

A NIGHT HANDLINE FISHERY FOR TUNAS

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An unusual fishery exists in the city of Hilo, Hawaii (population 28.5 thousand). This is the night handline fishery for tunas. As far as I know, the Philippines is the only other place that has a similar fishery (Erling Oswald, South China Sea Fisheries Development and Coordinating Programme, Makati, Rizal, Philippines, pers. commun.). The gear used in the fishery is simple and effective. For that reason this is a type of fishery that would be practical for areas where highly mechanized and expensive methods of fishing are out of reach.

HISTORY

The following account of the origins of the fishery are from interviews of oldtimers in the fishing community of Hilo as written references were not found.

Immigrants from Okinawa are believed to have started the fishery. They went out at night to catch squid as they had done in Okinawa. Occasionally some mysterious denizen of the deep would strike. Upon checking with the native Hawaiians they learned that the strikes were probably made by large tuna. They subsequently equipped themselves with gear to catch the tuna.

The exact year when the fishery started is not known. According to United Japanese Society of Hawaii (1971), the first Okinawans arrived in Hawaii in 1899 to work in the then burgeoning sugar industry. It took another 7 or 8 years, however, for their immigration to reach large numbers. By 1911, 12,000 were living in

Hawaii. Allowing for time to fulfill their contracts with the sugar plantations, I would guess that the fishery for squid started in the second decade of the 1900's.

In the early years of the fishery the boats were powered by sail. In the 1930's up to about 40 motorized boats were involved in the fishery. Until World War II the fishery was primarily for squid. The tunas caught by squid fishermen were known as ika-sibi (squid-tuna in Japanese). The ika-sibi, the name by which the fishery is still called locally, had a reputation for its poor quality as a result of being towed alongside the boat on the way to port. The squid did not require ice and the boats were too small to have the large fish on board. Consequently, these tunas could not compete on the market with the tunas caught on longlines.

The squid fishery stopped abruptly on December 7, 1941, with the Japanese attack on Pearl Harbor. Maritime restrictions prevented boats from fishing at night throughout the duration of World War II.

From the end of the war until 1971, 3-4 boats fished at night for tuna. These boats were equipped with iceboxes to keep the fish in good condition. The fish caught were almost all bigeye tuna, Thunnus obesus. The fishery was limited to these few boats by the market for fresh tuna. The entire catch was sold on the Island of Hawaii, which had a population of 55,000 to 63,000 during that period. By 1971 fresh tuna prices had increased enough to make air shipment of tunas to other markets economical. Since then the night handline fishing fleet has grown to about 30 boats about half of which are part-timers.

GENERAL DESCRIPTION OF FISHERY

The fishing area is located 15-20 miles (24-32 km) northeast of the port city of Hilo and covers about 50 square miles (129 km²) (Fig. 1). It is just beyond a marked change in the slope of the bottom. The edge of the shelf appears to be about 365 m deep.

Fig. 1

The boats leave port between 4 and 5 p.m. to get to the grounds at sundown. Upon arrival there the engine is turned off and a parachute is attached to the bow and lowered into the water. Two over the surface lights and one underwater light are turned on. Some boats use just the above surface lights and some use just the underwater light but most of them use both types. Typically 25-W and 50-W incandescent bulbs are used for the above surface and underwater lights, respectively. Some fishermen use slightly brighter lights on moonlit nights.

The first fishing operation is to catch the squid, Notodarus hawaiiensis, for bait. Cross-sections of mackerel scad, Decapterus pinnulatus, roughly an inch wide, are used as chum. Squid are caught by angling and gaffing. The hooks are baited with mackerel scad. This is done by cutting off the tail so that the body of the scad is the proper length to fit on the shank of the hook. The shank of the hook is pushed through the length of the fish starting with the cut end and ending at the mouth. A light line attached to the proximal tip of the shank is wound around the fish to keep it from falling apart. This makes it possible to use the same piece of bait repeatedly despite the squid bites that are inflicted upon it. The baited hook is tossed out

about 5 m and slowly pulled back to the boat. In this manner the hook is used not only to hook squid but also to lure the school of squid to within gaffing range of the boat.

