

Published by Yamaha

# Fishery Journal

No.17



# SINGLE-PERSON OPERATION

## SMALL-SCALE OTTER TRAWL



The small-scale trawl fisheries of the Japanese coast have developed from various traditional fishing methods which have long existed in various parts of Japan such as "kogi-ami" (small trawl), "utase-ami" (small sailing trawl), and "funabiki-ami" (boat seine); and with the motorization of fishing boats, the fishing techniques which exist presently have evolved according to conditions in the different regions.

In recent years, the size of the catch by coastal small-scale trawl fisheries in Japan has stood around 300,000 tons. Out of this, the fishing method which is called "itabiki" which uses an otter board has proved the most effective trawl and has gradually spread to coastal fisheries since its introduction for large boats of pelagic and offshore fisheries from Europe in the beginning of the twentieth century. Bottom fish such as flatfish, cod and hairtail are the major catches.

The "itabiki" which we will introduce to you in this issue is the otter trawl type of stern trawl, where net casting and hauling is done at the stern. Compared to other systems, it has the following advantages:

- Because the nets are hauled at the fore and aft line of the hull, net casting and hauling can be done smoothly while maintaining a certain headway.
- The catch landed from the stern can be immediately and smoothly accommodated inside the fish hold at the aft deck.

These advantages are made possible because: (1) small motorized boats have been developed which are equipped with sufficient stern buoyancy to accommodate the weight load of fishing equipment and load at net hauling, as well as having an aft deck with sufficient space; and (2) the fishing mechanization system including subsidiary devices such as net haulers and winding winches has been adopted.

The trend towards labour saving in fishing operations by mechanization is a recent trend which we can see not only in small trawl fisheries, but also in coastal fisheries in general. Its effect has been seen in its most drastic form in the field of the small trawl fisheries. That is, namely, "one-man operation". In Japan, various net fishing operations using 3-5 ton class fishing boat are usually operated by 2 to 3 persons; however, small trawl fishing can now be operated by a single person and the sight of "one-man operation" is becoming less unusual.

### Aparatos para ahorrar mano de obra que hacen posible la "operación de una sola persona"

La tendencia al ahorro de mano de obra en las operaciones de pesca mediante la mecanización, se nota ya no solo en la pesca pequeña a la rastra sino también en la pesca costera en general. Su efecto se ha visto en su forma más drástica en el campo de la pesca pequeña a la rastra. Aquí es donde se habla de la "operación de un solo hombre". En Japón suelen hacerse por 2 ó 3 personas operaciones de pesca con botes pesqueros de la clase de 3 a 5 toneladas; sin embargo, la pesca pequeña a la rastra puede hoy operarse por una sola persona, y se está haciendo menos rara la vista de la "operación de una sola persona".

### Dispositifs d'économie de main-d'œuvre rendant possibles les "opérations par un seul homme"

Dans les petites opérations de pêche au chalut et également dans les pêches côtières en général, on a pu noter récemment une tendance d'économie de main-d'œuvre par l'adoption des moyens de mécanisation.

Ses effets les plus spectaculaires se remarquent particulièrement dans le domaine des petites pêches au chalut. Et on les appelle entre autres "les opérations par un seul homme". Au Japon, des méthodes variées de pêche au filet, utilisant un bateau de pêche de classe 3 à 5 tonnes sont exploitées par 2 ou 3 personnes; cependant, la petite pêche au chalut peut maintenant être effectuée par un seul homme et ce spectacle devient de moins en moins inhabituel.



# HIGH LABOUR-PRODUCTIVITY

Osaka Bay is the basin formed inland sea surrounded by Awaji Island and the Osaka Plains on which a large urban center has developed. In the bay, a high basic productivity is being maintained with the nutrient salts supplied by the inflowing river waters, and seasonal migration of fish from the high seas is occurring caused by the active water-exchange with the high seas which takes place at high tide, thus forming a favorable fishing ground.

We visited Higashiura Town located on the north-east coast of Awaji Island, and there we gathered information on "itabiki"

fishery which has been carried out there since old times. At Higashiura about 70 5-ton class fishing boats are being operated and as a fishing village engaged in coastal fisheries, it is a medium-size village. Small fishing boats under 3-ton class numbered more than 100 immediately after World War II; however, from 1960 to the 1970's, the number decreased to about 40 as a result of urbanization. However, since a few years ago, the fishery force is gradually regaining size with the increased inflow of the young generation into the field.

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## Fishing ground environment of Osaka Bay

The eastern half of Osaka Bay consists of a flat sea bottom with a water depth of less than 20 meters. The central part of the bay and the strait region is deepest, reaching a depth of about 60 meters. The bottom material of nearly half the area centering around the deeper part of the bay is (very fine) mud with strong stagnancy. The two north and south strait regions have a complicated bottom topography because of the active flow of water and their bottom material is coarse with little accumulation of organisms.

The main fisheries of Osaka Bay are: (1) small-scale purse seine (10~20 ton boats) catching anchovy, (2) boat seine (3~5 ton)

catching sand lance, and (3) small-scale trawl (3~5 ton boats) catching shrimps, prawns and various bottom fishes. These three fisheries alone account for about 90% of the entire fisheries carried out here. The others include pole and line, and gill net fisheries carried out in the area around the straits, and trolling line and long line fishing carried out in the bay as a whole; however, their catch is small in scale.

In addition, since the 1970's laver culture has become popular, and culturing has developed in some parts of the shallow sea areas such as the area around Akashi Strait and the Awaji coasts.

## Fishery production of Kariya District, Higashiura Town

Higashiura has three fishing ports and three fisheries cooperative associations. Among them, Kariya District has the highest number of cooperative members and their annual fishery production is about to reach one billion yen.

The main work force of these fisheries is composed of fishermen possessing 3~5 ton class fishing boats (mostly 4.9 tons). Throughout the year they operate "itabiki-ami" (small-scale otter trawl); however, they also operate "funabiki-ami" (boat seine) during the period when sand lance migrate to the area. It is exactly this class of full-time fishing households whom we

will cover in this edition.

Gill net and angling are generally considered as part-time fishing methods operated by older fishermen using boats under 3 tons. Furthermore, as for laver culture, because a single management body has to have gross earnings of more than 30 million yen annually to cover the large expenditures involved such as the cost of equipment for the marine culture facilities and other expenses for the product processing facilities, only 4 management bodies are engaged in full-time laver culturing in Kariya.

Table 1. Past records of landings of Kariya Fisheries Cooperative

	1979		1980		1981	
	(ton)	(million yen)	(ton)	(million yen)	(ton)	(million yen)
"itabiki-ami" (small otter trawl)	837	541.9	1,230	576.1	1,382	653.7
boat seine	162	38.7	641	114.8	408	122.9
gill net	34	21.5	36	20.3	38	19.6
angling	5	7.3	8	2.6	12	3.9
laver culture	(thousand sheets) 5,474	113.1	(thousand sheets) 8,291	162.8	(thousand sheets) 9,913	171.9
Total (million yen)		722.5		876.5		972.0

Note: Production of laver here is indicated by the number of sheets of dried processed laver.

## Actual operation of 3-5 ton class "itabiki" fishing by a household

In spring, from February to March, some fishing boats will carry out boat seine fishing to catch sand lance; however, during the rest of the year, "itabiki-ami" fishing is carried out. The actual operation days average 220 days a year.

As compared to boat seine in which the catch is limited to sand lance, the catch

of "itabiki-ami" includes a widerange of fish as shown in Fig. 2.

The recent average catch per fishing household and the average fish price are as shown in Table 2. The average fishing household in this class is making a profit of more than 10 million yen annually.

