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TUNA FISHING GEARS OF THE PHILIPPINES

Arsenio S. de Jesus

PHILIPPINES

INDO-PACIFIC TUNA DEVELOPMENT AND MANAGEMENT PROGRAMME
Colombo, Sri Lanka

The Indo-Pacific Tuna Development and Management Programme seeks to assist the governments in the area in the preparation of long-term management and development of tuna and tuna-like species. Recognizing the need for intensive efforts in selected countries to generate the information to support this management and development in the Government of Japan, established a trust fund with FAO to enable directed Investigation on Indian Ocean and Western Pacific Small Tuna Resources. These investigations form a valuable part of the overall Indo-Pacific Tuna Programme (IPTP). This publication is made possible by Japan's support.

The project supported by Japan is carried out under the general direction of the IPTP in close cooperation with FAO's regional fisheries projects. The initial work has concentrated in the Philippines and Indonesia in cooperation with the UNDP/FAO South China Sea Fisheries Development and Coordinating Programme (SCSP).

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CATALOGUE OF TUNA FISHING GEARS OF THE PHILIPPINES

by

Arsenio S. de Jesus
Supervising Fishery Technologist
Bureau of Fisheries and Aquatic Resources

1. INTRODUCTION

The tuna fisheries of the Philippines are the most important of all marine fisheries in terms of volume and value of landings. The 1980 catch of tunas totalled 200,805 tonnes. This catch was taken by a variety of fishing gears. The Fisheries Statistics of the Philippines (1982) lists eight commercial fishing gears and twelve municipal fishing gears as capturing tunas. The most productive fishing gears in decreasing percentage of landings are hook and line 30%, purse seine 22%, ring net 19%, bagnet 12%, gill net 9%, beach seine 4%, fish corral 2%, trawl 1% and longline 1%.

A unique feature of the Philippine tuna fisheries is the extensive use of payaws (also spelled "payao") or fish aggregating devices (Aprieto, 1980). These are set in all seas off the Philippines except in the exposed waters of the Pacific Ocean. The principal fishing gears used to capture fish aggregated by payaws are handlines, purse seines and ring nets. These three gear types account for 71% of the total tuna landings, although not all of this is caught around payaws.

A classification of fishing gears in the Philippines with schematic drawings of the gears in operation has been compiled by Umali (1950). Many of these drawings have been reproduced in a report by Smith, et al. (1980) with brief narratives of description and mode of operation. There is little detailed documentation on the tuna fishing gears in the Philippines. A plan of a tuna purse-seine revised from the seine used by the F/V "Southward Ho" during explorations in Philippine waters from 1974 to 1977 is given in Murdoch (1978). Murdy (1980) describes payaws used off Mindoro Island in the South China Sea. Detailed plans and specifications of other tuna fishing gears used by the commercial and municipal fisheries are generally not available. The project document for the "Investigations on Indian Ocean and Western Pacific Small Tuna Resources" defined a pilot activity to evaluate the fishing techniques used in artisanal fisheries, especially in the Philippines. During the "Consultation Meeting of the Joint Indonesian/Philippine Tuna Working Group" convened in Manila on 21-23 October 1981, it was suggested that descriptions be obtained of the principal surrounding nets currently utilized in the Philippine tuna fisheries with particular reference to mesh sizes (Anonymous, 1981). In compliance with these recommendations, Mr. Arsenio S. de Jesus, Supervising Fishery Technologist of the Technological Services Division, Bureau of Fisheries and Aquatic Resources (BFAR) was requested to undertake the task of assembling this information for Philippine fisheries for publication, as one of the activities of a tuna resources project.

The Technological Services Division currently collects designs and specifications of fishing gears used in the Philippines. The available information on tuna fishing gears plus additional information collected during a Team Mission to the major tuna landing centres was compiled by Mr. de Jesus. This catalogue is intended for fisheries biologists, teachers in fishery schools and fishery extension workers in the Philippines. Also, this catalogue may be of interest to researchers, teachers and extension workers in other countries of the Indo-Pacific region.

2. MODE OF PRESENTATION - EXPLANATORY NOTES

Detailed specifications of fishing gears are given in line drawings. Information given with these drawings include type and name of gear, localities where the gear is used, type and characteristics of vessels used to fish the gear. Schematic drawings are included in several instances to show method of operation and sequence of fishing activities. Brief descriptions of target species, and methods of operation are given for each gear type.

The following abbreviations and symbols were used in this report.

B	-	Bar	Pb	-	Lead
D	-	Denier	PE	-	Polyethylene
M	-	Mesh	PES	-	Polyester
MD	-	Meshes deep	PVA	-	Polyvinyl alcohol
Mono	-	Mono-filament	SS	-	Stainless steel
NV	-	Nylon Vinylon	Ø	-	Diameter
PA	-	Polyamide			

Common names of fish have been used in the text. The scientific names of species and species groups are as follows:

Bullet tuna	-	<u>Auxis rochei</u>
Frigate tuna	-	<u>Auxis thazard</u>
Eastern little tuna	-	<u>Euthynnus affinis</u>
Skipjack tuna	-	<u>Katsuwonus pelamis</u>
Yellowfin tuna	-	<u>Thunnus albacares</u>
Albacore tuna	-	<u>Thunnus alalunga</u>
Bigeye tuna	-	<u>Thunnus obesus</u>
Longtail tuna	-	<u>Thunnus tonggol</u>
Scad	-	<u>Carangidae</u>
Squid	-	<u>Cephalopoda</u>
Milkfish	-	<u>Chanos chanos</u>
Sardine	-	<u>Clupeidae</u>
Anchovies	-	<u>Engraulidae</u>
Mackerels	-	<u>Rastrelliger sp.</u>

The seas and gulfs referred to in this catalogue are shown in Figure 1.

3. FISHING VESSELS

The principal craft used by municipal fishermen and to a lesser extent by commercial fishermen in the Philippines is the outriggered banca. These are narrow-beamed craft with hollowed-log bottoms and generally marine plywood sides reinforced with vertical and transverse frames (Fyson, 1978). The long narrow hull is stabilized by the use of 2 outriggers fabricated of large-diameter bamboos. Outriggered bancas range in length from 6.0 to 33.5 m with total beam over the outriggers of the 33.5 m banca extending 44.2 m. The smaller bancas are either non-powered or powered, generally with gasoline engines of 10 to 16 HP. The larger bancas are powered, either by reconditioned marine engines or converted engines from land vehicles.

4. TYPES OF FISHING GEARS AND FISHING AIDS

Five basic types of tuna fishing gears are used in the Philippines including hook and line, gill net, lift, surrounding net and trap net. The two types of fishing aids found in this country are barrier and fish aggregating device (payaw). These fishing gears and aids are described in this report.



Fig. 1. Map showing the seas and gulfs of the Philippines referred to in this report.

4.1.1.1 Two-boat troll line (Figure 2)

This fishing gear is used for surface schools of small tunas, principally bullet and frigate tunas. The bancas depart early in the morning and travel together as they scout for tuna schools feeding on the surface. When a school is sighted, the two bancas move towards the school and away from each other, paying out the troll line between them. The bancas move apart until the line is completely paid out, then they travel parallel to each other so that the feeding school passes between them (Fig. 2a). The bancas maneuver to stay outside the perimeter of the school so as not to frighten the fish into sounding or scattering. When fish strike, the bancas slow down, maneuver closer together and the line is retrieved by the fisherman in either one or both bancas.

The number of hooks ranges from 10 to 100 and the length of the line varies accordingly. Artificial lures are used on the hooks including strips of coloured plastic tubing or strands of coloured twine.

Fig. 2a. Operation of two-boat troll line

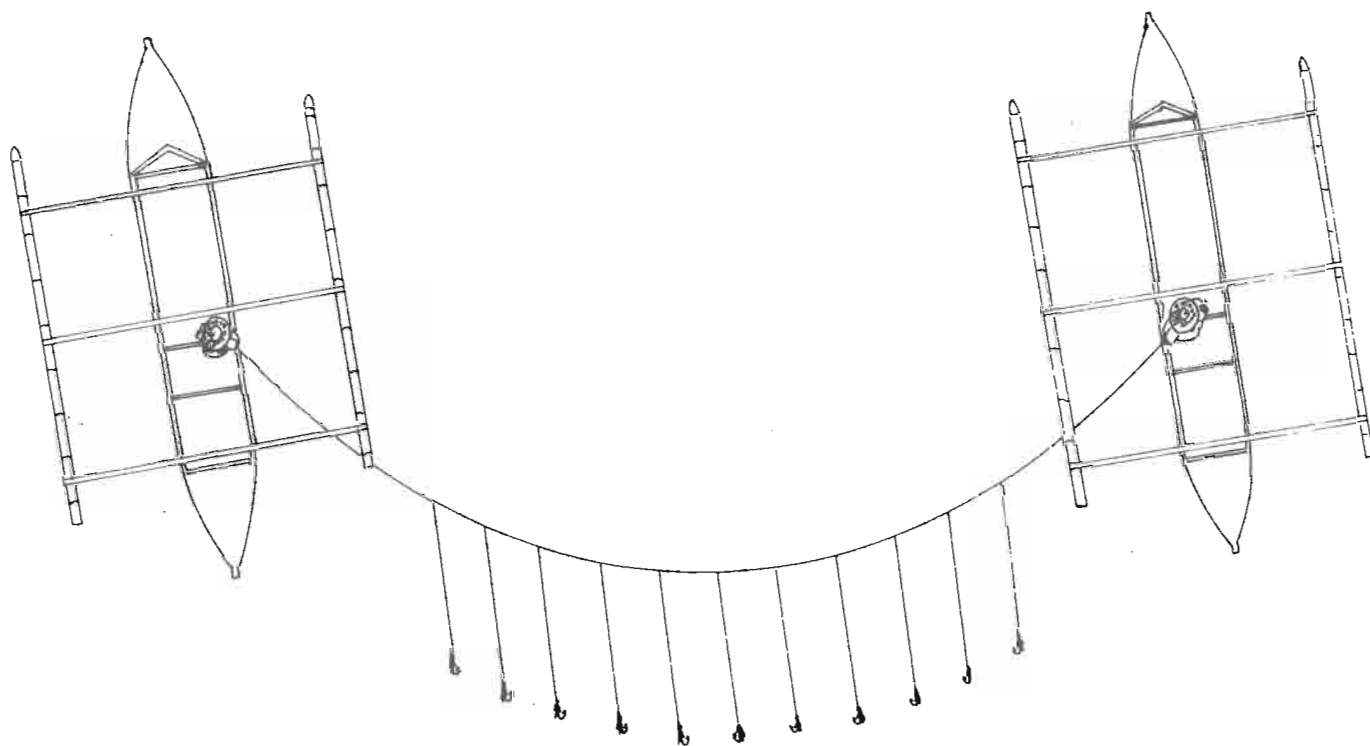
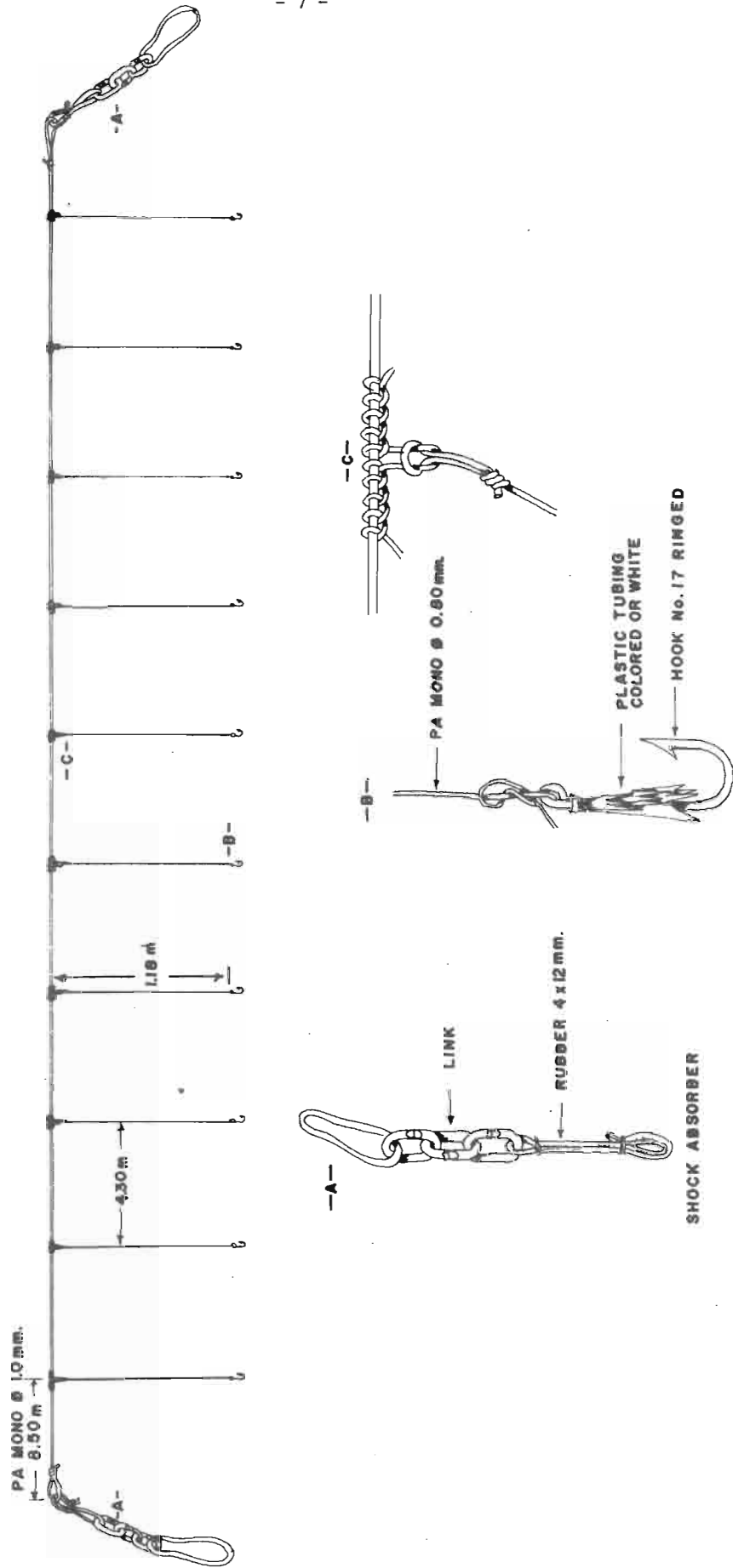


FIG. 2

TYPE : Lines
 NAME OF GEAR : Two-boat troll line
 LOCALITY : Bohol Sea, Celebes Sea

VESSELS : Outriggered banca, 2 units
 L.O.A. : 7.9 m
 G.T. : 0.7
 H.P. : 10
 CREW : 2



4.1.1.1 Mid-water troll line (Figure 3)

Mid-water troll lines are used off the west and southeast coasts of Luzon Island, and Cebu Island and in the Davao Gulf. The gear used in the Davao Gulf is heavier and used to catch deep-swimming tunas, principally large yellowfin (25-50 kg). Mid-water troll lines used in the other localities are lighter and used to capture subsurface skipjack and small yellowfin.

Mid-water trolling is generally practised in the morning in areas of known occurrence of tunas. The lead depressor is lowered into the water and the mainline paid out. Branchlines are snapped onto the mainline with stainless steel clips at regular intervals (Fig. 3a). Natural baits including milkfish, sardines, mackerels and scads are used as are artificial baits such as rubber squid and aluminum strips. Trolling is conducted at 1.5 knots.

