

APPENDIX 7

Exploratory Longline Fishing & Training
Programme.

TECHNICAL CO-OPERATION ATN/SF - 2474 - BA

INSTITUTIONAL STRENGTHENING OF
FISHERIES DIVISION OF
MINISTRY OF AGRICULTURE, FOOD AND FISHERIES
BARBADOS

EXPLORATORY LONGLINE FISHING
AND TRAINING PROGRAMME

SEPTEMBER 1988 TO JANUARY 1989

PREPARED BY L D M HARRISON

TFP 261

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25 MILES OF LONGLINE

EXPLORATORY LONGLINE INITIAL/PRELIMINARY FISHING AND TRAINING PROGRAMME

1 INTRODUCTION

One of the main tasks of the fishing gear technologist is defined as follows:

Task No 1

"Design and implement a comprehensive, experimental and developmental fishing programme utilising a variety of fishing gear and operational techniques aimed at improving the efficiency of the fleet as a whole and to maximise the use of the available resource."

One of the important areas to examine was that of the swordfish fishery which has been arousing considerable interest amongst the fishing communities in the region. Some progress had been made in this direction by utilising equipment fabricated locally and operated from the Fisheries Division in-shore boat during the early part of 1988. However, a more extensive off-shore investigation was required and plans were made to charter a suitable boat during the early summer of 1988. Due to budgetary and administrative delays the charter was not finalised until September but then a short programme of exploratory fishing was undertaken. The main aims of the programme were to investigate the surface longline fishery for swordfish, to examine off-shore fishing areas, to train the Fisheries Division counterpart officers, to train local fishermen, to provide specimens and related data to the Marine Biologist and to provide material of known origin for the fish processing expert.

This Report presents the results of the programme and some initial discussion.

2 CHARTERED VESSEL

The vessel chartered was the MFV Taygits which is a 40 foot fibre glass vessel constructed in the USA. She has a beam of 14 feet with a below decks insulated fish room of 9 cubic metres and there is a working deck space of approximately 20 x 14 feet. The vessel is equipped with RDF, SSB, CB and VHF radio equipment but, it was necessary to fit a video echo sounder and a satellite navigator in the wheelhouse.

The project also installed some additional deck equipment including a "steeler" nine mile main line winch, two gangion spoolers, a Hi-flyer rack, a buoy pound and a sun awning. The photographs in Appendix I to this Report give clear illustrations of the vessel and her equipment.

3 WORK PROGRAMME

The original objectives of the exploratory fishing programme were to establish whether a viable commercial longline swordfish fishery existed within the EEZ (Exclusive Economic Zone) of Barbados, to investigate the seasonality of the fishery and to locate areas of maximum concentration.

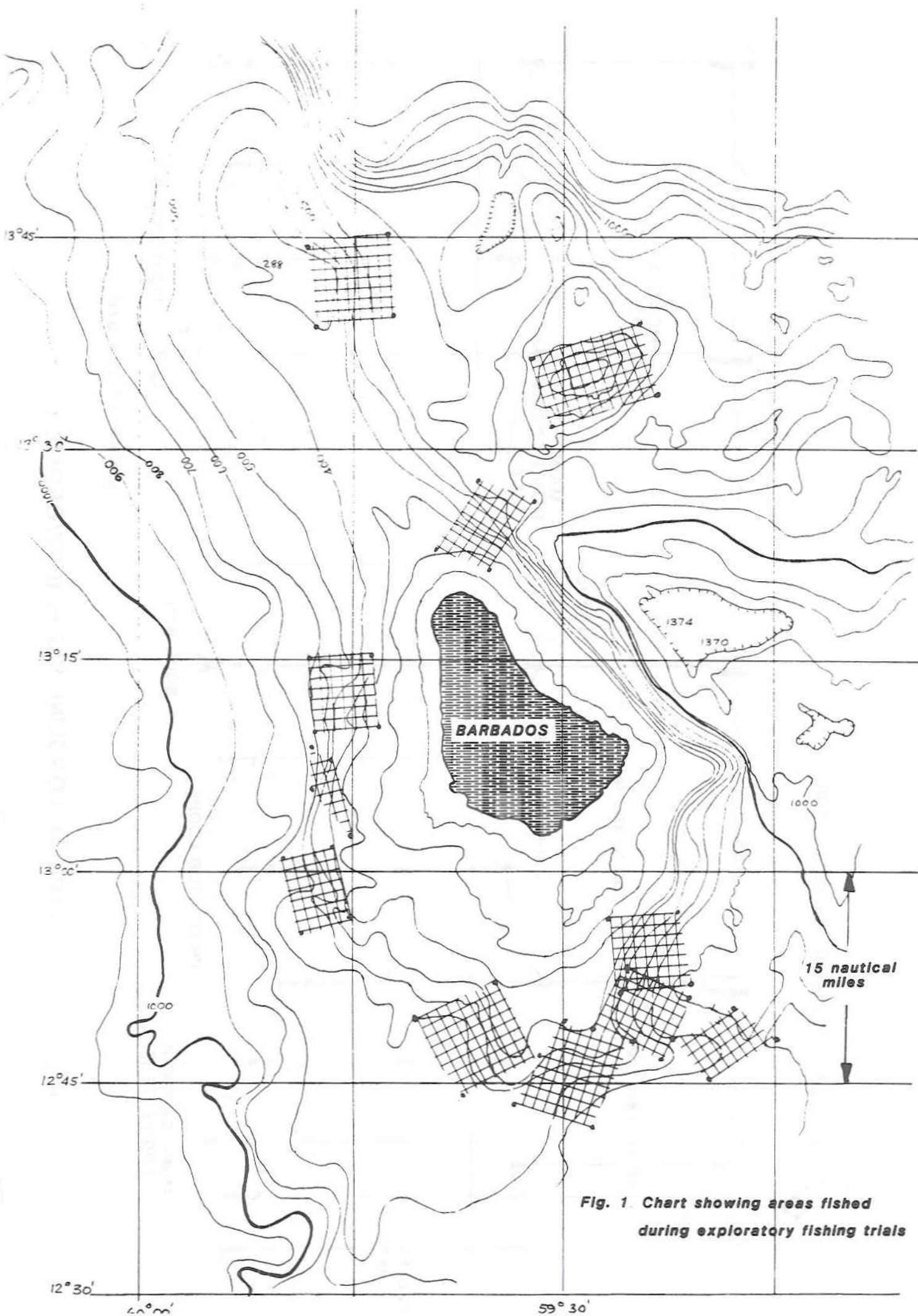
The original programme was planned to start in January 1988 and run for one year, however problems over finance and administrative delays meant that this programme had to be revised. (Reference Quarterly Report October to December 1987). The new programme involved carrying out exploratory fishing in Barbados waters from July to January, so as to include the "off-season" and to establish whether or not this form of fishing could provide a viable proposition for local vessels during the season when flying fish are absent from local waters. In addition, the intention was to train the counterparts and local fishermen with the skills and techniques of longline fishing for swordfish and other large pelagics.

Unfortunately, further delays in finalising the leasing of the vessel (Quarterly Report July to September 1988) meant that the revised programme did not commence until 20 September 1988. This meant that after fitting out the vessel with the wheelhouse and deck equipment required and resolving certain electrical problems, that the first cruise did not take place until October. In view of the limited charter time now available, it was decided to shorten the exploratory fishing component to a period of four to five weeks with the remainder of the charter period being devoted to the training component of the programme.

4 FISHING OPERATIONS

Prior to the commencement of the programme, the depth contour chart, Figure 1 was studied and based upon what was known of the habits of the swordfish; certain areas were targeted for the survey. Large pelagic fish such as swordfish, tend to congregate at the edge of the continental shelf and bank areas where the depth rapidly increases. Most of the areas identified lay within a 25 nautical mile radius of Barbados, these areas are indicated in Figure 1. The areas selected for fishing were located by using the satellite navigator in conjunction with the echo sounder. The longline consisted of a main line approximately six miles in length which was set with up to 100 hooks. Each hook was baited with frozen squid and each hook gangion line had a chemical lightstick attached five to ten feet above the hook (Figure 2). The number of hooks per mile varied between twelve and eighteen and the time taken to deploy the line was usually of the order of one and a half hours at a vessel speed of four knots. The line was deployed at about sunset and then left for a soak time of twelve hours with hauling commencing at around day-break. The hauling operation normally takes about two hours and is a virtual reversal of the setting procedure, except that the vessel travels back along the line under power. The fish are boated, cleaned and dressed, after which they are stored in ice in the fish room. The fishing depth was adjusted to fish deeper on brightly lit moonlight nights.