	Average annual catch per boat (kg)	Average fish price (yen/kg)
"Itabiki-ami" fishing	18,000	450-650
Boat seine fishing	20,000	180-300

Fig. 1

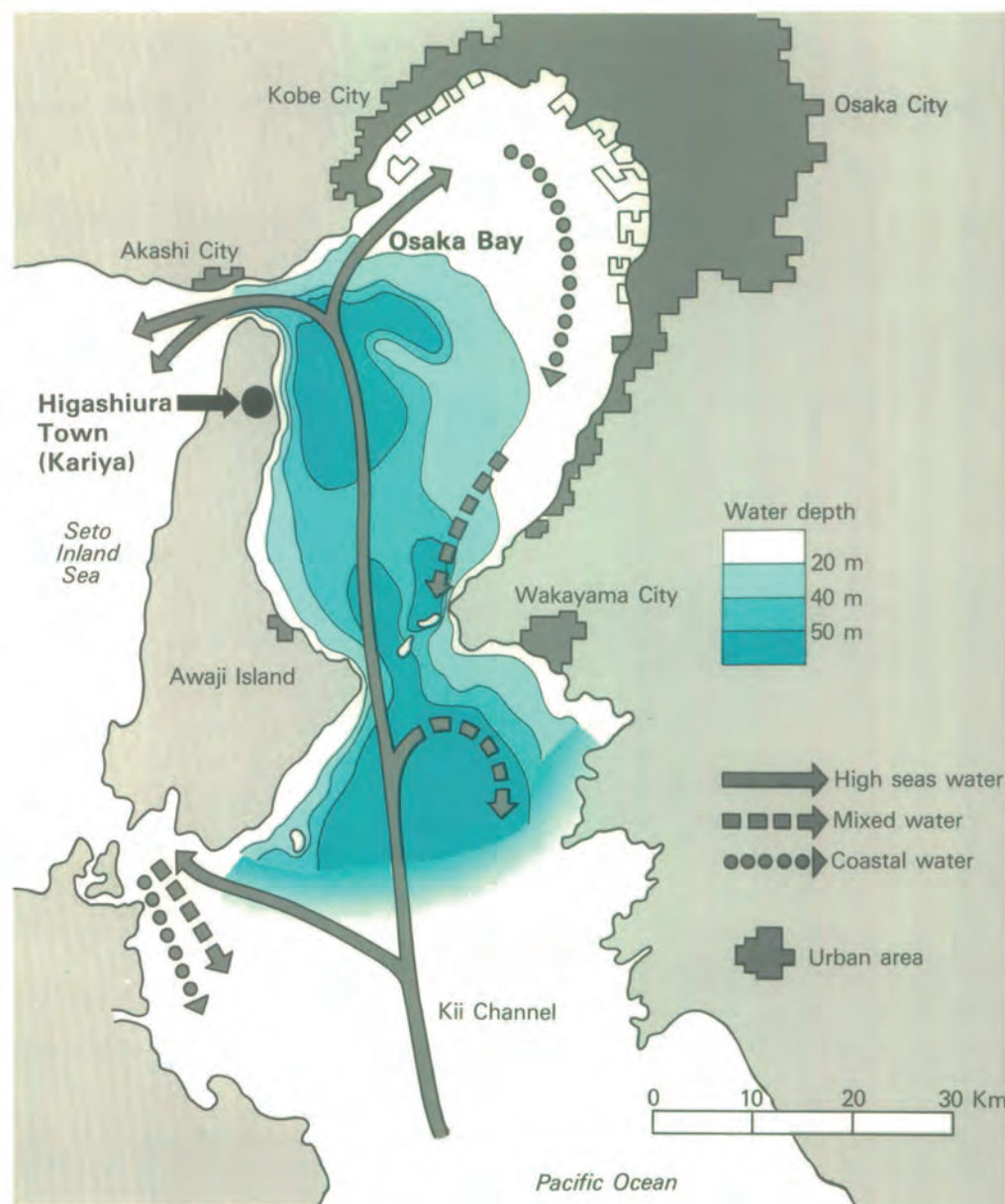
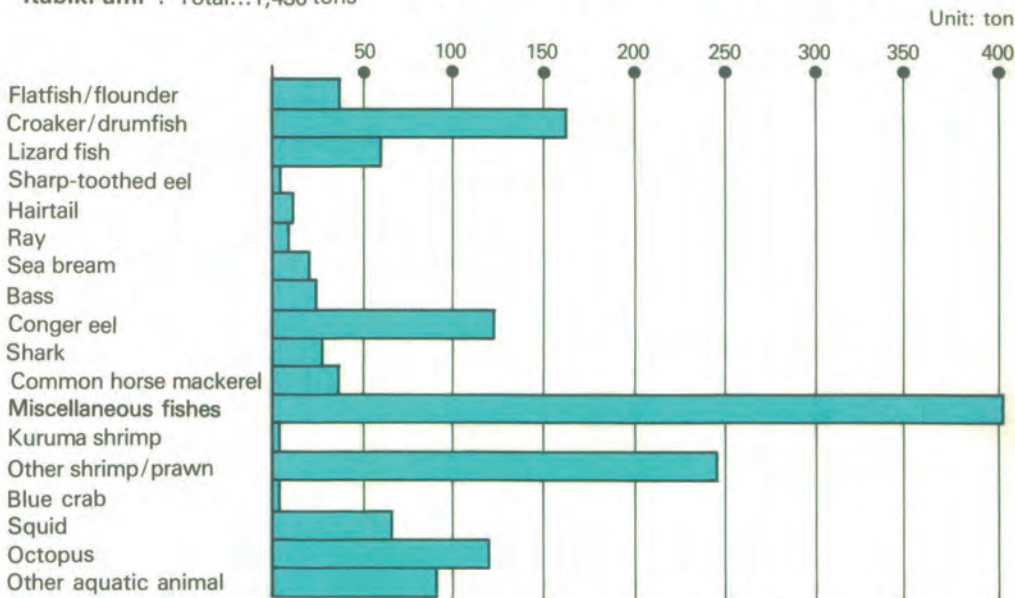


Fig. 2 Catch by "itabiki-ami" and boat seine of entire Higashiura Town (1980)  
"Itabiki-ami": Total...1,430 tons



\*Besides the above, a small amount of Spanish mackerel, crab, sea cucumber, abalone, and shellfishes are also caught.

Boat seine: Total (Sand lance)...488 tons

## Course of development of the "itabiki" fishing method

During the past ten-odd years, the "itabiki" fishing method of Kariya has gone through various changes as shown in Fig. 3.

Firstly, the net towing method has changed from a side-trawl type where the net is hauled from the hull side to stern-trawl where the net is hauled at the stern. Secondly, the net-hauling machine has changed from a standing-type roller to net-hauler; and thirdly, the main engine has changed from a hot bulb engine to a small diesel engine. Accordingly, as for the warp, wire rope has replaced the conventional Manila rope. Because wire rope is not so elastic as Manila rope, the tension of towing is conveyed more precisely to the net, thus improving the efficiency of net-opening. Also, in order to alleviate the water resistance on the net, the mesh size

has been enlarged a little and the shrinkage rate of the net has been reduced.

The improvement of fishing methods has reduced the required operational crew from three to one, and furthermore, the working hours required for net casting and hauling has been drastically reduced. During the "side-trawl" era, net casting and hauling took approximately 30 minutes; however, it can now be done in 10~15 minutes. The net-hauling time using a net-hauler is about 7 minutes.

As a result, an increase of catch can be sought either by extending the net-towing time or by increasing the number of towings per day. The selection between these two methods depends upon the fishing ground conditions at the time.

