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# THE DISCOVERY AND DISTRIBUTION OF THE SPINY DOGFISH SHARK RESOURCE IN THE PHILIPPINES

By

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## ABSTRACT

This paper traces the global distribution of spiny dogfish shark (*Family Squalidae*) species in the Pacific and Indian oceans since 1872 and the description of the spiny dogfish shark by Deania Jordan and Snyder in 1902. Likewise, it shows identification of the spiny dogfish shark species in the Philippines by Smith and Radcliffe in 1912, Albert Herre in 1922 and Henry Fowler in 1941. In April, 1975, the spiny dogfish shark caught by local fishermen was identified and described by Mrs. Salud Ganaden, of the Bureau of Fisheries and Aquatic Resources. This article also traces the discovery and identification of the spiny dogfish shark distributed in Philippine marine waters. A discussion of the economic value of the fish squalene oil is included. A program for the wise exploitation and conservation of this dollar-earning fishery is recommended.

### *Global Distribution of the Resources*

The Checklist of Philippine Fishes by Albert Herre describes the wide distribution of spiny dogfish shark (*Squalus fernandinus* Molina) in the Pacific and Indian oceans, (Fig. I). It shows that the resource is globally distributed from Chile to Japan, the Philippines, Australia, New Zealand and South Africa. Literature on spiny dogfish sharks was first published in Saggio, Stor. Nat., Chile in 1782.

Deania Jordan and Snyder described the spiny dogfish shark as small deep-sea sharks found in the Philippines, Japan, Australia, and the coast of Natal, South Africa. This description was published in the Proceedings of the US National Museum in 1902.

The Anglo-American Carribean Commission (1945) published articles on three species of spiny dogfish sharks namely: *Etmopterus*

*Hillianus*, and *Squalus cubensis* which are commonly found in the Caribbean Sea; and the *Squalus acanthias*, which closely resembles the *Squalus cubensis*. The third species is found not only on both sides of the North Atlantic, chiefly in temperate and Antarctic latitudes but also on both sides of the Northern Pacific, with close allies in corresponding latitudes in the southern hemisphere.

Smith and Radcliffe in 1912 described the dogfish shark specimen in the Philippines as small-scaled *Squalus*. It is called *Etmopterus brachyurus*, a Philippine species. It measured 325 mm long, was dredged at a depth of 236 fathoms off Sombrero Island, west of Luzon and near Burias Island, Masbate. Similar species was also caught at 236 fathoms off Jolo Island.

Albert Herre in 1922 identified two dogfish shark specimens as *Squalus fernandinus* Molina which were caught by a fish corral about six meters deep in Dumaguete, Negros Island. These, together with the identified specimen, measured 645 mm and 655 mm long. In 1941, Henry Fowler identified another species as *Squalus Philippinensis* which was caught in the Verde Island Passage between Batangas and Mindoro Island.

On April, 1975, the author collected two specimens of spiny dogfish sharks (Fig. 2) and requested the assistance of Mrs. Salud Ganaden, an ichthyologist of the Bureau of Fisheries and Aquatic Resources, to identify and describe the two specimens. The specimens were identified as *Atractophorus* sp. and *Squalus Acanthias*.

#### *The Resource Habitat and Distribution in the Philippines*

A study of the habitat and distribution of the spiny dogfish shark resource began during the later part of 1967 after the author returned from two years of study on Japanese fisheries and the applied techniques in deep-sea and coastal fishing methods and gear construction.

The foreign market demand for spiny dogfish shark oil encouraged the author to convince Mr. Conrado Napugan of San Joaquin, Iloilo, to engage in spiny dogfish shark fishing with the use of tuna longline gear in the coastal waters of Panay Gulf, east of San Joaquin, Iloilo. Mr. Napugan was taught how to operate the gear and the echo sounder apparatus for detecting the habitat of the fish. He was also informed about the kind of bait preferred by the fish, and the procedure for extracting the valuable crude squalene oil from the liver. The following year, Mr. Napugan moved his base of operation to Sta. Catalina,

southwest of Oriental Negros, adjacent to the waters of Southeastern Sulu Sea.