When fishing under water banks it is essential to utilise the current direction. For example, it is by far the best to set the line in a position along the 200 to 300 fathom depth contour where it is calculated that the current flow will cause the line to run off the bank and into deeper water. In this way, early hooked fish are less likely to be damaged by sharks living on, or around the bank.



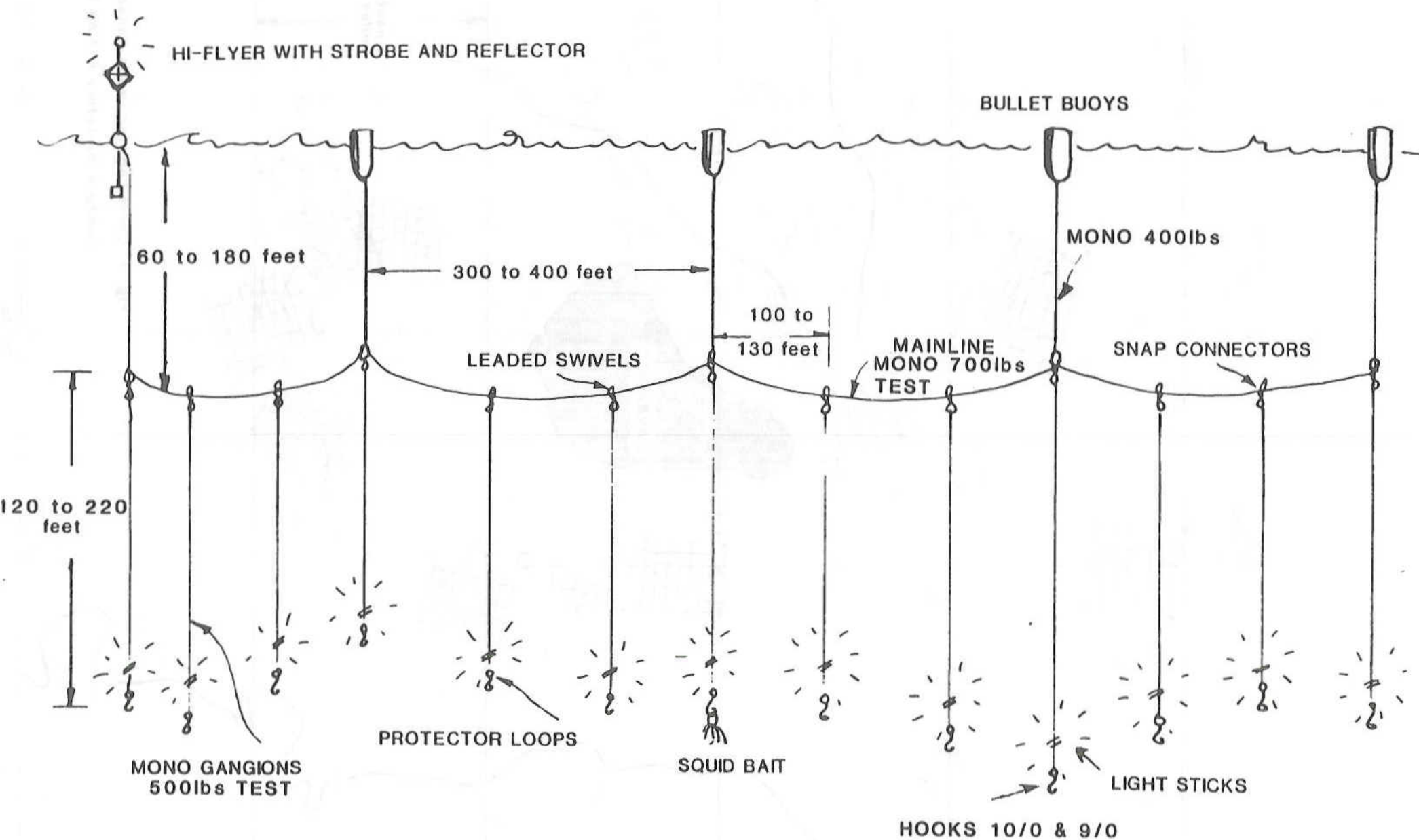
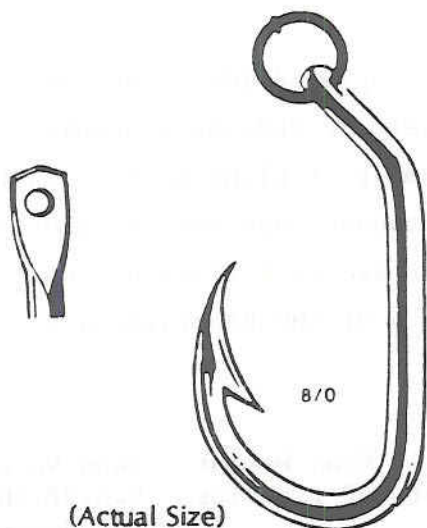


Fig. 2

TYPICAL LONGLINE RIG FOR SWORDFISH

Fig. 3

**HOOKS UTILISED DURING EXPLORATORY
LONGLINE FISHING OPERATION**



PATTERN #9202SKR

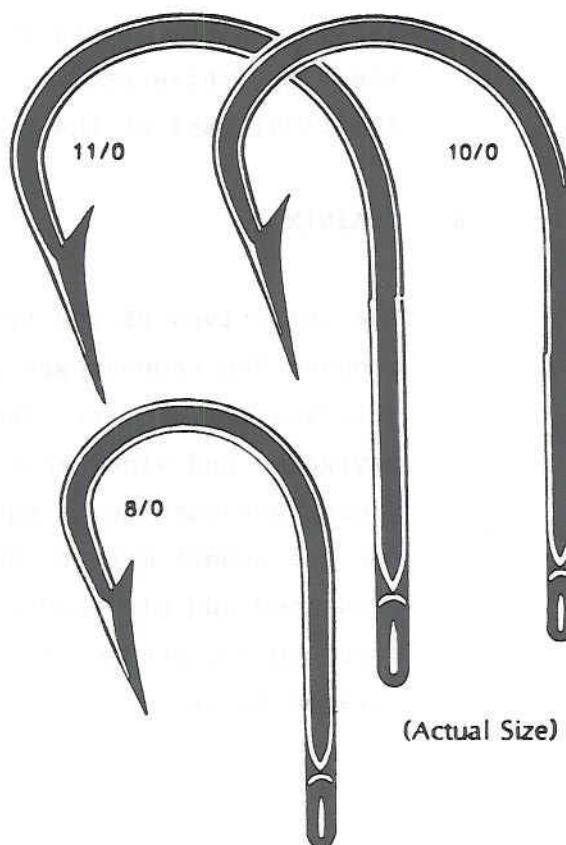
HOLLOW POINT TUNA HOOKS
FLATTED WITH HOLE IN FLAT,
WITH RING BRIGHT TINNED, POINT IS OFFSET

PATTERN NUMBER	HOOK SIZE	PER 100	PER 1000
Pattern #9202SKR	Size 8/0	\$62.73	\$565.11
Pattern #9202SKR	Size 9/0	\$64.47	\$580.81
Pattern #9202SKR	Size 10/0	\$69.35	\$624.76

PATTERN #7698B

KNIFE EDGE LONG POINT MUSTAD-SEA MATE HOOKS
FORGED, TAPERED BRAZED RING,
CADMIUM-PLATED AND TINNED, 2 EXTRA STRONG

PATTERN NUMBER	HOOK SIZE	PRICE PER 10	PRICE PER 100	PRICE PER 1000
#7698B	Size 8/0	\$10.30	\$ 92.30	\$ 831.51
#7698B	Size 9/0	\$12.18	\$109.74	\$ 988.62
#7698B	Size 10/0	\$13.65	\$123.01	\$1108.23
#7698B	Size 11/0	\$15.48	\$139.47	\$1256.52



NOTE: BOTH HOOK TYPES WERE EQUALLY EFFECTIVE

5 RESULTS

The vessel, the fishing gear and the layout proved ideal for the exploratory fishing programme. Unfortunately breakdowns and some other operational difficulties resulted in a number of planned trips being reduced from that which was originally intended. However, from October 1988 to January 1989 a total of 26 days at sea were achieved resulting in twelve sets of the longline. The results of the programme are presented in Table 1.