Although we could not obtain precise statistical data regarding the degree of im-



# IS MAINTAINED

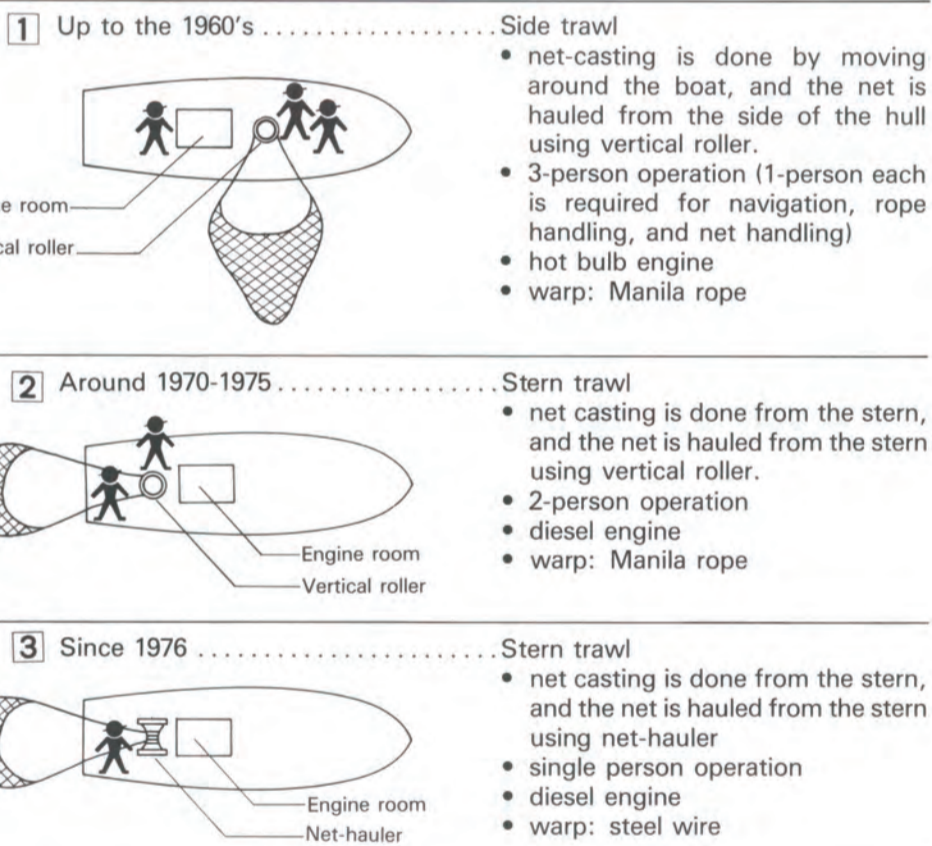
# 3-5 ton class stern trawl fishing boats of Osaka Bay



provement of productivity due to the modernization of fishing methods, because the level of catch of each fishing household

has not fallen compared to that of ten years back, it can be said that the labour productivity has tripled.

**Fig. 3 Course of development of fishing methods**



## Characteristics of 3-5 ton class fishing households

The economic effect resulting from the increase in fishing boat size can be seen from the two aspects of "productivity" and "composition of income".

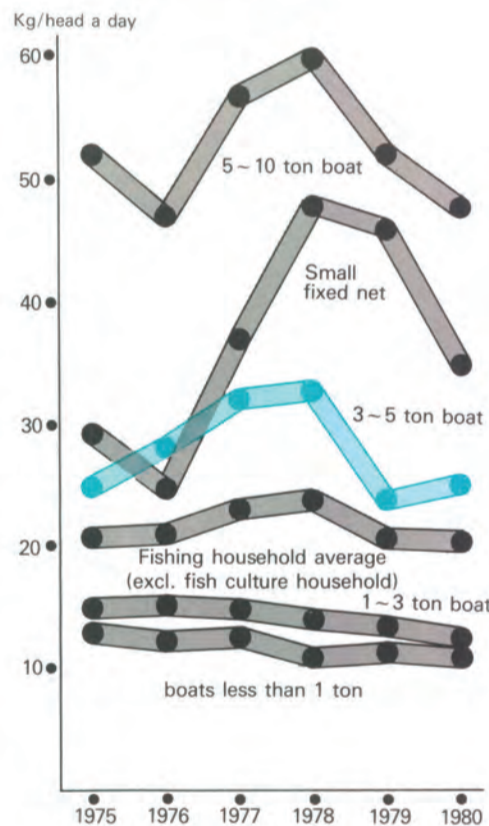
Fig. 4 compares the labour productivity by fishing boat tonnage class throughout the country (namely, the value of annual gross catch divided by the total number of workers). It shows that the productivity sharply rises with the class above 3 tons. Although it is natural that the catch capacity increases as the size of the boat becomes larger, there exists a clear difference between the 3~5 ton class and 5~10 ton class. That is, for 5~10 ton fishing boat the required crew is 3~4 persons or more depending on the fishery type, requiring a hired labour force of at least 1~2 persons; whereas 3~5 ton

fishing boats can be sufficiently operated with a labour force of 1~2 persons for all fishery types, thus enabling them to be managed by one family. What made family operation possible was the mechanization of fishing operations and improvement of navigation by such means as remote control devices.

The composition of income of the 3~5 ton class fishing household, as shown in Table 3, indicates a clear qualitative difference compared to the class under 3 tons. With the 3~5 ton class as the border line, the percentage that fishery income occupies in the total household income starts to exceed 50%. This fact shows that the household's dependency on fisheries becomes higher and that the number of full-time fishing households increases.

**Fig. 4 Comparison of labor productivity**

(Size of catch ÷ total no. of workers)



"Survey Report of Fishing Household Economy" by Ministry of Agriculture, Forestry and Fisheries

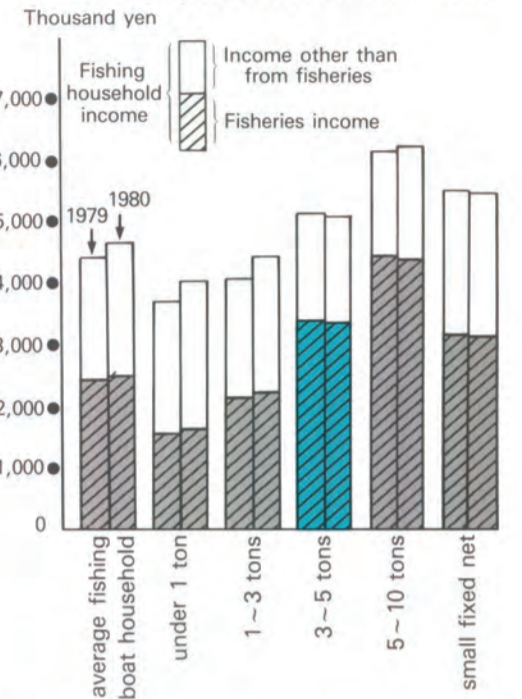
**Table 3 Ratio of fisheries income in the fishing household's income**

	1979	1980
Under 1 ton	40.8%	41.2%
1-3 ton	52.0	49.1
3-5 ton	65.1	64.9
5-10 ton	72.5	69.6
Small fixed net	59.0	59.4
Average for fishing households with a fishing boat	54.9	53.4

Note: Fishing household's income = ① Fisheries income + ② income from business other than fisheries (agriculture, fish processing etc.) + ③ income other than business (labour wages other than fisheries, subsidies, or compensations)

(Source: "Survey Report of Fishing Household Economy", by Ministry of Agriculture, Forestry and Fisheries)

**Fig. 5 Household income of marine fishery households (1979-1980)**



(Ministry of Agriculture, Forestry and Fisheries "White Paper on Fisheries")

## Curso del desarrollo del método de pesca "itabiki"

Durante los pasados diez o más años como se ve en la Fig. ha sufrido varios cambios el método de pesca "itabiki" de Kariya.