In 1969, Mr. Ignacio Balmes, a fisherman from barrio Santa Clara, Batangas City, conducted fishing surveys in the adjacent waters of Batangas Bay. He caught spiny dogfish sharks with the use of set bottom longline gear. Later, he extended his fishing operations to the waters of Southeastern Mindoro, Northern Marinduque Island, Tablas and Romblon Islands. All these areas yielded spiny dogfish sharks.

From that time on, many interested fishermen from different parts of the country have been visiting the Bureau of Fisheries and Aquatic Resources to inquire about methods of catching sharks and extracting liver oil from them.

Some of these fishermen informed the author of the results of their individual fishing activities. Mr. Alfredo Bascon who made fishing surveys in Illana Bay, south of Mindanao Island, reported that he caught big species of sharks weighing from seven to 20 kg each. Mr. Ding Cabrera who operated in Dingalan Bay, east of Luzon, reported that he was able to catch spiny dogfish sharks weighing 31 kg. On the other hand, Councilor Madlangbayan of Mabini, Batangas, who operated in Panay Gulf, southeast of Negros Island, reported that bigger species of spiny dogfish sharks were caught by his fishermen in deeper water areas off Panay Gulf.

The report of Councilor Madlangbayan was corroborated by the report of Mr. Napugan that in the deeper coastal areas of Panay Gulf, the later was able to catch spiny dogfish sharks averaging from five to 15 kilos per fish at a depth ranging from 100 to 500 fathoms. From Japan, there are reliable reports that Taiwanese fishermen are catching spiny dogfish sharks weighing 30 kilos per fish. On the contrary, the author, during his frequent visits to Batangas coastal areas, observed that majority of the spiny dogfish sharks caught ranges from four to six kilos per fish.

The existence of spiny dogfish sharks in eastern Luzon, Visayas and southern Mindanao (Fig. 3) is an indication that the resource is widely distributed at variable depths in the muddy seabed areas of the Philippines.

#### *The Spiny Dogfish Shark Species:*

The dogfish shark species belongs to Class *Elasmobranchii*, Suborder *Squalidei* (sharks without anal fin), Family *Squalidae* (dog-

fishes).

In April, 1975, two spiny shark specimens (Fig. 3) were collected by the author from Batangas and were identified by Mrs. Salud Ganaden, BFAR ichthyologist. One of the specimens was a female shark identified as *Atractophorus* sp. and the other was a male shark identified as *Squalus acanthias*. Each of the two specimens displayed different external morphological features of the body, size, shape of pectoral and caudal fins and scale complexion of the dorsal and ventral sides of the fish.

The *Atractophorus* sp. has almost a uniform grayish black color of the dorsal and ventral sides, the inner edge of the pectoral fin is elongated, the outer not extended. The upper caudal lobe is noticeably notched near its tip and the lower one is weakly defined. The specimen measured 630 mm in full length. When the fish was dissected by Mrs. Rizalina M. Legasto, BFAR Senior Fishery Biologist, two baby sharks were found inside the body cavity. The stomach was empty. However, traces of mud-like sediments could be seen by the naked eye.

On the other hand, the *Squalus acanthias* specimen has translucent dorsal and lateral sides and whitish ventral side particularly in the stomach. The body is elongated. The inner corner of the pectoral fin is rounded and the inner margin is weakly concave. The upper and lower caudal lobes are strongly defined. The specimen measured 710 mm in full length. It was also dissected by Mrs. Legasto and the result showed that only a muddy substance was present in the stomach. This indicated that the fish were looking for bait fishes when they were caught by the gear.

The common identifications of the two species are the conspicuous spines before the first and second dorsal fins and the absence of the anal fin. Generally, all sharks belonging to *Family Squalidae* and *Family Dalatidae* have no anal fins. The study showed that only these two species yielded squalene oil, although many of them are known the world over. Thus, when a fisherman happens to catch sharks without anal fin, he's sure of the money he'll be able to get from the squalene oil that could be extracted from them.

