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of the
Marine Fishing Technology

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Southeast Asian Fisheries Development Center

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Contents

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Marine Fishing Technology
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BOTTOM VERTICAL LONGLINE

By : Mr. Romeo C. Makinano
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I. Introduction

It is a well known fact to the fisherman that fish distribution, especially demersal fishes, are considerably affected by the depth of water and the sea bottom topography and condition. In places where there are banks or shoals, standing like a mountain in the ocean floor, and in the littoral zone, these areas are considered rich in organisms. With the advent of high-tech commercial fishing, government policy maker enacted laws that prohibits the operation of big commercial fishing boats within these areas. These areas, therefore, contains all the essential elements to be considered as a good fishing ground for coastal fisheries for marginal or sustenance fishermen.

Owing to its rough sea bottom fishermen sometimes have a hard time in selecting an effective fishing gear to operate in these areas without endangering its marine ecosystem. Such that, some of them resort to illegal fishing with the use of dynamite and the use of obnoxious substances like cyanide as, for them, these are the easiest way of fishing in these areas.

Most of the fishing gears used by marginal fishermen are the gill nets, fish traps and line fishing. Line fishing is mostly operated on a small scale in coastal waters, except for tuna longline, and this may be one of the reasons why there are relatively few studies made on line fisheries.

It is being hope in this report that more studies shall be conducted by the Training Department of SEAFDEC, Thailand pertaining to line fisheries particularly the bottom vertical longline.

The objectives of this report may be summarized as follows:

1. to discuss in general the construction of bottom vertical longline.
2. to describe the operation of this gear.
3. to study the catch composition of this gear.
4. to impart to the trainees the efficiency of this gear in coastal waters, shoals, banks and on continental shelf.

II. Materials and Methods

A. Construction of the Fishing Gear :

The bottom vertical longline gear used in this report has a more complex structure than the other ordinary bottom longline. The main line of this gear does not touch the bottom but is suspended at some distance above it, depending on the length of the branch lines. This peculiar structure of the gear was so designed so as to overcome the usual problems encountered in the conventional or ordinary bottom longline wherein the main line or branch lines are often times get caught by rocks which may result in damage or total loss of the gear and some other operational problems like baits taken away from the hooks by bottom dwellers like crabs and starfish. If a branch line gets caught in some obstacles at the bottom, only that particular line would get damaged or lost, without risking the rest of the gear. Thus, the hooks are strategically positioned between the sea bottom and the mainline. The targetted fish of this gear are those that dwells near or at the sea bottom.

A schematic diagram of the bottom vertical longline gear is shown in Figure 1 and its specifications appear in Table 1.

The main line of this gear is made of vinylon because this material has a high specific gravity that allows the gear to sink rapidly. In this way, the effect of current on the gear is reduced. The main line is being joined to a buoy and flag by a buoy line. This buoy will serves as a marker for the location of the gear during operation. For a longer main line, additional buoys may be provided. This gear can be operated in a deeper water or shallow water by adjusting the length of the buoy line and branch lines. The diameter of the main line, vinylon, is 5.00 mm.

The branch lines are connected to the loops of the main line at regular intervals with the use of a snap. The distance of the intervals of each loops for the branch lines should be at least double or triple to the length of the branch line. Hence, if the length of the branch line is 2.5 m, the interval should be at least 5-7 m in order to avoid the branch lines to entangle themselves. At the upper end of the branch line is a float and a sinker at the lower end. The sinker ensures that the branch line touches the bottom while the buoyancy of the float will sufficiently hold or suspend the main line above the bottom as high as the length of the branch line. In this manner the main line follows the contour of the bottom without actually touching it and keep it out of reach of any potential hazards even in a fishing grounds with an uneven bottom configuration particularly where rocks, corals and other obstacles that expose the gear to damage.

The branch lines of this gear are made of monofilament nylon or polyethylene crossed twine, whichever is cheaper, with a diameter of 2.0-4.00 mm. Although, vinylon material is more favorable because of its softness and easy to coil for storage in boxes, however, it cost much than monofilament nylon or polyethylene crossed twine. Besides, its availability in the local market is another problem. In as much as branch lines usually gets damaged by some obstacles at the bottom, it is therefore advisable to use a cheaper material but with a high frictional resistance and breaking strength.

Hook lines are connected to the branch line by a knot or a two-way swivel also at regular intervals. The intervals should be at least longer than the length of the hook lines. The number of hook lines and its length varies and depends upon the density of the fish in the targetted fishing ground. Usually, vertical bottom longline has 4-8 hook lines and its length ranges from 30 cm-1.5 meters. The material for hook lines is monofilament nylon No. 30 (0 = 0.90 mm) because of its low visibility to fish and high tensile property. The branch lines are placed in a especially designed boxes made of wood and porous plastic plate with rubberized edge on the top (see Fig. 2). Four branch lines are arranged in one box separated by sheets of paper. Hooks are fixed on the foam inside the box. Before operation, the hooks are baited and hang-out of the box through the slits in the rubberized edge.

B. Operation of the Gear :

B.1 Fishing ground selection

The choice of a good fishing ground has to be made first before departure for fishing Experienced fishermen in the locality may be a good source of information in the absence of hydroacoustic and oceanographic equipments. However, the exact operation position may be dictated by the sea conditions such as: the water current prevailing, presence of other boats operating in the area and the presence of potential hazards to the gear. Studies reveal that demersal fishes are usually abundant near a shoal, at the edge of an island slope or ocean banks.

B.2 Time of operation

Should the weather condition is favorable to fishing, operation of the gear may be done during twilight of the morning (5:00 AM to 10:00 AM) or twilight of the evening (4:00 PM-7:00 PM). Fish usually tends to exhibit a feeding migration before sunrise and before sunset.

B.3 Method of baiting

Although the use of live fish like milkfish and mackerel as bait proves to be more effective, however, its availability during operation is a problem in itself. Frozen fish (mackerel, saury and sardine) and squid as bait are commonly used. Good baiting technique and good quality of bait played an important role in the catching efficiency of the gear. Poorly hooked baits will most likely fell-off from the hooks while fish are less attracted to poor bait quality. The way of baiting on hooks is shown in Figure 3.

B.4 Shooting of the gear

Shooting of the line is done at the stern part of the boat. However, for small boats of less than 3 gross tons, shooting may be done at either side of the boat. Buoy and buoy line are shoot first, then followd by cement sinker and the main line. As soon as

the shooting of the main line started, the first branch line will be joined to the loop of the mainline and released simultaneously to the water. This procedure will be repeated until all branch lines are released to the water. Thereafter the cement sinker and the finishing buoy line will also be released. Shooting of the branch lines should be done carefully to prevent the branch lines and hook lines from entangling.

B.5 Boat maneuver and speed during shooting

The speed of the boat should be kept at slow ahead about 3 knots so that shooting of the gear goes smoothly. The boat has to be stopped whenever entanglement of the branch lines and hook lines occur. If a dense fish school is observed or found below, a greater number of hooks have to be used, that is to say, shortening rate should be high. While on the other hand, if the fish school is spread widely with low density, the main line should be shot with low shortening rate to cover a wide area.

Distance between the starting buoy and finishing buoy can be calculated as follows:

$D = 30.V.T$ Where D = distance between starting buoy and finishing buoy (M)

Example :

Given : V = 2 knots V = Speed of boat (Kt)
T = 30 minutes T = Time required for shooting

$D = 30\ V.T$
$= 30 \times 2 \times 30$
$= 1{,}800$ meters

On the other hand, shortening rate (k) of the mainline is obtained from the equation:

$K = \frac{L-D}{L}$

Where L = length of main line stretched (M)

Given L = 2415 meters

D = distance between starting buoy and finishing buoy (M)

$K = \frac{L-D}{L}$

$= \frac{2,415-1,800}{2,415}$

$= .25$ or 25%

B.6 Hauling of the gear

Hauling of the gear begins at one to two hours after finished shooting. For easy hauling of the gear, a line hauler may be used. In case of a one-man boat the line hauler is set at the stern, but if there are two fishermen on board, it is set on the bow part of the boat (Figure 4). The line hauler is driven by the main engine through the countershaft. First to be hauled is the buoy line and then the mainline follows. When a branch line appeared, it has to be taken off from the main line then stored at the storing box neatly after removing the hooked fish. This process will continue until to the last branch line. Afterwhich, the last buoy and the cement sinker are hauled to the boat. It should be noted that as much as possible, the boat has to be kept directly above the branchline which is being hauled so as to remain the branch line in a vertical position and not in an oblique position. If a branch line is obliquely hauled, the tendency is, it would touch the rough bottom and the hooks might get caught by rocks. The common species of fish caught with this gear are the emperor, bream, trevally, jack fish, parrot fish, sea bass, groupers, jobfish, snapper, catfish, trigger fish, soldier fish, grunt, sea robins, lizard fish, barracuda, ray, eel, shark and remora. (see Figures 5, 6, 7 & 8)

III. Summary/Discussions

There had been several experiments conducted before to test the effectivity of this gear. Results of the experiments conducted by Messrs. Masatake Okawara and Chuichi Miyata in the waters off Kota Kinabalu, North Borneo and Vanguard Banks in the South China Sea (June, 1982) proves that this gear is very effective in catching demersal fishes and fishes that dwells near the bottom of the sea. Further studies conducted by Mr. Bundit Chokesanguan and Mr. Somboon Siriraksophon in the Andaman Sea (Jan.- Mar. 1988) using this kind of gear likewise showed an encouraging results. Table below shows the results of the experiments conducted by SEAFDEC.

SEAFDEC experiments using BVL gear, 1982-1988

Item \ Year	1982[1]	1984[2]	1984[3]	1988[4]
No. of operations	9	6	6	14
No. of hooks used	4320	4320	4104	10830
No. of fishes caught	X	154	335	938
Total Catch (kg.)	564.0	163.4	445.5	1710.9
Catch/Operation	62.7	27.2	89.1	122.2
Hooking Rate	X	3.56	8.16	8.66

1982[1] : At the Vanguard Bank and off Sabah, 13-18 June
1984[2] : In the Central Gulf of Thailand, 26-29 May
1984[3] : At the Rifleman Bank, 2-4 October
1988[4] : At Andaman Sea, 31 Jan.-2 Feb. and 1-3 Mar.

Hooking Rate = (No. of fishes caught/No. of hooks used) x 100
X = No record

It is belived that the resources of demersal fishes are abundant around the oceanic banks or island slopes and shoals. The species of fish caught with this gear that commands a high price at the market are the groupers, sea basses, coral trouts, trevally, black banded jack, snappers and breams.

The time of immersion of the gear (time difference after finished shooting and start hauling) ranges from 130 to 270 minutes based on the results of the study conducted by Mr. Bundit Chokesanguan in the Andaman Sea.

It is our intention that this gear will be hopefully practiced or used by the margiral fishermen in the countries of Southeast Asian Region. However, in order to make this gear more adaptable in each country in the region, modifications may be made to suit the gear to the conditions or circumstances prevailing in their respective localities like the size of boat, facilities on board, depth of fishing ground, bottom topography and others.

IV. Acknowledgements

The proponents of this study report wishes to acknowledge and thanks the support extended to us by the following SEAFDEC Training Department staff in the realization of this report.

1. Mr. Bundit Chokesanguan
2. Ms. Vanusakorn Pongtrakul
3. Mr. Worawit Wanchana
4. Mr. Prasert Masthawee
5. Mr. Vitoon Tanasarnsakorn

Also, our appreciation to the staff of the Secretarial Services who made the typing of this report.

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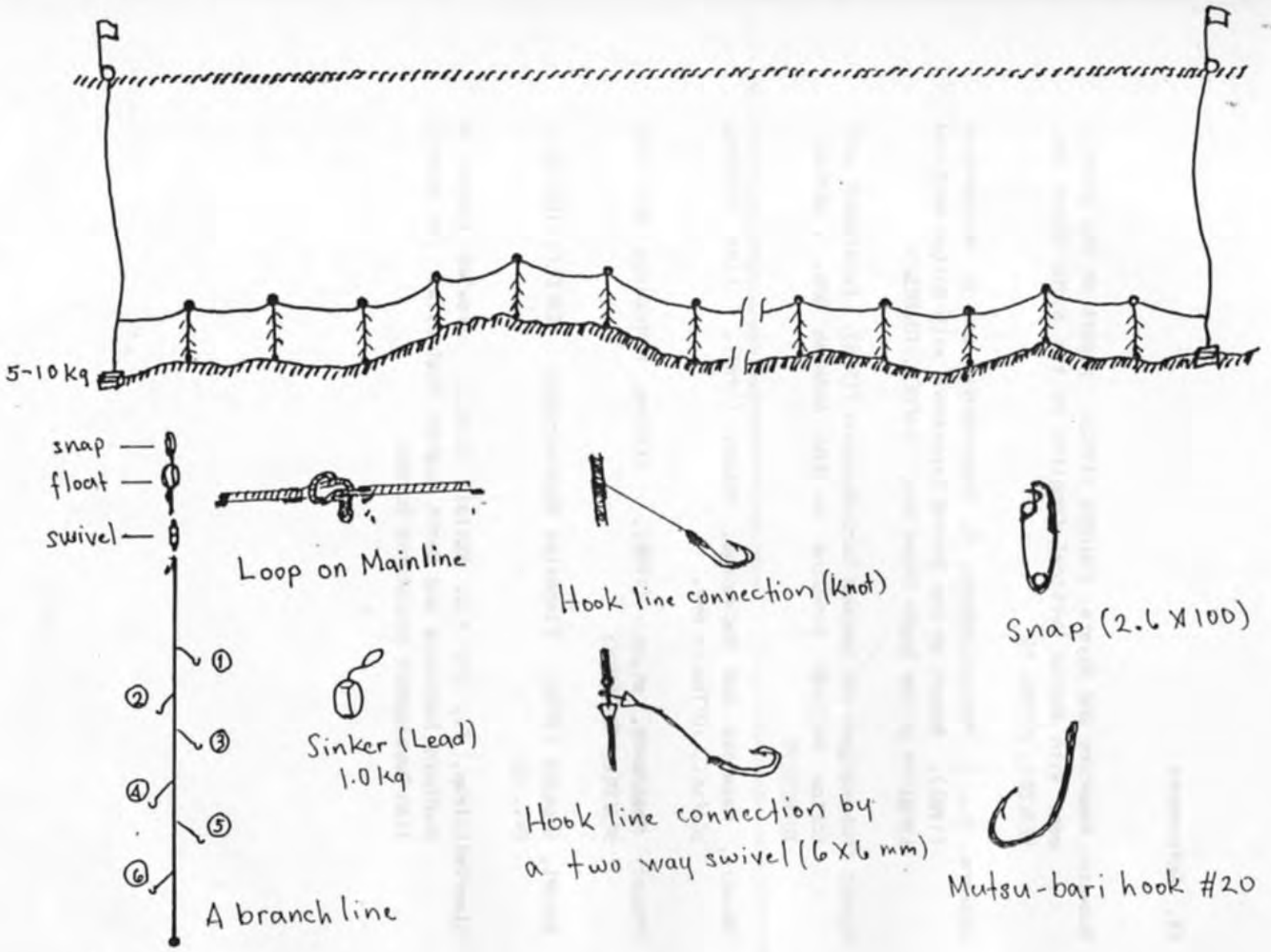
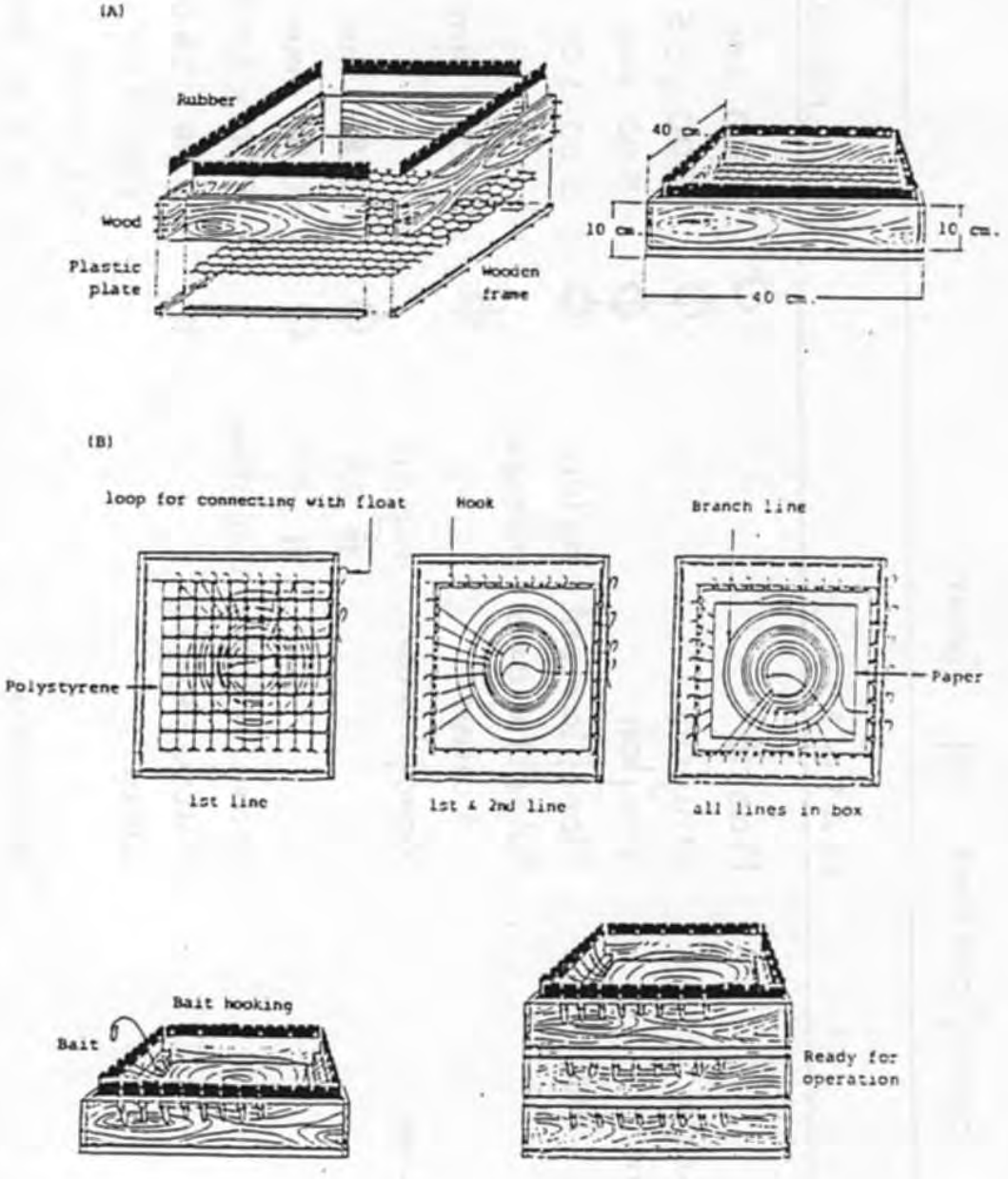


Figure 1

Bottom Vertical Longline Gear

Table 1. Specifications of Gear

NAME	MATERIAL		DIMENSION
Buoy	Plastic	ϕ	18.00 cm.
Buoy Rope	Vinylon	ϕ	5.00 ; 5.5 mm.
Main Line	Vinylon	ϕ	5.00 mm.
Branch Line	Monofilament nylon	ϕ	2.00 - 3.00 mm.
	Polyethylene crossed twine	ϕ	4.00 mm.
Hook Line	Monofilament nylon		
	# 26	ϕ	0.84 mm.
	# 30	ϕ	0.90 mm.
Float	Foam Rubber oval shape		8.00 x 12.00 cm.
Hook	Mutsu-bari	#	20.00 ; 26.00
Sinker	Lead		1.00 - 1.50 kg.
Snap			2.6 x 100
Swivel	Two way		6 x 6 mm