Fig. 3a. Operation of mid-water troll line

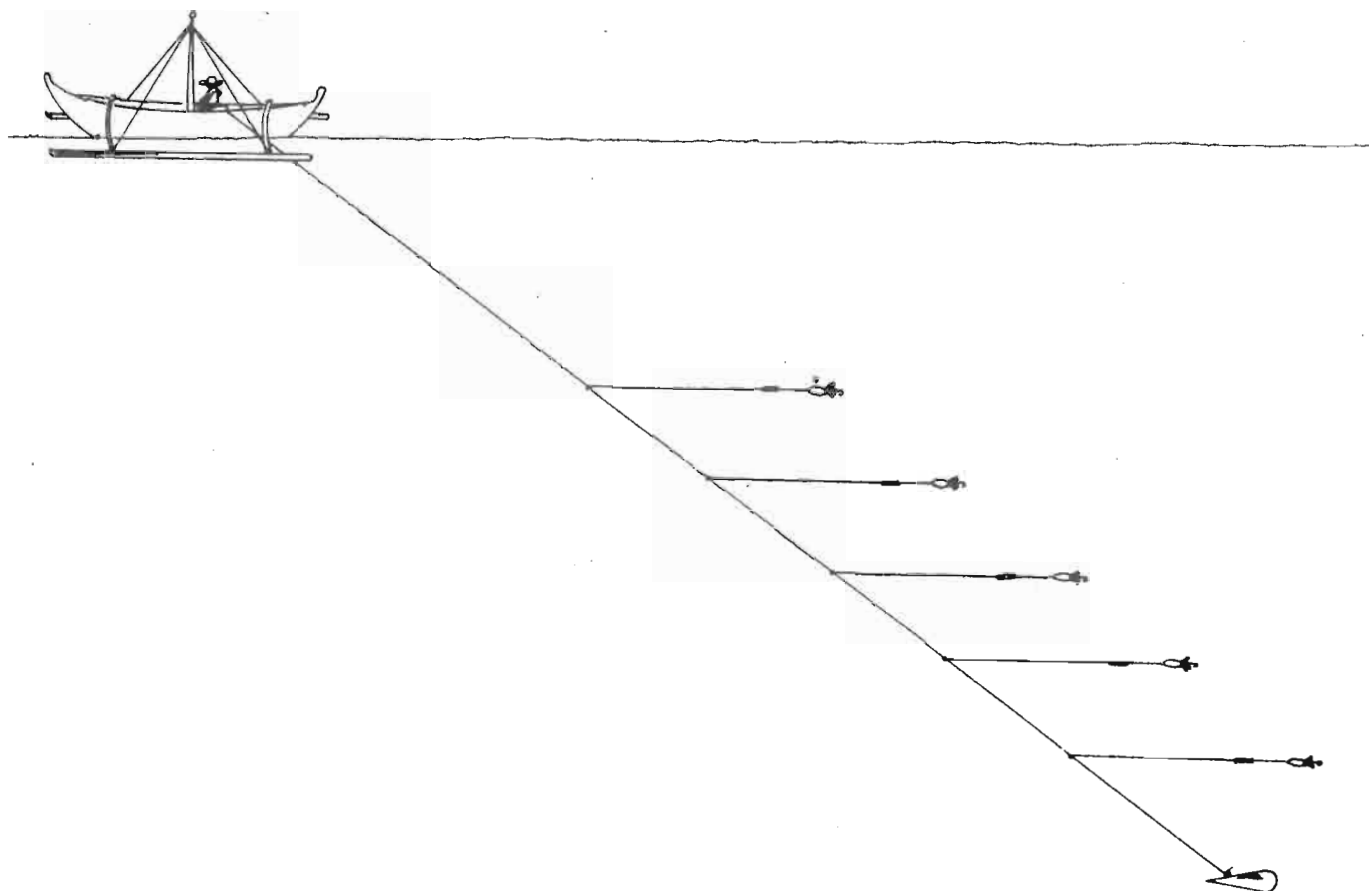
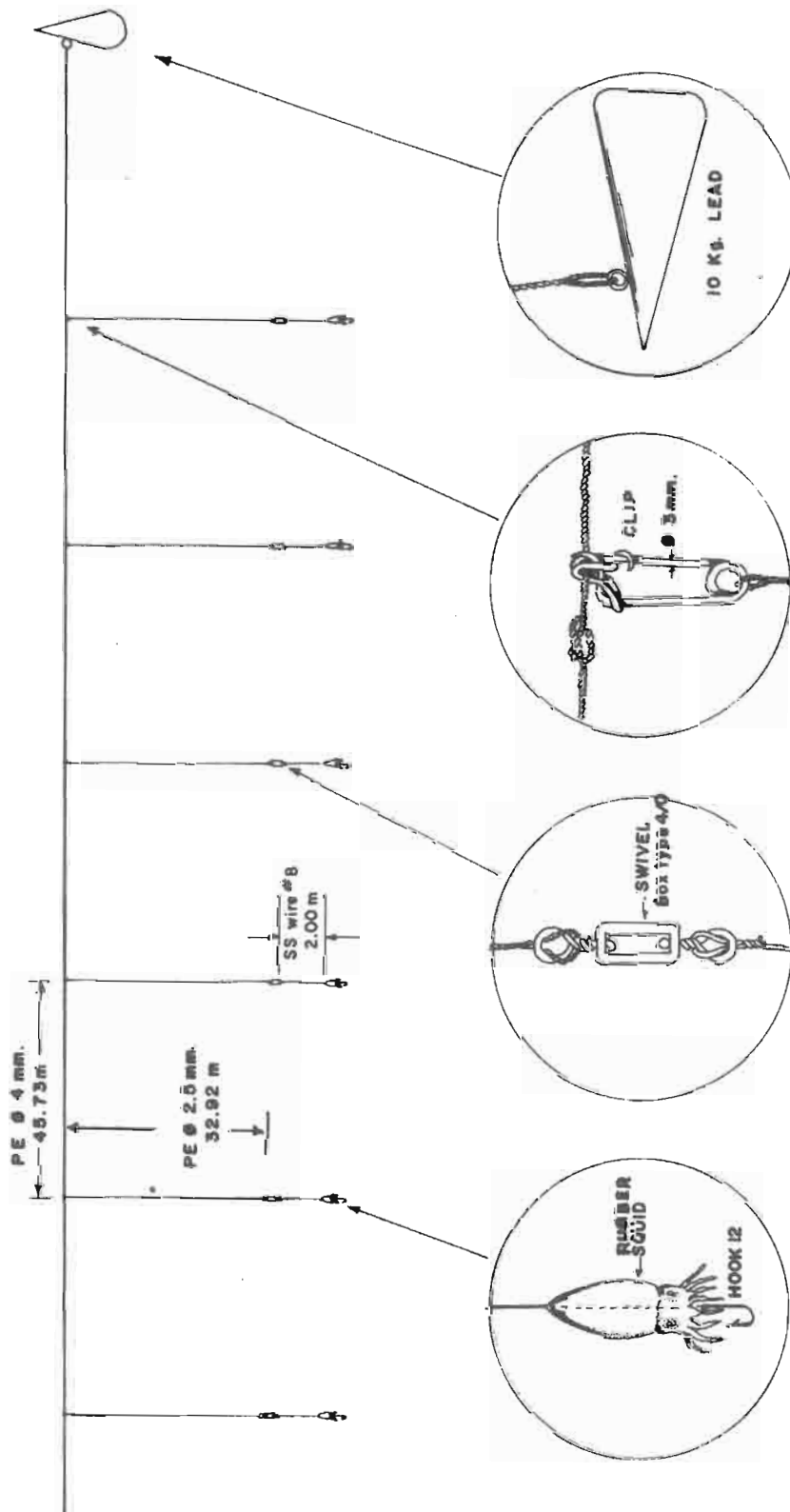


FIG. 3

TYPE : Lines
NAME OF GEAR : Mid-water troll line
LOCALITY : South China Sea, Pacific Ocean,
Camotes Sea, Daváo Gulf

VESSELS : Outrigger banca
L.O.A. : 11.6 m
G.T. : 1.5
H.P. : 16
CREW : 1-2



4.1.1.2 Handline (Figure 4)

This gear is used to capture deep-swimming tunas, principally yellowfin but also bigeye. Handlining is generally practised while the banca is tied onto payaws set in deep water. Tuna handlines are used throughout the Philippines, but are especially common in the Celebes and Sulu Seas. The boats used in this region are larger and higher-powered (160 H.P.) than those used elsewhere. They are fitted with insulated boxes capable of holding 0.8 to 1.5 tonnes of iced fish. These boats make 4-day trips with 700 to 800 kg of block ice.

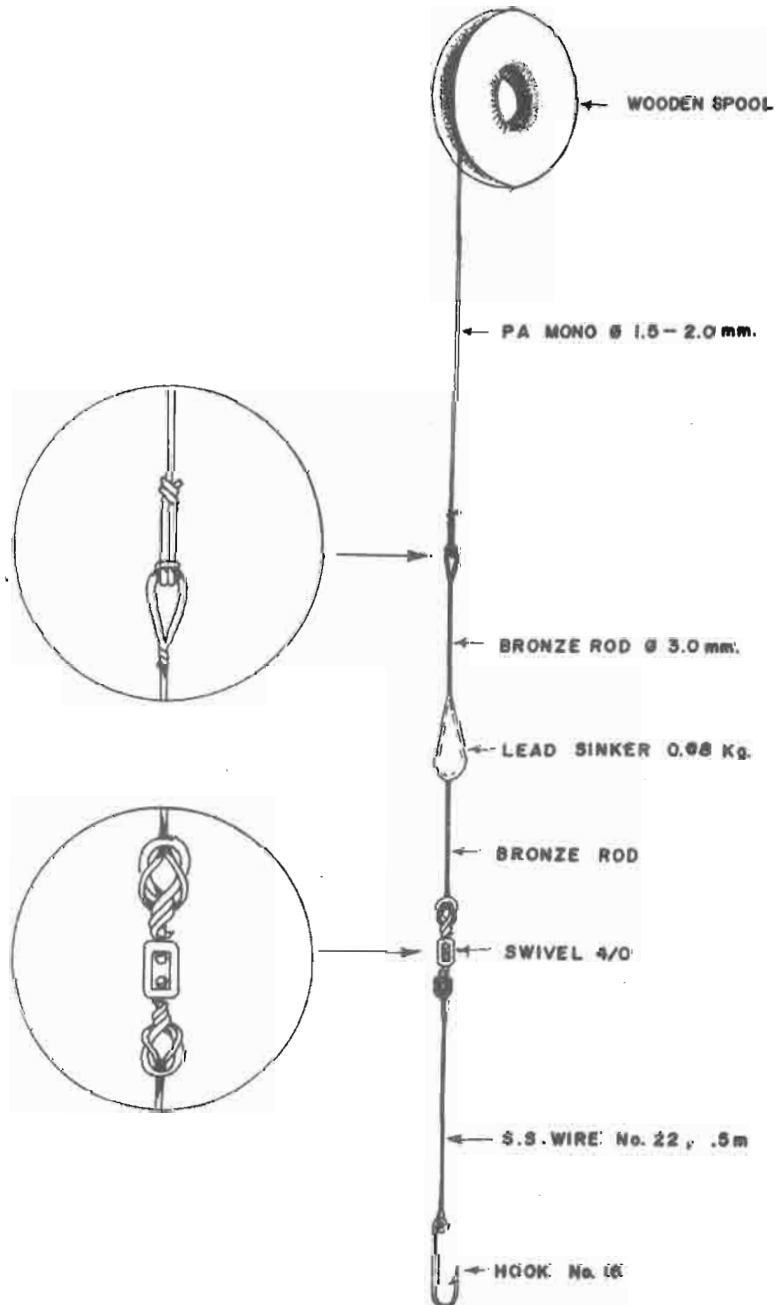
On the fishing grounds, fishermen lower the lines to varying depths ranging from 100 to 180 m. This interval is narrowed once the depth of highest fish concentration has been located. Only one hook is used per line, although up to 6 lines may be operated from the same vessel at one time. Dead scads and squid are usually used for bait. Handlining in southern Philippines was conducted primarily during the night with lights in the past, but is now practised during the day for security reasons.

Fishermen off the west coast of Luzon Island fish their lines at 100 m during the day and at 15 to 30 m at night. "Petromax" lamps are used to attract squid, which are jigged or scooped for bait.

Bancas that do not tie up to an anchored payaw use coconut fronds as sea anchors. A rope is tied to the distal end of the frond midrib and allowed to sink and drag to minimize drift.

FIG. 4

TYPE : Lines
NAME OF GEAR : Tuna handline
LOCALITY : Throughout the Philippines



LOCALITY : South China Sea, Sulu Sea,
Pacific Ocean, inland seas
and gulfs
VESSELS : Outriggered banca
L.O.A. : 9.2 m
E.T. : 1.3
H.P. : 16
CREW : 1-2

Sulu Sea, Celebes Sea
Outriggered banca
12.0 - 14.0
1.5 - 2.0
160
5-6

4.1.1.3 Tuna longlines (Figures 5 and 6)

Tuna longlines are used throughout the Philippines for deep-swimming tunas, including yellowfin, bigeye and albacore. The vessels engaged in the fishery are generally of Taiwanese origin, ranging in size from 15 to 80 gross tons. These vessels generally do not have mechanical refrigeration systems but use ice so that trips are usually of 2-week duration.

Two tuna longline systems are in use: the traditional system where the mainlines, buoylines and branchlines are tied together (Fig. 5) and a more recent system where the buoylines and branchlines are snapped onto the mainline with a stainless steel clip. With the latter system, labour requirements for setting and hauling are reduced considerably, and the mainlines are therefore usually longer, with as many as 42 branchlines (Fig.6). Setting of the longline begins at 0300 to 0400 hours and is conducted with the vessel underway at 4 to 5 knots. Milkfish is used for bait. Some of the vessels have live tanks to hold milkfish, which are baited live on the hook. Upon completion of setting operations, the vessel begins patrolling along the longline for hooked fish to minimize losses from shark attack. A branchline with a hooked fish is retrieved and replaced with a freshly-baited branchline.

Hauling commences at 0900 to 1000 hours at the first basket paid out and requires 3 to 5 hours to complete. The catch is gilled, gutted and preserved on ice. Some of the catch, especially bigeye tuna, is airshipped fresh to Japan for the sashimi market.

FIG. 5

TYPE	: Lines	VESSELS	: Displacement hull craft
NAME OF GEAR	: Tuna longline	L.O.A.	: 13.0 m
LOCALITY	: Throughout the Philippines	G.T.	: 30.2
		H.P.	: 105
		CREW	: 6-8