#### *The Dogfish Liver:*

The spiny dogfish shark liver (Fig. 4) is the most important and valuable part of the fish because it contains the very expensive oil. The liver, in its fresh state, is whitish ivory in color. It is

large, elongated and occupies a large portion of the abdominal cavity of the fish. The size is about one fourth of the body of the fish.

Toyoda Tsushu, Kaisha, Ltd., Japan, in a letter sent to the author dated August, 1967, (Appendix 1), stated that the weight of the liver of spiny dogfish shark is 25% of the total weight of the fish. It also stated that the amount of squalene oil that can be extracted from the liver is within the range of 80 to 85 percent of the oil produced.

For example, if the dogfish shark weighs 30 kg the weight of the liver will be 7.15 kg. The quantity by weight of squalene oil that can be extracted will be within the range of 6 to 6.38 kg or an average of 6.19 kg.

#### *The Squalene Oil:*

On March 1, 1968, the author submitted to Toyoda Tsushu Kaisha, Ltd., Manila, two bottles of oil samples each containing 350 cc. of spiny dogfish shark liver oil for chemical laboratory analysis in Japan. The samples had two different colors. One sample was white-greenish and the other was brown. The white-greenish sample was a week-old extract while the brown sample was about nine weeks old before the samples were air-freighted to Japan.

The laboratory analysis revealed the following findings:

	<i>White-greenish sample</i>	<i>Brown sample</i>
Saponification value	22.1	22.1
Iodine value	34.2	34.2
Acid value	0.22	0.64

The values obtained from the samples (letter of Toyoda Tsushu Kaisha, Ltd., Appendix 2) indicated that the quality of the two different colored samples were not affected by the passage of time. It was further confirmed that the quality of squalene oil was acceptable in accordance with Japanese quality requirements.

The oil is characterized by its unpleasant and viscous odor. It has high lubricating quality so that it will not freeze in temperate climate or at very low temperature.

#### *Utilization and Economic Value of Dogfish Sharks:*

Shark liver oil is widely used by industrial companies engaged in the production of high grade cosmetics such as pomades, creams,

hair oil, and perfume. It is also useful as a lubricant for watches and other expensive instruments.

The liver oil of some dogfish sharks is very popular among natives of South Africa for its medicinal value and commands an exceedingly high price. The meat maybe delicate and of good flavor but South Africans use it only for making fish-meal.

In Taiwan (Formosa), the meat (Fig. 5) is filleted by the fishermen, then soaked in brine solution before drying. The dried meat is grilled before eating. In Spain, the meat is also a good delicacy because it is tasty and odorless.

In the Philippines, the meat is also eaten after slight drying and grilling. The fresh meat is also mixed with locally available spices to make it more palatable. It is also a good mixing material for making fish sausage and fish balls for soup. The meat may also be preserved with relish or spices and canned afterwards. Dogfish shark fishermen in Batangas claim that after extracting the liver oil, the liver is dried and when burned, the smoke maybe used as insect repellent for fruit bearing plants.

#### *Outlook of the Spiny Dogfish Shark Fishery*

Spiny dogfish shark fishing has become a dollar-earning industry in the country. There is a considerable and continuing demand for squalene oil in the foreign market.

In addition, the fishery is still at its infant stage and the government is encouraging fishermen to go into spiny dogfish fishing because this species has a very wide and abundant distribution in the marine waters of the Philippines.

To utilize wisely this untapped resource, a program for scientific exploitation and development should be initiated by the Bureau of Fisheries and Aquatic Resources so that proper regulatory measures can be adapted for conservation purposes.

The program may be a joint project of some of the bureau's divisions, two of which are the Fisheries Research Division and the Technological Services Division. The objectives may be enumerated as follows:

1. To locate the fish habitat with the aid of acoustic sounding equipment and to make a fishing chart of the exploited areas such as depth of the water, bottom topography, type of seabed, etc.