(A) Box for storing of branch lines

(B) Arrangement of lines in the box

Method of Baiting

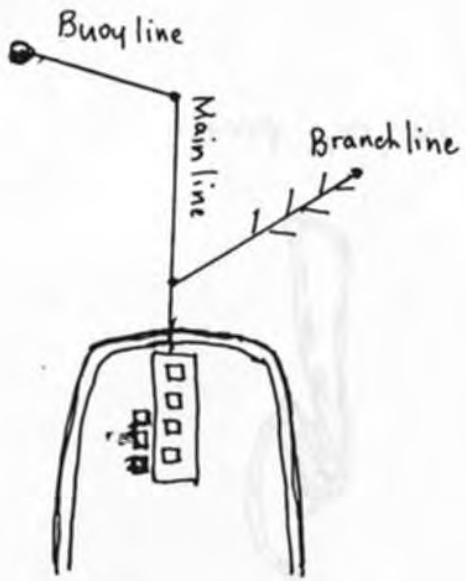
Fish as bait

Squid as bait

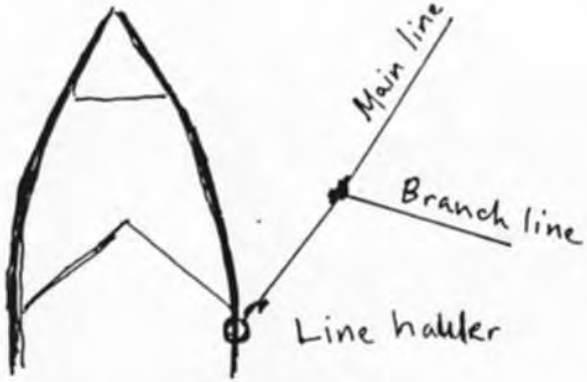
Squid Meat as bait

FIGURE 3

FIGURE 4



. Shooting of the line



Hauling of the gear

Position of the line hauler for small boat

FIGURE 5

Trevally

Job fish

Grouper

Parrot-fish

Snapper

Threadfin bream

FIGURE 6

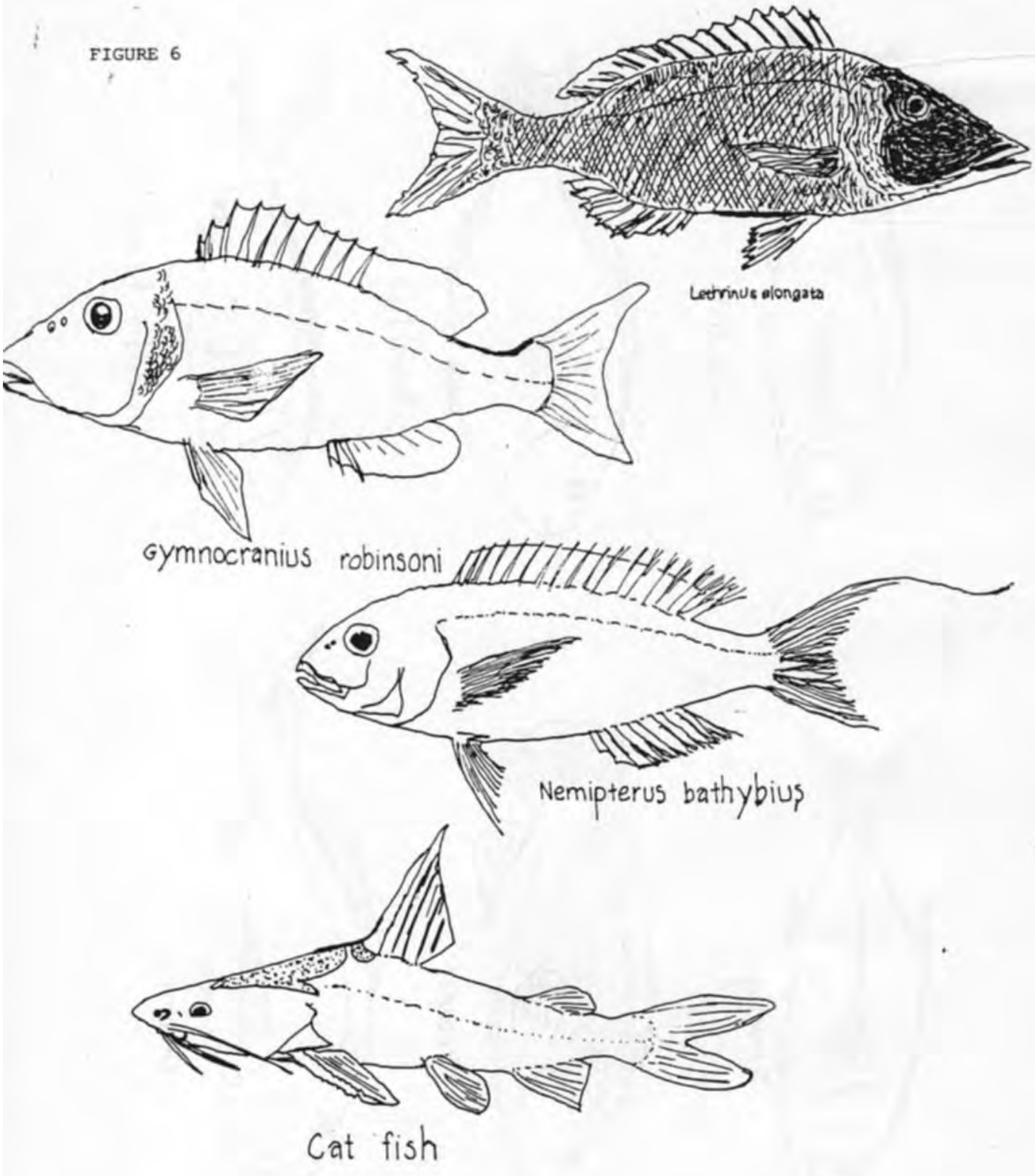

Lethrinus elongata
Gymnocranius robinsoni
Nemipterus bathybius
Cat fish

FIGURE 7

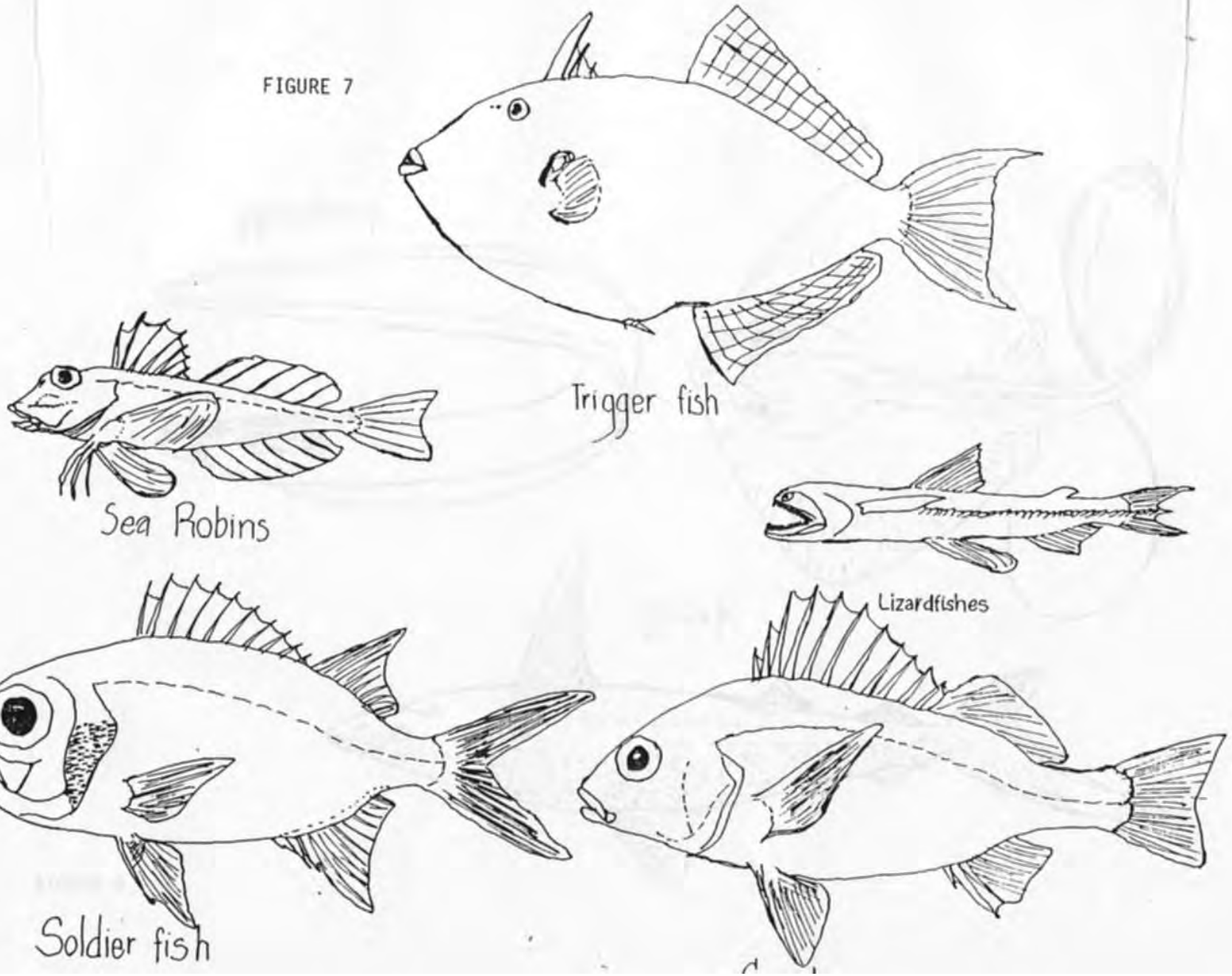
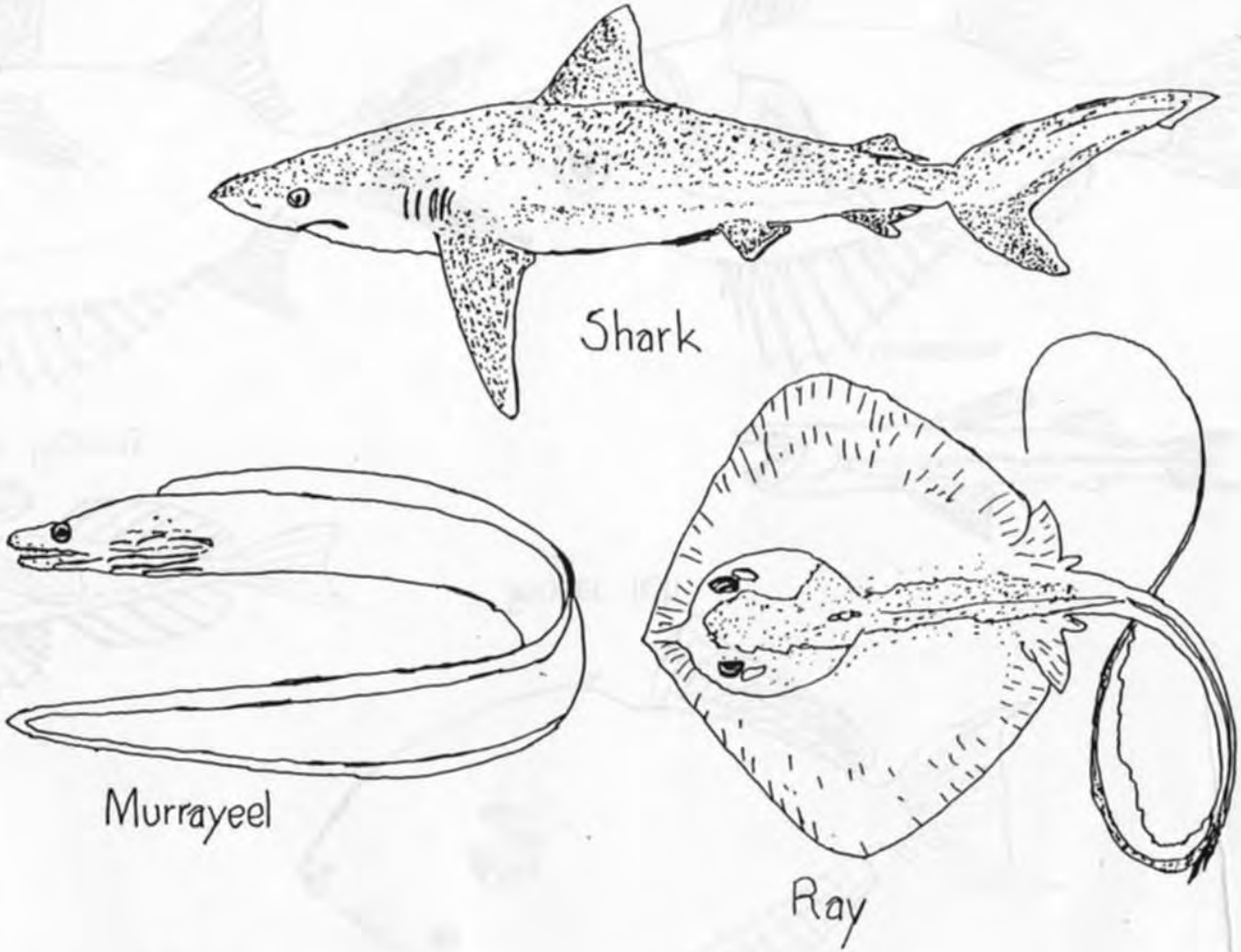


FIGURE 8



BOTTOM LONGLINE (RAWAI UMPAN) IN KUALA SELANGOR, MALAYSIA

By : Mr. Abdullah/Razali
Malaysia (241094)

Introduction

Bottom longline is classified as traditional gear under Hook and line group. This gear are still popular in some part of Malaysia especially in Kuala Selangor, Selangor Malaysia.

This Bottom longline is mostly operated by fishermen who got a very varse experience in this Hook & Line activity which they does not need so much of modern technology & equipment. So we can see the master fishermen are usually on old experience fishermen.

Construction

The Bottom Longline consists of main line, branch/hook lines and hooks. The construction of this gear is very muc similar as the Thailand longline. The materials for the main line and branch lines PE+Venylon and monofilament are used. The hooks for Bottom longline are of the same size and shape. The construction are of two type. See to the figure 1 attached.

Vessels

The operators are using inboard engine with 24-33 hp for 3-4 days a trip and 76-102 hp for daily trip. The vessels are mostly of 12-13 m in length with the grosstonnage below 10 GRT. See the figure 2 attached.

Operating Material

Before operation or going to the fishing ground, there are a few items need to standby such as,

a) 5-7 basket of Bottom longline
b) float, flag & light raft
c) Baits (mackerel, lizard fish)
d) Ice
e) Hook
f) Rope - measuring depth & current
Refer to figures 3 attached

Operation

Operation are mostly done at the strait of Malacca and nearby Island. In every boat, there must be at least 2-3 person onboard. Before operation, the most important to consider is the tide of water. Most of the operation are only done 2 weeks in a month.

For the daily trip boat, they so out to search for the trawl first to get the baits. They need at least 20-30 kilo of fish for the operation. On the way to the fishing ground, 2 person are prepare for baits and attach to the hooks while one will incharge of wheel house. See figure 3 (a) attach

For the 3-4 days trip, mostly are of 24-33 hp. They need to bring 100-150 kilo of baits and 6 block of crushed ice in the insulated box with capacity of 1200 kilogram. See figure 4 attach.

Shooting

As the boat arrived at the fishing ground, the master fishermen stop the boat and start to measure the depth and check the current direction by using the measuring rope. This measuring rope also can detect the structure of seabed either it is muddy, sandy or rocky. After the master fishermen satisfied, they start shooting with the engine at a slow speed. They operate either joint all the basket together or separate the basket at another fishing ground. It is really depend on the fishing ground. Figure 5 attached.

Hauling

Hauling time is done 2-3 hrs. after shooting. Again here the current is important to consider so that no problem arise during hauling operation. The line is direct put into the basket again and again the bait is attach standby for another operation either at the same fishing ground or other places. Whenever the catch is full and satisfied enough the boat will return to the harbour while for the daily trip, no matter how much fish they caught they must go back everyday. Figure 5 attached.

Target Fish (Fish caught)

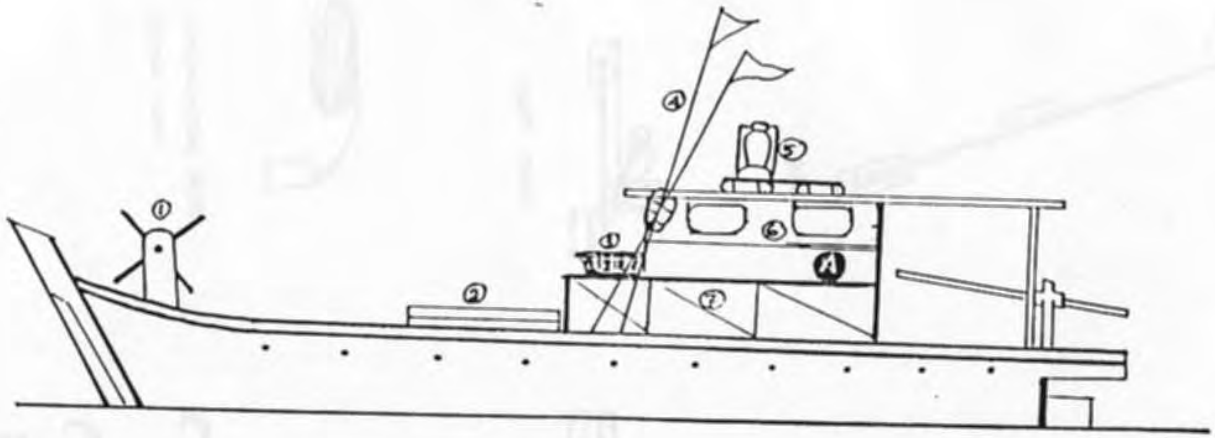
Mostly targeted fish are of demersal fish and also depend on the seabed. In coral area or hard bottom around Island, snappers and groupers are caught, whereas in muddy areas rays and pike-conger eel are mostly to be caught. Apart from that Giant fish, cat fish (yellow) shark are also caught. But the fishermen are very keen to catch the pike-conger eel because of the expensive price of the bladder and its usually caught in school. Figure 6 attached.

Conclusion

This bottom longline is still popular gear use as it is most suitable gear to catch fish like pike-conger eel. The longline type B shown in the figure is very popular because its easy to replace back after hauling.

VESSEL.

Fig. 2.



1. ANCHOR LIFTING
2. FISH HOLD.
3. LONGLING BASKET.
4. FLAG.
5. LIGHT RAFT.
6. WHEEL HOUSE.
7. ENGINE ROOM.

OPERATING MATERIAL.

Fig. 3.

LONGLINE BASKET.

FLOAT.

ANCHOR.

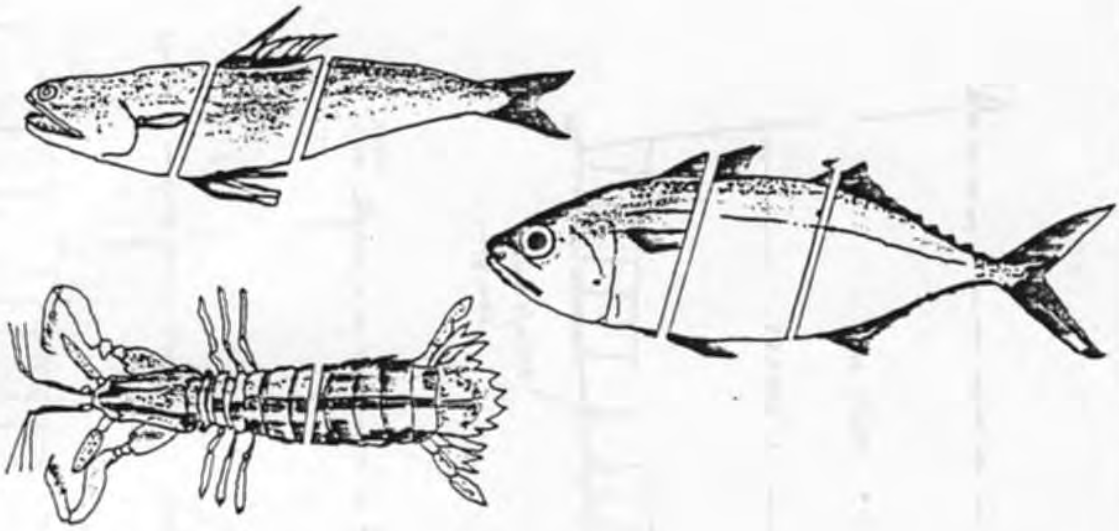
HOOK.