A few fishermen prefer to gaff the squid exclusively. In this case a whole scad is hooked through the head with a fish hook. It is tossed out and slowly pulled back to the boat in the same manner applied to the squid hook.

Fishing for tuna begins after 5-10 squid have been caught. A squid is placed on the hook and lowered 20-30 m. The fishing line is tied to the boat with a restraining line to keep the hook at the desired depth. The restraining line is fairly heavy, about 100-lb (45 kg) breaking strength, because it is intended to set the hook when the fish strikes. Three well separated hooks are fished: one at the bow, one amidship, and one at the stern. Some boats fish a hook at each corner of the stern and one amidship. It seems that none of the boats fish more than three hooks at a time. While waiting for the tuna to strike the fishermen continue to fish for squid.

When a tuna strikes it is allowed to run a short while until the outgoing line is slow enough to grab. It is then pulled by hand to the boat. At this point the fishermen differ in their technique; some stun the fish and then gaff the fish; others gaff the fish and then stun the fish after it is on board. Fish are stunned with a blow on the head with a baseball bat or a wooden mallet.

When there is a strike at least one of the other two lines is removed from the water as soon as possible. The reason given for this action is that it reduces the possibility of the lines tangling. Tuna strikes tend to come in clusters and while it is possible to keep two lines with struggling fish from tangling it is almost impossible to keep three lines from tangling. The fishermen claim that tuna schools move away when the lines get tangled.

The fish are stored in iceboxes with a mixture of ice and seawater. Often the catch exceeds the icebox capacity. Excess fish are left on deck and covered with canvas or burlap. Seawater is poured on the covered fish periodically. Departure from the fishing ground is around 5 a.m. so that the fish can be delivered in time for the 7 a.m. auction.

GEAR

Two sets of gear are used. One set is for catching squid and the other for catching tuna. There is much individual variation in the choice of materials and design of the gear. The following description is of gear that seems to be in use by most.

Fig. 2

Jigs and gaffs are used to catch squid. A typical jig (Fig. 2) has a shank 25 cm long and 8 prongs each of which is 5 cm long. Variation in the jigs occur in the number of prongs, which maybe 6-10, and in the linear dimensions, which vary about 10%. The head of the gaff (Fig. 3) is similar to the jig's with slightly longer prongs (7 cm).

Fig. 3

The handle is a straight piece of bamboo a meter long and 2 cm in diameter at the larger end.

Fig. 4 The tuna fishing gear (Fig. 4) consists of a hook, a leader,
 Fig. 5 a lead weight, and a line. The hook (Fig. 5) is of a Japanese design
 Footnote 1 (Tonkichi BKM #54)^{1/}. The leader is 7-strand stainless, 500#1b (227-kg)
 test, wire. The leader length preferred by most is about 1 m but
 leaders 0.6-1.8 m are used. The weight (Fig. 5) is a lead tube of 8-14
 oz (227-397 g). The tube is bent at the middle about 30° to keep it
 from rolling around on the boat. A stainless steel rod is placed
 through the tube and its ends are fashioned into eyes to facilitate
 the attachment of line and leader. The favorite material for the line
 is polypropylene rope either 3/8 in. (0.95 cm) or 5/16 in. (0.79 cm)
 in diameter. Lengths of the line range from 110 to 130 m. The fishing
 gear is coiled and kept in a square wooden box for easy handling.

Other equipment used by all boats are a parachute, lights, and a baseball bat. The parachute is 7.2 m in diameter and equipment surplus by the military. The lights, used for attracting squid, are of two types: above surface and underwater. Above surface lights are 25-W incandescent bulbs with polished metal reflectors. Usually two of these are used. The underwater light, usually one, is a 50-W incandescent bulb that has been waterproofed and weighted. Brighter bulbs are sometimes used for moonlit nights. The baseball bat is used for stunning fish.

^{1/} Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

A wide assortment of boats is used in this fishery. These range from 20-ft. (6-m) fiberglass skiffs to a 60-ft (18 m) boat that fishes longlines during the off season.

