

APPENDIX 2

Proposed Experimental & Development
Fishing Programme.

REPORT NO. F.G.T. - 2(b)

TECHNICAL CO-OPERATION ATN/SF - 2474-BA
INSTITUTIONAL STRENGTHENING OF FISHERIES DIVISION OF
MINISTRY OF AGRICULTURE, FOOD AND FISHERIES

PROPOSED EXPERIMENTAL AND DEVELOPMENT
FISHING PROGRAMME

PREPARED BY: L.D.M. Harrison.
September, 1987.

REVISED: November, 1987
(To be within budget.)

INTRODUCTION

The attached detailed experimental and development fishing programme is based on the background information the fishing gear technologist obtained on the fish resources and fishing activities in Barbados E.E.Z. and the Eastern Caribbean (report no. FGT-1) and on his own professional knowledge and experience.

The aim of the programme is first to establish whether or not the new and modified types of fishing gear and techniques proposed by the fishing gear technologist are suitable for the local fishery and that they will increase the catching efficiency and catch rates. This is to be done by means of a series of fishing trials on board a suitable and safe multi-purpose "offshore" fishing boat, owned or chartered by Fisheries Division.

Once a type of gear or technique has been proved successful they will be demonstrated to the fishing industry and interested fishermen can be trained in their use and given assistance to install the equipment on their boats.

This step-by-step approach is recommended, so as to prevent fishermen from spending large sums of money on unsuitable gear and modifications to their boats, or engaging in new and untried fisheries which could prove to be financially unviable.

The fishing gear, equipment and techniques that the fishing gear technologist recommends be investigated are as follows:

DEMERSAL FISHERY

Barbados, due to it having only a small area of shallow submarine bank, offers limited opportunity for a demersal fishery. It should, however, be possible to increase the efficiency and catch rates of those presently engaged in the fishery by modifying existing practices and by introducing new types of gear and techniques.

1. Mechanical Reels

Mechanical reels with stainless steel lines are used Worldwide, having replaced the traditional hooks and lines as a more efficient type of handline gear for catching demersal fishes. The advantages of the new gear is that by doing away with the physical labour required to haul the line, a greater number of hauls can be made in a trip and fish can be hauled from depths of up to 250 fathoms. Thus facilitating increased fishing effort and fishing on the deep water banks which cannot be exploited at present.

2. Vertical and Bottom Set Longlines.

Vertical and bottom set longlines employ a much larger number of hooks than the traditional hand lines, consequently they are generally expected to produce higher catch rates.

3. Echo-sounder and Precise Navigation Equipment.

An Echo-sounder and precise navigation equipment are required in the search for suitable areas for fishing deep water demersals and for the precise setting and recovery of Bottom set long lines.

PELAGIC FISHERY

There is a large demand for dolphin and kingfish in Barbados which is not being fully satisfied at present. Consequently there is need to investigate ways of increasing the catches of these species. Also, there is considerable interest amongst the fishermen to seek alternative types of fishing activities in order to extend the existing 'main' flying fish season. Specifically, due to the presence of U.S. swordfishing boats in Barbados waters, they are interested in targetting swordfish and other large pelagics.

1. Drift Nets.

The use of drift nets with larger sized meshes designed specifically for catching dolphins and kingfish, operated in conjunction with flying fish nets, is seen as a possible method of increasing the catch of these species.

Also the introduction of net haulers is seen as a way to increase the number of flying fish nets set by the boats and consequently the catch rates.

2. Trolling Booms.

The use of trolling booms, from which up to seven lines can be set, compared to the present practice of setting only one line from the stern of the boat, is seen as another possible way of increasing the catches of dolphin, kingfish and tunas.

3. Longlines.

Longlines with their associated mechanized line haulers are the standard fishing gear used to catch the large pelagics such as yellowfin tuna, billfish, and swordfish. The Americans have developed a particular form of longline gear, known as the 'Florida' style for catching swordfish which uses lines of up to 20 - 40 miles long. It is proposed to use lines up to 5 miles long in the experimental fishing programme.

WORK PROGRAMME FOR EXPLORATORY AND DEVELOPMENT FISHING

PHASE ONE:- Inshore (day boat) fishing using Bw26 Vessel

<u>ACTIVITIES</u>	<u>TIME SCALE</u>
<p>1. <u>Operation</u> A quality control experimental programme will be carried out in conjunction with the fish processor using nets and lines available from stores and the Fisheries Division's vessel.</p> <p>(a) <u>Method</u> Flying fish drift nets with F.A.D.'s.</p>	<p>November 1987 to Mid-December 1987.</p> <p>January 1988 to June 1988</p>
<p>2. <u>Operation</u> Using existing gear and the BW 26 vessel the counterpart and gear technologist will catch flying fish and other pelagics and preserve them, half by using the local methods and half by modern techniques and ice, keeping careful records of all data.</p> <p>(b) <u>Method</u> of capture is by longlines and drift nets when using the chartered vessel and preservation will be in the icehold of the vessel, packed in ice.</p>	<p>November 1987 to Mid. December 1987</p> <p>January 1988 to June 1988</p>

WORK PROGRAMME FOR EXPLORATORY AND DEVELOPMENT FISHING

PHASE II Offshore (ice boat) Component, using Chartered Vessel.

<u>ACTIVITIES</u>	<u>TIME SCALE</u>
<p>3. <u>Operation</u> Identify and assist Fisheries Division to obtain a suitable vessel for chartering.</p>	October to November 1987
<p>4. <u>Operation</u> Fabricate fishing gear for the start of the 'offshore' component of the work plan.</p>	<p>End December, 1987 to Mid January 1988.</p>
<p>5. <u>Operation</u> Commence exploratory surface longline fishing for oceanic pelagics. Locating offshore banks by using modern technology. In addition, during this period, continue the operations of surface drift netting for larger pelagics.</p>	<p>Mid January 1988 to June 1988 (August 1988 to Oct. 1988 using Fisheries Division's new vessel.)</p>
<u>Methods</u>	
<p>a. The method of longlining will follow the 'Florida' style, using 5 miles of lines, line reels.</p>	
<p>b. Drift netting will be evaluated as an additional catching method.</p>	March 1988 to May 1988
<p>c. Trolling with multi-lines will be an additional capture method that will be evaluated during these 'longline' trips.</p>	January to June 1988
	November 1988 to June 1989.

WORK PROGRAMME FOR EXPLORATORY AND DEVELOPMENT FISHING
 PHASE II; OFFSHORE (ice boat) Component, using Fisheries Division's
 new vessel.

<u>ACTIVITIES</u>	<u>TIME SCALE</u>
<p>6. <u>Operation</u></p> <p>Fishing gear assembly of larger mesh 'drift nets'.</p> <p><u>Method</u></p> <p>Training fishermen in net construction.</p>	Feb. 1988
<p>7. <u>Operation.</u></p> <p>Drift net fishing for flying fish will be carried out in conjunction with drift net fishing for the larger pelagics, using the larger mesh size nets and hydraulic net winch. This is to establish methods of increasing catch rates of the larger pelagics during the main flying fish operation.</p> <p><u>Methods</u></p> <p>Larger mesh size nets will be fished alongside the traditional nets, in various configurations to establish if new methods work successfully.</p> <p><u>Demonstration</u></p> <p>Demonstration of the successful fishing methods to fishermen on board the vessel, at sea.</p> <p>Instructions to fishermen, ashore, on gear assembly.</p>	<p>Using Fisheries Division's new vessel.</p> <p>January 1989 to May 1989.</p> <p>April to May 1989.</p> <p>August 1989 to Feb. 1990.</p>
<p>8. <u>Operation.</u></p> <p>Offshore areas suitable for deep water demersals will be investigated during this 'slack current' time of year.</p>	<p>May 1989 to July 1989</p> <p>August 1989 to October 1989</p>

WORK PROGRAMME FOR EXPLORATORY AND DEVELOPMENT FISHING
PHASE II; Offshore (ice boat) component, using Fisheries Division's
new vessel.

<u>ACTIVITIES</u>	<u>TIME SCALE</u>
<p>8. cont'd</p> <p><u>Methods</u></p> <p>Hydraulic reel fishing and bottom set longlines will be used to explore deeper areas than is the current practice.</p>	

APPENDIX 3

Work Programme & 'Terms of Reference'
for Counterpart training.

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F.G.T. 3

TECHNICAL CO-OPERATION ATN/SF-2474-BA
INSTITUTIONAL STRENGTHENING OF FISHERIES DIVISION
OF MINISTRY OF AGRICULTURE, FOOD AND FISHERIES

Work Programme and "Terms of Reference"
for Counterpart training.

Prepared by: L.D.M. Harrison.
Fishing Gear Technologist.
November, 1987.

OVERALL OBJECTIVE

To provide the Fisheries Division with the capability to advise and assist the fishing industry in the introduction and application of improved fishing techniques and fishing gear technology.

JOB DESCRIPTION

1. To command and operate an exploratory fishing vessel.
2. To develop new types of fishing gear and techniques, and to investigate new fishing grounds.
3. To provide advise and assistance to the fishing industry.
4. To provide training to the fishermen.

JOB DESCRIPTION

1. To command and operate an exploratory fishing vessel.

TASK	KNOWLEDGE AND SKILLS
<p>To operate a multi-purpose fishing vessel by:-</p> <p>i. Preparing the vessel for a fishing trip.</p> <p>ii. Undertaking a fishing trip and:-</p> <p>iii. By correct care of the catch by using ice and storing in the proper manner.</p>	<p>a) To have the ability to prepare a vessel for a fishing trip, having the knowledge of victualing, fresh water, fuel and ice loading.</p> <p>b) A knowledge of vessel safety by visual checks and routine checks of: trim, bilges, hull, engine and deck machinery etc.</p> <p>c) A knowledge of safety requirements.</p> <p>d) The ability to start the engine and a knowledge of instruments, including bilge pumps, lightswitches etc.</p> <p>e) The ability and knowledge of the "wheelhouse" instruments use and operations, including; compass, satellite navigator, R.D.F., automatic pilot, echo-sounder, radar (if fitted), radios and charts.</p> <p>f) To have the knowledge of navigating the vessel and the ability to successfully complete a fishing trip.</p> <p>g) To have knowledge of fish preservation and the ability to: gut, ice and pack fish into the vessel's ice hold.</p>

JOB DESCRIPTION

2. To develop new types of fishing gear and techniques and to investigate new fishing grounds.

Task	Knowledge and skills.
1. Identify the need for new gear and species to be caught.	a) A knowledge of the fish resources in the area. b) A knowledge of modern/latest fishing techniques and equipment e.g. longlining, trolling, gillnetting, etc.
2. Plan a fishing programme.	c) A knowledge of planning fishing trials and the ability to proceed with the trials.
3. Acquire the equipment.	d) The ability and knowledge to rig and install fishing gear and equipment.
4. Fit out the vessel.	e) Be able to organise and supervise fishing trials, recording data etc.
5. Implement the programme.	f) Be able to write concise reports.
6. Report the results.	g) A knowledge of 'Oceanography' with relation to Barbados, e.g. local currents, upwellings, banks, nutrients, fish migration etc.

JOB DESCRIPTION

3. To provide advice and assistance to the fishing industry.

Task	Knowledge and skills.
<p>To advise and make recommendations and to answer enquiries from the industry on:</p> <p>i. Fishing Gear. ii. Deck Machinery. iii. Wheelhouse Instruments. iv. Fish Handling. v. Safety and equipment. vi. When and where to fish etc.</p>	<p>a) To have the knowledge and ability to advise on:- gear specifications, gear purchase and gear fabrication.</p> <p>b) To have the knowledge of where to acquire deck machinery and the ability to advise on deck lay out and the fitting of deck machinery.</p> <p>c) To have the knowledge and ability to advise on: purchase and outfitting a wheelhouse with instruments such as, echo-sounder, radios, R.D.F. compass etc.</p> <p>d) How to best care for fish, ice, gutting, stowage etc.</p> <p>e) To have the knowledge to advise on local safety requirements.</p> <p>f) To have the ability and knowledge to advise the industry in such matters as:- fish seasons, E.E.Z. regulations etc.</p>

JOB DESCRIPTION

4. To Provide training to the Fishermen.

Task	Knowledge and Skill
To train fishermen in:	
i. Fishing methods.	a) A knowledge of fishing methods pertinent to local requirements, and the ability to train fishermen in these methods.
ii. Navigation.	b) A knowledge of navigation and the ability to train fishermen in such subjects as, Compass and courses to steer, how to use R.D.F., rules of the sea, seamanship, use of radios for communications etc.,
iii. Gear Fabrication.	c) A knowledge on gear specification, fabrication and the ability to train fishermen in such matters.
iv. Safety at Sea.	d) To have the knowledge and ability to train fishermen in all aspects of safety at sea.
v. General Seamanship.	e) To have a knowledge of seamanship and the ability to train fishermen in seamanship.
	f) A knowledge of 'Training' methods.

NOTES ON COUNTERPART TRAINING

Counterpart training of Mr V. Skeete will be conducted with active "on the job" participation in fishing and related activities as set out in the "Work Programme" for counterpart training (prepared by the expert). Mr V. Skeete already has a good degree of ability and skills and training from previous courses. He is skilled in many aspects of the training schedule, however, strengthening of these skills will take place during his period with the consultant. Specific areas of training will be conducted in:

- (a) gear specification, fabrication and the ability to train fishermen in such matters
- (b) Deck layout and fitting of deck machinery.
- (c) longlining.
- (d) operation and use of satellite navigator.

APPENDIX 4

Iceboats

REPORT NO FGT - 4

TECHNICAL CO-OPERATION ATN/SF - 2474 - BA

INSTITUTIONAL STRENGTHENING OF FISHERIES DIVISION OF

MINISTRY OF AGRICULTURE, FOOD AND FISHERIES

REPORT ON: "ICEBOATS"

PREPARED BY: L D M Harrison

January 1988

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1 NORMAL ICEBOAT FISHING METHODS

1.1 Description of Vessel

Offshore fishing vessels or "Iceboats" as they are known in Barbados have the ability to travel and operate over greater distances than the "Dayboats" which do not carry ice. The "Iceboats" remain at sea for up to 10 days before returning with their catches.

