When the promoters receive the notice of authorization, they register the cooperative without delay. Through this procedure, the fisheries cooperative is formally established.

(3) Investment capital

Self-financing is required for the fisheries cooperative to perform various economic business activities. In addition, the fisheries cooperative must have a certain basic amount of fundamental property to be able to gain the trust of society. Since the fund must be raised by the investment of the cooperative members, all the cooperative members have an obligation to pay one or more units of investment capital. One unit of investment capital must be set equally and its amount should be one that those who have the qualifications for cooperative membership can shoulder, because a high amount for the unit of investment capital restricts affiliation with the cooperative.

Although the minimum payment of the investment capital is one unit, two or more units of the investment capital can be made according to the economic power of the individual. As for the voting rights in general meetings, which is a fundamental right as a cooperative member, one person has one vote even though some of them may pay more than one unit of the investment capital. However, the distribution of profits to the cooperative members is made according to the number of units they have invested.

II. Examples of Businesses of the Fishermen's Organizations

1. Thrift and Credit Business

(1) Savings

The fisheries cooperative accepts savings to raise the profits of cooperative members and the credit of the cooperative. There are two types of savings: One is the demand deposit (current deposit, ordinary deposit) and the other is the maturity designated deposit (time deposit).

Since the income of fishermen generally fluctuates greatly and is unstable and their lives are irregular, they are apt to have a less than enthusiastic interest in savings. Therefore, the fisheries cooperative must encourage the cooperative members about savings and hold savings movements.

Most of the Japanese fisheries cooperatives engage in the sales business and function effectively in collecting savings from the cooperative members. The fisheries cooperative collects the fish caught by the cooperative's members and sells them. Payment is not made in cash directly to the cooperative members, it is transferred to the saving accounts of each cooperative member. The cooperative counsels the cooperative members so that they do not withdraw excess money from their savings accounts and so that they save a certain amount of money out of the amount transferred into their saving accounts as time deposits. In addition, a women's section is organized in the fisheries coopertive by the fishermen's wives. This women's section greatly contributes to movements to encourage saving of money and increases in savings.

Most of the savings of the cooperative members are deposited in an upper-level institution, the Prefectural Credit Federation of Fisheries Cooperative Associations.

(2) Loans

The fisheries cooperative also makes a loans for the cooperative members' businesses and personal lives.

As for funds needed by a cooperative member for the construction of a new fishing boat, introducing modern equipment or building a new house, government promotional subsidies and the Agriculture Forestry and Fishery Finance fund are offered to fisheries cooperatives through the Prefectural Credit Federation of Fisheries Cooperative Associations and are loaned to the cooperative members.

Upon loaning of money to a cooperative member, it is important to investigate the business details of the cooperative member and judge the necessity for the loan and whether or not the amount to be loaned is appropriate.

In addition, careful attention must be paid so that money is not only loaned to certain cooperative members and so that loans are made fairly. Furthermore, the fisheries cooperative must consider balancing the amounts saved and loaned. If the amount loaned greatly exceeds the amount saved, loan restrictions must be considered.

Collection of loan payments must be performed reliably. To do that, one effective method is to deduct a certain amount of money from the payment when the price from the sales business is paid to the cooperative members.

2. Purchasing Business

The purpose of a cooperative's purchasing business is to purchase all the fishing materials and daily necessities of cooperative members at one time and to offer good quality items at a low price.

The fishing materials include expendable supplies, such as petroleum, fishing nets, fishing gear, equipment, and packing materials. Among these, petroleum is the most important item handled. The National Federation of Fisheries Cooperative Associations buys petroleum directly from the oil producing countries and offers it to the Prefectural Federation of Fisheries Cooperative Associations. It is then offered to the fisheries cooperative in each area.

The fisheries cooperative stores petroleum in tanks installed in the wharf at the fishing port and develops a system which can respond to the demand of cooperative members at any time.

As for the purchasing business for daily necessities, cases in which a supermarket is opened have been increasing recently. Since the payments of cooperative members are generally made with the buy-on-credit system, the fisheries cooperative must make an effort so that no accounts receivable remain, similar to what is done with the collection of loan payments.

3. Sales Activities

(1) Objectives and Roles

The primary objective of a cooperative's sales activities is to prevent unfair purchases at prices beaten down by commercial capital by collecting fish caught by cooperative members and performing joint sales, and to realize prices which make the reproduction of fishery possible. The secondary objective is to contribute to the stability of people's eating habits by offering fishery products to consuming areas in a stable manner.

(2) Sales to the wholesale market in producing areas

The fisheries cooperative opens a wholesale market and sells caught fish that is consigned for sale by cooperative members in the market as a wholesaler. The buyers who come to the wholesale market are the shipment dealers who transport and sell fishery products to consuming areas in distant places, processors who purchase them as processing materials, and retailers who sell them to the people of the district and the surrounding area. The fish sold in the market are perishable seafood and live fish. They are sold by auction or by closed bid.

The fisheries cooperative collects a 4 or 5 percent sales commission from cooperative members. The sales in the market are performed for a certain period of time every day while fish are being landed by cooperative members.

In districts where the landing quantity of fish is low and buyers are few, the fisheries cooperative transports the caught fish to an adjacent large-scale wholesale market of a fisheries cooperative and sells them there.

(3) Collection and sales in places other than the wholesale market

Since the delivery period of products that are processed by fishermen, such as dried laver, sea tangle and dried sardines is constant, they are collected at the fisheries cooperative and then collected at a joint market center of the Prefectural Federation of Fisheries Cooperative Associations. Those products are sold to wholesale dealers by closed bid.

(4) Freezing, processing and sales

The fisheries cooperative establishes a freezing and processing plant, purchases fish caught by cooperative members at reasonable prices, freezes or processes them and sells them.

(5) Direct sales in consuming areas and tie-ups with other cooperatives

This is a cooperative's direct sales system for sales in comsuming areas of perishable fish, live fish and products that are collected from cooperative members, and of frozen and processed products produced by the cooperative. In this case, tie ups with consumers' cooperatives and farmers' cooperatives to obtain secure markets are encouraged as the most effective sales method.

4. Fishery and Fishing Ground Management

(1) Maintenance of the fishing ground environment

Recently, the environment of fishing grounds is being damaged by the reclamation of seashores and the outflow of liquid wastes from factories and from city waste water and sewage. Therefore, the investigation and monitoring of the environment has become an important role of the fisheries cooperative to prevent further worsening of the environment. Also, fishermen must themselves call their own attentions to this issue so as not to throw old fishing nets and fishing gear away into the sea and to encourage collection of wastes materials.

In the case of the culture industry, even though drugs are often used to promote growth, it is also necessary to direct cooperative members not to give more than the specified dose of drugs, or, to use drugs as little as possible .

In shore fishery, fish forest reserves have historically played an important role in maintaining the fishing ground environment. Therefore, it is important to make efforts so as not to excessively cut down forest trees on the seashore and to maintain forests by planting trees.

(2) Propagation and preservation of resources

Stocking waters with fry and preserving their growth for the propagation of aquatic resources are important businesses for fisheries cooperatives.

These projects involve cultivating finfish, shellfish and crustacean fry in large numbers, stocking them at appropriate points, administering measures to protect them while they grow naturally, and then harvesting them as adults. In Japan, the government has established 12 National Fishery Resource Restoration Centers, and all coastal prefectures now have their

own Prefectural Fishery Resource Restoration Center. Research at these facilities includes techniques for mass production of fry for valuable species such as prawns, seabream (mainly silver seabream), salmon, trout and crabs. Fisheries Cooperatives purchase the fry inexpensively from these centers. Afterwards they either stock the sea with them immediately, or continue raising them in net enclosures for later stocking. Fishermen then establish regulations which protect the newly stocked fry until they reach harvestable size.

(3) Effective utilization of resources

It is important to manage fishery so that excessive competition and overfishing of resources by illegal fishing methods do not occur. The fisheries cooperative must perform effective measures with the cooperation of cooperative members so that an appropriate degree of fishing effort is made at all times. For this, regulations on the exercise of fishery rights are created voluntarily by the general will of the cooperative members. In these, fishing grounds, the fishing season, the number of fishing days and hours, fishing gear, fishing methods, and size limitations on the fish catch are specified by type of fishery.

Furthermore, some fisheries cooperatives perform control activities other than those in these regulations, such as group operations by operators of the same type of fishery, use of a pool system (equal distribution of fish catch), use of a five-day work week, total catch control, and individual fishing quota systems.

(4) Planning of Proper Fisheries Economic Management by Area

The planning of proper fisheries economic management by area is being developed in order to increase fishery operators' income by preserving the fishing ground environment, propagating and preserving resources, and effectively utilizing of resources in a

comprehensive manner and further, by adding value to products and selling them at profitable prices.

This process is performed within about five years by each fisheries cooperative. The procedure used is as follows.

(1) Analyzing the current situation of the fisheries economic management in the area

A. Understanding the current income level by arranging a basic ledger for fisheries economic management
B. Cataloguing the problems of local fishery by investigating the views of fisheries managers

(2) Setting a target income

Set the target income at a level in which fishermen in the area can live a stable life.

(3) Planning for the improvement of proper fisheries economic management (individual business plans to make current incomes reach the target income)

Annually position businesses efforts, such as preservation of the fishing ground environment, propagation and preservation of resources, effective utilization of resources, improvements in the processing techniques for the fish catch, and expansion of sales activities, according to necessity.

5. Other Businesses

(1) Common Facility Service Business

Fisheries cooperatives establish facilities, such as slipways, repairing docks, warehouses for fishing gear, cold storage, ice making plants, and water supply places, for cooperative members.

(2) Fishery

This means that the fisheries cooperative does business on its own account. This system is used by large-scale fisheries in cases in which it is considered to be inappropriate for individual cooperative members to run their own fishery businesses or by fisheries that have exclusive use of fishing grounds.

In Japan, there are many self-managed cooperatives in the large-sized set net fishery business. The people who are engaged in this kind of fishery are cooperative members in principle and proper wages are guaranteed for these people. When a profit is made by a self-managed fishery, part of the profit is accumulated and the rest is allotted to the cooperative members.

(3) Mutual Insurance

There are three insurance systems for fishermen, which insure their fisheries management businesses or their lives. Two of these are in the field of fisheries management; one is Fisheries Insurance under the Fisheries Accident Compensation Law, and the other is Fishing Vessel Insurance under the Fishing Vessel Damage Compensation Law. The third system, which insures the lives of fishermen, is the Fisheries Cooperative Mutual Insurance System under the Fisheries Cooperative Association Law.

Fisheries Insurance and Fishing Vessel Insurance are insurance schemes based on the government's initiative to cover economic

security, and are implemented under government subsidies in a bid to promote the stability of fishermen's management.

Meanwhile, the Fisheries Cooperatives Mutual Insurance System is operated as one of the fisheries cooperatives' own businesses, like the marketing and credit businesses, and is considered to be "cooperative insurance" internationally.

- Fisheries Cooperatives Mutual Insurance System -
Types of schemes

(1) Ordinary Welfare Insurance
(2) Crew Welfare Insurance
(3) Fire Insurance
(4) General Home Insurance
(5) Fishermen's Old-Age Welfare Insurance
(6) Organization Credit Insurance
(7) Automobile Insurance

(4) Educational Activities

Study meetings are often held to improve the fishery techniques of cooperative members and their management efficiency.

Lectures sponsored by the Prefectural Federation of Fisheries Cooperative Associations are given several times a year to cooperative officials on the basic knowledge needed for the management of a cooperative.

Study activities by the young men's section play an especially important role for the development of new fishery techniques and the improvement of fishery methods.

In addition, activities by women's sections to improve the fishermen's lives are also being actively developed. In particular, the development of a movement to prohibit the use of synthetics that contaminate the sea has recently attracted attention.

III. Operation and Management of Fishermen's Organizations

1. Basic Ideas

First, the most important thing for the operation of a fisheries cooperative is to attempt to base operations on democratic principles. Cooperative activities must be done for all the cooperative's members so that they can get equal benefits, not for only a part of the members. Therefore, sufficient consideration must be given in order for cooperative members to be able to have daily opportunities to gather and discuss problems democratically. A new business run by the cooperative must be started after consulting and having sufficient discussions with cooperative members.

Second, the cooperative's businesses must be performed in order to improve the management of individual cooperative members and their lives. For example, in the purchasing business, efforts should be made to determine how to purchase good quality goods at low prices, not to just purchase them without any aim. Also, in the sales business, efforts should be made to determine how to sell fish at profitable prices, not only to collect the cooperative members' fish catch and deliver it to merchants to sell it by auction and closed bid. For that, cooperative businesses, such as production of processed foods and direct sales to consuming areas must be further expanded.

Third, even though it is said that the cooperative exists to give services to cooperative members, since cooperatives are organized to perform economic actions, the profits of the cooperative itself cannot be ignored. Careful attention must be given to the operation of the cooperative so that it is not operated in the red. If possible, the cooperative's businesses should be in the black, and it is desirable for any profits to be returned to cooperative members.

2. General Meeting

The general meeting of the fisheries cooperative is the highest decision-making institution of the cooperative. There is the ordinary general meeting held regularly once every business year and the extraordinary general meeting held when a problem occurs.

A business report and a financial statement must be submitted during the ordinary general meeting and these must be approved by the cooperative members.

The required quorum for the general meeting is the attendance of half or more of all the regular cooperative members. Decisions on items covered in the general meeting are made by votes of half or more of those in attendance. However, changes in the article(s) of the cooperative, dissolution or merger of the cooperative, removing a member(s) from the cooperative list, and establishment, change or abolition of regulations on the exercise of fishery rights require the votes of two-thirds or more of the people present in the general meeting, because these are matters for special resolutions.

3. Officials

(1) Directors

The directors represent the fisheries cooperative externally and execute business affairs internally as a necessary institution that must be placed within the cooperative. The number of directors in one cooperative is five or more. The representative director (head of the cooperative) is selected through deliberation by the directors.

As a rule, directors are selected through election by the regular cooperative members. When there is an exceptional case, they can be elected at the general meeting. The election of directors is performed by a secret vote with one vote for one regular cooperative member. The term of a director is to fall within three years.

(2) Auditors

The auditors audit the condition of the properties of the fisheries cooperative and the condition of the execution of its business affairs by the directors and are an institution that must be placed within the cooperative. This is a standing institution that requires two or more auditors per cooperative. The selection method and the term of the auditors are the same as those for the directors.

(3) Secretary and chief accountant

The secretary and chief accountant assist the directors and execute the business affairs of the cooperative. This is a voluntary institution. Their positions are office staff positions, but are different from those of general office staff, and have an important legal meaning. In particular, the secretary has the right to represent the cooperative concerning

the business affairs of the cooperative and has a position which corresponds to that of a manager as defined in commercial law. The selection and dismissal of the secretary and the chief accountant are determined by a majority of the directors.

4. Internal Organizations

(1) Fishery rights control committee

This is a voluntary institution that supervises the fishery rights possessed by the fisheries cooperative to see whether or not they are exercised properly according to the regulations, and deliberates on disputes which arise between fishermen. This committee also has an important role in making a suggestions about the revision of the regulations to exercise fishery rights. The members of the committee are generally selected by recommendation of the cooperative members and are commissioned by the directors.

(2) Subcommittee by type of fishery

This kind of subcommittee is composed of cooperative members who are engaged in the same type of fishery as the fisheries cooperative and discusses problems related to that kind of fishery. It has an especially important role in performing measures for the effective use of resources and in making decisions for the planning of proper fisheries economic management.

(3) Subcommittee by village

When the scale of a fisheries cooperative is considerably large and the members of the fisheries cooperative live over a wide area, the members of each village gather and discuss subjects such as matters decided upon by the officials.

(4) Young men's section

This is organized by people aged between 30 and 40 years who are engaged in the fishery, and the families of members of the

fisheries cooperative. The activities of the young men's section are to develop new fishery techniques, to improve fishery methods and to create a new proper fisheries economic management. Together, the young men's sections form regional federations and the national federation.

(5) Women's section

This is organized by women and young women related to the members of the fisheries cooperative. The women's section performs activities to protect the fishing ground environment and to develop savings movements, activities which have achieved good results. Recently, they have spearheaded activities for the development of new processed foods from fish catch and the propagation of fish eating to consumers. The women's sections form regional federations and a national federation in a similar way as do the young men's section.

5. Staff Members

Fisheries cooperatives must secure an appropriate numbers of staff members in accordance with the scale of each fisheries cooperative to promote their business activities smoothly. Each fisheries cooperative must hire staff members who have knowledge of the cooperative's activities and must hold study meetings after they are hired so that the staff members can deepen their understanding of the cooperative's activities and improve their level of capability.

Recently, even though good employees who have received a higher education and good engineers have been hired as staff by fisheries cooperatives, it is said that they are not given very good treatment compared to the staff in other industries. Fisheries cooperatives must make an effort to improve labor conditions.

Outline of Fishing Net Construction

by : Ritsuo Morimitsu,
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1. Basic Condition for the Design of Fishing Net

(1) Determination of target fish species
(2) Determination of fishing ground
(3) Basic fishing operation how to catch target fish species
(4) Determination of fishing gear and its operation suitable for the characters of target fish species
(5) Consideration & determination of currents, waves, etc. as external forces, affecting fishing net
(6) Determination of the design and physical strength of fishing net
(7) Examination of workability during the fishing operation
(8) Durability of fishing net
(9) Selection of low-priced fishing gear materials
(10) Utilization of fishing gear materials, which are available locally

2. Characteristics of Fish Behavior and Reaction for Fishing Net

(1) In general, fish school change their swimming direction along with the fishing net horizontally and/or vertically, when they encounter the fishing net.
(2) Fish school is sensitive to light, sound, shape, motion and smell.

(3) In the case of shallow coastal sea, fish school takes evasional action to swim into deeper water, in case of danger.
Some fish species hide himself into the fish reef or burrow.
(4) Fish school swim to a certain direction headed by the leader fish.

3. Valuable Information & Methods for the Performance of Fishing

a) Methods to find out fish school

(1) Direct methods to find out fish school by

- ° change of sea surface
- ° behabior of seabirds
- ° floating or drifting timers and other materials
- ° fish finder and other detecting devices
- ° trial fishing operation

(2) Indirect methods to find out fish school by

- ° estimation of fishing ground from the view point of environmental and ecological condition of the target fish species
- ° estimation by the experience, season and actual results in the past
- ° estimation by sea condition or by information of other fishermen

b) Fish gathering methods

(1) to gather fish by utilizing fish behavior and characters of the target fish naturally
(2) to gather fish by threatening
(3) to gather fish by light, bite and sound
(4) to guide fish school into a certain place by interfering fishway

c) Fishing methods

(1) Fishing net ..... Gill net, Trawl net, Purse seine, Trap net, Lift net, Scoop net, Casting net

(2) Angling fishing ... Long line, Vertical long line, Trolling line, Hand line, Pole and line

(3) Others ..... Spearing , Clip and twisters,

4. Fabrication of Fishing Nets

In designing and fabricating fishing nets, it is important to prepare necessary nettings, ropes, floats and sinkers and, to think about their arrangement, shapes and quantities comprehensively.

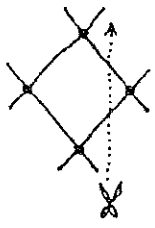
Especially, the knowledge and skill of netting handlings such as cutting, sizing and making a special shape of each part are indispensable.

(1) Knot Tightening

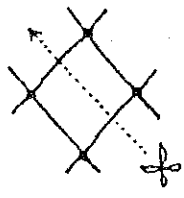
The knot tightening is done by stretching a piece of netting to horizontal and vertical directions. Uniformity of meshes in size is also checked in this process. Today, however, this work is carried out in the net making factory.

(2) Point and Bar Cutting

When cutting a piece of netting horizontally or vertically, cutting two legs from a knot should be repeated. This cutting is called Point(P) cut. Cutting one leg from a knot is called Bar(b) cut.



Point Cutting



Bar Cutting

(3) Lacing and Sizing

Lacing

When additional length or depth is needed for a piece of netting, another piece is jointed by making half meshes with the same twine as the netting twine. This is called as " lacing ".

Sizing

When the lacing is difficult due to the smallness of mesh size, or when two pieces of netting are not the same in mesh size or in length of selvage, they are jointed by sizing. For sizing, single twine of double thickness or double twine of the same thickness as netting twine is used.

(4) Edges of Netting

Horizontal edges of netting must be reinforced by making them double with the same twine as material of the netting. The vertical edges are also reinforced in the same way or by adding a row of half meshes.

(5) Selvage

When a float line and a sinker line are to be attached to netting, the horizontal edges of the netting should be further reinforced. For this purpose, the border nets are prepared and used between the main netting and the float line or sinker line.

The border net's twine is usually two to three times as thick as that of main net; its mesh size is a little bigger than that of main net; and its depth is five to ten meshes.
This border net is called selvage.

(6) Shortening

When netting is attached to lines or framing, it should be longer than the lines or framing so as to have a proper looseness. This excess length expressed as a percentage of stretched netting is call the hang-in.

$$\text{Hang-in (\%)} = \frac{\text{L(stretched length of netting) - (length of line)}}{\text{L(stretched length of netting)}}$$

The shape of mesh is greatly influenced by the hang-in ratio.

The following table shows the theoretical data on the height of meshes for different hang-in ratio.

Hang-in (%)	10	20	30	40	50	60	70	80	90
Height of mesh (%)	44	60	71	80	86	92	95	98	99

For example, when 40 percent hang-in applied to a netting, whose mesh size is 5 cm and depth is 100 meshes, the depth of netting after hand-in will be (5 cm x 100) x 80/100 = 400 cm or 4 meters.

$$\text{Length of Rope} = L \times \left(1 - \frac{\text{H.R.(\%)}}{100} \right)$$

$$\text{Length of Net} = 1 - \left(1 - \frac{\text{H.R.(\%)}}{100} \right)$$

$$\text{Depth of Net} = \frac{\text{stretched depth of netting}}{\text{(mesh size x No. of meshes)}} \times \frac{\text{height of mesh (\%)}}{100}$$

L ..... stretched length of netting
l ..... length of rope (float rope or sinker rope)
H.R. .... hang-in ratio

(7) Cutting

To cut a bar from a knot is called "b" and to cut two bars from a knot is called "P". In the case of cutting a slope of a section whose horizontal and vertical edges are same in number of meshes, the repetition of only "b" cut is adopted.

