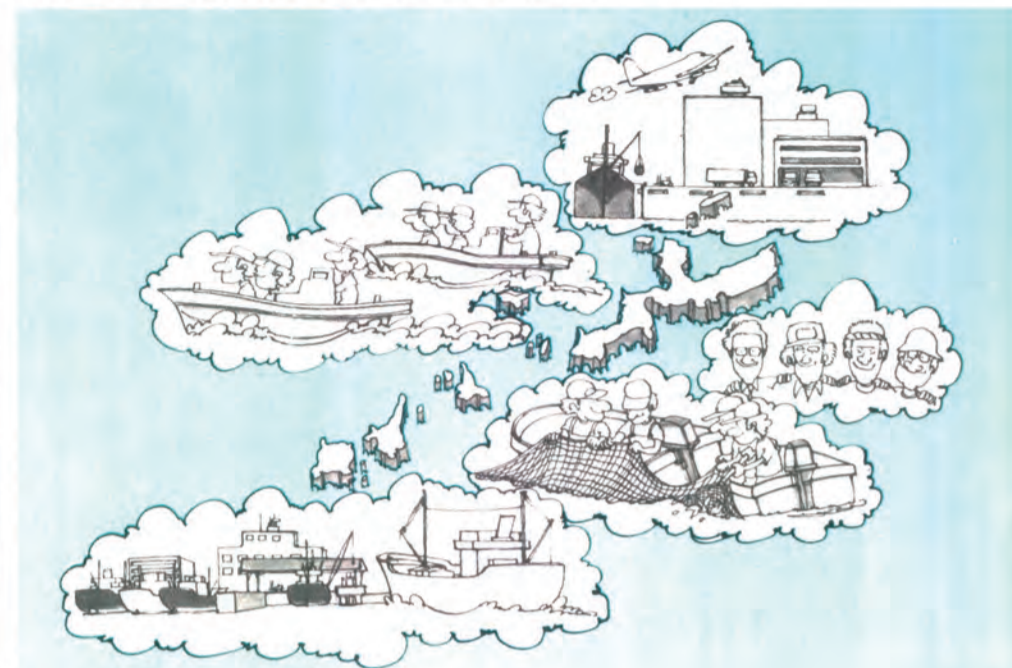
Aperçu sur les pêcheries à Okinawa

Les pêcheries à Okinawa ont été presque totalement détruites pendant la deuxième guerre mondiale. Cependant, plus tard, elles ont regagné le niveau d'avant-guerre (production annuelle de douze mille tonnes) en 1954, et le tonnage de poisson pris a augmenté d'année en année grâce au développement des pêcheries d'exocets, thons dans les mers adjacentes. De plus, aux alentours de 1960, les pêcheries pélagiques d'exocets et de thons ont commencées à être exploitées. La pêche à la ligne et à la perche pour l'exocet contribuent substantiellement à supporter les pêcheries à Okinawa dans les années récentes.

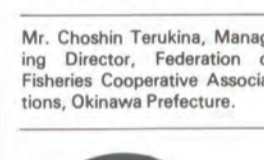
Les prises de poissons dans les pêcheries côtières subirent une transition depuis le niveau de 4.000 ~ 6.000 tonnes jusqu'à 1969, et le niveau de 8.000 tonnes en 1970 ~ 1972, puis au niveau de 12.000 ~ 13.000 tonnes depuis 1973. L'accroissement de production dans les années récentes est dû largement à la cueillette active des algues et l'introduction de nouvelles méthodes telles que la pêche au filet à araignée fixe.

Three Possibilities Are Pursued

Future Directions of Development in Coastal and Offshore Fisheries in Okinawa



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Mr. Ken-ichi Sakiyama, Director, Fisheries Experimental Station of Okinawa Prefecture.

It can not be said yet that fishery in Okinawa is hurrying on its way to "modernization". As in the case of the entire economy of Okinawa, fisheries of this prefecture are backed up by a heavy administrative investment, mainly by government subsidies. Therefore, it seems it will take another several years before enough fishery capital is accumulated within the prefecture to enable fisheries to grow by themselves. So far as coastal and offshore fisheries are concerned, however, it seems that the direction of their development has gradually become defined. By referring to the opinions of fishery advisors of this prefecture, we have tried to sketch a picture of the future of fisheries in Okinawa.

The first problem we can foresee for the future is the direction of development in coastal fishery. The aim is the modernization of coastal fishing-boat fishery and the promotion of culture fishery. In the future, the type of management used by fishermen supporting these two fisheries may be concentrated into the following two types:

- (1) The first group will specialize in offshore fishery using mainly 3-5 ton type fishing boats.
- (2) The second group will use 1-1.5 ton type FRP fishing boats fitted with an outboard motor. This group consists mainly of fishermen engaging in culture and fixed shore net fisheries in the shallow waters in and around the coral reef areas.

The second problem is the future direction of development in offshore fishery. We expect to see the development of fishing in the fishing grounds on the continental shelf and in the southern sea area. Moreover, they also desire to promote offshore fishery by constructing a transit base which will invite fishing boats of other prefectures to land their catches in addition to the upbringing of more fishing boats in this prefecture.

The third problem is to back up the production activity of fishery by improving the systems and facilities for fishery product distribution.

- The projects now under way and the plans under consideration as countermeasures are as follows:
- (1) Seeking practical means to increase production in coastal fishing-boat fishery: Fish shelters are set up in the neighboring seas to maintain and increase resources, and at the same time artificial methods producing "seeds" of fish, shellfish and seaweeds are developed to stock the surrounding sea with. Through these means, fishermen now engaging in fishing-boat fishery are encouraged to recognize the importance of "resources controlled type fishery", leading to the increase of productivity with more stabilized management. At present a "Culture Fishery Center" is under construction with facilities for car-

rying out the research and development of artificial methods of seed production and for supplying seeds.

- (2) Creation of fishing grounds in shallow sea areas: It is estimated that the total length of the coastline of Okinawa is about 1,600 km, and the shallow sea area suited for the creation of culture sites amounts to about 1.2 times the area of the land (about 2,800km²). The islands of Okinawa, e.g., 10% of the perimeter of the main island, 30% of Miyako-jima, 50% of Yaeyama Islands, are surrounded by coral reefs, and they thus offer good natural breakwaters necessary for creating culture sites. Besides, it is possible to rear fishes, shellfishes and seaweeds at a very fast rate, by making efficient use of the warm water temperature and solar heat. Culture of prawn, pearl and Mozuku is already being carried out, and as the next step, research on the culture of prime scallop and blue crab are also being tried.
- (3) Construction of a transit base for offshore fishery: There exist many unsurveyed areas in the vast waters around Okinawa. There is room to develop new fishery in the waters around the Okinawa Islands and on the continental shelf of the East China Sea, and at the same time to develop good fishing grounds on the continental slope where the resources are not yet surveyed. In order to make these tasks possible, a powerful fishery base is necessary. At present, reformation work at Itoman Port is in progress, with a target date of 1981 for completion.