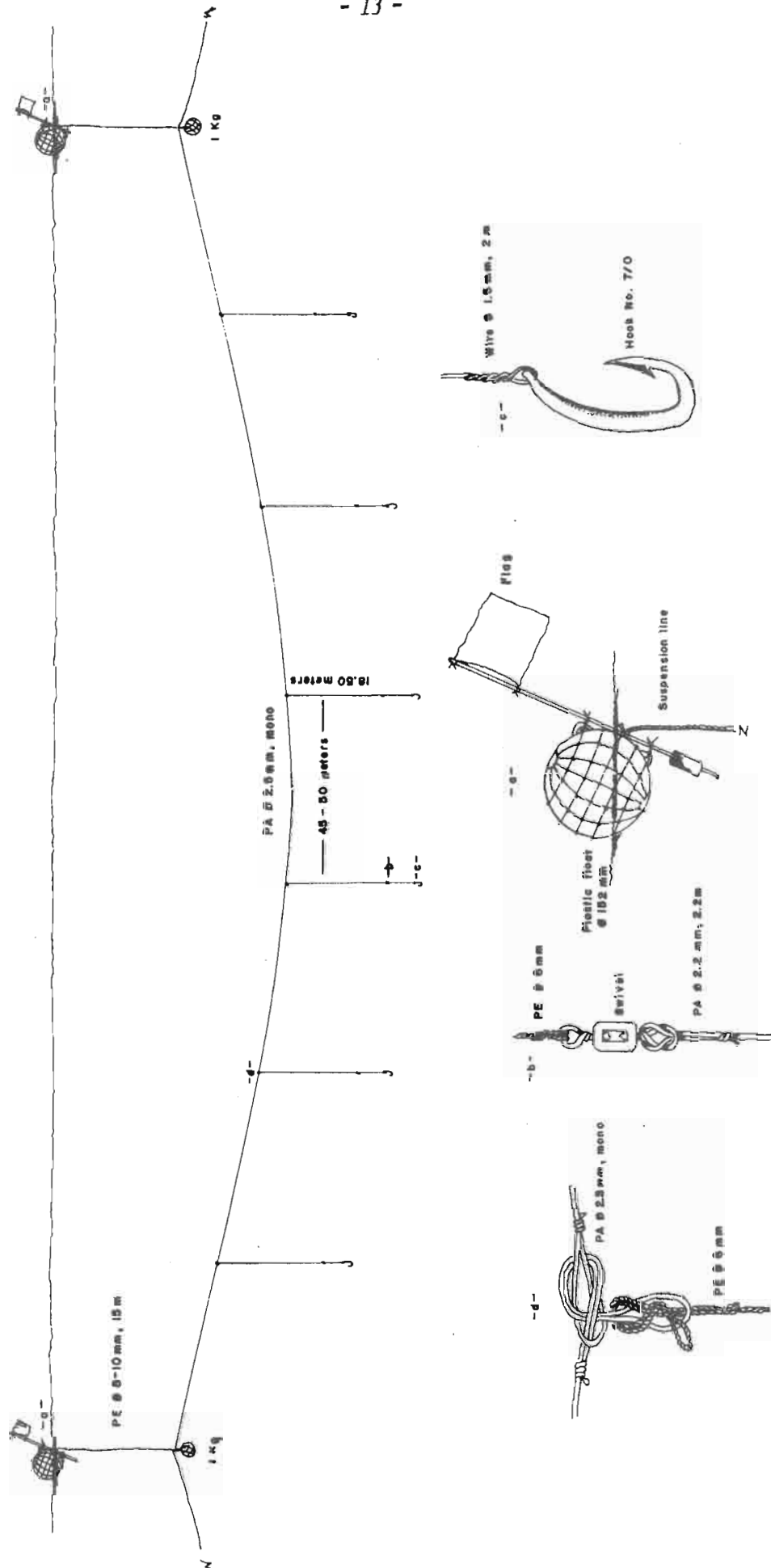
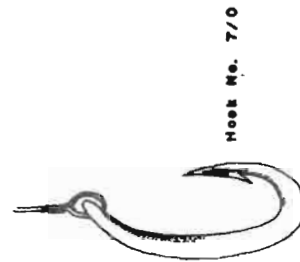
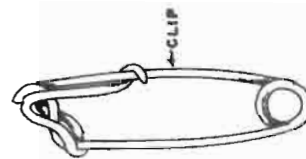
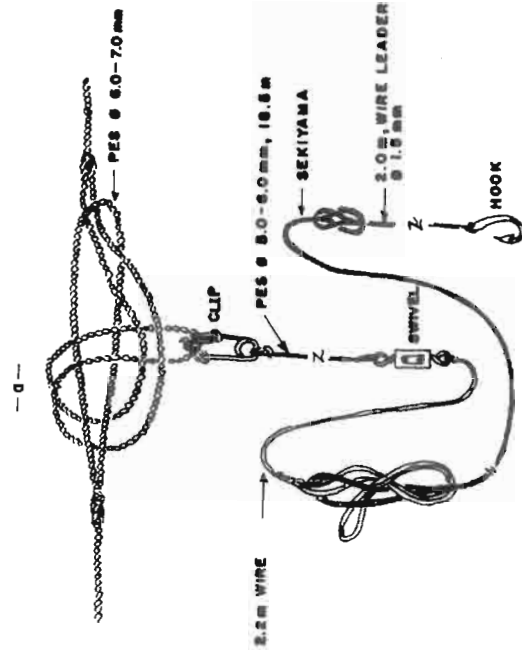
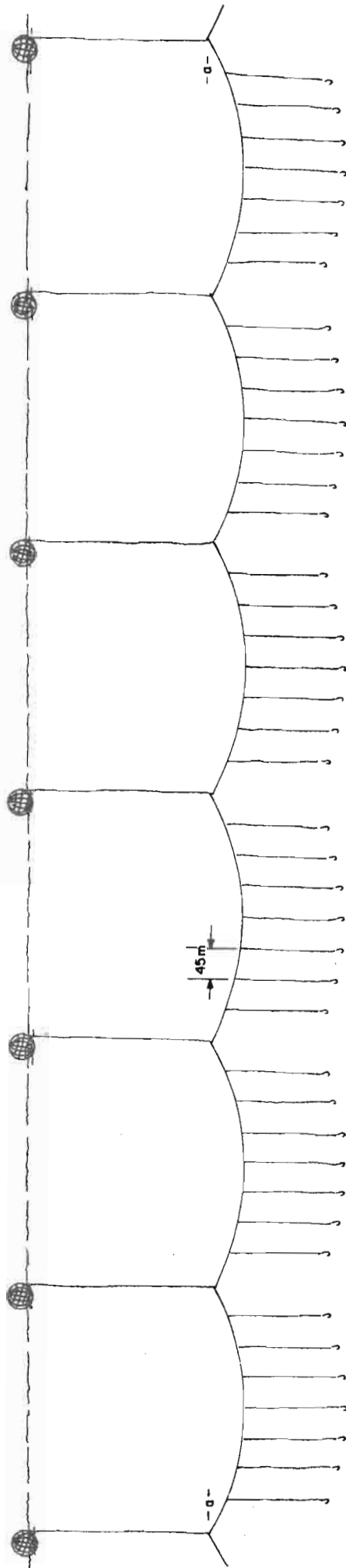


FIG. 6

TYPE : Lines
NAME OF GEAR : Tuna longline
LOCALITY : Throughout the Philippines

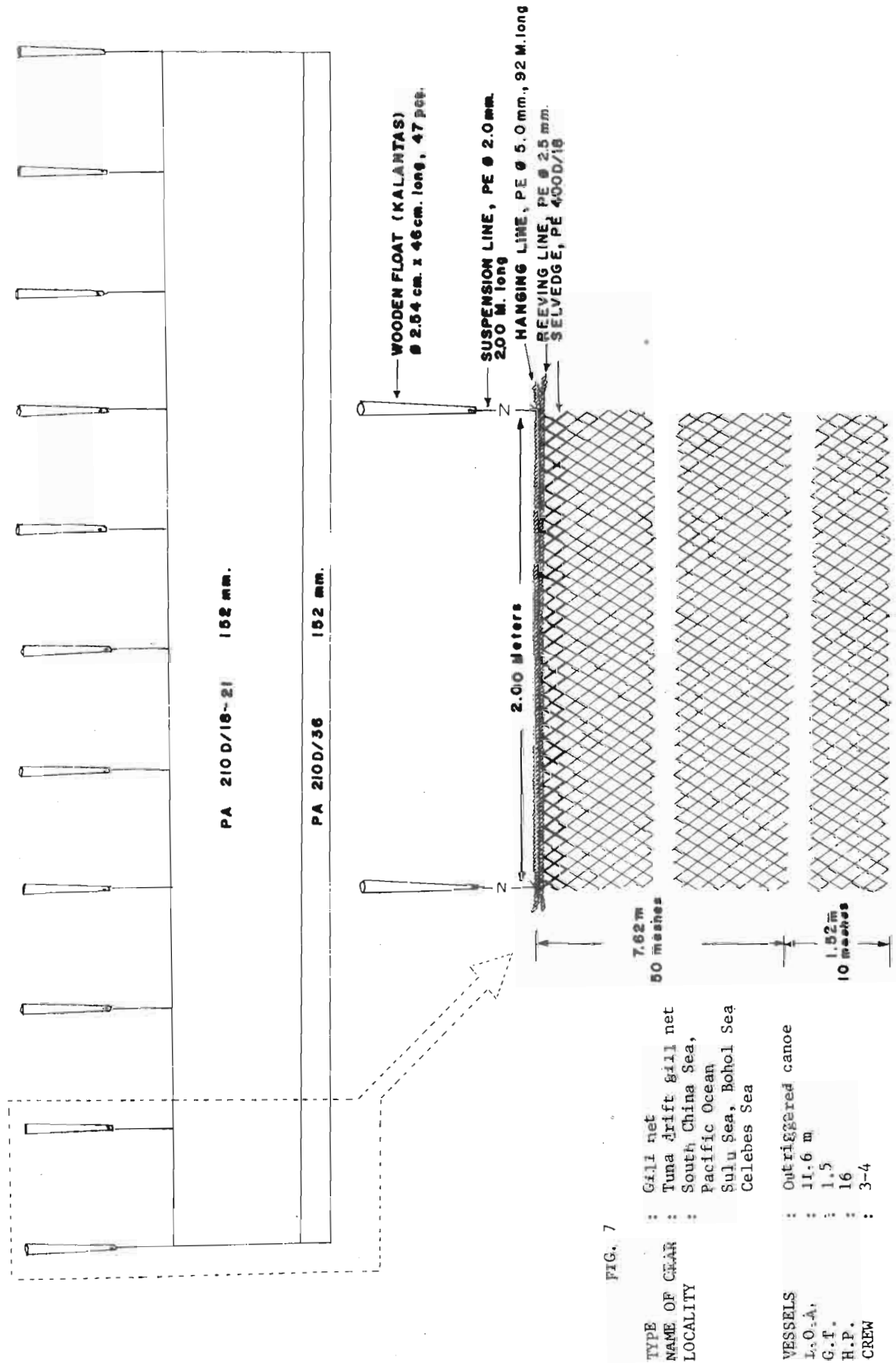
VESSELS : Displacement hull craft
L.O.A. : 13.3 m
G.T. : 40.0
H.P. : 150
CREW : 9



Plan of one Basket (42 hooks) of Tuna Longline

4.1.2.1 Gill net (Figure 7)

Gill nets are used in most regions of the Philippines to capture surface-swimming tunas, including skipjack, small yellowfin, eastern little and longtail. A gill net usually consists of 6 to 7 shackles, each of which is 92 m long by 9 m deep. Sinkers are optional on these nets. If sinkers are not used, a bottom strip of webbing of heavier twine serves as weight to hold the net vertical in the water column. The net is set at dusk with kerosene lamps to mark each end. After setting the net, the banca returns to the end paid out first, ties onto the net and drifts. A "Petromax" lamp is lighted to attract small fish, which in turn, attract tunas and other large pelagic fish. At regular intervals during the night, the banca patrols the net for gilled fish which are removed to minimize spoilage. The net is hauled in the morning. During hauling operations, one fisherman pulls in the lower half of the net while another pulls in the upper half and a third fisherman arranges the wooden floats.



4.1.3.1 Bagnet (Figure 8)

Bagnets are used throughout the Philippines, principally for anchovies, sardines, mackerels and scads. Juveniles of surface-swimming tunas such as frigate, bullet and eastern little tunas are captured incidentally by this gear. The size of this gear is determined by the length of the banca and the span of the outriggers.

Bagnets are used to capture fish aggregated by payaws in some regions of the Philippines. However, the usual procedure is for the bagnet banca to anchor in a suitable location at night and to capture fish attracted to the vessel by lights. The sequence of setting and hauling operations is shown schematically in Figs. 8a to 8i.

- Fig. 8a. The bagnet banca arrives at the fishing ground before dusk. The banca is anchored and the lights are switched on in the outboard position. The pull ropes are passed under the banca to their respective places on the outrigger. There are 10 to 14 pull ropes, depending upon the size of the banca.
- Fig. 8b. The bagnet is thrown over the side and under the vessel.
- Fig. 8c. The bagnet is spread out under the outriggers.
- Fig. 8d. The bagnet is dropped onto the sea bed in shallow water. When the banca is anchored in deep water, the bagnet is set and hauled during the slack tide period.
- Fig. 8e. When fish are attracted in sufficient quantities, the lights are shifted to the inboard position. Also, cones are placed over the lights so that the areas of illumination are reduced to small beams. These maneuvers concentrate the fish in a compact school directly under the banca. While the lights are being adjusted, the anchor line is slackened to allow the banca to drift directly over the bagnet.
- Fig. 8f. At a given signal, the men begin hauling up the bagnet with the pull ropes.
- Fig. 8g. The upper rim of the bagnet is lifted out of the water and then the net is transferred to the starboard side of the banca.
- Fig. 8h. Sections of the bagnet are hauled into the banca and the remaining sections are confined to the stern of the banca between the rear and mid beams of the outrigger.
- Fig. 8i. Fish are brailed out of the bagnet.

FIG. 8

TYPE : Lift net
NAME OF GEAR : Bagnet (Basnig)
LOCALITY : Throughout the Philippines