If two edges are not the same in number of meshes, the number of the "P" cuts equivalent to the difference must be added.

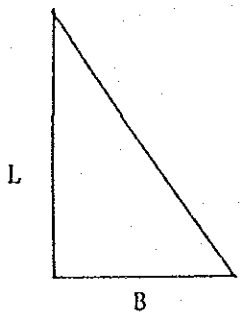
Besides the number of the "b" cuts needed to cut the slope is always double of the number of meshes of the shorter edge.

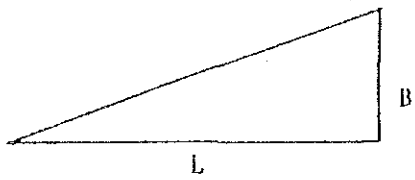
Thus, any required slope can be cut, or in other words, any triangular section can be tailored by distributing proper numbers of the "b" and "P" cuts in good balance.

If the above is expressed in formula,

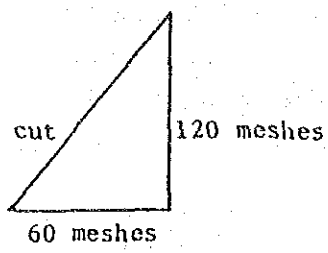
$$P = L - B \qquad b = B \times 2$$

P : necessary number of "P" cuts
b : necessary number of "b" cuts
L : number of meshed of longer edge
B : number of meshes of shorter edge





For example, if a triangular section as illustrated on the right is required,



Number of P cuts = 120 - 60 = 60

and

Number of b cuts = 60 x 2 = 120

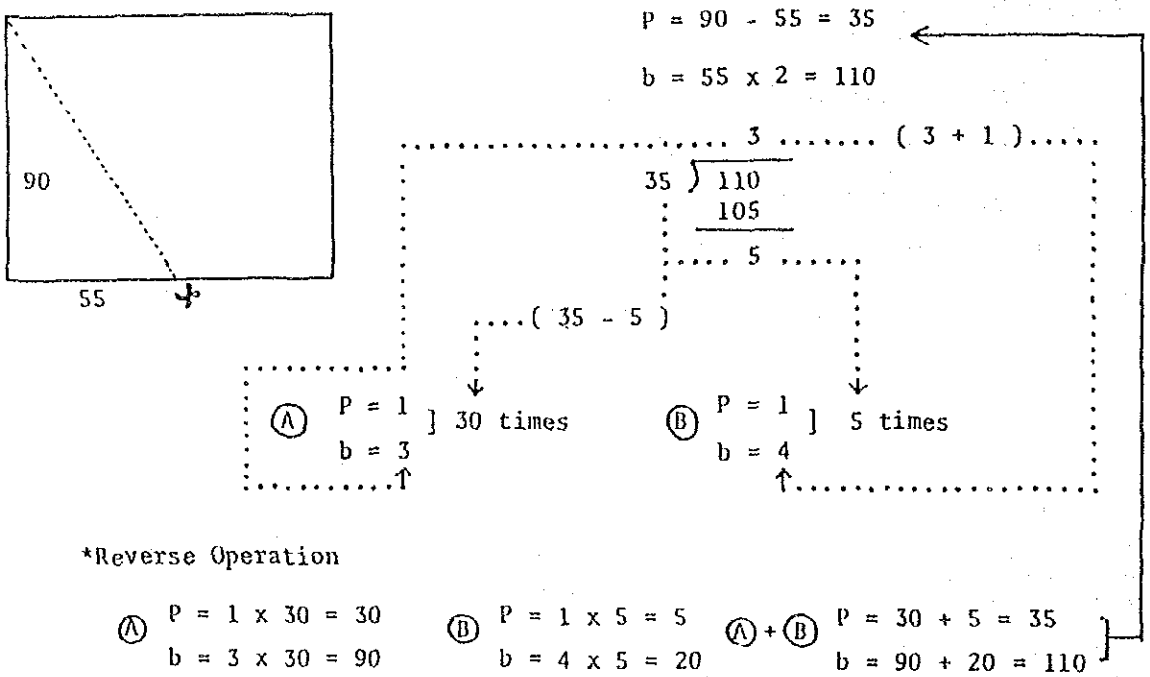
P : b = 60 : 120 = 1 : 2

So, 1 P 2 b cutting is needed.

Sixty times of repetition of (P b b), (P b b) ..... will make the required saction.

It is recommendable to adopt under mentioned formula,

Example - 1



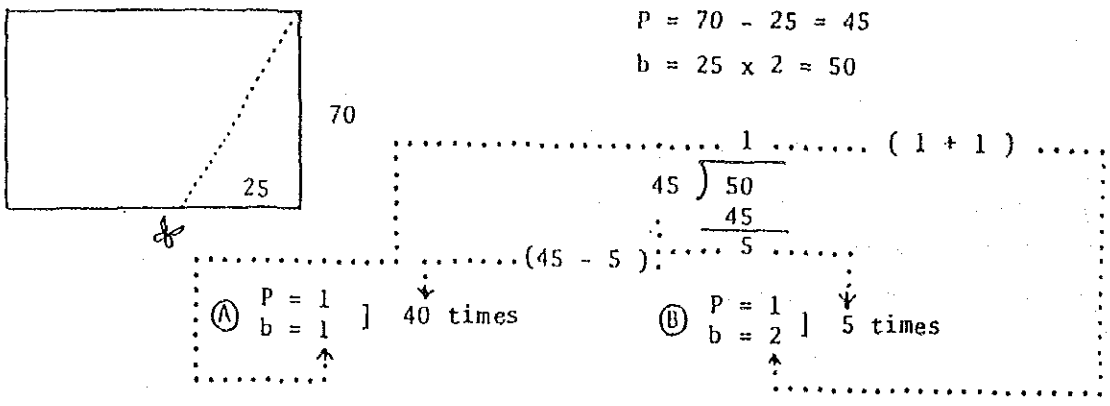
*Reverse Operation

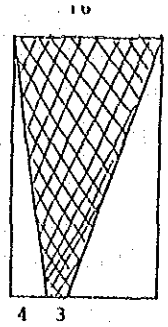
Ⓐ P = 1 x 30 = 30, b = 3 x 30 = 90

Ⓑ P = 1 x 5 = 5, b = 4 x 5 = 20

Ⓐ + Ⓑ P = 30 + 5 = 35, b = 90 + 20 = 110

Example - 2





P = 22 - 4 = 18

b = 4 x 2 = 8

P/b = 18/8 = 2 ...2(residual)

P = 2, b = 1 } ...6 times

P = 3, b = 1 } ...2 times

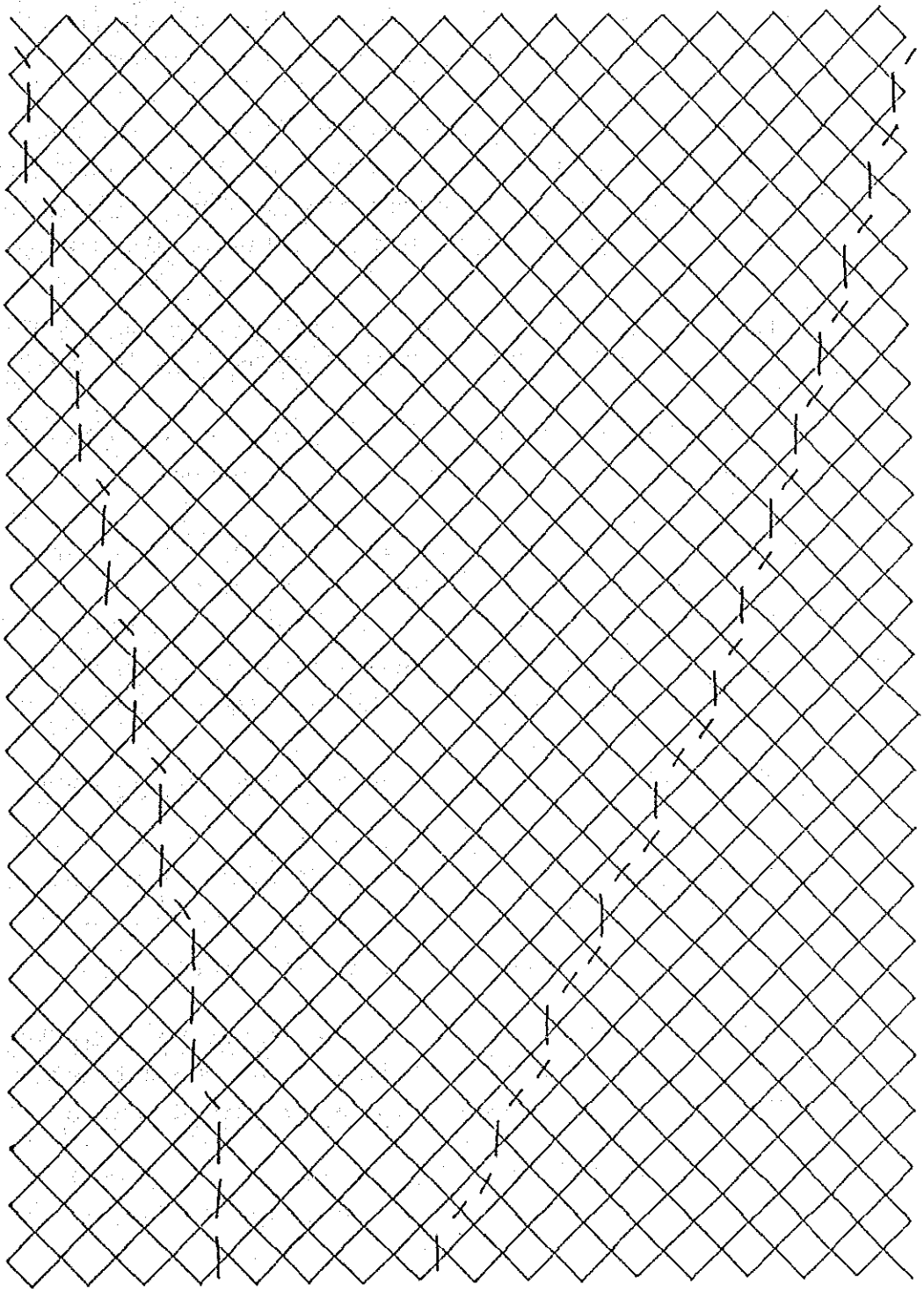
P = 22 - 9 = 13

b = 9 x 2 = 18

b/P = 18/13 = 1 ...5(residual)

P = 1, b = 1 } ...8 times

P = 1, b = 2 } ...5 times



5. Discussion on Gill-net

(1) Outline of gill-net fishery

Gill-nets are operated in a way that they are vertically set to block the fishway in the swimming layer of the target fish species.

Gill-net to gill the fish are mainly used to catch sardine, mackerel, horse mackerel, etc., body size of which is almost uniform.

However, the gill-nets to entangle the fish are mainly used to catch larger-size fish such as shark, spanish mackerel, etc. which strike the net with great momentum or the fish of irregular body shapes such as flatfish, crab, prawn, spiny lobster, etc.

The structure of a gill-net is very simple. It is a single wall of net which comprises several sheets of netting joined together.

It has floats for buoyancy as well as sinkers to enable it to expand vertically when submerged into the water.

Semi-trammel net or trammel net which are quite similar to bottom gill-net are also operated in the coastal waters.

The depth of the net is determined according to the density of fish schools and depth of the swimming layer of fishes to be caught.

Easy handling of the gear should also taken into account.

(2) Classification of gill-nets

a. Floating gill-nets (Fixed surface gill-nets)

The gear is operated to catch fish, which swim near the water surface. Either one end or both ends of the net is anchored to prevent the net from drifting away by the current or wind while in operation.

As the net is firmly fixed, the shape of the net is not deformed by the effects of current or wind. In Japan, floating gill-net are popularly operated to catch sardine, mackerel and flying fish.

b. Bottom gill-nets

Since the gear is set near the bottom of the sea with the aid of anchors, floats are submerged under the water. Thus, the sinking force of the net plus sinkers is to be larger than the buoyant force of total floats which is just enough to open the netting with a proper looseness in vertical direction.

There are various types of bottom gill-nets including trammel net to catch such species as flatfish, horse mackerel, cod, prawn, crab, mullet, etc.

c. Drift gill-nets (Drift surface, mid-water and bottom gill-nets)

Drift gill-nets are not fixed by the anchors but are allowed to drift at the mercy of the wind and/or current. They are by and large operated at the surface or mid-layer of the water.

Since the gear is not anchored, fishing places are considerably extensive. It is possible to set the net, chasing a school of fish. Bottom drift gill-nets are sometimes witnessed in coastal waters. Among them, spiny lobster drift-net is most popular.

d. Encircling gill-nets

When a school of fish is sighted, the net is cast into water in such a way that it will encircle the fish school.
Fishes are driven towards the net by beating the sides of boats with pieces of wood or disturbing the water by throwing stones.

The encircled fish will try to escape out of the net and become entangled as well as gilled. Other gill-nets are also set inside of the surround nets for gilling the fishes already surrounded by the net.

This gear is usually operated during the daytime. The fish species to be caughts by this gear are young yellow tail, yellow tail, mullet, etc.

(3) Essential Points in making Gill-nets

a. Single gill-net

This is the most popularly used gill-net with the hang-in ratio of 30-60%. This type is easily constructed and maintenance/ repair work is also easy. Hang-in ratio should be determined according to the size and shape of the target fish species as well as fishing ground to be set.

Thickness of twine and mesh size are also determined by the fishermen with their experience and contrivance. Total length of the gill-net will be shorter with the increasing hang-in ratio but such gill-net is still effective to entangle target fish and damage will be less in the case gill-net is entangled in the rocky sea bottom.

Bottom gill-net is roughly subdivided into two types, that is, (1) height of the gill-net is only one meter to gill crab and Japanese whitings(Sillago japonica) and (2) height of the gill-net is 5-6 meters to entangle bottom(demersal) fish species.

According to the target fish species, buoyant force is sometimes minimized so that such gill-net entangle target fish species when they attach the gill-net, even though original purpose of the gill-net is to gill the target fish species into the mesh.

In general, sinking force of the bottom gill-nets are almost double of the total buoyant force of the net itself, rope and floats in constructing the gill-net.

However, fishermen construct their gill-net with the changing proportion of sinking and buoyant force, according to the fishing ground, current and target fish species, with their experience and contrivance.

Bolch line is oftenly attached to the float line and sinker line but, sometimes, bolch line is entangled with floats or sinkers and this causes damage of the gill-net.

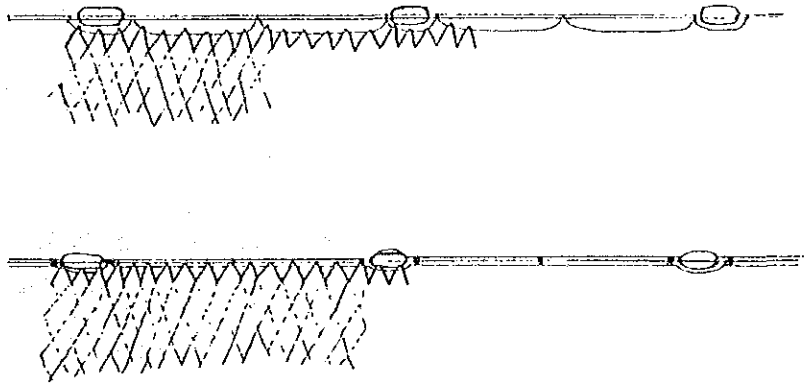
Such entanglement is mainly caused by the fact that fishermen cast many gill-nets in a short time in order to raise his fishing efficiency. And, therefore,if gill-nets are cast little by little, no such entanglement will be occurred but, in such case, working efficiency will be rather low.

In case no bolch line is attached to the sinker and float line, two ropes are used as sinker line and float line and sinkers and floats are attached to one rope and gill-net is attached the other rope and two ropes are connected with a certain intervals.

Such gill-nets has less trouble (entanglement of gill-net and floats/sinkers) so that working/fishing efficiency can be raised.

Such structure of gill-nets can be constructed easily with low-cost but, if you want to entangle target fish species, bolch line should be attached, which will be more effective to entangle target fish species.

Sinker line should be comperatively thick in diameter with rigid(hard) structure to minimize entanglement in the rocky sea bottom.



Nowadays, monofilament is oftenly used as netting material of gill-net but repair work is not easy and, also, easily broken when entangled with rocks, etc. in the sea bottom.

Monofilament has some shortcomings such as deterioration by sun light and short durability but low-priced and gill efficiency is superior to multifilament and monofilament has one more advantage, that is, due to less hydraulic resistance, total number of floats and sinkers can be reduced.

Multifilament netting should be employed as netting materials in the case of bottom gill-nets used in the rocky sea bottom, from the view point of less repair works.

b. Semi Trammel Gill-net

Semi trammel gill-net is not so popular in Japan.

Semi trammel is constructed by attaching outer net with larger mesh size (4-5 times larger than that of main net) to the main net.

Hang-in ratio of outer net (30%) is small than that of main net (40-50%) in the horizontal direction.

Construction method is different in each region but roughly classified into two types; (1)outer net is directly attached to the main net and (2)outer net is attached to the main net by lacing both end of outer and main net using mesh gauge.

Gill efficiency is good in the case fish strike on the gill-net from main net side.

Outer net should be shorter than the main net by 20-30% in vertical direction, after construction of the gear.

c. Trammel Gill-net

Main net is sandwiched by two outer nets in its structure and so, it takes more time in construction and repair works but hang-in is taken into outer nets both in vertical and horizontal direction and, by this structure, various sizes of fishes can be entangled by this trammel gill-net (a certain size of fishes can be gilled in the case of single gill-net).

In Japan, trammel net is used particularly for spiny lobster as well as bottom gill-nets for miscellaneous fish species.

Please refer the construction drawings/specification in page 16 - 20.

d. Required condition for netting materials, etc.

(1) Netting materials

- twine/monofilament must be fine with enough tensile strength
- has characteristics of elongation
- has enough transparency(invisibility) in the water
- has enough durability
- low-priced
- easy to procure
- mesh size should be suitable for the size of the target fish

(2) Length and breadth(height) of net

- length and breadth of net should be determined by the dimention(scale) of fish school, swimming water layer, density of fish school, etc.
- length should be determined by each fishing operation

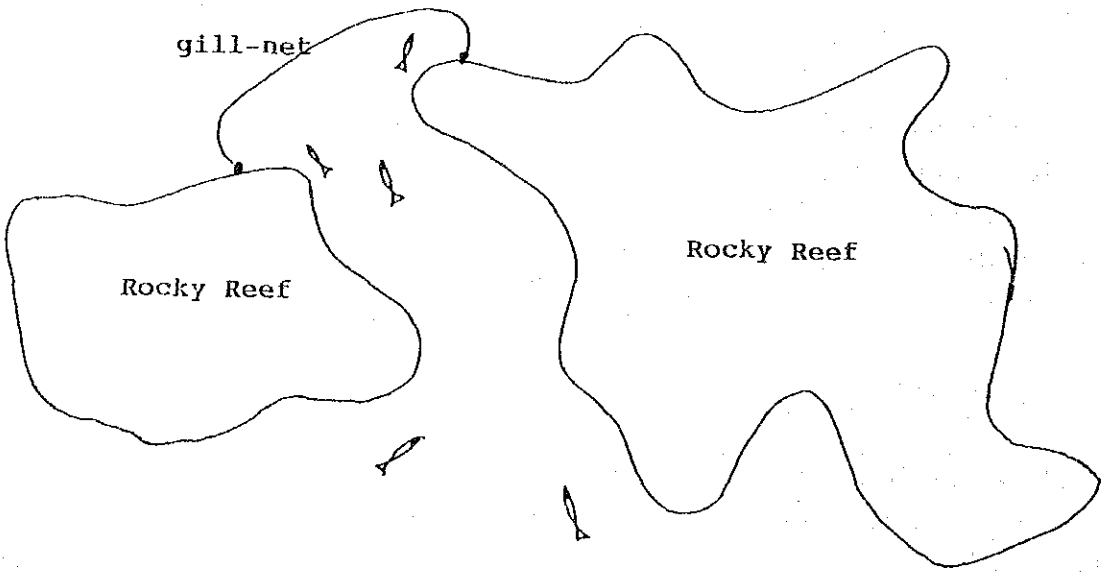
e. Fishing Ground

Suitable fishing ground for gill-nets are around the rocky reef, boundary between reefs and flat sandy bottom, flat sandy bottom between

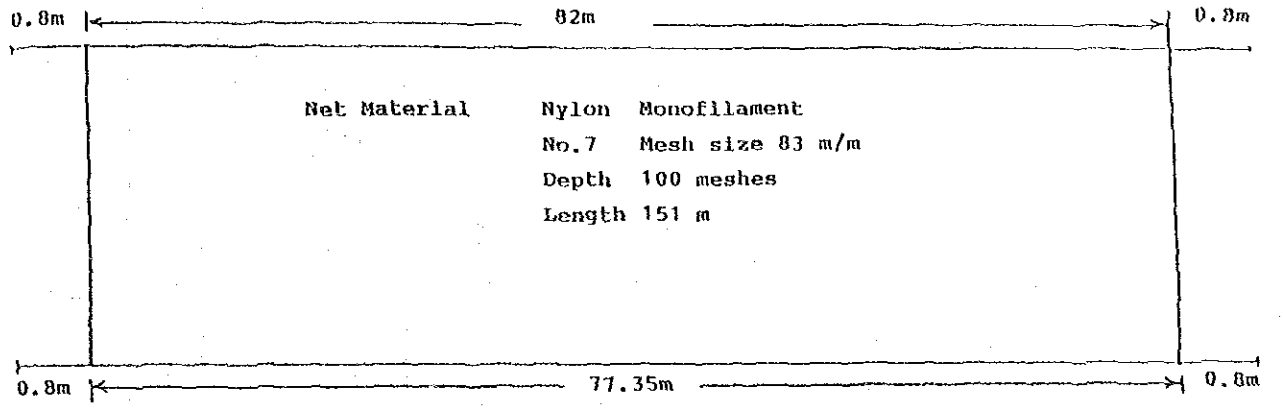
reefs, sea bottom where water depth is sharply inclined and fishways for feeding and spawning migration of fish school and so forth.