- (4) Improvement of the distribution system and facilities for fishery products:

It is necessary first to improve the fishing ports where fishes are landed, and to construct distribution facilities on land (fish markets and facilities for ice making, ice storage, cold storage and freezing). It is also necessary to construct a transportation network of carrier ships and airplanes for the transportation from the markets in the producing areas of islands to the consuming areas on the main island of Okinawa and the mainland of Japan.

There will also be a drive to intensify the role of the local fisheries cooperative associations and prefectural federation of fisheries cooperative associations as the management system for the distribution of fishery products. The details of this problem will be mentioned later (P.6).

No podría decirse aún que la pesca en Okinawa haya estado en la etapa de "modernización acelerada". Como en el caso de la situación económica general de Okinawa, la pesca en esta Prefectura depende en gran parte de inversiones oficiales, principalmente de subsidios gubernamentales. Por lo tanto, se necesitarán varios años más para acumular el capital necesario dentro de la prefectura para que la pesca pueda desarrollarse en forma independiente. Sin embargo, en lo referente a la pesca en aguas costaneras o en alta mar, existen señales evidentes de que la dirección de sus operaciones de desarrollo ha quedado bien definida.

On ne peut pas encore dire que les pêcheries l'Okinawa ont pris le tournant décisif vers la modernisation. Car, en estimant la situation globale de l'économie d'Okinawa, les pêcheries de cette préfecture sont soutenues par des investissements administratifs lourds, principalement par les subventions gouvernementales. Par conséquent, cela prendra encore plusieurs années avant que le capital de l'industrie des pêches dans cette préfecture soit assez substantiel pour que les pêcheries puissent s'y développer de façon autonome. Cependant, en ce qui concerne les pêches côtières et au large, il semble que l'orientation de leur développement soit progressivement définie.

Traditional Fisheries

VS.

Modern Fisheries by Small Powered Fishing Boats

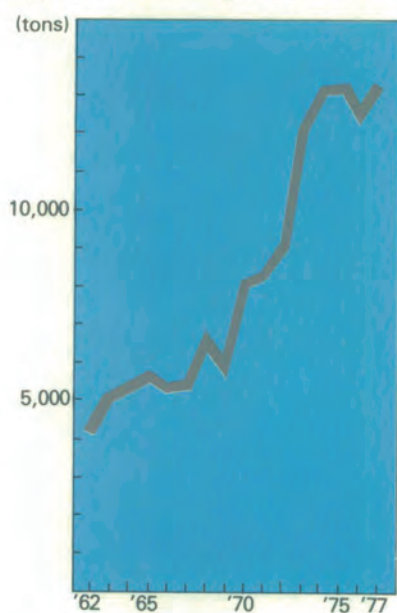
At present in Okinawa, the old and the new are intermingled in an interesting vortex. In coastal fishing villages, there are still many small wooden boats (called "Sabani") with a design unchanged for more than a century engaged in fishing. On the other hand, "modernization", such as the introduction of large fishing boats and the use of fiberglass reinforced plastics (FRP) in constructing fishing boats is now being actively promoted. Fishermen sometimes say that, owing to historical circumstances, fisheries in Okinawa are 20~30 years behind the mainland in all aspects of technology, including the fishing boats, equipment and fishing methods. Fishermen are making every endeavor now to catch up with the mainland.

However, among the fishermen of Okinawa, there are

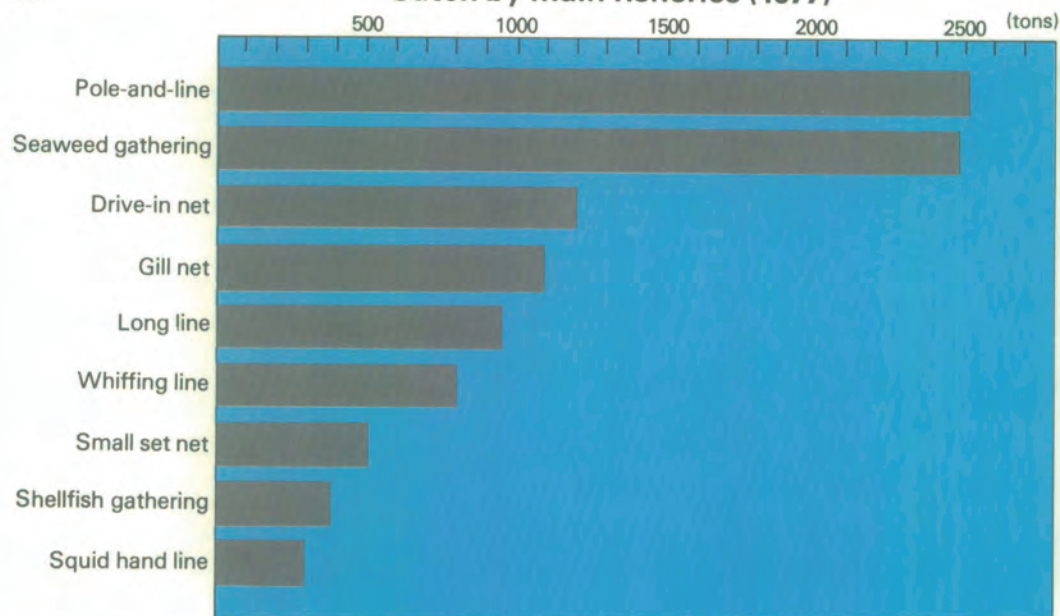
many veterans who have a deep knowledge of the fishing grounds and are very skilled in their own ways of fishing, although they are not really blessed with good material resources. Since olden times, the "Ichimana", fishermen of Itoman who ventured far into the southern seas, were known even in other countries.

Now the coastal fishermen in Okinawa are having to shape a new form of fishery adapted to new social conditions, making good use of what advantages they have and overcoming the disadvantages of the geographical situation of Okinawa. It is hoped, however, that traditional fishing methods will continue to be used in a more refined form by introducing new scientific techniques.