En primer lugar el método de remolque con red ha cambiado de un tipo de rastra lateral, en que la red es arrastrada desde el casco hasta la popa. En segundo lugar, la máquina haladora de red ha cambiado del rodillo de manejo en pie al halador de red; y en tercer lugar, el motor principal ha cambiado de un motor de bulbo caliente a un pequeño motor diesel. De acuerdo con esto, en cuanto a la estacha, la cuerda de alambre ha sido remplazada por una cuerda de Manila convencional.

Como resultado, puede observarse aumento de pesca sea prolongando el tiempo de remolque de red, sea aumentando el número de remolques por día.

Aunque no podamos obtener datos estadísticos precisos sobre el grado de mejora de la productividad debido a la modernización de los métodos de pesca, pues el nivel de pesca de cada familia no ha decaído en comparación con el de hace diez años, puede afirmarse que la productividad de la mano de obra se ha triplicado.

## Evolution de la méthode de pêche dite "itabiki"

Durant les dernières dix années, la méthode de pêche "itabiki" de Kariya a subi de nombreux changements comme le montre la Fig.

En premier lieu, la méthode de traîne du filet qui consistait auparavant à traîner un chalut latéral d'un côté de la coque se fait maintenant en traînant le chalut arrière par l'arrière du bateau. Deuxièmement, la machine de halage du filet qui était du type à rouleau debout est maintenant du type à remorque du filet; et troisièmement, le moteur principal qui était du type à boule chaude est maintenant un petit moteur diesel. Par conséquent, en ce qui concerne l'aussière, le filin d'acier a remplacé le filin conventionnel de chanvre de Manille.

On peut espérer ainsi augmenter substantiellement la prise de poisson soit en prolongeant le temps de halage de filet soit en augmentant le nombre de halages par jour.

Quoique l'on ne puisse pas obtenir des données statistiques précises concernant le degré d'amélioration de productivité suite à la modernisation des méthodes de pêche, parce que le niveau de prise de chaque maison de pêche n'a pas baissé par rapport à celui d'il y a dix ans, on peut néanmoins affirmer que la productivité de main-d'œuvre a triplé.



# Case studies of small otter trawl

—Japanese name; *Itabiki-ami*—(Kariya District, Higashiura Town, Awaji Island)

With small-scale trawl fishery, the fishing gears and methods vary according to the type of catch. The small otter trawl of this district uses 3 types of nets as follows. In this edition, we shall introduce the net with a small size mesh which is called "Koami".

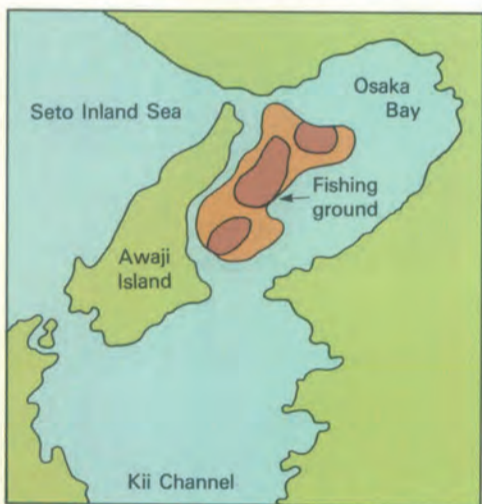
Table 1. Kinds of net

	Mesh	Size	Catch	Season	Remarks
"Koami"	20 m/m	Separate figure	Miscellaneous	Throughout the year	
Chain net	Same as above	Same as above	Flatfish	Winter-spring	Iron chain is attached to a ground rope
Large mesh-net	80-90 m/m	Every part has double-size	Sea bream & skipjack	Spring & autumn	

## Fishing ground description

Fishing is done throughout the Osaka Bay, but areas where the bottom is sand or sandy-mud with a water-depth of 50-60 meters are the favored fishing grounds. Due to the fact that bottom fishes generally prefer to inhabit places where there are abundant demersal organisms (feed organisms) which exist because of the relationship between bottom topography and sea current, the favorable fishing grounds are in areas such as bottoms with a lot of ups and downs rather than flat bottoms, or areas surrounding reefs, and cavities. However, bottoms with many rocks, gravel, seaweeds or shells cannot be used as fishing grounds since net towing will be difficult.

Fig. 1 Small otter trawl fishing ground of fishing boats from/to Awaji Island



## Fishing season and operation time

Because "koami" fishing is meant to catch miscellaneous demersal fishes, it is done throughout the year following the habitat of the fishes to be caught.

The fishing is carried out in the daytime from dawn to the afternoon, but the time-period with the highest catching rate is the time before and after tide changes. This is because it is the time when the net opening is most stable and also because the fishes start to gather in the area near the bottom. Moreover, since the food-searching activities become especially active around sun-rise, the netting rate then is also high.

## Structure of fishing gears

Although the sizes of individual parts and mesh size of the net vary according to

individual, the "itabiki" net of this district is basically composed of the following parts:

- (1) Towing rope: wire rope of 8-9mm diameter; length is 3-4 times the water-depth, thus 300-400m.
- (2) Otter board: made of wood or resin (there is a size limit which is; (width) 60cm x (length) 125 cm)
- (3) Rope: nylon, diameter 35mm.
- (4) Supporting pole: iron bar.
- (5) Wing net: nylon 12 ply.
- (6) Ceiling net: same as above.
- (7) Belly net: same as above.
- (8) Bag net: same as above.
- (9) Float: made of foam plastics.
- (10) Sinker: made of iron or ceramic

Fig. 2 Construction of Itabiki Net

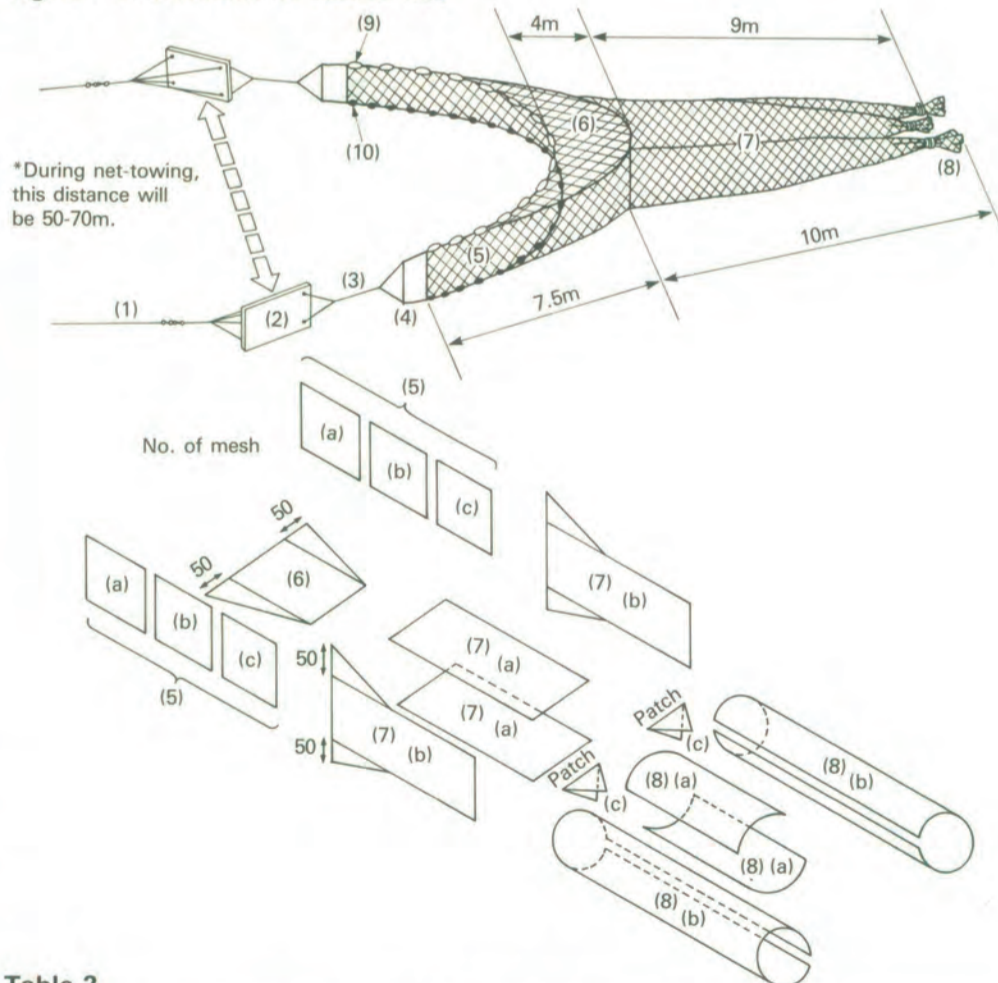
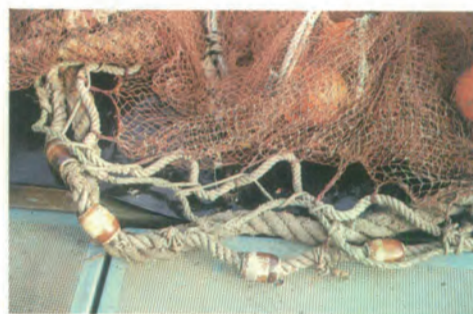


