

# THE SET BOTTOM LONGLINE GEAR FOR DEVELOPING THE SPINY DOGFISH SHARK (FAMILY SQUALIDAE) FISHERY IN THE PHILIPPINES

By

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## ABSTRACT

The paper describes the nature of the fishing grounds where the spiny dogfish shark (*Family Squalidae*) is being exploited. The modification of the drift tuna longline gear into a set bottom longline for exploring the resource in the adjacent waters of Panay Gulf is described. The paper also describes the construction and operation of a new type of set bottom longline for catching the shark in the adjacent waters of Batangas Bay. Previous catch records of the gear is also discussed. A part of the paper mentions the economic values of the shark, and the practice of processing the fish for the local market. The procedure of extracting the liver oil and its quality control for export is also described. The profitability of the fishing venture is estimated side by side with the capital investment and the sales of "crude squalene oil" and other parts of the fish. The conclusion is that dogfish shark fishing is a profitable venture for fishermen.

## DESCRIPTION OF THE FISHING GROUNDS:

The first attempt to exploit the commercial fishing possibilities in the Philippines of the spiny dogfish shark resource was started during the later part of 1967 in the adjacent waters of Panay Gulf, particularly in the coastal waters of San Joaquin, Miagao and Gimbald towns located southwest of Iloilo City. (Fig. 1).

The geodetic chart taken of the locality describes the bottom topography as sandy and muddy seabed. The average depth of the

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water is about 395 fathoms. The general water current is influenced mostly by the onset of flood tide and the receding ebb tide. The replenishment of the coastal waters is attributed to the flow of fresh tidal waters from the South China Sea which flows into the Sulu Sea basin. The flow of the tidal current is from the SW to NE direction. The coastal area is exposed during the Southwest monsoon season which makes fishing somewhat difficult.

The second fishing area exploited in 1968 was the coastal waters of Barrio Sta. Catalina and Bayawan town in southwestern Negros Oriental (Fig. 2). Three to five nautical miles offshore, the seabed is muddy and the water depth has an average sounding of 252 fathoms. However, the muddy area is extended further offshore to about 10 to 15 nautical miles and the average depth of the water is about 647 fathoms.

The intrusion of flood waters into the coastal areas is influenced by the onset of the tidal flow originating from the Pacific Ocean which streams at a great velocity into the Bohol Sea (formerly Mindanao Sea). The area is exposed to the Southwest monsoon winds from July to October. The favorable fishing months in the two fishing grounds are during the occurrence of the Northeast monsoon and the trade winds.

An attempt to exploit the resource in the Luzon area was conducted in 1969 in the adjacent waters of Batangas Bay and the south approaches to Verde Island Passage between Batangas and Mindoro Island (Fig. 3). The previous echo soundings of this area conducted by the author on board the M/V Lapu-Lapu shows that the echogram of the bottom is characterized by sandy, muddy and rocky seabed and irregular topographic configuration. The average water depth of the area is about 181 fathoms.

In contrast to the sounding depth of the adjacent waters of Batangas Bay, the southern approaches to Verde Island Passage has an average depth of about 210 fathoms. The replenishment of the coastal waters adjacent to Batangas Bay and the Verde Island Passage areas are influenced by strong tidal and whirling water currents originating from the South China Sea. Set bottom longline fishing is favorable in the Batangas side during the northeast monsoon season. Fishing is favorable on the Mindoro Island side during the southwest monsoon season.

The successful attempts to exploit the spiny dogfish shark resources in Panay Gulf, Batangas Bay and the south approaches to Verde Island Passage in 1967, 1968, and 1969, respectively, led to many other spiny dogfish shark fishing exploitations in the different marine water areas in the Philippines (Fig. 4).

### MODIFICATION OF DRIFT TUNA LONGLINE GEAR

A Japanese drift tuna longline gear, which was modified into a set bottom longline, was adopted for spiny dogfish shark fishing. There are three main sections of the longline with hardware accessories, namely: float line, main line and the branch lines (Fig. 5). The three sections of the gear are made of "Kuralon" rope about 1/4 inch in diameter. The drift tuna longline is composed of 50 sets. When the sets are joined end-to-end the gear will require 12 pieces of glass buoys, 12 pieces of flag poles, 12 pieces of float line, 10 pieces of main lines, 250 pieces of branch lines and 250 pieces of tuna hooks.

On the other hand, the conversion of the drift tuna longline into a set bottom longline demands some alterations in the original design and specifications (Table I) to adapt the gear for operations at greater depths. The set bottom longline will need two pieces of glass float buoys or bamboo raft and two flagpoles, two anchor lines (total length will depend on the depth of the fishing ground), 440 pieces of branch lines each about 7 meters long, 440 pieces of tuna hooks, 2 pieces of anchor weights and 132 pieces of lead sinkers No. 4 (about 8 pieces to a kilo).

### DESCRIPTION OF THE MONOFILAMENT SET BOTTOM LONGLINE

The set bottom longline gear used in fishing for spiny dogfish sharks (*Family Squalidae*) was made of three separate breaking-load capacity monofilament line tackle fishing materials. The gear (Fig. 7) is divided into three main sections, namely: anchor line, main line and branch lines. The specifications of the longline materials (Table 2) include hardware accessories which are also attached to the different parts of the gear.



*Anchor lines:*

The set bottom longline is provided with two pieces of anchor lines of monofilament materials about 3.0 mm in diameter with a breaking strength of about 260 lbs. per meter length. The accessories attached to the anchor lines are: two units of bamboo raft buoy, two pieces of flagpoles, each about 10 feet long, two pieces of suspension weights for the flagpoles. The anchor line is held in a vertical position from the water surface down to the bottom by means of the bamboo raft buoy and the anchor weights. The total length of the anchor lines will depend on the depth of the fishing ground.

*Main line:*

The main line varying from 1,500 to 3,000 meters long, is also made of monofilament material about 2.5 mm in diameter with a breaking strength of about 210 lbs. per meter length. Two or more units of main lines can be linked to each other by a linking swivel made of brass or stainless steel. Both ends of the main lines are linked to the bottom ends of the anchor lines about one meter away from the anchor weight. Lead sinkers no. 2 are tightly clamped along the main line 20 to 25 meters apart. The number of lead sinkers will depend on the total length of the main line. The lead sinkers provide a uniform sinking speed of the main line as it horizontally sinks to the bottom.

*The branch lines*

The branch lines to which the hooks are tied are also of monofilament material about 1.5 mm in diameter with a breaking strength of about 110 lbs. At the free ends of a line is the wire leader holding the hook. Each branch line which is about 1.5 meters long is hung from the main line at intervals of 3.5 meters each. The leader wire which is about 5 inches long is made of stainless wire gauge No. 7 with a breaking strength of about 69 lbs. The size of the hooks used in catching spiny dogfish sharks is No. 16 or No. 18. The number of hooks depend on the number of branch lines which in turn depends on the spacing along the main line and the total length of the main line.