Change of catch by coastal fisheries



Catch by main fisheries (1977)



Traditional Fishing Methods

Spear fishing, barrier fishing (shallow water set net) and drive-in net fishing were carried out widely all over Japan long ago; however, at present, they are out of use on the mainland due to bad conditions of the resources and fishing grounds. In Okinawa, however, they are still carried out, mainly on the remote islands. At first glance, these methods seem to be primitive, but they are the methods which originated as a result of long studies on the habits of fishes.

•Spear fishing in tide pools

Spear fishing is probably the oldest fishing method. At low tide, many fishes left by the ebbing water are swimming in the tide pools of coral reefs. These fishes can be caught by diving into the water with a harpoon or a spear. Shore fishes such as blue humphead parrotfish, threadsail filefish and balloonfish are caught, and on rare occasions porgy and striped jack which come from the open sea also are caught. Also, octopus and spiny lobster inhabiting the rocky zone can be caught by a special technique using a hook.

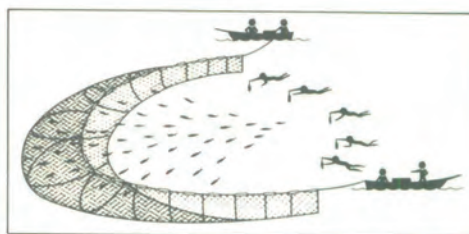
•Spear fishing in the open sea

Spanish mackerel, inhabiting warm sea areas, has a maximum body length of about 2 meters. They migrate through the open sea and come near the coast in the spawning season (spring). Although Spanish mackerel is easily caught by trolling, they are also caught by a method of luring the fish with a dummy fish and then spearing it with a harpoon. Good fishing grounds are found around bottom reefs. As the fishing boat is set adrift, Spanish mackerel are lured by towing a dummy fish. When the aimed fish comes near the dummy, the dummy is pulled in a way that makes it jump up into the air at the right time. The fisherman then throws a spear to catch the fish just as it starts to jump up after the dummy. Since a rope is tied to spear used in this method, the shooter catches the fish by hauling in the rope after the fish has become inactive.

•Drive-in net fishing

This is a group fishing method which is operated jointly by dozens of fishermen from one village. In this method, a netting gear consisting of a long-wing net

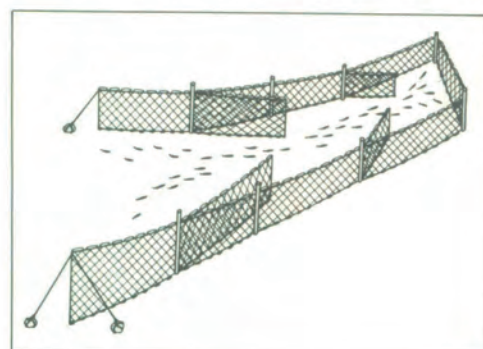
and a bag net is spread out beforehand in a certain place. Then, fishermen enter the water and scare the fish out from between rocks and drive them into the net with their own hands, feet and a "swing line (scare line)". Some of the fish become entangled in the wing net and a considerable number of fishes are caught in the bag net. The structure of the netting gear and fishing method will vary in accordance with the species of fish being caught, being shore fishes such as wrasses and Japanese parrotfish or surface fishes such as goldenbanded fusilier and flying fishes.



•Barrier fishing (shallow water set net)

In this method, fishes and other marine animals are caught by making use of the ebb and flow of the tide.

As regards the method of spreading the net, there are various types including a straight, zigzag, and curved ones or ones with a bag net. At high tide, the net is set in a tideland or a lagoon which is covered by sea water during high tide. Fishes which come into the net at high tide are entangled in its meshes or trapped within the bent sections of the net during ebb tide.





Drive-in net fishing

Modern Fishing Methods

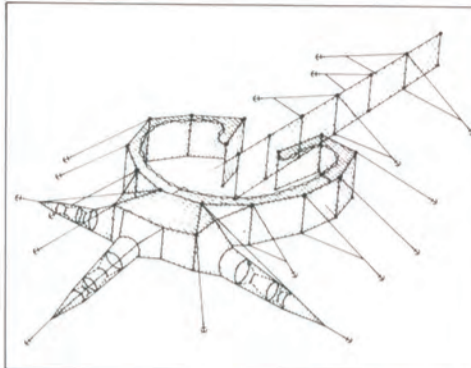
For coastal fisheries operated by small fishing boats of about 1 to 3 tons; pole-and-line, long line, trolling and gill net are main methods carried out. All of these are fishing methods which have been handed down hundreds of years. After the Second World War, however, these fishing methods have been modernized, improving the fishing efficiency by means of technical improvements such as: (1) changing the power source of fishing boats from sails to engines, (2) synthetic fibers being introduced in the making of fishing gear such as nets and ropes, and (3) large fishing boats being introduced in recent years.

•Small set net (Kasutani-type pound net)

This fishery developed due to a joint research project by the Fisheries Experimental Station and Federation of Fisheries Cooperative Associations of Okinawa Prefecture around 1972 as a modern fishing method which will take the place of the traditional barrier net. This is an improved type of pond net aimed at the reduction of labor, and it has a characteristic that the net can be set with only a small amount of money and can be easily operated by a small number of family members.

Good results from test operations stimulated the rapid increase of fishermen engaging in this fish-

ing method since 1976, and at present in Okinawa over one hundred nets are in operation. It is an epoch-making development that this net can be successfully set on sandy beaches which were considered unproductive because of their unsuitability for angling and shore fishery, in spite of the fact that prime fishes can be caught.



Moreover, as a fishing boat for this new fishery Yamaha FRP utility boats (driven by an outboard motor) are starting to spread in place of the wooden boat used until now. This is due to the recognition on the part of fishermen of the following merits of Yamaha FRP boats:

- (1) Stability and work efficiency are superior to those of "Sabani".
- (2) High speed is achieved with an outboard motor.
- (3) The boat can freely go in and out of the net by tilting simply up the outboard motor.
- (4) It is easy to haul the boat ashore because it is lighter in weight than a "Sabani" fitted with a diesel engine.
- (5) Little time is necessary for boat maintenance.

•Mozuku culture

This fishery does not require as much capital for facilities as in improved small set net fishery, and can be easily engaged in by ordinary fishermen. Therefore, each fisheries cooperative association is endeavoring to spread Mozuku culture in order to improve the fishery income of its members and to reinforce the constitution of the fishery management.