FLAG.

LIGHT RAFT.

ROPE MEASURING CURRENT AND DEPTH.

FIG. 3a.



ATTACHED BAITS

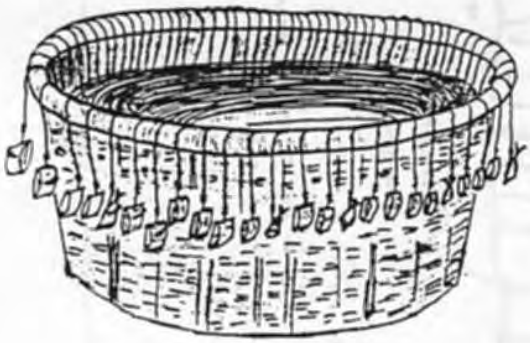
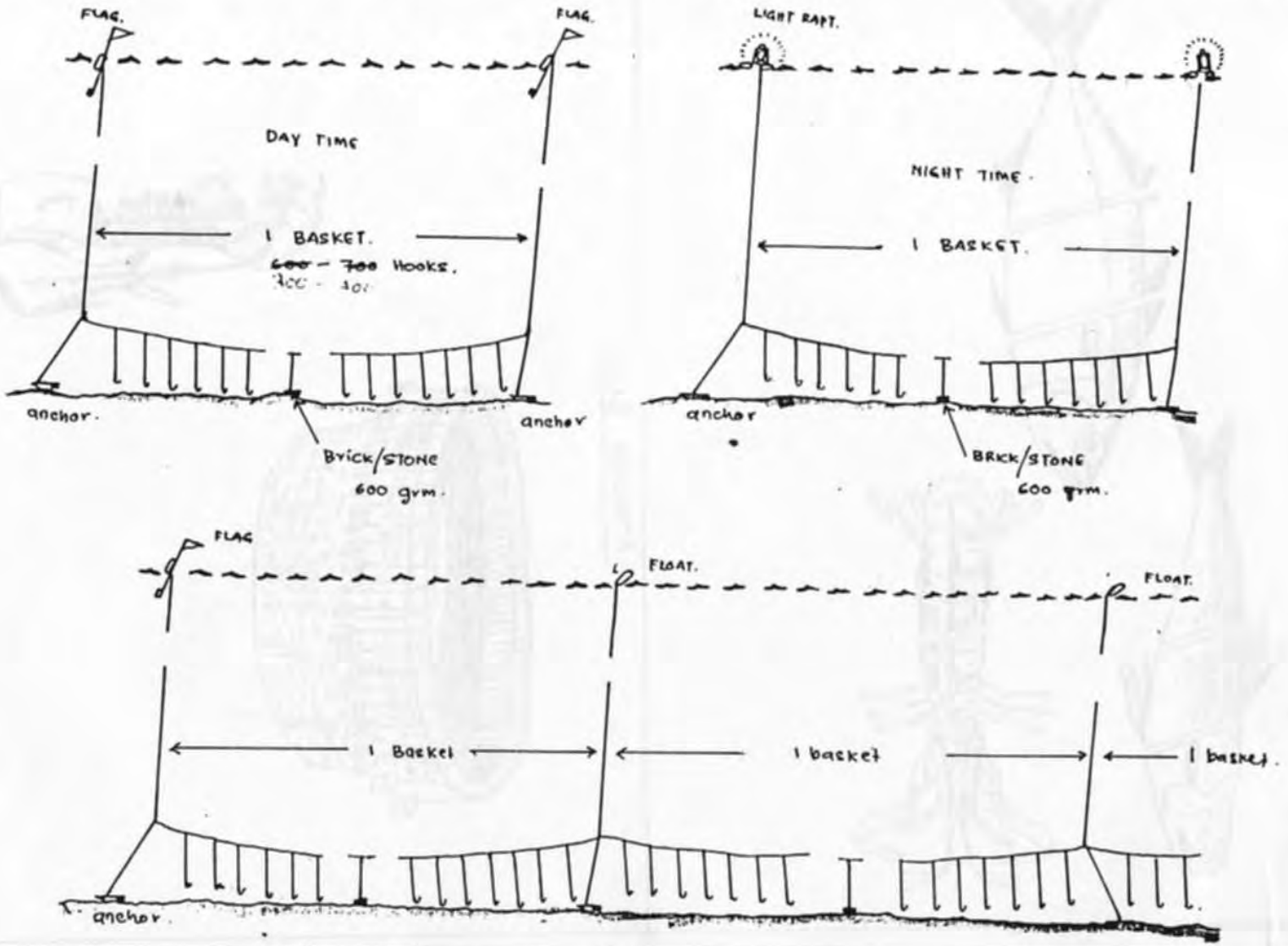


Fig. 4.


FLAG.
FLAG.
DAY TIME
1 BASKET.
~~600~~ - ~~700~~ Hooks.
anchor.
anchor
BRICK/STONE
600 grm.
LIGHT RAFT.
NIGHT TIME.
1 BASKET.
anchor
BRICK/STONE
600 grm.
FLAG
FLOAT.
FLOAT.
1 Basket
1 basket
1 basket.
anchor.

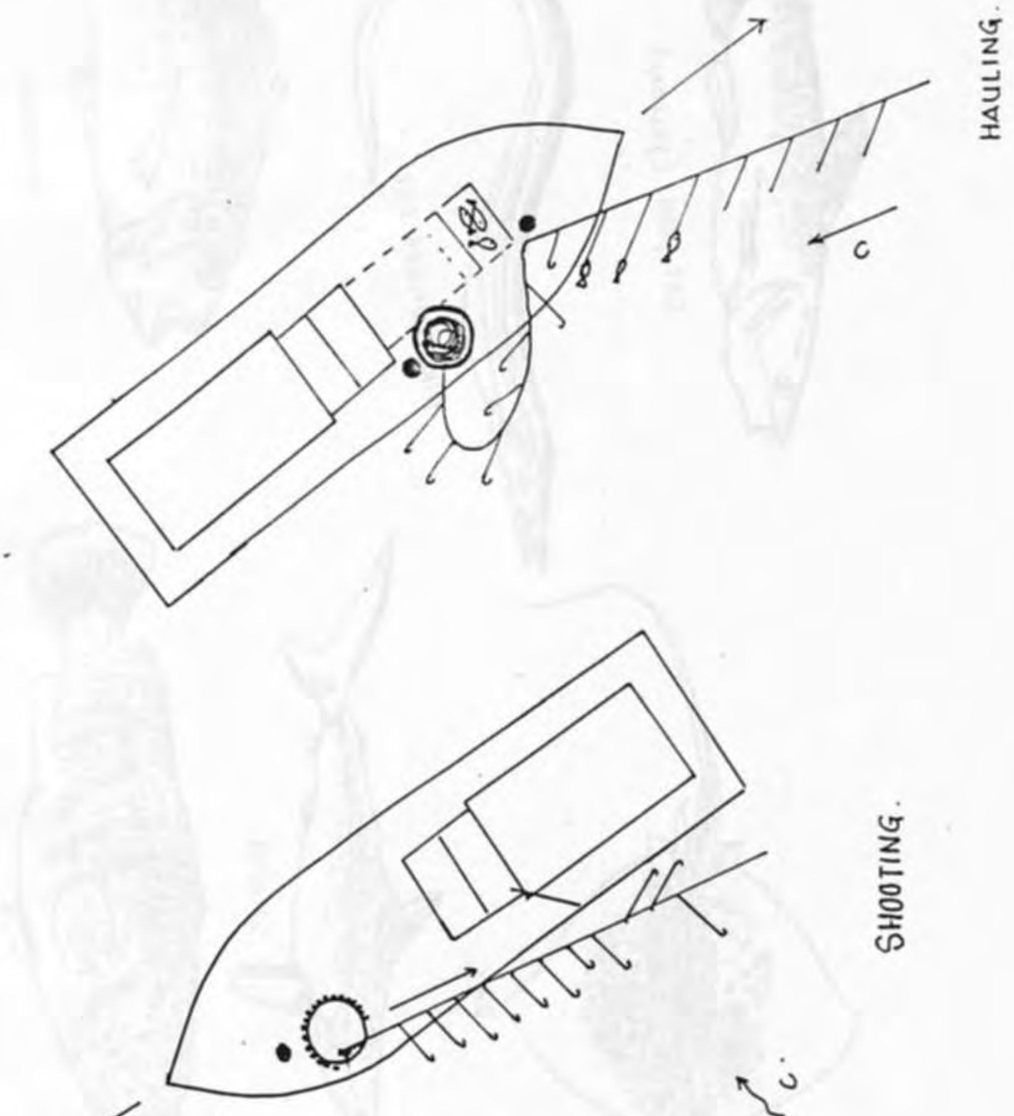
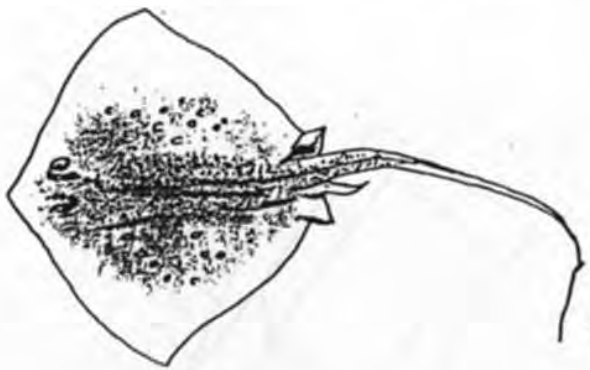


FIG. 6.

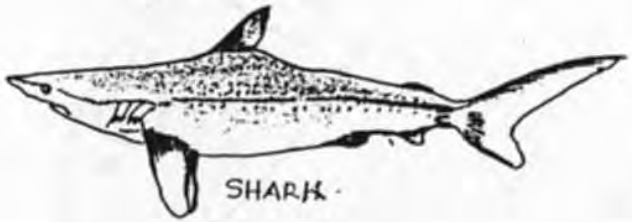
TARGET FISH.



RAY.

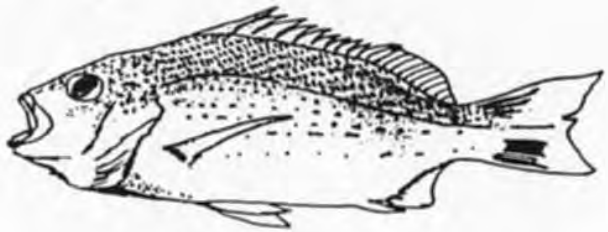
CAT FISH (YELLON).

PIKE-CONGER EEL.



SHARK.

GROUPER.



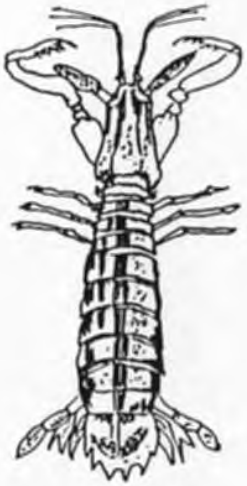
SNAPPER.

FIG. 6.

BAITS

BLUNT NOSE LIZARD FISH.

MACKEREL.



MANTIS SHRIMP

BOTTOM SET GILL NET
(GROUPER, SNAPPER)

By : Mr. Amnat Dowreung
Mr. Pablo A. Abad
(Fishing Technology
Course)

A net wall, with its lower and weighted by (or heavy net as drift gill net) and the upper and raised by floats, in set transversely to the path of migrating fish. Fish trying to make their way through the net, the trammel net with three wall nets, is included herein. Although in this case the migrating fish are entangled between two layers of net, and not in the mesh, and a combination of different types of nets are used.

In this kind of fishing gears are fixed to the bottom intended for grouper and snapper species see figures 1 & 2. nylon monofilament was the most commonly used by the fisherman in the Southeast Asian Region. We have to used the following specification see figure 3 such as mesh size, the length and the height of the net and the hanging-rates vary on the different species of marine animals, but we intend to catch more on groupers and snappers. Bottom set gill nets are usually operated in a shallow coastal waters with corals on its surrounding where the depth ranges between 5 to 20 meters. This is undoubtelly an important small scale fishery using fishing boats varying from 4 to 8 meters length with 5 to 15 horse power inboard or outboard engine. 2 to 3 fisherman can operate in this kind of fishing gears once or twice a day. Supposing you have good catch then another setting will be made in the afternoon as long as you have enough provision and fuel supplies and the styrofoam box full of ice for the fish preservation before going back to the shore.

1. Material needed:

1.1 PA mono Ø 0.45 mm. XX 100 mm.
1.2 PE 2x39.00 Ø 2.5
1.3 PE 36.40 Ø 2.5
1.4 Float PL 26 pcs. Ø 22 L 91.25 GT.
1.5 Sinker Pb Ø 8 L 28
1.6 Stone 2 pcs. 3 kg.
1.7 Flogpole marker 2 pcs.

2. Construction:

2.1 Count and cuts first the required mesh length and mesh depth at PA monofilament net.

2.2 The PE rope inserted into the floats as required number as specified by its Diameter, size and its distance to its other. Another PE rope inserted into the length of the mesh net upper end.

2.3 Attach the float rope to the upper portion or end of the monofilament net and distribute the meshes in accordance to the ratio hang-in percentage varying the different species of marine animals.

2.4 The PE rope inserted into the sinker as required number specified by its Diameter, size and length, distance to its other then attach it to the lower end of the net.

2.5 Prepared 5 to 10 units of monofilament net and other accessories to complete the bottom set gill net such as stone, flogpale marker and others.

3. Boat size:

3.1 A wooden boat made of marine plywood measuring 4 to 8 meters in length with outtrigger using bamboos on both side or boat with wide body without outtrigger using outboard engines.

3.2 Have an engine 5 to 15 horse power inboard or outboard to have more speed in going to or coming from the fishing ground or used small boat w/paddle in case the fishing ground is about 500 meters or 1 nautical miles.

4. Operation of fishing ground:

4.1 Before going to fishing ground select first your intended fishing area. Upon arrival at the fishing ground you must be sure that your net are ready to shoot any moment.

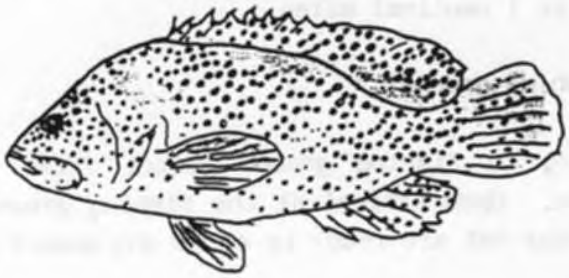
4.2 In shooting the net at 5 AM. Boat move slowly with the wind or current or which is more stronger to avoid the net intangled.

4.3 After shooting the net, wait until sun rise or watch your flag marker where you can start hauling the net at about 8:00 AM.

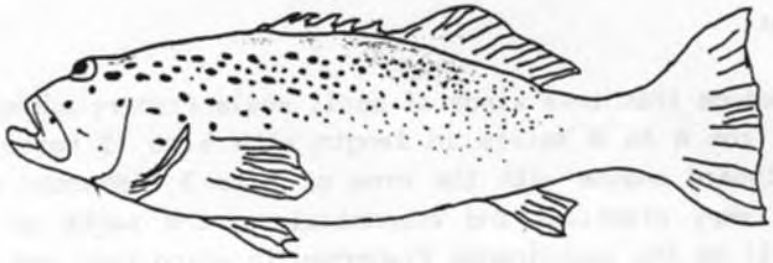
4.4 If you have good catch you can try again in the afternoon at about 5:00 P.M. to 8:00 P.M. or you can make it by planning and you have a box of ice full and foods provision and fuel enough before going back home to save more on the expenditure.

5. Conclusion:

I conclude that this kinds of small scale fishery using small boats varying from 4 to 8 meters in length with 5 to 15 horse power inboard or outboard engine with the crew of 2 to 3 fisherman or its operation. A very practical and economical on the parts of small operator as will as the sustainance fisherman in which they can afford to have this kind of fishing net and boats. And at the some time we can preserved other marine animals because it was not destructive to corals and others marine life. I considered this fishing gear as selectivity fishing method which is more important now a day for the future generation.

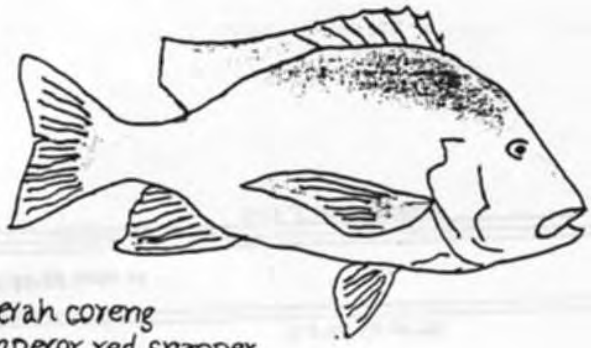


Kerapu bara
Vermilllon seabass
Cephalopholis miniatu

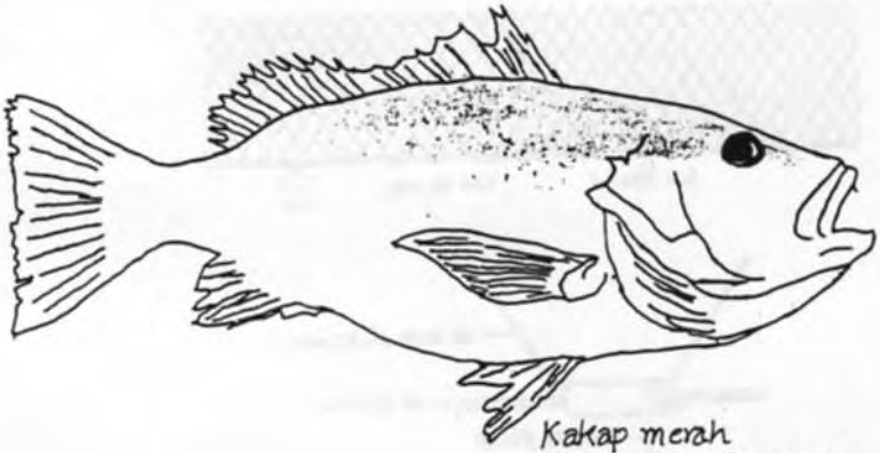


Kerapu conor
Spotted coral-trout
Plectropomus maculatus

FIGURE 1.



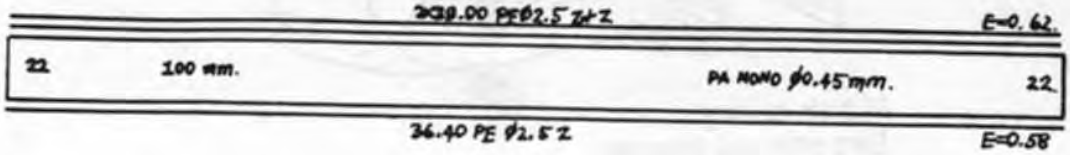
Merah coreng
Emperor red snapper
Lutjanus sebae



Kakap merah
Mangrove red snapper
Lut janus argentimaculatus

FIGURE 2.