THE CATCH

The fishery catches bigeye tuna, Thunnus obesus, and yellowfin tuna, T. albacares, primarily. Albacore, T. alalunga, is a third tuna species that is commonly caught. The contribution of these species to the catch in weight and in value for the years 1973, 1974, and 1975 are listed in Table 1. The catch has increased from 89.1 metric tons to 154.6 metric tons during these years. The dollar value of the catch has increased at a slightly faster rate, from 141.1-327.5 thousand dollars.

Table 1

Although the total tuna catch exhibited a continuous growth for the 3 years, the catches of the individual species fluctuated tremendously between years. In 1974 the bigeye tuna catch was almost twice as much as the other 2 years; in 1975 the yellowfin tuna catch was more than thrice the amount of the previous 2 years; and the albacore catch in 1975 increased by fiftyfold.

PROBLEMS

Some of the fishermen were asked what they thought was the biggest problem in the fishery. They unanimously expressed the need for a larger market. They felt that they would receive a better price for their catch with a larger market. (The average price for all tunas in 1975 was \$2.13 per kg.)

A problem that was observed to be common was an unsatisfactory flesh condition in which the normally deep red, translucent muscle tissue appears pink and opaque. In the trade this condition is called "burn." Scientists from the National Marine Fisheries Service have recently concluded that this condition is caused by inadequate chilling of the catch. Fish with "burn" sell for a fifth to a third of the normal price depending on the degree of burn.

DISCUSSION

The wide fluctuations in the catch of individual species portends an instability of the fishery. So far, however, a decrease in one species has been compensated for by an increase in another. Perhaps it is a natural state that a correlation exists among the availability of these species. Continued observation of this fishery is recommended to see if this is so.

The constant location of the fishery suggests that some environmental feature or a set of environmental features exist which concentrates the fish. It would be interesting, and possibly profitable, to study the oceanographic characteristics of the area of the fishery and to look for other areas with similar characteristics.

LITERATURE CITED

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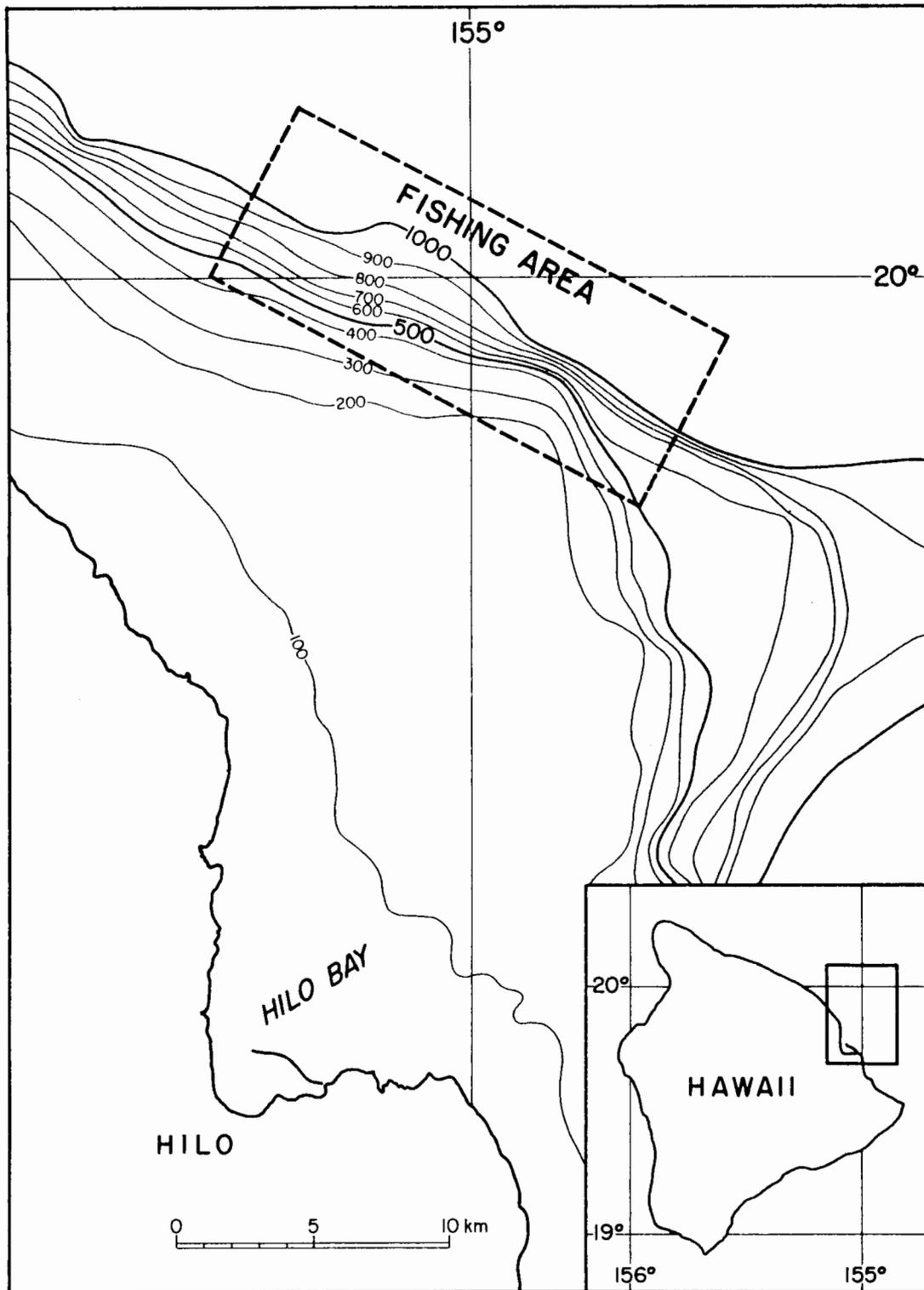