In a natural habitat, Mozuku germinates in autumn and continues to grow from winter to spring. When it has grown to about 20cm, the grown section is cut and gathered. However, with natural Mozuku, the body of this seaweed disappears around June (early summer). A technique for preserving seeds over the summer has been developed, and in 1976 a first test culture was performed.



It was by the members of the fisheries cooperative association of Onna, located on the west coast of Okinawa's main island, that the spread of Mozuku culture was actively tried for the first time in Okinawa. In the autumn of 1977, over 150 of the 358 members began to engage in this type of culture, and by the spring of the following year, a total of 4,000 cans (each can containing 20kg) of cultured Mozuku were gathered. Since raw Mozuku was sold to middlemen for about 400 yen per 1kg (this is a high price comparable to that of prime fish), each household earned an income of about 1.5 to 5 million yen (4 million yen on an average). In contrast, the initial investment for equipment used in the farming including nets, iron rods etc. was about 100 thousand yen per household.

A remark by Mr. Seikichi Tamaki, Chairman of Onna Fisheries Cooperative Association

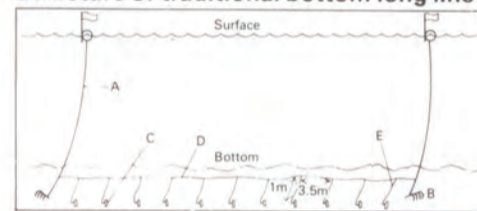


"From old times, fishermen in this district have made a living somehow by engaging in self-supporting agriculture, while engaging in small-scale fishing such as pole-and-line, trolling and spear fishing. However, with the success of Mozuku culture, we could for the first time earn a fishery income in excess of our living expenses. These earnings are being reinvested in the improvement of our houses and storehouses for fishing materials."

•Deep-sea vertical long line

This is a new fishing method devised by the fishermen of Ie-shima located northwest of Okinawa's main island to suit their particular fishing grounds and is based on a fishing method of Kagoshima Prefecture. As compared with the traditional bottom long line, which is operated at the depth from 40 to 100m, the improved type long line can be operated even at the depth from 150 to 180m. By this fishing method, fishing efficiency for deep-sea prime fishes such as blue fusilier and ruby snapper has been greatly improved.

Structure of traditional bottom long line



Water depth: 40—100 m

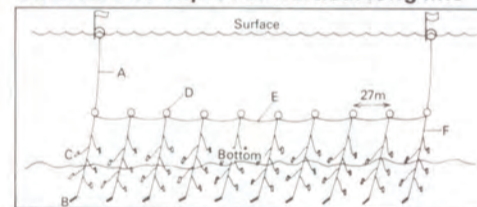
Number of hooks in one unit: 200—240

(A) Buoy line (B) Four-arm anchor

(C) Hook (D) Main line (Nylon)

(E) Branch line (Nylon)

Structure of improved vertical long line



Water depth: 150—180 m

Number of floats in one unit: 51

Length of one unit: 1,350—1,500 m

Number of hooks in a branch line: 5

(A) Buoy line (B) Sinker (C) Hook

(D) Float (E) Main line (PP rope 4 m/m)

(F) Branch line (Nylon)

•Prawn culture

Shrimp and prawn, except spiny lobster, do not inhabit the waters of Okinawa, where the transparency of the sea water is high and there are few fishing grounds with bay conditions. However, as Okinawa is blessed with solar energy, cultivating prawn in closed-system culture ponds has been conducted by obtaining prawn seed from the mainland. Prawn grows rapidly because of the high water temperature, and it can be raised to an adult state in a short period. Besides, the catch is carried by air to city markets still alive. Since a large amount of initial capital investment is required for this culture fishery, it is managed only by a small number of enterprises.

Actualmente, en Okinawa la entremezcla de lo nuevo y lo viejo está creando un cambio muy singular. En las aldeas de pescadores que operan en aguas costaneras se utilizan muchas embarcaciones pequeñas de madera (denominadas "Sabani") que se caracterizan por su diseño de hace más de un siglo atrás. Por otro lado, se ven señales de evidente "modernización" a través de la activa promoción del uso de grandes barcos pesqueros y de la construcción de embarcaciones pesqueras con material plástico reforzado con fibras de vidrio ("FRP"). Los pescadores afirman que, debido a sus circunstancias históricas, la pesca en Okinawa lleva un retraso de 20 a 30 años en comparación con las demás prefecturas japonesas, en lo referente al nivel tecnológico de las embarcaciones, los equipos y métodos de pesca. Los pescadores de Okinawa están esforzándose notablemente para colocarse al nivel de los del resto del país.

Maintenant, à Okinawa, les choses anciennes et nouvelles se trouvent mêlées de telle sorte que cela crée un gros tourbillon. Dans le village de pêche côtière, de nombreux petits bateaux en bois appelés "Sabani", dont la forme n'a pas changé depuis plus d'un siècle sont utilisés activement pour la pêche. D'autre part, la "modernisation" telle qu'elle est introduite avec les grands bateaux de pêche et l'emploi des matières plastiques renforcées de fibres de verre (FRP) pour la construction des bateaux de pêche se trouve mise à profit sans répit. Selon l'avis des pêcheurs locaux, du fait des circonstances géographiques et historiques de cette région les pêches à Okinawa sont de 20 à 30 ans en retard sur celles de la métropole, s'agissant du domaine technologique du bateau de pêche, des équipements et des méthodes de pêche. Aussi, les pêcheurs doivent-ils s'efforcer de rattraper le temps perdu sur l'avance prise par le territoire principal.

Coastal Fisheries Are Developed Steadily by Established Infra-structure

For the sound development of fisheries and stabilization of fishery management, close connections among the three branches, fishing, processing, and distribution along with their well-balanced development are necessary.

In a fishing port which will be a base for fishery, the following facilities related to fishery must be fully provided, in addition to basic facilities such as a breakwater, quay wall, mooring stations for fishing boats and cargo work facilities:

- (1) Fish market
- (2) Processing factory
- (3) Storage facilities for fishes (ice storage house with ice machine; cold storage; freezer)
- (4) Supply facilities (ice supply facilities; oil storage and supply facilities)
- (5) Repair and storage facilities (storehouse for fishing gear; repair shop for fishing boats, engines and fishing nets)
- (6) Transportation facilities (roads; railways; carrier ships; trucks; etc.)

Only after the organizations and systems which will operate and control these facilities are established in addition to the abovementioned facilities, can a true "infra-structure" of fishery be established.