2. To construct bottom longline gear in two sets. One set with 100 books will be used for Test Fishing or sampling fishing in the area to be exploited. The other set with 1,000 hooks will be used only for determining the commercial feasibility of the fishing ground after the test fishing gear has attained successful sampling operation.

3. To identify the number of dogfish shark species that make up the fishery on the basis of their external morphological features and other biological studies such as maturity and sex determination, size and weight comparison, feeding habits and stomach contents composition, and assessment of the resource, etc.

4. To determine the quality of the liver oil content of each species for appropriate grading of the oil for export. Under this objective, the improvement of the utilization of the other parts of the fish for human consumption and for making fish meal products will be undertaken.

5. To formulate policies for appropriate development and conservation of the fishery on the basis of the assessments and conclusions derived from biological studies of the resource.

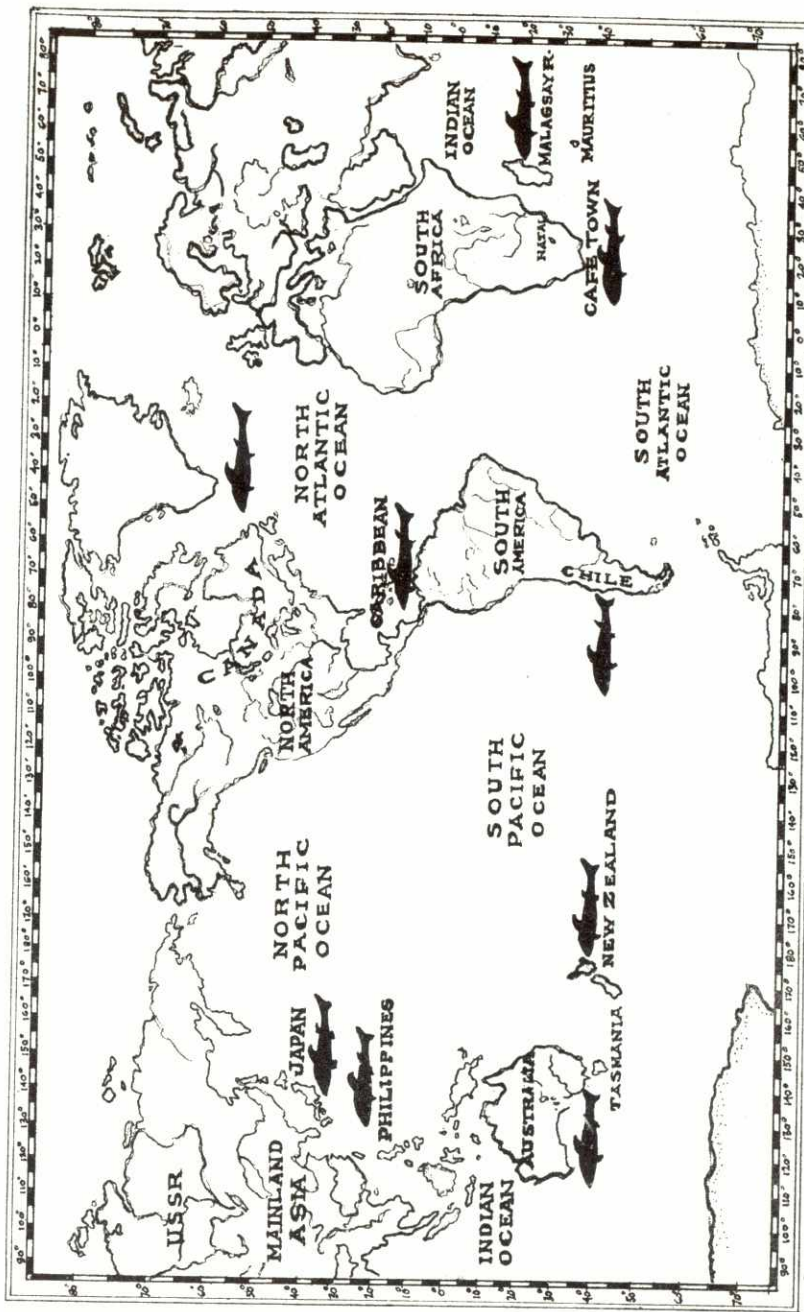
#### ACKNOWLEDGMENT

The author is deeply indebted to Dr. T. Abe of Tokai Regional Fisheries Research Laboratory, Tokyo, Japan, for introducing him to Toyoda Tsushu Company, Ltd., which was perhaps the first Japanese company to take interest in spiny dogfish fishing in the Philippines and for handling the laboratory analysis of the shark liver oil samples submitted. The author also wishes to express his sincere gratitude to the following: Mr. Conrado S. Napugan of San Joaquin, Iloilo, for his great interest in conducting the first spiny dogfish shark fishing in 1967; Mr. Ignacio Balmes of Sta. Clara, Batangas, for supplying the necessary information of dogfish shark fishing in the Batangas area; Mrs. Salud Ganaden, for her kind assistance in identifying the dogfish shark specimens; Mrs. Rizalina M. Legasto for dissecting the fish and verifying the stomach content, Councilor Madlangbayan of Mabini, Batangas, for supplying the author with valuable information for the article, and Messrs. Alfredo Bascon of Cebu, Ding Cabrera and Jimmy Ang of Manila.

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- Letter of Toyoda Tsushu Kaisha, Ltd., Tokyo, Japan to the author dated August 19, 1967 and March 14, 1968 attached in this paper.
- Field trips and observations of the author.
- Field reports of fishermen.

Figure 1. Global distribution of spiny dogfish shark (Family Squalidae).