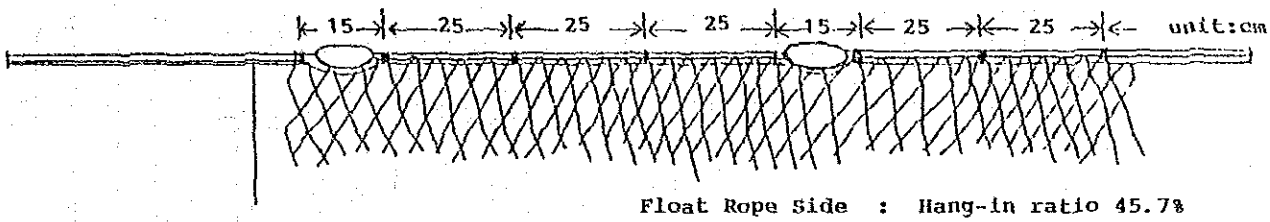
f. Fishing method by bottom gill-net

- ° In the evening, cast gill-net from the stern or side part of fishing boat
- ° In the case gill-net is fixed by anchors, casting order is (1) mark buoy---(2) rope (1.5-2.0 times of water depth)---(3) anchor---(4) rope---(5)gill-net---(6)rope---(7)anchor---(8) rope---(9) mark buoy
- ° Current should be taken into consideration when gill-net is set into the fishing ground
- ° In the next morning, haul the gill-net from side part of fishing boat
- ° In the case gill-net is entangled tothe rocky reef, fishing boat should be positioned on the current-ward side and, then, start hauling gill-net slowly.
- ° Fish school normally take evasional action from shallow sea to deeper sea
- ° Fish school, when they encounter gill-net and some of fishes are gilled, change their swimming direction in parallel with the gill-net and, therefore, both ends of gill-net are bent/ curved sometimes



Bottom Gill net (yellowtail)

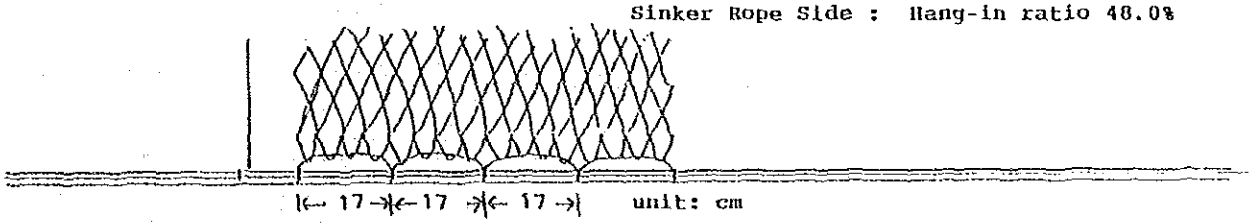




Float Rope Side : Hang-in ratio 45.7%

Depth after construction : 7m

Sinker Rope Side : Hang-in ratio 48.0%



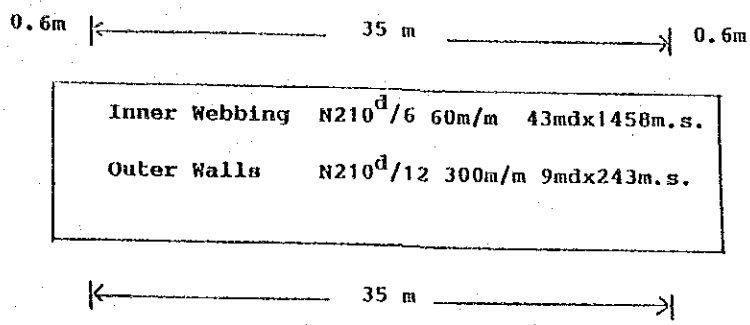
1) Net	Nylon Monofilament No.7	Mesh size 8.3 cm Length 151 m	
2) Float	Polyvinylchloride	Buoyancy 76.6 grams	92 pcs.
3) Float Rope	Polypropylene	83.6 m x 2	
4) Sinker Rope	Lead is twisted inside of the rope	78.95 m x 2	
5) Seizing Twine	Spun Tetron(polyester)	float side 30 yarn	200 grams
6) Bolch Line	Spun Tetron	sinker side 45 yarn	260 grams

SPECIFICATION (Calculation)

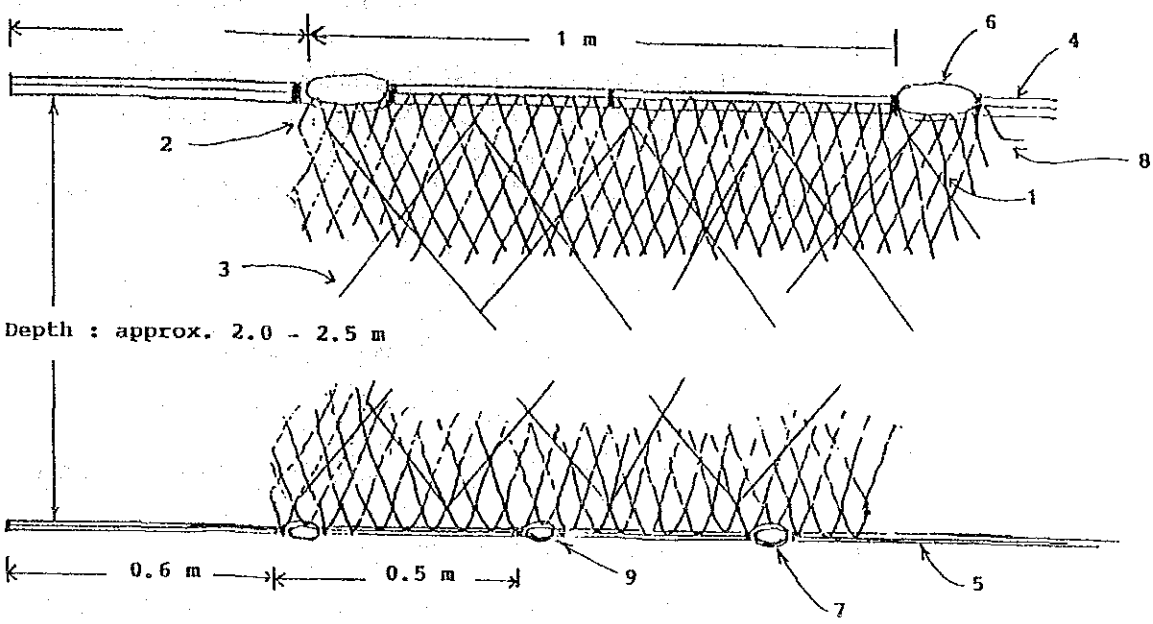
Type of Fishing Gear : Bottom gillnet (yellowtail)					
Net	Material	Nylon	Weight in air	6,680 g	Total Weight in water 950 g
	S.Gravity	1.14	Weight in water	820 g	
Seizing Twine	Material	Spun Tetron	Weight in air	460 g	
	S.Gravity	1.38	Weight in water	130 g	
Float	Material	Polyvinyl Chloride	Weight in air	30g(92pcs)	Total Buoyance 7,197 g
	S.Gravity	0.28	Buoyancy	76.6g(7047g)	
Float Rope	Material	Polypropylene	Weight in air	1,520 g	
	S.Gravity	0.91	Buoyancy	150 g	
Total buoyancy is 7.6 times against the total underwater weight of the material					
Sinker	Material	Lead	Weight in air	195g/m	total length of sinker rope 77.35 m
	S.Gravity	11.34	Sinking force	178g.m	Total Sinking Force 13,768 g
Total sinking force is 1.9 times of the total buoyancy					
Interval between floats : 90 cm			Interval of Bolch sinker rope : 17 cm		

S P E C I F I C A T I O N

Trammel Net



Construction

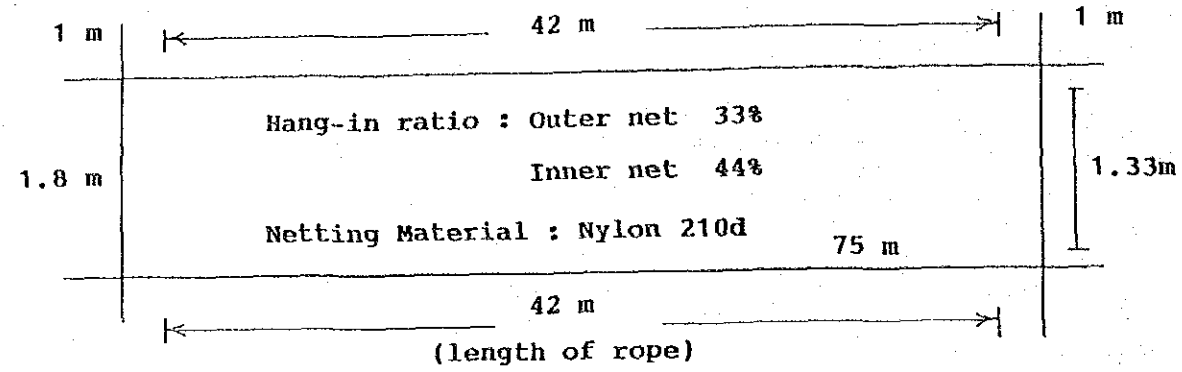


Specification

1. Net (Inner Webbing)	Nylon Multifilament	210d/6	50m/m	43md x 1458m.s.	1pc
2. " (Selvage)	"	"	210d/12	60m/m 1md x 1458m.s.	
3. " (Outer Walls)	"	"	210d/12	300m/m 9md x 243m.s.	2pc
4. Float Line Rope	Polytex	15 g/m	S and Z	1 pc each	
5. Lead Line Rope	"	"	"	" "	
6. Float	PVC 2T-5	1 pc/m	36 pcs	F = 2.2 kg	
7. Lead	75 g/pc	1 pc/0.5m	71 pcs	W = 5.3 kg	
8. Hanging Twine	Vinylon	20'/45			
9. Seaming Twine	"	20'/21			

S P E C I F I C A T I O N

Bottom Trammel Net



1) Net	a) Inner net... Nylon 210D 3 yarns Mesh size 6 cm 41 meshes in depth 75.12 m in length	
	b) Outer net... Nylon 210D 6 yarns Mesh size 30 cm 6 meshes in depth 62.7 m in length	
2) Float	Polyvinyl Chloride (PVC)	Buoyancy 23 g
3) Sinker	Lead	Sinking force 19 g
4) Float Rope	Polypropylene & Polyester	44 m (1m spare in both ends)
	2 ropes (4 mm) S & Z Type	
5) Sinker Rope	Polypropylene & Polyester	44 m (1m spare in both ends)
	2 ropes (4 mm) S & Z Type	
6) Seaming	Vinylon 210D 12 yarns	

Calculation

Net	Material	Nylon	Wt. in air	1890 g	
	S.Gravity	1.14	Wt. in water	230 g	Total Weight in water : 252 g
Rope	Material	P/P & Tetron 70% : 30%	Wt. in air	1600 g	
			Wt. in water	22 g	

Required total buoyance is 4.8 times of the total underwater weight

Float	Materials	Polyvinyl Chloride	Wt. in air	10 g
	S.Gravity	0.3	Buoyance 23 g x 53 pcs. = 1120 g	Total Buoyancy

Required total sinking force is 2.2 times of the total buoyance

Sinker	Material	Lead	Wt. in air	21 g
	S.Gravity	11.34	Sinking force 19 g x 141 pcs. = 2680g	Total Sinking F.

Interval between floats : 80 cm

Interval between sinkers : 30 cm

(1) Formula for computing sinking force in water

$$S = W \left(1 - \frac{1}{c} \right)$$

where, S : sinking force (weight in water)

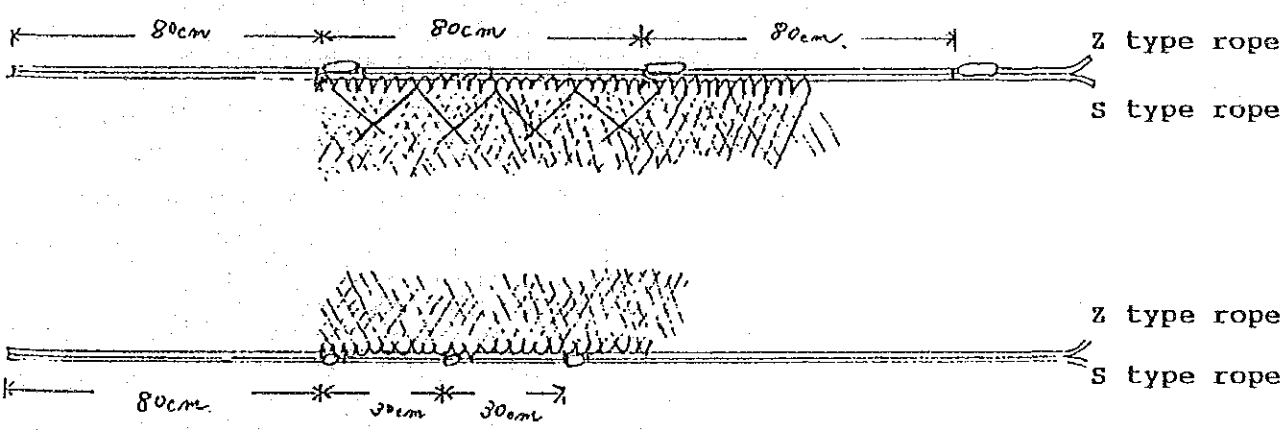
W : weight of material in air

c : specific gravity of the material

(2) Formula for computing buoyancy

$$F = W \left(\frac{1}{c} - 1 \right)$$

24 meshes for one interval



6. Discussion on Medium & Small Scale Set-net

(1) Outline of medium & small scale set-net fisheries

a) The procedure of this fishery is to fix the set-net on the shore for a certain period, intercept the fish school by leader net and finally lead them into bag net. This method is one of the ideal fisheries from the resources conservation standpoint.

b) Even though initial investment is larger, this can be depreciated by 20% annualy (x 5 years) and the annual maintenance cost is small. The applicable type of boat is launch equipped with outboard motor.

c) Since the catches are alive until the landing, they are very fresh, which command high price in the market. Also, those fish, which are not marketable, can be used as good baits for long line, basket and pot fisheries.

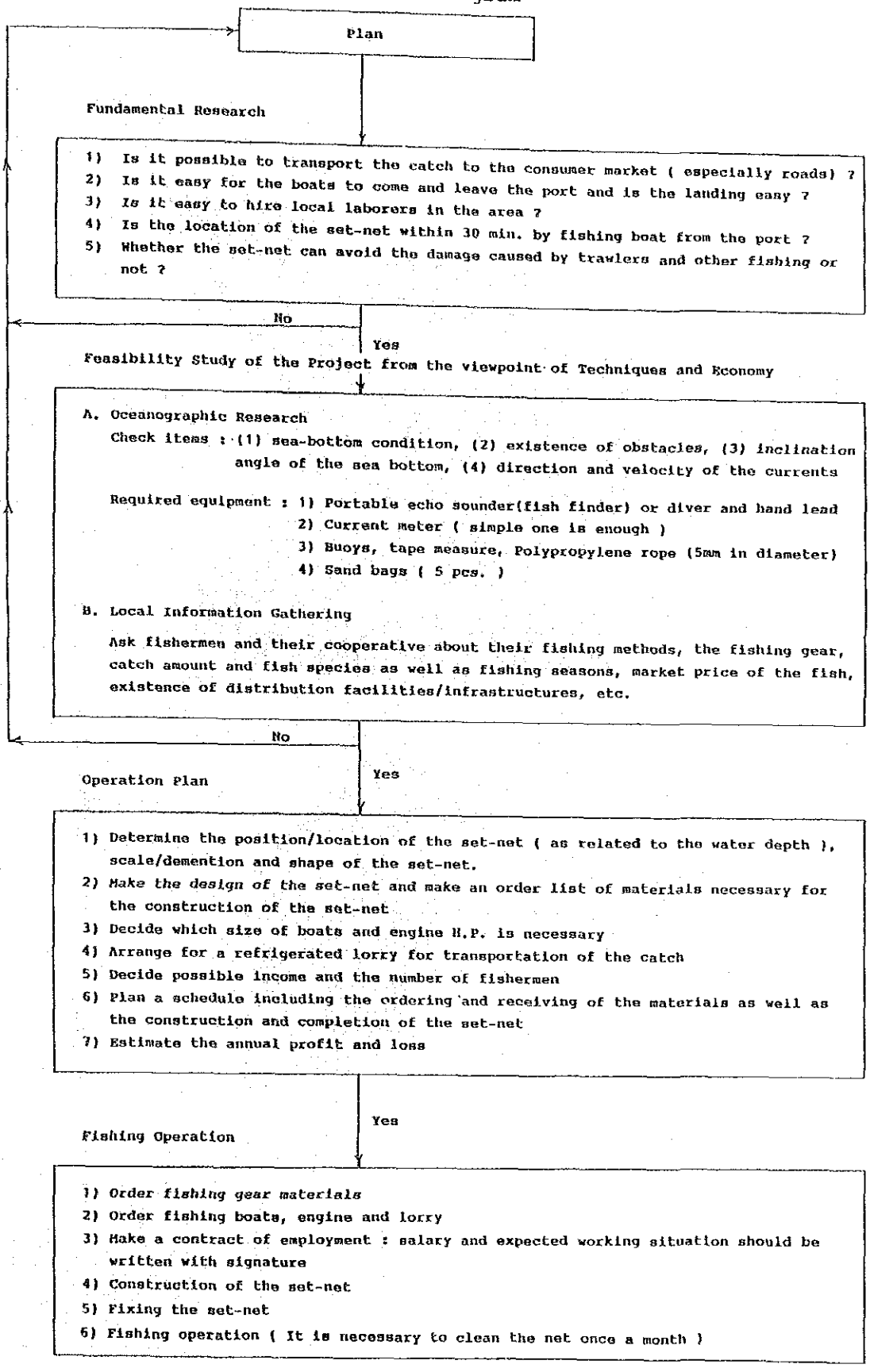
d) This method is effective when the operator is a local fisheries cooperative or community. The members of a cooperative or community will be engaged as fishermen. Thus it will contribute to the development of community.

e) The fishermen are engaged in the fishing operation for about 5 hours a day, and their spare time can be directed for other business/works.

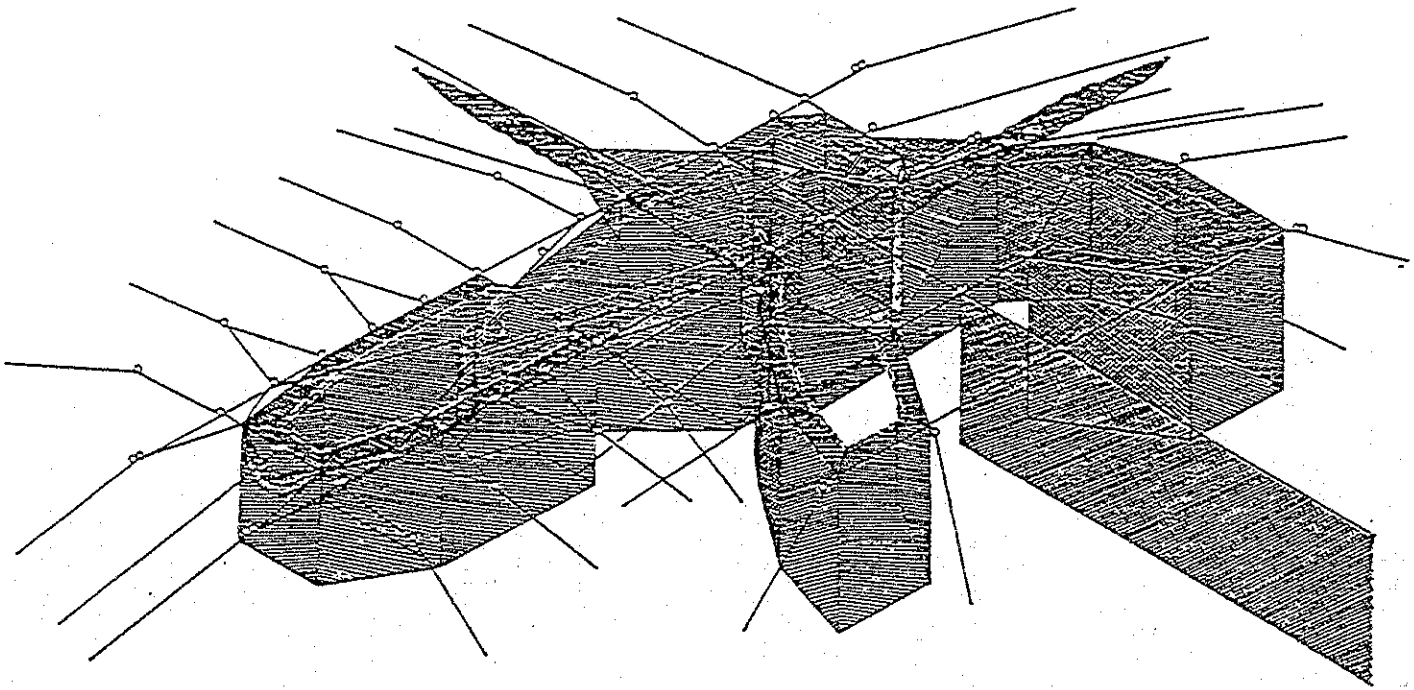
f) It is important to conduct thorough investigation and preparation in advance, since the set-net cannot be easily replaced.

g) Another important point is periodical maintenance work. In order to avoid current effects such as deformation of net shape and decline of catch efficiency, the bag net must be landed once a month for maintenance works such as washing and drying.