Number of Sets	Mean No of Hooks/Set	Mean No of Swordfish/Set	Mean Weight of fish lbs	Mean No of Swordfish/100 Hooks
12	91	2.4	52.2	3.75

The fishing operation also produced a further 1518 lbs of other species including tuna, shark and billfish. It may be worth noting that during the first three cruises which took place during October, that is during the final part of the "off season", no swordfish were caught at all.

6 TRAINING

The objectives of the training programmes were to familiarise and educate the counterpart and local fishermen with longline fishing practice and methods, the use of equipment such as the satellite navigator and video echo sounder, the location of fishing areas by using charts and wheelhouse equipment and how to dress and preserve the catch for the export market. The approach to the training was for the master fishermen and his counterpart to select two trainee fishermen for each trip who would then receive "hands on" training with longlining and related tasks.

TABLE 1
CATCH DATA FOR OCTOBER TO DECEMBER 1988

DATE	POSITION	NO OF HOOKS	DEPTH FISHED	CATCH				MOON PHASE	REMARKS
				SWORDFISH	TUNA	SHARK	BILLFISH		
11 Oct 88 12 Oct 88	LAT 12°52'N LONG 59°36'W	94	<u>FATHOM'S</u> 30 to 40			(1) 100 lbs		New Moon 10th Oct	Sea state 1.5 to 2.0m swell. wind 25 to 35 kph SE cloudy to overcast. Tide 1k SE.
20 Oct 88 21 Oct 88	12°42'N 59°22'W	94	30 to 60		(1) Yellow Fin 65 lbs	(1) 35 lbs		First 1/4 18th Oct	Sea calm to moderate. Sky clear. Tide SE 1/2 knot.
24 Oct 88 25 Oct 88	12°52'W 59°35'W	96	40 to 70				(1) Sailfish 65 lbs	Full Moon	Sea calm to moderate Sky clear. Tide Nil.
25 Oct 88 26 Oct 88	13°37'N 59°33'W	96	40 to 70	(4) 20 lbs 30 lbs 100 lbs 120 lbs	(2) 19 lbs 19 lbs	(1) 35 lbs		Full Moon	Sea calm to moderate Sky clear. Tide NW. 1/2 knot.
1 Nov 88 2 Nov 88	13°27'N 59°32'W	97	40 to 70	(6) 56 lbs 48 lbs 21 lbs 21 lbs 19 lbs 14 lbs		(1) 160 lbs		Last 1/4	Sea moderate. light wind. Tide NW 1/2 knot.
2 Nov 88 3 Nov 88	13°04'N 59°47'W	84	40 to 70	(2) 100 lbs 220 lbs		(2) 100 lbs 100 lbs		Last 1/4	Sea moderate to light showers. Tide NW 1 knot.
8 Nov 88 9 Nov 88	13°03'N 59°42'W	95	30 to 60	One Hook Bitten Off. One fish "Fell Off" Dead Before Boating.				New Moon 9th Nov	Sea calm. This trip was used to make a video film of the longline operation.

COMMENCEMENT OF TRAINING PROGRAMME

DATE	POSITION	NO OF HOOKS	DEPTH FISHED	CATCH				MOON PHASE	REMARKS
				SWORDFISH	TUNA	SHARK	BILLFISH		
15 Nov 88	12°52'N	72	40	(2) 100 lbs				First 1/4	Rough sea, overcast. rain. Wind NE 40 kph Tide North at 1/2 knot.
16 Nov 88	59°27'W		70	25 lbs					
16 Nov 88	12°55'N	72	40	(4) 100 lbs				First 1/4	Rough sea, cloudy with showers. Wind NE 35 kph. Tide NE 1 knot.
	59°43'W		70	50 lbs 20 lbs 10 lbs					
23 Nov 88	12°58'N	95	40	(4) 25 lbs	(1) Yellow	(2) 135 lbs		Full Moon	Completed second half of video film. Moderate sea. Tide NW 1 knot.
24 Nov 88	59°39'W		70	20 lbs 15 lbs 15 lbs	Fin 55 lbs	90 lbs			
8 Dec 88	Drifting 7n miles off Holetown	Gill nets for flying fish	Surface	300	Flying Fish			5 am to 4.30 pm	This trip used to video tape flying fish operations for future training courses on fish handling at sea.
13 Dec 88	12°52'N	97	40	(7) 140 lbs		(3) 100 lbs	100	First 1/4	Rough sea, early moon. Windy, NE 35 kph. Tide Nil.
14 Dec 88	59°36'W		40	100 lbs		140 lbs	F Fish		
15 Dec 88	13°00'N	107	to	30 lbs		140 lbs	3 Dolphin		
	50°49'W		70	25 lbs 30 lbs 20 lbs 20 lbs			Fish		

The training commenced at the fishing quay with a briefing inside the wheelhouse where the trainee was introduced to the video echo sounder, satellite navigator and other instruments and how these could be used in conjunction with charts for locating potential fishing areas. Training continued en route to the fishing area with the trainees monitoring the vessel's progress and actively participating in gear preparation such as rigging the Hi-flyers with the strobe lights, preparing the lightsticks, squid bait etc. Once preparations were complete the setting operations were described in detail to the trainees. On reaching the selected fishing area as dusk approached, both trainees were given particular duties and the setting operation commenced under the supervision of the master fishermen. The full six mile main line was normally set by 1800 hours. During the soak period each fisherman was allocated a watch period so as to maintain the vessel on station and was shown how to monitor the gear deployed.

On completion of the soak at daybreak the line was hauled back with the trainees first being shown and then participating in the correct procedure for hauling the gear. Once fish were boarded, the master fisherman and his counterpart instructed the trainees with the correct methods of fish preparation with an eye for the USA export market. This included such duties as the instant killing of tuna by inserting a 3mm monofilament line down the spinal cord after removal of the head, the dressing of the carcasses, the maintenance of the carcass in the round and the packing of ice into the carcasses and storing the fish covered with ice.

In addition to the formal training of fishermen, two of the cruises were used for the preparation of training material for subsequent use. The first of these involved the making of a video film of the longline operation and the second one involved a flying fish cruise, again where a video was made of the flying fish operations and more importantly, of the methods of handling the fish once caught.

7 DISCUSSIONS

The results of this brief programme have demonstrated that swordfish can be caught within Barbados waters and in the sort of numbers that are achieved by the commercial fleets operating elsewhere. During the period of the survey, two American owned longline vessels were based in Barbados and have been given permission to tranship their catches through the seaports and airports of Barbados. They were fishing outside of the Barbados fishing zone in water to the west of St Lucia but, as part of the agreement for them landing into Bridgetown, these vessels provided information on their fishing activities. The Marine Biologist from the Fisheries Division is producing a report analysing the catches of these vessels but initial results indicate that the mean fish weight is slightly less than that achieved by the survey although the number of fish per hundred hooks was somewhat higher. One of the most interesting points to emerge is that good catches were achieved during September and October when no fish at all were caught around Barbados. It is believed that one of the reasons behind this is that the waters lying to the west of St Lucia are one of the areas where swordfish are believed to congregate during the off-season.

A lot more work has to be done on the swordfish resource, particularly in view of some concerned voices which have been raised in the USA. It is certainly true that the mean fish weight has dropped quite considerably since the early 1980's when swordfishing commenced in the Caribbean and Florida regions. However, actual numbers of fish landed per given unit of effort have stayed much the same. The considered wisdom is that the swordfish fishery in the Caribbean region is unlikely to be a long term fishery if it continues in its current unmanaged state.

There are strong moves within the USA to ban swordfish fishing for at least a season and should this take place it is almost certain that swordfish will become a banned import particularly if it is being imported from areas from which American boats are banned. Should this take place it will obviously have a very considerable effect upon the commercial viability of any operations based in or around the Caribbean region.