The average size of these offshore vessels is GRP, 40 feet, or wooden ships of up to 50 feet long.

Fish holds are insulated boxes that can contain between 8 to 20 m³ of ice and fish.

Engines vary in power between 90 and 200 plus hp. Very little deck machinery is fitted as the methods currently employed are "passive" requiring little if any machine power to assist operations which are typically handled by a crew of three. Generally the offshore fleet has semi-displacement type hulls which are designed more for speed than efficiency of fuel or maximum carriage of fish with safety.

During the building of the current fleet no consideration has been given to any other type of fishing methods, therefore, before the current fleet can be utilised for other methods of fishing, ie longlining, costly major refits would be required. However, before such outfitting is contemplated the target resource should be evaluated.

1.2 Areas of Operation

Iceboats travel great distances during their operation. Normally they will go to the area off Tobago, and then drift towards Grenada returning to Barbados after about 10 days. A great deal of fishing is therefore carried out in other countries territorial waters.

1.3 Fishing Practices

The amount of fishing gear carried is typically 8 to 10 drift nets for flying fish and handlines of various lengths for catching the larger pelagics. During steaming to the fishing grounds, a constant watch is kept for any drifting debris; this debris may contain spawn of flying fish which would indicate a good fishing area.

When operations commence a "screeler" is placed into the sea attached to a line, (a "screeler" is a bundle of sugar cane or coconut fronds, normally used as a FAD (fish aggregating device), the line is payed out as the vessel drifts, a second, third and fourth "screeler" are attached at intervals of about 100 yards along the line, the end of which is tied to the vessel, as the vessel drifts broadside to the sea a wire basket of fish offal is hung over the vessel in such a way as to dip in and out of the sea as the vessel rolls, this food/bait helps to attract fish to the vessel.

Flying fish are observed after a period of time, (anything from 1 hour to 4 hours depending on fish density) and then all nets are drifted off the vessel from approximately 20 yards. One "screeler" is brought to about mid-gillnet and left and the crew then watch as the fish are gilled.

When a good quantity (500 to 1000 flying fish is typical) of fish are gilled the net may start to sink at which point the nets are retrieved, cleaned of fish and reset. At times of very heavy fish density a hand scoop net is used to scoop the fish directly into the vessel from the sea.

Should predator fish such as dolphins be observed then the gillnets are not set and the large pelagics are caught by handlines baited with live flying fish. When there are no more predators the gill nets are reset.

"Lurklines", for any large fish are kept continuously baited, one at the bow and one at the stern and allowed to sink to whatever depth the drifting vessel and length of "Lurkline" determines. Between periods of fishing activity the fishermen usually find a cool place to lie down and

sleep. There are quite long periods of inactivity due to the very passive nature of this style of fishing. The resource is so thinly spread in the wave tops that a good deal of patience is needed if a fisherman is to remain interested in this type of employment. The most active times for flying fish appears to be after midday and again just prior to sunset and at sunrise for the predators that seem to accumulate overnight. However, predators may strike at any time of the day or night, so a constant watch is maintained in order to catch the predators whenever they are available.

1.4 Care of the Catch

Flying fish are boxed in quantities of a hundred, washed by the mechanical deck-wash hose and iced in layers. Typically, icing consists of tipping the fish from the boxes into loose or flaked ice, mixing with a plastic shovel and then shoveling ice/fish mixture into a fish pound. When the pound is full the fish are covered by a further layer of ice and the pound is sealed by adding the remaining pound boards. Dolphin and other fish are gilled, gutted, washed and iced as soon as the fish settle down after being caught. It is worth noting that vessels only use boxes or buckets in order to temporarily handle the fish, only 3 or 4 containers are carried.

1.5 Navigation/Communications

Navigation is by Radio Direction Finder with a transistor radio tunable to, "Voice of Barbados" as an emergency back up RDF. Communications are via CB, VHF and LF radios. Location is known by identification of visible islands. No precise navigation is carried out as the RDF is only utilised to get a bearing to steer home at the end of a period drifting around the ocean for between 6 and 10 days, at the whim of wind and currents.

1.6 Comments

In order to consider alternative fishing methods for Barbados, using iceboats, it is first necessary to consider a number of relevant important factors facing the industry. These facts can be summarised as questions in the following order:-

- i) is the fish resource available?
- ii) what season will be fished?
- iii) are the present vessels suitable?
- iv) will the fishermen need training in the new methods?
- v) how much investment is required?
- vi) can the operation be profitable?
- vii) how high are running costs? ie bait, lightsticks, fuel, ice, etc.

The Barbados "iceboats", are on the whole suited for the work that they currently undertake. However, due to the need for large ice boxes to contain the iced fish, there is very little room left for alternative fishing methods. In order that different methods of fishing may be practised on these vessels they would need to be modified in the following areas:-

- a) hydraulic machinery, to the engine and on deck;
- b) precise navigation equipment;
- c) safety rails on gunwales;
- d) deck lights for night work;
- e) flush working deck of say 12' x 20' min;

- f) a lifting derrick for large fish and fish pots;
- g) line setting/hauling gallow.

The major vessel modification would be the lowering of the ice box to deck level. This problem is not usually present with full displacement vessels as their ice/fish hold is normally below deck level.

A good number of the current wooden ice boat vessels have already undergone modifications by "stretching" and fitting large ice-boxes. These vessels would present difficulties when being considered for further modification. It is felt that the fishing fleet can only be altered or modified to a limited degree.

Attached as Appendix 1 is the specification of a vessel recommended for the project in Barbados by the FAO Investment Center Report (1982). This specification was worked out for the fishing area off Barbados and the masterfishermen for the current project is in full agreement with the specifications.

2 OUTLINE DESCRIPTION OF A TYPICAL "LONGLINE" OPERATION TARGETING SWORDFISH ("FLORIDA" STYLE)

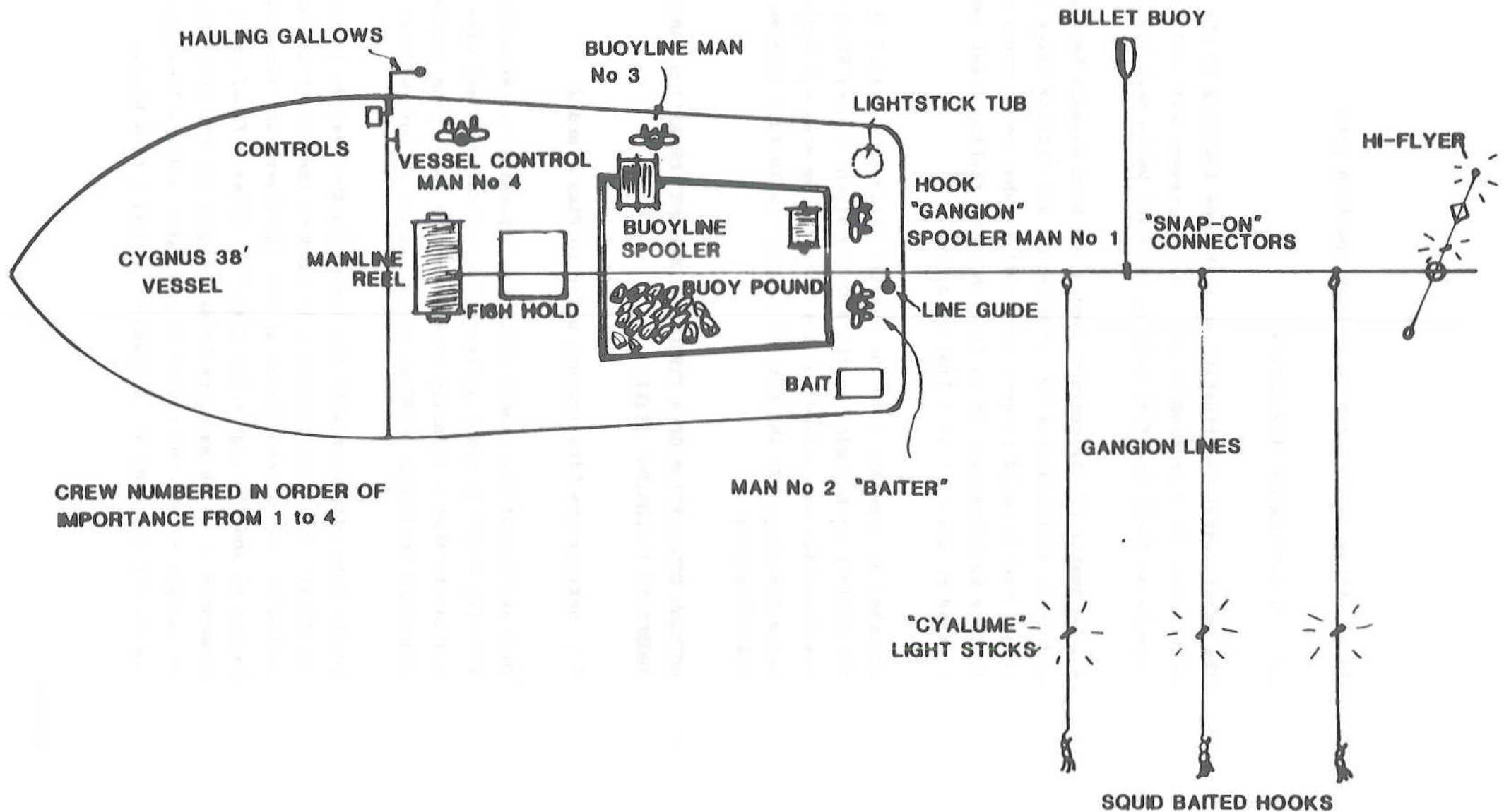
2.1 Setting the Line (Please refer to Figs 1 and 2)

This section of the report describes a possible alternative fishing activity which is being attempted by a local boat and crew on a vessel similar to that originally recommended by FAO. These trials only commenced in January 1988 so an evaluation is not yet possible.

In the late afternoon with the vessel in the desired location, the first "Hi-flyer" (floating flagpole) is tied to the end of the mainline; typically, two strobe-lights on the "Hi-flyer" are fitted with their batteries and the lights set flashing. After a final check the operation commences with the mainline being dragged off the free wheeling spool by the weight of the "Hi-flyer" in the water and the line paying out as the vessel proceeds at a speed of around 3 to 4 knots.

Fig. 1

SCHMATIC LONGLINE SETTING OPERATION: SHOWING CREW POSITIONS



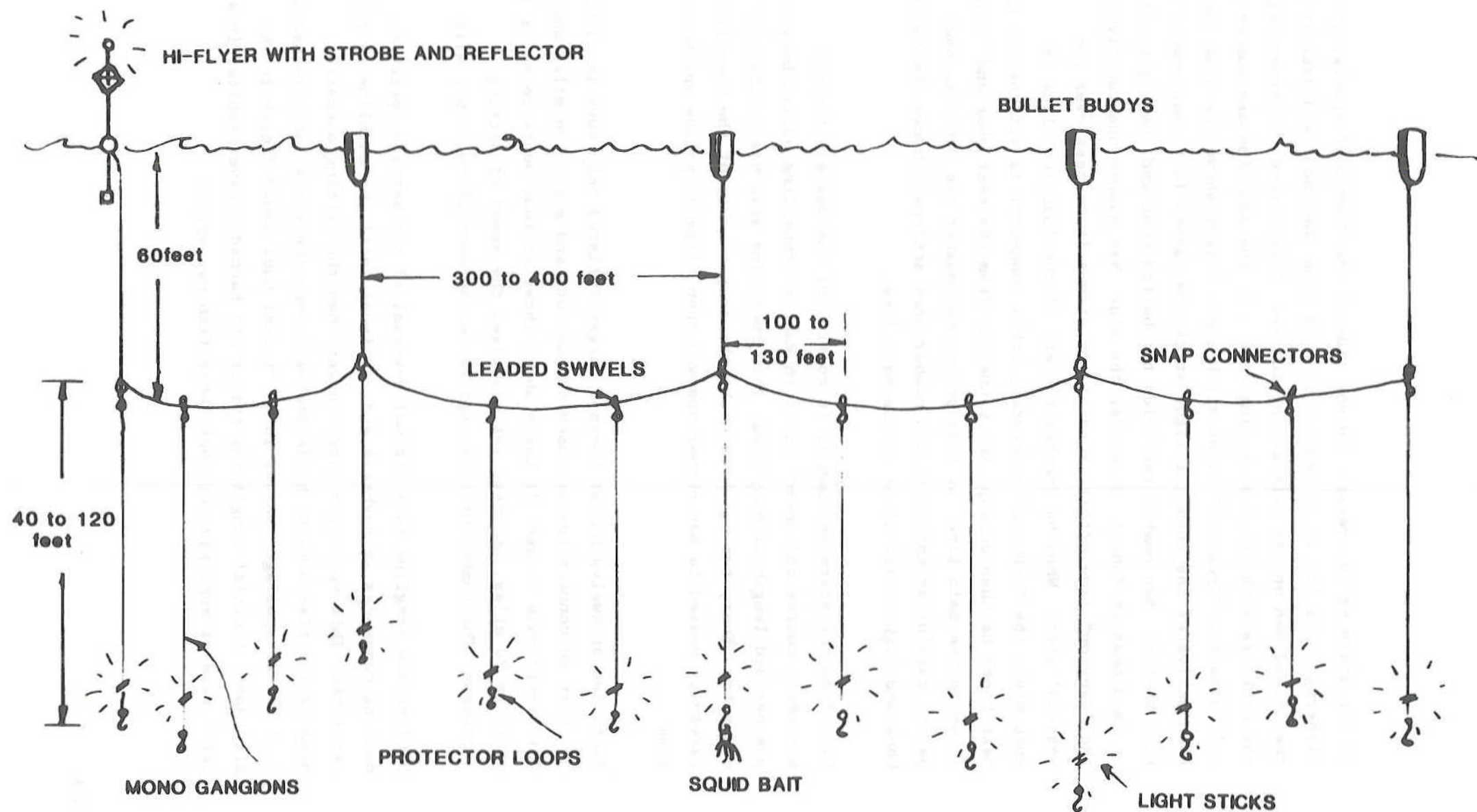


Fig. 2 TYPICAL LONGLINE RIG FOR SWORDFISH

At the stern of the vessel, on one side of the "Gangion" spooler is one fisherman, his job is to remove the hook from the spool and pass it to the second man on his left facing forward, this second fisherman baits the hook (ie with squid or flying fish), in the meantime man number one will attach a "Cycalume" light stick about 5 feet above the hook, he then activates the chemical light stick and passes it to man number two (the baiter). Man number two holds the baited hook and the light stick in readiness to "shoot" them over the side. Man number one rapidly hauls the "Gangion" line off its spooler and allows it to pass over the vessels' stern. When he reaches the end of the "Gangion" line he encounters the "snap-on" connector, (this connector is attached to the next hook) he then unsnaps the connector from the next hook and "snaps" it on to the main-line, at this point, man number two (who has been paying careful attention to man number ones actions) throws the baited hook and light stick clear of the main line.