## THE FISHING CRAFT

The spiny dogfish shark fishing craft was a motorized banca with outrigger (Fig. 8), with a unit of set bottom longline with 1,000

hooks (Fig. 9). The motorized banca was originally a dugout enlarged to the desired length by fixing hull plankings to increase the width and depth. The boat measures about 11 meters long by 1.5 meters wide and 1.5 meters deep. A 45 hp gasoline engine propels the boat at a speed of 10-12 knots per hour. The boat can load a catch of 400 to 600 kilos of spiny dogfish sharks.

## METHOD OF FISHING

The fishing craft is manned by two to three fishermen. The hooks are baited on land before the boat leaves for the fishing ground. The spiny dogfish sharks generally feed on baits like squids, eels, shrimps, fish and other deep-sea dwelling animals. However, fishermen in the Batangas area prefer to bait hooks with small mullet (about 3 inches long) because it is always available at much cheaper prices.

The common practice of the fishermen is to leave their home base in the evening at about 9:00 or 10:00 P.M. It takes one to two hours sailing to reach the vicinity of the fishing ground. The site of the fishing ground is determined and located by the three point landmark bearing. When the fishing ground is located, the direction of the underwater current is determined with a rope with a buoyant sinker.

The fishermen at the stern of the boat drops the lighted bamboo craft buoy into the water and start paying out the lines. The gear is set parallel to the current flow so that the main line will be straightened out as the gear sinks into the seabed. The gear is allowed to lie on the seabed for about 5 hours until about sunrise and then hauled manually (Fig. 10). The hauling time could be much longer specially when the catch are plentiful. The fishermen land their catch the following afternoon at about 3:00 p.m.

## CATCH COMPOSITION AND CATCH RATE

It was observed that the catch were mainly dogfish sharks (Fig. 11) with the rest composed of eel fishes, groupers, several elephant fishes and several pieces of common sharks. The fishes caught weighed a total of 433 kilos, of which 369 kilos came from 111 pieces of spiny dogfish sharks caught (Fig. 12) in a single operation using 1000 hooks. Tentative estimate of the catch rate is one spiny dog-



fish shark for every nine hooks, a catch ratio of 1:9 or 111 dogfish sharks for every 1000 hooks of the gear.

For comparison, the author has interviewed several fishermen in the locality regarding their catch. They said that in a bad fishing day the catch is less than 100 kilos but during a good fishing day, they can catch as much as 200 kilos to 400 kilos of spiny dogfish sharks. Accordingly, the fishermen and the author have agreed that the success of a fishing operation is greatly affected by oceanographic and meteorological factors.

### PREVIOUS CATCH DATA OF SPINY DOGFISH SHARKS

The Avals Fishing Company in Batangas kindly made available to the author the catch data of their four motorized fishing bancas which operated during the month of September, 1974 (Table 3). The total number of fishing days differs from each other: Boat No. 1 made 18 fishing trips; Boat No. 2, 14 similar trips; Boat No. 3, 12 trips and Boat No. 4, 7 trips. It should be noted that each boat is equipped with a set bottom longline with 1,000 hooks.

To find out the daily average, the total catch of each boat is divided by the number of fishing trips made. Comparatively, the total catch of Boat No. 1 showed a daily average catch of 220 kilos, while Boat No. 2 and 3 poorly made the average catch of 160 kilos each. These two boats recorded the lowest daily catch. On the other hand, Boat No. 4 with the fewest number of trips made an average of 230 kilos, the highest in the group. It even made the highest daily catch of 715 kilos landed on September 23. Among the four, Boat No. 1 showed regularity in daily catch.

Comparative analysis of the catch data shows the need to increase the average catch rate of the gear. The author believes that the catching efficiency of the gear could have been improved through proper selection of baits and accurate setting of the gear within the fishing area.

The most reliable instrument to locate the fishing ground is a highly sensitive 200-kilo Hertz Echo sounder with white line indicator. The beam angle of the transducer should be 8° to 10°. This is a useful guide to fishermen who wish to invest in set bottom longline fishing for spiny dogfish sharks.

Table 3. Spiny dogfish shark catch data of the four boats of Avals Fishing Company in the month of September, 1974.

DATE Sept., 1974	BOAT NO.1 Catch-kilos	BOAT NO. 2 Catch-kilos	BOAT NO.3 Catch-kilos	BOAT NO.4 Catch-kilos
1	*	*	*	*
2	*	*	*	*
3	*	*	*	*
4	281	*	*	*
5	149	418	119	42
6	237	96	10	*
7	387	95	*	*
8	261	167	219	154
9	*	*	*	*
10	435	373	145	57
11	*	*	*	*
12	100	32	*	*
13	74	77	99	*
14	*	*	*	*
15	237	*	*	*
16	*	*	*	*
17	303	216	268	*
18	65	13	15	*
19	*	*	*	*
20	165	*	*	*
21	*	*	*	*
22	*	*	*	*
23	335	72	238	715
24	144	387	233	*
25	150	178	119	*
26	175	67	27	119
27	*	*	*	*
28	*	*	*	*
29	387	*	*	268
30	269	126	154	172
	4,100	2,317	1,900	1,612

\*No fishing operation

SOURCE: Avals Fishing Company.



fish shark for every nine hooks, a catch ratio of 1:9, or 111 dogfish sharks for every 1000 hooks of the gear.

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\*No fishing operation

SOURCE: Avals Fishing Company.



## THE LIVER OF THE SHARK

The liver, somewhat ivory-white in color, is the most valuable portion of the spiny dogfish shark because it is the source of the industrial squalene oil. According to Toyoda Tsushu Co., Ltd. which is handling a thriving spiny dogfish shark business in Japan, the liver makes up 20 to 25 per cent of the total weight of the fish and the amount of squalene oil which can be extracted is 80 to 85 per cent of the total liver weight.

To verify this information, the author supervised the actual weighing and extracting of the liver oil at the factory of Avals Fishing Company in Batangas. The following data were obtained:

Number of spiny dogfish shark caught .....	111 pieces
Total weight of the sharks .....	369 kilos

The livers were partitioned into two parts and weighed separately.

1st weighing:	
Weight of livers in container .....	27.0 kilos
Weight of container .....	1.5 kilos
Net weight of livers .....	25.5 kilos

2nd weighing:	
Weight of livers in container .....	53.5 kilos
Weight of container .....	1.5 kilos
Net weight of livers .....	52.0 kilos
Total weight of the livers .....	77.5 kilos

The total weight of the livers is about 21 per cent of the total catch weight of 369 kilos. The data show that the proportion of fish catch to the weight of the fish livers in the experiment is within the 20 to 25 percentage range mentioned by Toyoda Tsushu Co. Ltd.

The author then checked the quantity of liver oil that could be extracted from the 77.5 kilos of livers. The livers were placed in a large pan and heated for about 45 minutes until the oil was extracted. The extracted oil was then allowed to cool for about three hours to allow the minute particles to settle.

The extracted oil weighed 64.33 kilos which is 83 per cent of the total liver weight. This shows that the local extraction of the spiny dogfish shark liver is well within the Japanese percentage range.