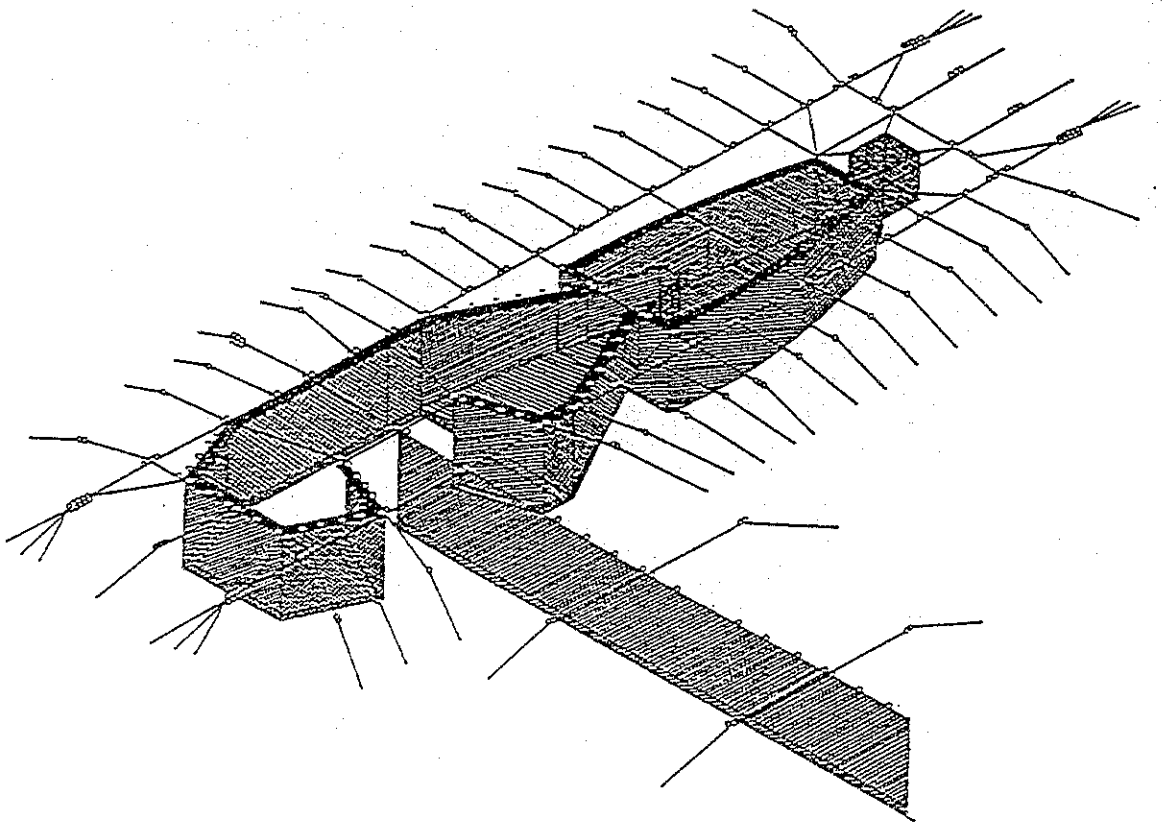
Flow Diagram



Medium & Small Scale Set-net (1)



Medium & Small Scale Set-net (2)



Medium & Small Scale Setnet (3)

(2) Good Fishing Ground to fix set-net

Fish school migrate to the fish reef, sea weed bed, river mouth and river as feeding grounds and/or spawning ground or, sometimes, fish school get around such places one after another, the route of which is commonly called as fishway.

Fish school which are trapped by the set-net are the latter one, getting around such places passing through the fishway as feeding migration or spawning migration.

Therefore, set-net should be so fixed(placed) as to cross fishway.

In other word, the fixing location of the set-net is not the place where fish school is migrating but the passage in the fishway and, therefore, most important point is to firmly seize the location of fishway for the target fish species, when you decide the location of fixing set-net.

a) Location of fixing set-net

In the case inclination of sea-bottom is rather steep (where isobathes are densely gathered), dispersed fish school get together and migrate densely in such place and so, such place is suitable for fixing set-net but, if inclination is too steep, fixing of set-net is almost impossible.

In the case sea-bottom material is sand or mud, damage of set-net will be minimized. Wave height and current velocity should be as small as possible (0.4 knots).

Embayment should be as large as possible in the circumference and, in the case embayment is comperatively small, Masu-ami type set-net is best fitted for such place.

b) Fishing operation

The size of set-net should be determined within the range of loading capacity of fishing boat but, of course, set-net can be separated into main part/components if necessary.

In the designing stage, the scale/dimention of set-net can be determined by the size/dimention of fishing boat and number of fishermen required for fishing operation.

In the case number of fishermen is limited to 1-3 personnel, Masu-ami type set-net, only the pocket of bag net should be hauled to take out the catch, is recommendable.

c) Funds (Funds supply and demand program)

Scale/dimention and type of set-net should be determined, after considering available amount of funds supplied. In the first, you had better choose small scale set-net with surplus funds in hand and, after confirming the amount of catch and marketability, you should employ larger scale set-net for sound management.

d) Market

Scale/dimention and type of set-net should be determined by the fish species caught and its consumption amount in the market
In case the market is rather small in size, you should adjust the amount of delivered catch to the market by using net cage or store pot.
If you have some fish species, which are cheap in price or not suitable as edible fish, such fish species should be utilized as live baits for long line, etc.

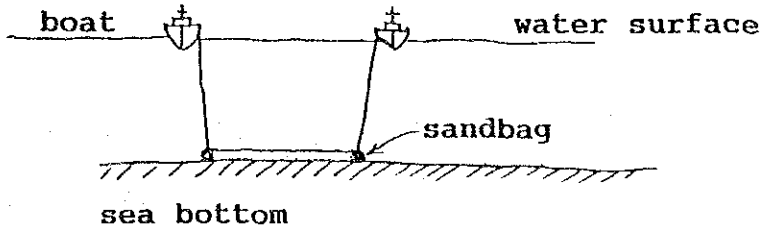
e) Design

(1) Proper scale and type of set-net is determined on the basis of available data & information about fishing ground and market.
(2) Set-net is so designed as to meet with the fishing ground and fishing operation condition.
(3) Total height the set-net should be 1.2-1.5 times of sea water depth.
(4) In this stage, necessary data & information are (1) water depth of set-net, (2) total length & inclination of leader net from the shore-end, (3) direction and velocity of sea current, (4) target fish species and (5) fishing operation condition, etc.

(3) Investigation Methods to determine the location(setting point) of set-net

a) Sea bottom condition

° Utilization of scanning sonnar (Fish finder)
° Watch sea bottom by naked eyes (shallow sea)
° drag rope & sand bags by two boats (as illustrated)



b) Sea bottom materials

° tie lead at the end of rope and sent into the sea bottom
° check by chart

c) Velocity of current

° use current meter
° firmly fix the boat by anchors and then, throw piece of wood on the water surface and count seconds (how many seconds does it take for the piece of wood to flow 10 meters)
° current velocity is preferably less than 0.4 knot/hour

(Example) It took 40 seconds for the piece of wood to flow 10 meters

1 hour = 60 min. = 3,600 seconds
3,600 / 40 = 90 x 10 meters = 900 meters
1 knot = 1,852 m/hour
900 / 1,852 = approx. 0.48 knot/hour

d) Survey for fishway and fish species

- ° trial fishing by long line and vertical long line
- ° trial fishing by gill-net

e) Survey for water depth in the estimated location of set-net

- ° place buoys at 4 corners of the estimated location
- ° check water depth inside of the square as many as possible, using rope with lead tied at one end of rope (put marks at every 1.0 meter interval of rope)
- ° check water depth by fish finder

(4) Masu-ami (Small scale set-net)

Masu-ami is a type of small scale set-net and consist of (1) leader net, (2) surround net and (3) pocket net. In general, surround net reaches from sea bottom to water surface and, therefore, no bottom-net is attached or used. Masu-ami is set into shallow sea, less than 20 meter in depth.

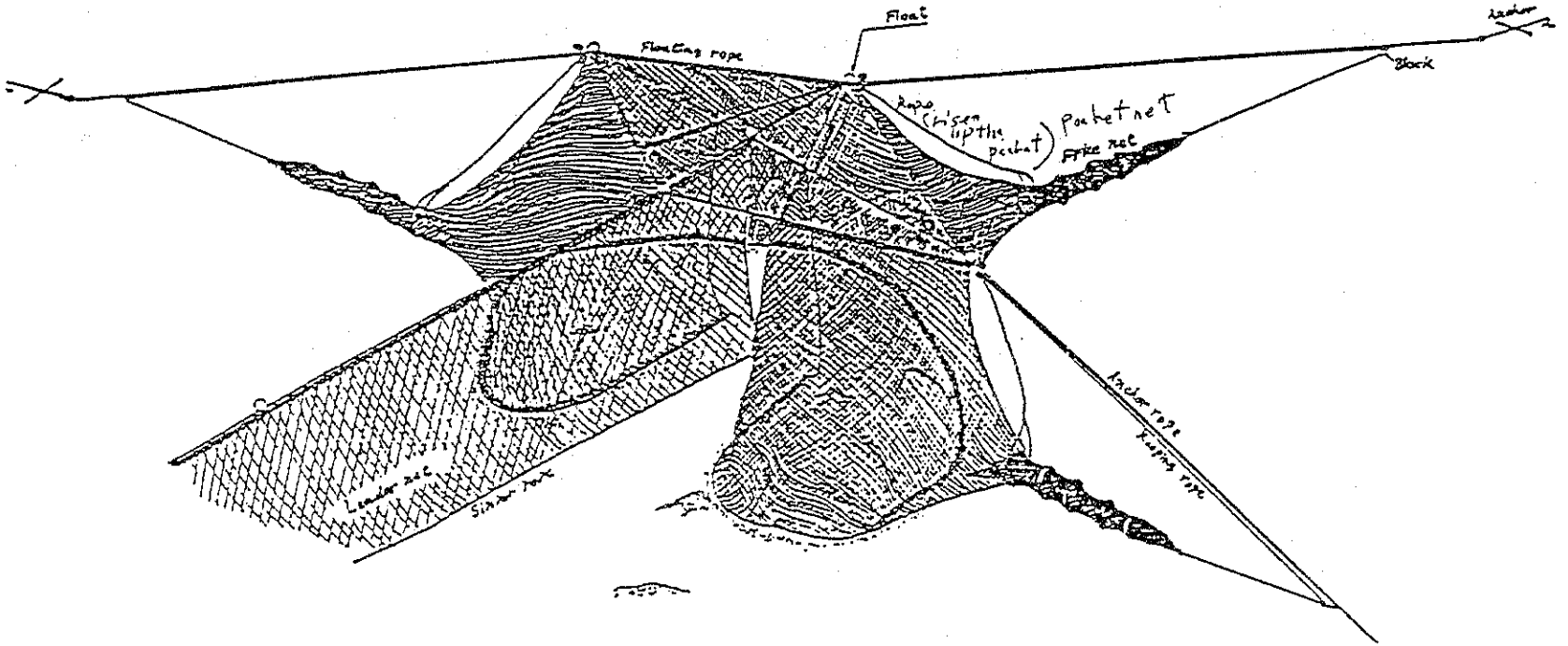
Characters of Masu-ami are (1) can be operated by few fishermen and (2) can be set into shallow water with high current velocity and sometimes 3 - 8 pocket nets are attached for this Masu-ami.

Pocket nets are conical and long bags with a few funnels in them, which prevent trapped fish from escaping out of the bag.

Fishing operation

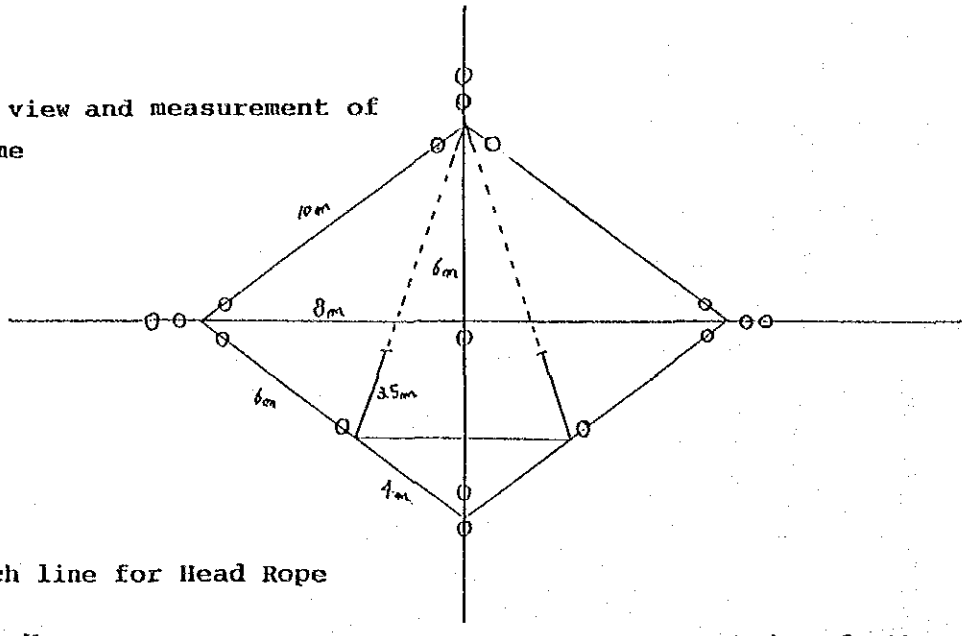
1) fix fishing boat along with the anchor rope
2) after slackening rope which is connected to the block, hauling the rope which is tied with packet net
3) pulling u p pocket net one by one into the deck and take out the catch by opening end part of the pocket net
4) send back pocket net one by one into the water with the order of 3) and 2)

Masu-ami (Small scale set net)

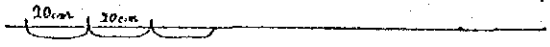


Masu-ami (Small Scale Set-net)

Top view and measurement of Frame

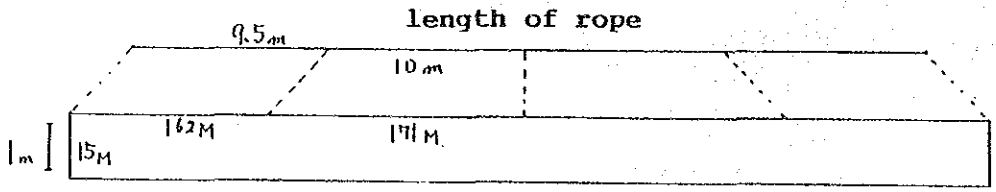


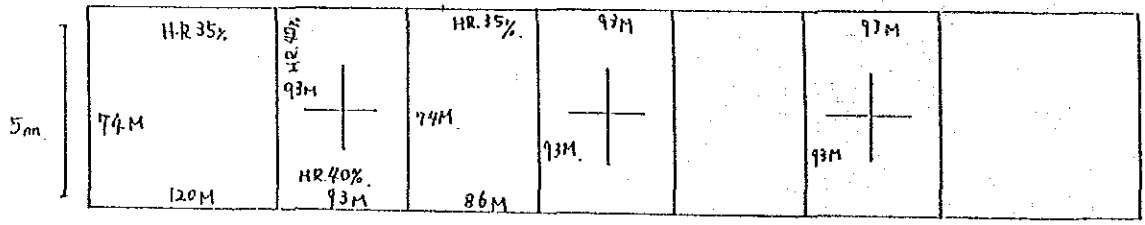
Bolch line for Head Rope



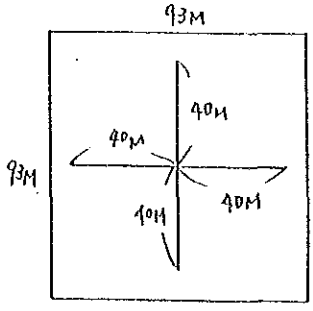
Water depth : 5 meters

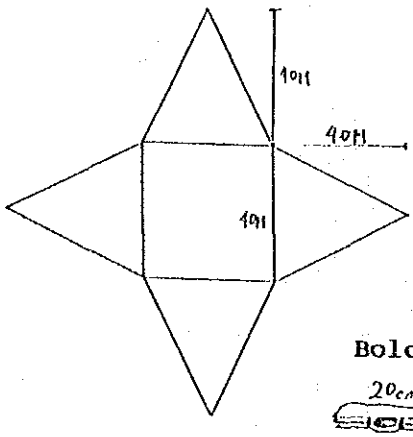
length of rope



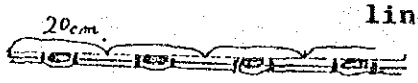


mesh size : 5 cm

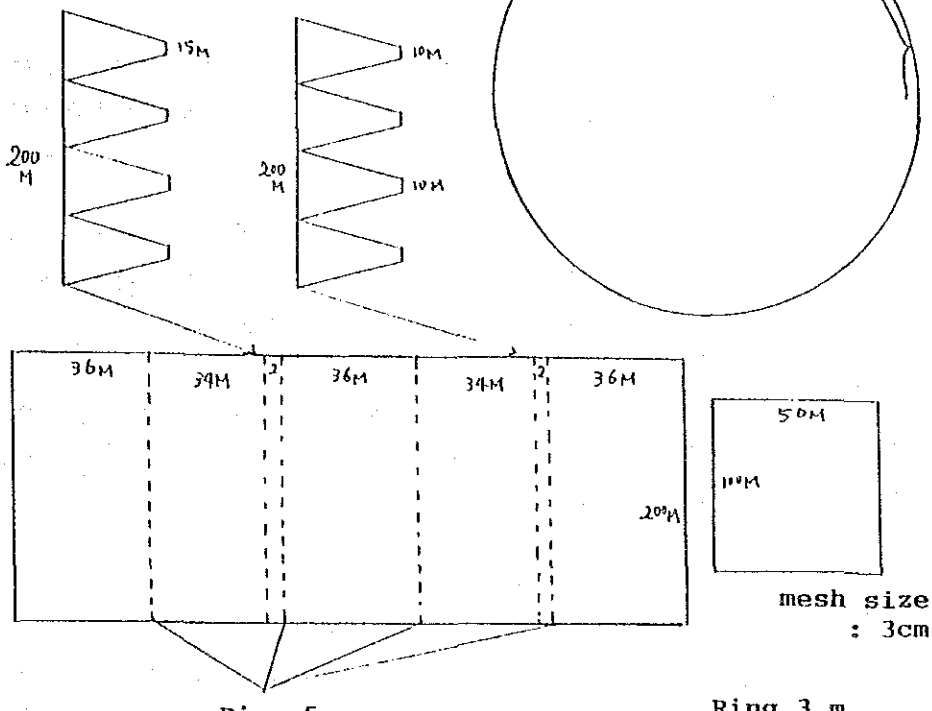




Bolch & lead for sinker line



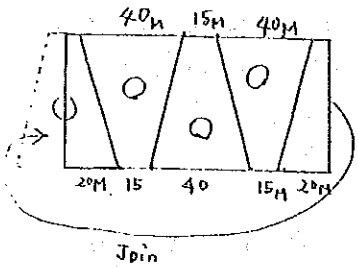
Flapper



Pocket net

mesh size : 5cm

mesh size : 3cm



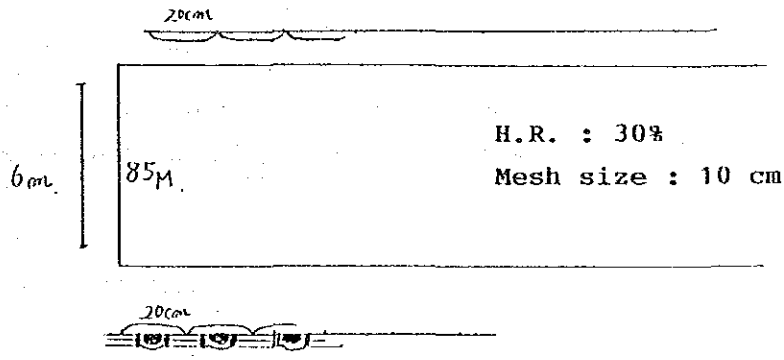
Ring 5 m

(Diameter : 1.6 m)

Ring 3 m

(Diameter:0.95m)

Leader Net



7. Vertical Long-line Fishing

Vertical long-line was originally developed in improving fishing efficiency of handline fishing and this gear consists of (1) float attached to one end of the main line, and sinker attached to another end of the main line to suspend the main line vertically in the sea water.

Bottom vertical long-line is subdivided into (1) vertical long-line fixed in the sea bottom and (2) drift vertical long-line, which drifts in the sea bottom slowly with the current.

Drift vertical long line is that main line is suspended in the sea water and drifting with the buoy as float (Floating and drifting Type)

a) Fishing ground

Fishing grounds are changing according to the season, current, temperature and water depth but, in general, good fishing ground is located at the rocky reef, end of rocky reef and border line where water depth change largely.

Fishermen determine such good fishing ground, considering the above condition and gathering useful information from his fellow fishermen.

Fish finder is useful to find out such good fishing ground but most important factor is the skillfulness accumulated during the long experience as fisherman.

Finally, many fishermen concentrate into some good fishing grounds, which is narrow in its space.

b) Fishing gear

This fishing gear consists of float, leading line, main line, branch line, three-pronged corkscrew swivel, hook and sinker.