Away from the stern one man is in control of the vessels forward movement, course and speed. A fourth man is connecting bullet buoys to a pre-decided length of buoy line. This buoy line also has a "snap-on" connector. Every two or three hooks the snap-on clip of the buoy line is carefully passed to man number one who then clips buoy line and hook line.

Every ten or twelve bullet buoys a larger inflated poly buoy is clipped on (clip on connections are used throughout) and every two miles another "hi-flyer" pole is set. It takes about three or four hours to set a line of 15 to 20 miles. As crews get practised the speed of setting increases. The number of hooks set varies between 20 to 50 per mile.

Hauling the longline is a virtual reversal of the setting operation. Hauling commences at daybreak and continues until the mainline is fully retrieved. This operation takes longer than the setting operation because the fish have to be landed back into the vessel and cleaned and iced before spoilage can set in. A typical haul would finish in the afternoon. (Initial longlining trials off Barbados have resulted in a catch rate of approximately one large fish per mile.)

It should be understood that the operation of longlining is an extremely busy one. Men have to work as a finely balanced team, it is a highly labour intensive operation taking many hours of the day and night. Little time is available for preparation of meals, smoking, resting or sleeping. Constant vigilance is an absolute must if accidents are to be avoided.

The style of operation is very different to that which is currently practiced in Barbados. The operation of shorter lengths of line as a supplementary during the high fishing season is a possibility.

2.2 List of Longline Fishing Equipment Requirements

This is for 5 miles of longline, targeting swordfish. Some additional fishing gear will be required for targeting other pelagics and for "spare" gear to allow for losses and training.

- a) 30,400 feet mainline
- b) 16,200 feet of "Gangion" lines
- c) 2,100 feet of buoylines
- d) 135 hooks
- e) 170 snap connectors
- f) 30 "bullet" floats
- g) 1000 "bait light" sticks
- h) 135 hook protectors
- i) 5 Hi-flyer Danns
- j) 135 leaded swivels
- k) bait
- l) ice
- m) spares of all the above items

Vessel Requirements

- 1) Compass
- 2) Auto pilot
- 3) Longline reel
- 4) Hydraulic power system
- 5) Echo-sounder

1. The 1990s and the 2000s

The 1990s and the 2000s were two decades of significant change for the world. The 1990s saw the end of the Cold War, the fall of the Berlin Wall, and the beginning of the end of apartheid in South Africa. The 2000s saw the rise of the Internet, the 9/11 attacks, and the beginning of the end of the Iraq War.

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APPENDIX 1

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E. Fishing Vessel Design for Proposed Project

Design for Project Vessel

32. The designs chosen for the Barbados fisheries are intended for either local or foreign construction. Since Barbados lacks well equipped workshops and shipyards, consideration has been given to simplicity in design, selection of hull material for easy maintenance and simple, robust equipment that can be operated easily. The designs and layouts allow for the inclusion of hydraulic equipment, which will also contribute to increased fishing efficiency and a reduction in labour costs.

Vessel Size and Description

33. The fishing vessel recommended for the project is a multi-purpose vessel that can operate up to 12 days/trip and with a maximum range of up to 180 nautical miles from the base of operations.

34. As average wind speed in the area is 16 knots and wave height 1 to 2 m, the vessel has to be designed to operate under rough weather conditions. It should, therefore, be of a heavy displacement type with a larger displacement in function of the length. It should also have sufficient depth and a wide beam, and would need an economic cruising speed of 8 to 9 knots.

Fish Hold Capacity

35. The fish hold capacity has been designed on the basis of the predicted catch rate/trip, to which a correction factor of 1.8 tons has been added, i.e. 6 tons of fish. The fish would be stored in bulk on ice, at the ratio of 1:1; therefore, the fish hold would need to hold a total of 12 tons of fish and ice, representing a total hold capacity of 18 m³.

Engine Power and Consumption

36. During the fishing season the maximum trip duration would be 12 days, including two days steaming to and from base and fishing ground. The required cruising speed of 8-9 knots would necessitate an engine power of between 110 to 150 hp. Fuel oil consumption per maximum trip of 12 days would be 2,200 l; therefore, the fuel oil tank should be of a capacity to hold a minimum of 2,500 l.

37. The freshwater tank capacity has been designed based on length of trip and number of crew. It is estimated that a total of 1,000 l would be required for a 12 day trip. (Based on three crew members - 20 l/day/person, plus 40% additional allowance).

Vessel Volume and Engine Power

38. For a fish hold capacity of 18 m³, a fuel tank of 2.5 m³ and freshwater tank of 1 m³, the cubic number (CUNO) is between 100 and 120; therefore, the

LOA should be between 11.5 to 14 m, but for good stability in Barbados waters the minimum vessel depth should be around 2.1 m. Assuming a constant value for boat depth of 2 m, the beam and overall length would lie between 4 - 4.5 m and 11.1 - 12.5 m respectively. The vessel specification has thus been calculated as follows:

LOA	=	12.0 m
Beam (B)	=	4.2 m
Depth (D) ^{1/}	=	2.1 m.

For a CUNO of 100-120, the engine power should be between 110-145 hp and the recommended engine would, therefore, be in the region of 120 - 150 hp rating of 1,800 RPM.

General Characteristics of Proposed Project Vessel (see Figures 13 and 14)

LOA	=	12 m
Beam	=	4.2 m
Depth	=	2.1 m
Fish hold volume	=	18.0 m ³ (12 tons of fish and ice)
Fuel oil tank	=	2.5 m ³
Fresh water tank	=	1.0 m ³
Main engine	=	110 to 150 hp (at 1,800 RPM)
Diesel generator	=	10 hp
Electric power	=	2 kW
Hydraulic power	=	20 hp pump, open system

Deck Machinery

- 1 Hydraulic net hauler (600 kg pull)
- 2 " longline haulers (600 kg pull)
- 2 " trolling gurdies (300 kg pull)
- 2 Outrigger trolling booms (10-12 m long, aluminium)

Navigation, Communication and Detection Equipment

- 1 Steering compass (5 in diameter)
- 1 Automatic pilot (connected to steering compass)
- 1 Radio transmitter SSB (output 50 watts)
- 1 " " VHF (output 10 watts)
- 1 Radio direction finder (RDF) in MF or LW frequency
- 1 Echo sounder (50 KHZ frequency and 500 m range)
- 1 Sea water temperature register (recorder, dry paper type).

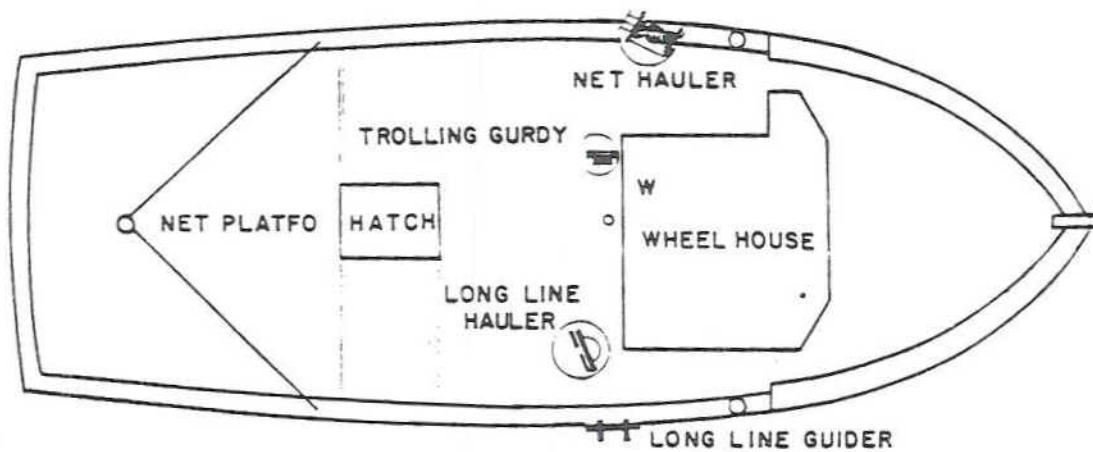
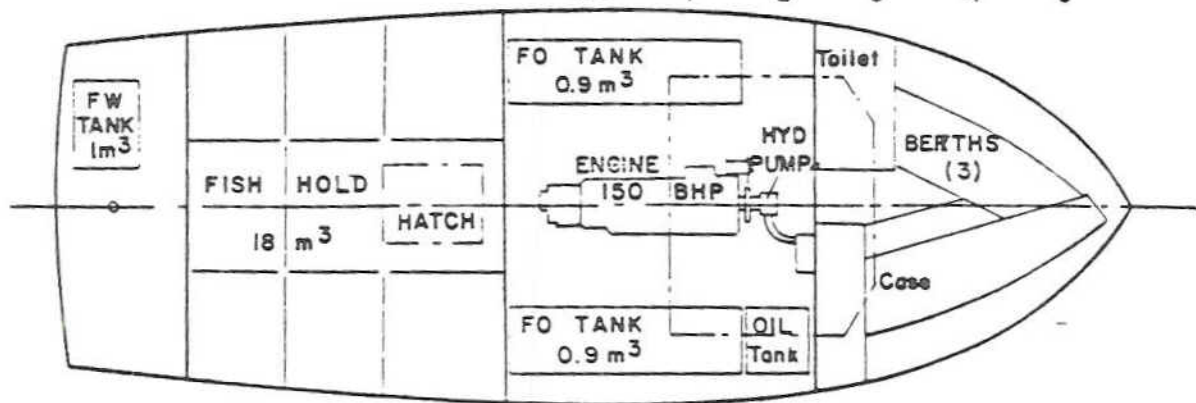
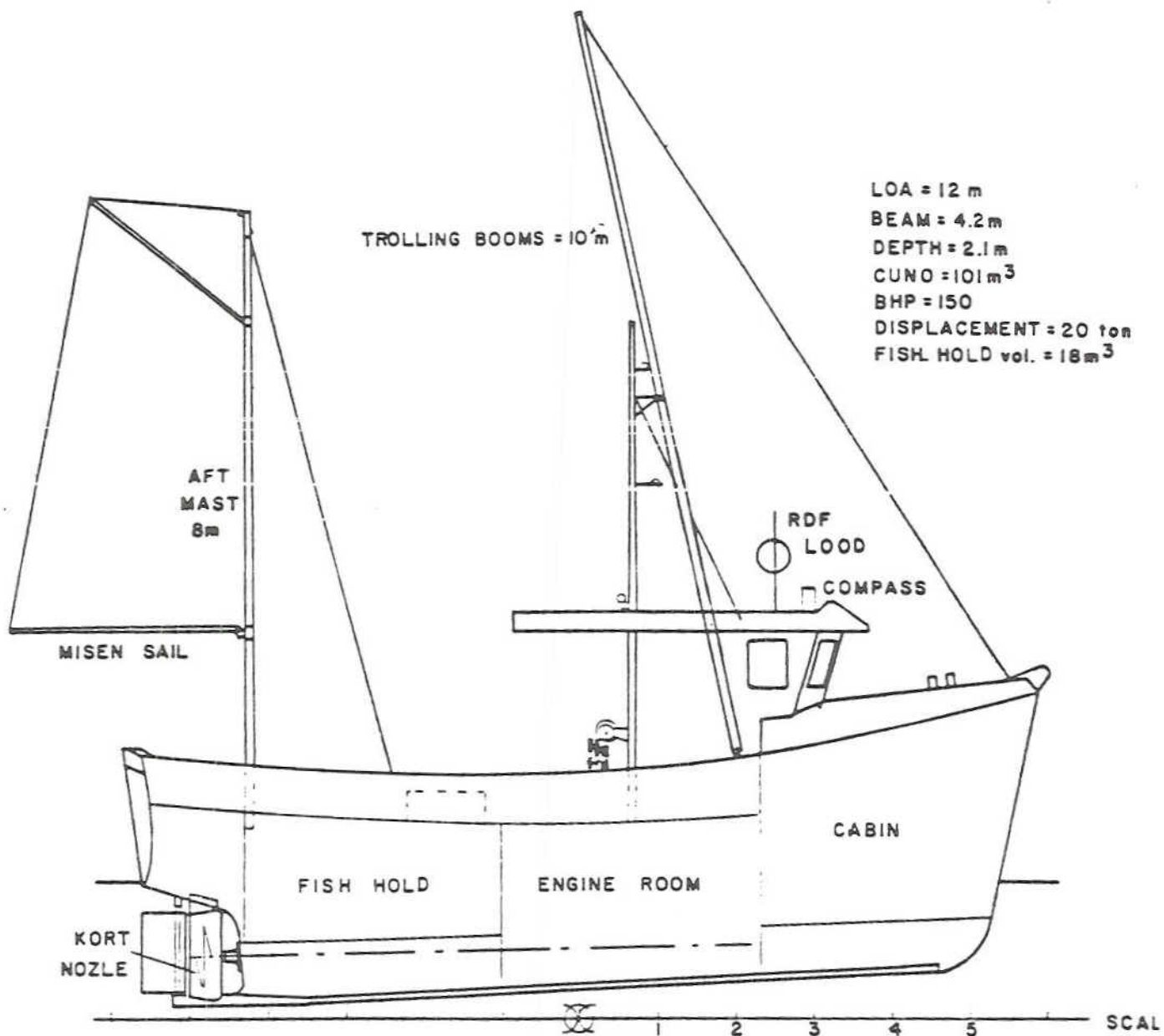
^{1/} Minimum moulded depth.