VESSELS : Outriggered banca
L.O.A. : 27.4 m
G.T. : 29.0
H.P. : 225
CREW : 25

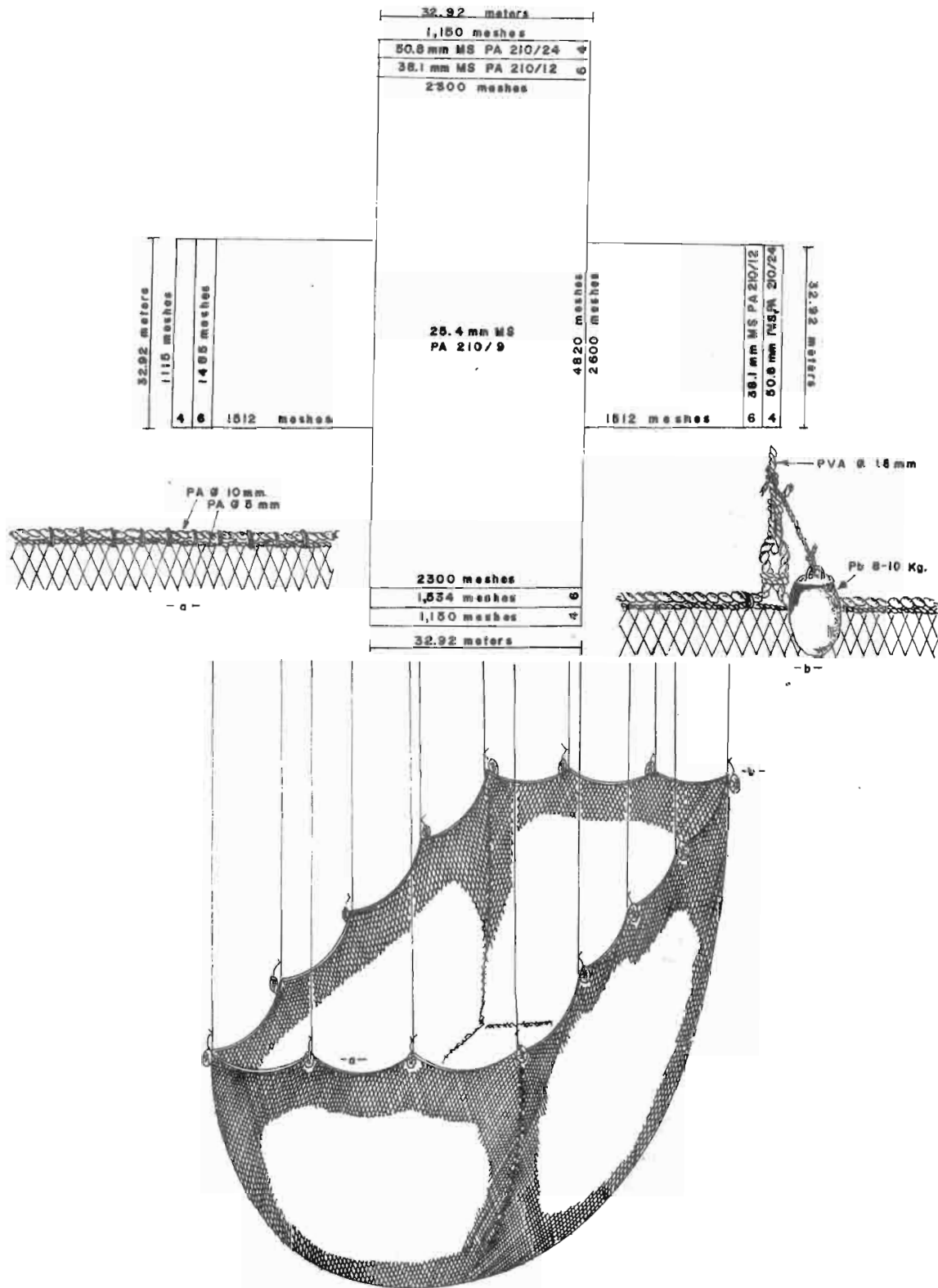


Fig. 8a

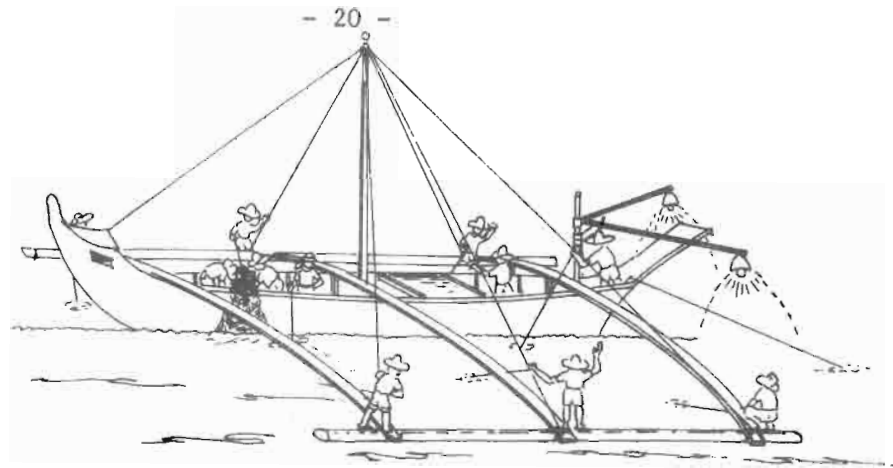


Fig. 8b

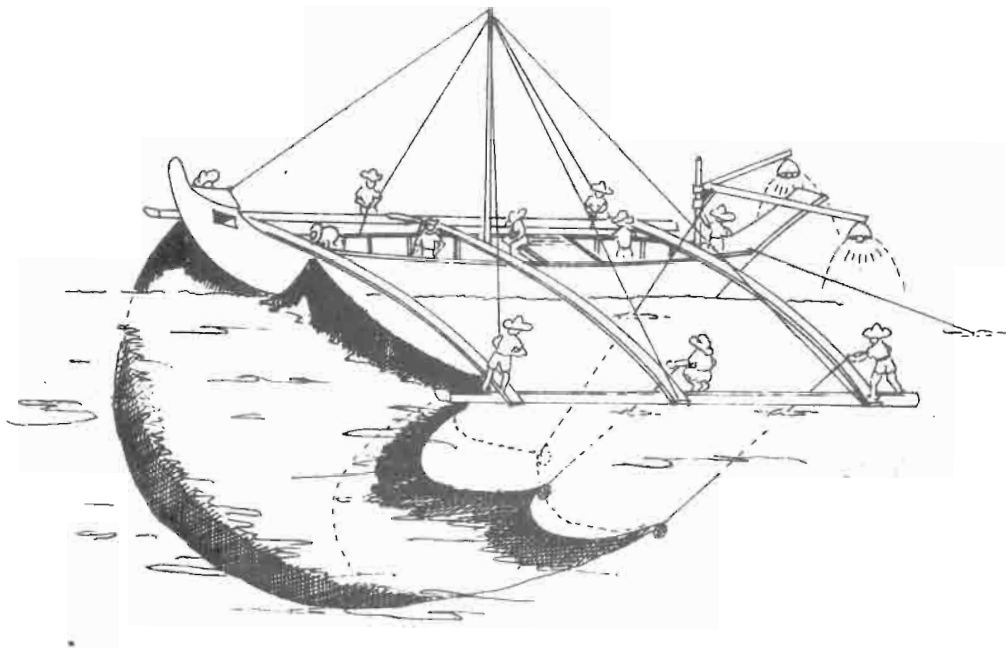
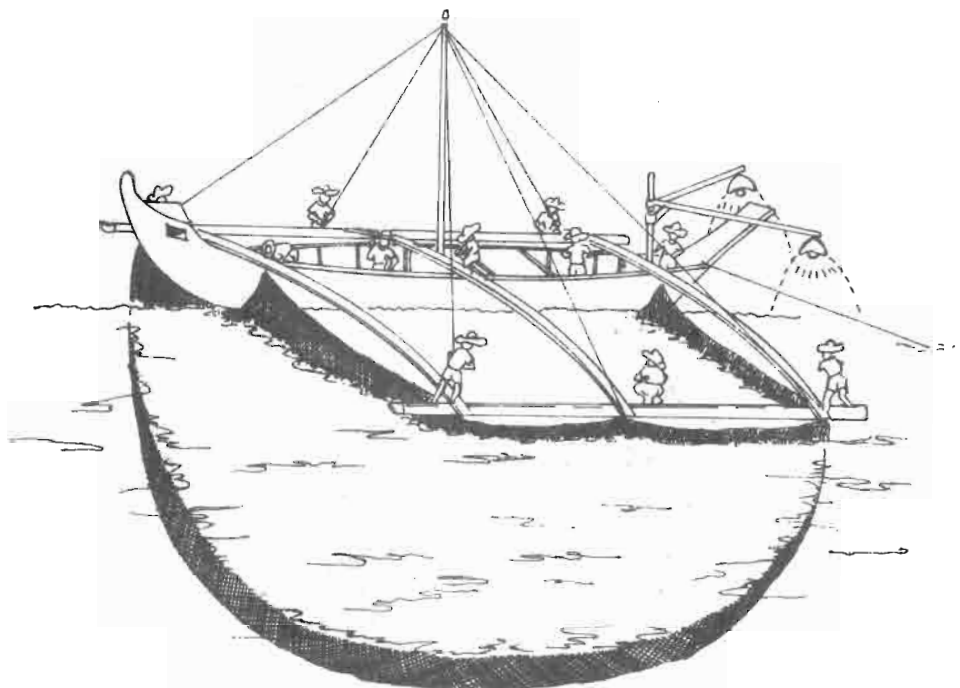


Fig. 8c



Figs. 8a-c. Operation of the bagnet

Fig. 8d

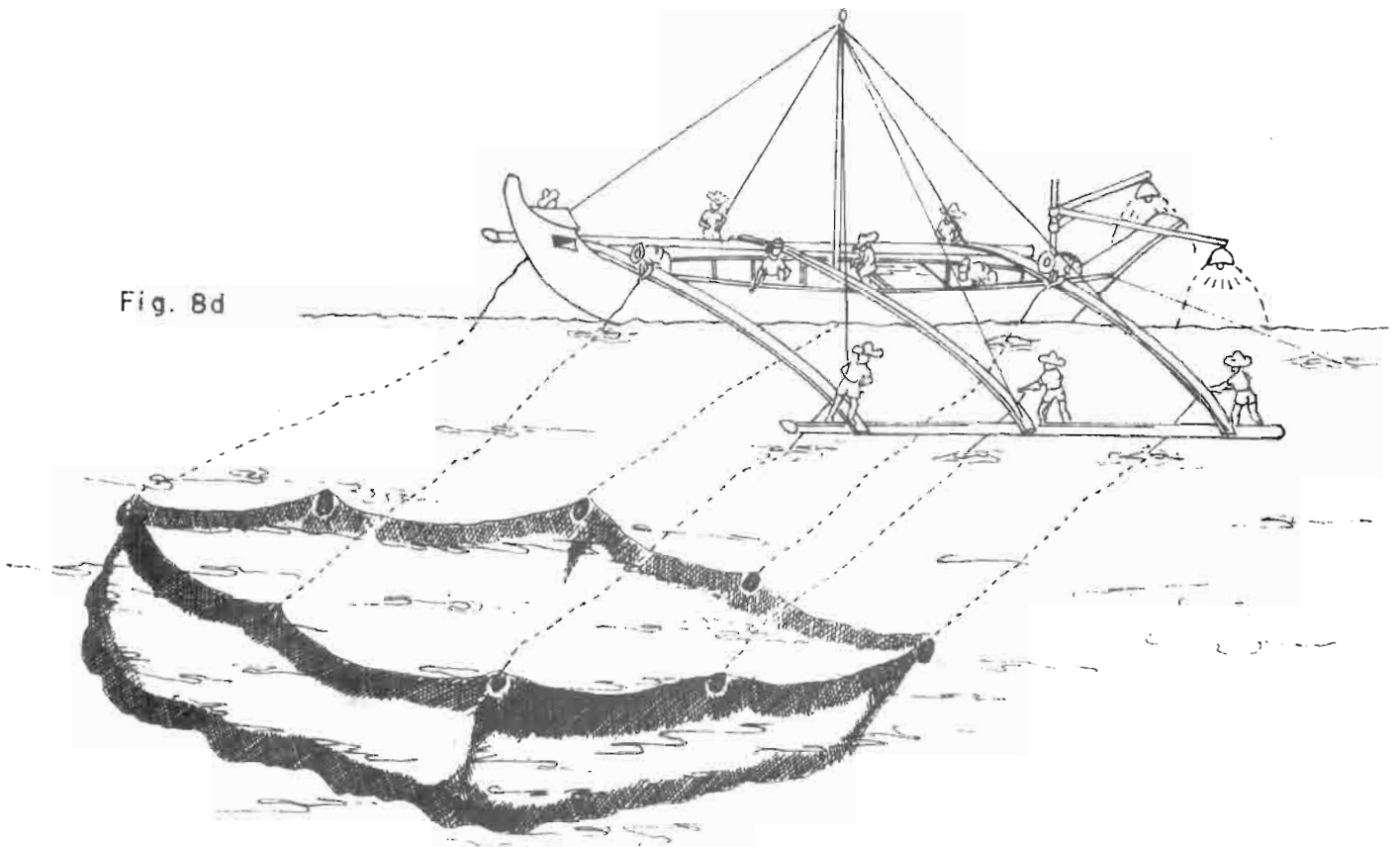
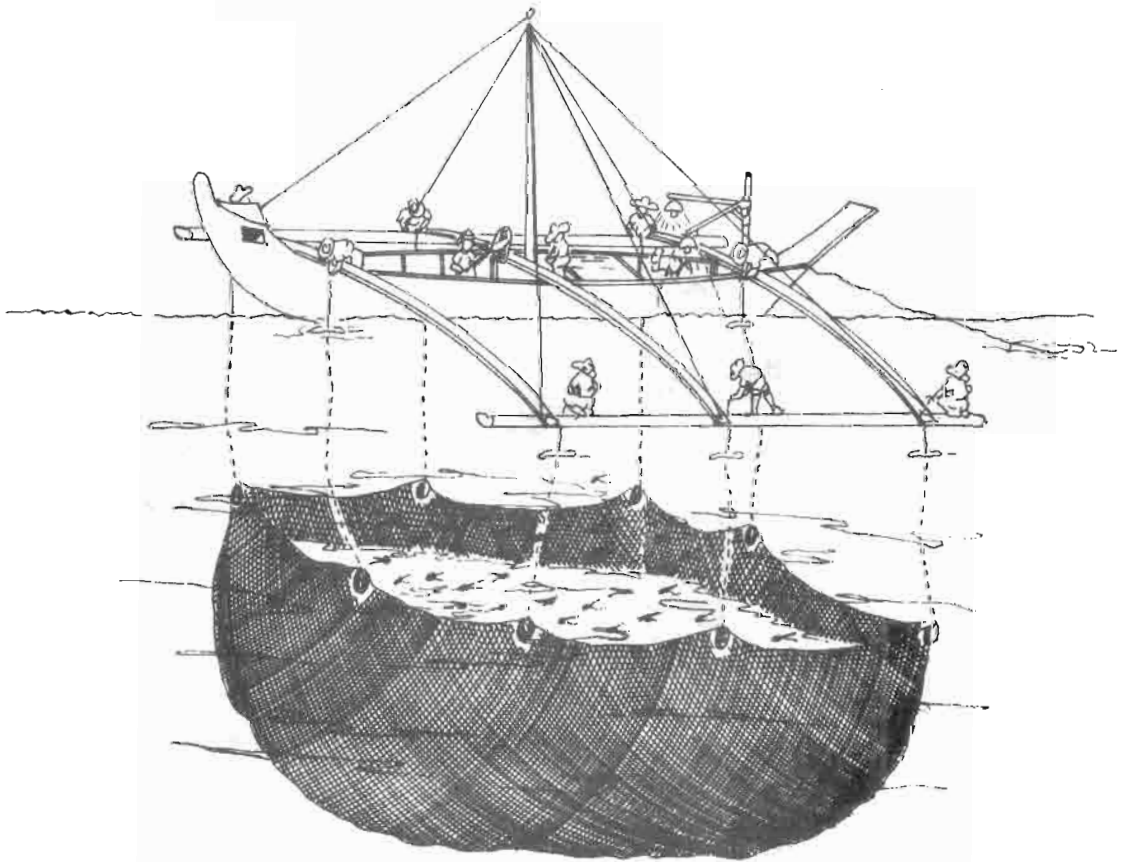


Fig. 8e



Figs. 8d-e. Operation of the bagnet

Fig. 8f

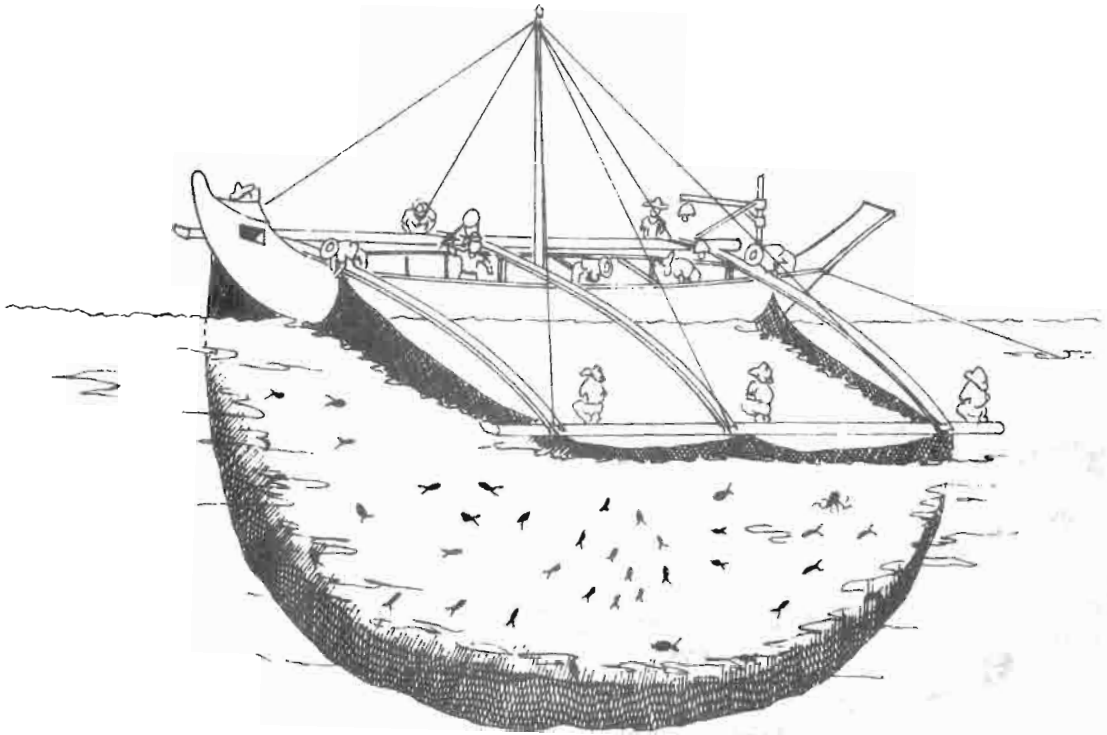
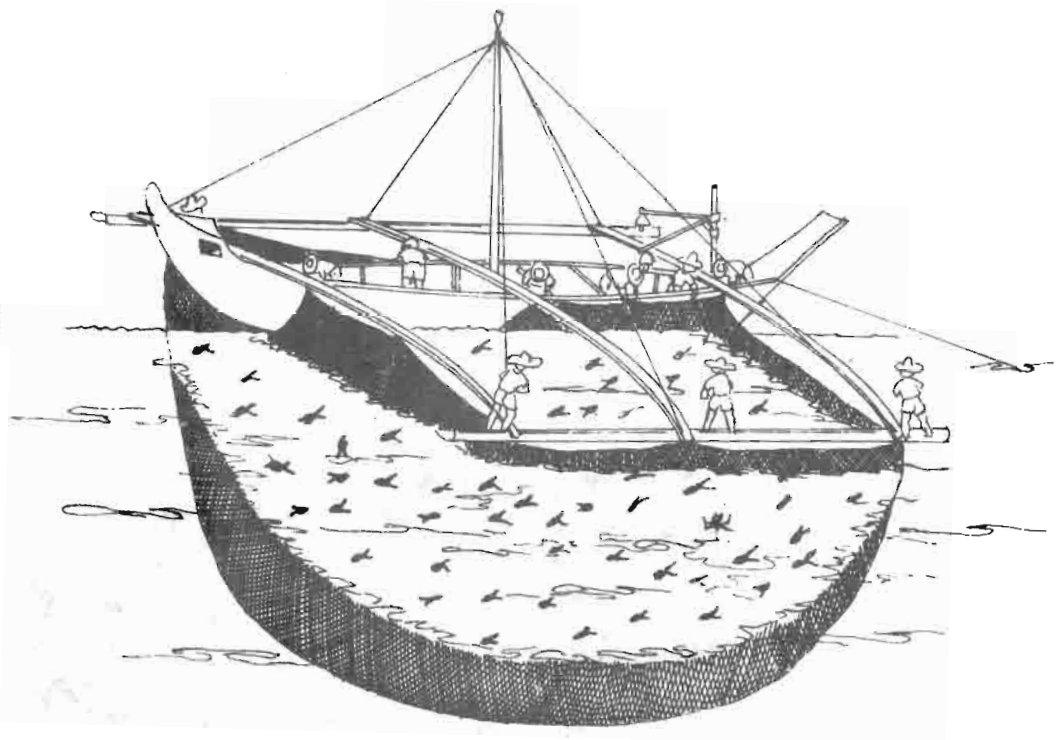