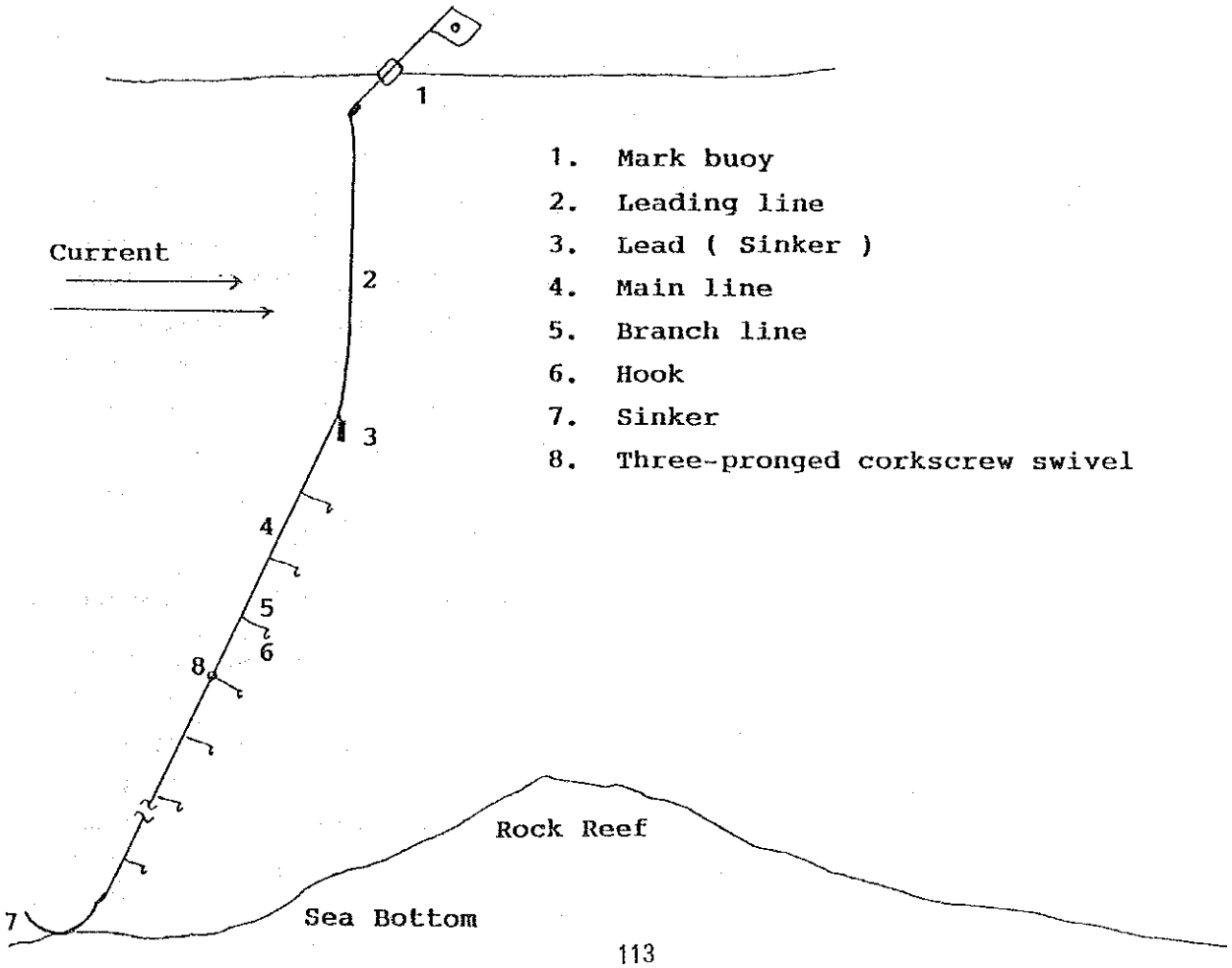
Total length of two branch lines should be shorter than the length of one main line. Interval(length of each) of main line and webbing size should be determined by each target fish species.

In the major fishing season, interval of main line should be shorter so that more amount of branch line and hook can be attached in one set to raise fishing efficiency in a narrow and limited area of good fishing ground.

Monofilament should be effective if hydraulic resistance by current is taken into consideration.

c) Drift Bottom Vertical Long-line

Locality : Western part of Japan
Target fish : Catlassfish or hairtail (Trichiuridae)
Total length : 50 - 120 meters



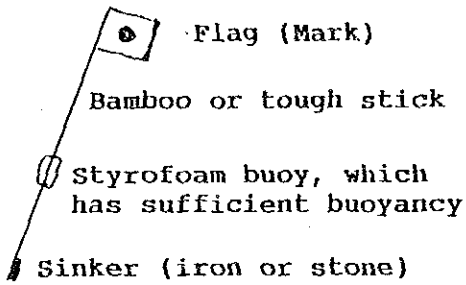
1. Mark buoy
2. Leading line
3. Lead (Sinker)
4. Main line
5. Branch line
6. Hook
7. Sinker
8. Three-pronged corkscrew swivel

d) Gear Construction

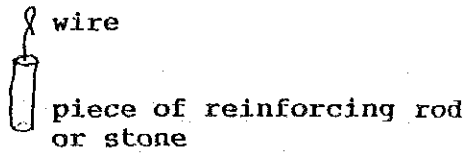
Many parts are required for the gear construction and, therefore, most important points are (1) you had better utilize low-priced parts as much as possible but still (2) you should make efforts to raise fishing efficiency as much as possible.

In addition, you should positively improve gear to get higher working efficiency.

Mark Buoy



Sinker



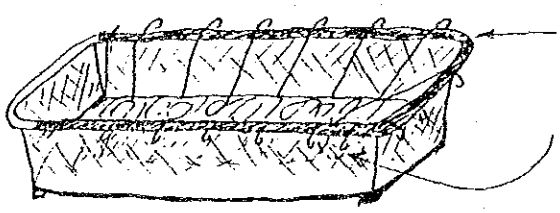
(you had better utilize low-priced materials or waste articles)

three-pronged corkscrew swivel

O in case above swivel is not available, line is connected directly to the ring

Sinker

Ordinarily, main line should be prepared 2 three-pronged corkscrew swivels at both ends and, in constructing gear, branch lines are attached to the main line one by one and hook should be fixed at the edge of basket, as illustrated in the following.



Basket

∘ Main line (nylon monofilament)

Very new nylon monofilament is stiff(not accustomed) which will lower the working efficiency in casting the gear into sea water and, in such case, you had better put such new monofilament into boiling water for 3-4 hours with some amount of blue-color detergent and vinegar and, then, nylon monofilament is slightly bue colored and get accustomed (softened) for easy handling of the gear.

After that, nylon monofilament is cut off at a certain intervals (3 meters for example) for ready use at any time.

° Fishing operation

Fish school migrate from deeper sea to shallow sea and vice versa, according to the season and so, fishing operation is actually carried out by adjusting the depth of the gear and so, total length of the gear should be constructed at least 1.5 times of the water depth in the shallow sea.

Total length of the gear should be determined by the degree of sea current and other factors from the long experience of each fishermen.

In the case total length of the gear is too short, sinker is not attached to the sea bottom and just suspended in the water and to much inclined by the sea current and branch lines are entangled to the main line, which causes much trouble in the gear handling.

Fishing operation is actually carried out in the evening or early morning in accordance with the feeding activity of the fish but fishing operation is sometimes carried out all night from evening to next morning in the moonlight night.

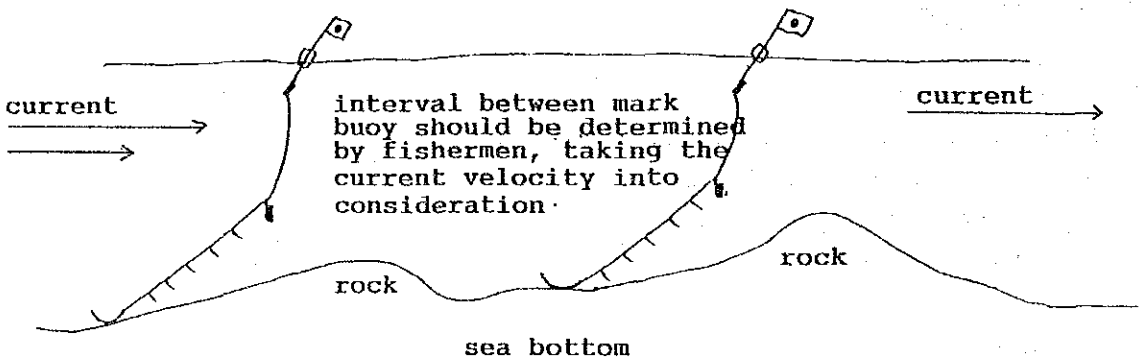
° Casting the gear

Casting the gear in the following order, (1) sinker, (2) main line, (3) branch line, (4) intermediate-sinker which is attached in the midway of the gear from the stern part of fishing boat, after confirming the location of fishing ground.

Finally float is attached to the end of the gear and casting operation of one gear is completed with 1-2 minutes.

Normally, one fishing boat uses 10-20 sets of the gear and each gear should be casted into water from current-ward of the fishing ground (If many sets of gears are casted in narrow fishing ground, such gears are entangled with each other).

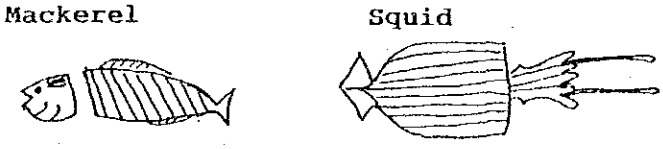
In the case fishing ground is wide enough, you should cast each gears with wide intervals in the first and, after hauling each gears and find out good catch in a certain place, you should again casting the gears in such a good place with short intervals.



° Hauling operation

Waiting time from casting to hauling is different in each target fish species and each fishermen but 30 - 60 min. is most popular. Fishing gear itself is flowed near to the rocky reef by the current and, therefore, vertical long-line should be hauled against the direction of current. Hauled gears should be orderly put into the basket for the next casting.

° Bait preparation



9. Cuttlefish Encircling Gill-net (Purse seine with gill-net)

a) Fishing method, utilizing artificial spawning reef

In the spawning season of cuttlefish (Sepia esculenta Hoyle), artificial spawning reef, as illustrated under, is placed into sea water to gather cuttlefish around it and, then, gathered cuttlefishes are caught by gill-net, etc.

b) Fishing season

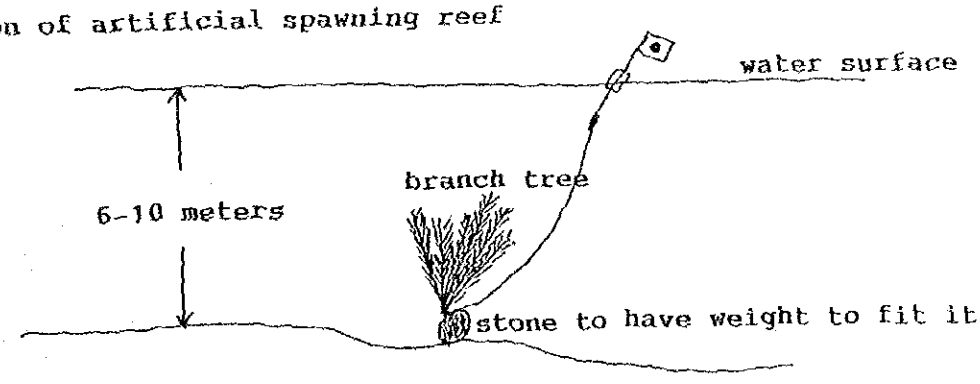
Such artificial spawning reef is placed into sea water in the spawning season of cuttlefish (February - October in the case of Japan).

c) Fishing ground for the artificial spawning reef

Suitable coastal water for the placement of artificial spawning reef is;

(1) in the gloom(semi-dark) place
(2) sea water is gently exchanged in the place
(3) water temperature is preferably approx. 20°C
(4) water depth is preferably approx. 10 meters
(5) cuttlefish has a character of spawning migration to get together around the rocky reef, where comperatively hard materials are abundant for adhesive eggs of the cuttlefish and, therefore, should be placed around such sea bottom.
(6) initial feeds should be abundant for the larval cuttlefish and fry of cuttlefish
(7) sand/mud is preferable as sea bottom materials

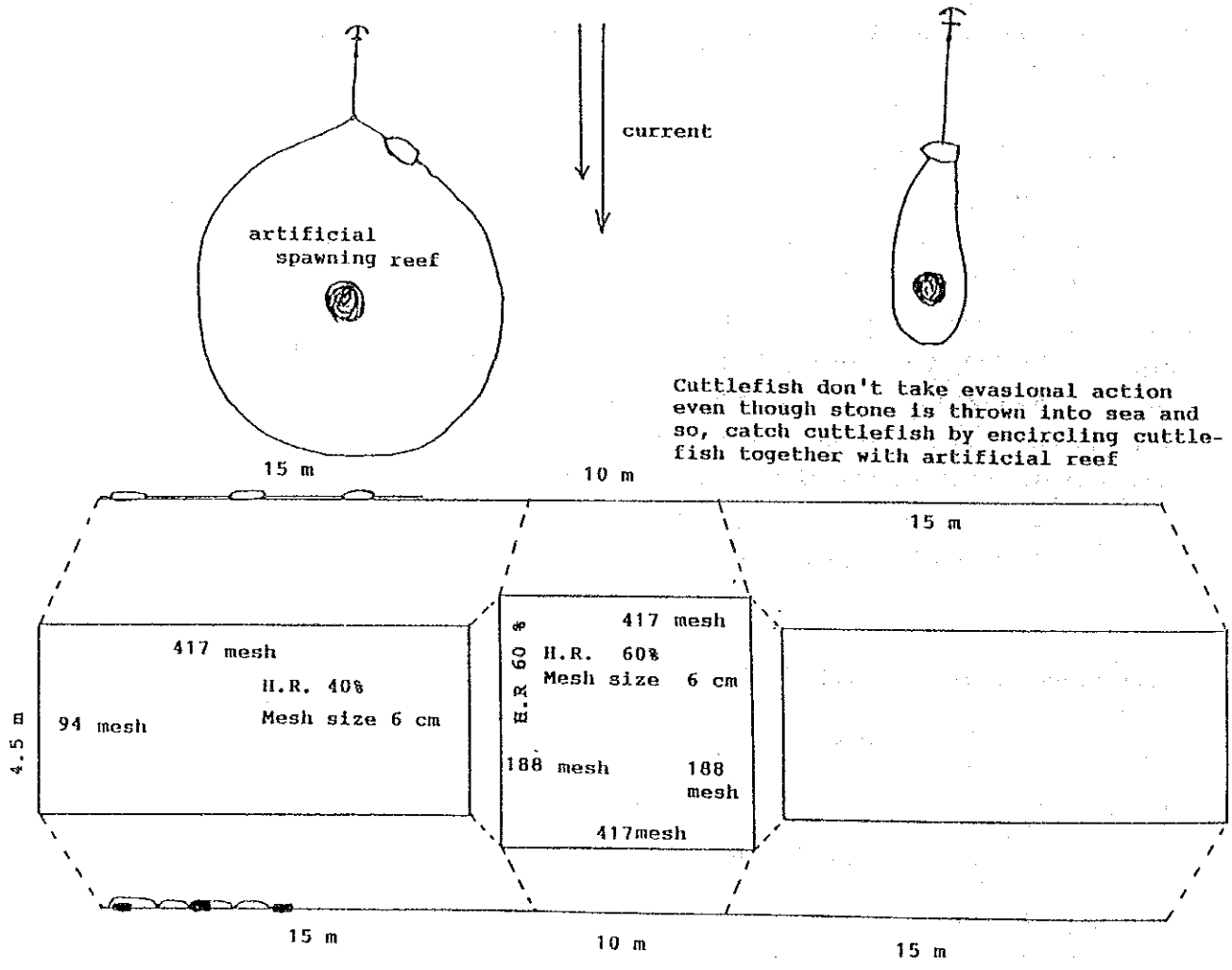
d) Constructon of artificial spawning reef



e) Fishing operation

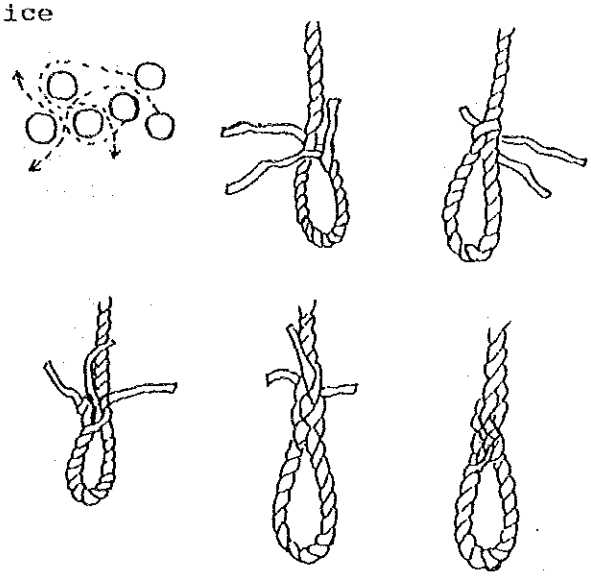
Cuttlefish migrate around the artificial spawning reef 2-3 days after the placement and so, catch the migrating cuttlefish 1-2 times per day. Newly placed artificial spawning reef attract cuttlefish more effectively and, therefore, catch efficiency is high in the first 10 days or so but, after that, decreasing gradually. Therefore, artificial spawning reef should be replaced sometimes.

On arriving the fishing ground, fishermen start casting gill-net from the current-ward positon and encircling the artificial spawning reef and return to the current-ward position and, after fixing the fishing boat by anchoring, start hauling up the gill-net and, at this time, gill-net is formed as illustrated in Fig.2 and, therefore attention should be paid for hauling up operation without detatching the gill-net from sea-bottom.

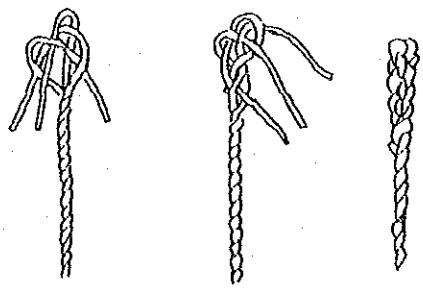


S P L I C E

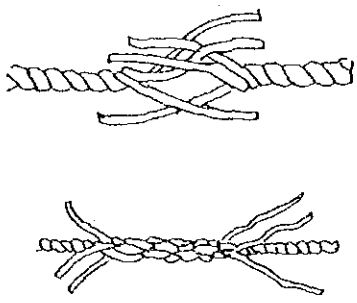
(1) Eye splice



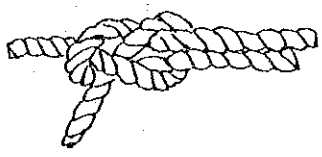
(2) Back splice



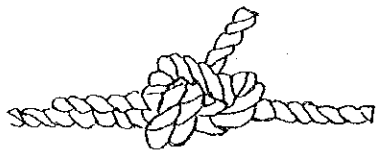
(3) Cut splice



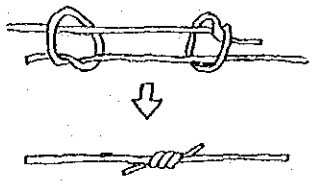
(4) Single sheet bend



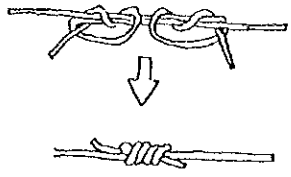
(5) Double sheet bend



(6) Angler's knot



(7) Double angler's knot



Post-Mortem Changes and Handling of Caught Fish

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Science for Doctoral Course,

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Introduction

After the death of fish, metabolic action carried on in living body goes to terminate, then post-mortem changes begin to start. This changes reveal several biological phenomena varying step to step by enzymatic and microbiological actions in the fish. The changes proceed currently and can not be divided each steps clearly, but these are characterized as following:

(1) Biochemical change such as glycolysis caused by enzymatic action
(2) Rigor-mortis in muscles
(3) Muscle tenderizing by post-rigor
(4) Autolysis caused by the action of muscle proteinases
(5) Spoilage caused by microbial action

At much progressed steps through the post-mortem changes, such quality losses as softening muscle, discolouration and off-odour are often found.

For few hours after death, a fish muscle keeps normal texture, then turns to stiff gradually. This phenomenon is called rigor-mortis. At the second step, the muscles begin to soften and become limp again, then slimes form to cover surface skin. Deep-set eyeballs become dull. Finally, the fish evolves adverse smell. This phenomenon is called spoilage.

Biochemical Change in Rigor-Mortis

Rigor-mortis results from a series of complicated chemical changes in the muscle of a fish after death. However, the process is not yet fully understood, but it is known that factors like the physical condition of the fish at death, and the temperature at which it is kept after death, can markedly affect the time a fish takes to go into, and pass through rigor-mortis.

While the fish is alive, cycles of chemical changes take place continuously in the muscle. These provide energy for the muscle while the fish is swimming, and also produce substances necessary for growth and replacement of worn-out tissue, The compounds that bring about, and control, these changes are known as enzymes.

The enzymes in the flesh go on working even after the fish is dead, and some of them act on those substances that normally keep the muscle pliable and lifelike. During life the muscle would contract and become rigid if its two main components were allowed to interact and bond together, but the bonding is prevented by the presence of substance, that keep the muscle pliable, rather like the way in which oil lubricates the moving parts of machine and prevents it from seizing up.

For so long as the muscle contain a reserve of energy, these substances can be replaced by one set of enzymes as fast as they are destroyed by another. Thus the muscles stay pliable for a time after death. But once the energy reserves are used up, the replacement stops and depletion results. The protein components are then able to interact, the muscle

attemps to contract, and it eventually becomes hard and rigid.

The interaction of the protein components is also influeneed by the accumulation of lactic acid, which is produced in the muscle when the energy reserves break down. The relative importance of the two factors, depletion of one set of substances and accumulation of another, is not fully understood but they are known to vary with the type of animal and with how well nourished and rested it was at the time of death.

The time a fish takes to go into, and pass through, rigor mortis depends on the following factors; the species, its physical condition, the degree of exhaustion before death, its size, the amount of handling during rigor and the temperature at which it is kept.

(1) Species

Some species take longer than others to go into rigor mortis, because of differences in their chemical composition. Such active migrator as mackerel or bonito, for example, go into rigor mortis very quickly and may be completely stiff one hour after death, whereas bottom fish or slack swimer as flounder or flat fish stored under the same condition may take as long as 10 hour to develop full rigor mortis.

(2) Condition

The poorer the physical condition of a fish, that is the less well nourished it is before capture, the shorter will be the time it takes to go into rigor mortis; this is because there is very little reserve of energy in the muscle to keep

it pliable.

(3) Degree of exhaustion

In the same way, fish that have struggled in the net for a long time before they are hauled aboard and gutted will have much less reserve of energy than those that entered the net just before hauling, and thus will go into rigor mortis more quickly.

(4) Size

Small fish usually go into rigor mortis faster than large fish of the same species.

(5) Handling

Manipulation of pre-rigor fish does not appear to affect the time of onset of rigor, but manipulation, or flexing, of the fish while in rigor can shorter the time they remain sriff.

(6) Temperture

This is perhaps the most important factor governing the time a fish takes to go into, and pass through, rigor mortis because the temperature at which the fish is kept can be controlled. The warmer the fish, the snoor it will go into and pass through rigor mortis.

Autolysis

Succeeding to post-rigor, the fish mucle is subject to attacks of proteolytic enzymes. This phenomenon is called autolysis. Generally, animal tissues can undergo a process of autolysis which involves degradation of their proteins into

peptides and amino acids. The autolysis of such tissues is caused by intercellular enzymes named cathepsins.

The proteolytic enzyme activity varies with different tissues and organs in the body, and is much low in muscle. Normally, cathepsins and other proteolytic enzymes are inactive in lysosomes of tissue cells. However, they are activated significanly by cell damage in acconpanying with destruction of the lysosomes.