Fishing Gear

Five pieces of flying fish gill net (each of 50 m length; 38 mm mesh size)	=	250 m
One Florida surface longline (100 hooks)	=	2,000 m
Trolling lines (and 11 hooks)	=	11 lines
Hand lines (1 hook/line)	=	3 lines

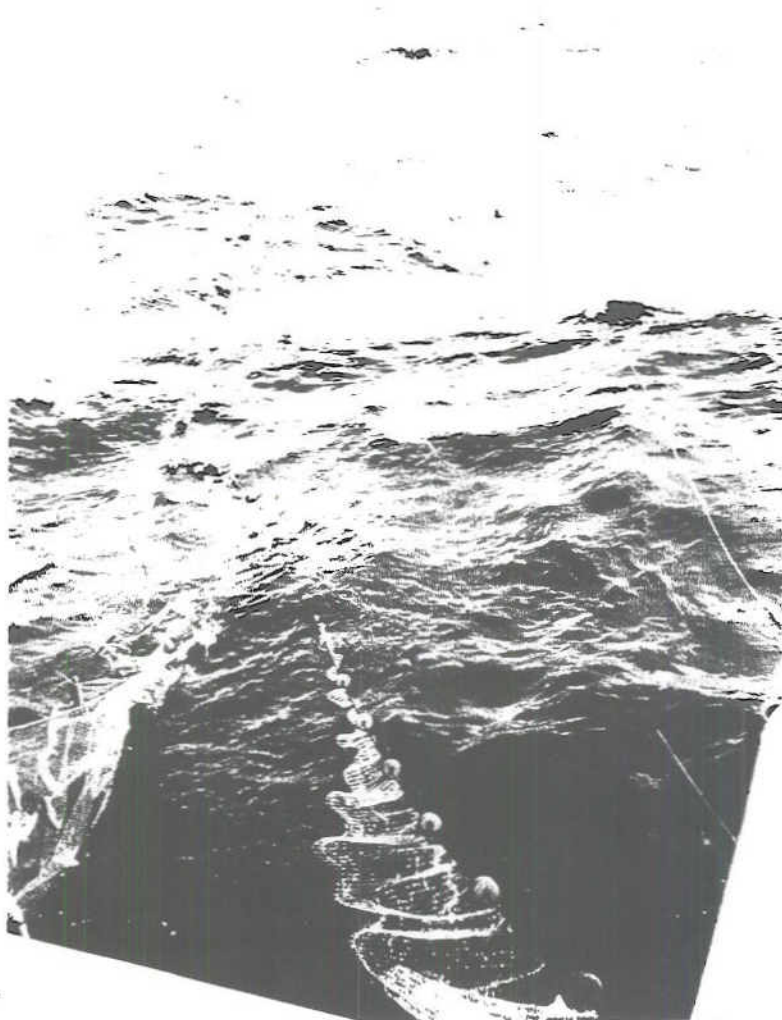
Project Vessel Cost (detailed)

	US\$
<u>- Investment Cost</u>	
Hull (CUNO 100)	50,000
Engine (hp 150)	18,500
	<hr/> 68,500
<u>- Deck Machinery</u>	
1 Hydraulic net hauler (pull 0.6 tons)	1,100
1 " longline hauler (0.6 tons)	1,100
1 " trolling gurdy (0.2 tons)	850
Hydraulic system	1,950
	<hr/> 5,000
<u>- Navigation, Communication and Detection Equipment</u>	
1 Radio Direction Finder (RDF)	1,700
1 SSB radio-transmitter (50 watts)	2,600
1 VHF " " (10 watts)	630
1 Echo sounder (for 500 m)	1,000
1 Automatic pilot (with steering compass)	1,270
1 Recording SWT (chart type)	500
	<hr/> 7,700
<u>- Fishing Gear</u>	
Five pieces (250 m) of gill net, 38 mm mesh size	3,830
One set of surface tuna longlines (2,000 m)	1,190
Eleven trolling lines	738
Assorted hand lines	242
	<hr/> 6,000

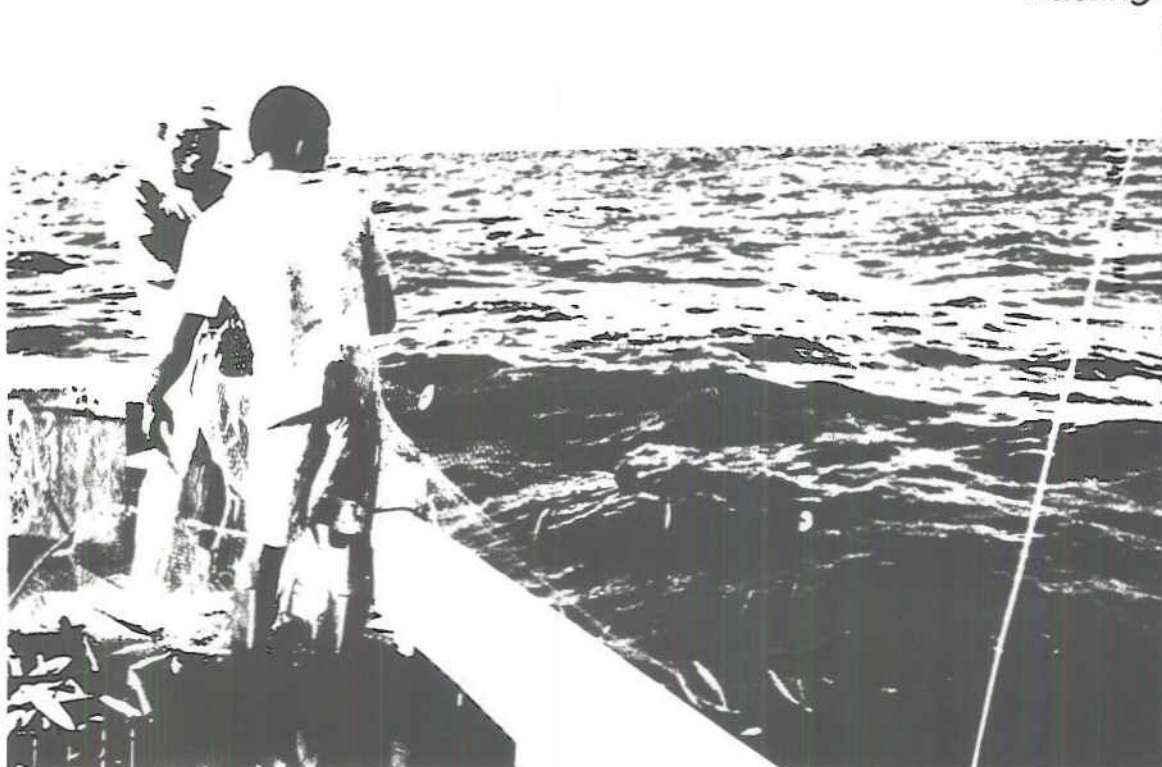


Appendix 2

Nets set



Hauling nets



Flying fish gill netting



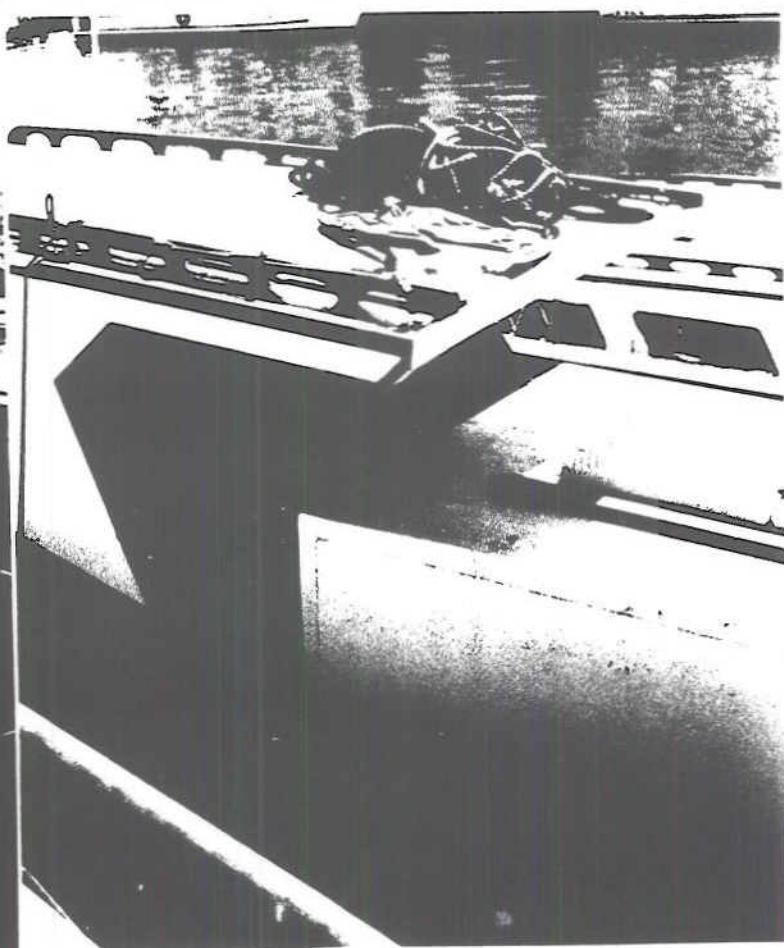
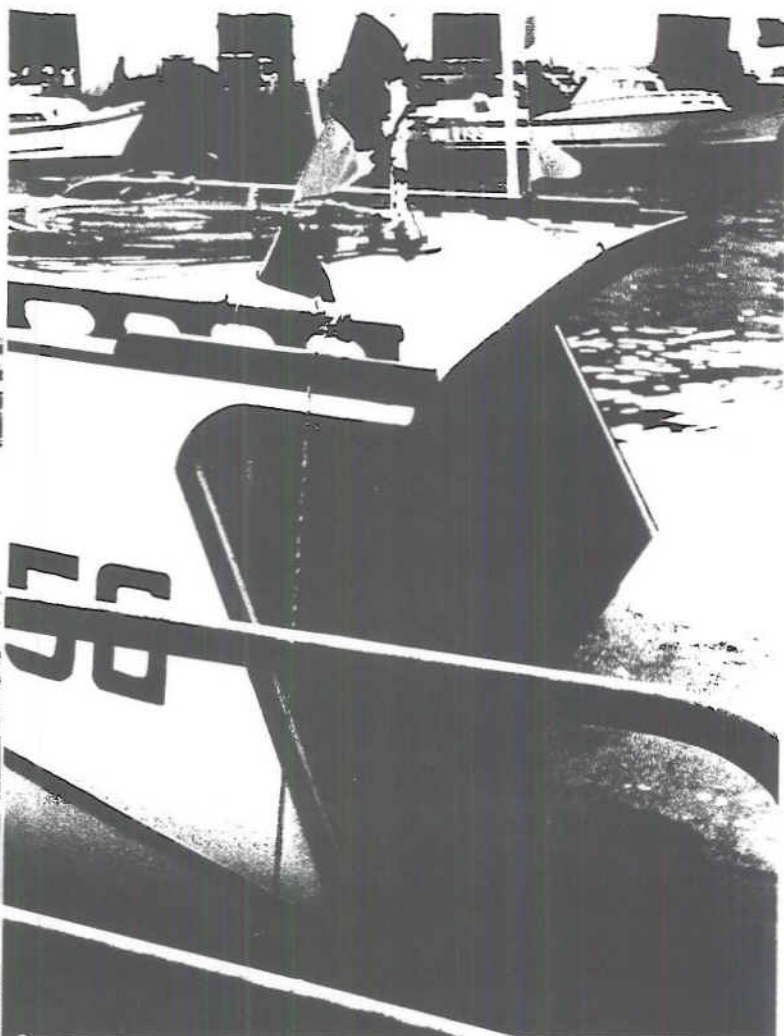
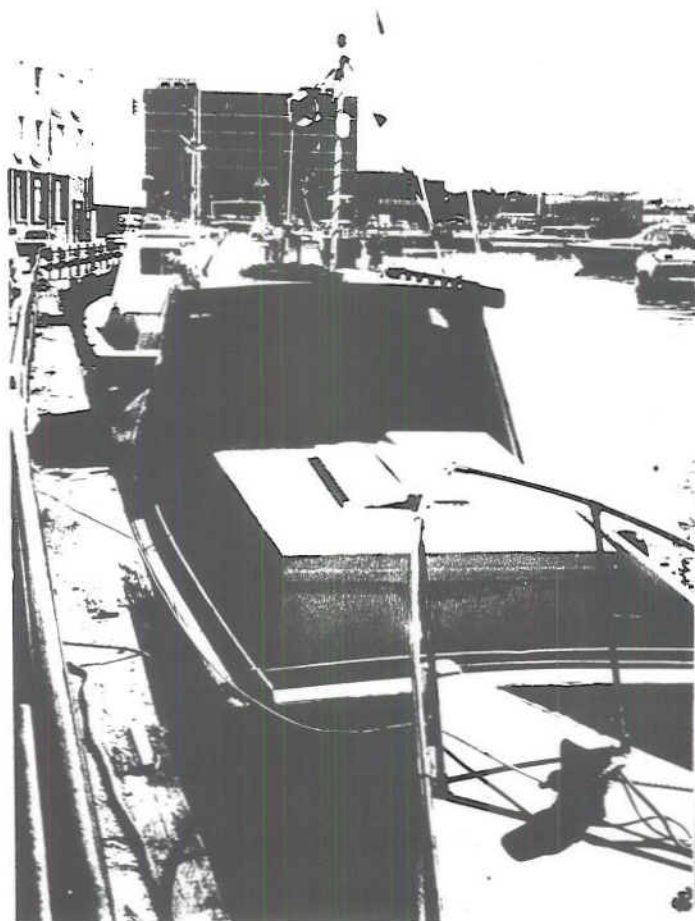
Hauling nets