Table 2

	Thickness	Mesh stretched	Width	Length	No. (sheets)	
(5) {	Wing net (a)	12	28 mm	100	100	2
	Wing net (b)	12	28 mm	100	100	2
	Wing net (c)	12	28 mm	100	100	2
(6)	Ceiling net	12	23 mm	200-100	200	1
(7) {	Belly net (a)	12	28 mm	100	300	2
	Side belly net (b)	12	28 mm	100	300	2
(8) {	Bag net (a)	12	20 mm	100	100	1
	Fish catching section (b)	12	20 mm	100	200	2
	Patch (c)	12	20 mm	100	200	2

## Features of the net

The lower part of the belly net and ground rope: these two parts are connected by a thin rope (shown by the arrow) as shown in the figure, and can be easily separated. The same ground rope is used for 2 to 3 different types of net with different finishes.



## Fishing boat

### Boat type

Hull weight: 4.42 tons (FRP), Full load displacement: 9.54 tons, Length overall: 14.04m, Breadth overall: 3.60m, Depth overall at midship: 1.63m

1 Net casting is to be started at a end of the wing net is reached, then by extending the warp, the trawling



•Casting of otter board

4 Propulsion is stopped for net net-roller while the boat is two side-reels. When the otter Then the warp and net are rolled



•Net-hauling (1) net roller

5 The hydraulic roller is stopped when the bag-net has been pulled up to the stern, and then the bag-net is hauled up and placed on the stern deck by hand. In cases where the catch is large, one should attach a rope to the bag-net part and haul it up using a derrick.



(5) Bag net

### Engine:

Fishing boat law: 15 P.S. (continuous standard output 15PS/1,500 rpm)

### Fishing restrictions

According to the "Seto Inland Sea Small Trawl Fisheries Regulation" designated by the Japanese Government, the boat size is restricted to under 5 tons, and the maximum horse power of the main engine is restricted to 15 P.S., as calculated by the Fishing Boat Law.

### Main equipments

- (1) Hydraulic net roller
  - (2) Derrick for net-hauling
- Reported model boat/  
YAMAHA DT-46A-OA



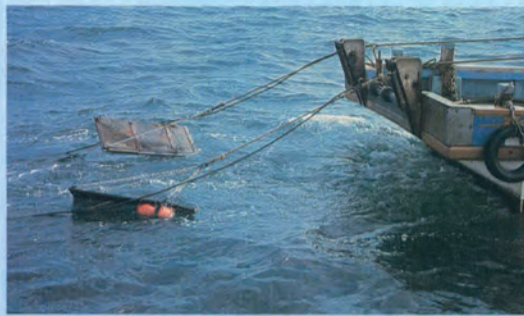


# Operation method

slow-speed cruise. When net casting proceeds until the the otter boards are placed in position with chains; and state is created.



**2** Trawling speed (speed against water) is 3-4 knots for net catching large fishes and about 2 knots in the case of small shrimps/prawns. In either case, trawling is performed from up to down according to the tidal current.



**3** Trawling time is 40-50 minutes per operation, and 6-7 trawls are performed in a day.



•Trawling

hauling, and the warp as well as the net are rolled up by means of a hydraulic powered pulled back. The net-roller is a quadruplex type, and the warp (wire part) is rolled up into the boards are pulled up to the deck, they are hung on the bitt at the stern after the chain is removed. up into the two central reels.



(2) wing-net



(3) wing net-belly net



(4) belly net

**6** The rope tying up the bag end is untied, and the catch is dumped out on the deck. After throwing sea weeds and large debris caught inside the net into the sea, the catch is stored in either of the two fish holds on the sides.



**7** The next net-casting is done.

**8** While the rudder is placed on automatic-pilot during net-towing, catches inside the fish holds are sorted.



•Sorting of catches

**9** Second net-hauling starts.



## Features

- This boat is designed mainly for trawl fishery. Because it has a large stern deck space, even after the net roller and net gears are installed, there is still plenty of space to facilitate the fishing work.
- Four large fish holds are installed in each fore deck and aft deck. In particular, the fish holds of the aft deck are installed well out to both sides of the boat to facilitate net handling.
- Keel-type hull bottom increases the

boat's stability during motion and serves to prevent drifting by wind and rolling.

- It features a large bridge. The bridge has improved living conditions and has facilitated the placement of equipment inside the bridge.
- It is a multi-purpose 5 ton class boat which can not only be used for trawl, angling, long line and gill net, but also for small purse seine if the equipment are changed.

bien que fondos llanos, o áreas rodeadas de arrecifes y cavidades. Sin embargo, los fondos con numerosas rocas, grava, algas o mariscos no se pueden usar como campos de pesca por la dificultad de halar las redes.

Table 3 Types of Yamaha boats suitable for small trawl

Model	Length overall	Breadth overall	Depth overall at midship	Displacement (light load)	Recommended main engine
DT-46A-0A	14.04 m	3.60 m	1.63 m	Approx. 7 tons	90-120HP (ME590, ME990)
DD-40-0B	12.08 m	3.76 m	2.05 m	" 9	52-90HP (ME590, ME300)
DT-46-1A	14.08 m	3.00 m	1.73 m	" 7	90-120HP (ME590, ME990)
DT-79-0B	17.27 m	3.75 m	1.75 m	" 13.5	120-185HP (ME990, ME1300)
DT-100-1A	17.74 m	3.88 m	1.97 m	" 14	165HP
DX-149-1A	17.83 m	3.99 m	2.15 m	" 23	185HP
DY-199-0A	19.95 m	4.30 m	1.85 m	" 30	300HP
DT-149-1A	20.54 m	4.16 m	2.26 m	" 21	165HP

Please contact AD & PR Div., Yamaha Motor Co., Ltd. for more particulars of the above-mentioned Yamaha fishing boats.

## Descripción del campo de pesca

La pesca se hace a través de la bahía de Osaka; pero los campos favoritos de pesca son aquellas áreas de fondo arenoso o lodoso y de 50 a 60 metros de profundidad. Debido al hecho de que los peces de fondo generalmente prefieren para vivir lugares de abundantes organismos sumergidos (organismos alimentados), que existen a causa de la relación entre la topografía de fondo y la corriente marina, los campos de pesca favorables se dan en áreas tales como fondos de muchas subidas y bajadas, más

## Description des lieux de pêche

La pêche est effectuée dans toute la baie de Osaka, et les lieux de pêche préférés sont ceux à fonds sableux ou boueux dont la profondeur varie de 50 à 60 mètres. Du fait que les poissons de profondeur fréquentent généralement les endroits où abondent les organismes démersaux (organismes nutritifs) qui habitent de tels endroits à cause des conditions topographiques et de courants marins, les lieux de pêche favorables se trouvent dans les endroits où les fonds présentent beaucoup de reliefs plutôt que des fonds plats, ou les endroits à récifs et crevasses. Cependant, les fonds ayant de nombreuses roches, graviers, plantes aquatiques ou coquillages ne peuvent être utilisés comme lieux de pêche à cause que cela entraîne des difficultés de remorquage du filet.