## EXTRACTING THE FISH LIVER OIL

The liver is removed from the abdominal cavity of the shark through a cut on the dorsal portion starting from the head to the dorsal side. This facilitates the removal of the liver and makes the split fish easy to dry or smoke. The liver is placed in a container ready for chopping into pieces (Figure 3).

The oil can be extracted from the liver very inexpensively by using a double boiler. However, the practice of Filipino fishermen is to extract the oil directly in a large boiling pan. After chopping the liver into pieces, they were placed in a large iron pan and a little water was added, then heated for about 45 minutes. The heat breaks down the liver tissues and sets the oil free to rise to the surface where it is skimmed off. The skimmed oil is then allowed to cool off for about three hours until residues settle to the bottom. The oil is finally transferred to another container which is usually a gasoline drum.

## THE ECONOMIC VALUE OF THE SHARK

The spiny dogfish shark meat is white and odorless. It is filleted and dried for food and is tasty (Fig. 14). It is usually grilled for eating. The shark is also a good source of fish meal. The whole split shark is dried for several days (Fig. 15) preparatory for Klen smoking in the copra type smoke house located inside the warehouse (Fig. 16).

The Klen smoked shark meat is sold to local manufacturers of fishmeals. One thousand kilos of fresh meat will produce about 300 kilos of Klen smoked shark meat.

The most important product obtained from the spiny dogfish shark is the crude squalene oil extracted from its liver. It is used in the manufacture of good quality cosmetics such as creams, pomades, perfumes and hair oil. It is also used as lubricant for watches and other precision instruments. The squalene oil is a dollar-earning export product. Before acceptance, the oil must pass the quality control laboratory for quality test which can be conducted by the Food and Drug Administration. Laboratory tests are made for the following values:



Saponification value, not less than 22.1; Iodine value not, less than 34.2; Acid value should be less than 0.22.

The exportation of shark liver oil started in 1969, according to the data of the Bureau of Fisheries and Aquatic Resources.

Table 4. Fish Liver Oil Exportation of the Philippines from July 1969 to April 1975.

Quality (Kgs.)	Value (Peso)	Dates	Exported to:
3,100	10,140.00	July 1969	Japan
2,340	11,934.00	June 1970	"
1,200	6,120.00	Oct. 1970	"
900	4,590.00	Dec. 1970	"
1,000	3,900.00	Jan. 1971	"
1,500	6,192.00	May 1971	"
2,000	9,375.00	Nov. 1971	"
2,000	12,000.00	May 1973	Hongkong
2,000	12,600.00	Aug. 1973	Japan
2,300	12,600.00	Oct. 1973	U.S.A.
1,000	8,700.00	Nov. 1973	Japan
2,000	26,000.00	March 1974	U.S.A.
2,170	9,900.00	Nov. 1974	Japan
1,080	12,500.00	Dec. 1974	U.S.A.
1,300	23,450.00	Dec. 1974	Japan
6,862	105,017.00	Jan. 1975	"
2,160	33,264.00	Feb. 1975	"
14,580	199,587.00	March 1975	"
6,444	67,205.00	April 1975	"
22,180	336,839.00		

NOTE: No record of Exportation in 1972.

SOURCE: Marketing Section, Bureau of Fisheries and Aquatic Resources

### INVESTMENT PROFITABILITY

Plans for investment in dogfish shark fishing must primarily consider the size of the banca and the distance of the fishing grounds. The size of the gears to be operated will depend on the size and fish catch loading capacity of the banca. A banca with a 300-kilo capacity can operate a set bottom longline with 500 to 1,000 hooks.

A banca of a 600-kilo capacity can operate a set bottom longline with 1,000 to 1,500 hooks.

The profitability of the venture for 260 fishing days is shown in the following breakdown of capital and operational cost requirements:

#### A. Technical

1. Type of Boat: Number: Specification:  
Motorized 1 32 ft long x 2.5 ft wide  
(Wooden Banca) x 2.5 ft deep
2. Rated Capacity:  
Catch Rates:  
One spiny dog-fish shark bottom  
longline gear ..... 200 kg/day of fish  
Effective fishing days per year ..... 260 days  
Yearly aggregate capacity ..... 52,000 kg  
Total weight of liver  
(20% to 25% of fish weight) ..... 10,400 kg  
Total weight of extracted oil  
(80% to 85% of liver weight) .... 8,320 kg  
Total weight of dried or smoked  
spiny dogfish after removing the  
liver ..... 14,500 kgs  
(One ton of fresh shark meat when dried or smoked will  
produce 300 kg of dried or smoked meat).

#### B. Financial (Fixed Capital)

1. One (1) motor banca with shafting ..... P 6,000.00  
One (1) set bottom longline with 1,000  
hooks and accessories ..... 800.00  
One (1) smoke house 2.5 m long  
x 2.5 m wide x 2.5 m high made  
of hollow blocks ..... 1,200.00  
One (1) cemented stove with 2 boiling  
(iron) pans, dipping cup, screen  
wire strainer tray ..... 650.00  
Wooden grinder (locally made) ..... 150.00



Two (2) pieces of galvanized iron container with 10-gallon capacity .....	60.00
One (1) warehouse made of bamboo and Nipa materials 10 x 8 m .....	2,000.00
Total fixed Capital .....	P10,860.00
2. Operational Expenses:	
Cost of fish bait at P50.00/day for 260 days ....	15,000.00
Cost of fuel (15 liters per day) at P1.20/liter for 260 days .....	4,680.00
Cost of 80 liters lubricating oil for 260 days operation at P4.50/liter .....	360.00
Miscellaneous expenses per day at P10.00 for 260 days .....	2,600.00
Total running cost .....	22,640.00

## C. Total Revenue:

Total weight of extracted crude squalene oil — 8,320 kg x P6.00/kg .....	P49,920.00
Total weight of smoked or dried shark meat — 14,500 kg. x P2.00/kg .....	P29,000.00
	P78,920.00
Gross Sales .....	P78,920.00
Total Operating Capital .....	P22,640.00
Net Income .....	P56,280.00

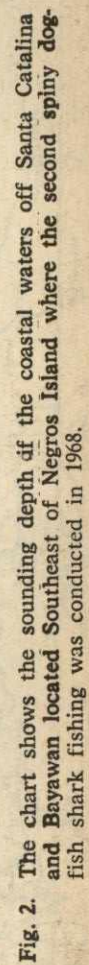
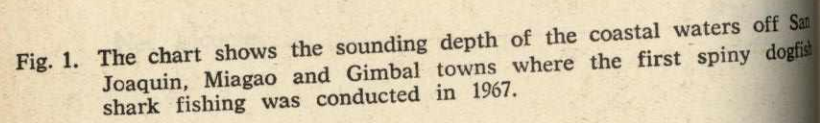
## ACKNOWLEDGMENT

The author wishes to acknowledge with deep gratitude, Avar Fishing Company of Batangas for allowing the use of its facilities and providing previous fish catch data for comparative analysis. Further acknowledgment is extended to Mr. Conrado Napugan for his great interest in spiny dogfish shark fishing in Panay Gulf and for supplying the necessary data to complete the paper.