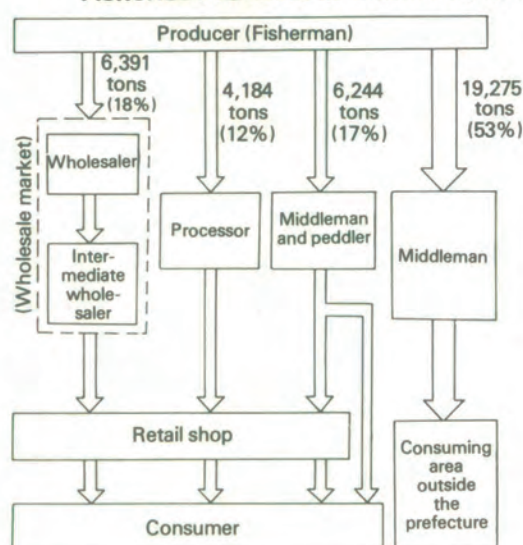
Fisheries in Okinawa show us some good examples of how the improvement of various supporting conditions exerts an important influence on the development of fishery industries.

(1) In the past, the investment in fishing port facilities was not large. Public investment in the fishing ports during the 18 years from 1954 to 1971 was only about 2 billion yen and "the fishing port improvement project" which was formed in 1961 attained only 47% of its target during a 12-year period. In 1972, most fishing ports were not much different from a natural beach, and only 4 out of the over 60 fishing ports of the entire prefecture could function as a port of distress.

(2) In Okinawa, the development of the market and distribution system for fisheries products had been too slow. The fishery production within the prefecture in 1970 was 36,094 tons, and the distribution pattern is as shown in Fig. 1. Only 18% of entire catch was distributed through wholesale markets, and most of the catches by offshore and pelagic fisheries were sold outside the prefecture by middlemen or directly landed in other prefectures. On the other hand, in the coastal fishing villages, a so-called "selling on the beach" system, by which each fisherman directly sold his catch under contract with a middleman or a peddler, was the usual system of business.

With Okinawa's return to Japan in 1972, an official program with regard to special measures for the promotion and development of Okinawa Prefecture was shaped. Based on this program, a large-scale fishing port improvement project was started. That is, public investment in the repair and improvement of fishing ports amount-

Fig. 1 Distribution Pattern of Fisheries Products in Okinawa (1970)



ed to 1 billion yen in 1972 and 11 billion yen in 1973-1976, and furthermore, from the fiscal year 1977 on, full scale improvement is being carried out under the nation-wide "6th fishing port improvement program (1977-1982)" by the Japanese government.

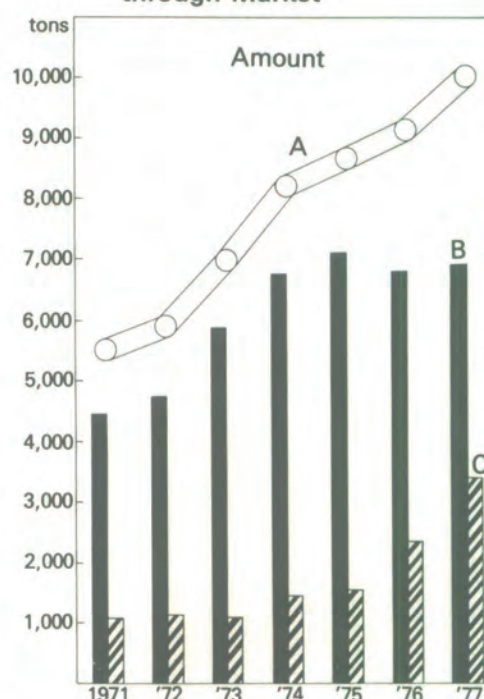
In Japan, fishing ports are classified into the following four types according to this program and planning and improvement works are carried out accordingly. These regulations apply to the fishing ports in Okinawa as well, but the above works are carried out according to a specific order of priority as follows: (1) fishing ports specifically essential to the general promotion of fisheries, (2) those without sufficient facilities, (3) those where increased fishery development is expected to lead to high economic benefits, and so on.

Classification of fishing ports by function

- 1st class: fishing ports functioning as a base of production for the local coastal fisheries.
- 2nd class: fishing ports functioning as a base of production of the regional fisheries including neighboring fishing villages.
- 3rd class: fishing ports functioning as a base for nation-wide distribution and processing of marine products.
- 4th class: ports of distress for fishing boats.

In parallel with the improvement of fishing ports, the improvement and expansion of the distribution system for fishery products are being carried out. While the construction of ground facilities such as fish markets, facilities for the disposal of products and cold storage have been in progress, the strengthening of fisheries cooperative associations and cooperative selling activities led by these associations have also been promoted.

Fig. 2 Transition in the Amount of Fishery Products Distributed through Market



- A: Sum total of B and C
 B: Amount distributed by local wholesale markets (two markets within the prefecture)
 C: Amount distributed by other wholesale markets managed by regional fisheries cooperative associations

Since the beginning of 1976, facilities in each district began to be actually usable, and they began to fulfil the functions of collection of products, sorting, storage and shipping. As a result, coastal fishing villages gradually became more active. The distribution of fishery products became smoother, and the market value of the catch was improved; and in turn this stimulated the fisherman's will to produce.

Usually, islands in an archipelago are isolated from one other and because of the limited demand within each island, fishery tends to remain on a self-sufficient small-scale level. Since 1977, the federation of fisheries cooperative associations of Okinawa Prefecture has been working to strengthen the distribution system and has been making efforts to connect the catch in the islands with the large consuming power of the main island.

One of the measures to improve fishery product distribution is to use larger fishing boats. When catches can be landed at Naha Harbor and Ito-man Harbor in the consuming cities by fishing boats of the isolated islands such as Miyako and Yaeyama, the price of fresh prime fish will rise because of the demand in the cities. Besides, buying of mass-catch fishes will increase too, resulting in added incentive for the fisherman to catch more fishes.

Presently, in Okinawa, two wholesale markets functioning as distribution bases have been set up in Naha City, and wholesale facilities which serve as collection and distribution bases have

been set up in twelve other places. These markets and facilities are managed by the prefectural federation of fisheries cooperative associations and the local fisheries cooperative associations, respectively. Cooperative selling through the system of cooperative associations is continuing to grow year after year (Fig. 2), and the share sold by this system has reached a level of 70% of the catch by coastal fisheries and a part of the offshore fisheries.