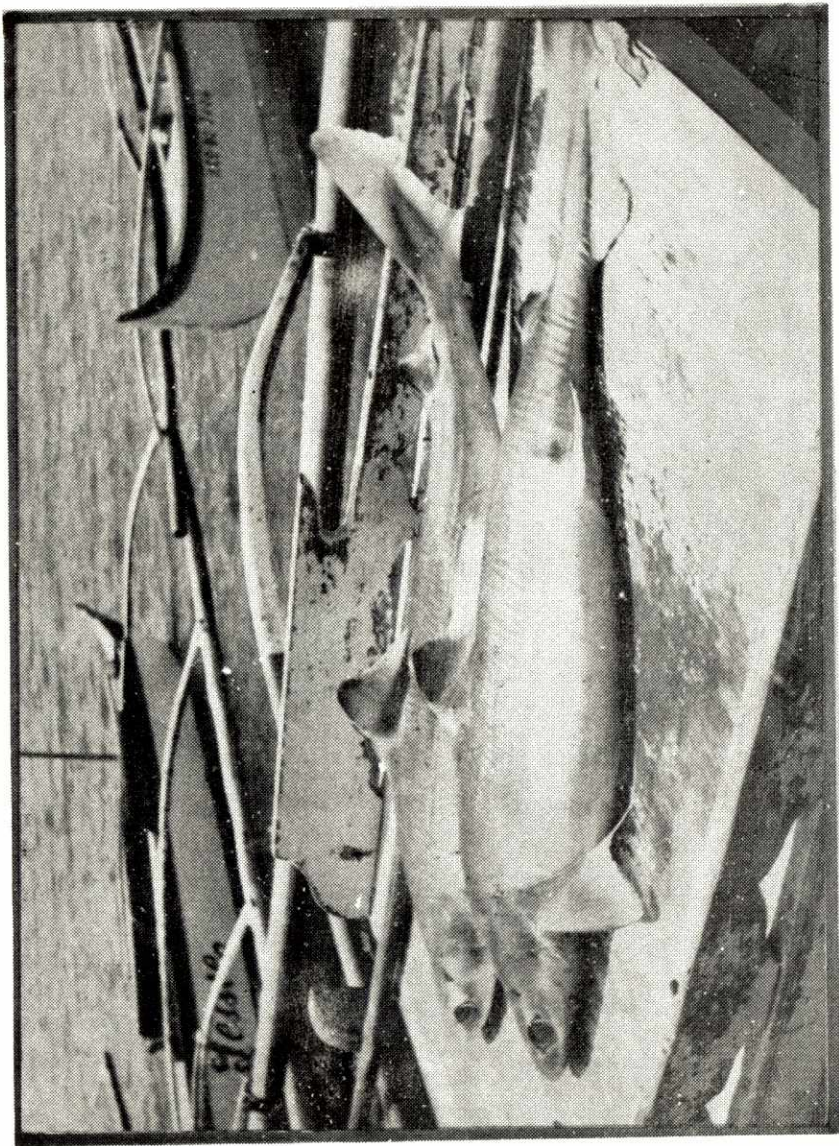


Figure 2. This shows the two specimens of spiny dogfish sharks collected by the author in Batangas.