## REFERENCES

- Anglo-American Caribbean Commission. 1945. *Guide to Commercial Shark Fishing in the Caribbean Area*. pp. 31-36.
- ENCINA, VITALIANO B. 1973. Discovery and Distribution of Spiny Dogfish Shark (Family Squalidae) in the Philippines. *Philippine Journal of Fisheries*, Vol. 11 (1-2): 127-141.
- HERRE, ALBERT W. 1953. *Checklist of Philippine Fishes*. pp. 29-32.
- TAPIADOR, DOMINGO D. 1951. A Report on Deepsea Longline for Tuna in the Philippines. *Bul. of the Fisheries Society of the Philippines*. Vol. 2, 3-27.







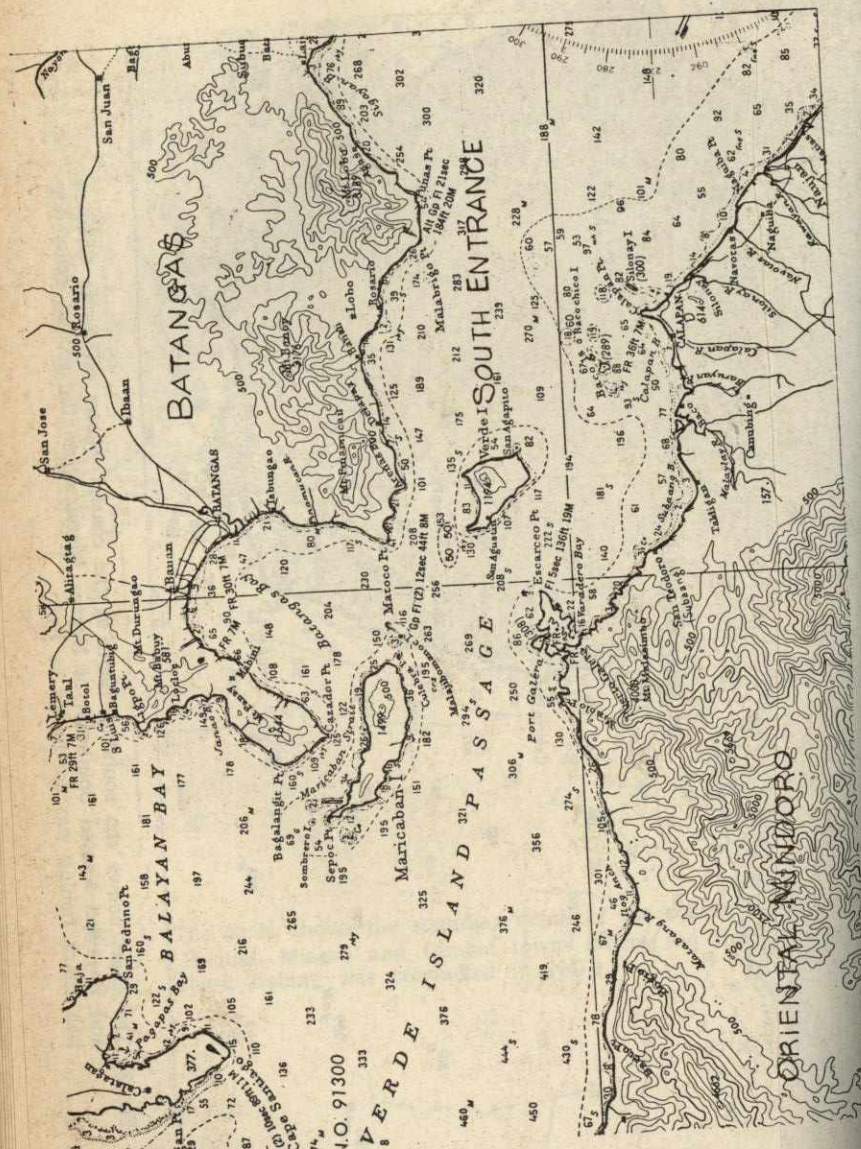


Fig. 3. The chart shows the sounding depth of the adjacent waters of Batangas Bay (the dotted line) and the depth of the sounding (the solid line) when the third attempt to exploit the oil field was made.

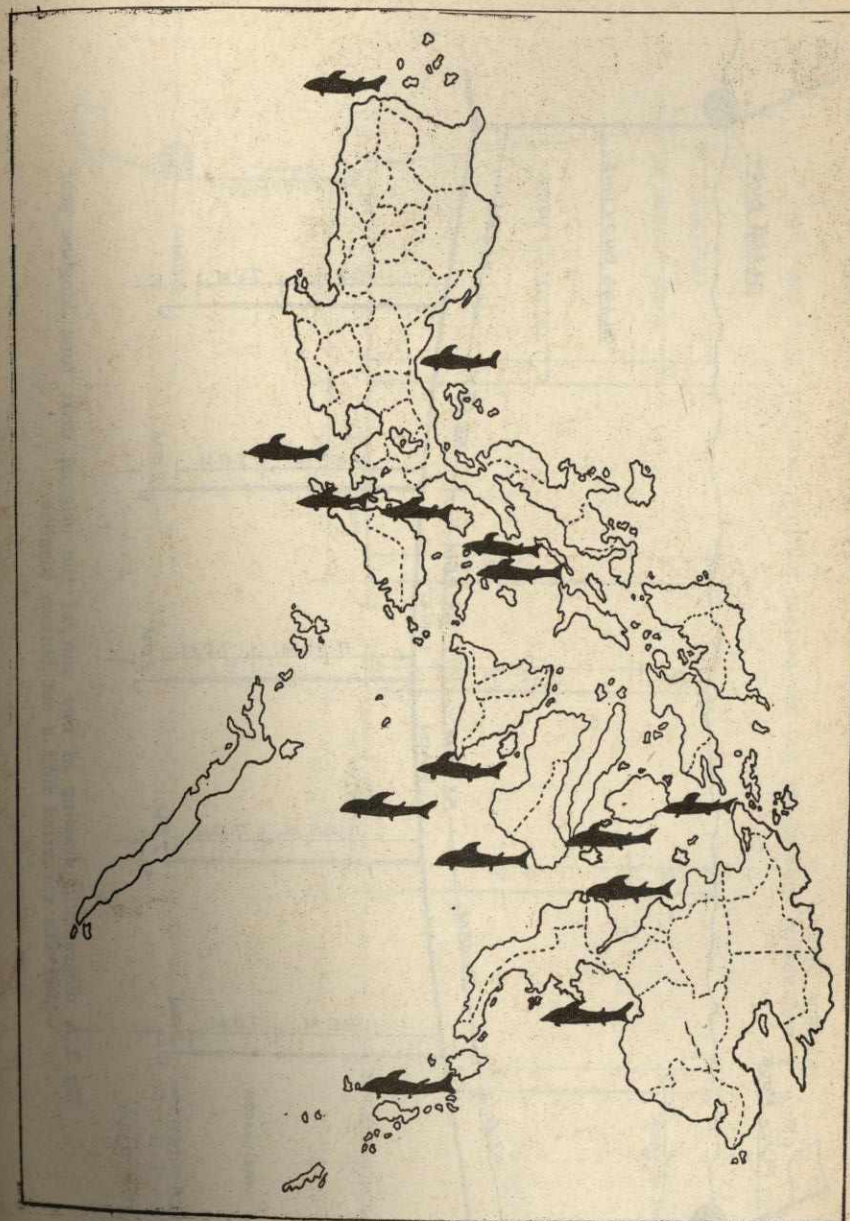


Fig. 4. The spiny dogfish shark fishing areas presently exploited by fishermen.