GILL NET
Bottom set
Grouper, Snapper



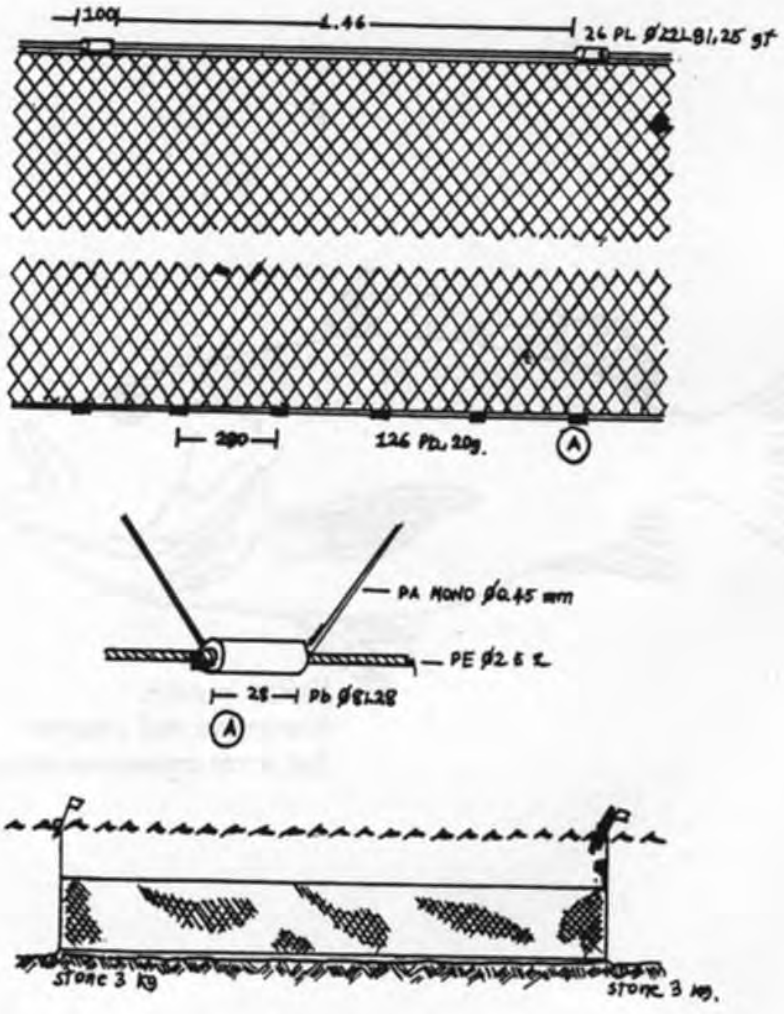
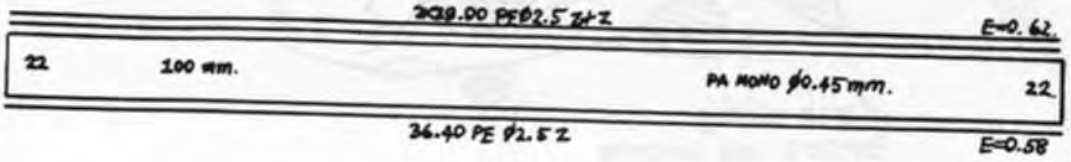
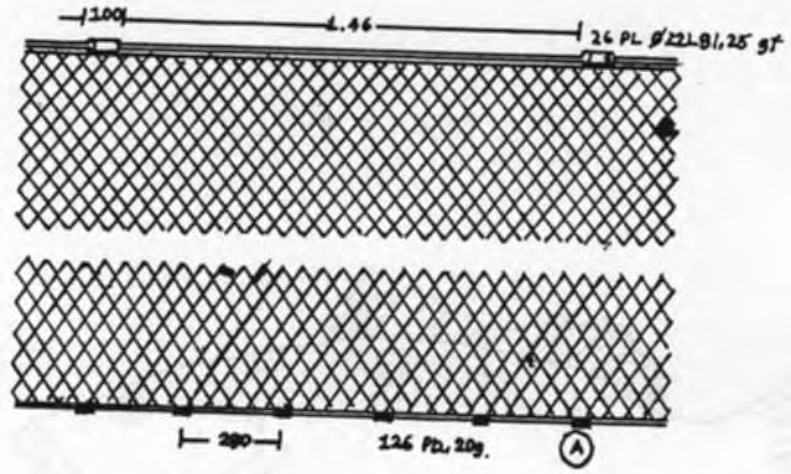
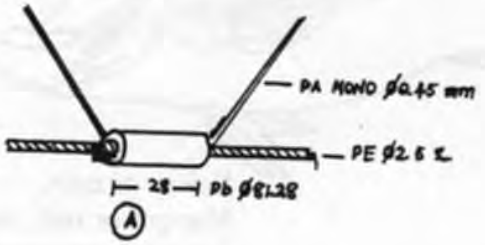


FIGURE 3

GILL NET
Bottom set
Grouper, Snapper







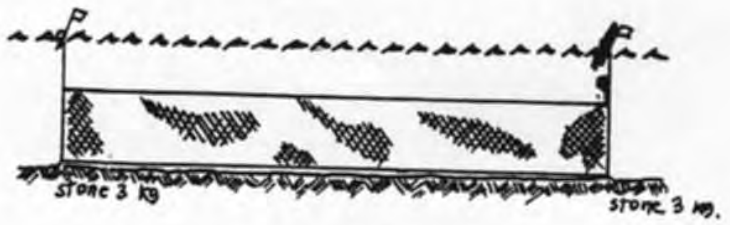


FIGURE 3

FISH TRAP

By : Mr. Hamdan Bin Jaafar
Mr. Uthai Cheanhom

1. Introduction

Fish trap is a traditional gear and very popular sometimes ago in Eastern Part of Johore, it's usually operated by a certain group of people, who is operating is still based on traditional ways, whereby they still using their own capability on remembering the location of trap by taking mark on Island, mountain and high trees for their guide on tracking the trap location.

This trap is usually operated at the rocky seabed mostly at the coral area around the Island in Johore. The fish caught is of demersal type like grouper snapper travelly. Sea beam and other quality demersal fish.

2. Construction

The fish trap they use usually a semi cylinderical shape with a rectangular bottom frame and a rectangular valve to enable fish entering into the trap. (See figure 1)

2.1 Material needed

Rattan is the main material used for this trap. It is used because of it's also strong and pliable to make a cylinderical shape and does not get rusty as compare to metal.

At the bottom part which is a rectangular in shape is usually made from wood or bamboo and the surrounding of the frame is their place or attach with wire netting with 30 or 50 mm. in diameter.

2.2 Fish trap size

Each fish trap having a dimension of between 1.8-2.4 meters in length. 0.9-1.5 meters in height, 1.5-1.8 meters in width and the valve size between 1-1.1 meters in long. 100-120 mm in width and 250-300 m. in height depend on the size of the traps.

3. Boat Used

Most of the boat used in this operation is made of hard wood like cengal as local resident call because the fishermen need not to change for several time so as to reduced the cost of maintenance.

In the front part of the boat (bow area) they make a fish hold for storage of fish and ice. The fish hold is of 2 meters in length. 1.5 meters in width and 1.5 meters in depth, at the starboard side also being place a roller (capstain) for easy pulling the main wire of the trap while hauling is in progress.

3.1 Boat Size

The size of boat for operating this gear is 10-15 meters in length, 2.5-4 meters in width and 1.5-2 meters in depth with gross tonnage 5-15 grt. generally use Yanmar diesel engine ranging from 11-27 horse power.

4. Operation Area

This trap is mostly operated near to the Island like Pulau Aup. Pulau Pemanggi. Pulau Silau Pulau Tinggi and Pulau Besar, at the distance of 3-5 miles from shore.

5. Operation

The fisherman usually leave the harbour for to the fishing ground at about 6 a.m. and reach the fishing ground after six to seven hours sailing.

The fisherman usually choose the area where the seabed is rocky and plenty of coral reef.

In a single operation 50-60 fishing traps are lowered in stage the area with the depth between 15-20 meters, the lowering process take 2 to 3 hours.

Each unit consist of two fish trap are tied together with wire 10 to 15 meters long and each fish trap tie to bottom frame work with singker. Every location of fishing unit is marked and judge by the visual positioning the object like the hill, high trees and Island but not using float as a marker, this is to avoid the fishing unit being student at this stage the fishermen need skill and experience. (See figure 2)

At a duration of 5 to 7 days the fisherman harvest their fish trap by wire equipped with gribnal and singker at the end of the wire and drag at the location of the fish trap by the boat at the speed of 1 to 2 knots, the gribnal will engange to the wire linking each unit, the fish trap is lift to boat and the fish is taken out and the fish trap will be lowered again at the same location or move to new area but depend on the amount of the harvest. Average catch per trip is about 500-1000 kg.

The process of harvesting the fish traps usually 2 to 3 days but again depend on the weather condition, the fish is kept in fish hold with crushed ice at the ration 4 to 1.

6. Conclusion

Due to the difficulties in the traditional method of operation of this gear which need fishermen with skill full knowledge of the sea and owned experience and know how but some time face difficulties in getting back the fish traps especially during bad weather.

The operator of this traditional method of fish trap fishing are changed by the introduction of modern fishing equipments such as G.P.S, line haulers, echosounder and marker with the employment of this modern equipment the fish trap can be easily detected at a short time, less labour requirement and reduce the operation cost.

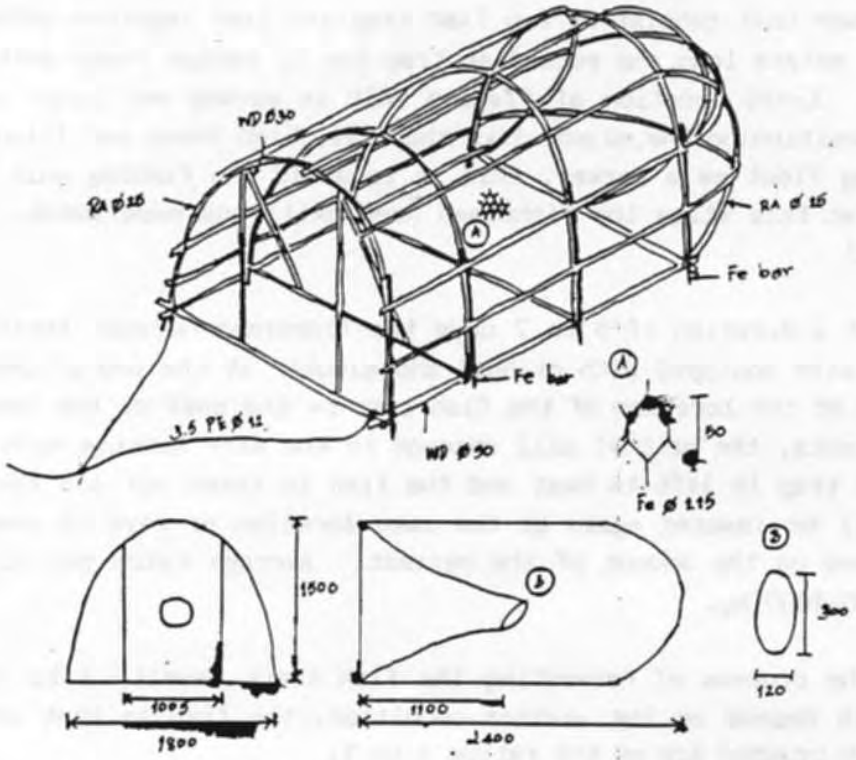

WD Ø30
RA Ø25
RA Ø 25
Fe bar
Fe bar
3.5 Ft Ø 12
WD Ø 30
50
Fe Ø 2.15
1500
1005
1800
1100
1400
300
120

FIGURE 1

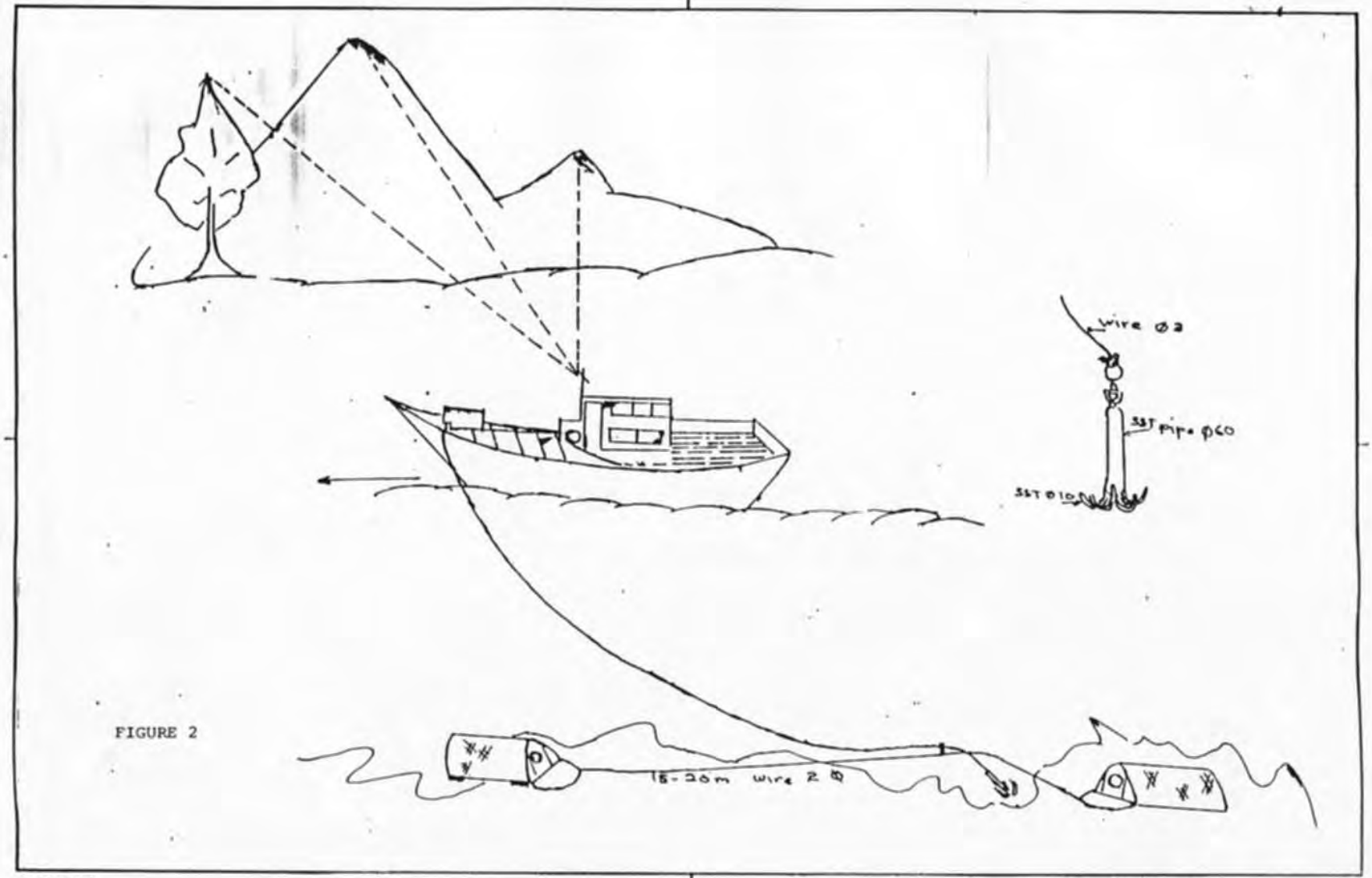


FIGURE 2

PAIR TRAWL NET
FOR BOTTOM FISHES
IN VIETNAM

By : Mr. Nguyen Duc Nam

I. Introduction

The sea of my province with an area of 52,000 km^2 is one of the greatest three fishing grounds of Vietnam. Owing to a suitable environment is drawn various sea products from everywhere to come in to life (It is the place where to cold and warm sea currents meet together) at the result it has created a concentration ground for fish, shrimp, cuttlefish and squid, scallop, oyster... at high density. The everage output of exploitation for the past years reaching about 100,000 tons/year among that had 40% are bottom fish.

Some main objects of the pair trawl are : cuttlefish, squid spotted lizard fish, red bigeye, banded corunt, crrate threadfin in bream, mackerel.

II. Fishing Boat

The whole province has more than 5,000 fishing boats with total power about 200,000 hp of which are 600 pair trawler boats (pair trawl bottom fish) with total power of 40,000 hp active in area 30-100 meter depth. The boats are made by good wood.

The form of the trawler boat (See Fig. 1)

III. Net and its parts

The length of the net is 49.58^m, stretch parameter of net mouth is 69.7^m. The form of the net is straight and tall to reduce the net resistance. The wing is length to increase wind top wing biger than lower wing to increase catch effect.

The section of the net (See Fig. 2)

In the bridle system don't we betteryty because the bottom is not ever and flat also that is habit of the fisherman (Fig. 3) (statistical tabe).

IV. Fishing Operation

There are twelve fisherman on the two boats. The main boat (the boat with the net aboard, No I boat) has 8 person each time go on the sea about 15-20 days.

When the boats arrival at a fishing ground, the echosounder used to find fish and fathom water depth. Usually 1^m depth open 8-10 warp length, if good sea is open 8^m warp/1^m depth, heavy sea is open 10^m warp/1^m depth.

V. Method Shooting

When setting, the main boat sets it out with the bridles held at the follows. The pull of one bridle is then transferred to other boat by means of the heaving line and messenger, and the second boat then connects is warp to that bridle.

Both fishing boats then stream ahead together, paying out the warp evenly to their required extent, and fishing commences (See Fig. 4) towing speed about 2.5-3 knots. About 4 or 5 hour for towing.

VI. Method Hauling

Both fishing boats haul on their warp until the bridle reach the gallows. The fishing boats then converge until they are a safe distance apart, and a having line is used to transfer a messenger line fastend to the bridle end on one boat to the other. The fishing boat these disconnects the bridle from its warp so that the other may have in the messenger on the winch through its second gallows block. When that bridle is heave up to the gallows, the net may be brought aboard and the cool net emptied in the usual manner for arrangement aboard. (See Fig. 4)

Statistical Table some Particular of the Trawl

No.	Name	No. of part	Length (m)	Diameter (mm)	Mat
1.	Head rope	1	28	25	PE
2.	Ground rope (fishing line)	1	31	25	PE
3.	Balsh	1	31	15	PE
4.	Wing line	2	22	15	PE
5.	Lastridge line	2	43.7	20	PE
6.	Top leg	2	10	25	PP
7.	Bottom leg	2	10	25	PP
8.	Bridle (heavy line)	2	120	80	Pe (cable) + PA
9.	Wrap	2	1,000	25	PE
10.	Float	27		137.5	Plastic
11.	Chain	1	50		FE
12.	Shackle	8			FE
13.	Swivel	4			FE