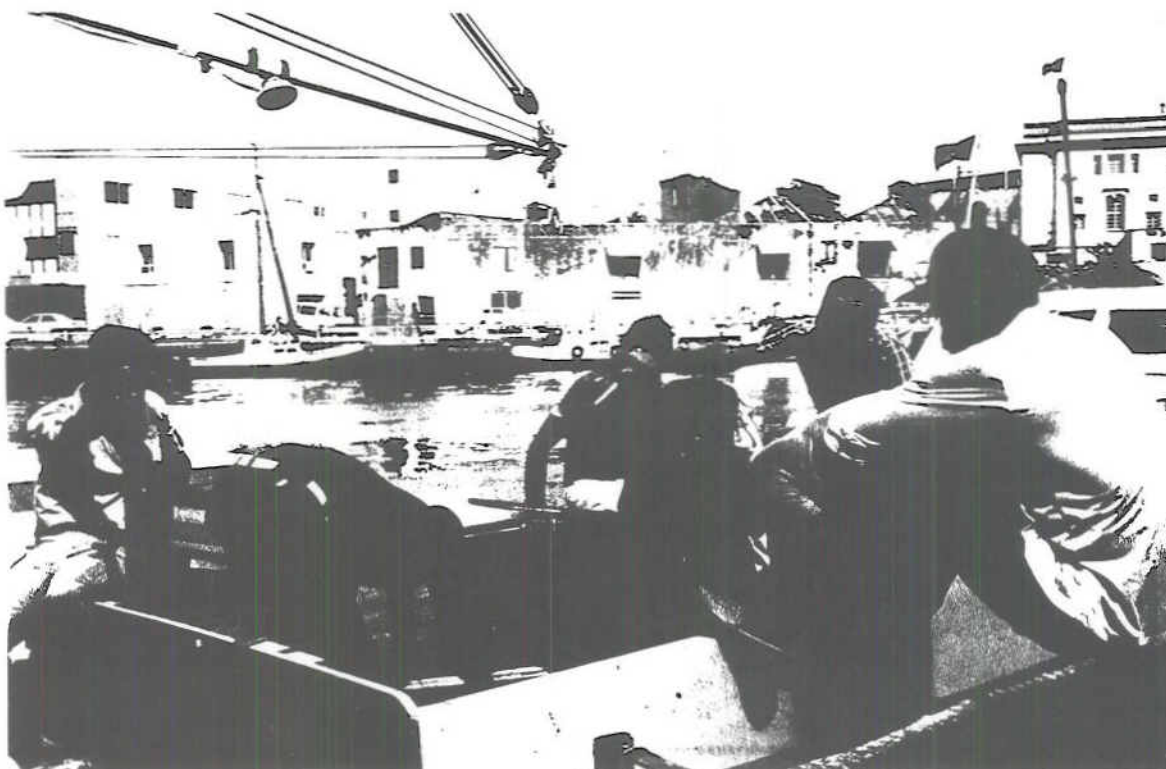


Cleaning nets

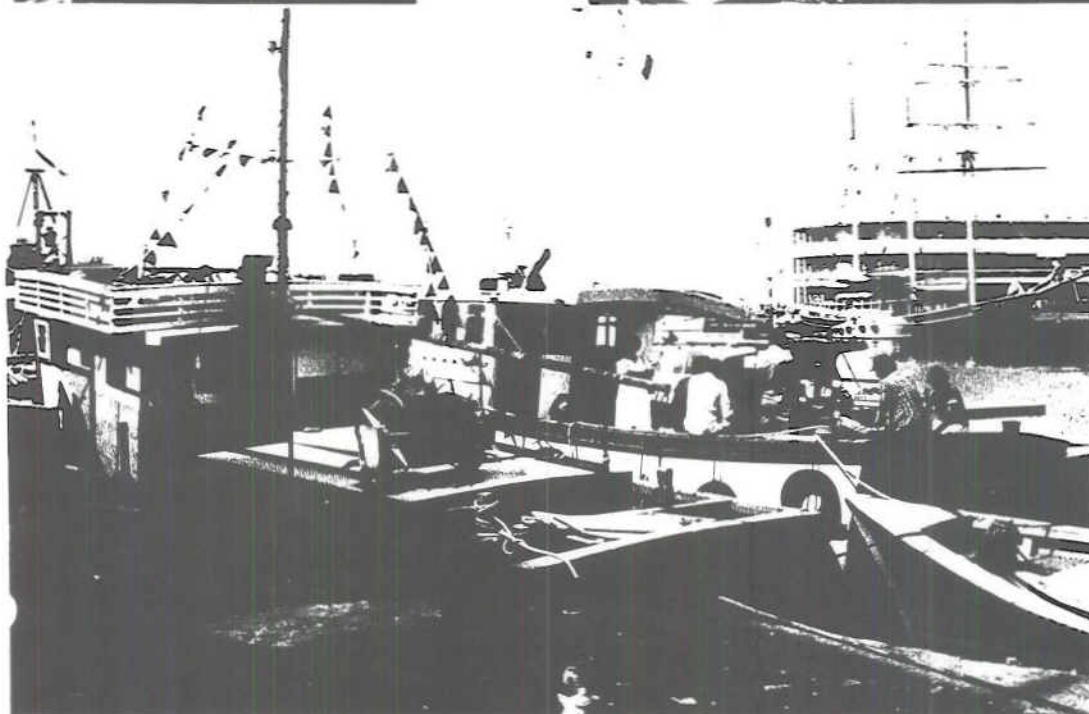
Appendix 3

Barbados "iceboats" showing restricted cabin door

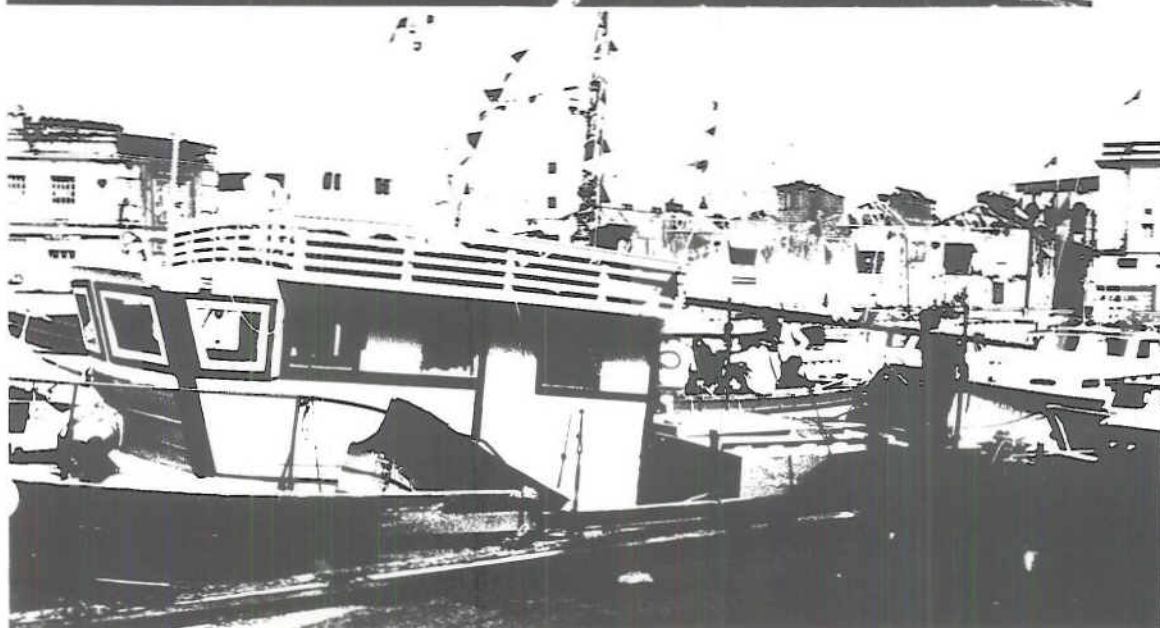


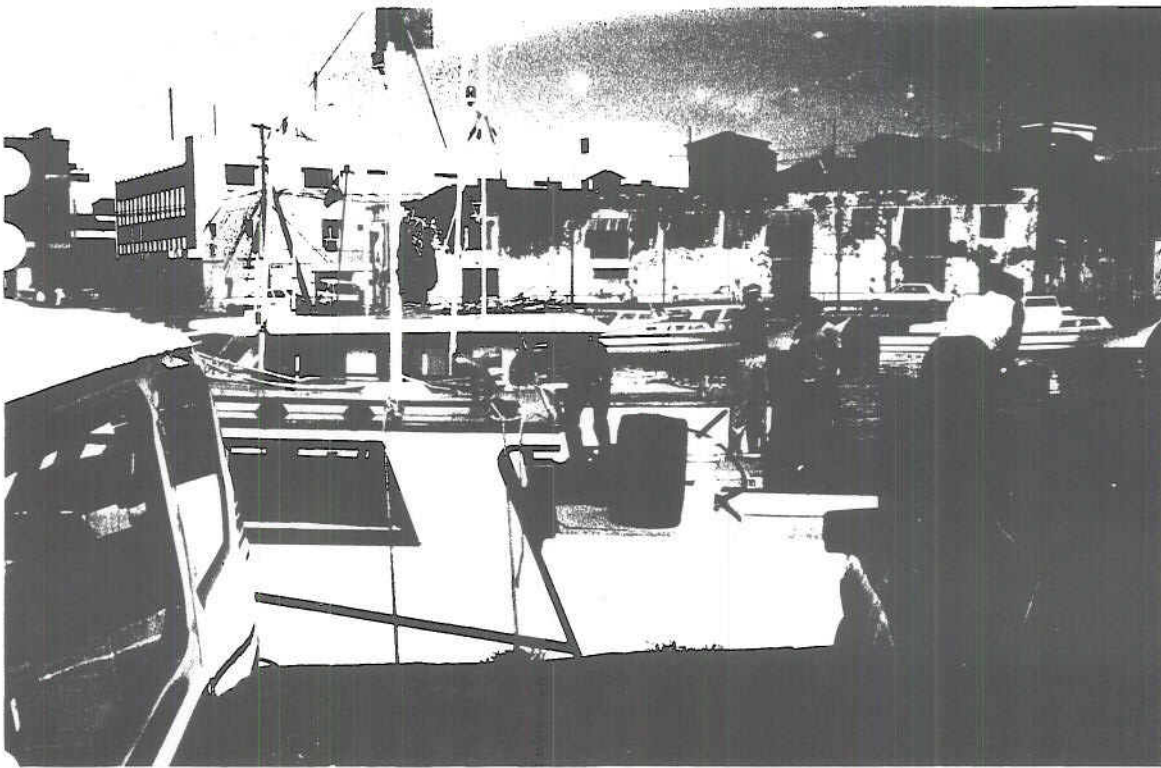


*Fitting out
38' Cygnus
for longlining*

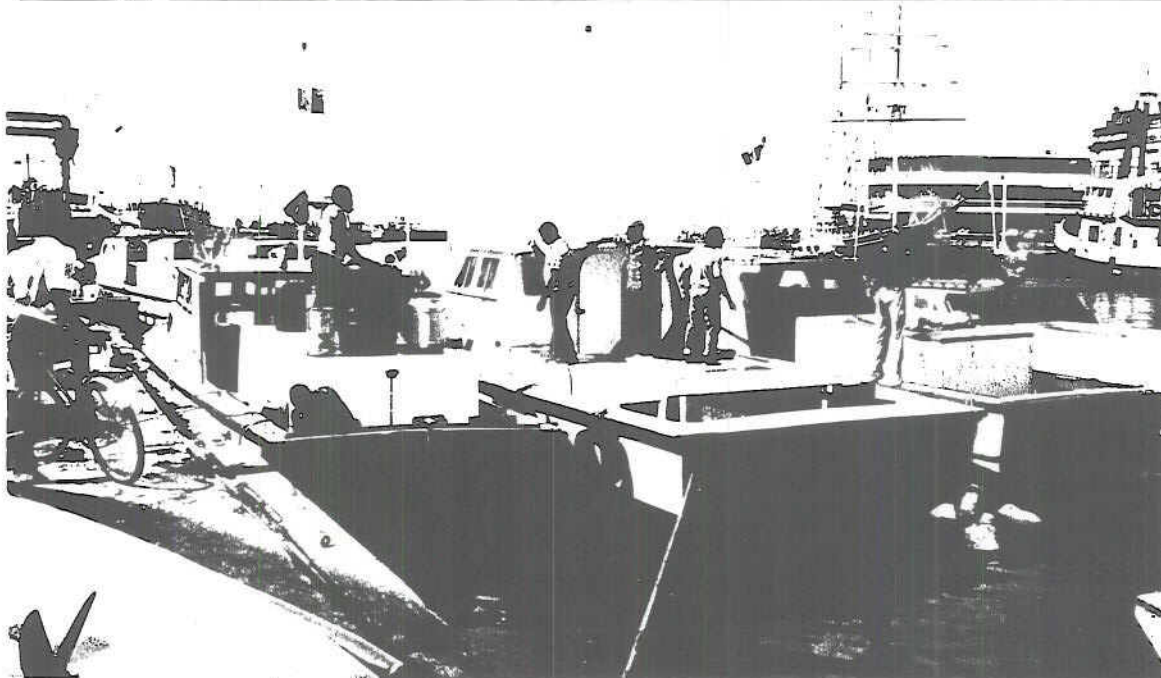


*Large wooden
"iceboat" fitted
with 2 mile
longline spool
on top of icebox*

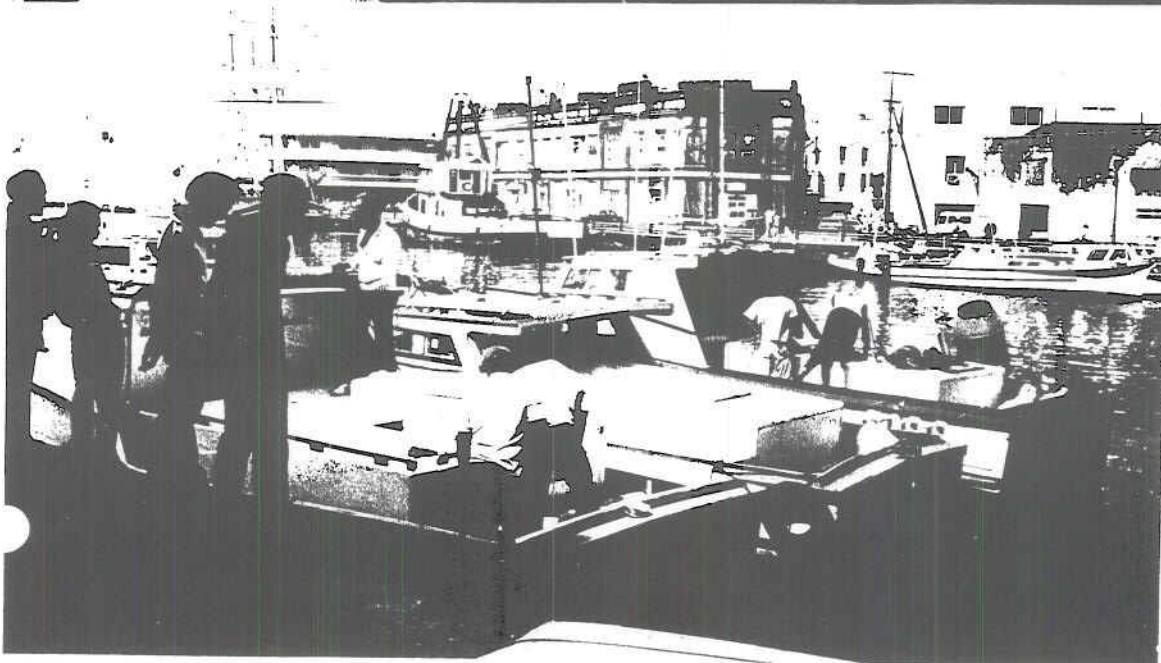