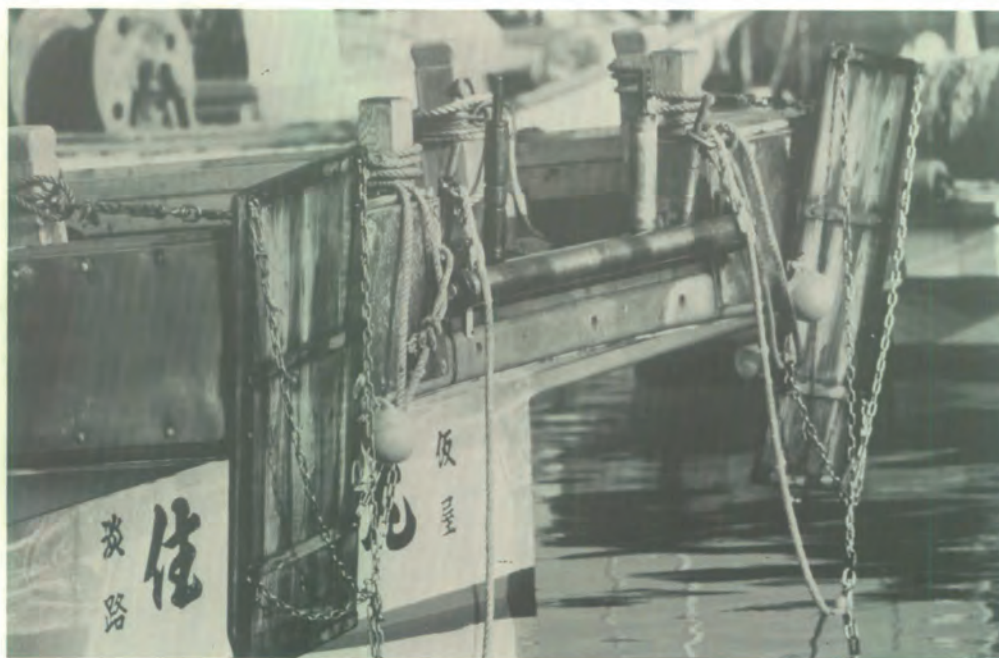
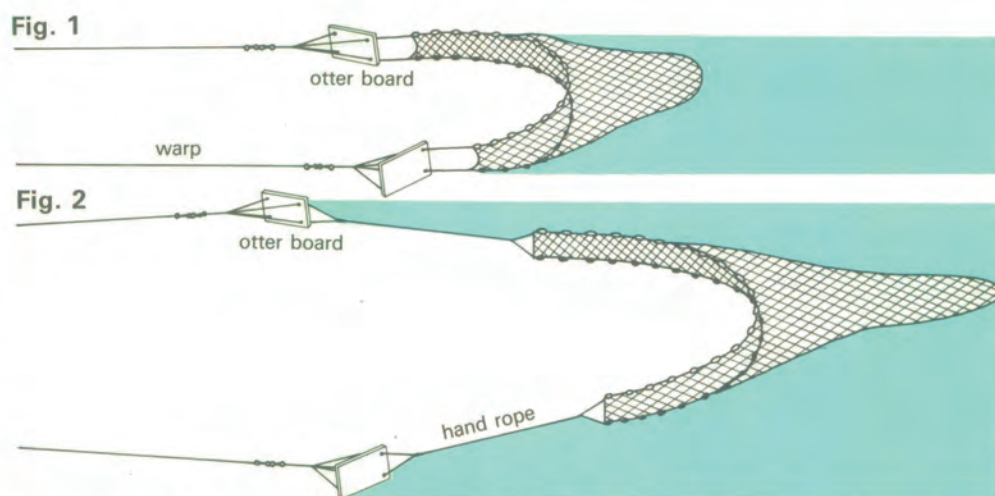
# Handling method for the otter boards

The old-type of otter trawl had a short wing net and thus the otter board was attached at the end of the wing net as shown in Fig. 1. Even at present, this method is used for shrimps and is considered to be one of the effective fishing methods, called the "out-rigger" method.

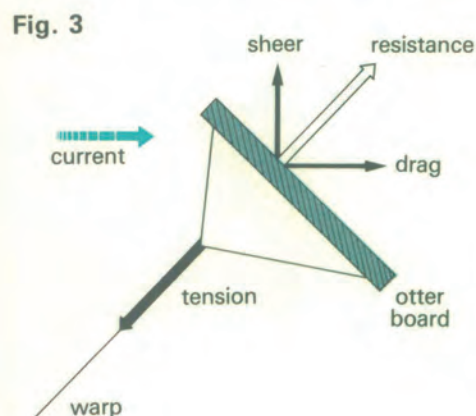
In 1925, V.D. type trawl (Vigneron Dahl trawl) appeared. As shown in Fig. 2, this system employs a hand rope which is attached between the wing net and otter board. With the success of this system, otter trawl was to see further developments from that time on. First of all, a transformation has taken place in the shape of the net. The square part (belly net) became smaller, and in turn the wing net and cod-end were extended. The hand rope functions to create clouds of sand by scraping the sea bottom and to chase the fish into the net center by intimidating them. The catching efficiency was improved because one could now operate in a wider area of sea bottom with higher mobility.

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The forces which act on the otter board can be divided into two elements as shown in Fig. 3. The shear force functions to widen the net mouth; however, drag force turns itself into the resistance towards the towing force of the boat. Of course, it is desirable to design the shape of the otter board so that the shear force becomes as strong as possible while the drag force



Attachment of otter board to the stern



stays as small as possible.

For the otter board, although a flat rectangular board is generally used, in order to improve its functions, up to now, several boards with various shapes have been developed and put to practical use. Among them, there are curved rectangular boards, V-shaped boards and oval-shaped boards.

As for the materials used, ones which are made up of assembled wooden boards strengthened by steel belts are commonly

used; however, ones made of duralumin or FRP are also starting to become popular. Furthermore, measures are taken so that the towing angle can be controlled by devising metal fittings for the pendant chain.

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The make-up of the otter board and the attached gears is shown in Fig. 4. Although the board will be moved with A and A'

sides touching the sea bottom, it is necessary to make the chain length adjustable.

As for the otter pennant, the lower part should be several centimeters longer than the upper part, so that during towing, the board will face upward slightly. Swivels should be fitted to both the front and back parts of the board in order to prevent the rope from twisting. The idle rope should have some marginal length by making it several meters longer than the length of the towing rope and pennant rope put together.

Regarding the connecting metal fittings of a-g, besides the rings with gaps (photograph 2), shackles or G-shaped hooks are used where appropriate. In this figure, however, all parts are rings with gutters for purpose of simplification.