The trials reinforced some observations made elsewhere including the effect of the moon, with the greatest catches being obtained in the period between the moon's first quarter and full moon and also an increase in catches with the depth that fishing takes place. Another point worthy of note was the observation that the use of stale bait resulted in lower catches, therefore any squid used for bait must be fresh frozen.

8 CONCLUSIONS

Whilst the existence of swordfish and other large pelagic stocks off Barbados has been demonstrated, the viability or otherwise of investing specifically in such a fishery has still to be fully demonstrated. Appendix II of this Report outlines indicative costs for the outfitting of a 45 to 50 foot vessel for commercial operations. What is now required is for a brief economic viability study to be undertaken of such a venture given the known facts concerning catch rates, markets, prices etc. It is almost inevitable that Barbados will be shown to have a distinct season for swordfish as it does for flying fish, thereby limiting the time available to the fishery. Other constraints worthy of consideration are possible problems with the USA market, doubts over the long term health of the stock and difficulties with exclusive economic zones and access rights.

The prospect of prosecuting both the flying fish and swordfish fishing together has been looked at as a way of increasing the returns for the fishing fleet. Such an approach is possible but unfortunately the true fishing methods do not lend themselves to being worked simultaneously but there is a possibility that some developments could take place in this direction.

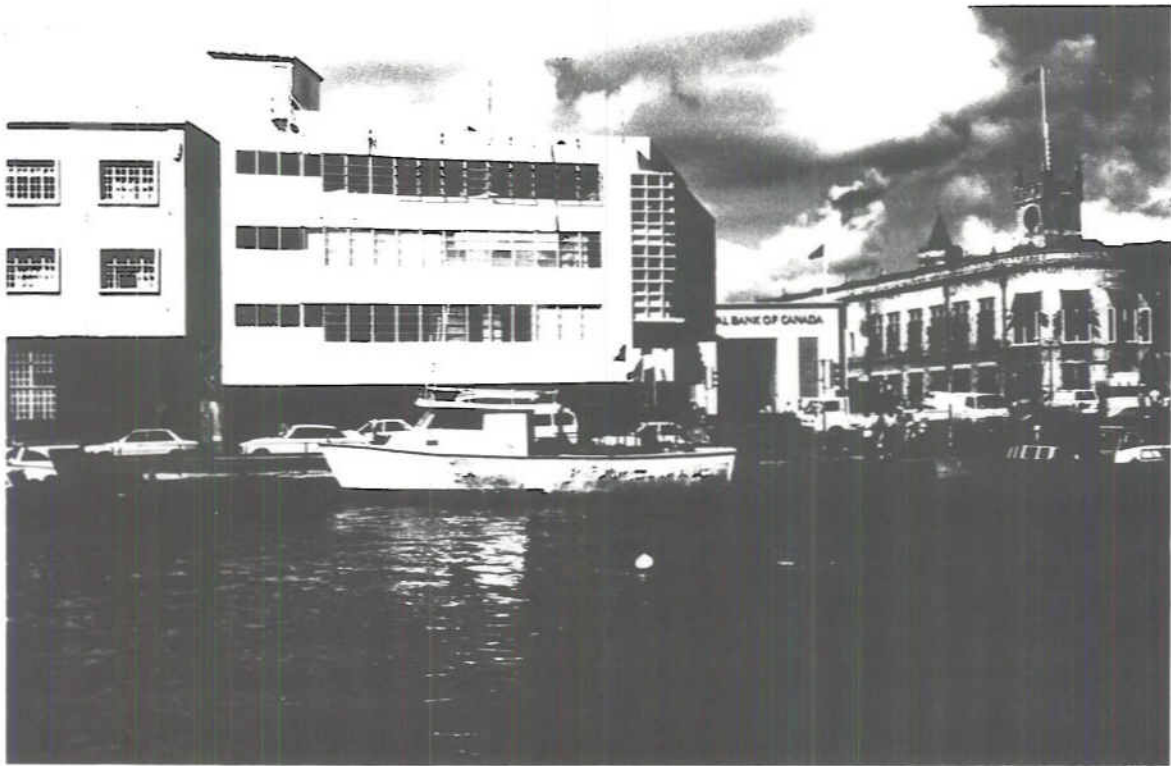
However, regardless of how advantage is taken of the swordfish resource, the Fisheries Division, and a significant group of local fishermen, are now fully versed in the techniques required and are in a position to assist any fishermen wishing to take up the fishery.

APPENDIX I

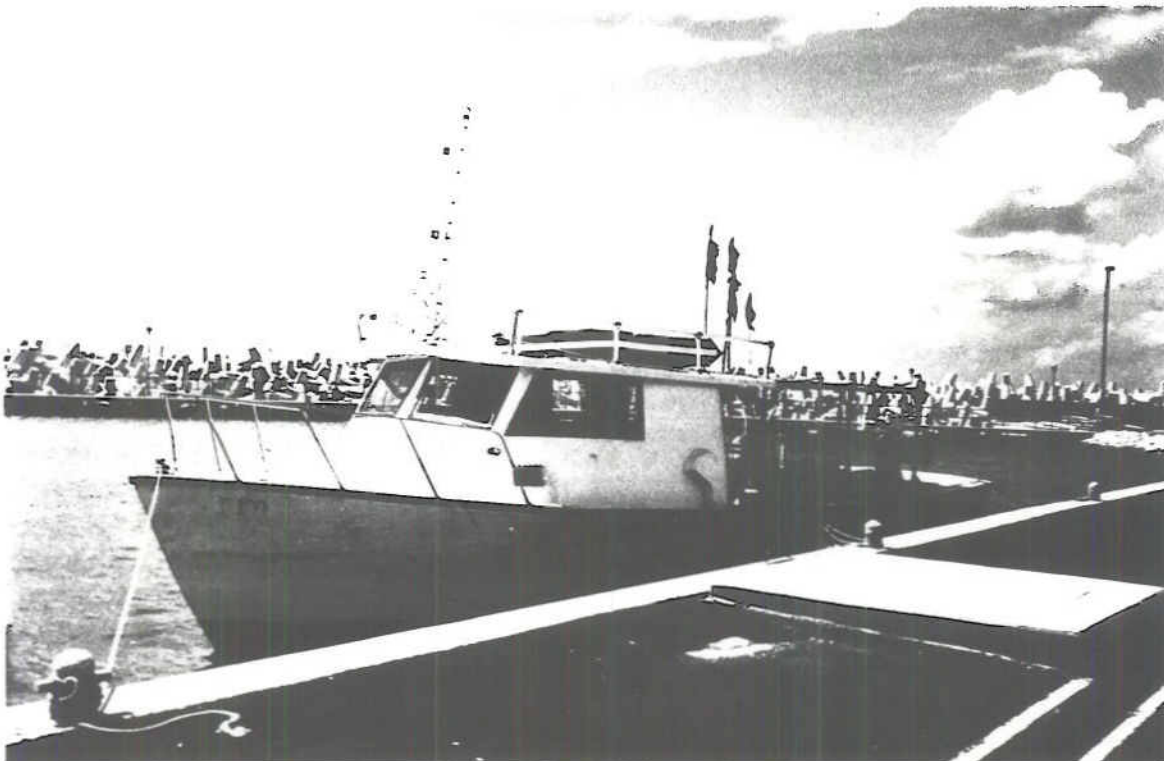
PHOTOGRAPHIC RECORD
OF
PROGRAMME

COMPILED BY: L D M HARRISON

(1)