Fig. 8g



Figs. 8f-g. Operation of the bagnet

Fig. 8h

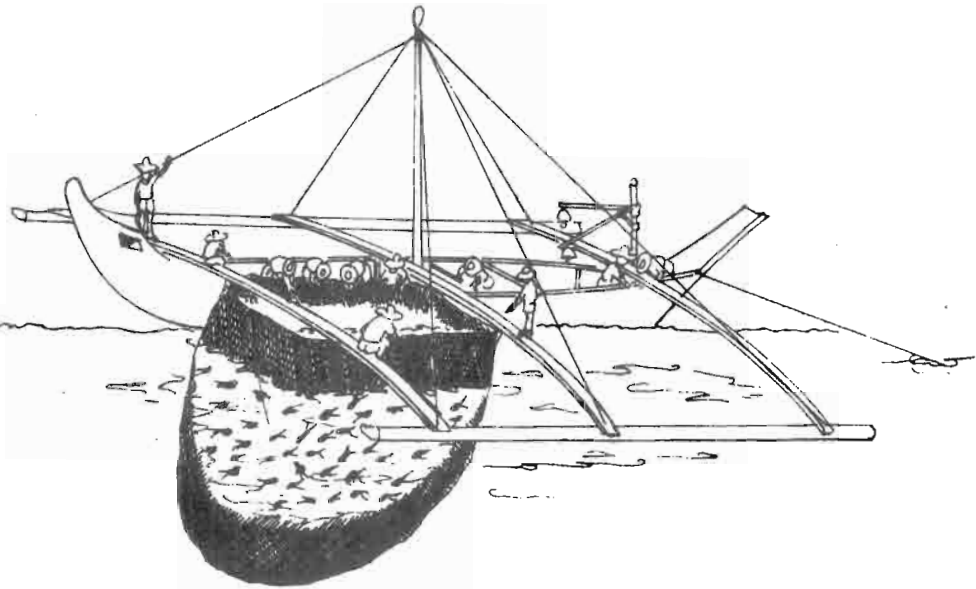
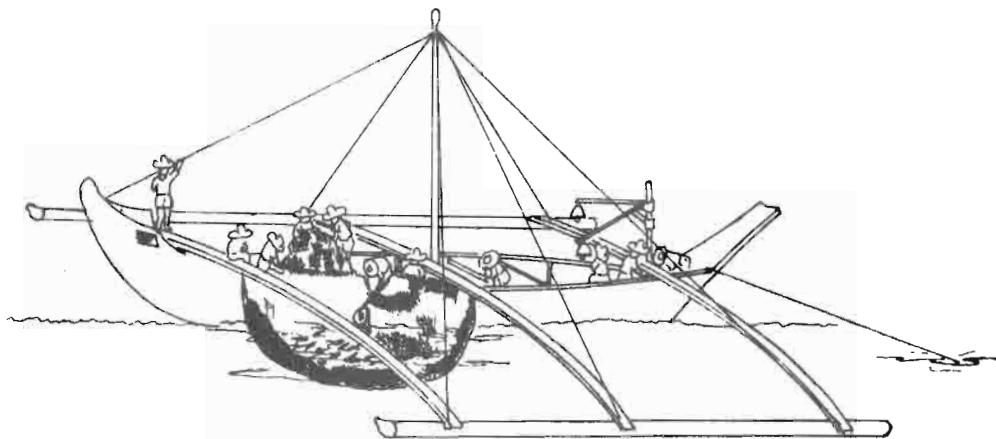


Fig. 8i



Figs. h-i. Operation of the bagnet

4.1.4.1 Ring net (Figures 9 and 10)

The ring net is a surrounding net with the bunt in the middle and purse rings on the bottom. The net is pursed by pulling in simultaneously both ends of the purse line. This gear is used throughout the Philippines and varies considerably in size and webbing used in construction. Figure 9 shows a design of a ring net used by an outriggered banca and Figure 10 shows that used by a displacement hull vessel. Ring nets are used to capture sardines, mackerels, scads and surface-swimming tunas. The latter includes skipjack, small yellowfin, frigate, bullet and eastern little tunas.

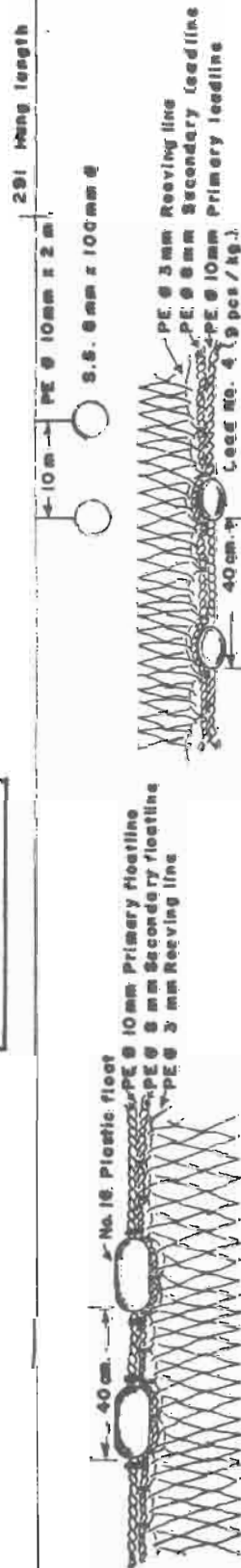
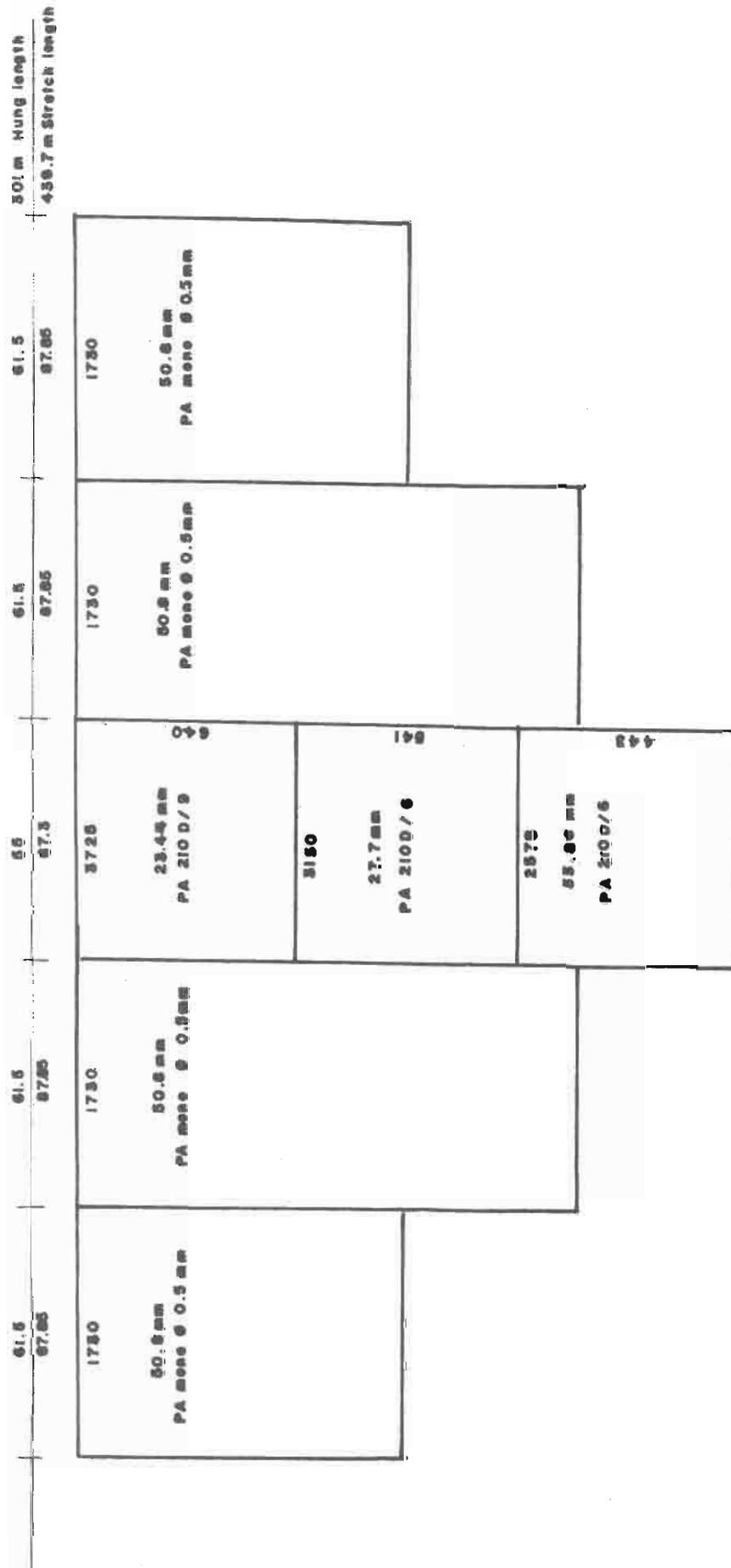
Ring nets are generally used in conjunction with payaws. Payaws are checked during the day to determine if fish are aggregated in sufficient quantities to warrant making a set. If fish are present, a light boat ties up to the payaw and at dusk switches on the lights. When the school is concentrated by the lights, the string of coconut or buri fronds (habong) is untied from the payaw (see Figs. 15 to 17) and transferred to the light boat. The light boat then releases the line to the payaw and drifts away. After the light boat has drifted some distance from the payaw, a cone or red cloth is put over the lights to further concentrate the fish into a compact school. A signal is given to the ringnetter to set the net. The ringnetter sets in a circle around the light boat and after taking aboard the end set initially, begins to close the net. A tom weight (Fig. 9a) is used to accelerate pursing the bottom and to facilitate pulling in the purse line. This is a heavy object which is dropped down both ends of the purse line to bunch the purse rings quickly. Tom weights range in weight from 50 to 900 kg, depending upon the size of the net and the number of fishermen. These weights are generally cubical in shape with 3 eyes. Two of the eyes are on opposite sides and the other on the top of the cube. The top eye is used to attach a line for lifting the weight. The side eyes are used for threading each end of the purse line.

After the ringnet has been pursed, the crew take the purse rings aboard the vessel. They then begin hauling in both wings of the net and finally the excess webbing of the bunt to dry-up the catch. The catch is brailed and stored in the hold.

The net is cast overboard again after the catch has been stored. It is rehailed from one end and stacked on the net platform for the next set.

TYPE : Surrounding net
NAME OF GEAR : Ring net
LOCALITY : Sulu Sea

VESSELS : Outrigger banca
L.O.A. : 13.1 m
G.T. : 2.6
H.P. : 16 x 2
CREW : 10



Note: Selvedge is not provided in the ring net

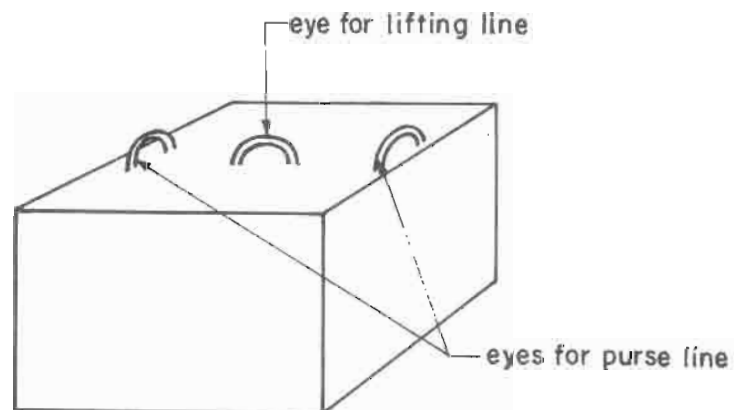
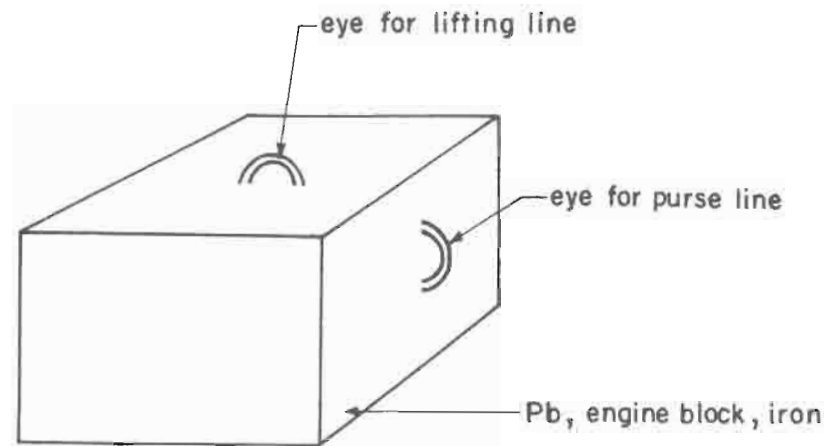


Fig. 9a. Schematic drawings of tom weights showing arrangement of eyes for lifting and purse lines

4.1.4.2 Purse seine (Figures 11 and 12)

The purse seine differs from the ring net in having the bunt in one end of the net. Different sizes and types of purse seines are used in the Philippines. Purse seines used by small vessels are short with a deeper mid-section (Fig. 11), whereas those used by large vessels (generally catching only tuna) are considerably longer with uniform depth except for the shallower bunt end (Fig. 12). The small purse seine is used in the Sulu and Celebes Seas to capture sardines, mackerel, scads and surface-swimming tunas. The tuna purse seine is used in the Sulu, Celebes and South China Sea for surface-swimming tunas, principally skipjack and small yellowfin.

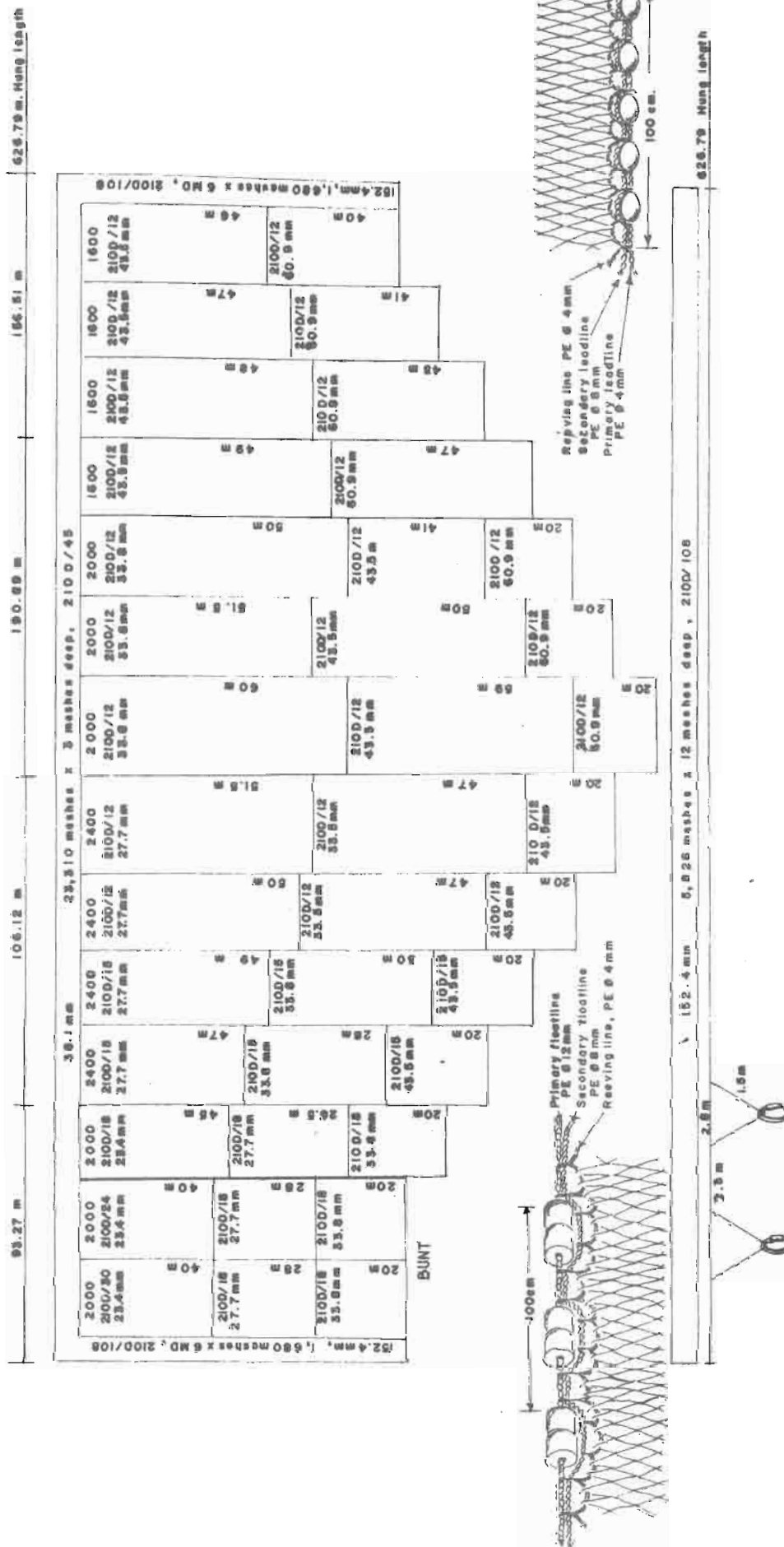
Purse seining for tuna in the Philippines is conducted almost exclusively on schools aggregated around payaws. In other parts of the world, purse seiners generally set either on free-swimming or porpoise-associated schools. Fishing operations for purse seining around payaws are essentially the same as the operations for ring netting.