### Reference materials

1. M. Nomura et al: "Fishing Techniques (1)", published by Japan International Cooperation Agency, 1975, 240pp
2. Thesis by Takeo Koyama, Director of Fishing Method Research Office, Institute of Fisheries Engineering Research



Upper: swivel Lower: ring with gap



In some parts of east Japan, circular otter boards are popular (photo courtesy: Institute of Fisheries Engineering Research)

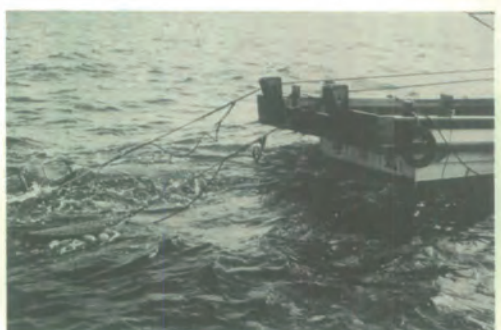
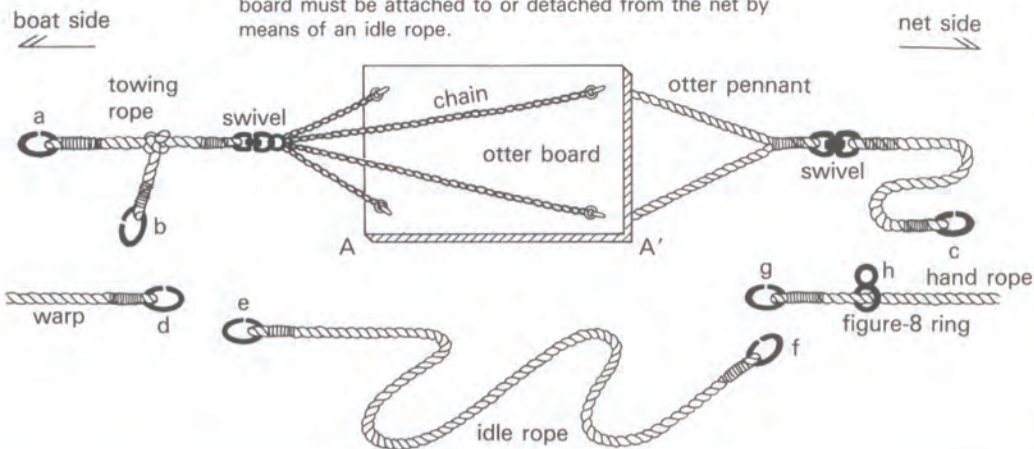




Fig. 4

Parts of the net up to a belly net are rolled up by a net roller at the time of net-hauling. Therefore, the otter board must be attached to or detached from the net by means of an idle rope.



**Tabla de nutria**

Para tabla de nutria, aunque generalmente se usa una tabla rectangular plana, a fin de mejorar sus funciones hasta el presente se han desarrollado y puesto en uso práctico varias tablas de diversas formas. Entre ellas hay tablas rectangulares curvadas, tablas en forma de V, y tablas de forma ovalada. En cuanto a los materiales usados, las más comunes son las confeccionadas de madera ensamblada con refuerzos de cinturones de acero; sin embargo, también comienzan a cobrar popularidad las hechas de duraluminio o FRP. Además se están tomando medidas para que los ángulos de halar puedan controlarse con accesorios metálicos para la cadena pendiente.

**Otter**

Quant à l'otter, bien qu'on ait utilisé jusqu'à maintenant un panneau rectangulaire plat en général, afin d'améliorer ses fonctions, plusieurs panneaux aux différentes formes ont été mis au point et utilisés en pratique. On trouve ainsi, les panneaux rectangulaires incurvés, les panneaux en forme de V et les panneaux de forme ovale. En ce qui concerne les matériaux utilisés, ceux constitués par des panneaux de bois renforcés par des ceintures d'acier sont d'usage commun; cependant, ceux en duralumin ou en FRP deviennent de plus en plus populaires. En plus, des mesures sont prises de façon à pouvoir contrôler l'angle de halage en réalisant des grées métalliques pour les chaînes pendantes.

# Innovation of sales with the introduction of bidding system

— Actual activities by the youths' research group of Kariya Fisheries Cooperative Association —

The main forces which support the promotion of coastal fisheries are the productive spirit of small-scale and artisanal fishermen and their drive to achieve better position in society. Because coastal fisheries using small boats have small catches very different from fisheries involving large boats, which are based upon mass-catch and mass-sales; the former should seek to increase their profits by catching medium-to-prime fishes and by selling them at high prices. In fishing villages, their main task is to perfect the selling system for their catches and the transportation system to big cities, with fisheries cooperative associations as their bases of activities.

However, in areas where the local market in the producing area is still not systematized, or where merchant capital still retains a strong controlling power, efforts for favorable control of fish prices and the maintenance of freshness of catch cannot be very successful.

The Kariya District of Higashiura Town in Awaji Island is a traditional fishing village society which has existed since the Edo period (17th-19th centuries), and until recently the price agreement method by a non-bidding system was used. The following is the experiments made by the youths' research group within the local fisheries cooperative in order to modernize sales.

\* \* \* \* \*

In Kariya District, until recently the fisheries cooperative association was collectively selling the catches of its fishermen to the local middlemen and then the middlemen shipped them to the markets in the big cities (Osaka, Kobe and Kyoto). However, the fish price was not determined through bidding. The middlemen in consultation with only a few people, elected as sales committee members by the cooperative were setting low fish prices which were only benefiting themselves, and ignoring the difference in value of each daily catch.

The following protesting voices arose among the ordinary fishermen against this unrational system:

- (1) The middlemen, for their own advantage, were said to be always setting prices lower than in other districts, because they fixed the price by agreement without confirming the daily quantitative fluctuations of the catch, the fish size, or the quality of the freshness.
- (2) For this reason, fishermen's main interest became just to catch more in order to raise their sales, which resulted in their negligence in sorting the catch by size or in trying to maintain their freshness.
- (3) Since the voices of the sales committee members representing the fishermen were rarely reflected in the decision, the agreed price could not be raised unless a strong request from the fishermen side came up.
- (4) The productive spirit of fishermen thus declined, and they easily abstained from going fishing on days with bad weather.

In around 1973, the youths' research

group, "4H Club" which had continued to get involved in various autonomous activities within the Kariya Fisheries Cooperative such as the improvement of fishing gears and technical research for culture fisheries, took up the subject of improvement of the sales system as their research theme hoping to solve the above mentioned problems.

They have sought to resolve the problem through actual implementation of programs on a trial and error basis as follows:

**Stage 1: Direct landing of catches at the urban markets by the producing fishermen**

Twenty volunteers experimented in landing catches directly at Akashi Market, located close to the big cities. Due to the fact that the prices at Akashi market were 30-40% higher than in the local market, the merit of having higher fish prices was obtained; however, on the contrary, a big disadvantage occurred at the same time. Because of the extended transportation time of the catch to the landing site, shortening of fishing hours was necessitated, resulting in a decrease in catch.

In addition, the cost of fuel for transportation rose. Furthermore, with the additional negative factor that this system required double payment of the market sales commission fee (at Akashi market and the local fisheries cooperative's market), the net intake of producer was not that much different from what they had gained through the old system.

**Stage 2: Direct shipment to the urban markets by the fisheries cooperative**

The fisheries cooperative implemented a joint shipment system by purchasing one 4-ton class truck. This method was effective in raising the unit agreement price for it stimulated the local middlemen, and thus raised the actual income of the fishermen.

However, because the shipment work was entrusted to the fisheries cooperative personnel, the maintenance of freshness and sorting was not done with care. Moreover, because the expenditures such as the vehicle cost and labour cost were more than they had expected, the fisheries cooperative incurred a deficit of 1.2 million yen in 6 months with the joint shipment project. As a result, receiving criticism from opposition faction members of the cooperative and of the middlemen, the project had to be suspended. In the meantime, middlemen had gradually started to lower the price again, and within a month things went back to the old system. At this stage, the 4H Club judged that the most favorable system would be to implement joint sales through a bidding system at the local fisheries cooperative market.