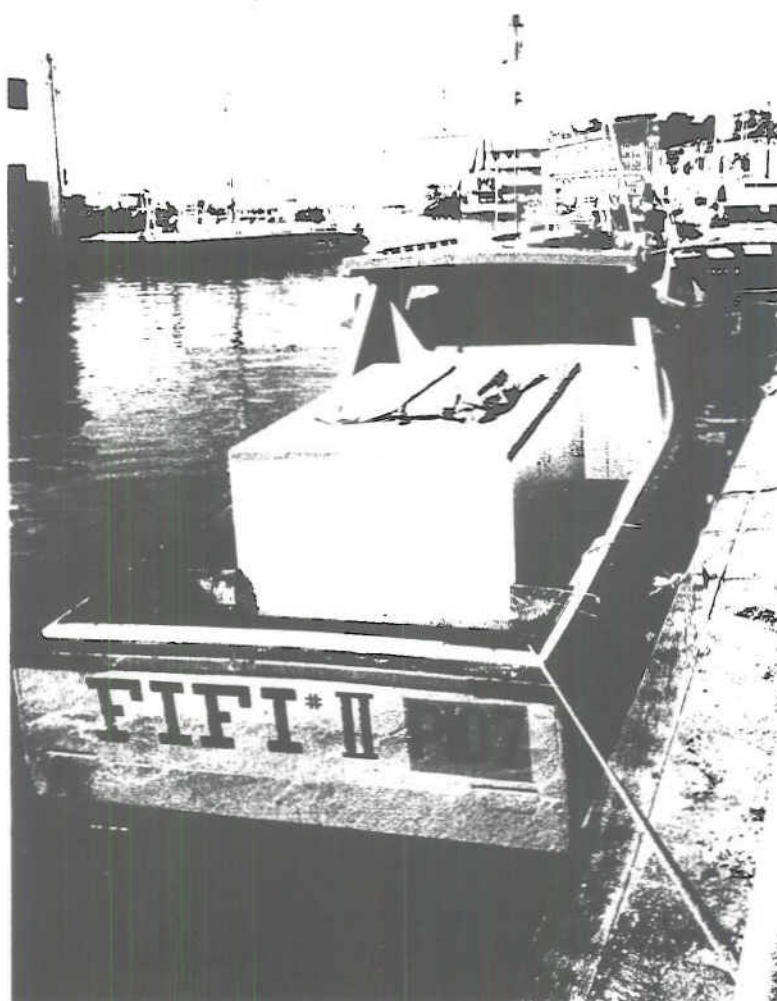


Iceboats



*Iceboat
taking on ice*

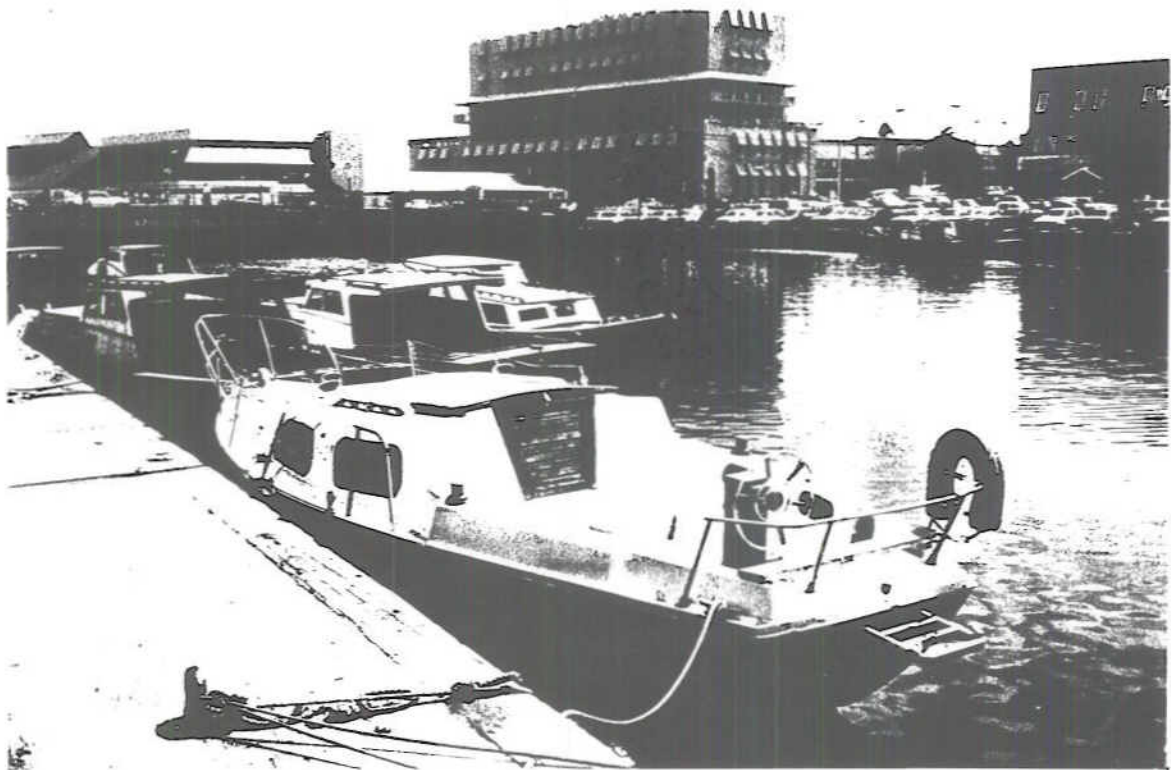




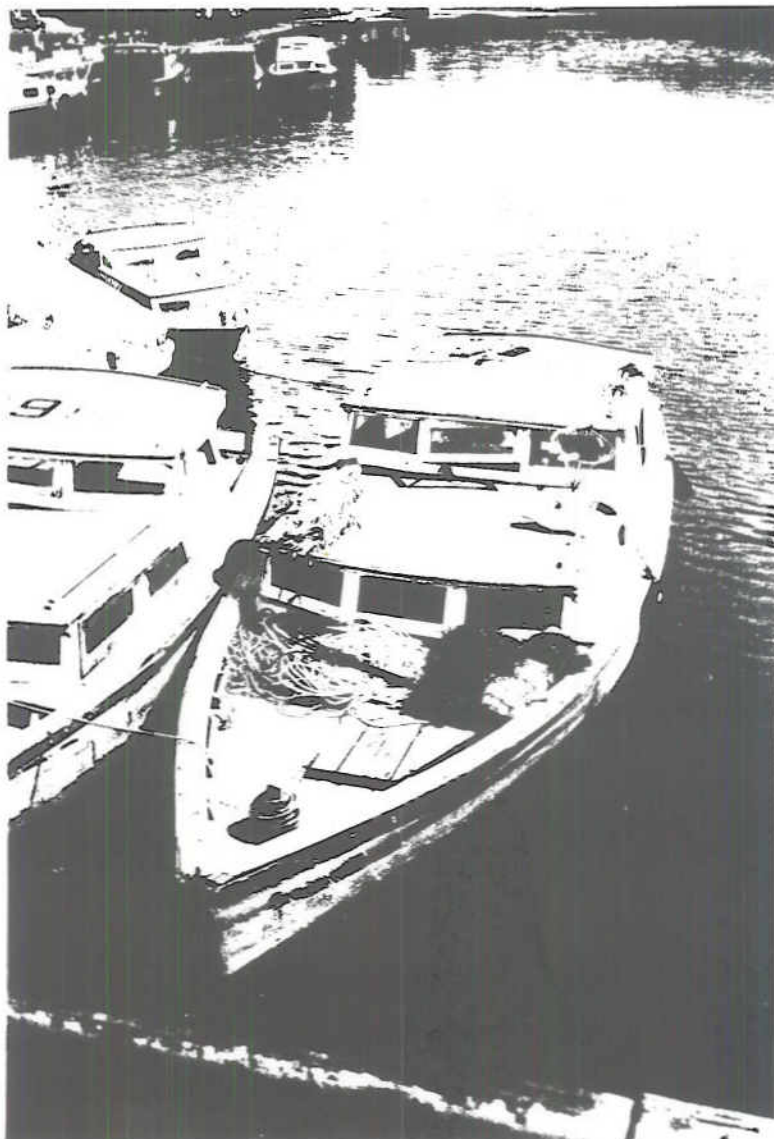
Iceboats



Iceboats



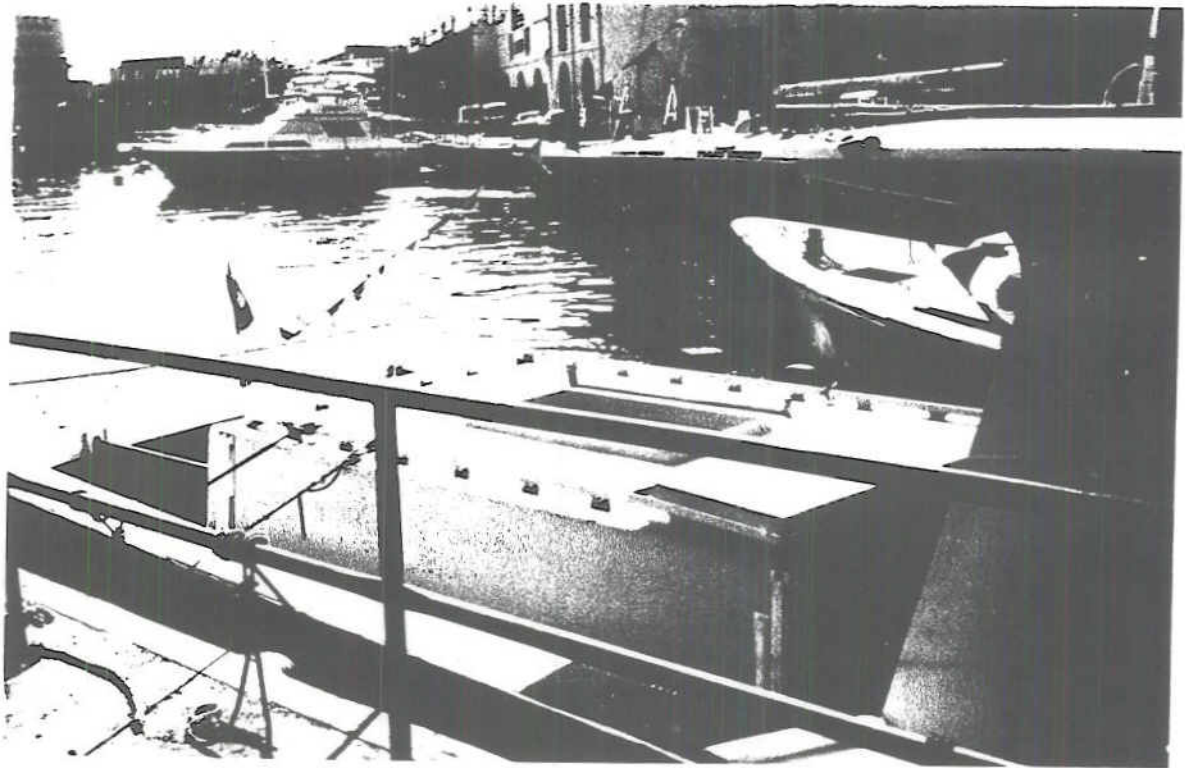
*Sail boat converted
to "Dayboat"*



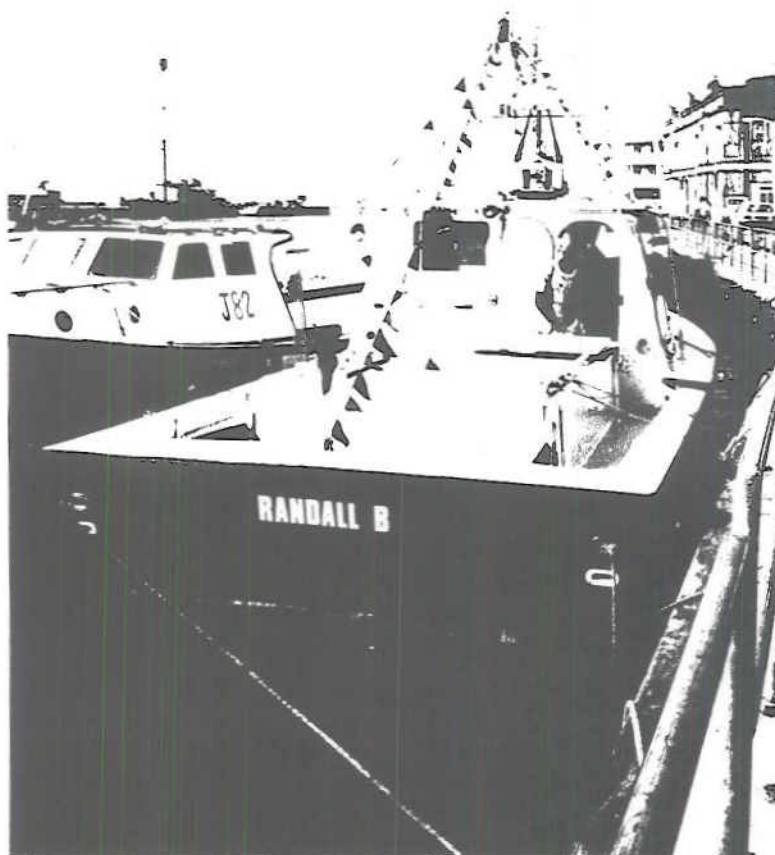
Dayboat

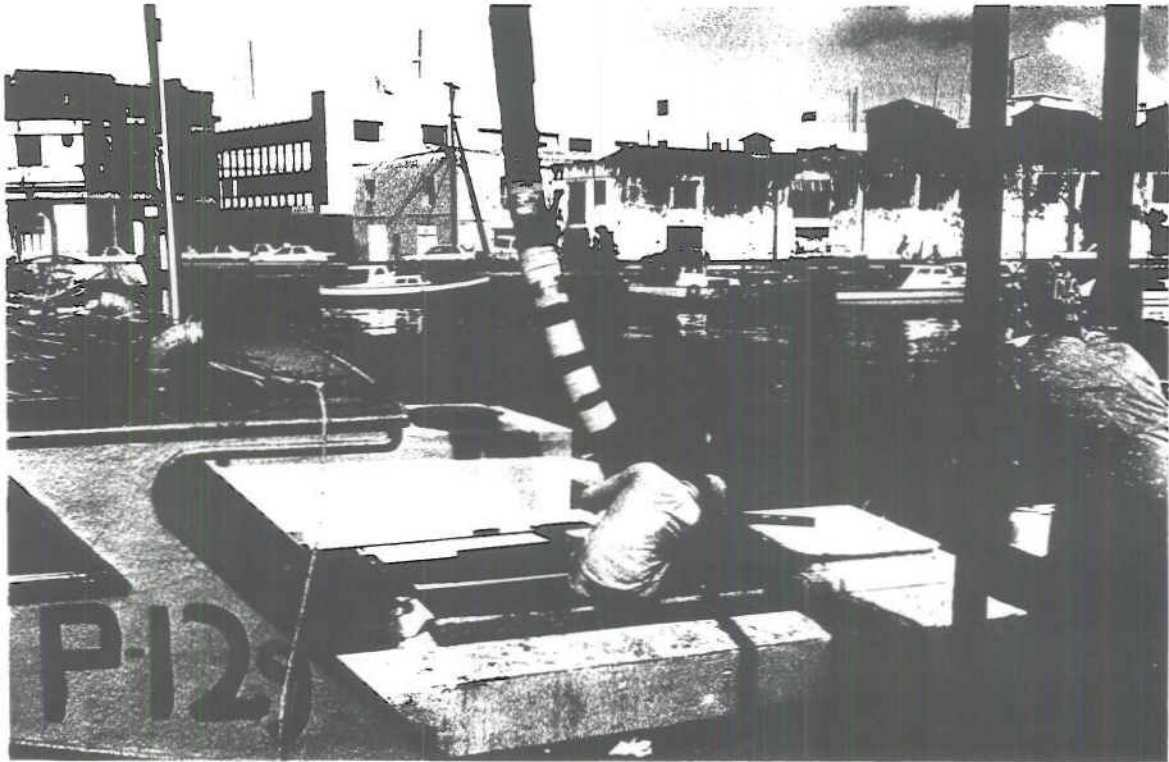


Dayboat

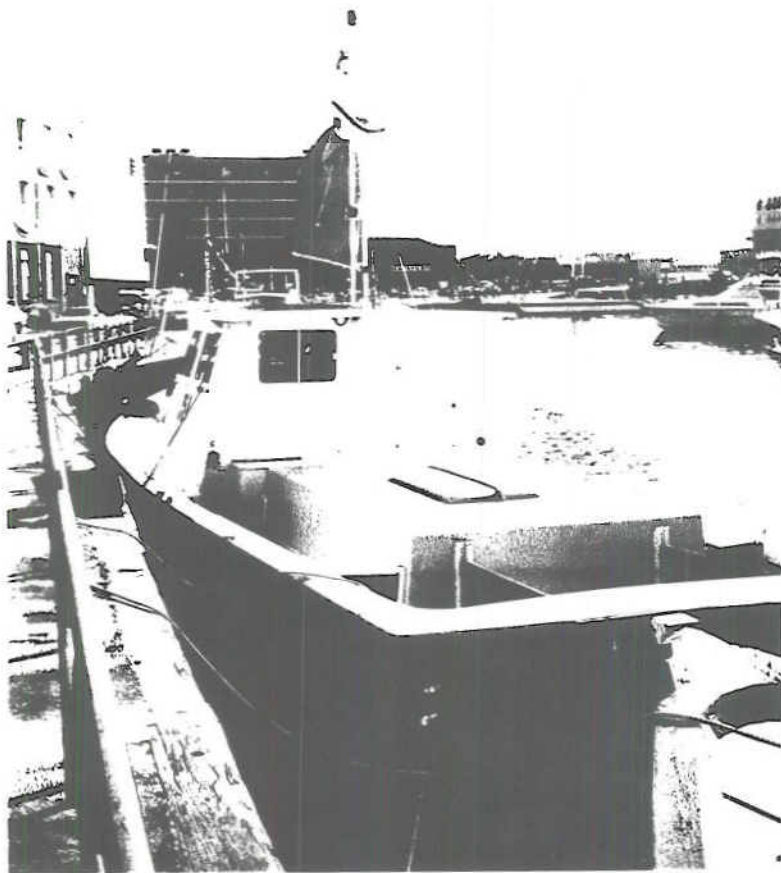