Figure 1.--Location of night handline fishery for tunas.

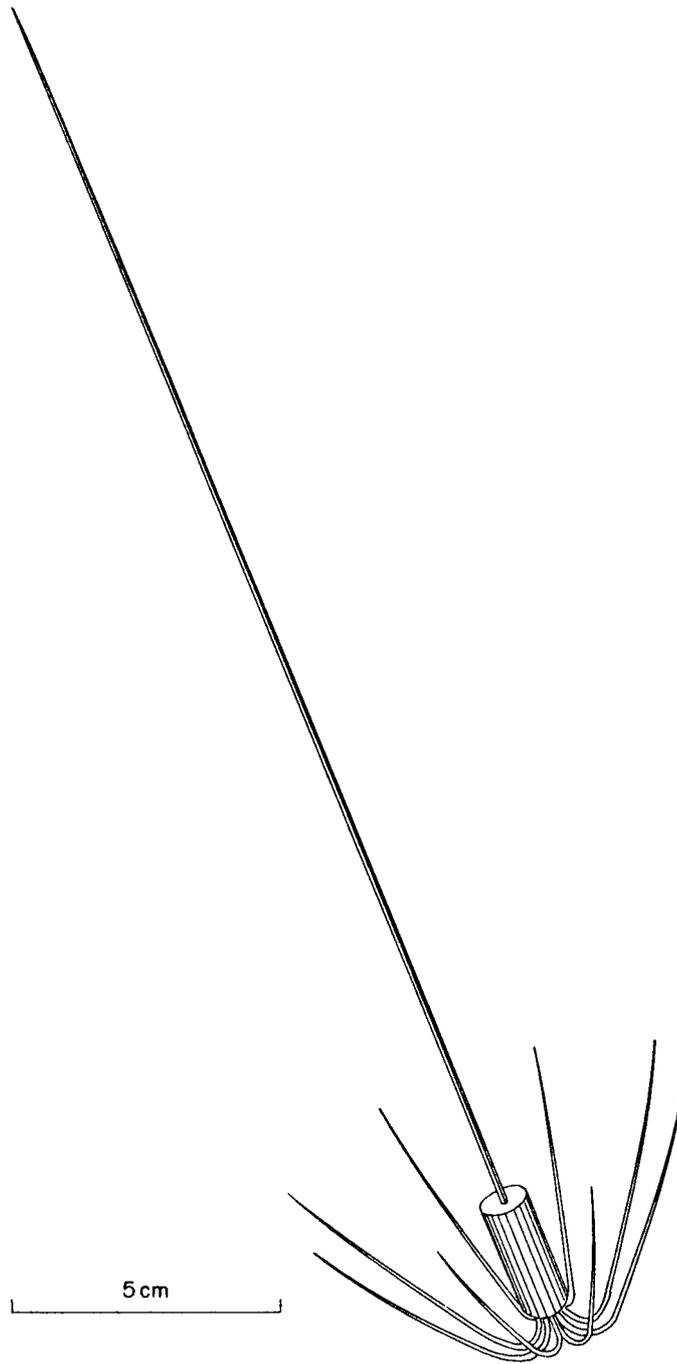


Figure 2.--Drawing of hook for catching squid.

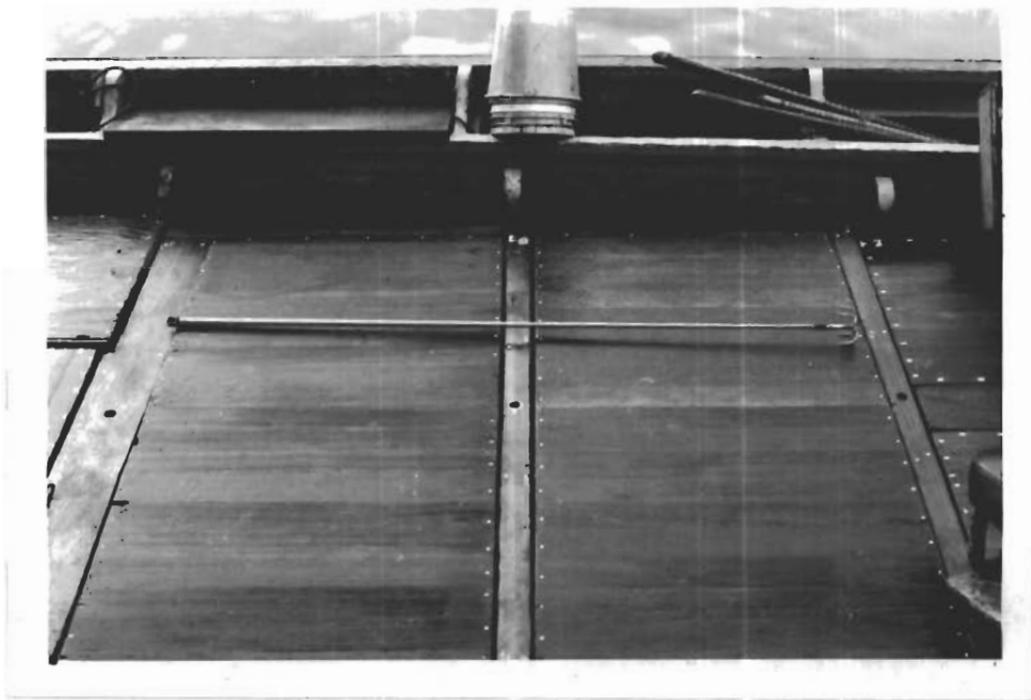


Figure 3.--Photograph of a squid gaff.