**Stage 3: Participation of middlemen from other districts in the bidding for mass-catch fishes**

Sand launcea caught by boat seine are

landed in very large quantities during the spring, especially in February and March. For this reason the fishermen were forced to sell them to the middlemen at a price much lower than they had to for catches by trawl. Thus, it was necessary to think of a special system regarding sand launcea. Sand launcea are mainly used as raw material for processed goods rather than for eating directly, and so the middlemen only buy the surplus portion of the catch, exceeding the local processing capabilities, at an extremely low price. The fisheries cooperative and the 4H Club drew up a plan to enlarge the processing capabilities by constructing a processing plant to be self-managed by the cooperative, but because of the opposition from middlemen and a part of the fishermen, the plan did not actually develop.

The 4H Club, however, sought out sales destinations outside the island, thus creating a breakthrough. Sand launcea are a major feed for yellowtail culture, and thus negotiation was attempted with middlemen outside the island for culture feed which ended with successful reply of agreement that they would participate in the bidding.

In 1974, the first bidding at the Kariya Fisheries Cooperative Association was carried out. The sand launcea which had been priced the day before at 20 Yen per Kg was now sold at the high price of 33 Yen on average, and the bills were collected with no trouble. Although there were various protest movements and slanders, the sales of sand launcea completed with good results. With this accomplishment as a background, the fisheries cooperative again negotiated with 17 processors within the island and concluded a bidding sales contract.

**Stage 4: Establishment of an "open bidding system" of small trawl catch**

Based upon the implementation of the open bidding system for sand launcea, the fisheries cooperative and the 4H Club put their efforts into strengthening the mutual ties among fishermen and continued to negotiate with the local middlemen for several times, and finally sought the realization of a bidding system for the catch by trawl, which is the key fishery of the region. Consequently, in April, 1975, the fisheries cooperative implemented a complete bidding sales system providing equal bidding rights to the neighbouring retailers, merchants and restaurants, in addition to the usual middlemen.

**Stage 5: Present situation**

The new system has advanced successfully, and at present even the middlemen who opposed this system have now changed their attitudes to the extent that they are now participating in the bidding.

The introduction of this bidding system has brought about the following results: — (a) increase of sales profit for the produc-

ing fishermen as a result of the average fish price increase, (b) breaking away from the old custom tradition of the fishing village, (c) increased income for the fisheries cooperatives through sales commission fees, and (d) active offering of loans for facilities and operation funds to fishermen of the cooperatives. Finally, the biggest achievement was (e) the improvement in the will to produce of the fishermen. By breaking out of the old tendency to catch at random, fishermen are now seeking to maintain the freshness of their catches using fish preserving equipment for live fish, and are placing their efforts to ship high quality and high priced commodities by sorting even the general catches according to type and size.

Furthermore, the middleman side has also improved. With the start of free competition through the bidding system, they have tried to find new marketing routes. Presently, the catches are not only shipped to the nearby markets, but a part of the prime fish catches are even shipped as far as the Tokyo markets in the form of live fish.

**Innovación de ventas e introducción del sistema de licitación**

En las aldeas pesqueras la tarea principal es perfeccionar el sistema de ventas de las pescas así como el sistema de transporte a las grandes ciudades con asociaciones cooperativas de pesca como base de actividades.

Sin embargo, en áreas en que el mercado local de la producción todavía no se ha sistemizado, o en que el capital de mercado sigue siendo gran fuerza de control, no tienen mucho éxito los esfuerzos para controlar favorablemente los precios del pescado y para mantener la frescura de las pescas.

El distrito de Kariya del pueblo de Higashiura de la isla de Awaji es tradicionalmente una sociedad pesquera que ha existido desde el período de Edo (siglos XVI a XIX), y hasta hace poco se usaba el método de acuerdo de precios por un sistema diferente al de subasta. A continuación expondremos los experimentos hechos por un grupo de jóvenes investigadores dentro de la cooperativa local de pesca a fin de modernizar las ventas.

**Innovation dans le domaine des ventes avec l'introduction du système d'enchères**

Dans les villages de pêcheurs, le problème principal est de perfectionner le système de vente des prises de poissons et le système de transport du poisson vers les grandes villes, en coopérant surtout avec les associations coopératives de pêches.

Cependant, dans les régions productrices avec un marché local non encore rationalisé, ou lorsque le capital exerce une pression importante, les efforts visant à régulariser les prix du poisson et à conserver la fraîcheur des prises n'aboutissent pas autant qu'il se devrait.

La commune de Kariya du canton Higashiura dans l'île Awaji est un village communautaire de pêche traditionnel dont l'histoire remonte à la période Edo (17ème — 19ème siècles), et jusqu'à l'époque toute récente, on y adoptait la méthode d'accord de prix sans mise aux enchères. Voici l'expérience d'un groupe de recherche composés de jeunes dans le cadre d'une coopérative locale de pêches en vue de moderniser leur système de vente.



## Landings



1. The fishing boats which leave the port early in the morning at 5.00 - 6.00 a.m. return to the port one after another from 1.00 p.m. to 4.00 p.m., at which time the bidding is carried out at the fish market and the catches are individually put on auction. The market is run by the fisheries cooperative, and middlemen/merchants participate in the auction.

### Desembarco

Los botes de pesca que dejan el puerto temprano por la mañana entre 5 y 6, regresan al puerto uno tras otro de 1 a 4 de la mañana, para llegar a tiempo a la hora en que se efectúa la subasta en el mercado de pescado. El mercado es dirigido y administrado por la cooperativa de pesca, y en la subasta participan mercaderes e intermediarios o corredores.

### Arrivée au port

Les bateaux de pêche quittant le port très tôt le matin entre 5 h. et 6 h. reviennent au port l'un après l'autre entre 1 h. et 4 h. de l'après-midi, et à ce moment a lieu la mise aux enchères au marché du poisson et les prises sont mises séparément en vente. Le marché est dirigé par la coopérative de pêche, et des intermédiaires et vendeurs à la criée y participent.



4. Middlemen sort the fish according to type and size and pack them inside a heat resistant styro-foam case with ice packed inside as well.



2. Middlemen store the fish which they have purchased by auction in different water tanks according to the fish type.



3. Medium to prime fishes are kept alive just before bidding. Fishermen temporarily keep some catches which are put into baskets inside the live well owned by the fisheries cooperative, and after several days when an appropriate amount of catch are collected, they are put on auction.



5. A cold-storage truck departs in the evening to be able to arrive in time on the following morning for auction at markets in big cities.

## Processing by fishing household

With net fisheries, especially trawl, a large amount of small miscellaneous fishes which cannot be put on market are caught. In order to be salable commodities, they are processed into delicacy items by means of seasoning and sun-drying, and are sold directly to middlemen. Although the production per fishing household is small, when all the produce of the single district is gathered, the volume can compete with that manufactured by small-scale factories, and furthermore a stable supply system is being created.

### Proceso de industria casera

Por la pesca de red, especialmente la que se hace a la rastra, se coge gran número de pescados pequeños misceláneos que no pueden llevarse al mercado. A fin de convertirlos en artículos vendibles, se han de procesar y darles exquisitez sazonándolos y secándolos al sol; después se venden directamente a los corredores. Aunque la producción por familia pescadora es pequeña, reunido todo el producto de un distrito se obtiene un volumen que puede competir con el manufacturado por las fábricas de producción masiva, y formar un sistema estable de suministro.

### Traitement local des produits de pêche

Avec les pêches au filet, en particulier au chalut, une grande quantité de petits poissons divers qui ne peuvent être mis sur le marché doivent être traités autrement pour les liquider. En les assaisonnant ou en les séchant naturellement au soleil, on trouve alors des intermédiaires qui les achètent. Quoique la production individuelle de chaque foyer de pêcheur est faible, quand on accumule la production de toute une communauté de pêche, le volume global devient considérable et est comparable en importance avec la production de petites entreprises de traitement de poisson, en outre une telle production constitue alors un réseau stable d'approvisionnement.