Repeat of freezing and thawing, piling, and/or long time stowage of carcasses may allow to cause damage of tissue cells, and result to destroy the lysosome structure. Accordingly, rough handling, and stacking up the catches on deck board and temperature fluctuation during frozen storage of the fish render the muscle cells broken, and eventually accelarate the start of autolysis.

Basically, autolysis decomposes proteins to amino acids currently, and this is the case, it is absolutely different from spoilage which decomposes nitrogenous compounds to such products as ammonia, hydrogen sulside and other compunds of low molecular weight. The texture and the taste of beef, chicken and pork are tough and tastless immediately after slaughter, but become tender and tasty by autolysis after leaving them for several days. On the contrary, a fish allowed to stand for a while become too soft to make the flesh inadequate for dishes.

Autolytic degradation rate of fish proteins varies depending on species, pH and temperatures. Apparently, red flesh fish like as bonito, mackerel, tuna and yellow tail are

larger in the rate than white flesh fish like as snappers and flat fish. The optimum pH of catheptic enzymes is between 3.5 to 5.0, so that fish in rigor goes to be digested readily by the enzymes because low pH lies in the muscle, while spoiled fish is unlikely digested due to its high pH value of the muscle. The optimum temperature of the catheptic enzymes are between 40℃ to 45℃ for marine species and between 23℃ to 27℃ for fresh water species.

Spoilage

Like meat, fish may be spoilt by naturally occuring autolytic enzymes as mentioned above, or by bacterial activity. Spoilage is principally due to the activities of enzymes produced by Gram negative rods, particularly pseudomonads. These organisms invariably bacome predominant during prolonged storage of fish whether or not stored in ice,

The role of pseudomonads in the spoilage of fish has been studied in some detell. Adams et al. (1964) characterized potential spoilers by inoculating them as pure culture into sterile muscle press juice from sole and measuring their ability to produce off-odours, volatile reducing substances and trimethylamine. They found that only about 10 % of the initial flora were spoilers using the above criteria and that the proportion of spoilers was never more than 30 % of the total flora during storage at 5℃. The spoiling bacteria were later identified as being mainly pseudomonads (some of these would now be classed as

Alteromonas spp.) acinetobbacters or vibrios; it was stressed that even though pseudomonads were the predominant group only a small proportion were acive spoilers. Similar results were o btained with cod by Shaw and Shewan (1968) who found that the proportion of active spoilers to the total viable population d id not change significantly during spoilage and always remaine d below 25 %; again Pseudomonas spp. were the principal group but in this work Acinetobacter/Moraxella spp. and Vibiro spp. were not implicated as spoilers.

Spoilage bacteria first utilize low molecular weight compounds such as nucleotides and amino acids present in fish muscle and it is the breakdown of these materials which is responsible for off-odours and other spoilage effects; thus, as with meats, protein plays a minor role in spoilage (Lerke et al., 1967). Studies in which pure cultures of spoilage inducing pseudomonads have been inoculated into blocks of sterile fish muscle indicate that different strains generate totally different odours. Some of the volatiles produced were "fruity" and probably esters whilst others were "sulphidy" (Herbert et al., 1971). More definitive studies using gas-liquid chromatography have identified some of the principal volatiles in spoiling fish as methyl mercaptan, dimethyl sulfide, dimethyl disulfide, hydrogen sulfide, trimethylamine, ethyl acetate and ethanol (Miller et al., 1973); it should be noted that many of these volatiles have also been associated with meat spoilage and that they need only be present in very low concentration to produce obvious off-odours.

After landing, the fish may be left on the quay for many hours uniced in boxes or kits. Under such conditions the temperature of the fish will rise and growth of the psychrotrophic bacteria will become more rapid so that a 10-fold increase in numbers in few hours can be anticipated (Shewan, 1961). The wooden fish boxes still widely used ashore harbour vast numbers of bacteria, counts often being in excess of 10^6 per cm^2 even on "clean" boxes, however, it is probable that these bacteria have little effect on the spoilage of fish since the time spent by fish in boxes is usually limited to less than 12h. The fish may then be re-boxed, often in ice, and transported to the processor. Here, depending on the type of fish, they may be filleted or otherwise processed. All these events, including filleting and final transport to the retailer, affect the bacteriological flora which becomes more varied and more mesophilic in character with increasing degrees of handling.

Ice storage of Caught Fish

Chilling is an extremely effective way of reducing enzyme action, the growth and reproduction of bacteria, if the fish is chilled as fast as possible after catch, handled carefully and hygienically.

It is known that lowering temperature by 5℃ might halve the rate of freshness decline involving autolysis and spoilage. The effect of cooling on extension of shelf life is generalized in Table 1. In the tropics, with tilapia, for

ambient temperature will cause as much spoilage as 1 day at 0 ℃.

The potential shelf life of the fish stored in ice differs greatly with species. The shelf life of various fish species is given in Table 2. It has been known that: ⑴ Freshwater fish have generally longer shelf life than marine fish. ⑵ Red meat fish such as mackerel has generally shorter shelf lifethan white meat fish such as cod. ⑶ Tropical fish have longer shelf life than temperate or cold water fish. ⑷ Quality of lean fish can be maintained much longer than that of fatty fish .

It requires longer time to cool down the centre of the fish. The cooling rate is inversely proportional to the thickness squared, i.e., if the thickness is double, it takes as long as four times. The theoretical figures calculated are given in Table 3.

Ice is the most ideal medium for cooling the fish. The way for cooking fish with ice is roughly classified into two basic ways; One is the way using crushed ice, being termed as dry-icing. There are three practical ways of chilling and storing fish in crushed ice on fishing vessels, i.e. bulking, shelving and boxing, except for the way using an ice-water mixture. Proper and improper ways of icing with crushed ice in the wall of fishing vessels are illustrated in Figs. 2, 3 and 4. In any cases, the fish and crushed ice should be mixed well. Small pieces of ice are the best; If large lumps are used, either a large quantity of ice is needed, or large pieces of ice will give the larger gaps between fish and ice,

acting as insulation and results to keep fish warm. .It is, of course, true, when the fish is stored and transported in fish boxes on shore.

Another is the way using a crushed ice-water mixture in a tank or a cask. Usually, a mixture of crushed ice and sea water or water containing NaCl (2-3%) is used as cooling media. For fresh water fish, an ice-fresh water mixture is used. The fish can be cooled rapidly by this way, and occasional agitation is helpful. In the case that the fish have been dipped in the mixture for long time the skin will be discoloured, and gills and eyes become opaque. In small size fish, there is a possibility that NaCl may penetrate into the body, and, in contrast with this, low molecular weight substances such as amino acids and nucleotides in the tissue may flow out into the water. As mentioned above, the fish caught a large amount at a time, for example, sardine, mackerel, skipjack, and tuna, are usually chilled in an ice-sea water mixture on fishing vessels.

Ice is usually made from fresh water in block from of 130kg in rectangular ice cans in Japan. This block ice is crushed into small pieces mechanically or by hand with a mallet before using. Expect for block ice, there are many different types of ice: flake ice, plate ice, bean ice, scale ice, tube ice, etc. named after the types of ice-making machine. The criterion of the amount of ice to be used for icing the fish in a wooden box or a wooden cask is given in Table 4. This criterion is useful for icing fish in older style wooden boxes or wooden casks. A large part of the fish

for processing is still stored and transported in crushed ice in older style wooden boxes. However, recently, forming polystyrene boxes in a variety of sizes which have good thermal insulation and is light to carry, easy to handle, and waterproof have almost replaced older style boxes. Since forming polystyrene boxes and refrigerated trucks came into wide use, fish dealers seem to have been careless of the amount of ice to be used for cooling fish. They tend to use a large excess amount of ice by a simple reason that the larger amount of ice, the safer. There seems to be no basic study on the reasonable amount of ice to cool and store fish in forming polystyrene boxes.

Table 1. Extension of shelf life of the fish by lowering temperature

Drop of the temperature from 25°C by:	Temperature of the fish	Rate of freshness decline	Extension of shelf life
0°C	20°C	100	1
5°C	15°C	50	2
10°C	10°C	25	4
15°C	5°C	12.5	8
20°C	0°C	6.25	16

The rate of freshness decline and the length of shelf life at 25°C were taken as 100 and 1, respectively.

Table 2. The potential shelf life of the fish stored in ice

Fish	Length of storage in days
Temperate marine	
Cod	12–15
Haddock	12–15
Whiting	9–12
Hake	8–10
Herring	2–5 or 6
Mackerel	7–9
Redfish	13–15
Temperate freshwater	
Yellow walleye	20
White fish	18
Trout	10
Channel catfish	12
Tropical marine	
Snapper (Brazil)	11–16
Red snapper (Seychelles)	20
Purple headed emperer (Bahrain)	15
Grouper	28
Spanish mackerel	11
Chub mackerel	18
Tuna	29
Bonga	20
Tropical freshwater	
Tilapia	22–28
Mrigal carp	35
Catfish (Amazon)	12–16
Nile perch	20
Lung fish	25

Table 3. The relationship between the thickness of fish and the time required for cooling the central part of the the fish from 25 to 1°C

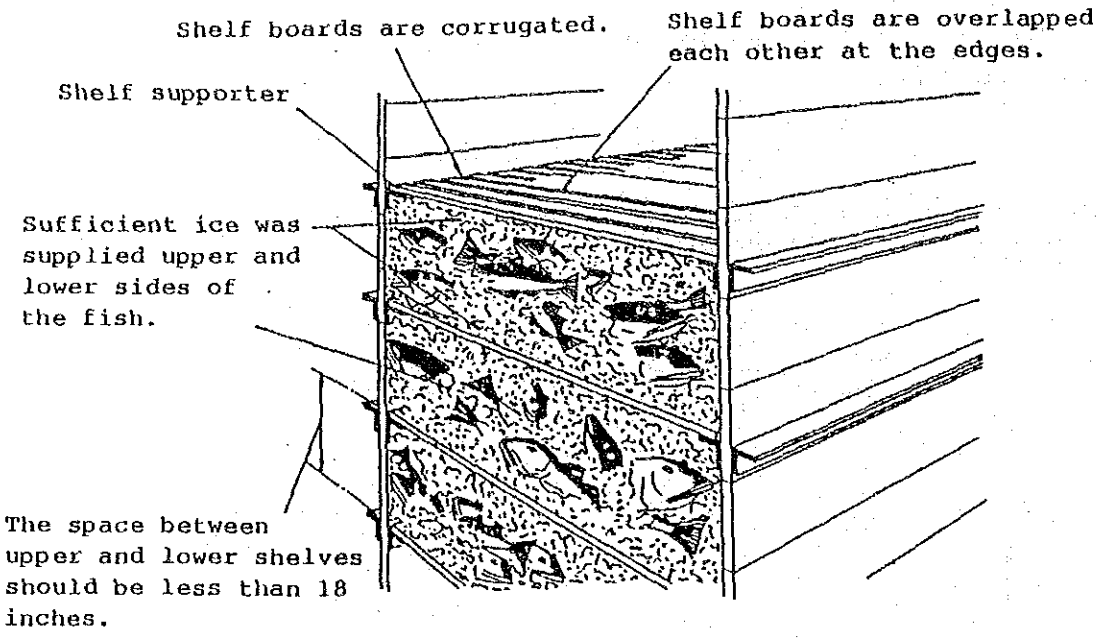
Distance to the center of fish (1/2 thickness)	Time to cool from 25 to 1°C
1 cm	20 min
2 cm	1 1/4 hr
4 cm.	5 hr
10 cm	31 days 5 hr

Table 4. Criterion of the amount of ice needed for the overland transportation

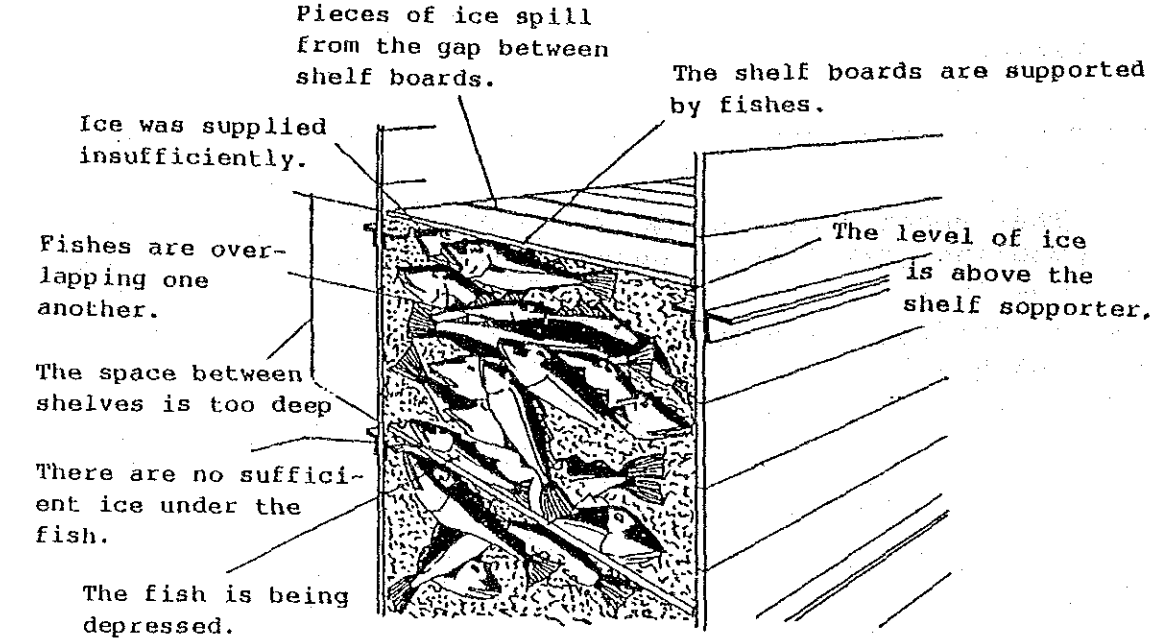
Season	Length of Icing (day)	Ratio of fish to ice* (weight)	
		Crushed ice	Ice-water**
Summer	3	1 : 3	5 : 3
	2	1 : 2	5 : 2
	1	1 : 1	5 : 1
Spring & Fall	3	1 : 2	5 : 2
	2	1 : 1	5 : 1
	1	2 : 1	10 : 1
Winter	3	3 : 1	15 : 1
	2	4 : 1	20 : 1
	1	5 : 1	25 : 1

* The capacity of fish is about 0.4 t/m^3 by crushed ice cooling (dry icing), and about 0.6 t/m^3 by ice-watermixture cooling.

** The ratio of ice to water (saline) is usually 2 1 : 1 by weight.

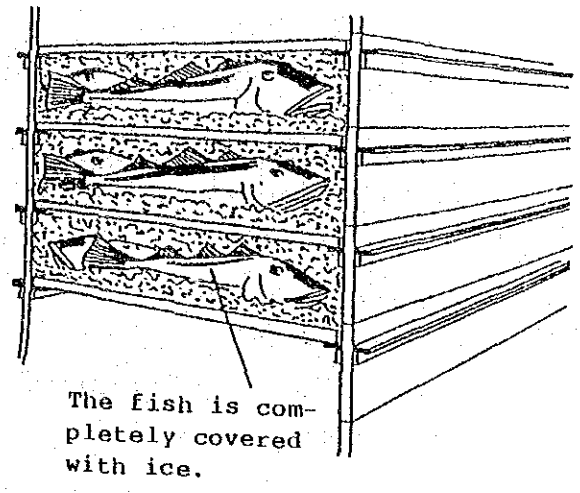


Proper shelving

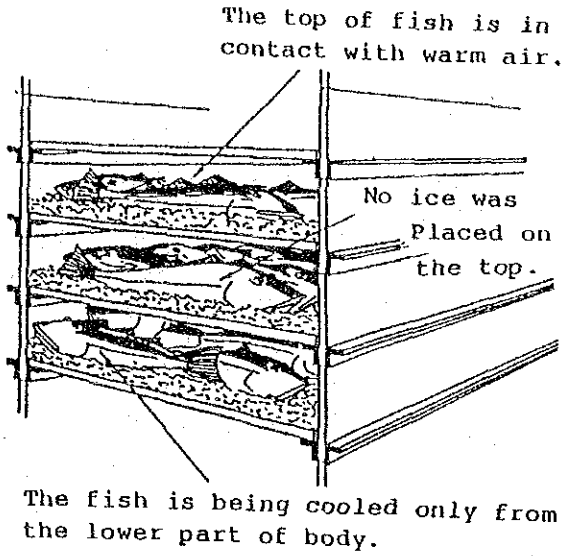


Improper shelving

Fig. 2. Bulking

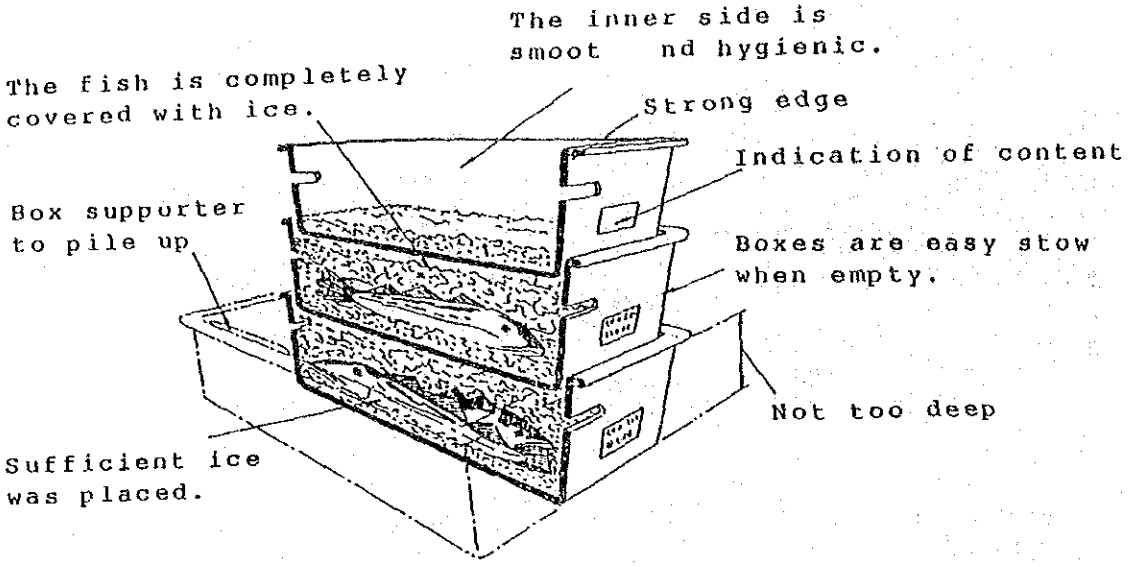


Proper boxing

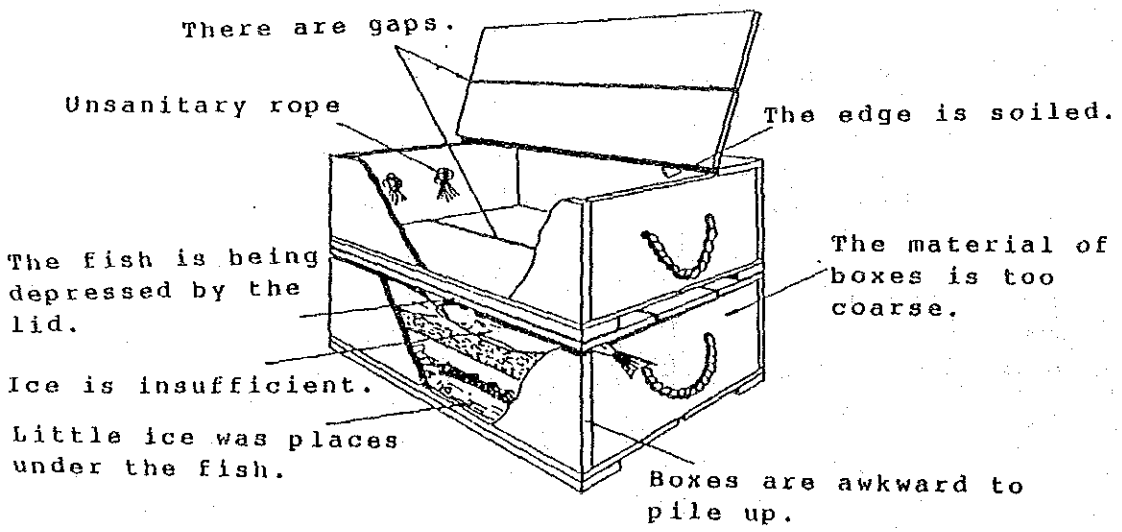


Improper boxing

Fig. 3. Shelving



Recommendable boxing with plastic or aluminium boxes



Improper boxing with older style wooden boxes

Fig. 4. Boxing

If ice is not melting, it is not adsobing heat and so not cooling.

Ice-melting-water should be allowed to flow away outside the box bellow, but not through it on to the fish in the lower box.

(漁民組織　仏語テキスト)

I. Organiser les pêcheurs en syndicat

1. La nécessité de syndicat des patrons-pêcheurs

(1) Élever la condition sociale et économique des pêcheurs

Il y a les sociétés coopératives de consommation et les sociétés coopératives de production.

Les sociétés coopératives de production sont formé par les producteurs, comme les agriculteurs, les pêcheurs, les industriels, et les commerçants, pour s'entr'aider et élever leurs positions sociales et économiques.

Le syndicat des patrons-pécheurs appartient á la société coopérative de production et formé par les pêcheurs pratiquant la pêche côtière et les petits entrepreneurs pour la pêche d'haute mer.

Ils n'ont que de maigres capitals, et leurs entreprises ne rendent pas bien, et ils ont beaucoup de désavantages. Par example, les banques ne leur ouvre pas de cédit, et, quand ils veulent vendre des poissons, les marchands, en rabaissant le prix, n'achètent pas à un prix convenable.

Les pêcheurs qui ont les meme difficultés se groupent en syndicat, pour s'entr'aider protéger les intérêts communs, et améliorer leurs situations sociales et économiques.

Pour cela, quand ils se groupent en syndicat, ils doivent avoir la volonté d'améliorer leurs situations, et l'esprit de secours mutuels.