M.F.V. "TAY GITS" IN THE CAREENAGE



"TAYGITS" IN THE NEW FISHING HARBOUR

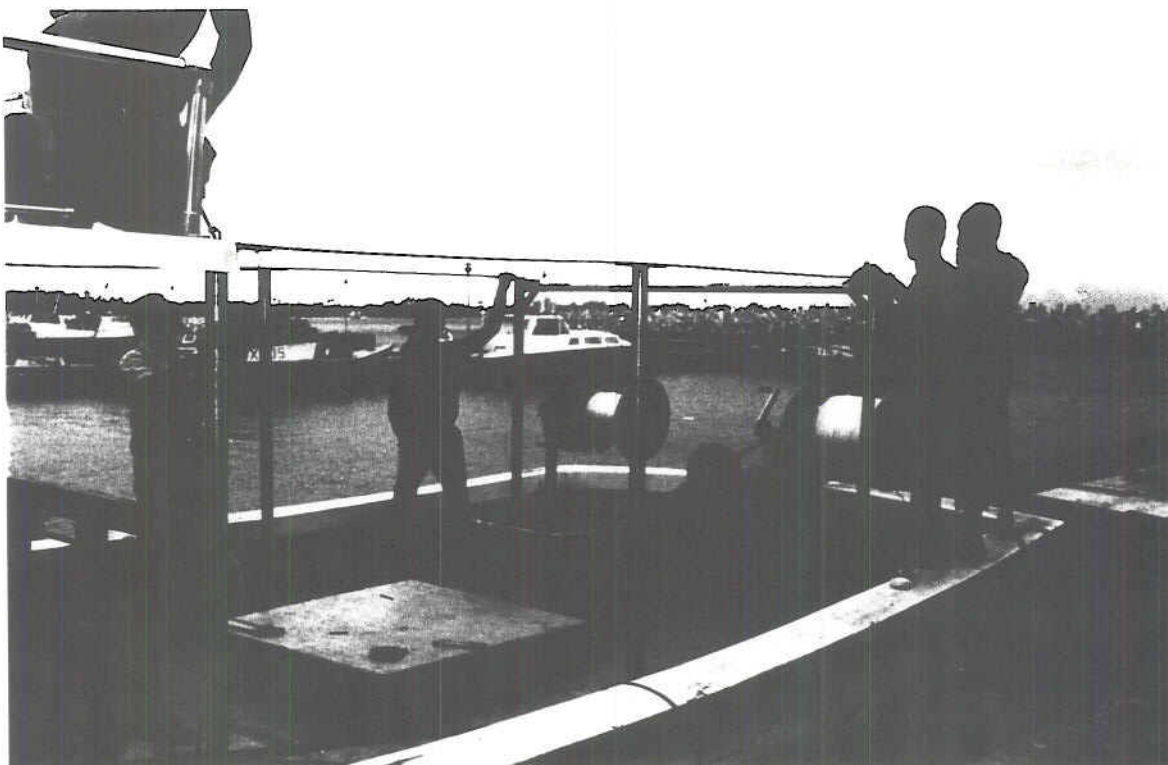
(ii)



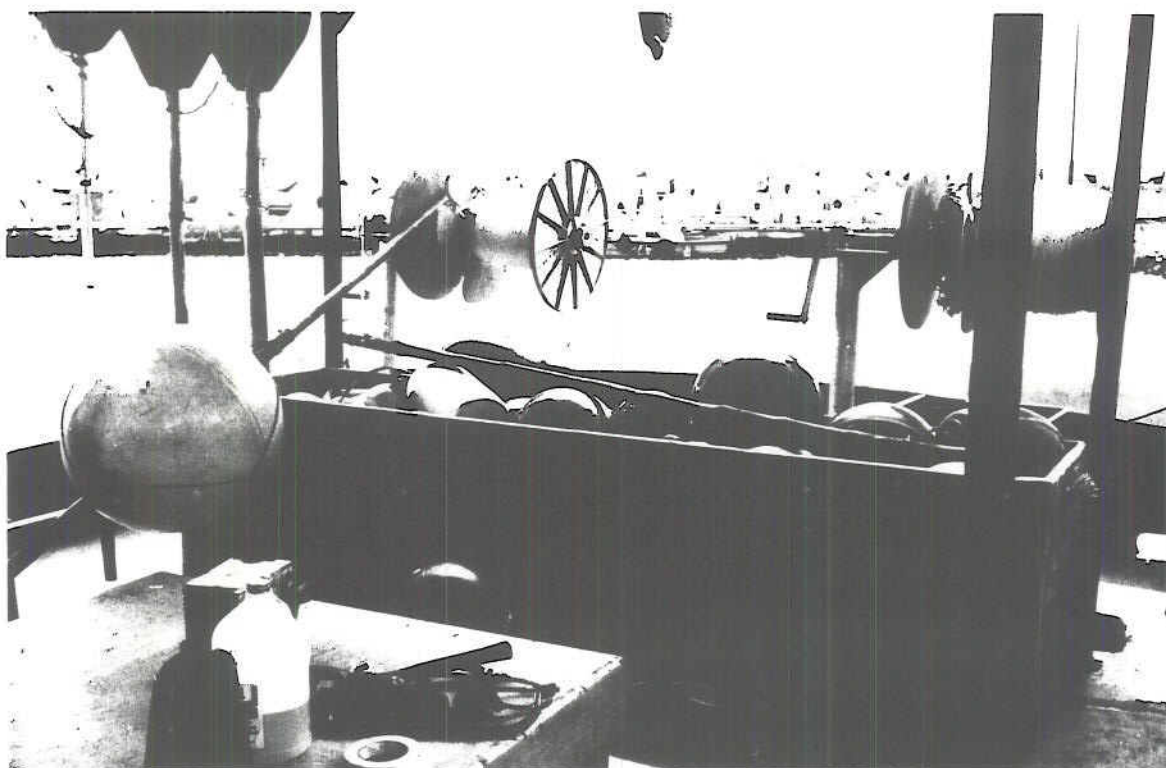
TWO VIEWS MFV "TAYGITS" SHOWING THE GANGION HOOKLINE SPOOLER AND SQUID BAIT BOX ON THE PORT SIDE AND THE GANGION BUOYLINE SPOOLER ON THE STARBOARD SIDE



(iii)

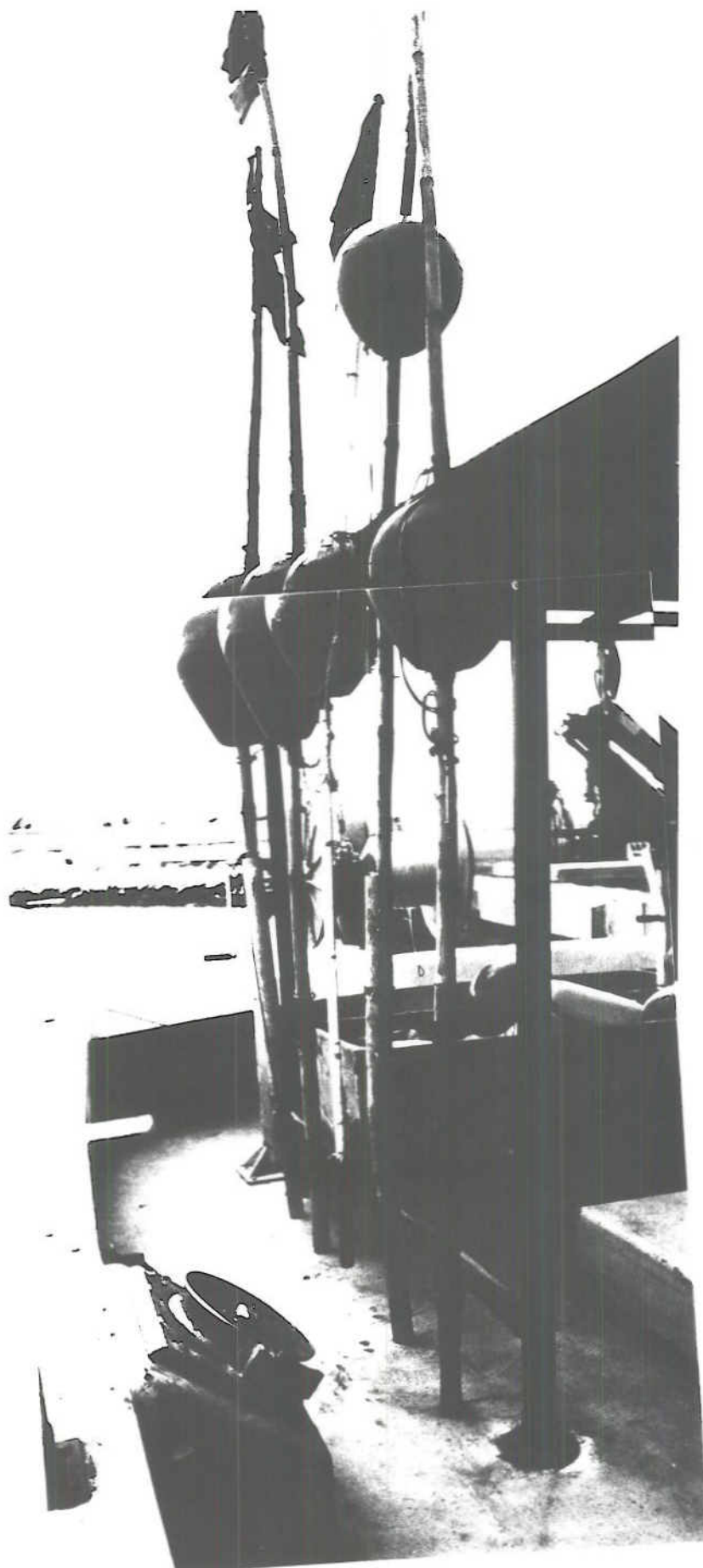


ERECTING SUN AWNING



BUOY "COMPOUND"