Un puerto pesquero deberá estar dotado, además de las instalaciones básicas tales como rompeolas, desembarcaderos, amarraderos y equipos de movimiento de carga, de las siguientes instalaciones:

- (1) Pescadería
- (2) Fábrica de elaboración
- (3) Instalaciones de almacenaje de pescados (con depósitos de hielo y máquinas de hacer hielo, frigoríficos y congeladores)
- (4) Instalaciones suministradoras (para suministrar hielo, para guardar y suministrar combustible)
- (5) Instalaciones de reparación y almacenaje (depósito para equipos de pesca, taller de reparación para embarcaciones pesqueras, motores y redes de pesca)
- (6) Instalaciones de transporte (carreteras, ferrocarriles, buques de carga, camiones y demás vehículos)

No se podrá decir que las condiciones básicas para la pesca han logrado alcanzar un nivel de perfección, sin haberse establecido antes la organización y el sistema que operarán y controlarán las mencionadas instalaciones.

La industria pesquera de Okinawa constituye un ejemplo típico de la notable importancia que tiene el mejoramiento de las condiciones básicas de las regiones apartadas en el desarrollo de las industrias.

Dans un port de pêche servant de base des pêcheries, les facilités suivantes en rapport avec la pêche doivent être prévues entièrement, en plus des facilités de base telles que digues, quais, poste de mouillage pour les bateaux de pêches et facilités pour le travail sur les cargaisons.

- (1) Marché du poisson
- (2) Usine de traitement
- (3) Facilités de stockage pour les prises de poissons (stockage de glace avec machine à fabriquer la glace, entrepôt frigorifique et congélateur).
- (4) Facilités d'approvisionnement (facilités d'approvisionnement de la glace, et stockage de carburant et facilités d'approvisionnement).
- (5) Facilités de réparation et de stockage (Hangar de rangements des appareils de pêche, atelier de réparation pour les bateaux de pêche, moteurs et filets de pêche).
- (6) Facilités de transport (routes, chemin de fer, bateaux de transport, camions, etc.).

L'infrastructure des pêches ne peut être conclue parfaitement qu'une fois que l'agence et le système de fonctionnement et de contrôle de ces facilités sont mis en place en plus des facilités énoncées plus haut.

Les pêches à Okinawa sont un exemple typique pour montrer à quel point l'amélioration des moyens d'exploitation de base exerce une influence prépondérante sur le développement des industries.

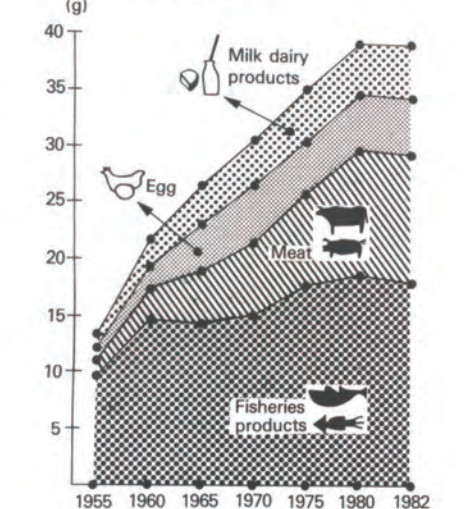




Advanced fishery nations in the world will have to provide more and more aid and guidance to those nations directing specific efforts toward fisheries development. Japan has already dispatched some 100 fishery members of the Japan Overseas Cooperation Volunteers to 18 nations. They have made great contributions in the technical improvement of coastal-water, inland-water and culturing fisheries, as well as fishery processing in these nations.
 Courtesy: Japan Overseas Cooperation Volunteers

Securing of Stabilized Supply of Fishery Products

Fig. 2 Daily Consumption of Animal Protein per Person (g)



In Japan where about 50% of the national consumption of animal proteins are supplied by fishery products, promotion of the fishing industry occupies an important position in the food policy. With the reduction of production in pelagic fishery and the gradual increase in the degree of dependence on coastal and offshore fisheries brought about by the beginning of "the age of 200 mile sea limits", Japanese fisheries have been forced to cope anew with each step of production, processing, distribution and consumption.
 In Japan, the final aim of fisheries promotion is to secure a stabilized supply of marine products. Various measures for this purpose must be undertaken collectively and systematically. At present, the tasks presented by the Japanese fishery administration are as shown in Fig. 1.

Fishery budget of Japan in 1979

The governmental budget for fiscal 1979 was approved some time ago, and this budget includ-

ed 38,600.1 billion yen in general accounts (12.6% increase over the last year) and 16,832.7 billion yen in special accounts for financial investment and financing (13.1% increase). The fishery budget was determined to be 295.2 billion yen (21.2% increase) in total general accounts. Further, a 46.4 billion yen (19.4% increase) budget for fishing boat reinsurance and fishery mutual aid insurance was provided in special accounts.
 The keynote of last year's policy has been upheld in this year's budget, and the policy of attempting to increase the fishery budget is also maintained. Various measures shown in the attached table are being performed collectively.

La Labor de la Administración Pesquera del Japón

En el Japón más o menos el 50% de las proteínas animales es suministrado por los productos marítimos, y la promoción de la industria pesquera ocupa una posición importante en la política alimentaria. Con la disminución de la producción en la pesca oceánica y el aumento gradual del grado de dependencia en la pesca en aguas costaneras y en alta mar, originada por el advenimiento de la "Era de las zonas Económicas de 200 millas", la industria pesquera del Japón se ve forzada a salir adelante otra vez con los problemas de producción, elaboración, distribución y consumo de los productos marítimos.