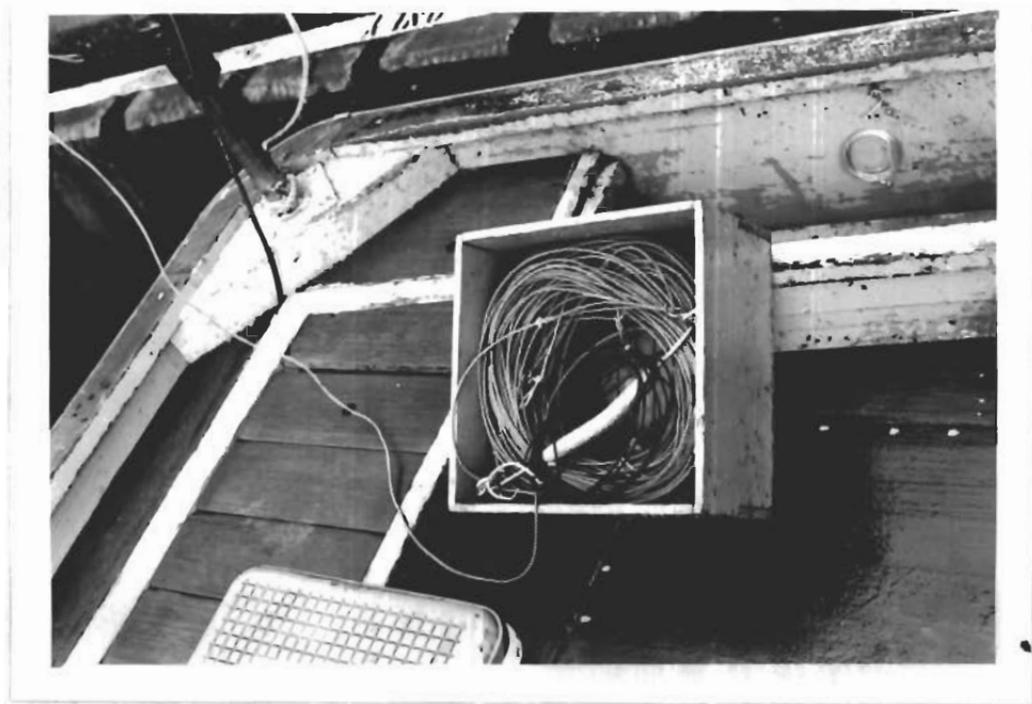


Figure 4.--Photograph of handline gear for fishing tuna.

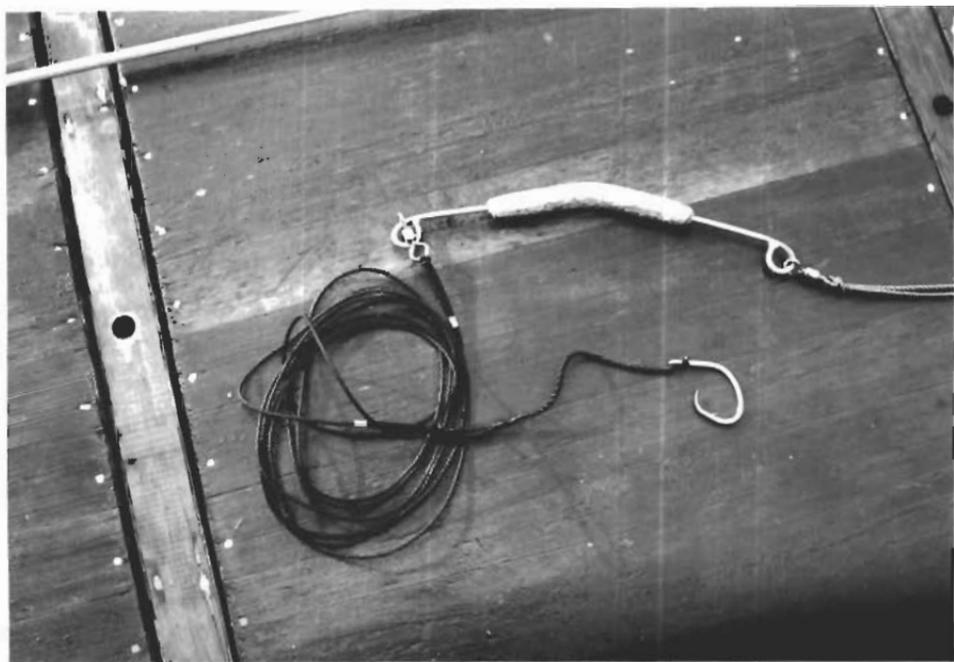


Figure 5.--Close-up of weight, leader, and hook.

Table 1.--Weight and value of tuna catch of night handline fishery.

	Weight metric tons			Value US\$ (thousands)		
	1973	1974	1975	1973	1974	1975
Bigeye	65.4	120.2	63.1	102.6	249.8	149.5
Yellowfin	23.3	22.9	75.5	38.0	38.4	157.0
Albacore	0.4	0.2	16.1	0.5	0.2	21.0
All tunas	89.1	143.2	154.6	141.1	288.2	327.5