Le syndicat des patrons-pêcheurs a de diverse activités comme d'autres sociétés coopératives, par exemple, le crédit, l'achat, la vente, l'utilisation, l'assurance mutuelle, et l'éducation.

Mais le syndicat des patrons-pêcheurs a quelques autres activités que d'autres sociétés n'ont pas, comme la sauvegarde de

l'environnement des pêcheries, la protection et l'augmentation de ressources maritimes, le contrôle des pêches.

La pêche dépend de la nature et l'exploite.

La dégradation de l'environnement de côtes par l'eau sale qui coule des usines, déterrement de pétrole, le déboisement des forêts, et la diminution des poissons par la concurrence des pêcheurs mettent obstacle à la prospéritè de la pêche.

Pour cela, les syndicat de patrons-pêcheurs doivent prendre des mesures contre la destruction de la nature et la pêche sans retenue.

Au Japon, les syndicats des patrons-pêcheurs possèdent les droits de pêche qui concernent la pêche côtière, par exemple, les droits pour la pêche au filet fixe, ceux pour la pêche en commun, et cenx pour la pêche dans la mer délimitée.

La possession des droits de pêche par les syndicats est utile pour empêcher la destruction de la nature et les pêche sans retenu.

(2) On fait les divers plans pour faire prospérer la pêche.

Les syndicats aident le gouvernement et les communes, quand ils font les plans pour encourager la pêche. On présente quelques exemples de l'utilité de syndicat.

Premier exemple: quand le gouvernement ou la commune construit les ports de pêche, les marchés, les conserveries, les glacières, les usines pour congeler les poissons, on peut charger le syndicat des patrons-pêcheurs de l'administration et la gestion de ces établissements.

Et, quand le centre de pêche est chargé de l'administration et de la gestion, l'existence de syndicat lui est utile comme l'organisation des pêcheurs.

Deuxième exemple: quand on veut améliorer et moderniser les bateaux de pêche, les filets de pêche, et les instruments de pêche, l'intermédiaire de syndicat facilite les choses. Parce que, on peut savoir les désires de pêcheurs, et la nécessité et les besoins de l'amélioration par l'intermédiaire de syndicat. Et, quand le syndicat est chargé de la vente de pêches, les pêcheurs peuvent s'y fier.

Le CAMP (le Centre d'assistance pour la motorisation des piroques) pourrait facilement introduire des appareils de la pêche par l'intermediaire de syndicat des patrons-pêcheurs.

Troisième exemple: le syndicat des patrons-pêcheurs prend l'initiative pour réformer les villages des pêcheurs assurer la base de vie de pêcheurs, et améliorer leur vie.

Surtout, il est indispensable d'organiser les pêcheurs en syndicat pour fixer les pêcheurs nomades et pour faire construire les villages de pêcheures.

2. De divers types de syndicats des patrons-pêcheurs.

Il y a deux types de syndicats des patrons-pêcheurs: Les syndicats communals et les syndicats professionnels. Et, chaque village de pêcheurs forme un syndicat, des syndicats d'une préfecture forme une union préfectoral, et des unions prefectorals s'assemblent sous l'union nationale.

(1) Les syndicats communals des patrons-pêcheurs

Un syndicat communal se compose des pêcheurs qui habitent une commune. Par conséquent, les membres de syndicat exercent les pêche de diverse espèce.

(2) Les syndicats professionnels des patrons-pêcheurs

Un syndicats professionnel se compose des pêcheurs qui pratiquent les pêches de la meme espèce. Par exemple, les pêcheurs qui entreprennent la pêche aux cordeaux forment les syndicats des pêcheurs qui font la pêche aux cordeaux, ceux qui entreprennent la pêche au filet forment les syndicats des pêcheurs qui font la pêche au filet, et ceux qui entreprennent la pêche au chalut forment les syndicats des pêcheurs qui font la pêche au chalut.

Des membres d'un syndicats ne sont pas les habitants de la meme commune. Un syndicat comprend, ordinairement, quelques communes.

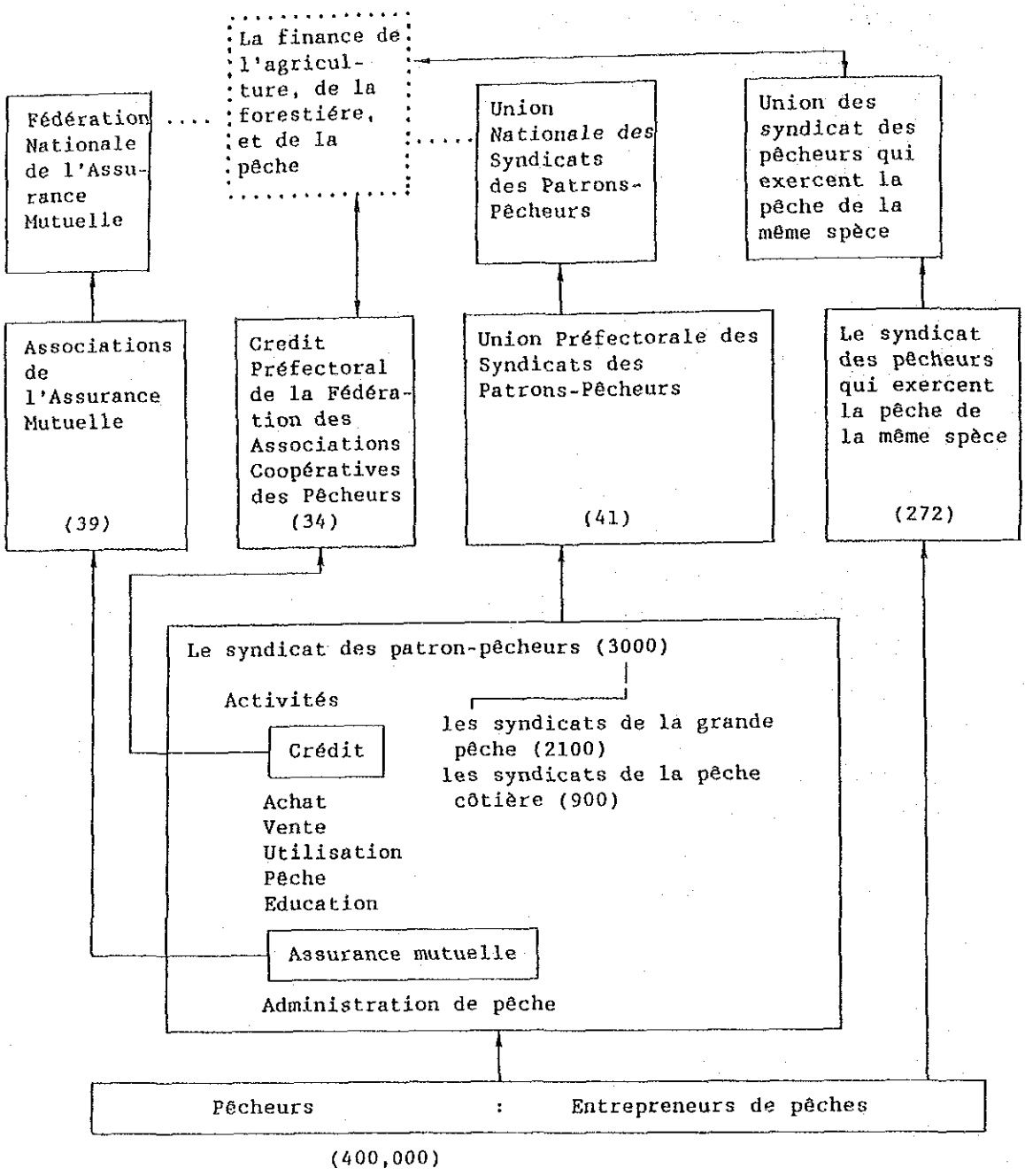
Beaucoup de ces syndicats sont formés par les gens qui pratiquent les pêche de grande envergure, comme la grande pêche. Et, Il y a des membres qui appartiennent aussi a un syndicat communal.

(3) Les unions

Des syndicats communals d'une préfecture s'assemblent et forment l'union préfectoral, qui s'unit a d'autres unions préfectorals sous l'union nationale.

Un syndicat professionnel comprend quelques communes, il s'unit à d'autres en formant directement l'union national des syndicats professionnels. Au Japon, comme ce diagramme montre, il y a d'autres unions comme celles de crédit et celles de secours mutuels.

L'organisation des syndicats des patrons-pêcheurs au Japon



Remarques: Le nombre des membres en 1988 se trouve dans les parenthèses. Les membres sont soit les pêcheurs, soit les entrepreneurs de pêches soit les syndicats régionals.

3. Constituer le syndicats des patrons-pêcheurs

(1) Les promoteurs

Le syndicats des patrons-pêcheurs doit avoir comme les promoteurs les pêcheurs, parce que c'est une organisation formée par la bonne volonté des pêcheurs, et pour leurs secours mutuels.

Mais, comme tous n'ont pas la bonne volonté, le pays et les communes doivent encourager les pêcheurs. Il est desirable d'avoir comme les promoteurs les gens qui exercent la profession de pêcheur. Et, quant á leur nombre, s'ils ne sont que deux ou trois, ils ne peuvent former qu'un trop petit syndicat qui ne peut pas fonctionner. Et, on ne peut pas constituer avec facilité un syndicat qui doit avoir plus de 100 promoteurs.

Au Japon, on peut constituer un syndicat des patrons-pêcheurs avec 20 pêcheurs qui consacrent plus de 90 jours l'an à la pêche. Un syndicat professional des patros-pêcheurs doit avoir plus de 15 pêcheurs.

(2) Les formalités pour constituer un syndicat des patrons-pêcheurs au Japon.

Chaque promoteur doit participer à faire le prospectus qui concerne les activités de syndicat, la region qu'il comprend, les qualités pour être membre. Ensuite, on annonce le jour et l'endroit de la réunion préparative, et le prospectus.

On doit tenir cette reunion plus de deux semaine après l'annonce. Les pêcheurs qui consentent au prospectus s'assemblent et tiennent la reunion preparative, elisent la comité pour faire rédiger les articles d'association. La comité doit se composer plus de 20 personnes. 15 personnes suffisent pour le syndicat professionnel.

Les articles d'association déterminent les regions que le syndicat comprend, les qualités pour être membre, de diverse activités, les finances. On ne doit admettre pour les membres réguliers, que les personne qui consacrent de 90 à 120 jours l'an a la pêche.

Ensuite, pour convoquer l'assemblée générale à l'occasion d'inauguration, on annonce les articles d'association le jour, l'heure et l'endroit de l'assemblée générale. Elle doit être convoquée au moins plus de deux semaine après l'annonce.

A l'assemblée générale, on approuve les articles d'association fait les projets des activités de syndicat, élit les commissaires, discute les moyens de ramasser les fonds, établit le budget, rédige les statuts, fixe le taux d'intérêt le plus élevé de prêt, la somme d'emprunt, décide les impôt, l'obtention de droit de pêche, les régles d'usage de droit de pêche.

On adopte les résolutions avec des suffrages des deux tiers des assistants quand plus de la moitié des personnes qui ont fait savoir leur consentement à la constitution de syndicat aux promoteurs, jusqu'au jour de l'assemblée générale, sont présents.

Après l'assemblée générale, on demande l'autorisation de la constitution de syndicat en présentant les articles d'association, et les plans des activités de syndicat.

La préfecture, c'est-à-dire le préfet donne l'autorisation dans deux mois, si on a rempli toutes les formalités.

Des l'obtention de l'autorisation, les promoteurs étant inscrits, le syndicat est constitué officiellement.

(3) Ramasser des fonds

Le syndicat doit avoir des fonds pour ses activités économique, et pour le credit de la société. Ayant le devoir de fournir des fonds au syndicat, chaque membre doit acheter au moins un titre

d'obligation. Pour que tous les membres puissent acheter les titres d'obligation, on doit les vendre à un prix modéré.

Car, le prix trop élevé ne permet qu'aux riches d'être membres. On est obligé d'acheter un titre, mais, on est libre d'en acheter plus d'un. Un titre donne droit à un dividende, quant au droit de vote, chaque membre n'a qu'un vote. Il n'a rien à voir avec le nombre possédé des titres.

II. On Présente quelquee-unes des activités de syndicat des patrons-pécheurs

1. L'épargne et le crédit

(1) L'épargne

Le syndicat des patrons-pêcheurs reçoit une caisse d'épargne pour le profit des syndiqués et en faire la base de crédit. Il y a le dépot en comptes courantes, le dépot d'épargne, et le dépot à échéance fixe.

Avec leurs revenus précaires et leur vie irrégulière, les pêcheurs ne pensent guère a l'épargne. Pour cela, le syndicat doit lancer la campagne pour les encourager à épargner.

Au Japon, les ventes faites par les syndicats servent à accroître les économies de leurs membres. Parce que le syndicat distribue des bénéfices de la vente de la pêche en déposant la somme à la caisse d'épargne, il leur conseille de ne pas retirer de l'argent dont ils n'ont pas besoin, et de placer une part de la somme comme le dépot à echeance fixe. Et, dans le syndicat il y a l'organisation des femmes de pêcheurs. Elle lance des campagnes pour propager l'économie et l'épargne. Elles ont abouti a un bon résultat.

On dépose cet argent au Credit Préfectoral de la Fédération des Associations Coopératives des Pêcheurs qui est l'organisme superieure du crédit des syndicats.

(2) Le prét

Le syndicat prête de l'argent aux membres comme les fonds des entreprises, ou pour leurs dépense personnels.

Les syndiqués peuvent emprunter de l'argent aux Finance de l'Agriculture et la Forestière et la Pêche, ou recevoir une subvention de l'Etat par l'intermédiaire du Crédit Préfectoral

de la Fédération des Associations Coopératives des Pêcheurs, quand ils veulent construire de nouveaux bateaux, acheter les instruments moderns, construire les maisons.

Il faut prendre les renseignements sur des entreprises du syndiqué pour savoir la nécessité et la somme convenable de prêt.

Et, il faut prêter de l'argent impartialement aux syndiqués qu'il n'y aie les gens qui empruntent beaucoup plus d'argent que les autres.

Le syndicat doit exercer un contrôle sur les prêt pour que la somme prêtée ne dépasse pas celle déposée à la caisse d'épargne. Pour ne pas manquer de faire rentrer ses fonds, le syndicat peut faire rembourser la dette a un syndiqué en prélevant une petite somme à l'argent gagné par la vente avant qu'il y touche.

2. L'achat

On achète en bloc les matieres nécessaires a la pêche et les nécessités de la vie pour fournir les syndiqués des marchandises de bonne qualité à bas prix.

Comme des matières et les instruments de la pêche, le syndicat traite les choses qu'on consomme: le pétrole, les filets de péche, les engins de pêche, les embalages. Parmi ces choses, le pétrole est le plus important. La Fédération Nationale des Associations Coopérative des Pêcheurs achète le pétrole directement aux pays qui en produisent, en fournit La Fédération Préfectorale des Associations des Pêcheurs qui en fournit tous les syndicats de cette préfecture.

Le syndicat des patrons-pêcheurs construit les reservoir de pétrole auprès des ports de pêche pour répondre au besoin des syndiqués.

Il y a quelques syndicats qui traitent les articles nécessaires pour la vie quotidienne ouvrent les supermarchés.
Habituellement, les syndiqués achètent les articles à crédit, le syndicat doit prendre garde qu'il ne renboursent de l'argent qu'ils doivent.

3. La vente

(1) L'intention et la tâche

Le syndicat rassemble les pêches de tous les syndiqués et les vend sous son contrôle, ayant l'intention d'empêcher que les marchands ne les achètent à un prix trop bas, et de les leur faire acheter à un prix convenable. En outre, il exerce un contrôle sur la qualité des produits de la mer, pour fournir les consommateurs des poissons de bonne qualité.

(2) Les ventes au marché de gros

Le syndicat ouvre le marché de gros et vend les pêches que les syndiqués lui consignent, comme le marchand en gros. Les acheteurs sont les marchands qui achètent du poisson destiné à être vendu au loin, ceux qui en achètent pour en faire des conserves, en fumer, en saler, et ceux qui en achètent pour en vendre dans les environs. On vend du poisson frais, et des crustacés à l'enchère ou par l'adjudication.

Le syndicat prélève 4 ou 5 pour cent sur la somme gagnée par la vente comme la commission. Tous les jours à l'heure fixe, on vend les pêches, quand les syndiqués débarquent leurs pêches.

Quant à les syndicats qui ne peuvent rassembler que peu de pêches et peu d'acheteurs, ils envoient les pêches aux grands marchés de gros des syndicats voisins.

(3) Les ventes en gros qui se fait hors des marchés de gros

Certains produits de la mer, comme les alques comestible séchés, les sardines séchées sont ramassés par le syndicat pour être expédiés aux marchés de gros de l'Union Préfectorale des Syndicats des Patrons-Pêcheurs, et vendus aux marchands en gros par adjudication.

(4) Congeler des poissons, en mettre en boîte, et en vendre

Le syndicat construit les réfrigérateurs et les usines pour congeler des poissons, ou en mettre en boîte.

(5) On vend directement aux consommateurs. Il y a la liaison entre les syndicats.

Quand le syndicat vend directement du poisson frais, les conserve, les algues comestibles séchées aux consommateurs, il peut trouver facilement les acheteurs par l'intermédiaire des coopératives de consommation et des coopératives agricoles.

4. La protection des ressources maritimes

(1) La sauvegarde de l'environnement des pêcheries

Dans ces dernière années, les mers (c'est-à-dire les pêcheries) sont salies par les remblais de mers, l'eau sale qui coule des usines, l'eau d'egout, des immondices. Le syndicat des patrons-pêcheurs doit l'empêcher en exerçant la surveillance active. Et, il doit défendre aux pêcheurs de jeter les vieux filets et les engins de pêche à la mer, leur recommander de ramasser les immodices.

Et, il doit surveiller les cultivateurs pour qu'ils ne dépassent pas la quantité déterminée de droque, quand ils l'administrent aux poissons pour accélérer leur croissance. Il leur conseille aussi de n'en user.

Il y a les forêts réservés au poisson qui servent bien à la sauvegarde de l'environnement des pêcheries. Pour cela, il est important d'interdire l'abattage des arbres sans retenue, et de conserver ces forêts en les boisant.

(2) Conserver et augmenter les ressources maritimes

C'est une tâche très important de syndicat d'aleviner les mers, et protéger les alevins. On fait les projets d'élever les alevins, les petits de coquillages et de crustacés, de les lâcher à la mer, de les protéger jusqu'à ce qu'ils soient grands.

Au Japon, 12 Centres Nationales de la Restauration des Ressources Maritimes sont constitués sur l'initiative de gouvernement. Et, toutes les préfectures qui se trouvent au littoral ont leurs Centres Préfectorales de la Restauration des Ressources Maritimes. On fait des recherches dans ces Centres sur les procédés d'élever une quantité de petits de poissons qui se vendent chers, comme ceux de langousts, ceux de daurades, ceux de saumons, ceux de truites saumonées. Les syndicats des patrons-pêcheurs achètent ces alevins à ces Centres à bas prix,

empoissonent les mers, ou les élevent dans la mer entourée de filets jusqu'à ce qu'ils soient grands, et les lâchent à la mer. Les pêcheurs ont décidé de proteger les alevins.

(3) L'exploitation des ressources

Le syndicat doit surveiller les pêcheurs, pour qu'ils ne pêchent pas trop de poissons avec les méthodes interdits, et par la concurrence. Le syndicat doit prendre mesures pour l'empêcher. Sur l'initiative de pêcheurs, les règles d'usage des droits de pêche sont établis. Ils déterminent selon les espèces de poissons pêchés, les pêcheries, la saison de pêche, des jours et des heures de pêche, les procédés de pêche, les engins de pêche, et la grandeur de poisson pêché.

En outre, il y a quelques syndicats où il y a un pool de pêcheurs, les syndiqués qui font la pêche de la même espèce font les pêches collectives, ils prennent deux jours de congés par semaine, ils limitent la quantité de poisson pêché, chaque syndiqué a les poisson pêchés en partage.

(4) Les plans régionales de la pêche

On a fait ces plans régionals de la pêche, pour exploiter des ressources maritimes, pour la sauvegarde de l'environnement de pêcheries et pour augmenter et protéger les ressources maritimes. Avec cela, on peut vendre les produits de la mer de bonne qualité au prix élevé, par consequent, le niveau de vie des pêcheurs sera élevé.

Chaque syndicat fait ces projets qui dureent ordinairement 5 ans, en suivant ces procédés.

1) On examine les situations

A. On fait la moyen de ressources des pêcheurs en consultant les grands-livres de pêche.

B. On sait les problèmes de pêche qu'il y a dans cette région en effectuant une enquête sur les problèmes de pêche.

2) On fixe le chiffre des revenus idéals

Ces revenus idéals permettent à un pêcheur de vivre à son aise.

3) Les plans d'amélioration de pêches. (Pour que le chiffle des revenus atteigne à celui des revenus idéals.)

On dresse les plans de la sauvegarde de l'environnement de pêcheries, de l'augmentation et la protection des ressources maritimes, l'amélioration des procédés de fablication des produits alimentaires faits de poisson, l'élargissement des ventes.

5. D'autre activités de syndicat

(1) Les travaux de service pour les facultés communes

Le syndicat construit les ports de livraison, les bassins de radoub, les dépôt des instruments de pêche, les réfrigérateurs, les glacières, les réservoirs pour que les syndiqués en usent.

(2) Les pêches que le syndicat dirige

Le syndicat aussi entreprend les pêches. Il dirige les grandes pêches, et les pêches qu'on ne pratique qu'en monopolisant les pêcheries.

Au Japon, le syndicat administre beaucoup de pêches, surtout les pêche au filet fixe. Les pêcheurs qui participent à la pêche doivent être les syndiqués, et on leur assure qu'ils soient bien rémunérés. Une part de bénéfices sera déposée à la caisse d'épargne, l'autre sera partagée entre ces pêcheurs.

(3) L'assurance mutuelle

Il y a trois systèmes d'assurance pour la protection des activités et de la vie des pêcheurs, dont deux concernent la pêche: il y a l'assurance de la pêche qui a pour la base les lois de dédommagement des accidents pendant la pêche, et l'assurance sur les bateaux de pêche. La troisième, pour la protection de la vie de pêcheurs, l'assurance mutuelle de syndicat des patrons-pêcheurs qui a pour la base les lois de association coopérative des pêcheurs.