Tâche de l'administration des pêches japonaises

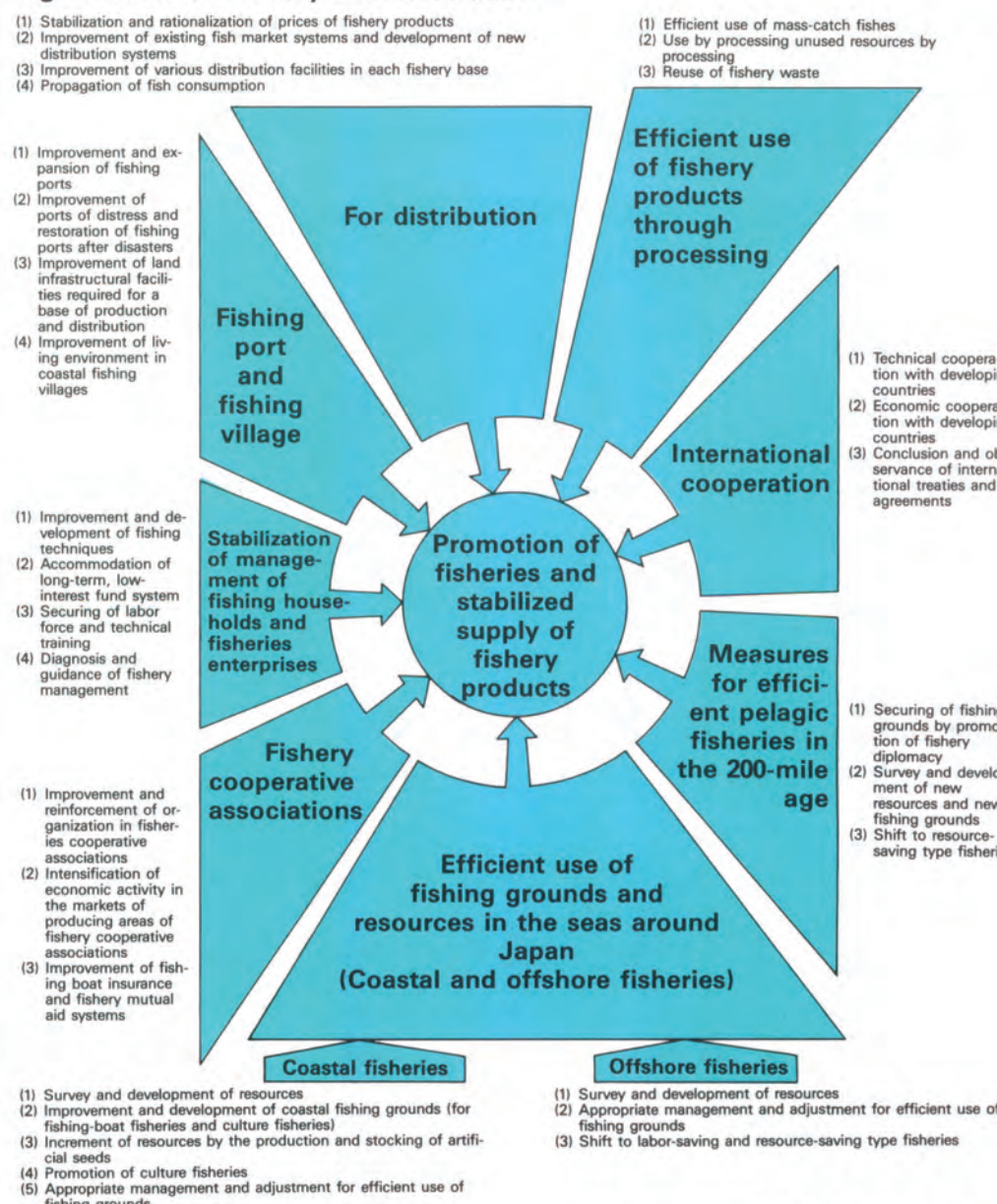
Au Japon, où environ 50% des protéines animales sont fournies par les produits d'origine marine, la promotion de l'industrie des pêches occupe une position importante dans la politique alimentaire de la nation. Par la réduction de la production des pêches pélagiques et l'augmentation graduelle du degré de dépendance sur les pêcheries côtières et au large survenues à la suite du commencement de "l'âge du régime des 320km d'eaux territoriales", les pêcheries japonaises doivent faire face avec chaque étape de production, de traitement, de distribution et de consommation.

Outline of Fishery Budget of Fiscal 1979

(Unit: million yen)

Item	Rough estimate decided	Remarks
1. Exploitation of fishery resources within the 200 mile limits and promotion of aquaculture		
(1) Survey of resources within 200 mile waters and compilation of fishing and sea condition information	1,840	
(2) Promotion of coastal fishing ground improvement projects	19,250	Continued from the 1st nation-wide program
(3) Promotion of aquaculture	7,703	Promotion of culture fishery, technical development of marine stock farms and expansion of hatching and stocking of salmon and trout
(4) Promotion of inland water fisheries		
(5) Countermeasures for fish diseases	1,041	
(6) Control and management of the Fishing Zone Act	436	
	1,783	
2. Exploitation of resources in distant seas and new development of pelagic fisheries		
(1) Survey and exploitation of new fishing grounds	7,039	
(2) Promotion of fisheries diplomacy	256	
(3) Preparation of a South Pacific Fisheries Promotion Fund	900	
(4) Expansion of overseas fisheries cooperation	4,300	Assistance expenses for economic development and the like are included in the budget of the Ministry of Foreign Affairs.
(5) Enforcement of treaty and agreement	3,922	
3. Measures for price stabilization of fisheries products and expansion of measures for distribution and processing		
(1) Measures for price stabilization of fishery products	3,328	
(2) Measures for improvement of distribution and processing of fishery products	3,778	*Technical development for highly efficient use *Promotion of frozen product distribution *Improvement of mass-catch fish use *Construction of distribution and processing centers in producing areas Limit of loan: 15 billion yen
(3) Accommodation of fisheries processing management stabilizing funds	690	
(4) Improvement of fisheries product consumption	268	
4. Reinforcement of measures for coastal fisheries development		
(1) Promotion of structural reform projects	5,436	Continued enforcement from the 2nd nation-wide program and start of the 3rd nation-wide program
(2) Promotion of urgent measures for promotion of fishing villages	1,156	Limit of loan: 2.5 billion yen
(3) Establishment of reform funds for fisheries management and technique	1,711	
(4) Expansion of measures for game fishing	47	
5. Improvement of fishing ports and environment of fishing villages		
(1) Improvement of fishing ports	161,917	Continued enforcement from the 6th nation-wide program
(2) Improvement of seashores	12,584	
(3) Promotion of natural disaster relief projects	3,283	
(4) Improvement of environment of fishery communities	1,044	
6. Enrichment of fisheries financing system		
(1) Accommodation of fisheries management stabilizing funds	6,020	Limit of loan: 65 billion yen
(2) Accommodation of fisheries modernization funds	3,925	Limit of loan: 115 billion yen
(3) Promotion of fisheries loan security system	2,524	
(4) Accommodation of funds from the Agriculture, Forestry and Fishery Finance Corporation	Separate budget	Limit of loan for fisheries: 107.8 billion yen
7. Measures for improvement of fishing ground environment and reinforcement of fishery accident compensation systems		
(1) Promotion of measures to counter red tide	590	
(2) Promotion of measures for protection of fishing grounds against pollution	1,170	Mercury, PCB, discharged petroleum, etc.
(3) Enforcement of fishery accident compensation systems	8,865	(Special accounts)
(4) Enforcement of fishing boat accident compensation systems	8,021	(Special accounts)
8. Other measures		
(1) Promotion of fisheries improvement and extension projects	896	Enforcement of extension service systems and encouragement for succession of the fishery business from generation to generation
(2) Improvement of fisheries cooperative associations and the like	68	
(3) Improvement of coastal ratio for fishery	240	
(4) Improvement of facilities in aquaculture research and research institutes for fishery technology	1,120	Reinforcement of specialization of national research institutes for fisheries by reorganization and improvement
(5) Promotion of measures for fishing labor improvement	64	