*GRP iceboat
made in Barbados*

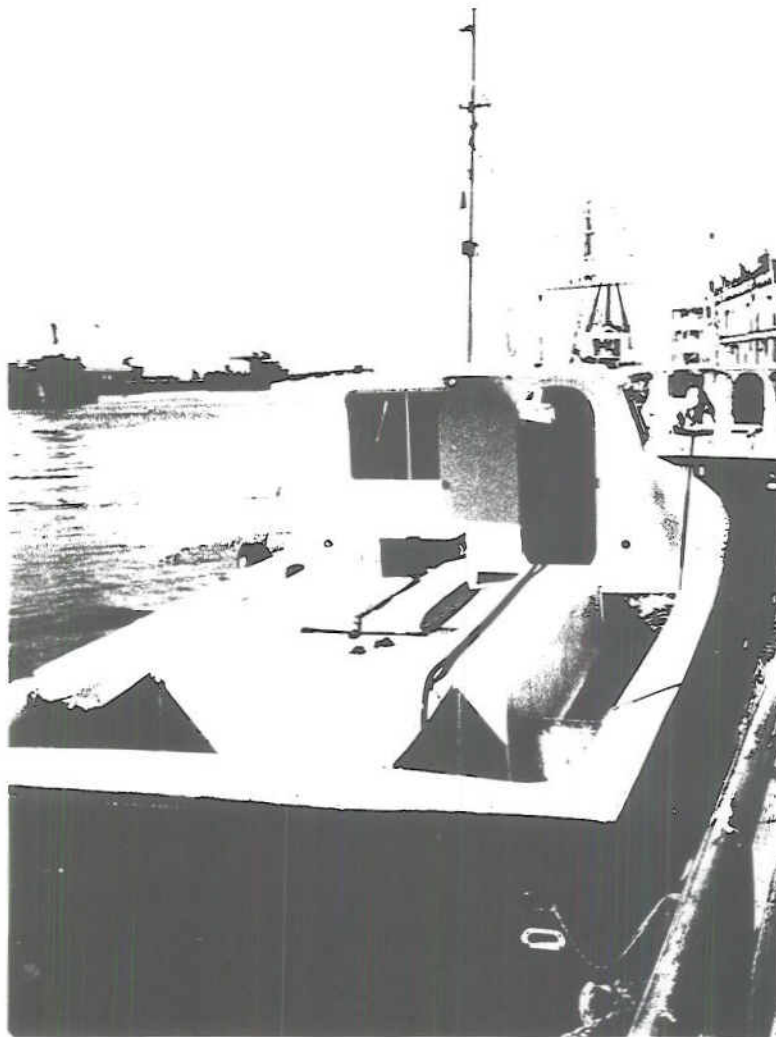




Iceboat taking on ice

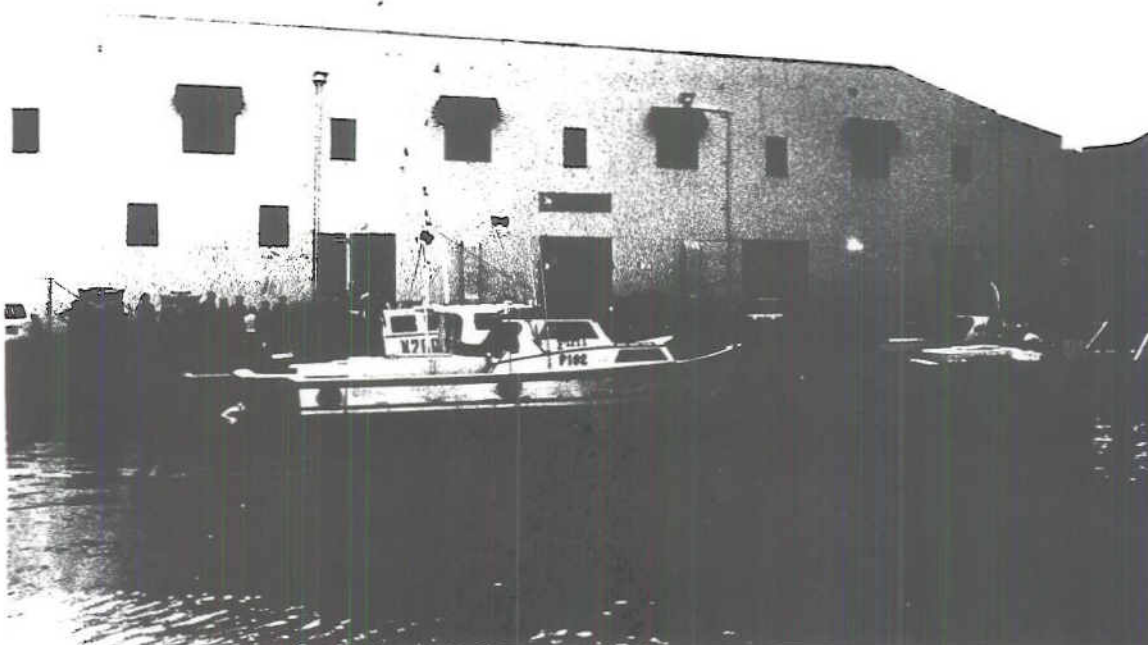


*GRP iceboat
made in
Barbados*





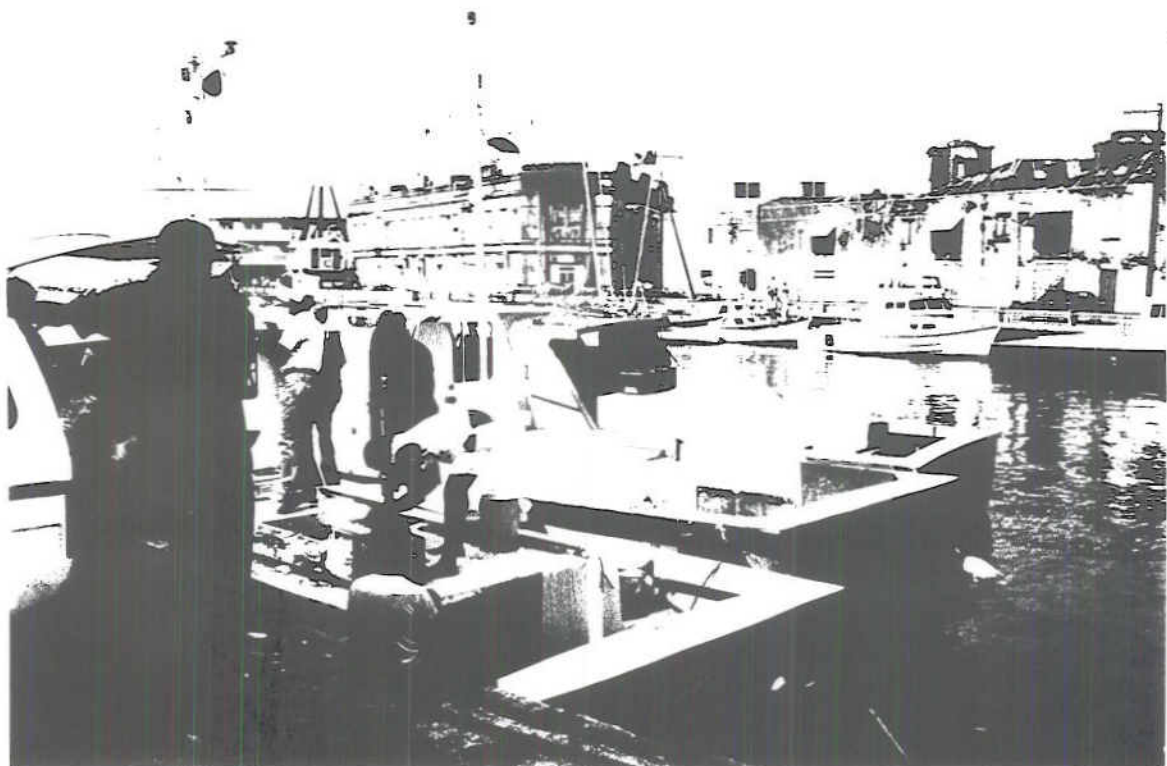
Iceboats



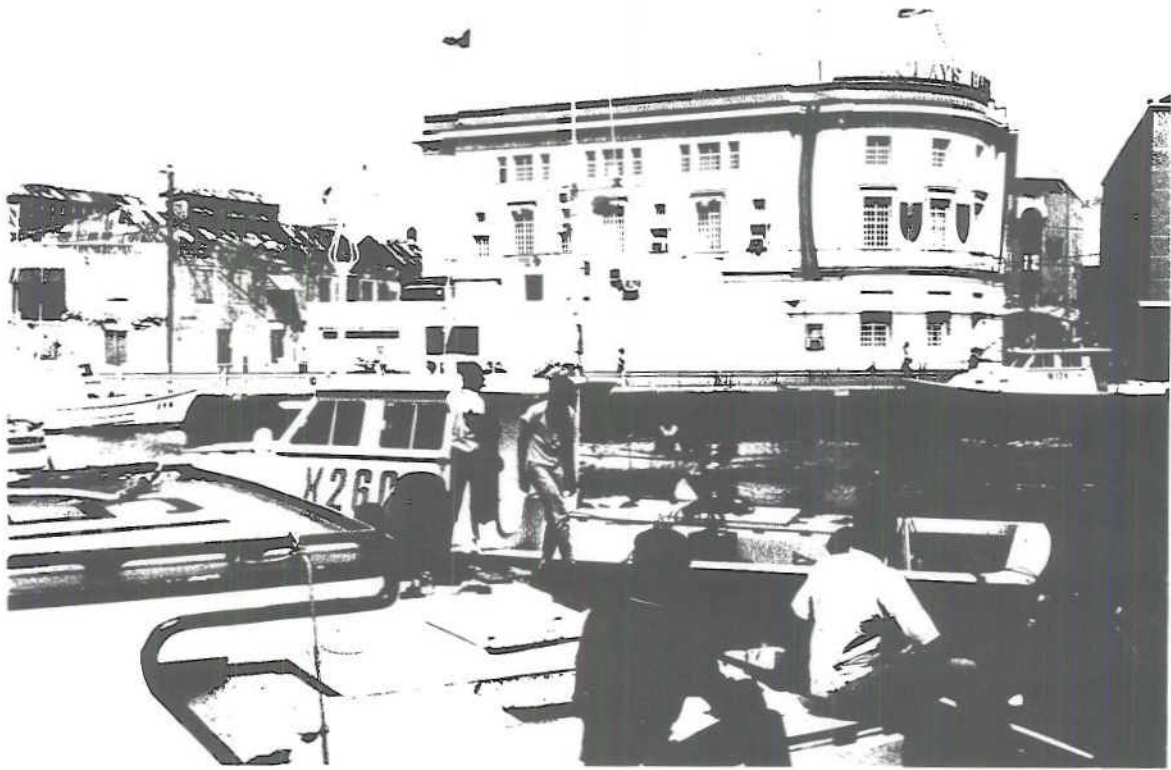
Iceboats



Iceboats

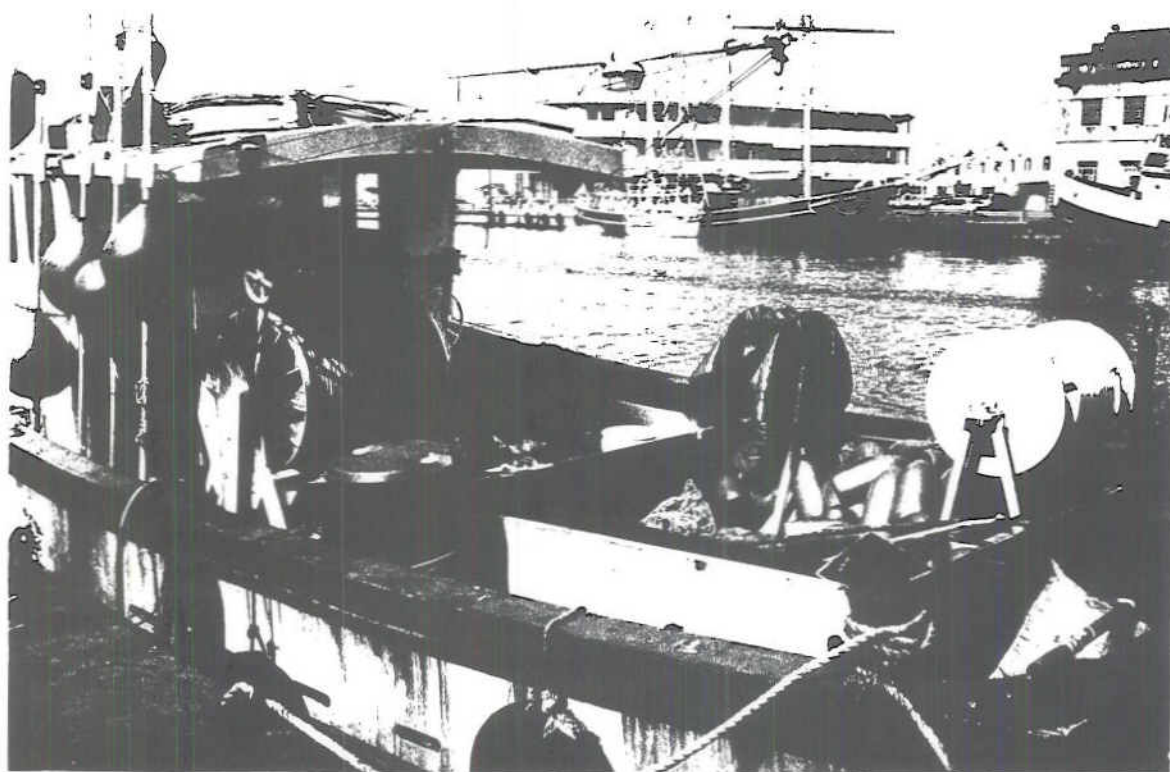


Iceboats

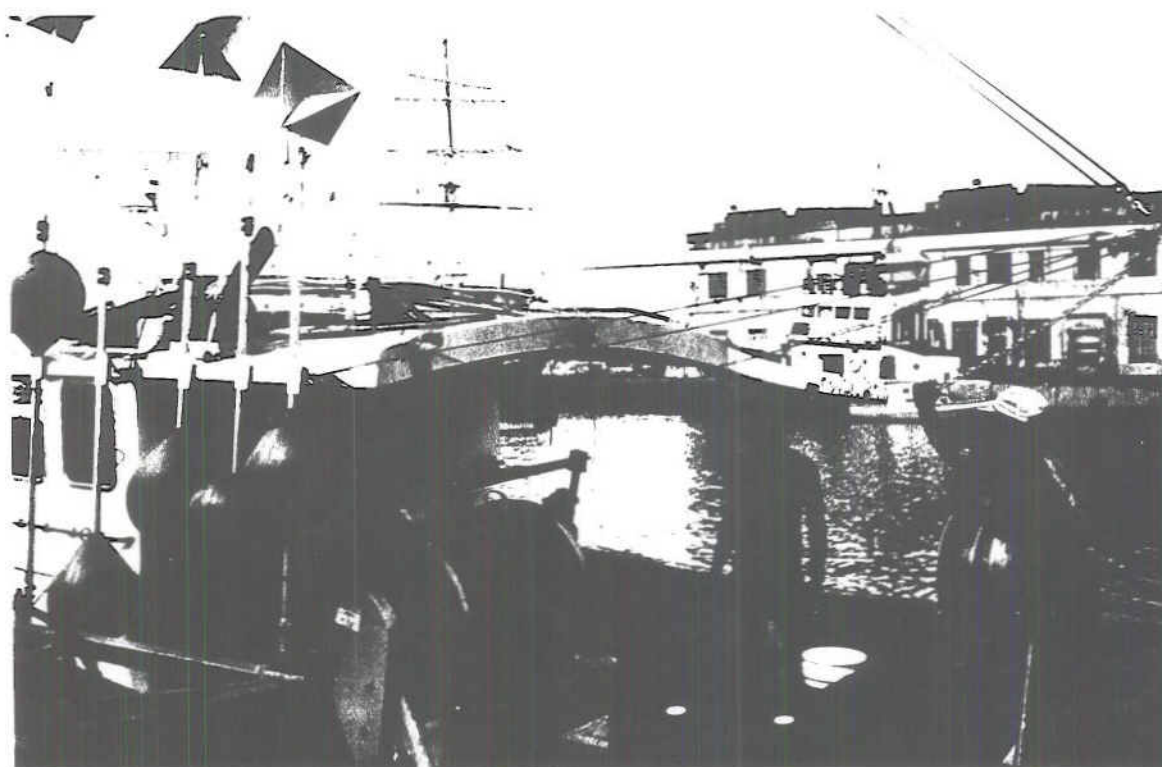


Iceboats

Deck layout of Cygnus 38' "Florida style" longliner