L'assurance de pêche et l'assurance sur les bateaux de pêche sont crées par le qouvernement pour protéger les pêcheurs, et ont comme assureur le gouvernement.

L'assurance mutuelle de syndicat des patrons-pêcheurs est administrée comme les vente et le crédit de syndicat, est considérée comme assurance coopérative internationalement.

- Le système de l'assurance de syndicat des patrons-pêcheurs -

Il y a de divers types d'assurances

1) Assurance ordinaire
2) Assurance maritime
3) Assurance contre l'incendie
4) Assurance générale
5) Assurance contre la viellesse
6) Assurance sur le crédit de l'organisation
7) Assurance automobile

(4) L'education

Les syndiqués se reunissent et se donnent des conseils pour améliorer les procédés de pêches, et pour rationaliser les affaires.

Et, il y a les cours élémentaire de l'administration organisées par l'Union Préféctorale des Syndicats des Patrons-Pêcheurs, pour les commissaires de syndicats.

L'organisation des jeunes fait des recherches pour inventer les nouveaux procédés de pêche, et les améliorer.

L'organisation des femmes a aussi ses activités. Dans les dernière années, elle lance une campagne pour défendre d'user de détergent qui contient du phosphore qui salit la mer.

III. L'administration du syndicat des patrons-pêcheurs

1. Les principes

Premièrement, on doit administrer le syndicat des patrons-pêcheurs avec les principes démocratiques. Il faut que tous les syndiqués puissent tirer les bénéfices des activités du syndicat. Pour cela, ils doivent avoir le lieu où ils se réunissent, et discutent démocratiquement. Quand le syndicat entreprend quelques choses, les syndiqués doivent bien discuter sur ces choses, et après cela, y consentir.

Secondement, les activités du syndicat doivent avoir pour le but l'amélioration de la vie des syndiqués. Par exemple, quand il achète les articles, il doit tâcher à les acheter de bonne qualité à bas prix. Et, quand il ramasse et vend les pêches des syndiqués, il doit tâcher à les vendre au prix le plus avantageux. Le syndicat doit agrandir les activités. Par exemple, il augmente la production de conserves de produits de la mer, il agrandit les vente directes aux consommateurs.

Troisièmement, le syndicat doit penser à ses intérêts en servant les syndiqués, étant l'organisation dont les activités sont économiques. On doit le diriger en prenant garde de ne pas avoir un déficit dans le budget, tâcher que les bénéfices dépasse les dépenses, et les distribuer aux syndiqués.

2. L'assemblée générale

L'assemblée générale décide toutes les choses qui concernent le syndicat. On convoque l'assemblée générale ordinaire une fois par an, l'assemblée générales extraordinaire, quand il y a quelques problèmes à résourdre.

Dans l'assemblée générale ordinarire, on présente les rapports sur les activités du syndicat, le bilan de liquidation, et les fait reconnaître aux syndiqués.

On peut tenir l'assemblée générale avec l'assisttance de plus de la moitié des syndiqués. Et, elle décide une résolution avec des suffrages de plus de la moitié des assistants. Mais on ne décide quelques résolutions graves comme la modification des statuts, la dissolution du syndicat, la fusion des syndicats, l'expulsion d'un syndiqué, la modification des règles d'usage de droits de pêche, qu'avec suffrages de plus de deux tiers des assistants.

3. Les commissaires

(1) Les administrateurs

Les administrateurs représententnt le syndicat des patrons pêcheurs, et l'administrent. Chaque syndicat doit avoir plus de 5 administrateurs qui élisent le président, qui est le chef du syndicat.

Ordinairement, ils sont désignés par la voie des suffrages, ou par la décision de l'assemblée générale, dans le cas particulier désignés par les statuts du syndicat. On les élit par le vote secret et uninominal. Le service d'un administrateur dure moin de trois ans.

(2) Les secrétaires

Le secrétariat est un bureau très important qui surveille les finances du syndicat et les travaux des administrateurs. Il se compose de plus de 2 secrétaires permanants. On les élit comme on élit les administrateurs. Et, ils ont la même durée de service que les administrateurs.

(3) Le conseil et la comptabilité

Le conseil et la comptabilité sont les bureaux qui aident les administrateurs dans l'administration. Les conseillers et les comptables ont les positions sociales très élevés. Surtout, les conseillers représentent le syndicat exerçant la fonction de gérant. Ils sont nommés et destitués avec des suffrages de la majorité des administrateurs.

4. La structure du syndicat des patrons-pêcheurs

(1) Le comité qui surveille l'usage des droits de pêche

Le comité surveille l'usage des droits de pêche, règle les conflits des pêcheurs. Il est facultatif et a le droit de proposition, quand on modifie les règlements. Il est chargé par les administrateurs, à la recommandation des syndiqués.

(2) L'assemblée des pêcheurs qui pratiquent la pêche de la même espèce.

Elle est tenue par des pêcheurs qui pratiquent la pêche de la même espèce, et qui appartiennent au même syndicat. Les pêcheurs discutent les problèmes qui concernent leurs activités. Ils étudient les mesures à prendre pour exploiter les ressources maritimes, et, font des projets des pêches.

(3) L'assemblée régionale des syndiqués

Quand le syndicat comprend une vaste étendue de terre, et les habitations de syndiqués se distancent, les syndiqués d'une région tiennent l'assemblée regionale pour discuter les décisions de l'assemblée générale du syndicat.

(4) L'organisation des jeunes

C'est une organisation des syndiqués et de leurs fils qui exercent la profession de pêcheurs, et qui ont moins de 30 ou 40 ans. Elle inventent les nouveaux procédés de pêche, les amèliore, et fait les divers projets des activités du syndicat. Il y a les unions régionales des organisations des jeunes qui sont sous l'union nationale des organisations des jeunes.

(5) L'organisation des femmes

C'est une organisation des femmes et des filles des syndiqués. L'organisation des femmes lance les compagnes comme celle de

protection de l'environnement des pêcheries et celle de propager l'économie. Dans ces dernières années, elle commercialise les nouveaux articles alimentaires faits de poisson, fait de la propagande qui a le but de conseiller aux gens de manger beaucoup de poisson. Il y a, comme l'organisaion des jeunes, les unions régionales des organisations des femmes, et l'union nationale des organisations des femmes.

5. Le personnel du syndicat

Le syndicat doit avoir le personnel qui satisfait les besoin. Le nombre de personnel doit être fixé par l'étendue des activités de ce syndicat. Et il doit employer les gens qui reconnaissent l'importance de syndicalisme, et les former pour enrichir leurs connaissances.

Dans les dernière années, le syndicat emploie les personnes cultivés qui ont la baccalauréat, et les ingénieurs experts. Mais comme ils sont mal payés, le syndicat doit tâcher de les mieux payer.

(漁具漁法　仏語テキスト)

Généralités sur la fabrication des filets de pêche

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1- Condition de base pour la fabrication des filets de pêche

(1) Détermination de l'espèce de poisson ciblé
(2) Détermination du fond marin
(3) Opérations de pêche de base : comment attrapper les différentes espèces
(4) Détermination du matériel de pêche et son utilisation adéquate pour attrapper l'espèce de poisson ciblée
(5) Considération et détermination des courants, vagues, etc. comme des forces extérieures qui affectent les filets de pêche
(6) Détermination de la résistance physique des filets de pêche
(7) Etude de l'efficacité durant les opérations de pêche
(8) Durabilité des filets de pêche
(9) Sélection de matériel de pêche bon marché
(10) Utilisation du matériel de pêche disponible localement

2- Caractéristiques du comportement du poisson en la présence de filets

(1) En général, les bancs de poissons changent la direction dans laquelle ils nagent quand ils rencontrent le filet afin de longer le filet dans les directions verticales et horizontales.
(2) Les bancs de poissons sont sensibles à la lumière, au son, aux formes, aux mouvements et aux odeurs.
(3) Dans le cas des côtes peu profondes, le banc de poissons tente de s'enfuir vers des eaux plus profondes en cas de danger. Certaines espèces de poissons se cachent dans les bancs de rochers, cavitations et autre. ,
(4) Les bancs de poissons nagent dans une certaine direction, menés par un poisson leader.

3- Condition sociales et physiques

Conditions physiques
1-Distribution
2-Stimulation
3-Opérations de pêche
4-Type et forme

Conditions sociales 1-Conditions économiques
2-Situation politique

4- Methodes et matériel de pêche

a) Méthodes pour trouver un banc de poissons

(1) Méthodes directes pour trouver un banc de poissons:
* changement à la surface de la mer
* comportement des oiseaux de mer
* ?
* détecteur de poisson et autres appareils
* essai d'opérations de pêche

(2) Méthodes indirectes pour trouver un banc de poissons
*estimation de la réserve de poissons en considérant les paramètres liés à l'environnement et l'écologie des espèces de poissons ciblées
*estimation par expérience, saisons et résultats connus dans le passé
*estimation selon l'état de la mer ou suivant les informations d'autres pêcheurs

b) Méthodes pour rassembler le poisson

(1) rassembler le poisson en utilisant le comportement du poisson ainsi que ses caractéristiques naturelles
(2) rassembler le poisson en l'effrayant
(3) rassembler le poisson en utilisant de la lumière, le son
(4) guider le banc de poissons dans un certain endroit en interférant sur sa trajectoire

c) Méthodes de pêche

(1) Filets de pêche : peigne (gill net), chalut (trawl net), seine (purse seine), piège (trap net), à lever (lift net), à jeter (casting net)
(2) Pêche à la ligne : ligne longue, ligne longue et verticale, ligne à cuillère, ligne à la main, perche et ligne
(3) Autres : trident, harpon, ?

5- Fabrication des filets de pêche

Lorsque l'on conçoit et fabrique les filets de pêche, il est important de préparer la maille, les cordes, flotteurs et plombs nécessaires ainsi que de penser à leur arrangements, formes et quantité.

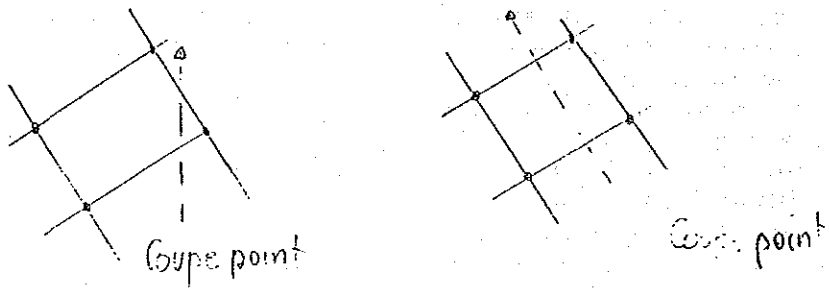
Tout spécialement, la connaissance et habilité du maniement des filets lors de la fabrication telle que la coupe, le collage afin d'obtenir une forme spéciale de chaque partie est indispensable.

(1) Les noeuds

Le noeud est réalisé en tendant une piece de filet dans les directions verticales et horizontales. l'uniformité des mailles en taille est également vérifiée durant le process. De nos jours cependant, ce travail est réalisé en usine.

(2) Coupe point et barre

Quand on coupe une pièce de filet horizontalement ou verticalement, on coupe répetivement les deux jambes d'un noeud. Cette coupe s'appelle coupe de point. Une autre méthode consiste à couper une jambe d'un point. Elle est appellée coupe de bar.



(3) Laçage et collage

Laçage

Lorsque une longueur ou profondeur supplémentaire est requise pour une pièce de filet, une autre piéce est ajoutée en faisant des demi-mailles avec le même entrelacement que le filet jumeau. Ceci est appellé un laçage.

Collage

Quand le laçage est difficile dû à la petite taille de la maille ou lorsque les pièces de filet n'ont pas la même

maille, ils sont joints par collage. Pour le collage, on utilise un entrelacement simple de double épaisseur ou un entrelacement double de même épaisseur.

(4) Bords du filet

Les bords du filet doivent être renforcés en les doublant avec le même matériel utilisé pour l'entrelacement du filet.

Les bords verticaux sont aussi renforcés de la même manière en ajoutant une rangée de demi-mailles.

(5) Selvage(?)

Quand une ligne de flotteurs et une ligne de plombs sont attachées au filet, les bords horizontaux du filet devraient tout d'abord être renforcés. Dans ce but, des filets de bordure sont préparés et utilisés entre la partie principale du filet et la ligne de flotteur ou la ligne de plomb.

L'entrelacement de la bordure du filet est généralement deux á trois fois plus épais que celui du filet principal. La taille de la maille est un peu plus petite que celle du filet principal. Sa profondeur est de 5 á 10 mailles. Cette bordure de filet est appellée selvage(?).

(6) Racourcissement

Quand le filet est attaché aux structures ou aux lignes, il devrait être plus long que celles-ci afin d'avoir un certain relachement. La longueur en excès exprimée comme un pourcentage de la longueur du filet tendu est appellée la tenture.

$$\text{Tenture}(\%) = \frac{L(\text{longueur du filet tendu}) - L(\text{longueur de la ligne})}{L(\text{longueur du filet tendu})}$$

La taille de la maille est grandement influencée par le ratio de la tenture.

La table suivante exprime les données théoriques de la hauteur des mailles pour différents ratio de la tenture du filet.

Tenture (%)	10	20	30	40	50	60	70	80	90
Hauteur des mailles (%)	44	69	71	80	86	92	95	98	99

Par example, quand le ratio de la tenture est de 40% pour un filet dont la taille de la maille est de 5cm et la profondeur est de 100 mailles, la profondeur du filet sera :
(5cm * 100) * 80/100 = 400 cm soit 4 mètres.

$$\text{Longueur de la corde} = L * \left(1 - \frac{T\ (\%)}{100}\right)$$

$$\text{Longueur du filet} = l - \left(1 - \frac{T\ (\%)}{100}\right)$$

$$\text{Profondeur du filet} = \left(\text{profondeur filet tendu} * \frac{\text{hauteur maille}\ (\%)}{100}\right)$$

L : longueur du filet tendu
l : longueur de la corde (corde de flotteurs ou de plombs)
T : tenture du filet

(7) Cutting

Couper une barre d'un point est appellé "B" et couper deux barres d"un point est appellé "P". Dans le cas d'une coupe inclinée dans une section dont les bords horizontaux et verticaux ont le même nombre de mailles, la répétition de la coupe "B" seulement est adoptée.

Si les deux bords ne n'ont pas la même maille, le nombre de coupes "P" equivalent à la différence doit être ajouté.

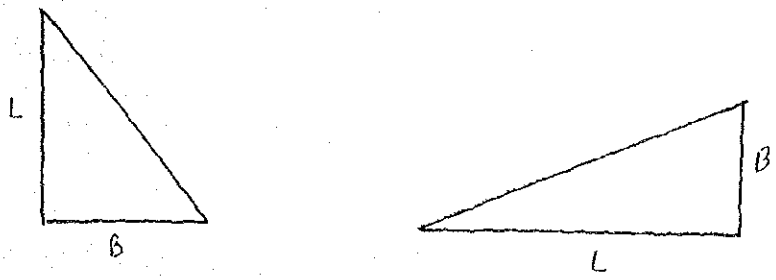
Le nombre de coupes "B" nécessaires pour la coupe inclinée est toujours le double du nombre de mailles du coté le plus court.

Toute inclinaison peut-être obtenue, ou en d'autre mots, toute forme triangulaire peut être taillée en choisissant un nombre approprié de coupe "B" et "P".

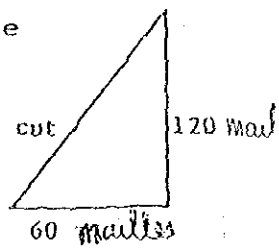
On peut le formuler par :

$$P = L - B \qquad b = B * 2$$

P : nombre nécessaire de coupes "P"
b : nombre nécessaire de coupes "B"
L : nombre de mailles du plus long bord
B : nombre de mailles du plus court bord



Par exemple, si une section triangulaire comme celle illustrée est requise :

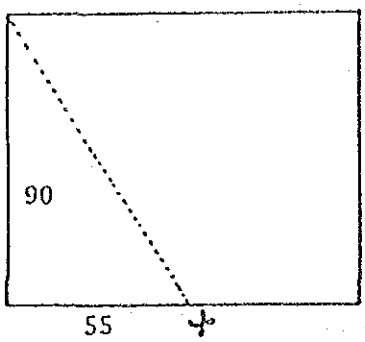


Nombre de coupes P : 120 - 60 = 60
et
Nombre de coupes b : 60 * 2 = 120

Donc il faut une coupe de type 1P2b.

On répète donc soixante fois (pbb),(Pbb)... et on obtiendra la section requise. Il est recommandable d'adopter la méthode suivante :

exemple 1



P = 90 - 55 = 35

b = 55 x 2 = 110

3 ..... (3 + 1)

35) 110
105
5

(35 - 5)

Ⓐ P = 1] 30 fois
b = 3

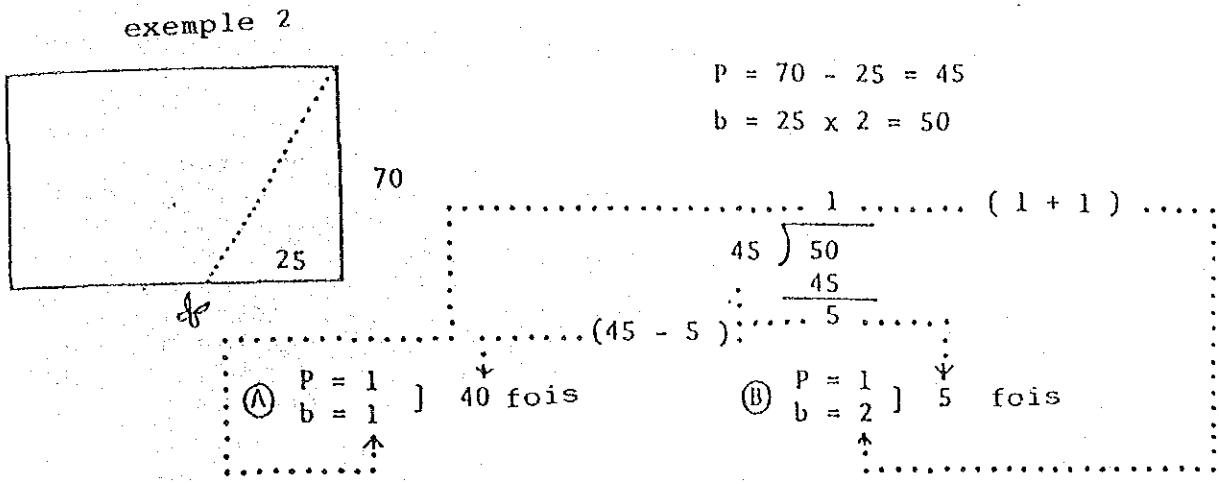
Ⓑ P = 1] 5 fois
b = 4

opération inverse

Ⓐ P = 1 x 30 = 30
b = 3 x 30 = 90

Ⓑ P = 1 x 5 = 5
b = 4 x 5 = 20

Ⓐ + Ⓑ P = 30 + 5 = 35
b = 90 + 20 = 110



6- Filet de type peigne (gill net)

(1) Généralité sur la pêche avec filet peigne

Les filets peigne sont placés verticalement dans la zone où nagent le type de poisson ciblé.

Ils sont généralement utilisé pour attrapper la sardine, le maquereau, etc. dont la forme est presque uniforme.

Cependant, les filets peigne pour empêtrer le poisson sont utilisés pour attrapper les poissons de large taille tels que le requin, le maquereau espagnol etc. qui percutent le filet avec une grande force. Ils sont également utilisés pour attrapper les poissons de forme irrégulière tels que le poisson plat, le crabe, la crevette rouge, la langouste, etc.

La structure du filet peigne est très simple. C'est un simple mur de filets qui comprend plusieurs couche de filets joints.

Ce filet a des flotteurs ainsi que des plombs pour lui permettre de se déployer verticalement quand il est submergé dans l'eau.

Les filets demi-tramail sont assez similaires aux filets peigne de fond et sont aussi utilisés dans les eaux cotières.

La profondeur du filet est déterminée selon la densité du banc de poisson et la profondeur de la zone où se trouvent les poissons. La facilité de maniement du filet est aussi prise en compte.

(2) Classification des filets peigne

a- Filets peigne de surface

Ce matériel est utilisé pour attrapper le poisson qui nage à la surface de l'eau. Soit une ou les deux terminaisons du filet sont ancrées afin d'empêcher le filet de dériver à cause des courants ou vents durant les opérations.

Comme le filet est fermement attaché, il n'est pas déformé par les effets du courants ou des vents. Au Japon, les filets peignes flotteurs (floating gill nets) sont très utilisés pour attrapper sardines, maquereaux et poisson- volants.

b-filet peigne de fond (bottom gill net)

Quand le matériel est disposé au fond de la mer avec l'aide d'ancres, les flotteurs sont submergés dans l'eau. De ce fait le poids du filet plus celui des plombs est trop grand pour compenser la poussée d'archimède due au flotteurs. Cependant les flotteurs permettent au filet d'avoir un certain relachement vertical.

Il y a plusieurs type de filet peigne de fond incluant le filet tramail pour attrapper des espèces telles que le amquereau batârd, la morue, le crabe la muge,etc.

c-Filet peigne à dérive (drift gil net)

Le filet peigne à dérive n'est pas ancré mais libre de dériver à la merci des vents et des courants. Ils sont utilisés à la surface de l'eau ou à demi imergés.

Comme le matériel n'est pas ancré, les zones pêchées sont considérablement augmentées. Il est possible de disposer le filet en chassant un banc de poissons. Les filets peignes de fond sont quelques fois utilisés en eau cotière. Parmis ces derniers, les filets à langoustes sont les plus populaires.

d-Filets peignes à encerclement

Quand un banc de poisson est repéré, le filet est envoyé dans l'eau de telle façon qu'il entoure le banc de poissons.
Les poissons sont dirigés contre le filet en frappant le bord des bateaux avec des pieces de bois ou en envoyant des pierres à la surface de l'eau.

Le poisson encerclé tente de s'échapper du filet et s'enchevêtre alors dans le filet. D'autres filets sont installés dans la zone du filet piegeur afin de prendre les poissons déjà entourés par le filet.

Ce matériel est généralement utilisé durant le jour. Les