(iv)



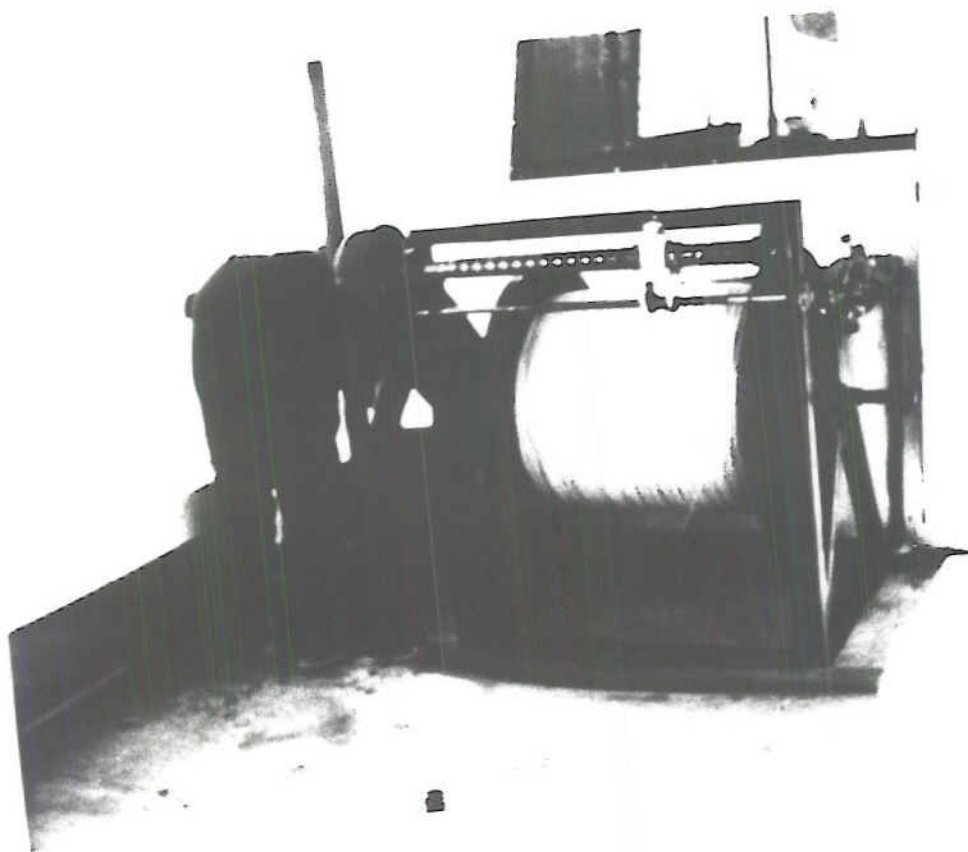
**"HI FLYER"
RACK
COMPLETE
WITH
"HI-FLYERS"**

"POT" HAULER

(v)