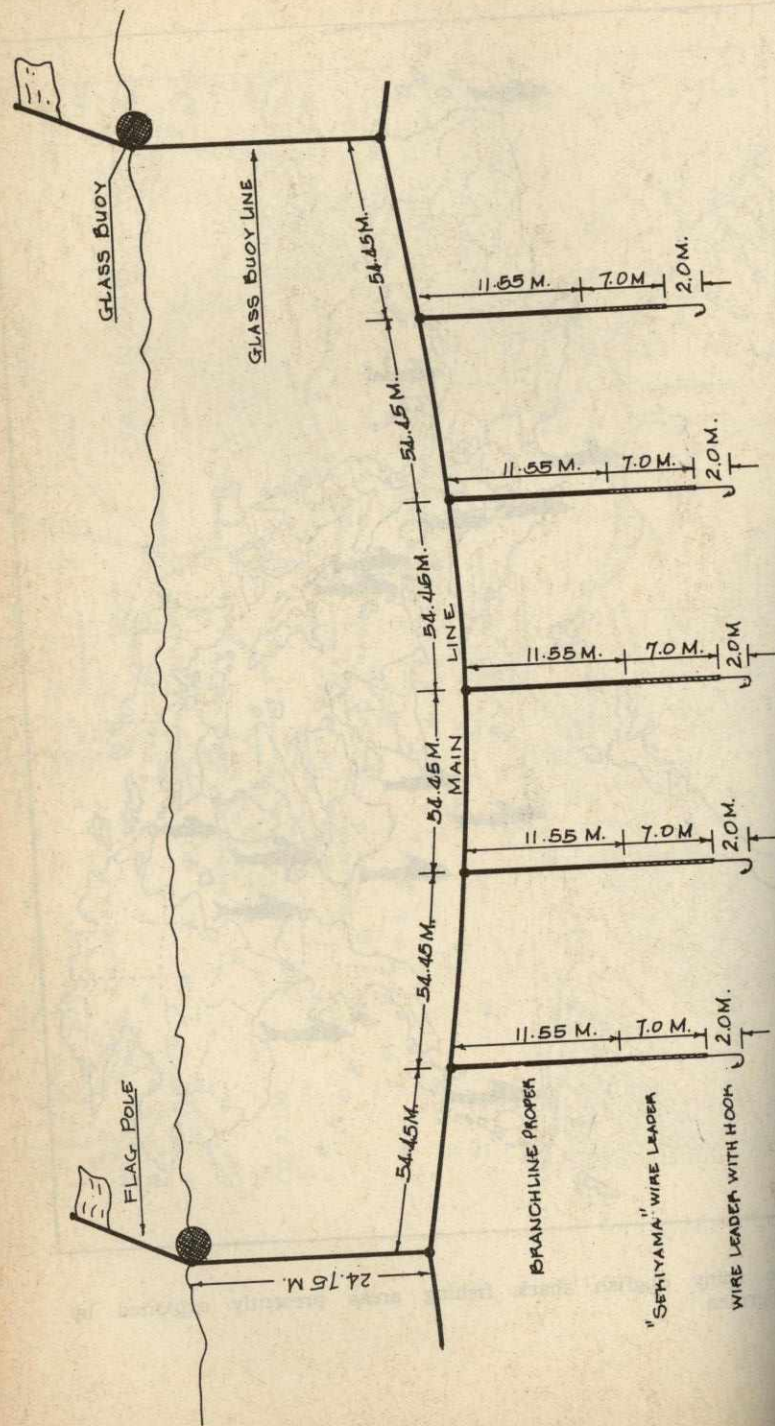


Fig. 5. A diagrammatic drawing of one unit of the original drift tuna longline gear which was converted into a set bottom longline.

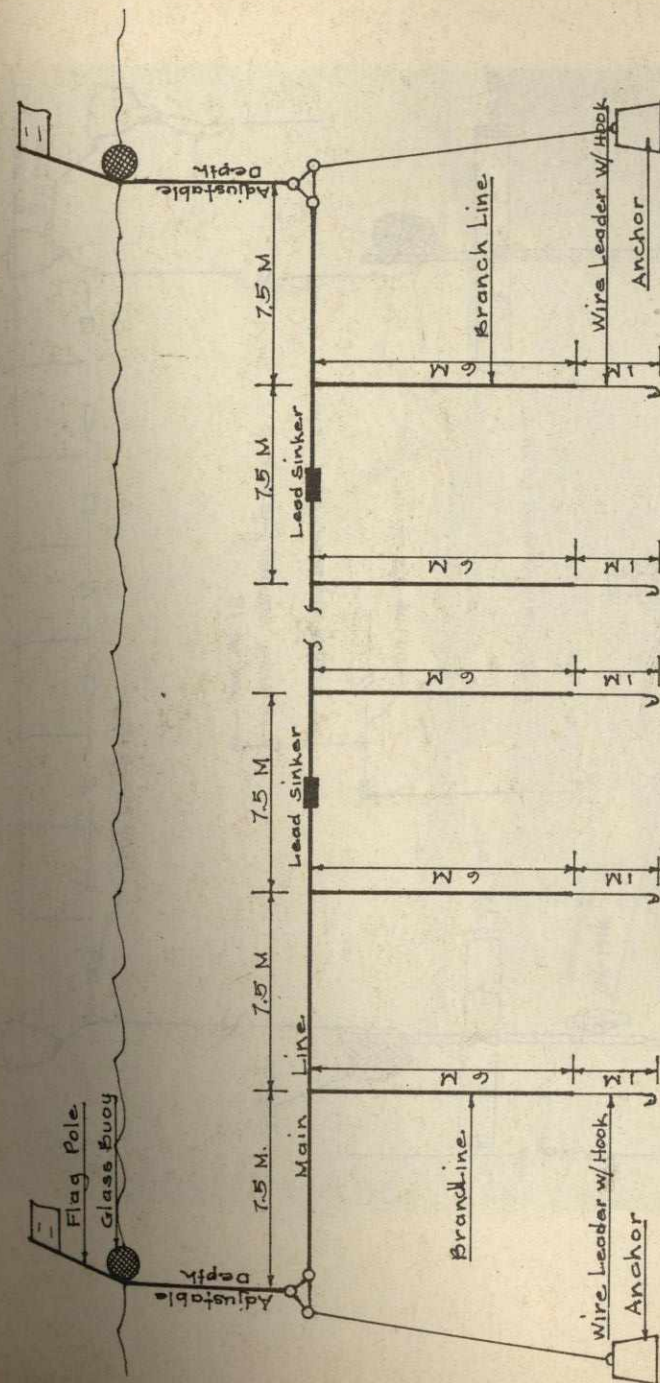


Fig. 6. A diagrammatic drawing of the set bottom longline modified from drift tuna longline gear.