A scout boat identifies a payaw with commercial concentration of fish and communicates to a purse seiner. The purse seiner and light boat ties up to the payaw and the string of coconut or buri fronds (habong) is transferred from the payaw to the light boat. The lights on the purse seine vessel are switched on at dusk. In the early morning, the lights on the light boat are switched on while those on the purse seiner are switched off one after the other. When all the lights are out, the light boat is untied from the purse seiner and drifted away. The master fisherman on the purse seiner monitors with sonar the behaviour of the school under the light boat. At an appropriate time, a signal is given to release the seine skiff and the seine is set around the light boat. The skiff transfers the wing-end of the seine to the purse seiner and the purse line is hooked onto the winch and taken in. When the bottom is closed, the purse rings are secured at the pursing davit and the seine hauled in from the wing end. The seine is hauled in until the fish are dried up in the bunt end of the seine. After the fish have been brailled out, the remainder of the seine is hauled aboard. The seine is stacked on the net deck ready for the next set.

FIG. 11

TYPE	:	Surrounding net
NAME OF GEAR	:	Purse seine
LOCALITY	:	Sulu Sea, Celebes Sea

VESSELS	:	Displacement hull craft
L.O.A.	:	16.0 m
G.T.	:	16.0
H.P.	:	225
CREW	:	25



Note: All nettings are nylon materials and knotted

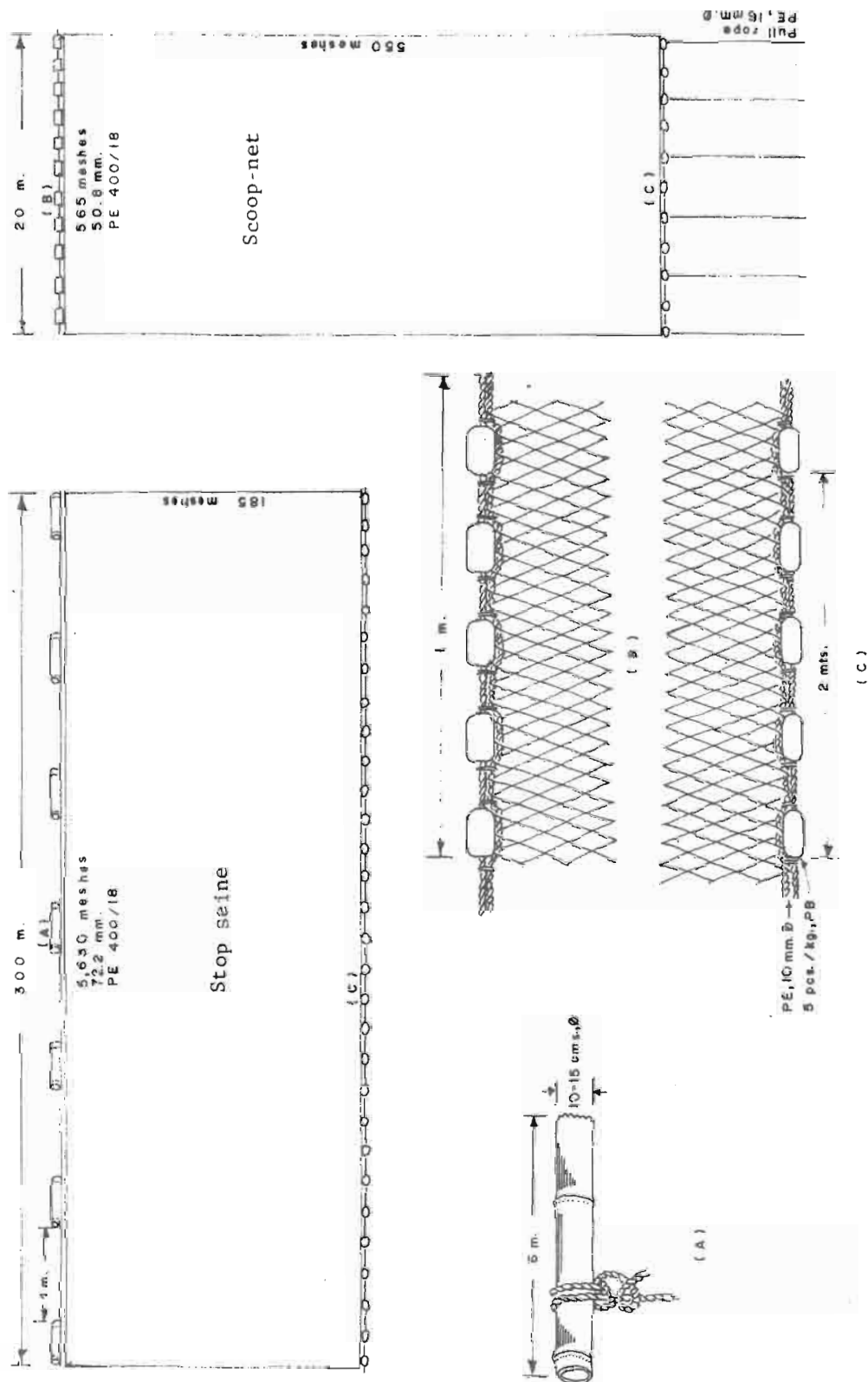
4.1.4.3 Stop seine (Figure 13)

The stop seine is a long rectangular net of uniform depth without bunt and purse rings. This net is rigged with pieces of bamboo for flotation and lead sinkers. Stop seine is used to surround and impound fish schools, which are then captured with a scoop-net. The latter is a short and relatively deep net with floats, lead sinkers and pull ropes on the lead line. The scoop-net is shot inside the stop seine to collect the catch. Stop seines and scoop-nets are used in Sulu and Celebes Seas in conjunction with fish corrals (Fig. 15a). See the section on fish corrals (Section 2.1.1) for description of fishing operations.

FIG. 13

TYPE : Surrounding net
 NAME OF GEAR : Stop seine
 LOCALITY : Sulu Sea, Celebes Sea

VESSELS : Outrigger banca
 L.O.A. : 12.0 m
 G.T. : -
 H.P. : 9



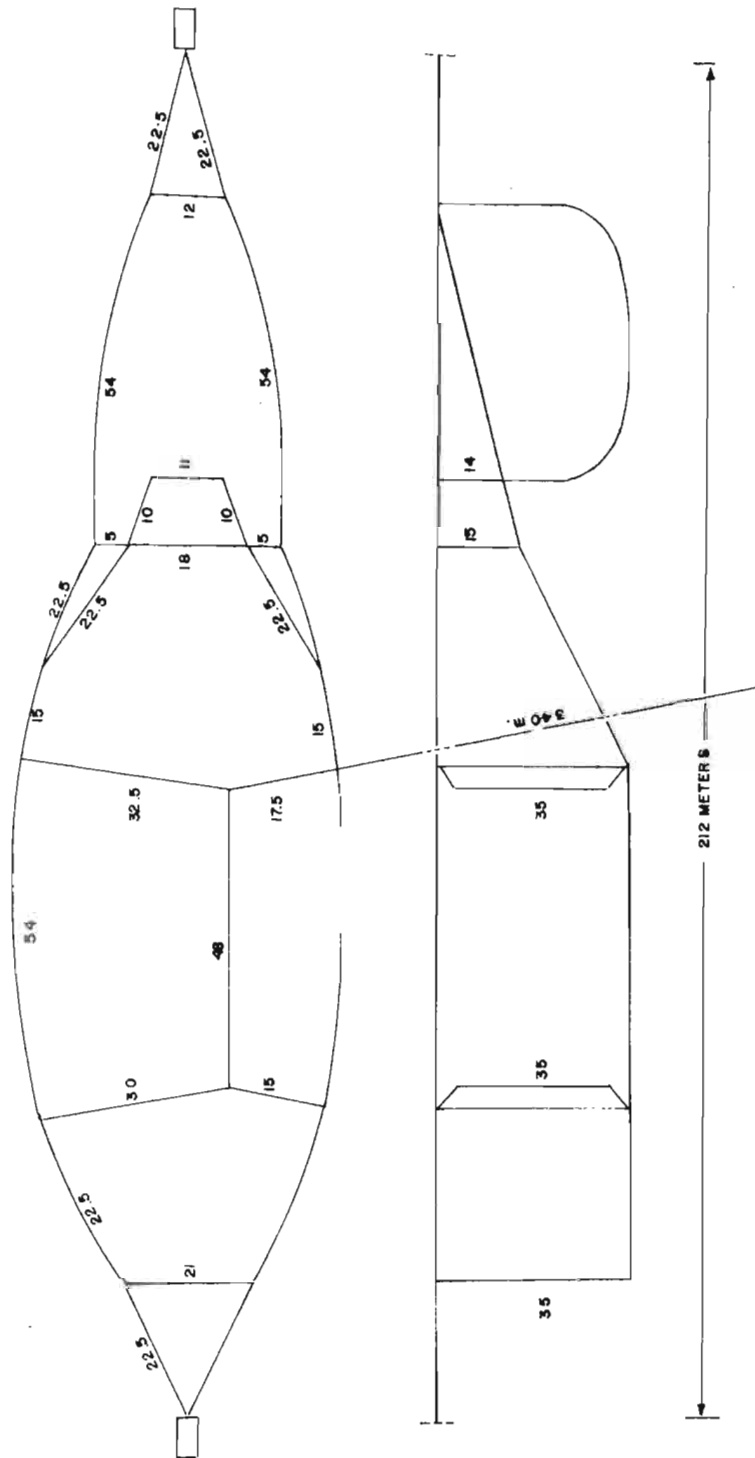
4.1.5.1 Trap net (Figure 14)

The trap net is not an indigenous fishing gear in the Philippines. The trap net shown in Figure 14 was introduced by an FAO Gear Technologist to the Antique coast, Panay Island to determine the effectiveness of this type of stationary gear in capturing large pelagic species. This is a Japanese-design trap net (otoshi-ami) with 3 main sections including lead, playground and catching pound.

For the experimental fishing trials on the Antique coast, the trap net was set in 31 m depths parallel to the coast with the catching pound facing the current. The catch for the first 45 days after setting was 10,255 kg, comprised of 42% tuna, 26% sailfish, 15% jacks, 3% spanish mackerel and 14% others. This catch was considered encouraging as the net was set after the peak of the fishing season.

FIG. 14

TYPE	: Impounding net	VESSELS	: Displacement hull craft, 2 units	Bamboo raft
NAME OF GEAR	: Trapnet (otoshi-ami)	L.O.A.	: 11.6 m	16.0
LOCALITY	: Sulu Sea	G.T.	: -	-
		H.P.	: 16	0