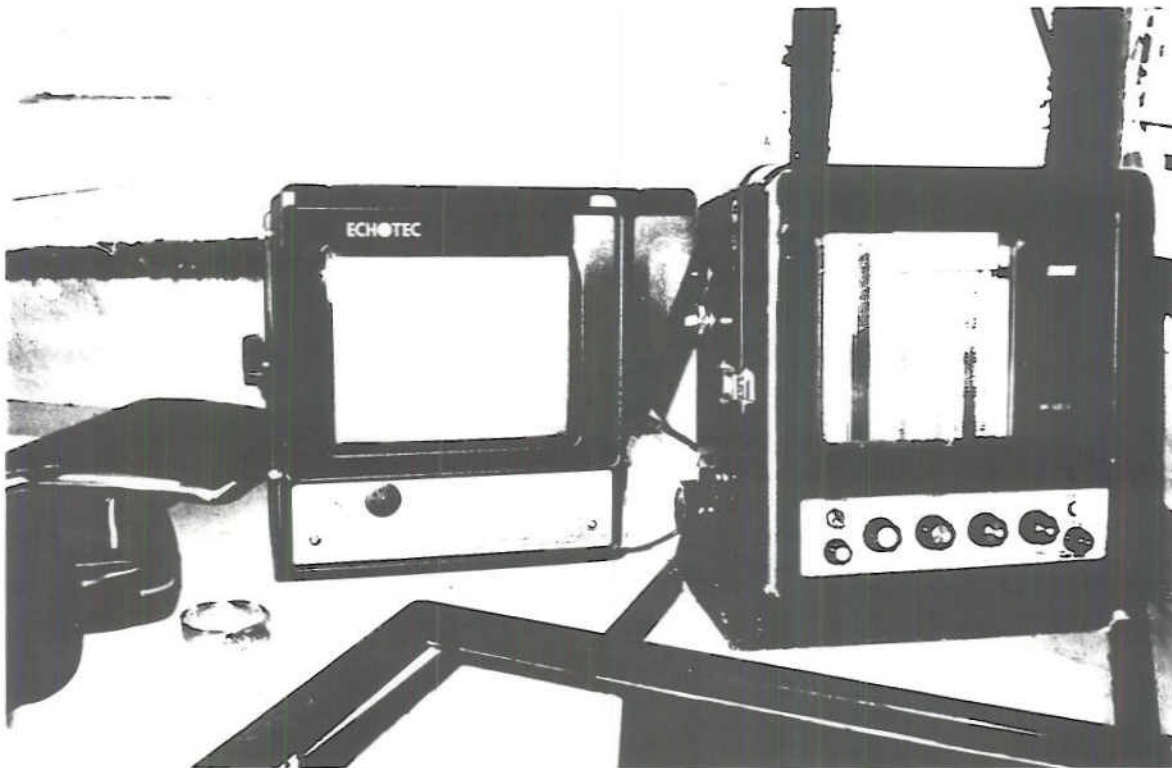


HAULING DAVIT

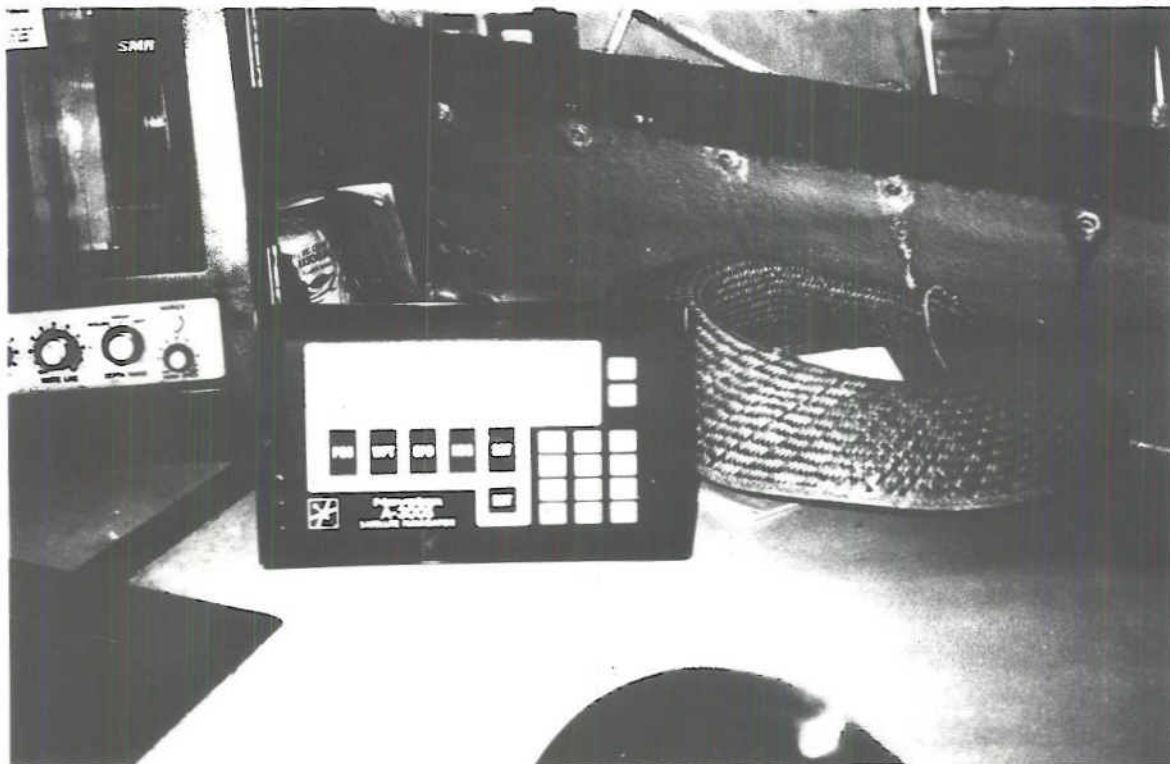


MAINLINE REEL

(vi)

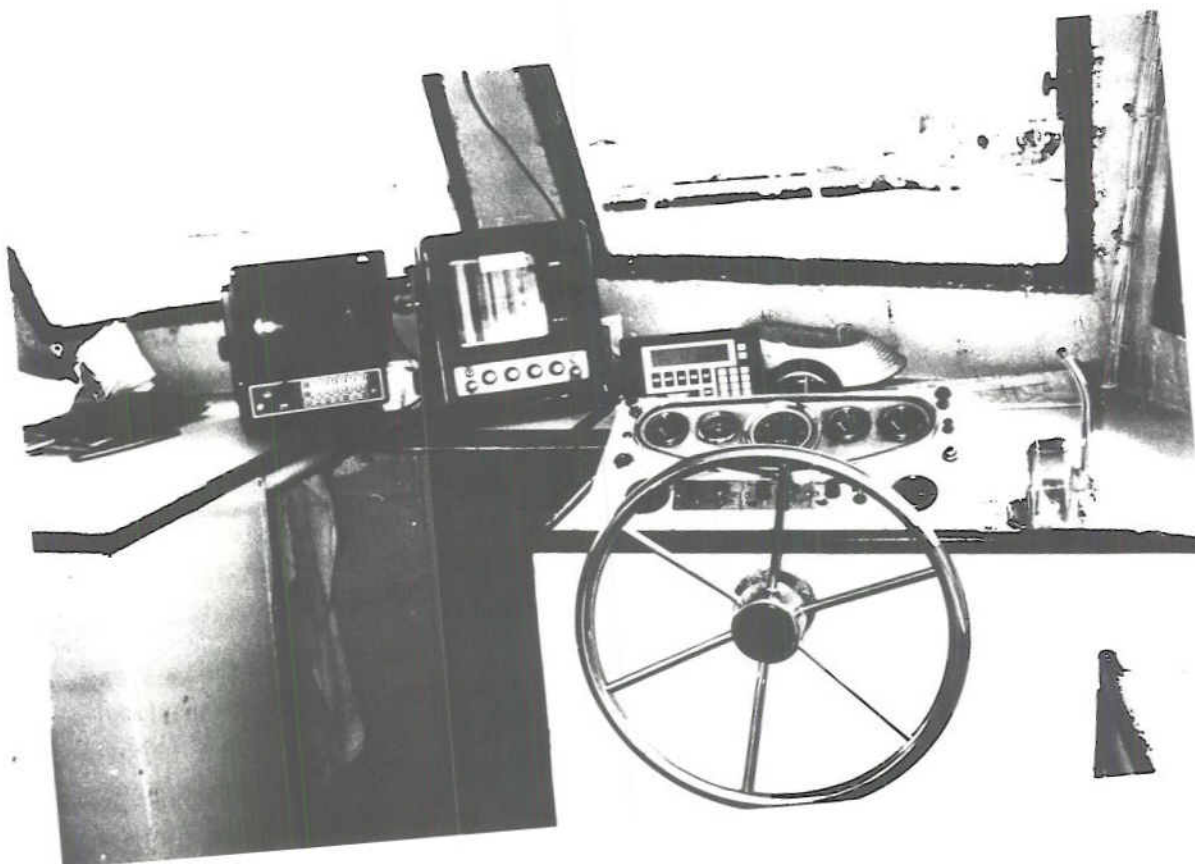


VIDEO ECHO-SOUNDER



SATELLITE NAVIGATOR

(vii)



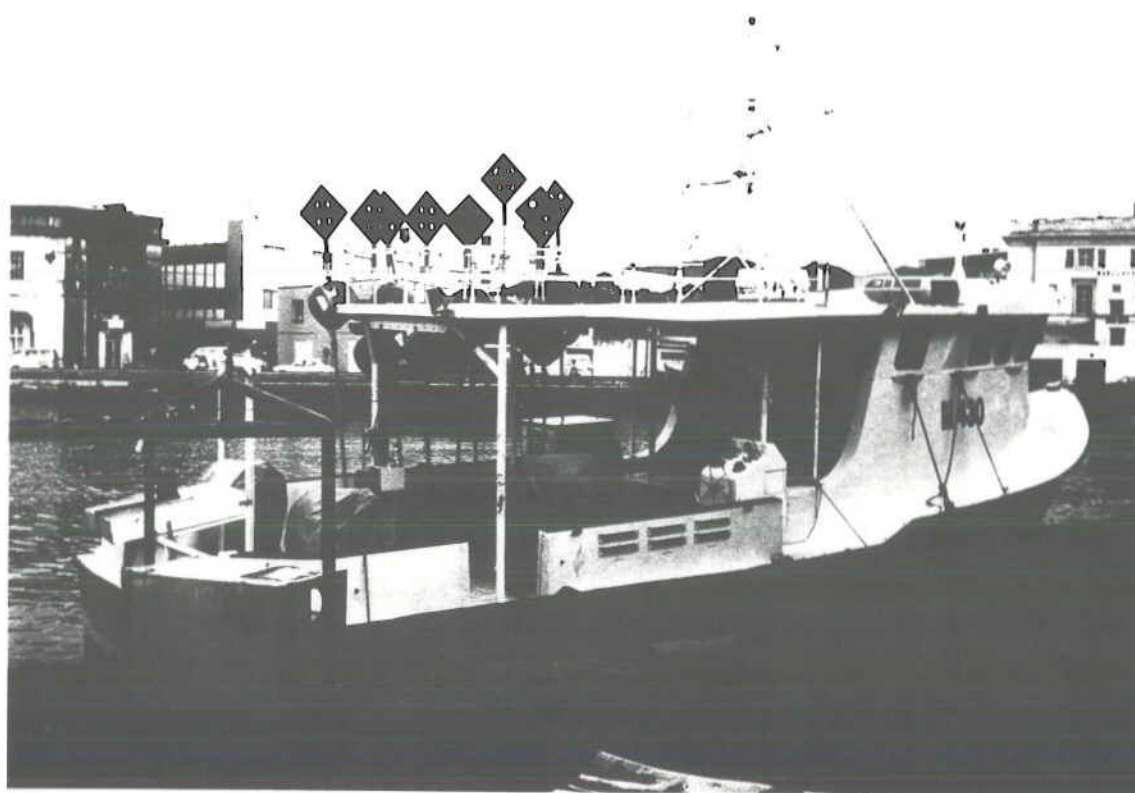
"TAYGITS" WHEELHOUSE LAYOUT

**MFV "LADY DI" PURPOSE BUILT IN BARBADOS FOR
LONGLINE FISHING. (G.R.P. CONSTRUCTION BY "FIBREPOL")**

**Radar Reflectors
on "Hi Flyers"**

**Telescopic
"Hi Flyer Poles"**

**Crimping Tool
Bait Table**



Radar

RDF

**Air/Conditioned
Wheel House**

30 Mile Spool

Dual Controls

1 Ton/Day Ice Maker

Side door, for landing large fish

(iii)