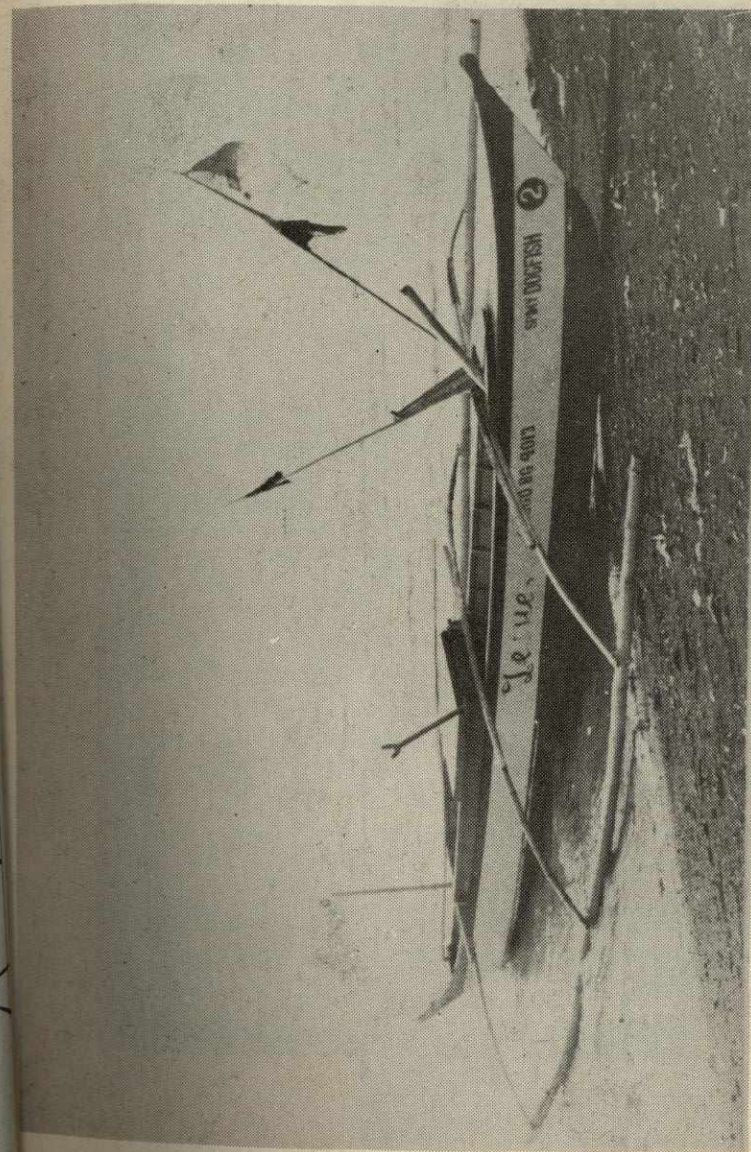
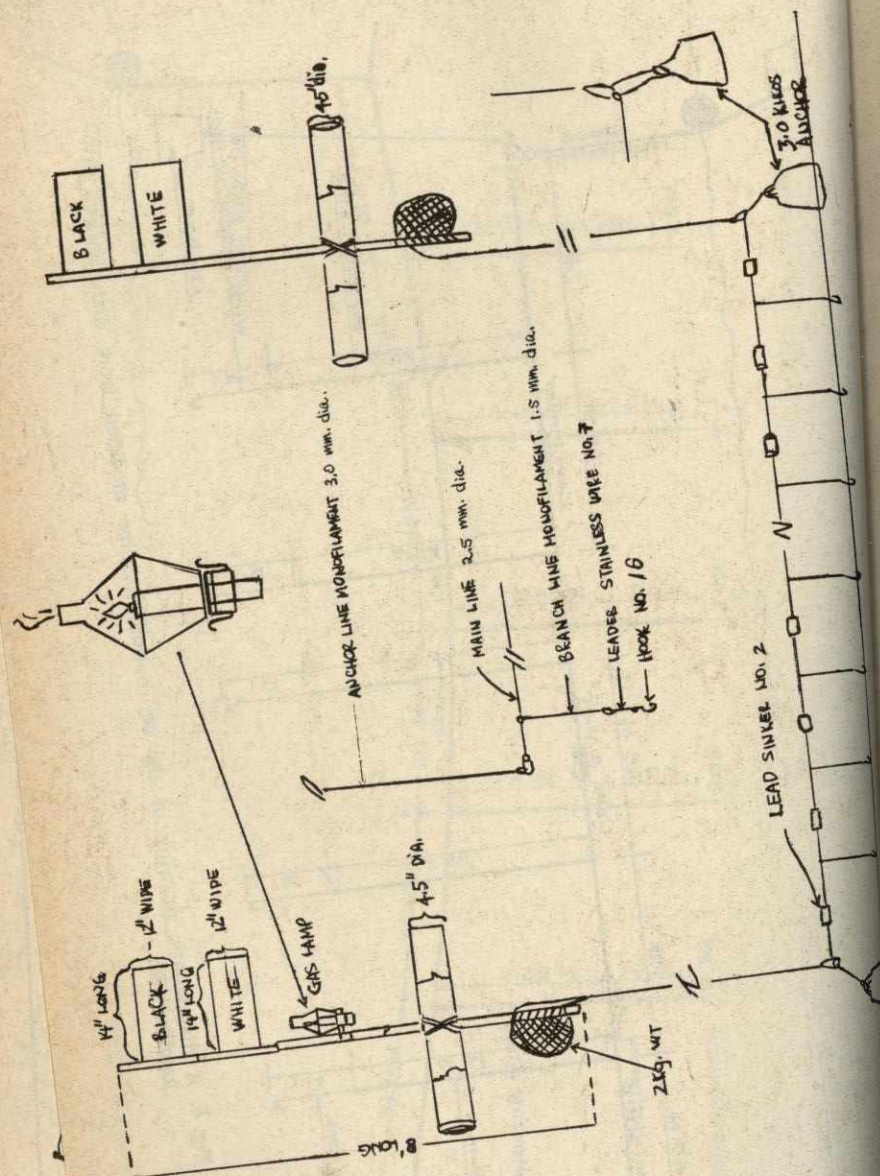


Fig. 8. The motorized banca named Spiny Dogfish.