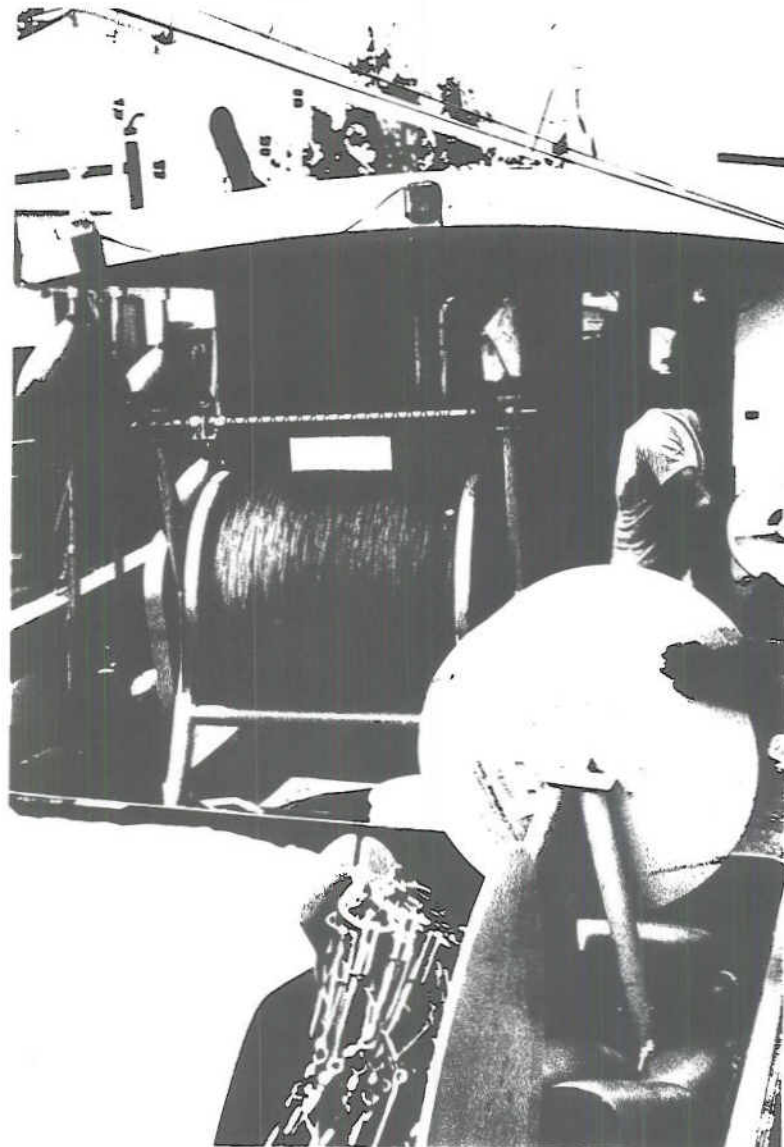
Fish/Gear pound



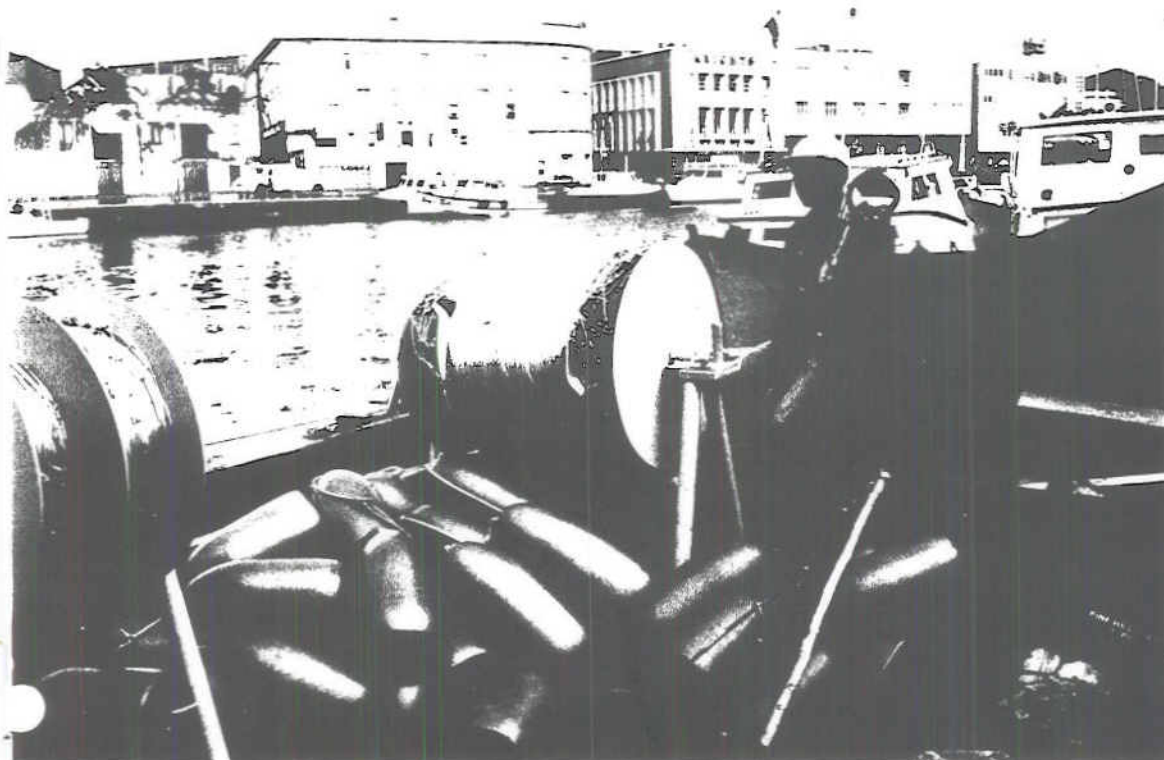
"Hi-Flyers" (flag poles) with radar reflectors and strobe lights

Deck layout of Cygnus 38' Longliner "Florida style"

*20 miles
longline
reel*



*"Bullet buoy
snap-on
line spool*



*Snap-on
"Gangions"
and hook spool*

*Bullet buoy
in "pound"*

Two separate buoy line lengths stored separately in same spool