(ix)



FRESH WATER, FLAKED ICE

LOADING ICE

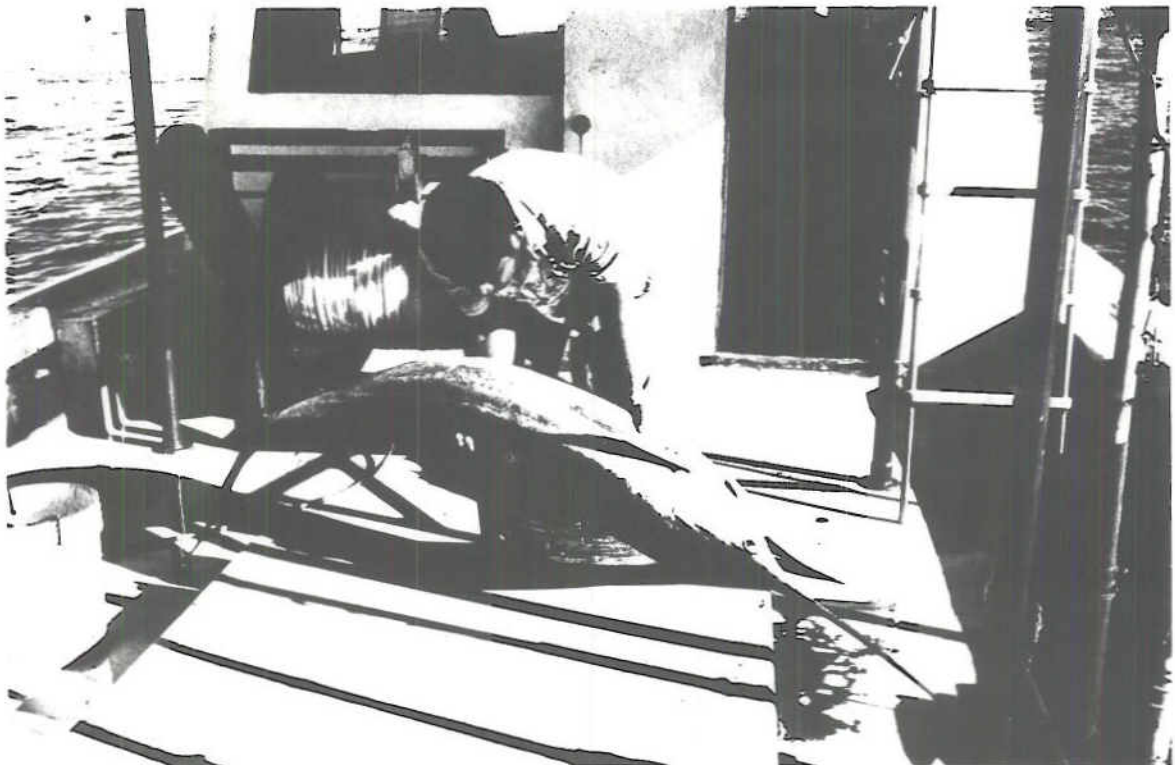


**SALT WATER
ICE**

(x)



100lb SWORDFISH



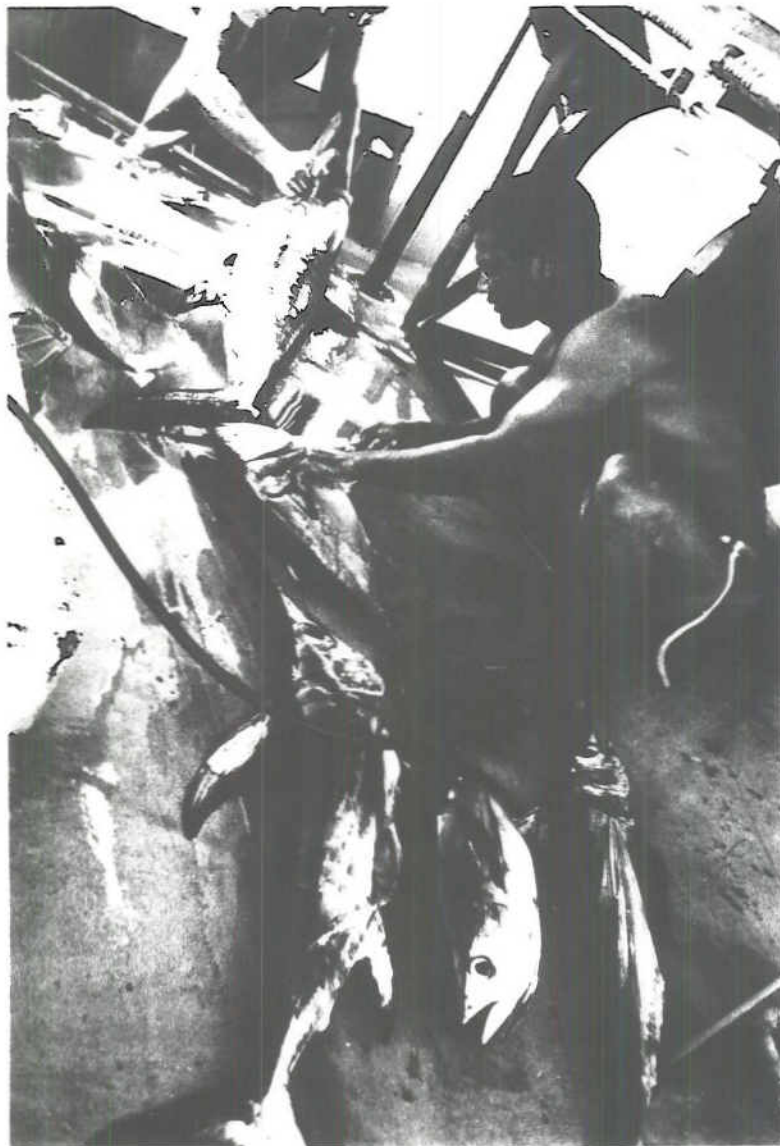
100lb SAILFISH

(x1)



45lbs SHARK

**CLEANING
THE CATCH**



APPENDIX II

Initial investment, to equip a 45 to 50 foot vessel with 25 miles of longline

Mainline	US \$7,422.50	
Gangion line	2,712.50	
Hooks	517.50	
Snaps	1,290.00	
Floats	1,082.50	
Hi-flyer poles	1,275.00	
Radar reflectors	255.00	
Strobe lights	367.00	
Knives	250.00	
Batteries	500.00	
Rubber bands	50.00	
Radio beacons	5,000.00	TOTAL US \$ <u>20,722.00</u>

Deck equipment

Mainline winch	6,645.00	
Gangion spoolers	1,300.00	
Fairlead blocks	636.00	
Gaffs	60.00	
Baiting table	200.00	
Crimping tool	95.00	TOTAL US \$ <u>8,936.00</u>

Wheelhouse equipment

Radar Scanner	5,000.00	
Echo-sounder	1,500.00	
Satellite navigator	3,000.00	TOTAL US \$ <u>9,500.00</u>

TOTAL INITIAL INVESTMENT IN US \$ 39,158.00

Operational Costs (Typical for 12 trips)

Ice @ \$200/Trip =	US \$ 2,400.00	
Fuel 12,000 gallons @ 90c =	10,800.00	
Groceries @ \$300/Trip =	3,600.00	
Bait @ 50c/lb =	9,000.00	
Lightsticks @ 90c/l =	16,200.00	TOTAL US \$ <u>42,000.00</u>

A six month "season" with six "fishing moons" gives 10 fishing days/month, each day 300 hooks are "SET" therefore $300 \times 10 \times 6$ gives seasons bait supply. Required are 18,000 of 1lb squids and 18,000 lightsticks.

Replacement gear (20%)

Mainline	US \$ 1,484.50	
Gangion line	542.50	
Hooks	103.50	
Snaps	258.00	
Buoys	216.50	
Hi-flyers	255.00	
Radar reflectors	45.00	
Batteries	100.00	
Knives	50.00	
Rubber bands	10.00	TOTAL US \$ <u>3,065.00</u>

Viable costs (typical)

Freight and handling	US \$ 6,000.00	
Winch and electronic monitor	600.00	
Equipment expenses	1,400.00	TOTAL US \$ <u>8,000.00</u>