DIMENSION IN METERS OF FRAMEWORK

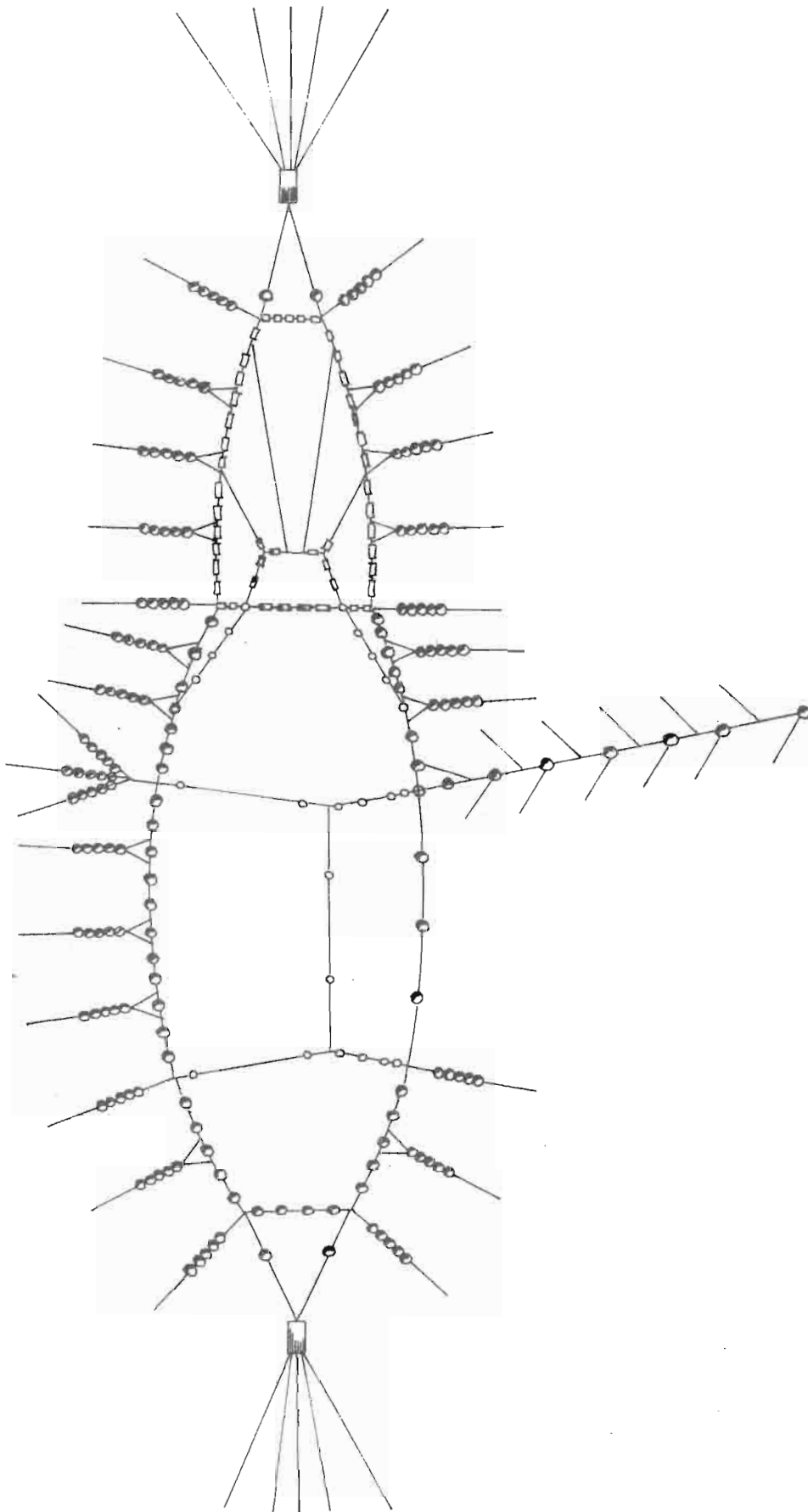


Fig. 14a. Plan of frame for trapnet showing placement of floats and anchors

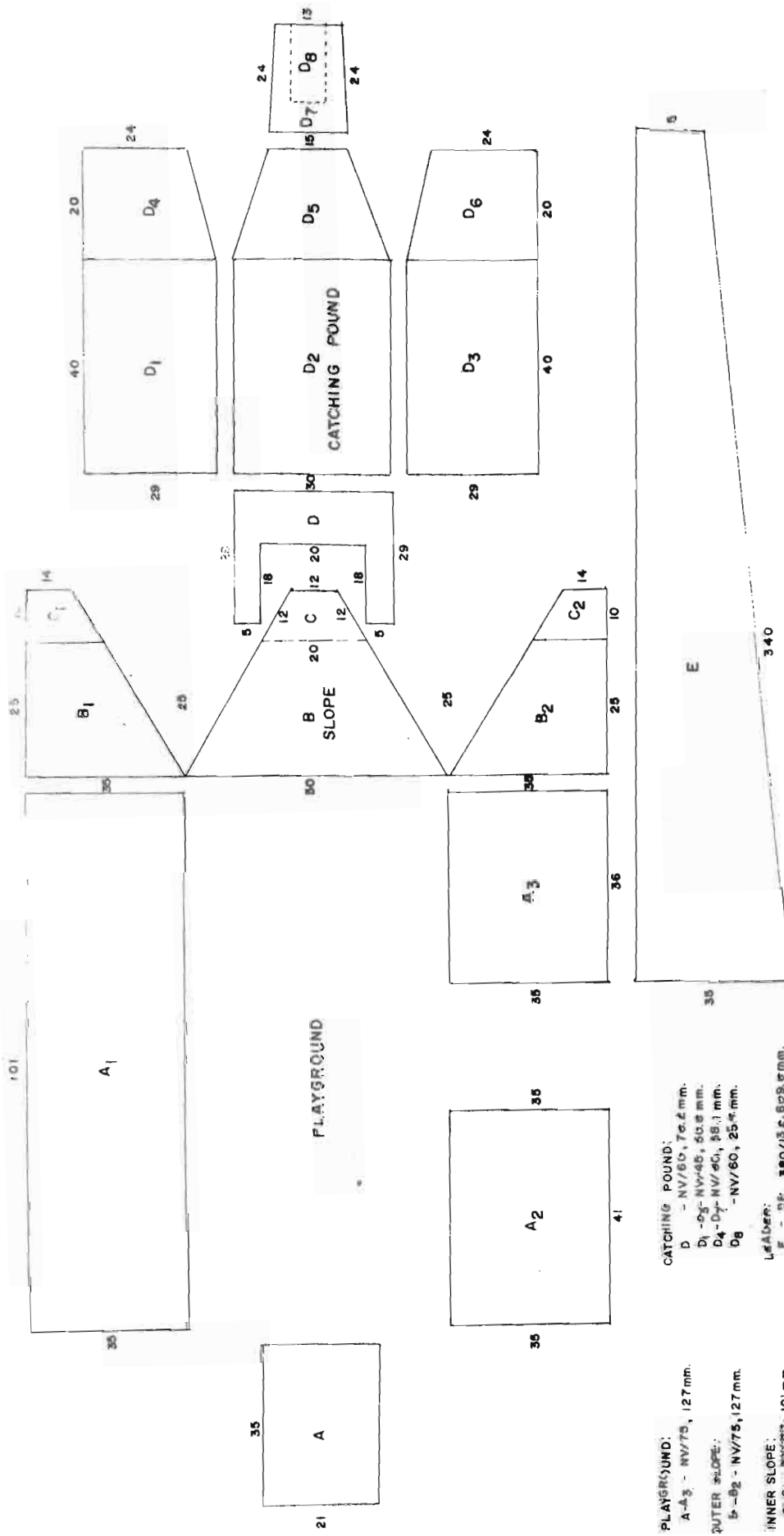


Fig. 14b. Plan of trapnet with specifications for the netting of lead, playground and catching pound

4.2.1.1 Fish corral (Figure 15a)

Fish corrals are found in Celebes and Sulu Seas where they are used to herd surface-swimming tunas, principally skipjack and small yellowfin. The concentrated tuna are then impounded with a stop seine (Fig. 13), a type of surrounding net. The sequence of events involved in herding a fish school into the corral and impounding it with a stop seine are shown in Figures 15a to 15d.

- Fig. 15a. The fish corral consists of a rope with bamboo floats from which are supported strings of coconut fronds. This rope is set in a hook with the open end in deep water and the hook end in shallow water. The rope is anchored at various locations along its length to keep it in position.
- Fig. 15b. A fish school is driven toward the barrier and into the hook end by a cordon of 6 bancas and numerous swimmers. Weighted lines are towed by the bancas and swimmers for herding the school.
- Fig. 15c. The net banca stands by until the school is in the hook of the corral, then sets the stop seine across the open end of the hook and around the school.
- Fig. 15d. The bancas that drove the school into the corral take up positions along the floatline of the seine and drop their anchors to maintain the seine in a circular shape. The net banca enters inside the seine and brails out the fish with the scoop-net if the school is large. However, if the school is small, the fish are concentrated into one end of the stop seine and brailed out directly from outside the net.

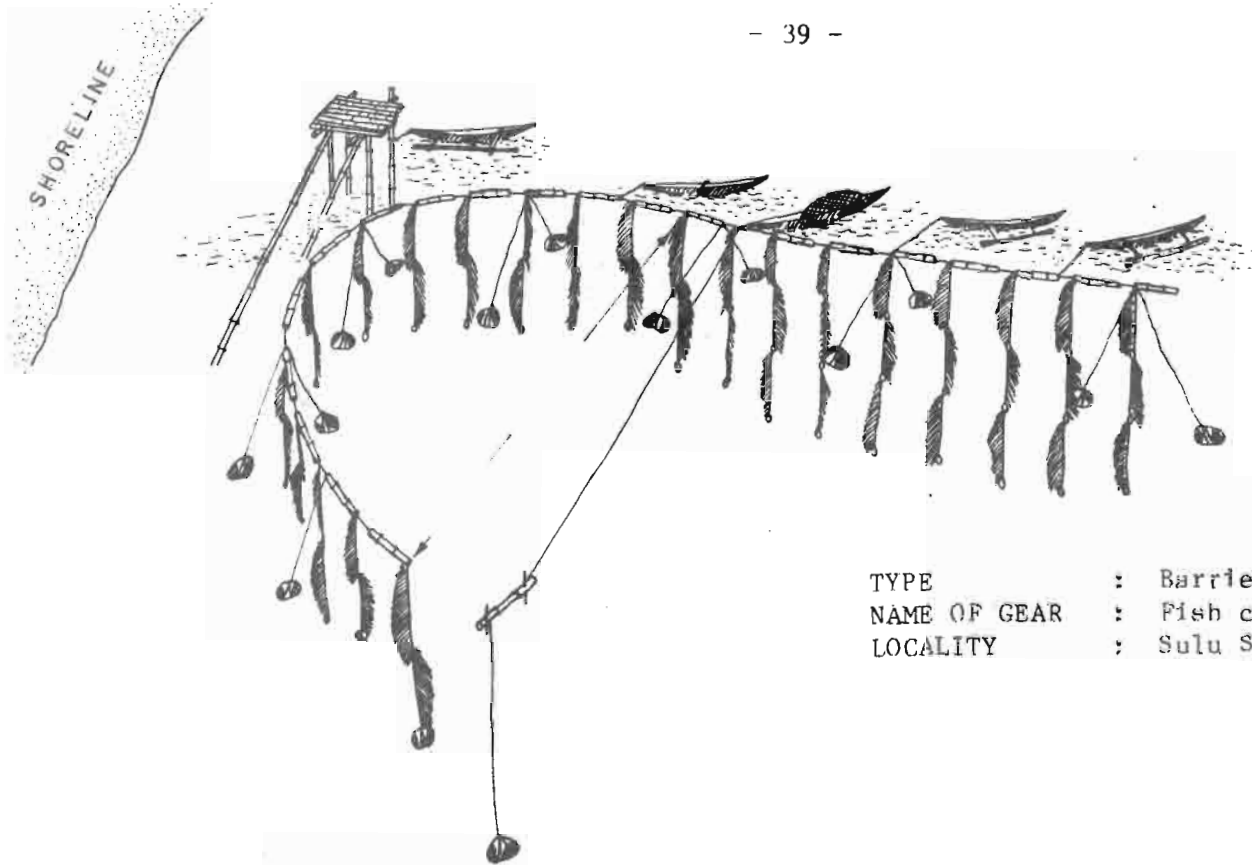


Fig. 15a

TYPE : Barrier
NAME OF GEAR : Fish corral
LOCALITY : Sulu Sea, Celebes Sea

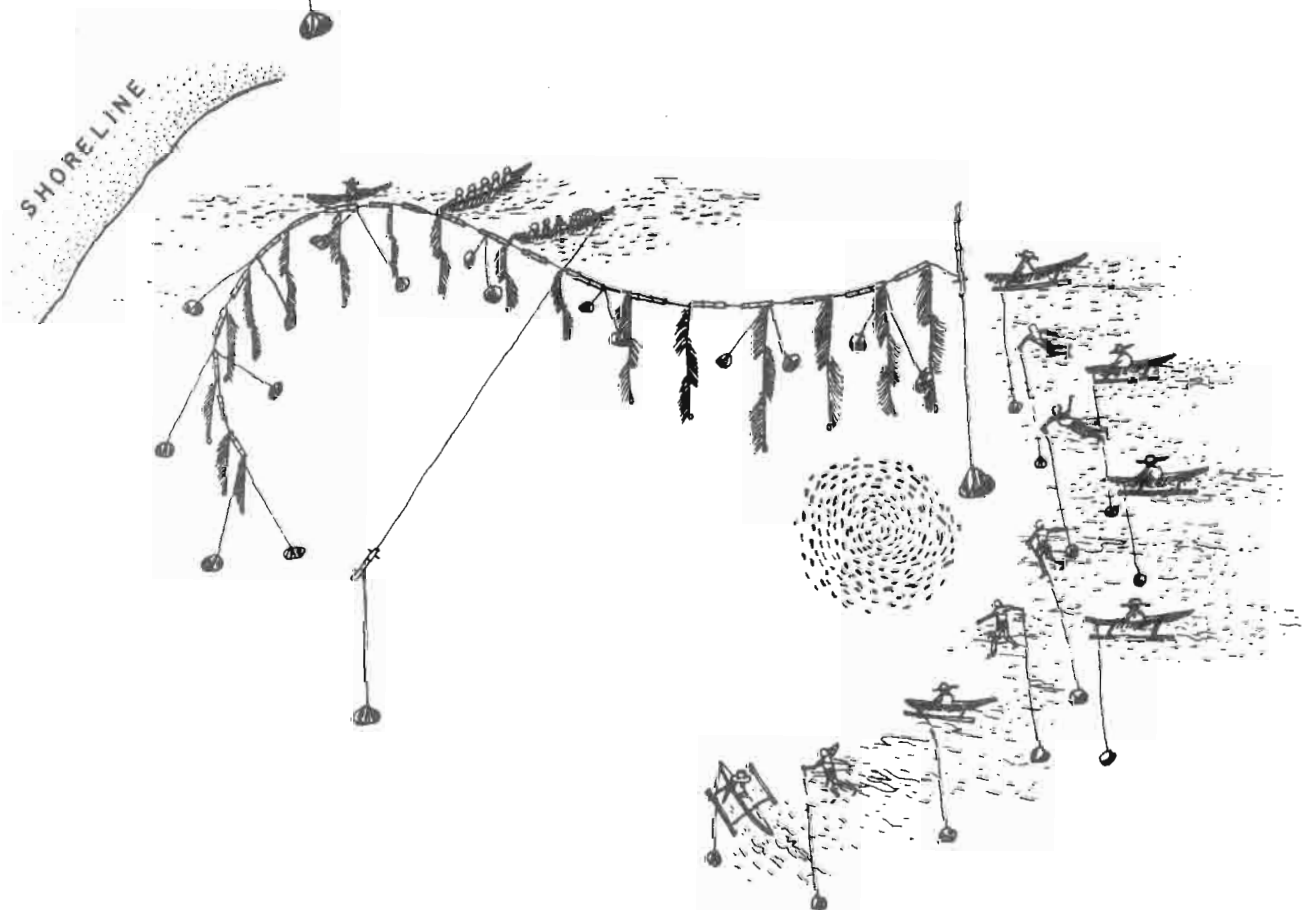
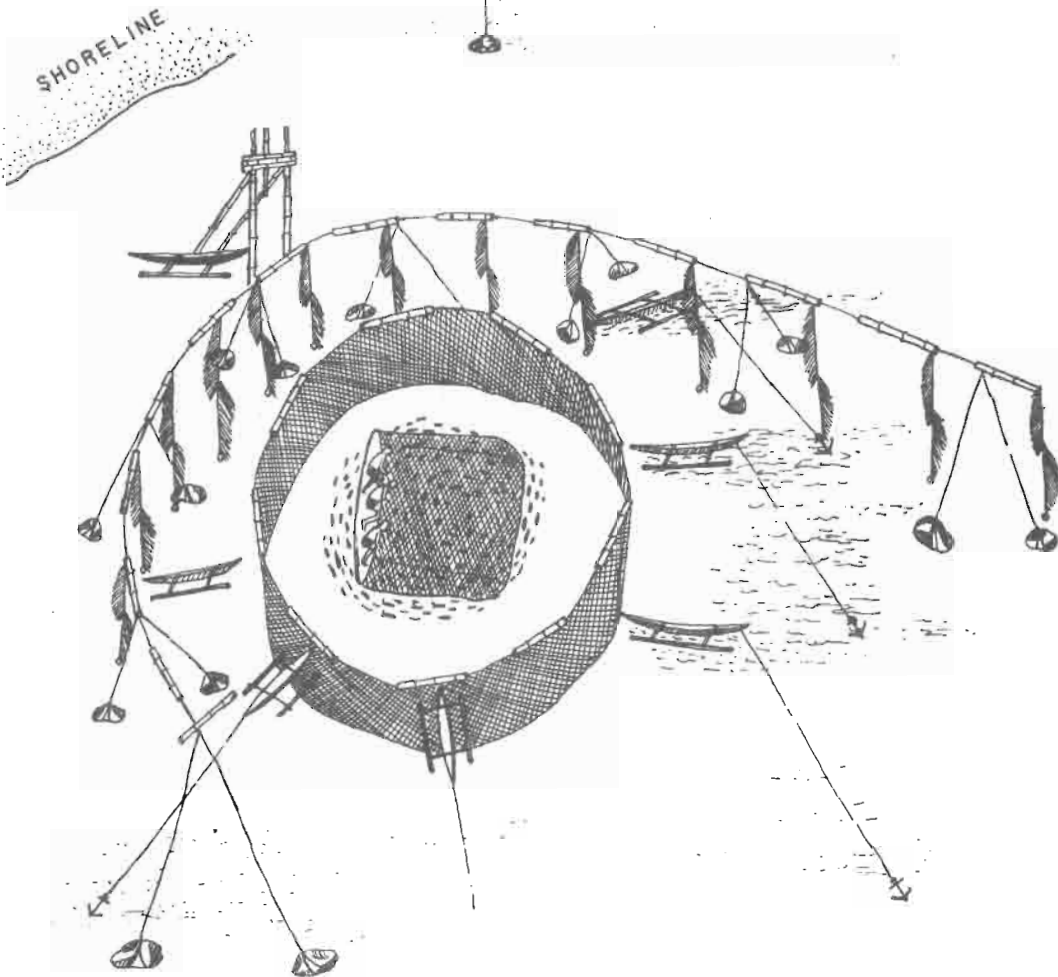
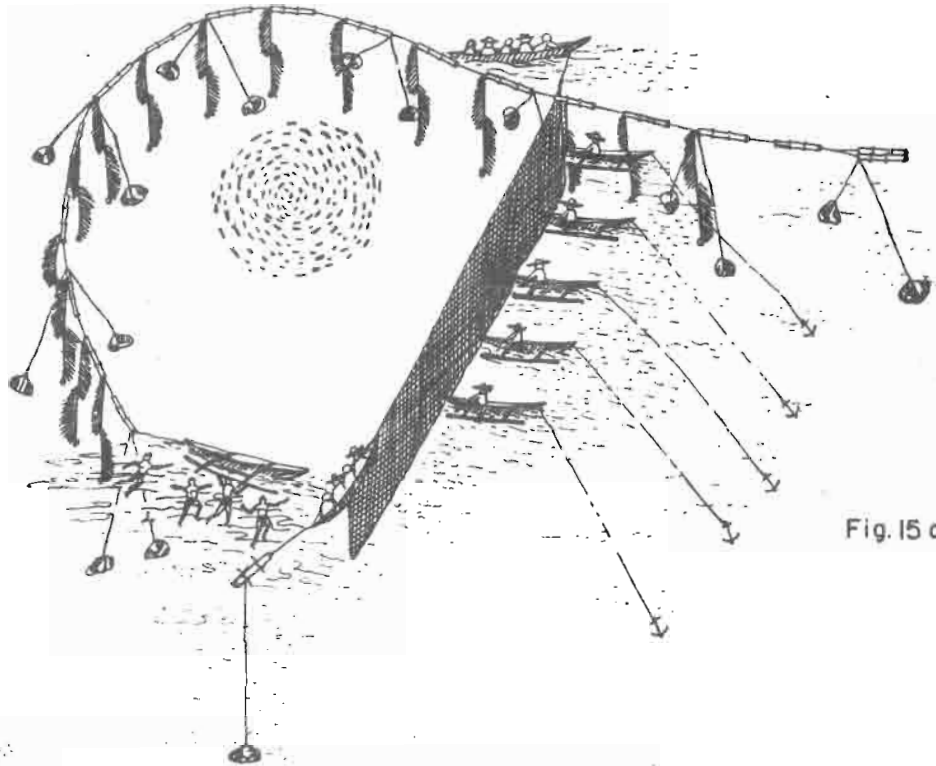


Fig. 15b. Herding fish school into corral



Figs. 15c-d. Impounding and capturing fish herded into corral

4.2.2 Fish aggregating devices (payaws) (Figures 16 to 18)

Payaws are anchored fish aggregating devices fabricated from either bamboo or steel plate under which is suspended a string of palm fronds (habong). These devices are used to aggregate small and large pelagic fish for capture with various fishing gears.