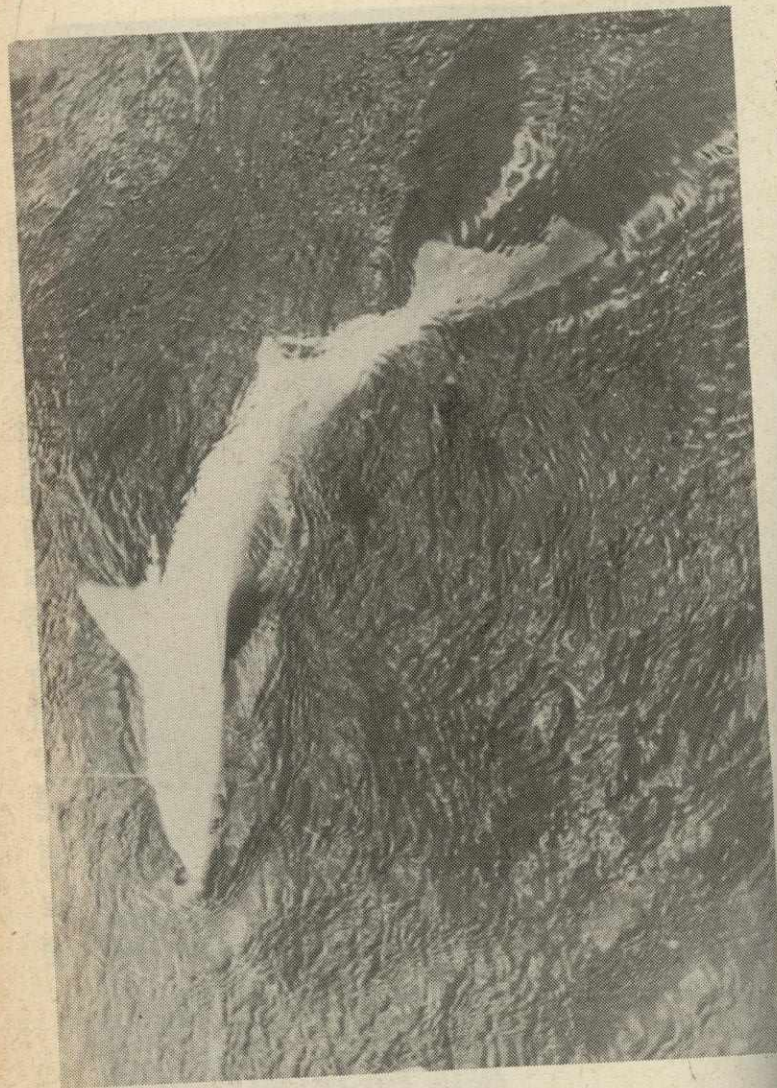


Fig. 11. The Spiny dogfish shark caught during the hauling of the set bottom longline.



Fig. 12. Partial catch of spiny dogfish sharks in a fish tub. (banyera).



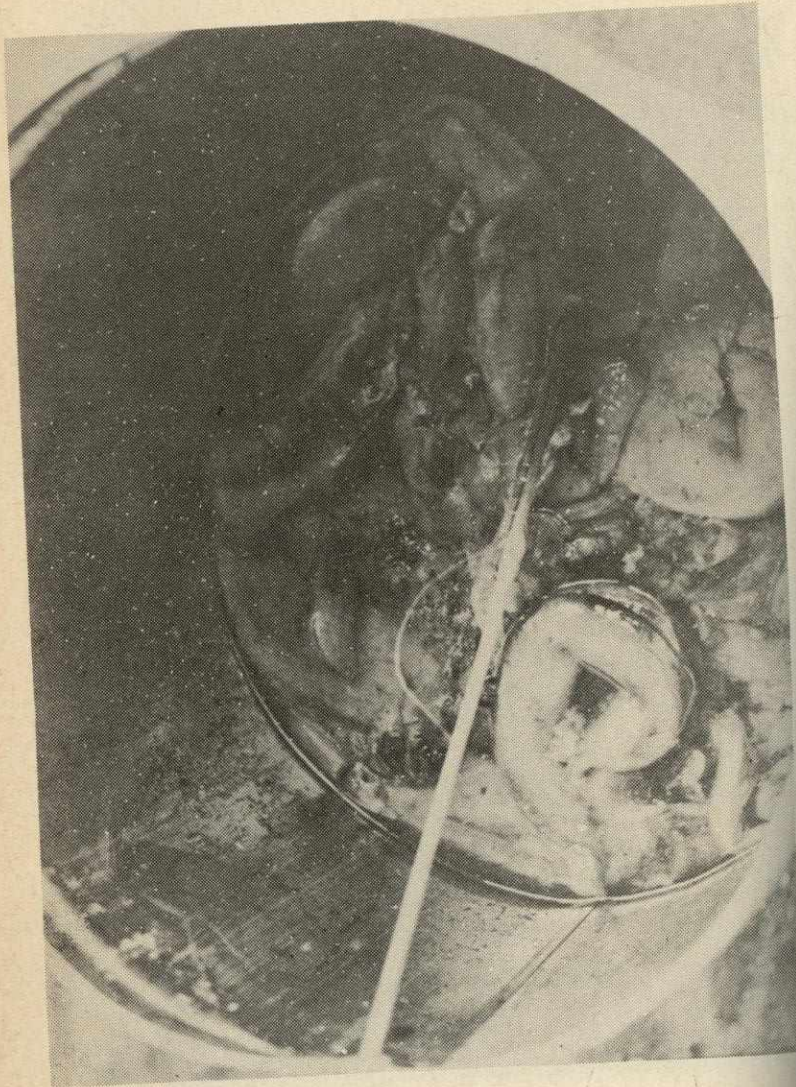


FIG. 13. Spiny dogfish shark livers will be chopped into small pieces.

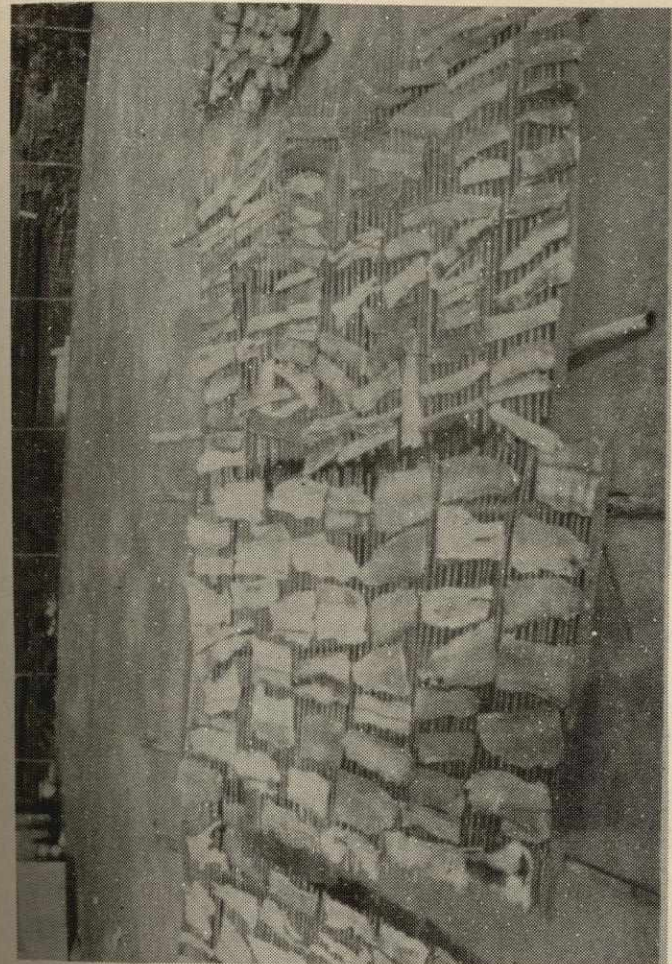


Fig. 14. Filleted spiny dogfish shark meat are sun-dried.