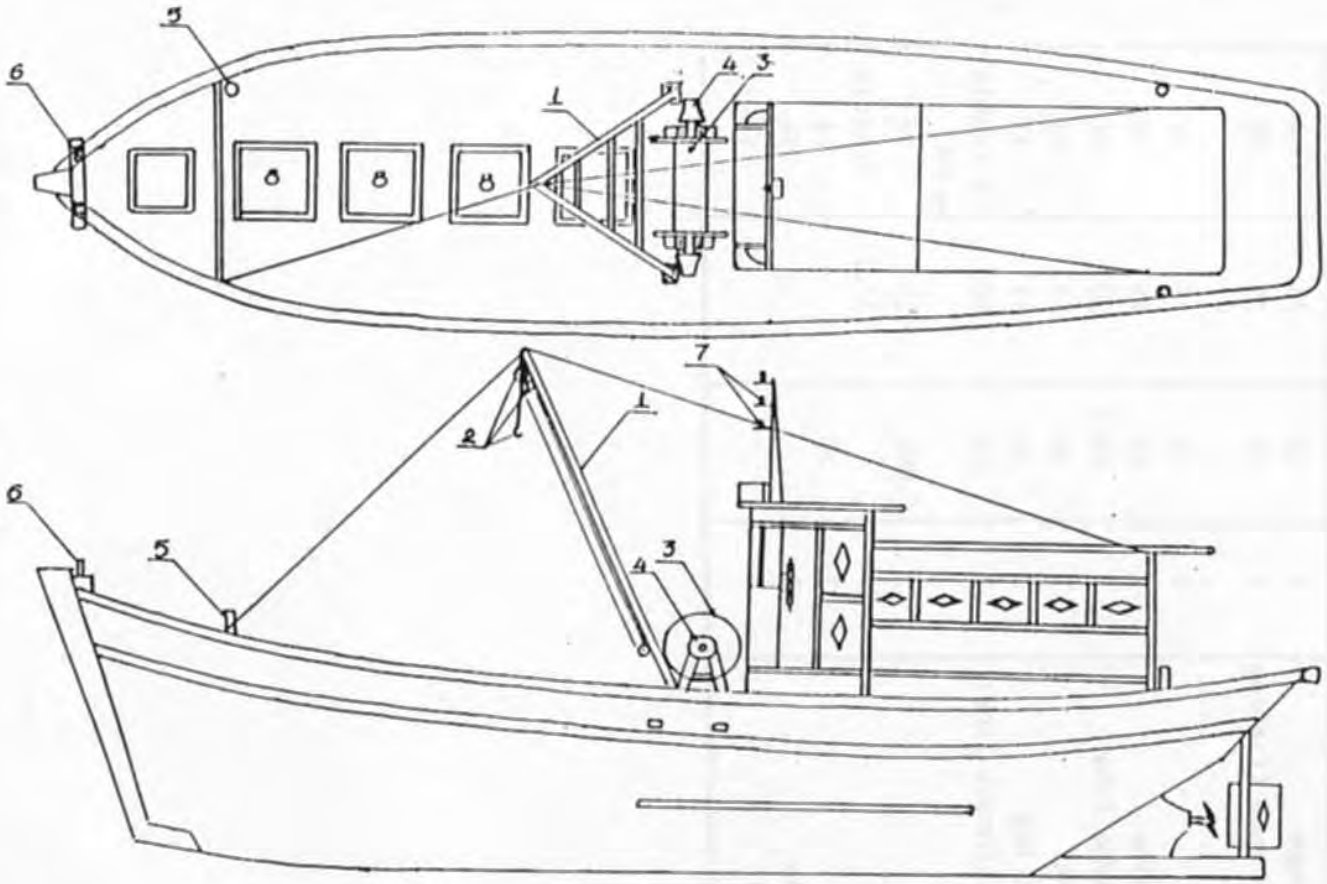
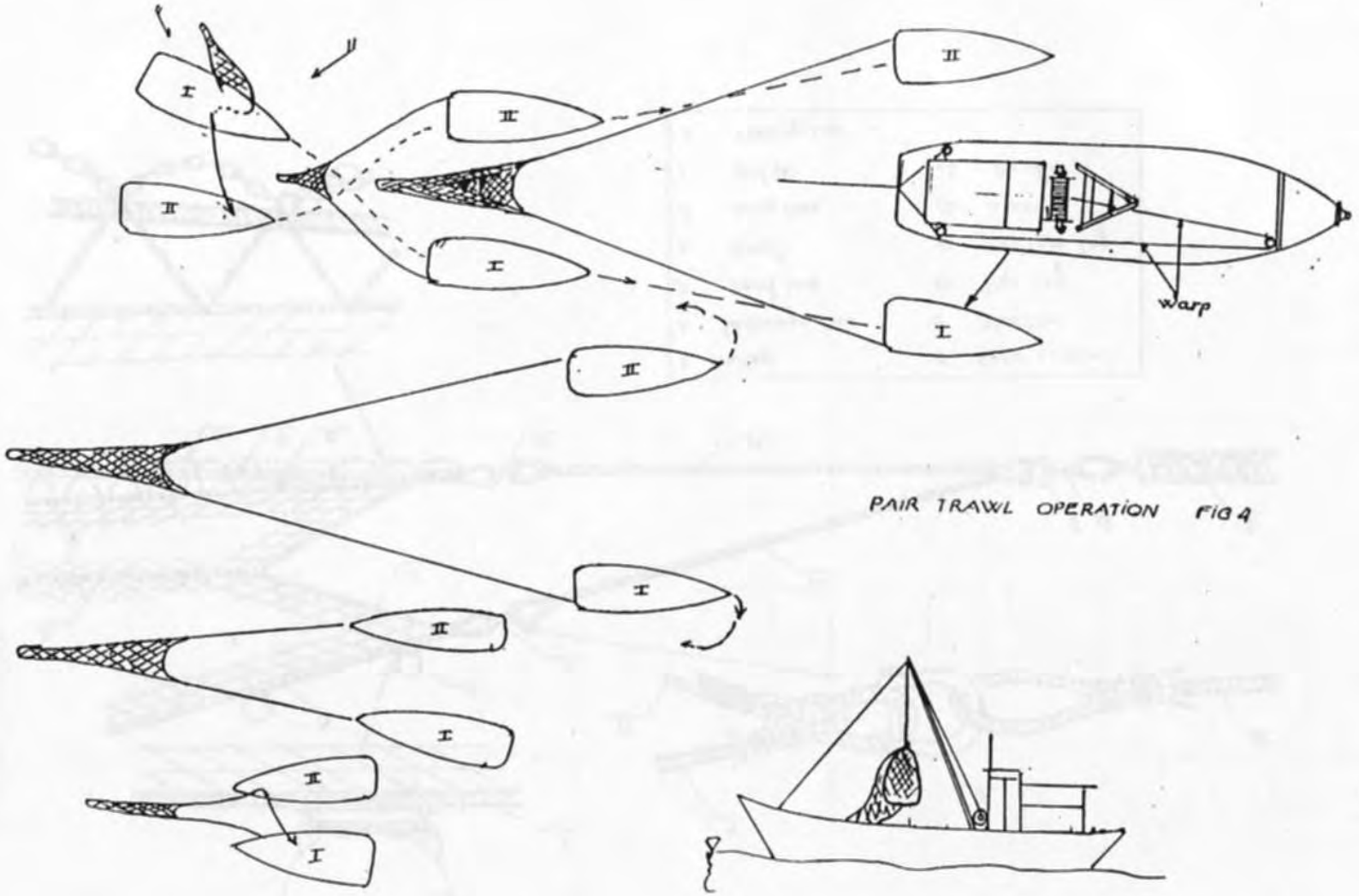


FIG 1. THE FORM OF THE TRAWLER BOAT HAS POWER 110HP

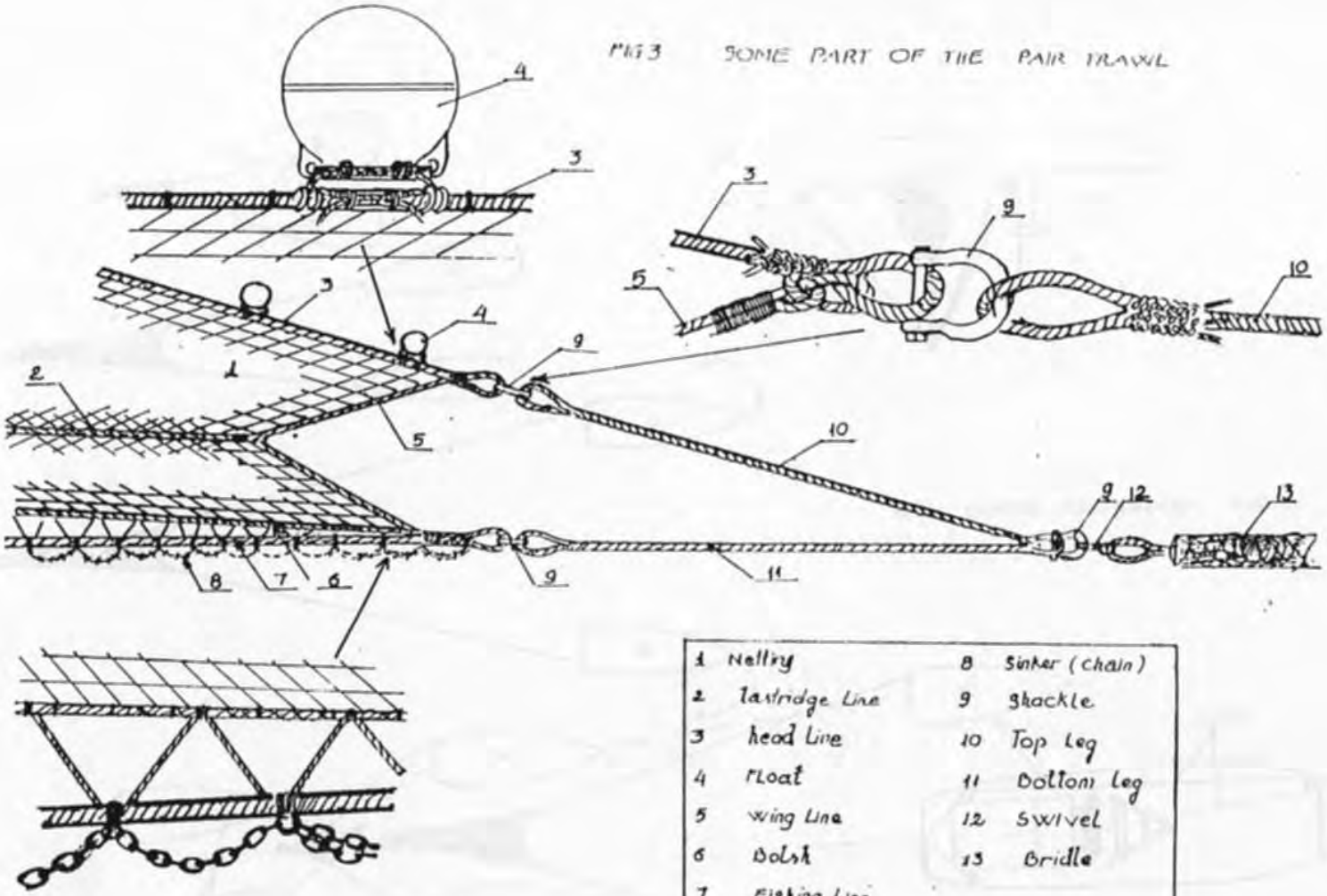
L	18.5 m
H	2.4 m
B	3.9 m
D	1.8 m

1 : Gilson
2 : Net pulling block
3 : Towing warp winch
4 : Capstan winch
5 : Pulley guide warp (Shooting)
6 : Pulley guide warp (Hauling)
7 : Fishing Lig[13]
8 : Fish hold



PAIR TRAWL OPERATION FIG 4

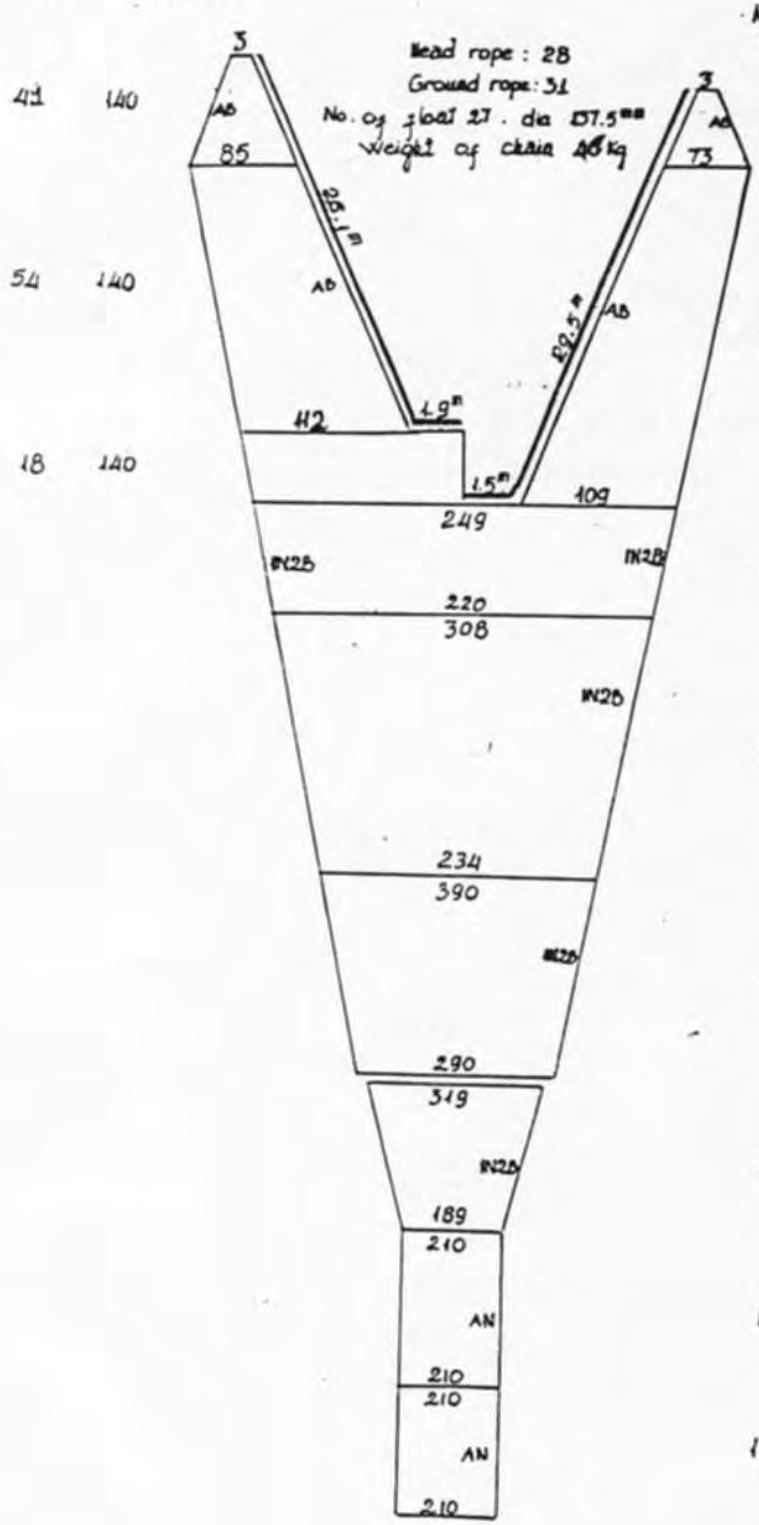
PIC 3 SOME PART OF THE PAIR TRAWL



1	Netting	8	Sinker (chain)
2	Lastridge Line	9	Shackle
3	Head Line	10	Top Leg
4	Float	11	Bottom Leg
5	Wing Line	12	Swivel
6	Bolsh	13	Bridle
7	Fishing Line		

_TRAWL FIG 2

Bottom, pair bottom trawl.



No. of Mesh	Mesh size mm	Mat denier
35	140	PE 210d/15
72	140	PE 210d/15
29	140	PE 210d/15
74	100	PE 210d/15
100	60	PE 210d/18
130	40	PE 210d/18
167	36	PE 210d/18
178	28	PE 210d/18

GIANT SQUID JIG IN THE PHILIPPINES

By : Mr. Mamerto T. Terania
Mr. Poramad Ploypradub

Introduction

Giant squid jig is a simple single longline gear purposely used for catching bottom duelling giant squids. Judging from the number of fishermen using it, one may quickly conclude that giant squid jig is an old practice in the Philippines. In fact, its the most recent. If has been practiced for sometime now in other Island of Visayas Particularly Region VI but was just recently to this part of the country.

Squid jig fishing has dramatically increased spreading from Visayas Sea to Camotes Sea (Region VII) believe to be in reach large group of fishermen in Region VIII. (Fig. 20)

The daily catch for export to Japan range from 80 kgs. to 200 kgs. during peak season. Since squid fishing is not so efficient fishing gear unlike purse seine and trawl, threat of resource depletion is believed to be unlikely and thus present production can be maintained. However, study of the biology and stock assessment of giant squid is highly recommended.

Technology

Description

Giant squid jig is more likely than not a natural development from the common squid jig. It consist of a single monofilament nylon, at least 140 fathoms, an 18 inches iron wire stem with eight (8) to ten (10) sharp, barbed hooks at the lower end and a loop at the upper end. The hooks form "ring" or "basket" are held together around the stem with either a 15 mm. mononylon or are soldered with lead which also serve as sinker. This improvised hook is locally called "sarangat". (Fig. 29). If held together by nylon twine instead of lead, a conical shape lead sinker is molded on the middle portion of the stem. This also serve to prevent deformation of bait. A bamboo float on styrofloat with a marker flag is tied to the other end of the monifilament nylon. To facilitate setting of the squid jig, a spool is integrated into the design of the floats. It works on the principle of catching squids with baits (fish). Fishing is done by one man only.

Fishing Ground

Good fishing has been noted in water depth is from 140 fathom (256 meters) to 210 fathoms (384 meters). The sea bottom should be rocky. Surface water current should not be too strong to enable fishermen to keep up with the jigs he set. Places where the bottom current is also strong are also avoided since catch is less.

The fishing ground is at least 30 minutes by non-motorized banca (Fig. 21). or about 1½ kms. from the shore.

Fishing Time and Season

Giant squid jig fishing is done during the day from early morning to early afternoon or before the sun's heat become too intense. And they can also go out fishing during night from 1660 hrs. to 1900 hrs., but they attached a marine flashlight with a flashing bulb (Fig. 22) for the squid to attracked. The depth of water were shallower compared to day time operation range from 60 fathoms (110 m.) to 80 fathoms (146 m.).

Except for bad weather, fishing can be done the whole year round with peak months observed to occur from May to August. It has also been observed that catch, regardless, of month, is greater during days just after the first quarter phase of the moon going to full moon.

Species Caught

Although other bottom dwelling species a caught by this gear, such instances are rather more and most of these no market value. It is only but proper to limit our discussion to the giant squid.

Most much is known about this species. Referrals to BFAR Research Division revealed that this giant squid is most probably what is scientifically known as Sepiotheutis lessoniana. (Fig. 19). Locally it is called "dalupapa". This demersal dweller is a varacious eater and is relatively slow moving. Squid caught averages from 4 to 5 kilos including the head. Longest caught so far weighed 9 kilos (body only). Mean body length is 22 inches with head and tentacles adding another 12 inches. The giant squid is reddish brown in color.

Materials

Bill of materials for one (1) unit giant squid jig

Bill of Materials

Quantity	Material	Unit Cost	Total Cost
200 fathoms (0.25 kgs.)	Monofilament nylon 0.85 mm.	₱ 100.00/kg.	₱ 25.00
8 pcs. to 10 pcs.	Hook 557 (Mustad Brand)	₱ 0.35/pc.	₱ 3.50
125 grams	Lead Sinker	₱ 20.00/kg.	2.75
1 pc.	Styrophore 12" Ø	10.00/pc.	10.00
18" (40 grams)	G.I. wire No. 10	.25	1.00
4 metres	Mononylon 0.15 mm.	-	-
1 unit	Flash light	45.00/pc.	45.00
			₱ 87.25

Accessories:

1. Non-motorized banca
2. Spiked truncheon or "gapok"
3. Baits milkfish (Chanos chanos)

Construction

To construct a unit of giant squid jig, the following steps are undertaken.

a. Construction of the line

1. Cut 365 meters (200 fathoms) long monofilament nylon 0.85 mm to serve as mainline. (Fig. 1).

2. Make an eye at the cut 365 meter nylon line using eight knot.

3. Insert the eye at the end of the bamboo spool float 2 feet by 4 inches dia. and tighten by pulling the line. Coil line between the two nodes of the bamboo spool or use a styrophore in lieu of a bamboo, insert the eye to the hole of styrophore, make a groove to a styrophore and coil the line between groove. (Figs. 2 and 3).

b. Construction of the wire stem:

1. Cut/get a piece of piece GI wire 10, 18 inches long. (Fig. 4).

2. Make a loop at one end about 5 mm diameter. (Fig. 4).

3. Roughen the surface of the other end of the GI wire by nicking it with a dull edge knife, both and flatter the end most part using a hammer. This is to provide a better surface attachment for the hooks. (Fig. 5).

4. Prepare a cone-shaped mold using a strip of banana leaf from the loof end of the GI wire. (Fig. 6).

5. Insert GI wire loop and first-into a 500 ml. softdrink bottle with a sand inside. (Figs. 7 and 8).

6. Put 125 grams lead sinker 1 (5-6 pcs.) in a tin can or any suitable cooking utensil and melt over fire.

7. Pour melted lead into the mold and wait until it hardens. (Fig. 9).

8. Remove the mold. (Fig. 10).

c. Hook

1. Get 8-10 pieces of hooks Mustad brand 557. (Fig. 11)

2. Reshape hook into an almost straight configuration about 66 degree by hammering or using fliers the bend-part of the hook. (Fig. 12)

3. Bend the eye of the hook about 7 m.m. in length 80 degree using a pair of fliers. (Figs. 13 and 14).

4. Attach the hooks into the nicked portion of the wire about 10 mm. from the tip using monofilament nylon 0.15 mm. (other fishermen use melted lead to fasten hooks to the wire stem). (Fig. 15).

Operation

Arranging the line

A two-foot bamboo (4 in. dia.) with at least two nodes or a styrophore is used as float as well as spool. The monofilament nylon twine 0.85 mm. (140 fathoms to sea fathoms depending on the depth of the fishing area) is inserted to a hole one end of the bamboo or styrophore and tied. The rest of the twine is then coiled over the bamboo or styrophone between the two nodes or the groove.

Arranging the hooks

Most popular bait used is the bangus (Chanos chanos) weighting about 175 grams. (Fig. 17). This species has a tough-elastic skin and are usually last up to 2 weeks of preserved in brine solution after operation. If place in brine, the fish is first washed with freshwater before baiting. In baiting, the fish then (loop end first) is inserted into the mouth of the and make to come out at the other end. The fish is then pushed forward until its mouth is just about 2½ inches away from the tip of the hooks. (Fig. 18).