It is not known when the payaw was first used in the Philippines. However, before World War II, fishermen in Cavite, Batangas and Mindoro Island were using simple payaws of bamboo. These payaws were initially used to aggregate fish for capture with handlines, principally tuna (Gonzales, manuscript report)^{1/}. Later, lights were used at night at payaws to concentrate small pelagic fish including sardine, mackerel and scad for capture with ring net. Payaws were set in depths ranging from 90 to 900 m up to the mid-1970's. With the introduction of tuna purse seining with large vessels in late 1975, payaws were deployed at even greater depths. These devices are at present anchored in depths up to 5 000 m.

Payaws have evolved through the years from small bundles of bamboo (bonbon and arong) as shown in Figure 16 to larger bamboo rafts. These in turn have evolved from single-layer to double-layer rafts. Various modifications of the raft type have appeared including the single-layer with buoy and double-layer with oil drums sandwiched between the layers. Murdy (1980) gives details of a V-shaped bamboo payaw used with an 80-gallon water barrel. The most commonly used payaw at present is the double-layer raft.

Bamboo payaws have a maximum service life of 6 months or less depending upon sea conditions. The bamboos break apart with constant pounding by waves. Steel pontoons have been developed for use in more offshore areas with rougher sea conditions. The standard steel pontoon has been rectangular-shaped, whereas the most recent design is cylinder-shaped. The latter design is reportedly less resistant to wind and wave action.

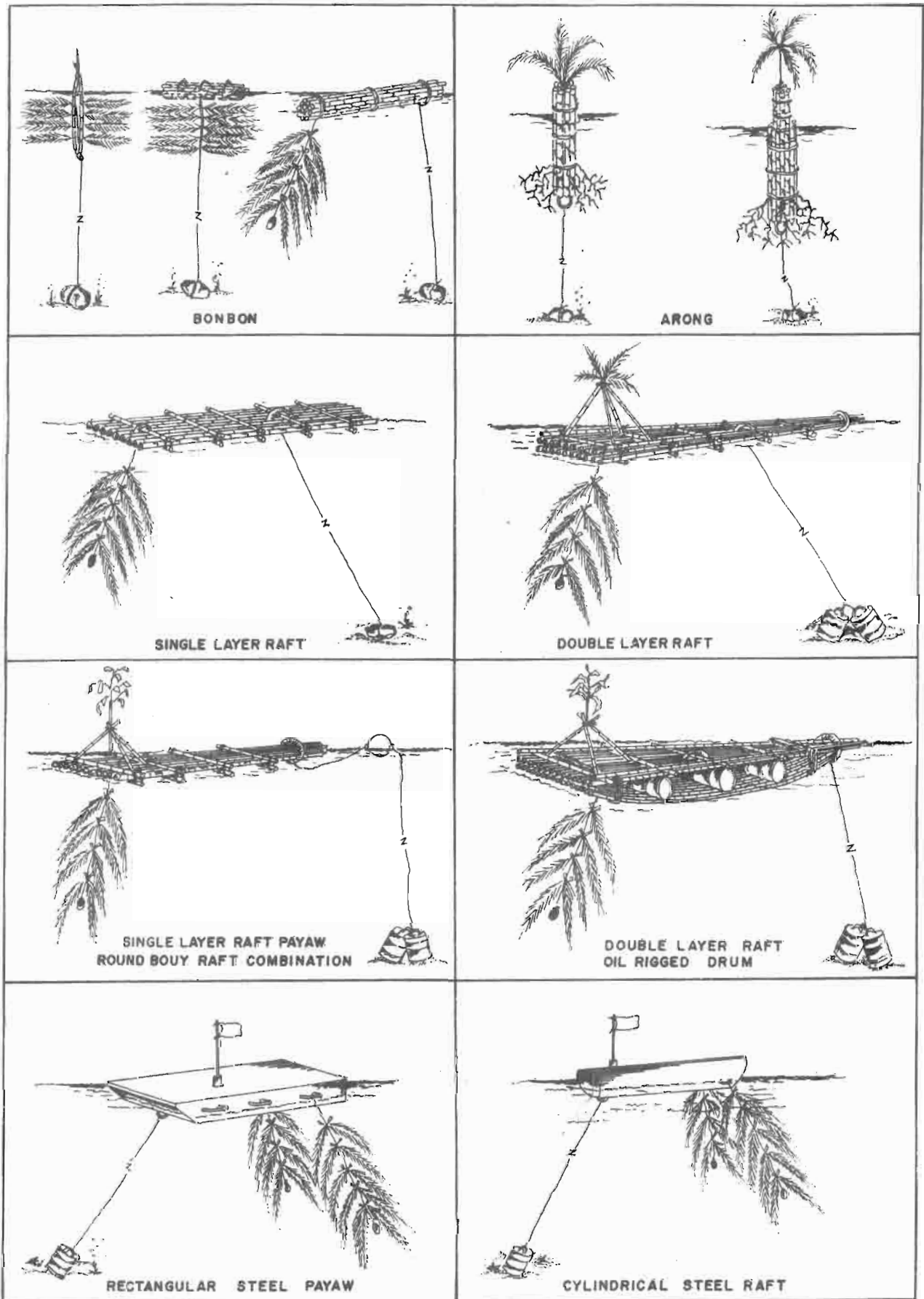
Weights used to anchor the payaw are made by filling oil drums with concrete. Steel rods are added for reinforcement. A side rim of an automobile tire is embedded half-way into the concrete on top of the oil drum. This rim is used to attach the anchor line. An oil drum filled with concrete weighs between 480 to 500 kg. The number of these weights required to anchor a payaw depends upon the depth. Three to four weights are needed for depths between 1 500 to 2 200 m, whereas five to six weights are used for depths between 2 200 and 5 000 m.

The "habong" consists of a line, 27 to 37 m long on which palm fronds are spaced 1 to 2 m apart. A 10 kg weight is tied to the lower end and the line is attached to the rear of the payaw to avoid tangling with the anchor line. During ring net and purse seine operations, the habong is transferred to the light boat and the light boat allowed to drift away. Fish aggregated by the payaw follow the light boat with the habong. The habong is returned to the payaw after completion of the set.

^{1/} Ruperto A. Gonzales, FAO Consultant. Report on technical assistance for skipjack and tuna seining with the use of anchored bamboo rafts in the Fiji Islands.

Payaws are anchored in likely areas of fish occurrence. Numerous payaws are deployed for each catcher boat, generally 30 payaws for a tuna purse-seiner. A tacit agreement between fishing companies specifies 7 miles as the minimum distance between payaws. Payaws are monitored at frequent intervals by scout boats for the presence of commercial concentrations of fish.

Fig. 16. Various types of payaws used through the years in the Philippines



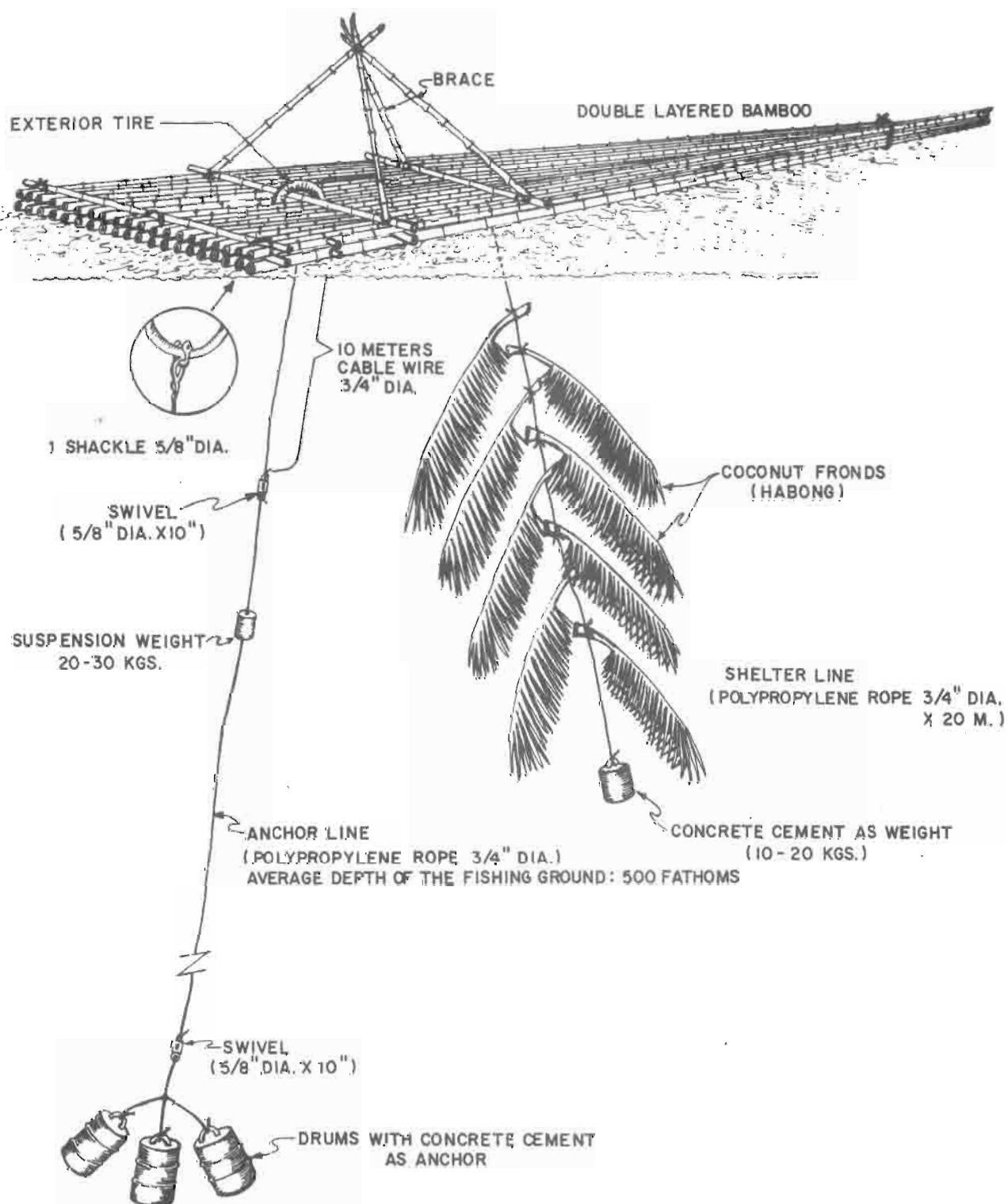


FIG. 17

TYPE	:	Fish aggregating device
NAME OF GEAR	:	Two-layer bamboo raft
LOCALITY	:	Throughout the Philippines

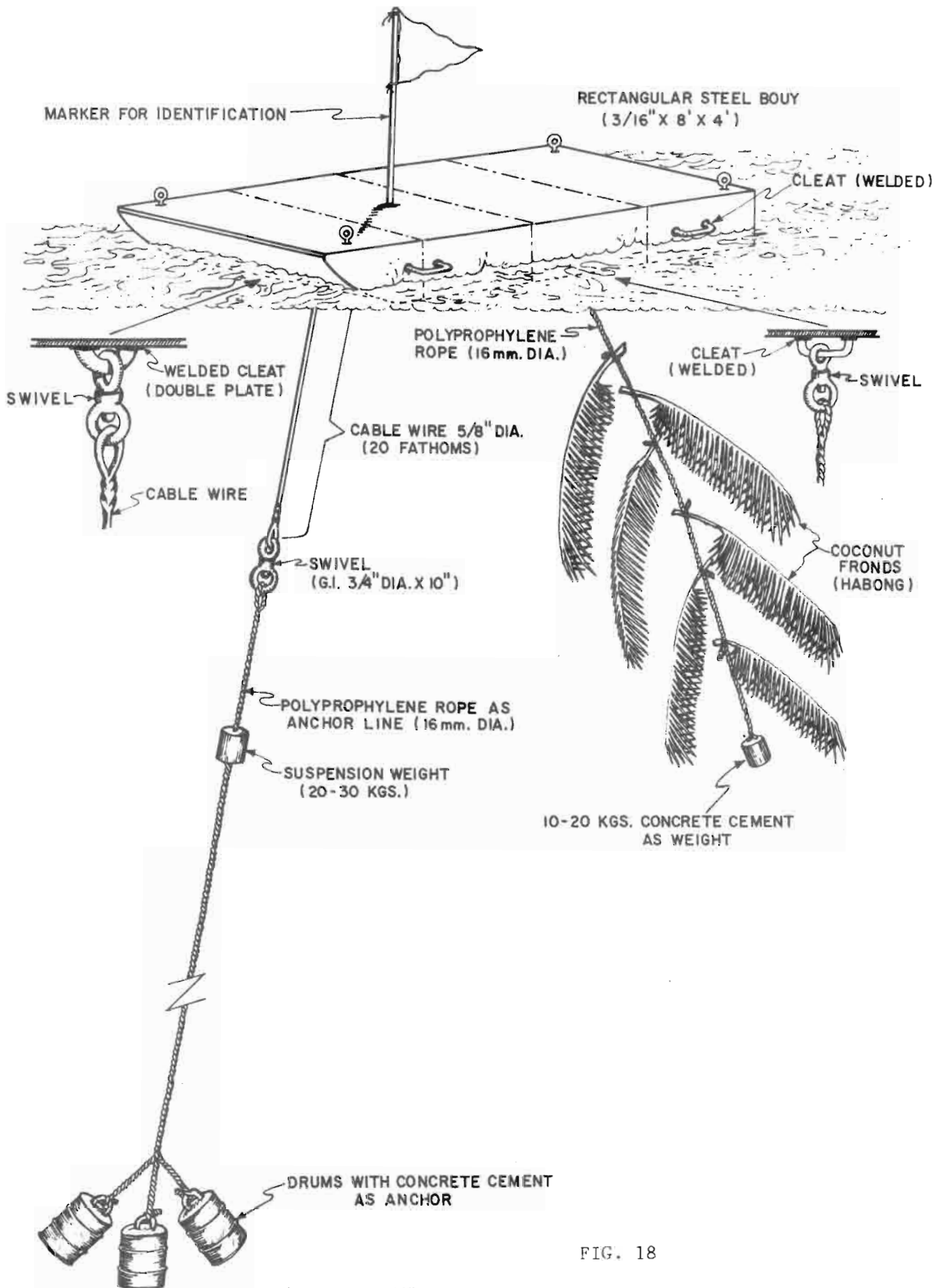


FIG. 18

TYPE	:	Fish aggregating device
NAME OF GEAR	:	Rectangular steel pontoon
LOCALITY	:	Throughout the Philippines

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