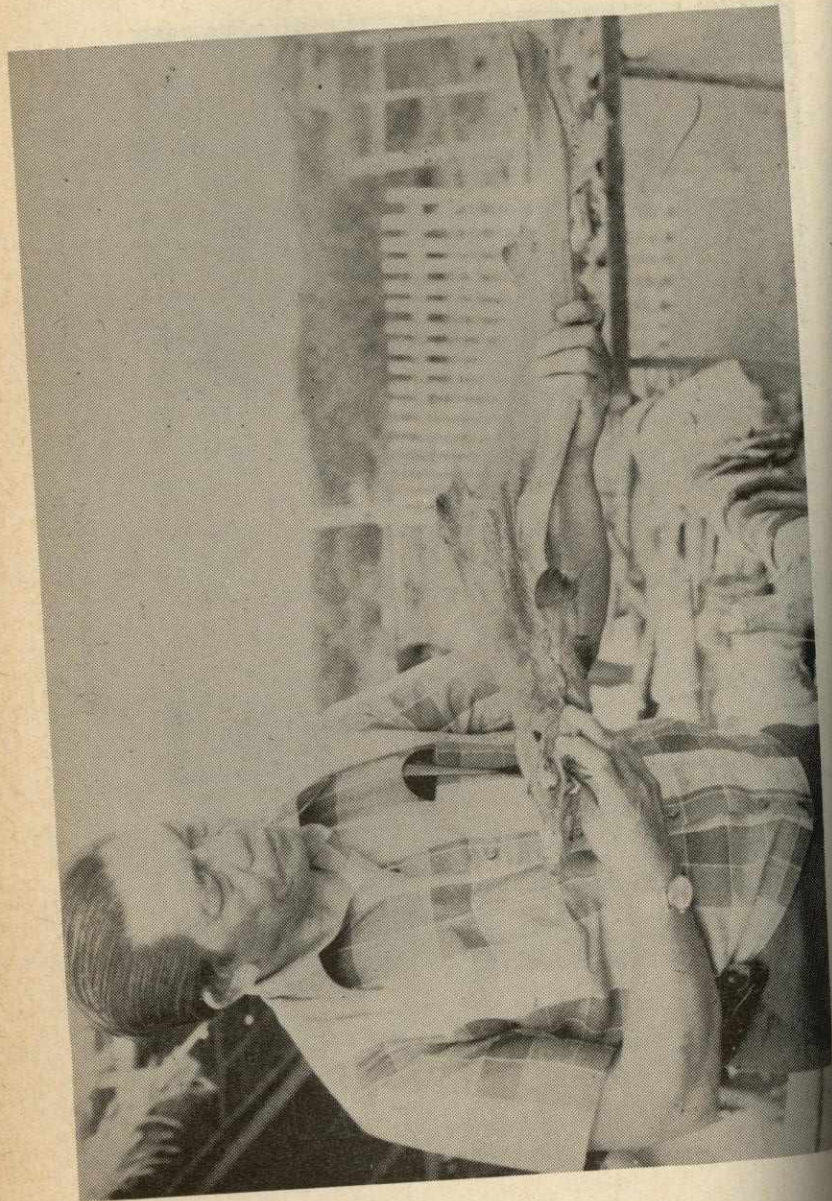


Fig. 15. Author holds a dried spiny dogfish shark.

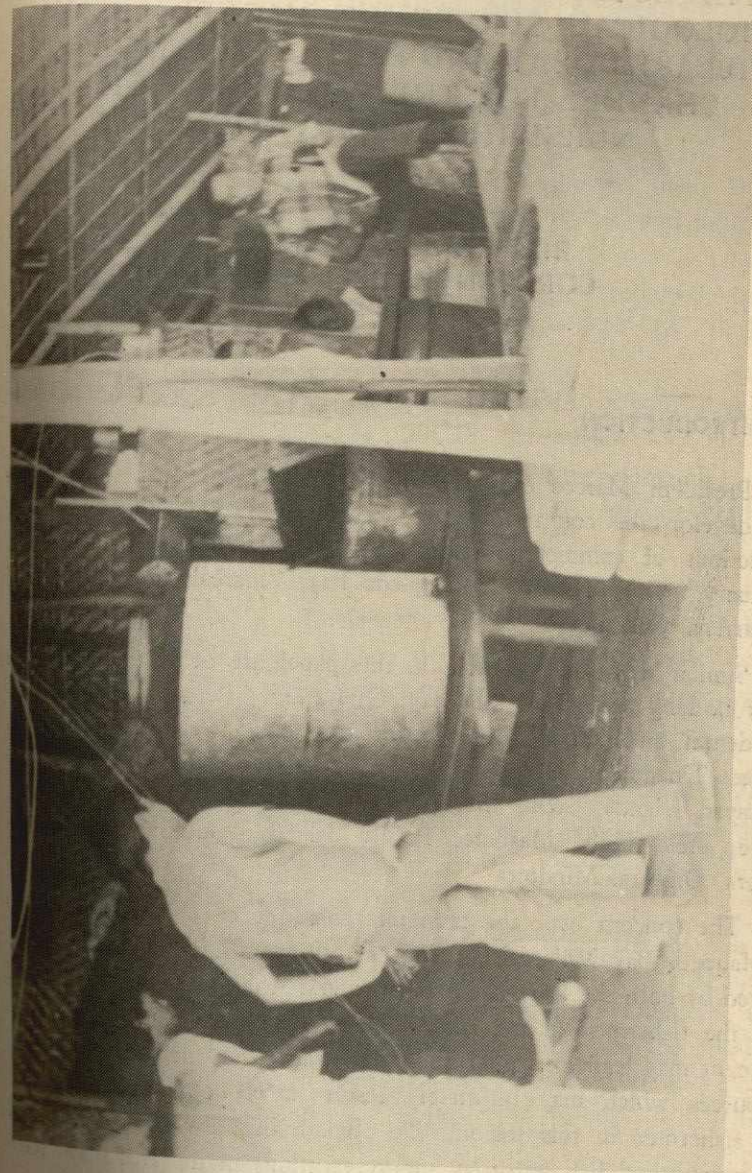


Fig. 16. The spiny dogfish shark processing warehouse has the following equipment: Left side, a partial view of the smoke house; center, container for stocking the liver oil; right side, boiling stove made of hollow blocks.