At this position, the fish has totally enclosed the lead sinker located at the middle portion of the wire stem. This will acts a stuffing and prevent deformation of fish due to pressure at the sea bottom. The fish is then tied to the wire stem using monomylon 0.15 mm. of both ends. Baited wire stem are the arranged in the banca prior to operation.

Shooting Operation

The average navigation time, distance from shore to fishing ground is about one and one half hours from by non-motorized banca. Upon reaching the site, the banca stops. Spooled line is "shoot" or inserted into the loop of the baited wire stem. It is them place in water and the line is paid-out. The line will pay out by itself due to

the weight of the hook/wire stem. Toward the end, the fishermen make sure to it that the hook will not settle or touch the bottom to prevents crabs on other scavengers from taking the bait.

The fishermen measures about 18 to 20 meters from the first drop off point then pays out another squid jig. Same procedure is followed.

After paying out the squid jig, the fishermen goes back to the first jig dropped and attach a flag at the other end of the bamboo or at the hole of the styrophore float. The same is done to the other floats. The fishermen there position himself in front of the jig facing the current and scout for baited jig. The baited jig is determined by the position of the flag.

Hauling Operation

The bobbing of the float accompanied by the straightening or rising of the flag marker signals the posibility of having attracted a giant squid. The gaint squid in this point has not yet been hooked but has just engulfed the bait. It is the sudden upward jerk made by the fishermen, if he noticed the present of squid. The line are hauled directly upwards without coiling over the float (coiling is done later on to facilitate hauling). As the squid emerges on the water, the fishermen hits its head with "gapok" (spicked truncheon). (Fig. 16). The fishermen sees to it that only the head is hit and out the body for otherwise, low quality catch will result. Some of the fishermen use scoop net instead of "gapok" but although this increased good quality, but the risk of squid escaping is high.

The squid is takes aboard and removed from hook. Squid jig operation usually ends by early afternoon when the heat of the sun gets too intense. Catch is delivered to the middlemen will in turn will delivered to the exporter. Baits are also removed from the wire stem and are put in brine solution for preservation.

Marketing

There are two market for Giant squid in Cebu Philippines the export market in which middlemen for exporters such as the coast of Magellan Marine Development Inc. (CMMDI) located at Mandaue City, serve as bulk buyers and the local market. The former buys at ₱ 90-120/kg. while the latter market generally buys at ₱ 10.00 less. Almost all squid jig fishermen sell their catch to the middlemen not only because of the higher payment more so because they are oblige to sell their catch since these middlemen are the ones pay for their fish paraphernalia and initial opening expenses. The export market however has strict weight quality standards. They only buy the body of the squid which they termed as "dalupapa" fillet. The fillet should weight at least 1.5 kg. and should have no mark on them. Less than 1.5 kgs. are to be undersized and through still bought generally ₱ 10.00 less. Fins and head/tentacles are sold at the local market at ₱ 30-45.00/kilo.

Cost and Returns

Capitalization

Banca with outrigger	₱ 3,500.00
Ten units squid jig	₱ 870.25
Total	₱ 4,370.25

Operating Expenses/Monthly

Bait (4 kgs. at 35.00/kg)	₱ 140.00
Repairs of gears	₱ 50.00
Food and others	₱ 250.00
Total	₱ 440.00

Returns/Month

Average catch of 10 kgs./wk at ₱ 105/kg.	₱ 4,700.00
Fins and head 2 kgs./wk at 38.00/kg	₱ 304.00
Total	₱ 4,504.00
Less : Expenses	₱ 440.00
Net Income	₱ 4,064.00

Return on Investment :

$$ROI = \frac{\text{Annual Net Income}}{\text{Capitalization}} \times 100\%$$

$$\frac{4{,}064.00 \times 12}{4{,}370.25} \times 100 \qquad \frac{48{,}768}{4{,}370.25} \times 100\%$$

1,115 %

Payback Period

$$P = \frac{\text{Investment}}{\text{Annual Net Income}} = \frac{4{,}370.25}{48{,}768} = 0.08 \text{ or 1 month}$$

Attachment of hooks to the stem

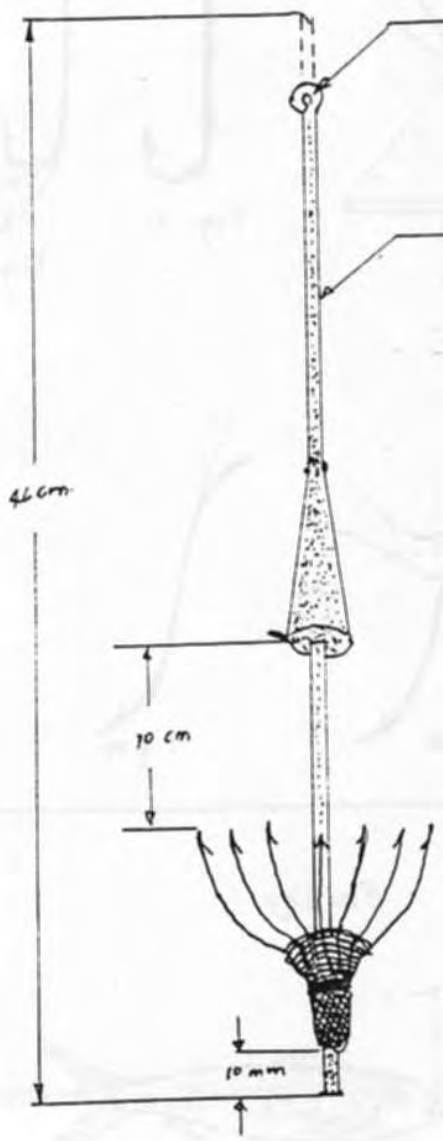


Fig. 15

Hook Reshoping

Fig. 11

Fig. 12

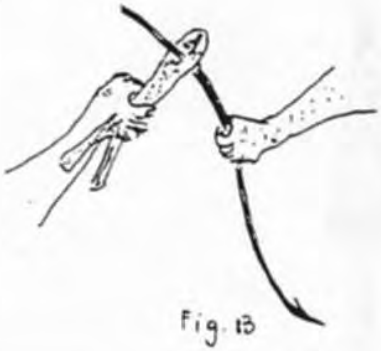


Fig. 13

Fig. 14

Baiting

Fig. 18

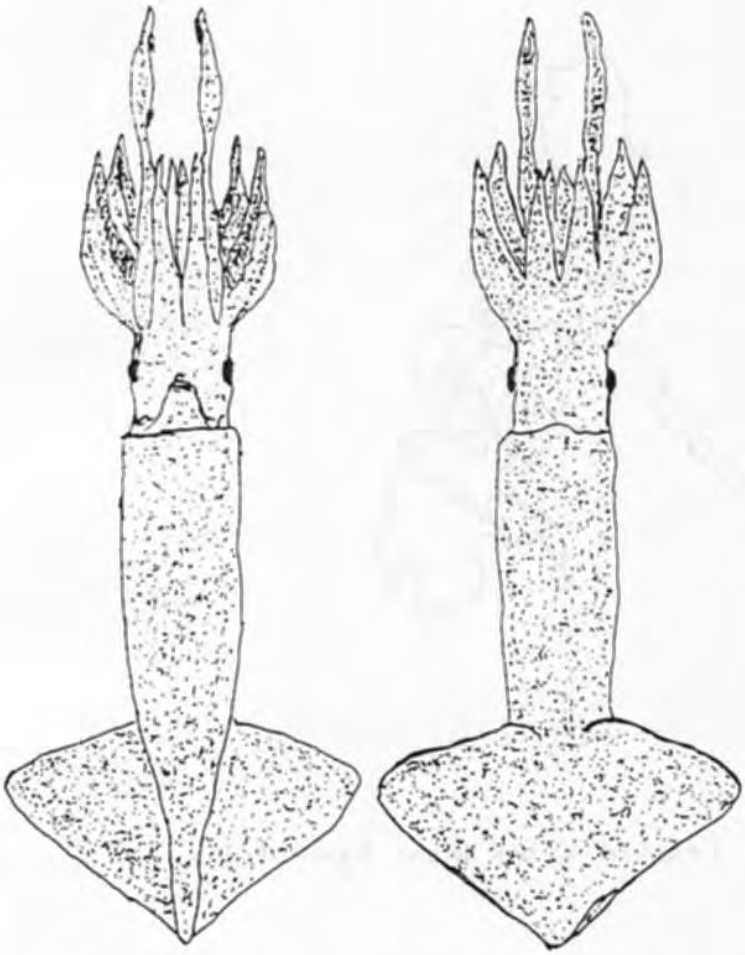


Fig. 18 Giant Squid (Sepiotheutis lessoniana)

Fig. 20 Location of the Giant Squid Fishing

Accessories

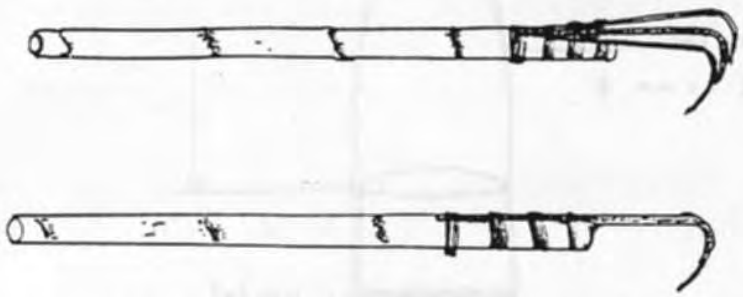


Fig. 16 Spiked Truncheon or "Gapok"

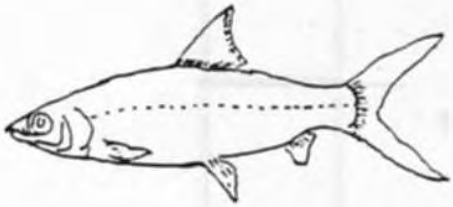


Fig. 17 Bait- Milkfish (Chanos chanos)

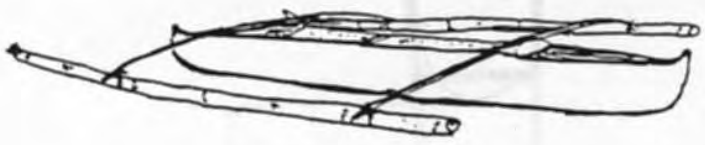


Fig. 21 Non-motorized banca

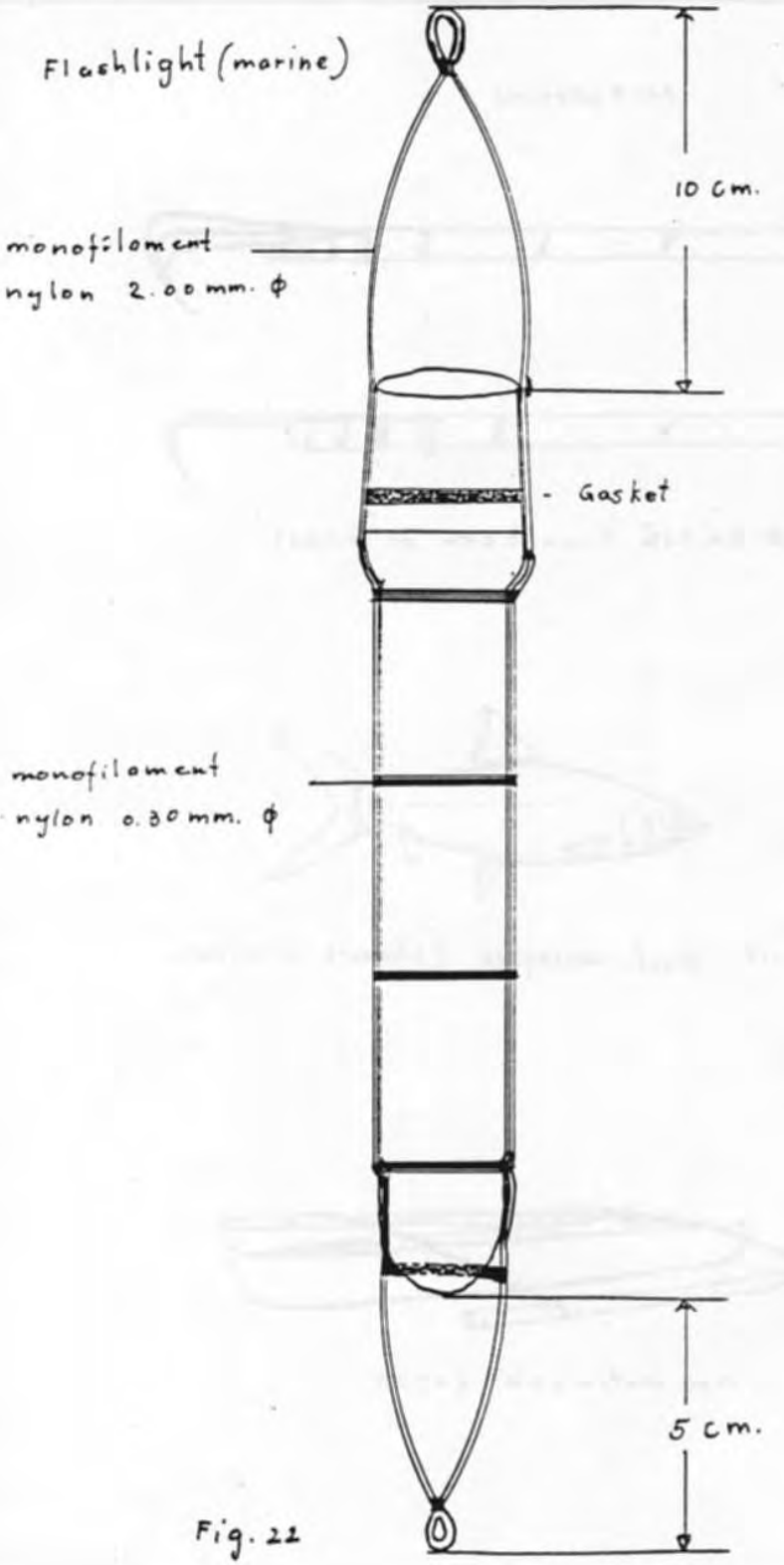

Flashlight (marine)
10 cm.
monofilament
nylon 2.00 mm. ϕ
Gasket
monofilament
nylon 0.30 mm. ϕ
5 cm.

Fig. 22

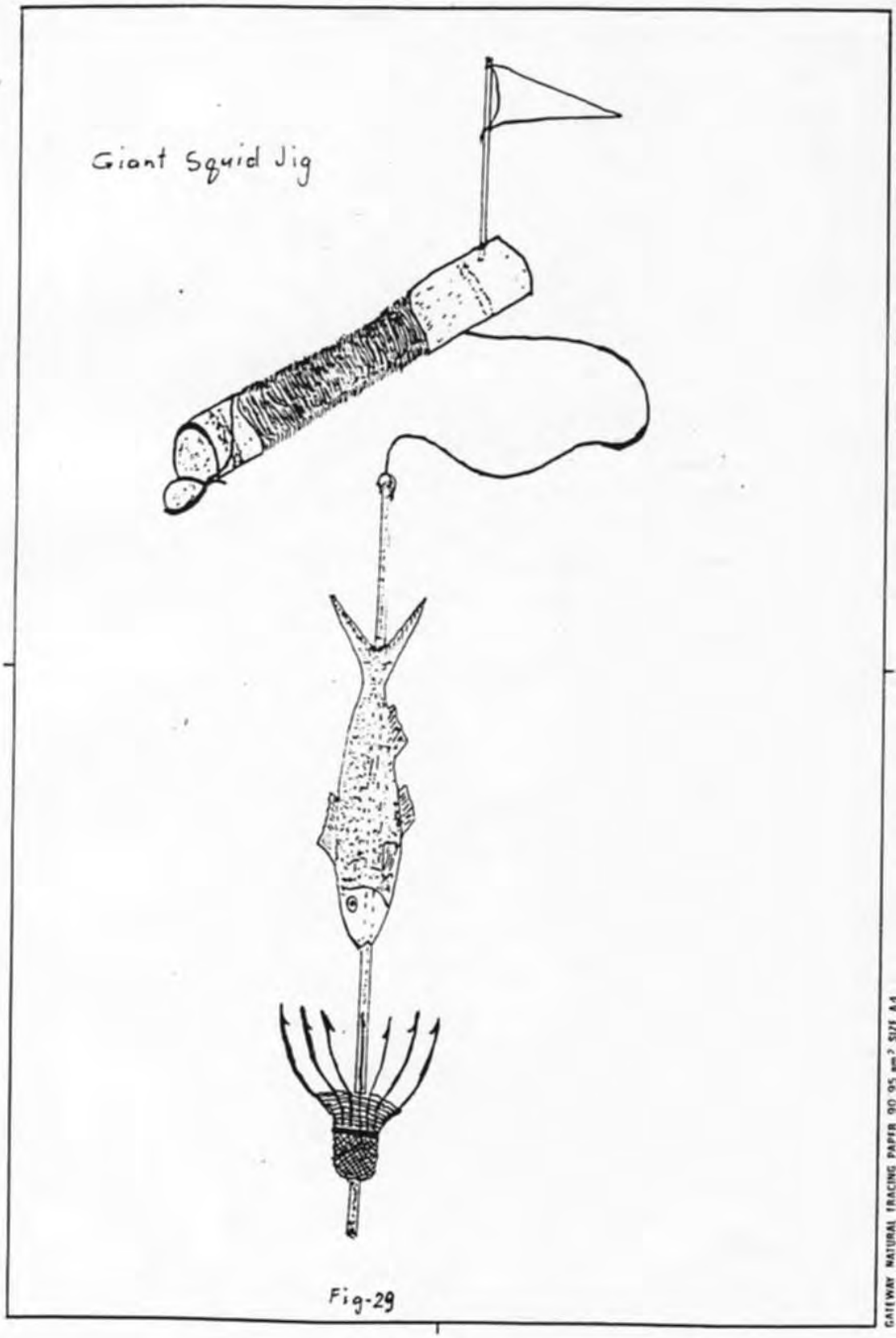

Giant Squid Jig
British Mus
GATEWAY NATURAL TRACING PAPER 90 95 gm² SIZE A4

Fig-29

LARGE SCALE TUNA LONGLINE FISHING

By : Mr. Pirot Choyvong
Mr. Pramual Meepan

Tuna longline fishing boats of 200-400 tons operate at the pelagic-tuna fishing grounds all over the world. These boats are under going rapid modernization of facilities and machanization of fishing equipment in the face of increasing demand for fish as well as rising cost of labour with the introduction of power equipment such as the line winder system and the reel system, it the been possible to reduce the number of crew of tuna longline from 27 or 28 to between 17-and 21. There has been a considerable development in the processing and the catch-preservation facilities on board tuna longliners. In modern vessel the temperature of the freezing chamber is -55° to -60°C and that of the fish hold is -45°C to -50°C, thus allowing exellent preservation of catch for very long period. At present, tuna longlines operate for 8-12 months continuousily storing their catch on board, only stopping at a port once every 2-3 months to renew their supplies of water and provisions.

Fishing Gear

Gear is shown in Fig. 1 and its specifications are given in Table 1.

The main line is a single line up to 150,000 m. long. When not operation, it is either would on the reel on the stern part of the boats which is equipped with the reel system, or it is coiled in the storage box in case of boats equipped with the line winder system.

Branch lines are attached to the main line, at suitable interval, by ..... the snap which is shown in Fig. 1.

Fishing Method

All tuna longline boats over 100 GT are built with along poop deck. Such a deck has certain advantages, for example, protecting the ship from following ware or beam ware during shooting of the line. Also, when the line is hauled against the wind at an angle, it is easy to keep this angle because the resistance of wind in bow part of the boat is less than in the stern part.

Frozensaury, squid and mackerel are used as bait study of artificial bait has been done, but it is still not developed.

The main line of the old type, which consist of many parts, is shot while the line is being joins by baskets, at speed of boat of 5 knots or more. The modern main line is a single piece of line to which branch line have to be attached which shooting is done, at speed of boat about 10 knots.

Generally shooting begin before sunrise the boat runs with a constant course following the directing of the wind.