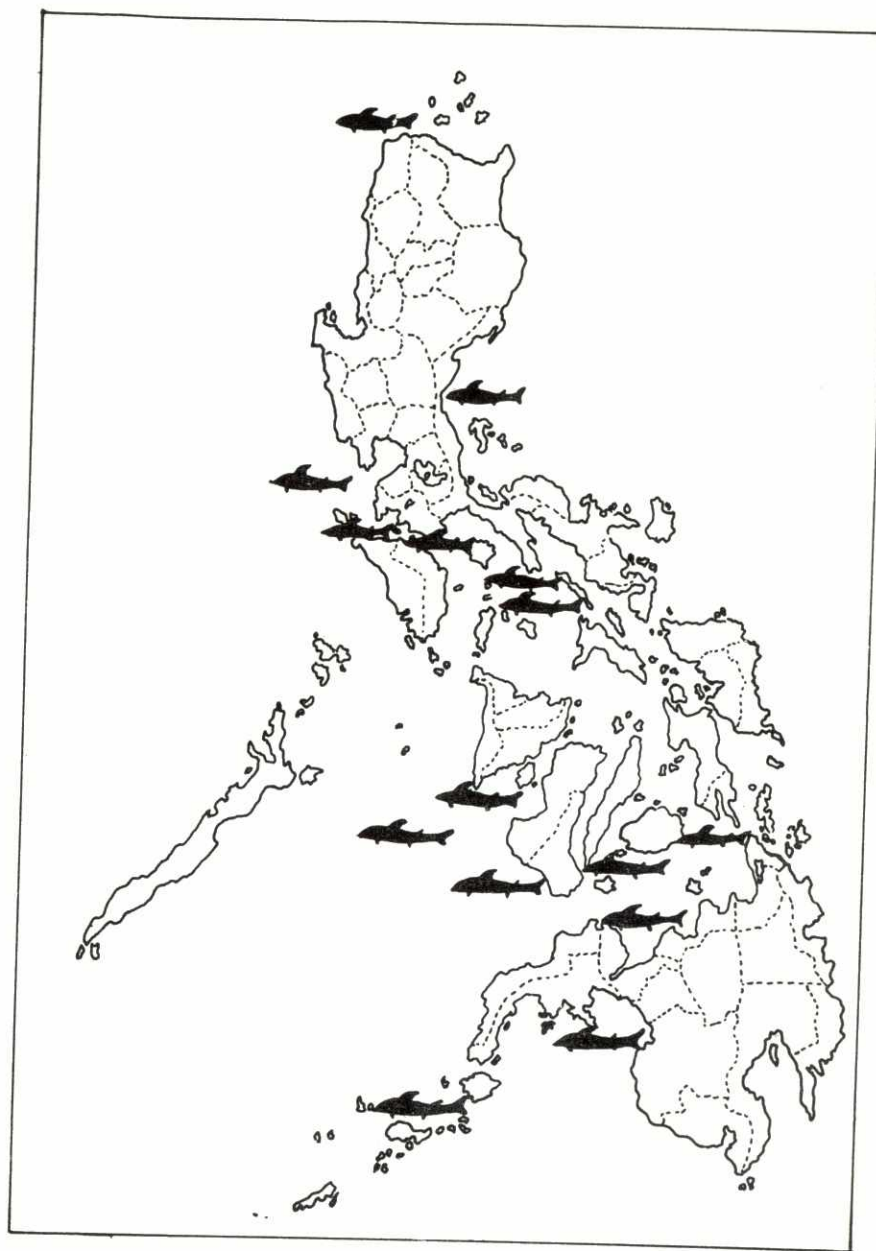


Figure 3. Distribution of spiny dogfish shark (Family Squalidae) in the Philippines.





Figure 4. The liver of the spiny