Fig. 1 Tasks of Fishery Administration



Fishes of Okinawa

A great many kinds of fishes can be found in seas with well-developed coral reefs. However, since the number of fishes per species is comparatively small, Okinawa has a "multi-kind and small-quantity type" tropical or subtropical biota. Beautifully colored fishes such as butterflyfishes, damselfishes and wrasses are abundant, but at the same time a variety of delicious edible

fishes are abundant as well. We shall introduce here ten odd species of fishes caught constantly in Okinawa which are important fishery resources. The representative fishes include yellowfin emperor and goldenbanded fusilier in the shallow water, and ruby snapper and blue fusilier (locally called "Machi") in the deep fishing grounds of the open sea.

Peces de Okinawa

El mar que rodea los escollos de coral bien desarrollados de Okinawa viven una numerosa variedad de peces. Sin embargo, la cantidad de peces por especie es relativamente pequeña. Okinawa se caracteriza por su flora y fauna tropical o subtropical "muy variada pero en reducidas cantidades".

Les poissons à Okinawa

On trouve une grande variété de poissons dans les eaux baignant Okinawa avec le reliefs coralien très prononcé. Cependant, le nombre de poissons disponible pour chaque espèce est relativement faible, et Okinawa possède un biota tropical ou sous-tropical du type à espèces variées en petites quantités".



Main Fishery Resources in Coastal Waters of Okinawa

Family	Japanese name	No. of Photograph	Scientific name	Degree of importance	Remarks
Serranidae	Suji-hata	①	<i>Plectropomus leopardus</i>	●	About 500—900 tons of Hata species are landed annually, and Suji-hata accounts for over 40% of the total catch. Next comes Madara-hata which accounts for 25%. Hata species inhabit the waters around coral reefs eating small fishes. Suji-hata, Madara-hata, Aka-hata, Bara-hata and Nomino-kuchi live in comparatively shallow waters (less than 100m); whereas Hoki-hata, Ma-hata and Shirobuchi-hata live in deep waters (100—30m) and are caught by deep-sea pole-and-line, vertical longline and other methods. Ma-hata grows to a very large size here, and many exceed 100kg. In Okinawa, Ma-hata is an important high-priced fish eaten as Sashimi (sliced raw fish) and other dishes.
	Madara-hata	②	<i>Epinephelus fuscoguttatus</i>	●	
	Hôki-hata▲	③	<i>E. morrhuia cometae</i>		
	Aka-hata	④	<i>E. fasciatus</i>		
	Bara-hata	⑤	<i>Variola louti</i>		
	Nomino-kuchi	⑥	<i>Epinephelus fario</i>		
	Ma-hata▲	⑦	<i>E. septemfasciatus</i>		
	Shirobuchi-hata▲	⑧	<i>E. maculatus</i>		
Lethrinidae	Iso-fuefuki	⑨	<i>Lethrinus mahsenoides</i>	●	In recent years, the catch of these fishes has increased to an annual 1,200—1,500 ton level. Among them, Hama-fuefuki is an important species and accounts for about 25% of the total catch. This species is well suited to culture fishery, and at present research on seed production is in progress. Among the Fuefukidai species, the Iso-fuefuki and Fuefukidai species are most abundantly caught, and over 35% of the total catch of Fuefukidai species consists of these two species. Fishes of this family are found in shallow waters to 70m depth. Shirodai and Sazanamidai are found in slightly deeper waters, and Hama-fuefuki is mainly at 30—70m depth. They are caught by bottom long line and pole-and-line.
	Fuefukidai		<i>L. haematopterus</i>		
	Hama-fuefuki		<i>L. choerorhynchus</i>	●	
	Shirodai		<i>Gymnocranius japonicus</i>		
	Sazanamidai		<i>G. robinsoni</i>		
Yokoshima-kurodai	⑩	<i>Monotaxis grandoculis</i>			
Lutjanidae	Kumasasa-hanamuro	⑪	<i>Caesio tile</i>	●	These fishes are important mass-catch species found around Okinawa, and 350—750 tons are landed annually. They inhabit the outer margin of coral reefs and are caught at 10—40m depth waters by driven-in net. Young fish are used as live bait for skipjack pole-and-line, and in Miyako and Yaeyama about 200 tons of young fishes are caught annually. These species are plankton-feeders.
	Takasago		<i>C. chrysozonus</i>	●	
	Hamadai▲		<i>Etelis carbunculus</i>	●●	These fishes are the most important species in Okinawa, and about 1,300—2,000 tons are landed annually. Hamadai and Aodai account for 70% of the total catch. Hamadai is caught abundantly at 300—500m depth and Aodai at 150—300m depth by deep-sea pole-and-line and bottom vertical long line.
	Aodai▲		<i>Paracaesio caeruleus</i>	●●	
	Himedai▲		<i>Pristipomoides sieboldi</i>	●●	
Scaridae	Hi-budai	⑫	<i>Scarus ghobban</i>		About 35 Budai species are found around Okinawa, and 450—800 tons are landed annually. Among them, there are no mass-catch species, with many different species being caught. They inhabit the outer margin of coral reefs and are omnivorous eating seaweeds, crustaceans and corals. Hi-budai is found in shallow waters 5—10m deep, and Nanyo-budai in waters about 30m deep. Large ones exceed 50kg. They are caught by gill net, drive-in net and other methods.
	Nanyo-budai		⑬	<i>S. gibbus</i>	
Siganidae	Aigo		<i>Siganus fuscoscens</i>		About 350—500 tons are landed annually. These fishes usually inhabit bay areas and especially rocky shores where seaweeds grow abundantly. They are omnivorous eating preferably seaweeds. Young Aigo come abundantly to waters near the coast at the spring tide of June 1 and 15 of the lunar calendar. These young fishes are caught to make Shio kara (salted and fermented fish meat and viscera).
	Goma-aigo		<i>S. guttatus</i>		

Note: ▲ Deep-sea fish

Note: ● Fish with high commodity value
● Mass-catch fish