Hauling begin in the early afternoon with the help of the line hauler. Ideally, course of the boat should be keep at the starboard bow wind. It take about 10 hours to haul the entire line. Fig. 2 shows the facility onboard boats equipped with the reel system and line winder system.

A study of tuna longline fishing

The Japan Marine Fisheries Resource Center (JAMARC) carried out an experiment in tuna longline fishing in higher latitudes of the South West Pacific, in the area shown in Fig. 4. The propose of the experiment was to investigate the fishing grounds vertically, i.e. below the depths. When tuna is normally caught with the existing tuna longline gear.

In order to examine vertical distribution of tuna and marlin, various type of tuna longline gear were used, Fig. 5 illustrates how the gear was used, the curve are obtained assuming that the main line in case makes a catenaly curve. The depths of branch line obtained from this figure, as well as the depth of branch lines measured by depth meter, are given in table 3.

Hook rates by species and by depth at fishing grounds. A, C, P and H. are shown in Fig 5. In the case of bigeye, higher hook rate was obtained at the fishing grounds. D. when deep longline with 14 branch lines in a basket was used. The depth where the hook rate showed over 0.5 was between 275-330 meters. From this, it was that the bigeye's dwelling depth is about 300 m. or more. Albacores were caught a lot at the fishing ground A with the gear constructed with 11 branch lines in a basket. Hook rate was more than 4.7 at the depth of 185-285 meters. In case of yellowfin and marlin, good hook rate was obtained at almost the same depth. The depth where the hook rate was over 0.4 for yellowfin and for marlin was 140-235 meters.

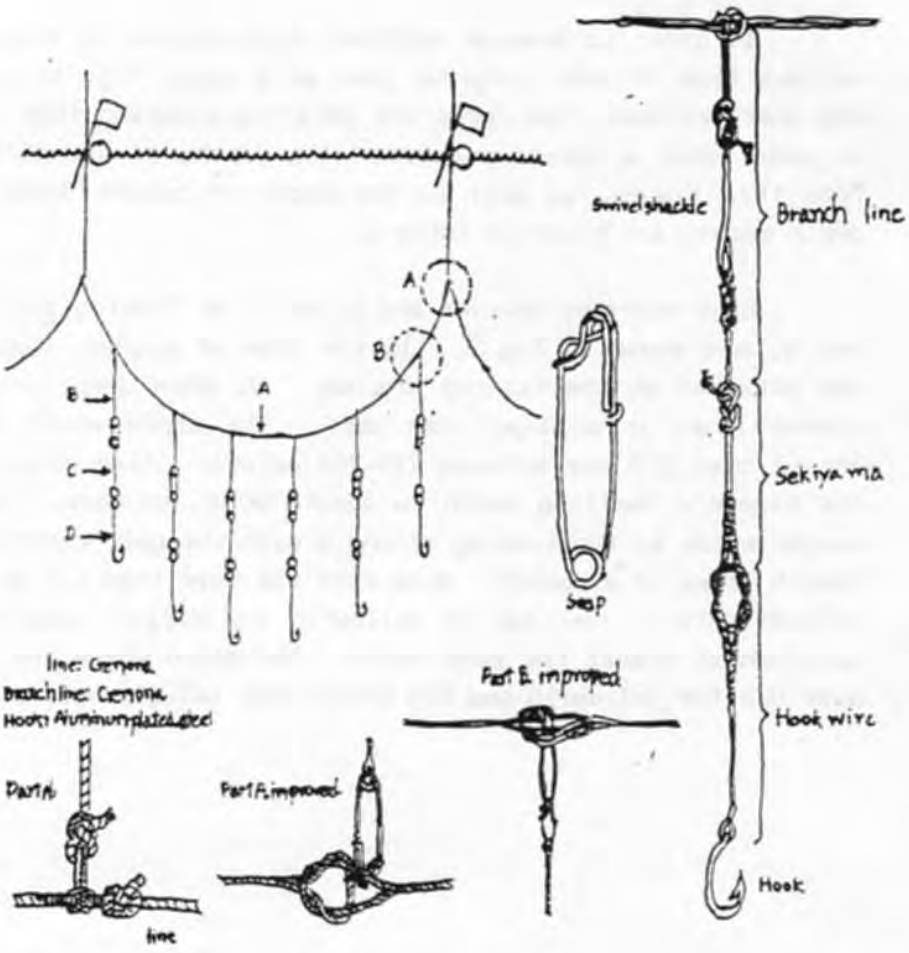


Fig 1 Gear for large-scale tuna longline fishing

Specification of tuna longline gear

	Name	Material	Size/Quantity
A	Main line	Vinylon	Ø 6.2 mm, 150,000 m
B	Branch line	Vinylon	Ø 5.5 mm, 11-14 m, 2000-2500 ps
C	Sekiyama	Wire with cotton	7-10 m, 2000-2500 ps
D	Hook line	Wire	2-4 m, 2000-2500 ps
E	Radio buoy		2-4 ps
F	Light buoy		10-20 ps
G	Float	Glass or plastic Ø 30 cm	

Table 1

a) Specifications of main line for tuna longline

Vinylon F (1500 D/120 F)

Diameter (mm)	g/m	Breaking strength (kg) Dry	Wet	Weight of 200 m (kg)
3.28	7.2	175	118	1.40
4.16	11.7	260	230	2.34
4.60	14.0	304	272	2.80
5.00	16.3	350	312	3.26
5.66	20.7	440	398	4.14
5.98	22.9	488	435	4.58
6.36	25.2	530	477	5.04

b) Specifications of branch line for tuna longline.

	Diameter (mm)	Breaking strength (kg)
Nylon (55%) Polyester (45%)	4.4	300
Nylon (55%) Polyester (45%)	4.8	350
Nylon (60%) Polyester (40%)	5.2	400

Table 3 Tuna longline experiment: relationship between the fishing method and the depth of hook

Fishing ground	No. of hooks per basket	Length of float line (m)	Per basket: length of main line (e)	Per basket: distance between floats (f)	Shrinkage (e/f)	Hook position	Depth by depth meter (m)	Depth by catenary curve (m)	Target fish
A and B	10	20 m	572 m	315	0.55	1, 10	86-93	90	
						2, 9		138	Bigeye, marlin
						3, 8		186	
						4, 7		227	
						5, 6	210-264	276	
A and C	11	20	628	331	0.53	1, 11	90-93	90	
						2, 10		140	
						3, 9		187	Bigeye, marlin
						4, 8		232	
						5, 7		269	
						6	293-302	286	
C	5	20	468	209	0.53	1, 6		139	
						2, 5		184	marlin
						3, 4	212-218	218	
D and E	14	20	780	411	0.51	1, 14		90	
						2, 13		136	
						3, 12	173-178	186	Bigeye
						4, 11		232	
						5, 10	268-279	274	
						6, 8	320-323	310	
						7, 8	307-364	332	
H	12	20	676	366	0.54	1, 12	70	90	
						2, 11	110	140	
						3, 10	180	186	Yellowfin
						4, 9	200	233	Bigeye
						5, 8	229	272	
						6, 7	280	300	

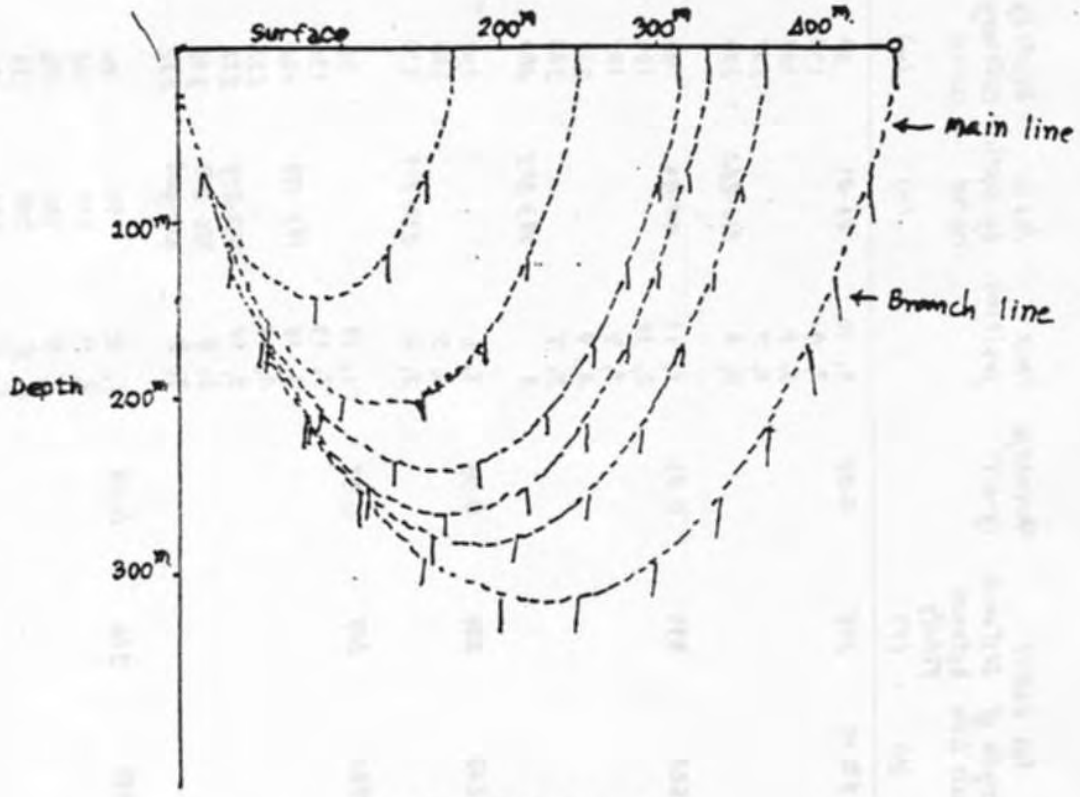


Fig. 4 Catenary curve

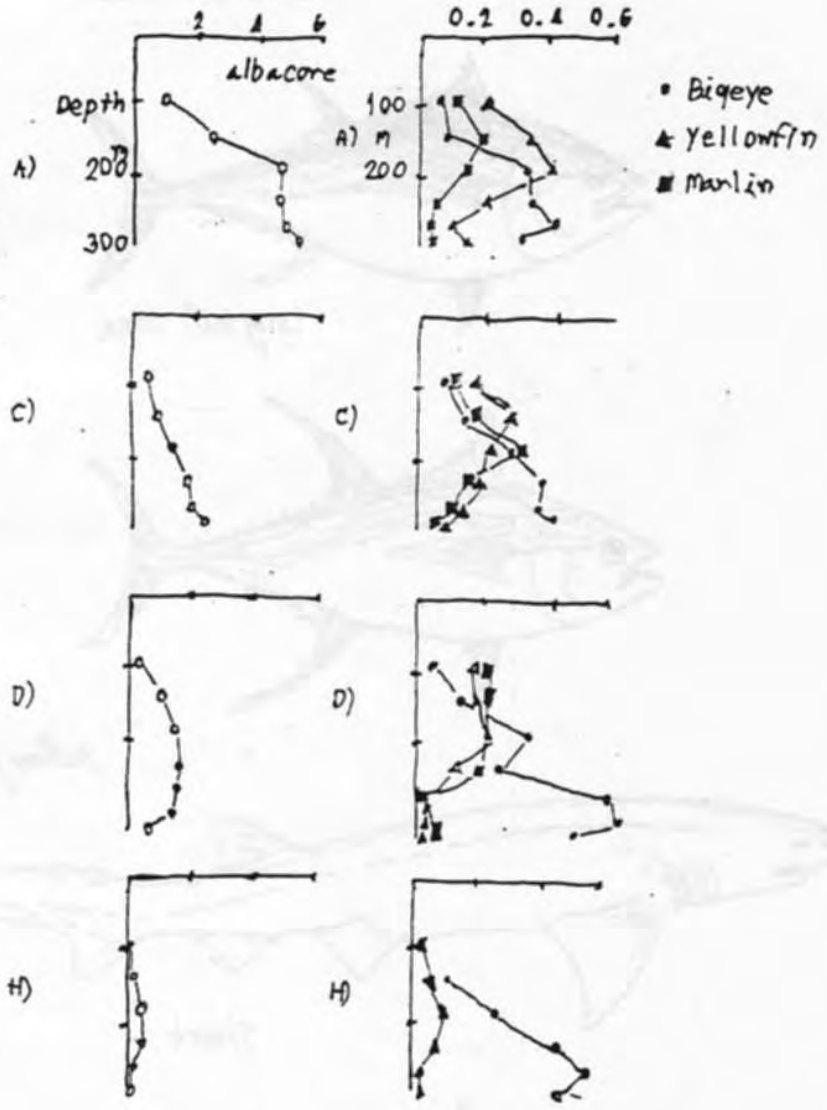
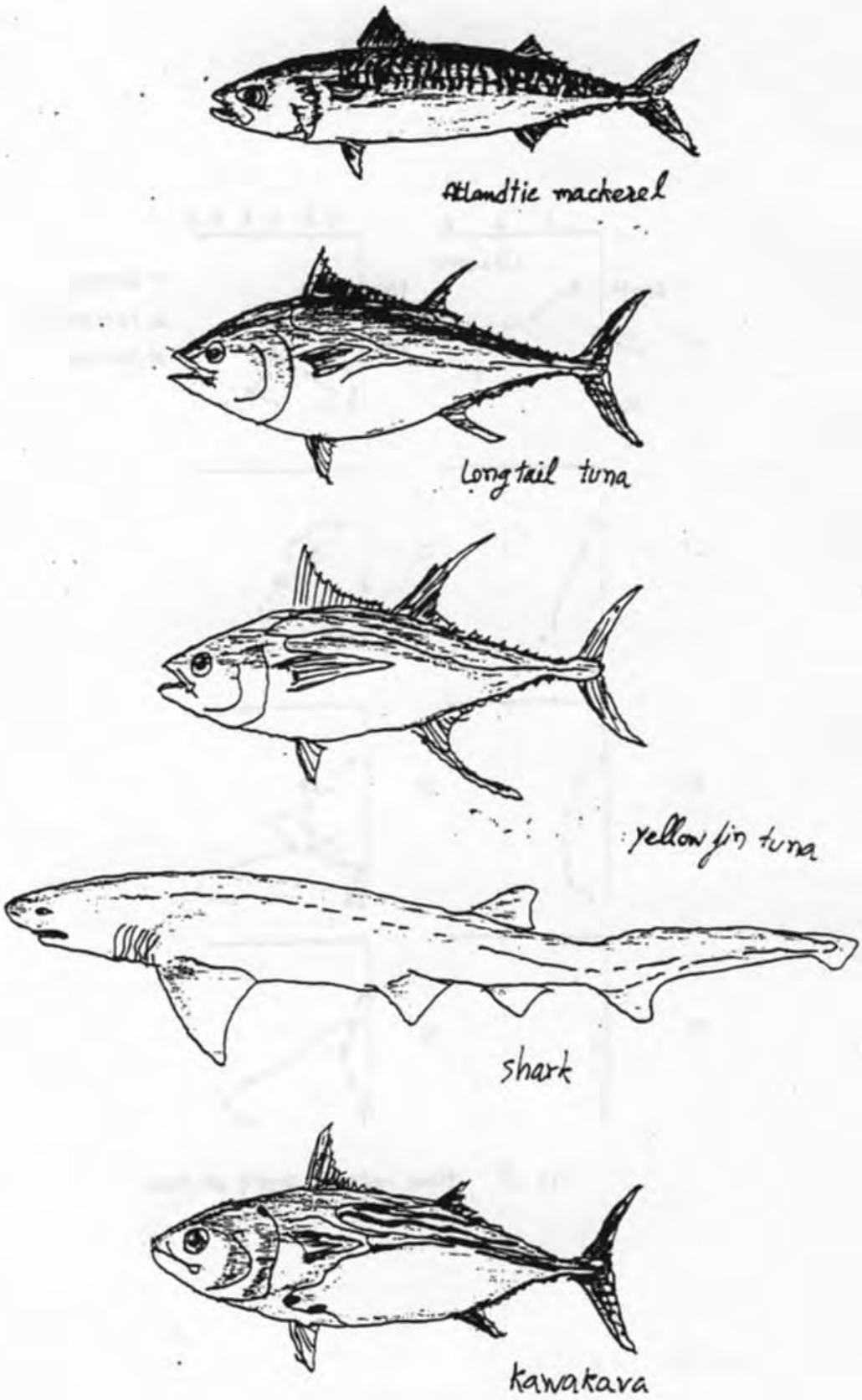


Fig 5 Hook rate by depth of hook



The Target of Tuna Longline

CONSTRUCTION OF PURSE SEINE NET IN VIETNAME

By : Mr. Tran Van Thang
(Viet Nam)

The length and depth of the net depend on the size of the fishing boat, the fishing method and in the case of the fish school the detection method used. If the luring method is used, the net should not too long. The mesh size used for a purse seine net depends on the fish to be caught, anchovy, sardine, round scale, etc. The shape, construction and material of the nets used to catch fish in conjunctions with coconut leaf shelter, luring lights or by simply using traditional visual sighting are mainly the same. (Figure 1.1)

1. Bunt : The bunt is the important part of the net where the fish collect in the last step of the fishing operation before being scorped into the fish held. The material of this part is used PA 210d/8 (Fig. 1.2)

2. Bbdy net : Body net is the largest part of the net for surrounding the fish school. The material of this part is used PA 210d/6 (Fig. 1.2)

3. Selvage : The selvage is joined to the sinker line on one side and on the other it is joined to the body of the net and the bunt. Usually, Viet Nam purse seine used polyethylene twine 280d/12 for this part. The mesh size is 25x25 mm. The length of the selvage must be equal to the length of the body net and the bunt. While the depth should be about 40 cm. (Fig. 1.2)

4. Float line : One price each "S" and "Z" twist polyethylene 0 8 mm. one rope is inserted into the meshes of the rims of the net while the other piece has the floats and is attached to the other piece of rope. (Fig. 1.2)

5. Sinker line : Two pieces of polythylene rope 0 8 mm. one piece each "S" and "Z" twist are used for the sinker line. One rope is inserted throught the meshes of the rim of the lower selvage while the other piece is attached to it with twine. (Fig. 1.2)

6. Bridle rope : Polyethylene rope Ø 18 is used one end of the bridle rope is tied to the sinker line while the other end is tied to the purse ring the length of the bridle rope is 2.5 meter. (Fig. 1.2)

7. Purse line : To close the bottom of the purse seine net during fishing operation the purse line must be think and strong and not twist or curl during used. Usually polyethylene brided rope Ø 30 mm is used for the purse seine. (Fig. 1.2)

8. Extra rope : This rope connects with the float line at the end of the right wing it is about 80-100 meter long. When shooting the net to surround the fish school sometimes the ends of the net cannot meet them this rope will be used usually polyethylene rope Ø 25 mm is used.

9. Floats : Long and flat in shape, the circular ends of the floats made of plastic are attached to the float line of the purse seine net usually plastic floats size 250x80 is used.

10. Sinker and purse ring : Generally purse rings must be make out of non-rust material such as brass, stainless steel. The diameter of the inside of the ring is 9 cm and the thinkness of the material is 1.5 cm. the interval between each purse ring 3 m. Sinker weigh 0.5 kg/each and attached to the sinker line near the bridle rope.

11. Two extra sinkers : These sinkers their weight's are about 40 to 50 kg a piece, are used as weights attached to the purse ring at the end of both wings during operations to ensure that the door does not open too widely.

12. Light raft : A light raft has an iron frame 1.20 m long, 0.9 m wide and 0.15 m think. The frame is packed with foam. There are three sets of gas cylinder lamp per raft. (Fig. 3.1) Other type is used the electric light, there are six sets electric light per raft, frame also with foam and wood. (Fig. 3.1)

Fishing Operations

1. To find a fish school during the day time

In the daytime we can find a fish school by looking for the following:

a) Chang of water colour:

A fish school near the surface, seen from for a way, will make the water appear coloured and the water around the school will show ripples distinguishing it from the surrounding water especially in the case of schools of sardine, anchovy.

b) Jumping fish

Sometimes fish in the school are seen to be jumping, such as bonito and hardtail scad.

c) Flocks of birds

A flock of sea birds often accompanies a school of fish. Birds flying in a fixed direction are usually in dependent of a school below. But birds flying high as well as low in various directions are generally following a school. When the movement of a fish school is rapid, the birds are very active the directions of their flight suggests the movement of the fish school. But when the movement of the fish school is slow the birds fly slowly and circle high in the air as soon as the fish school begins to come up to the surface, the movement of the birds again becomes very active.