dogfish shark just removed from the body cavity.

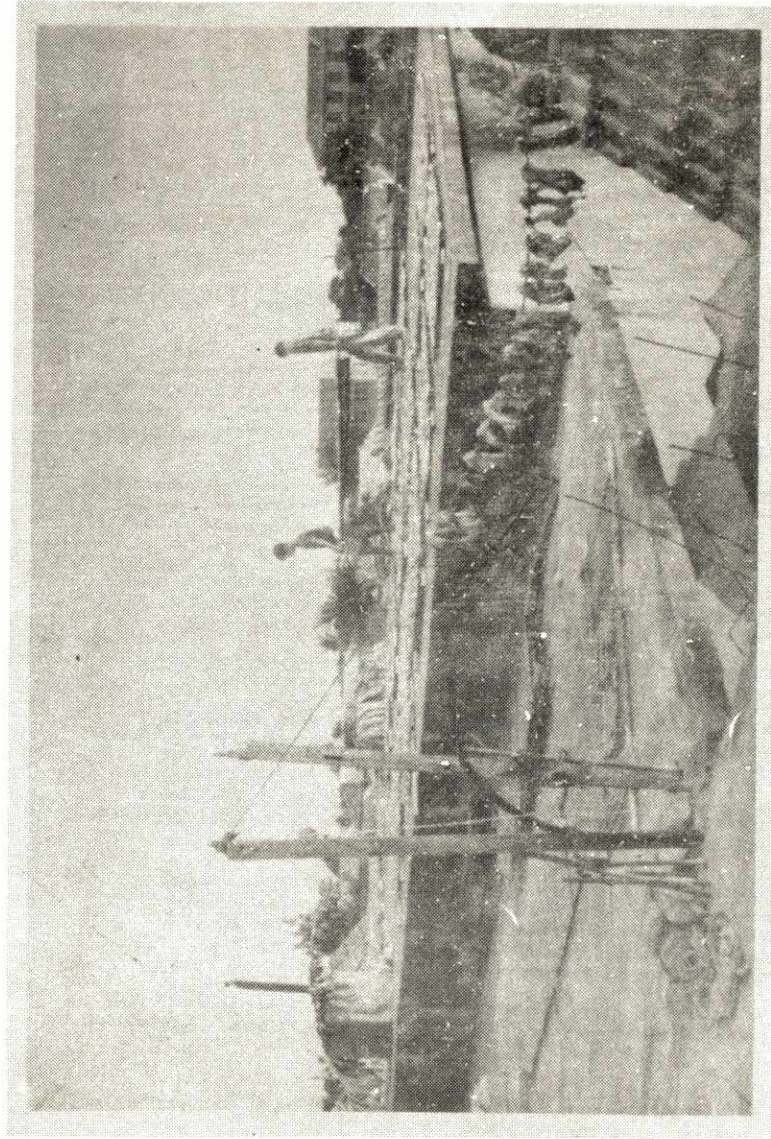


Figure 5. Filleted meat of spiny dogfish sharks being dried by two fishermen.