2. To find a fish school during night-time

At night-time when there is little moon light fish schools can be found be observing the plankton luminescence, caused by the swimming fish school.

3. To find a fish school by using fishfinder and sonar. The fish school must be migrating below the surface and can be found at anytime by the day or night.

There are four methods of luring to concentrate fish for purse seine fishing operations in Viet Nam today.

- Luring by light raft (generator)
- Luring by light raft (gas cylinder lamp)
- Luring by coconut leaf shelter with light raft
- Luring by coconut leaf shelter

Fishing Operation with Traditional Visual Observation

One-boat purse seine operation

When the fisherman finds a fish school, he will order the steersman to slow down and sail towards the school. Then stop while he consider the species, size of the school, swimming speed, direction current, wind and bottom of the sea. If the masterfisherman decides to operate he will give orders to standby all hands in position such as: 1 crewman for shooting line, 1-2 crewman for shooting the net (shoal the size net of the wing only, after that the net will release itself) 1 crewman for shooting float line, 1 crewman for shooting buoy or light raft in the case of night-time operations.

For the first shooting, the position is under the wind for foam the fish school, about 30-60 meters. Usually the fish school is swimming against the wind. The vessel moves at full speed while releasing the net to surround the fish school in a circular shape. The speed will be reduced when about three quarters of the net length has been released. Then the clutch is turn off before arriving at the float or light raft at the other end of the wing (left wing). When they meet, the maker is hooked up and pulls the top of the wing net to the boat. The purse seine will be maintained well in position. After that both sides of the purse line will be passed through the two pulleys at the bow, to the winch drums on both sides of the wheel house. Then the purse line is winch up on both sides of the fish come to the door, materfisherman will order 2-4 crewman to jump down and chase the fish by beating the water until all the purse rings reach the boat. After that the rings are winched on board using the pulley

on the fore deck post. Then the purse line is pulled back to be between the rings after that all the crewmen pull the net upon both sides while shaking the net to chase fish down into the bunt. When the left wing at port side has been pulled up to the bunt, then the crew must help pulling in on the starboard side. The float line must then be lifted over the bunt up by the boom to prevent the fish escaping. After that fish are scooped from the bunt and kept in the fish hold. The net will be arranged, after finishing putting the fish in the fish hold, for another operation (Figure 2).

Purse seine fishing operation with light raft

The purse seine leave port in the afternoon to fish with luring lights during a dark night. When they arrive at the fishing ground suitable for luring by lights, they will anchor and wait. After sunset the light raft will be released about 1 to 6 raft connected togetner with rope, the interval between the rafts is about 30-50 meter. After a while, fish will start to concentrate at non existant, when the operation will start. Before the operation, the light raft are pulled slowly towards the boat and tne light are turn off one by one, until there is one left. This is released along with the small gondola with one crewman aboard, before the anchore of the light raft is pulled up, then the gondola tows the raft slowly against the wind, while the purse seine, shoots the net to surround the light raft. After that the purse line is pulled up while the gondolar with light raft must be maintained for from the door of the net, until all purse rings reach the boat. Then the lights are turned off and the gondola with the raft moves out from inside the net and the raft is brought on board the purse seiner. The crew must haul the net up in the manner already mentioned (Figure 3).

• Steps to a fishing operation using Light rafts

Fig 3

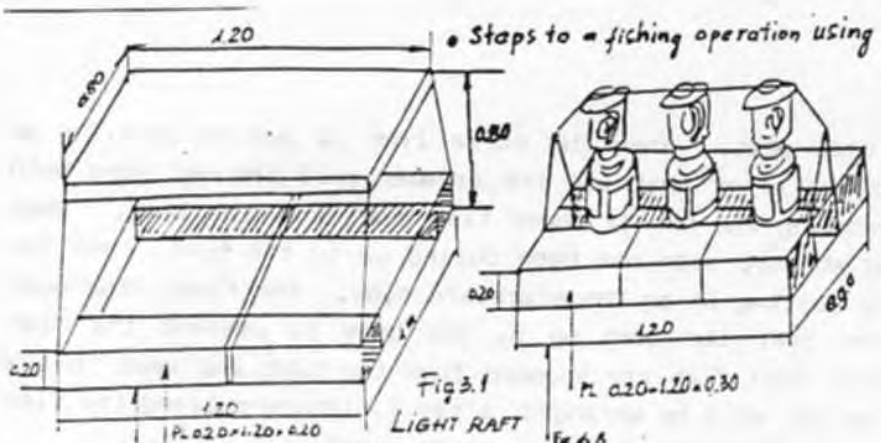
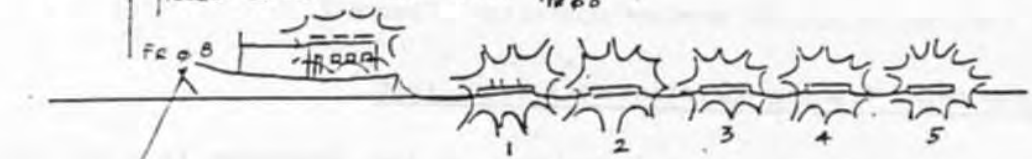
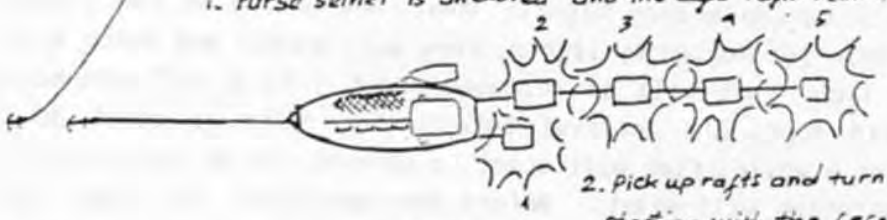


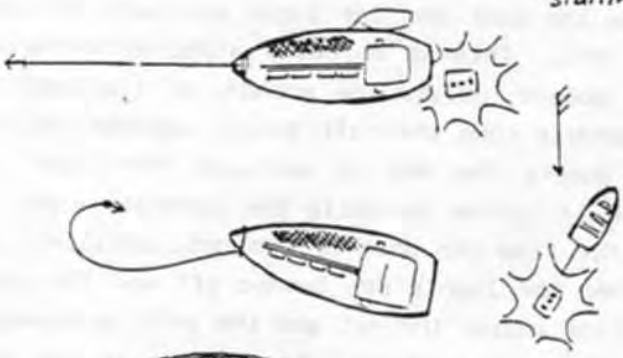
Fig 3.1
LIGHT RAFT



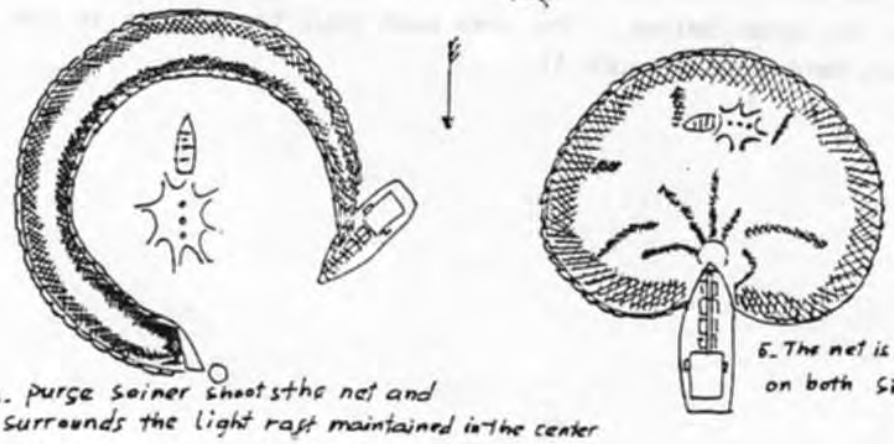
1. Purse seiner is anchored and the Light rafts released



2. Pick up rafts and turn off Lights starting with the second rafts



3. The gondola tows the released Light raft against the wind. Purse seiner pulls up anchor.



4. Purse seiner shoots the net and surrounds the light raft maintained in the center

5. The net is pull up on both sides

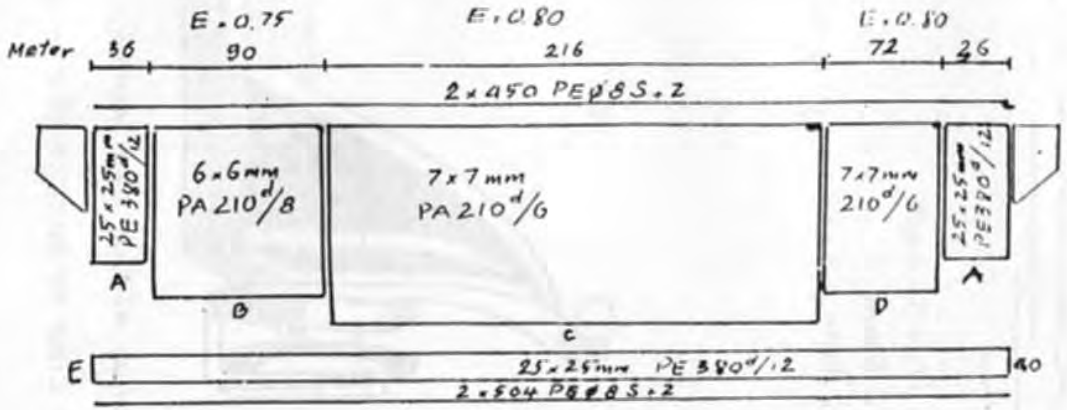
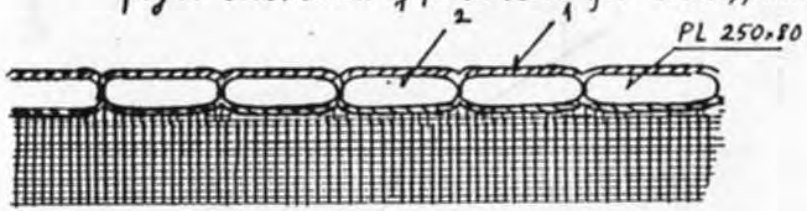


Fig 1.1 Construction of purse seine for anchovy, SARDINE

Construction of Purse seine
VIET NAM
450 x 50 m



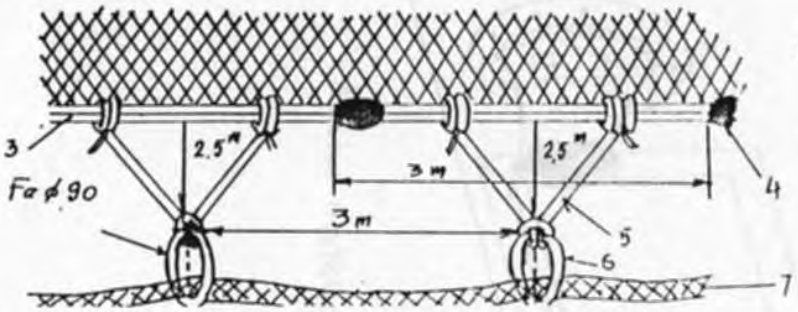
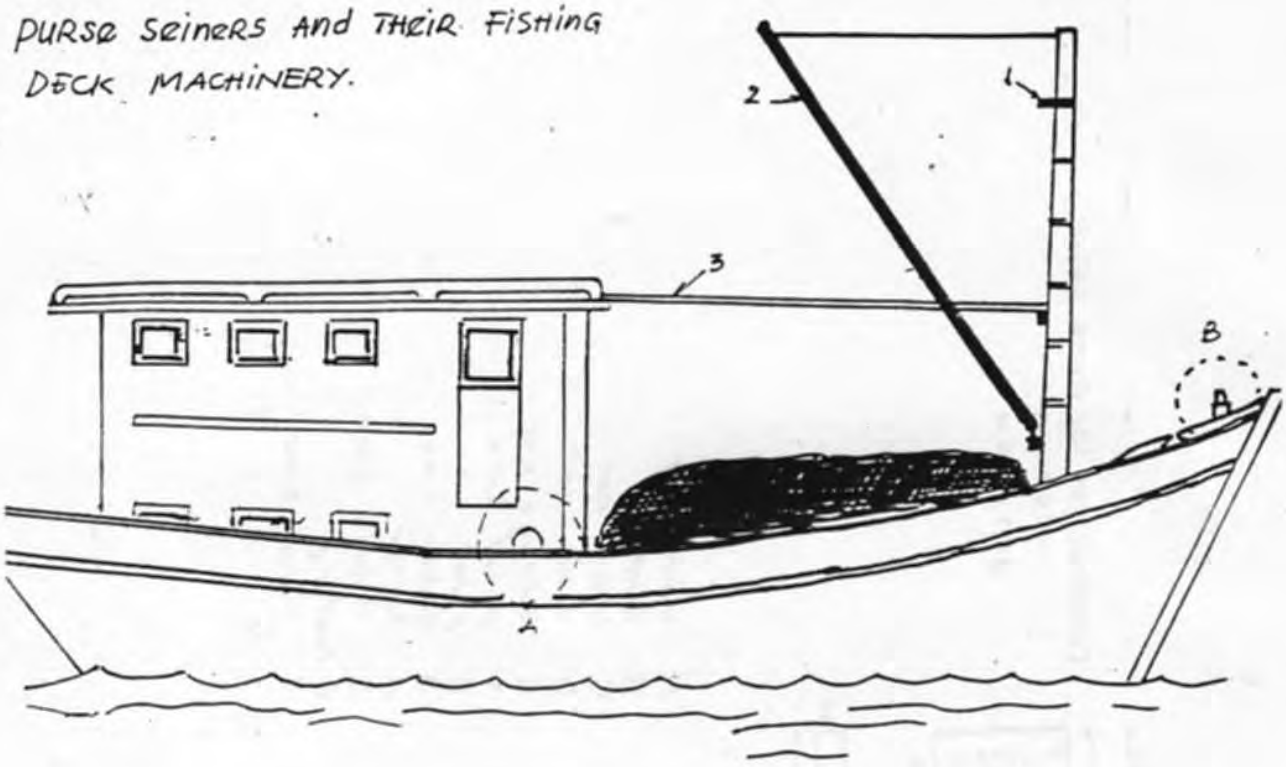


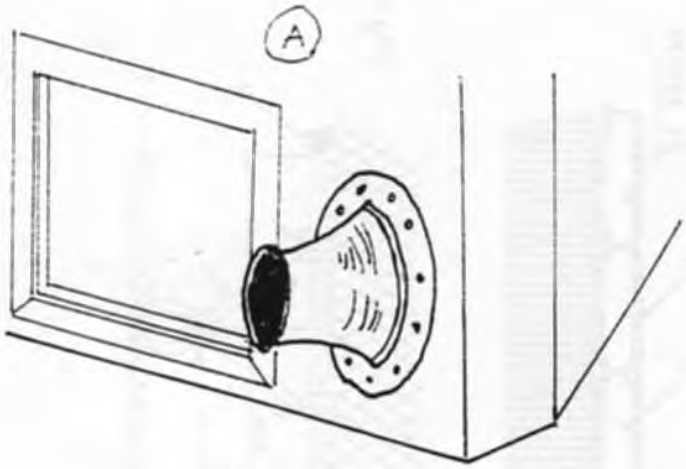
Fig 1.2

A	Wing net
B	Bunt
C	Main net
D	Wing net
E	Selvage net
1	Float Line
2	Float
3	Sinker Line
4	Sinker
5	Bridle Line
6	Purse Ring
7	Purse Line

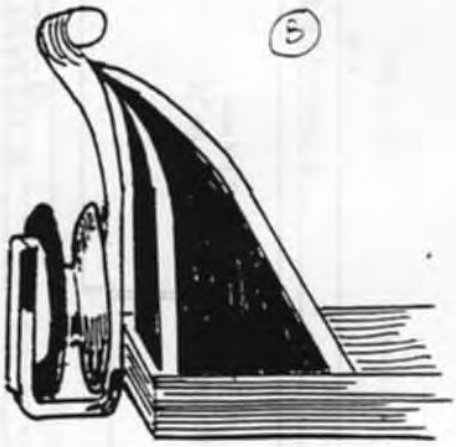
PURSE SEINERS AND THEIR FISHING DECK MACHINERY.



1. Crow's-nest
2. Boom
3. Boom for rearranging the net

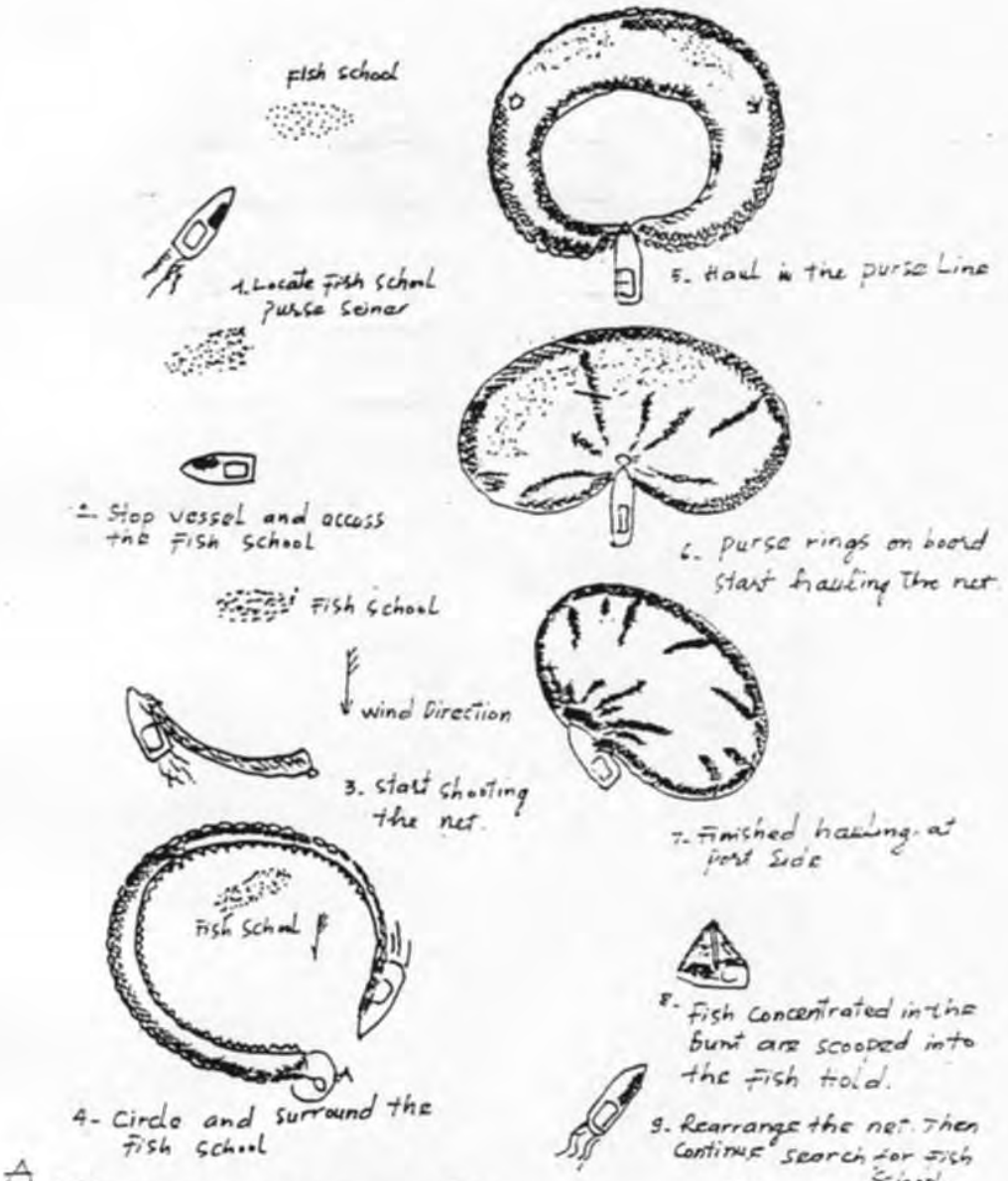


Capstan winch



The pulley at the bow for the purse Line to pass to the winch

Fig2 Steps to a Fishing operation with traditional visual observation.



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