

APPENDIX 8

Proposed Developments for the Day Boat
Fishery.

PROPOSED DEVELOPMENTS FOR THE DAY BOAT FISHERY

1. INTRODUCTION

One of the tasks of the Fisheries Institutional Strengthening Project (Technical Cooperation ATN/SF-2474/BA) is to examine possible areas for development within the fisheries sector which can be either further explored during the course of this project or examined at a later date by the Fisheries Division itself. To this end it was decided to assess possible avenues for development which could help improve the situation with the day boat fleet.

2. BACKGROUND

The majority of fishing boats in Barbados are day boats. In 1989 there were 450 registered day boats (although probably only 400 of these are operational), each with a crew of one or two men. In terms of fish supply, the day boats make a very significant contribution with landings estimated at between 2,400 and 3,000 tonnes per year.

However the day boat fleet is in a state of severe and rapid decline. In a recent FAO study (Horemans and Burtonboy) it was clearly demonstrated that the boats are unprofitable and that the fishery has now become a typical "subsistence fishery". The income from the boats is such that they can cover direct operating costs but not the payment of interest on their loans or depreciation costs. Consequently few, if any, new boats are entering the fishery so the fleet, is steadily becoming older with an average age of 13 years.

The same applies to the fishermen, whose age range is 35 to 65 and getting older all the time, since young people are not being attracted into the fishery. An additional problem is that some of the more dynamic members of this particular fishing community have moved into the ice boat fishery and that unless conditions change it is quite conceivable that, in due course this sector of the fishery will fail completely.

3. DEVELOPMENT OPTIONS

To become viable the day boats need to increase their earnings by catching more fish in a year and/or obtaining higher prices for their catch. It is also important to try and find ways of reducing costs, in particular, that of fuel which is disproportionately high due to the generally overpowered engines which have been fitted to the fleet. Whilst there is no single simple solution to the problem, there are a number of possible courses of action which warrant some investigation in an attempt to improve conditions within the fleet.

3.1 Fish Prices

Fish prices have remained low for a number of years due mainly to the fact that distribution is limited and there has been a shortage of appropriate storage facilities so that the market is very rapidly satiated during the fishing season. The introduction of the ice boats, over the past few years has had a dramatic effect with their much greater landings coming from the waters around Trinidad and Tobago.

During the 1988/89 season two factors contributed to a considerable increase in the fish price. One was the very poor landings from catches made around Barbados during the

early and middle part of the season. This was compounded by the ice boats being denied access to the waters around Trinidad and Tobago. This resulted in individual flying fish being sold at 90 cents compared with a figure of 20 cents during the previous season. Whilst it is to be hoped that the poor local catches are but an aberrant blip, a continuing denial of access to Trinidad and Tobago waters will certainly result in increases in fish prices creating a scenario which could prove very de-stabilising for the industry as a whole. The opening of the new Fisheries Terminal will hopefully provide the means whereby the peaks and troughs of supply, and therefore price, can be smoothed out to the advantage of everyone, but may be that the Government should give some consideration to the introduction of a minimum price scheme.

3.2 Increased Catches

Due to the limited continental shelf area and the resultant restricted demersal stock, the cornerstone of the industry in Barbados is the pelagic fishery which accounts for 90% of the total amount of fish landed each year.

The two principal species are: the flying fish, constituting between 60 and 65% of the total catches; and dolphin fish, accounting for between 20 and 25%. Other significant components are Kingfish, Tuna, Swordfish, Billfish and Sharks. The pattern of the fishery is therefore dominated by these species and their migratory behaviour - which is such that they are in the area for the months of November to July with peaks of abundance occurring around April and May.

3.2.2 Pelagic Fishery

Extended Fishing Trips

Since, in most years, flying fish are by far and away the largest resource, efforts should be concentrated on seeking ways of increasing the catch of this particular species.

It seems unlikely that anything can be done to improve the efficiency of the gill nets but it is felt that catches could be markedly increased if the boats spent more time on the fishing grounds than they do at present.

At the moment the boats operate on a daily basis, arriving on the grounds at sunrise where they remain until around 1500 hours at which time they depart in order to return to port to sell their fish that evening. The existing practice is highly inefficient with the boats frequently abandoning good fishing prospects in order to return to port that evening and the practice of steaming to and from port at high speed and searching for fish every day being both costly in time and fuel.

It seems probable that bigger catches could be obtained and operating costs markedly reduced if the boats were to remain on the fishing grounds overnight returning to port the following morning. Such an operation would require the boat to use ice and for the boats to maintain a crew of at least two for watch keeping duties at night.

Apart from flying fish, small improvements in fishing gear could result in considerably increased catches of other pelagic species. One such improvement would be the introduction of the "artisanal drifting long line system" which was introduced by the fishing gear technologist earlier in the current project. This deploys five miles of drifting long line with about 100 hooks. A further improvement would be the introduction of trolling booms from which up to 7 lines could be set with multiple hooks. Currently the boats only operate 2 trolling lines when they are steaming to and from the fishing areas, and a threefold increase in effort could be achieved at a very minimal cost.

FADS (Fish Aggregating Devices)

A considerable amount of the time and fuel currently utilised by the day boat fleet is spent in searching for shoals of fish. A possible improvement in this situation could be achieved by the introduction of FADS. FADS are anchored floating devices consisting of either rafts and/or collections of palm fronds which serve to attract and concentrate fish in their immediate vicinity. FADS have been successfully used in commercial bait fish and tuna fisheries in the Pacific and elsewhere.

The current fishery actually utilises a small version of the FAD which is in the form of the "Screeler". It is possible that the careful location of FADS around the island would serve to attract and concentrate both flying fish and the larger pelagics thereby minimising the search time required.

3.2.3 Demersal Fishery

Demersal species are caught throughout the year by small in-shore boats and the catch from these craft could probably be greatly increased by the introduction of some mechanised fishing gear such as snapper reels and pot-haulers. Snapper reels, in place of the hand lines used at present, would enable the boats to make more hauls per trip and to fish the deeper water banks which are currently under exploited.

The use of mechanical pot-haulers has already been shown to result in greater catch rates. The haulers enable boats to set an increased number of pots, to haul more in a trip and to fish in deeper water.

3.3 Extended Fishing Season

The majority of day boats operate for only 6 or 7 months a year from November to the end of June when the flying fish, Dolphin fish and other species are present in the waters around Barbados.

The economic position of the boats would be improved if they were able to operate viably during the months of July to October.

The availability of pelagic species is certainly limited at this time but there is a possibility for King fish and Jacks to be caught during the off season period. However very little is known about the resource at this time of year and it may well be that the use of FADS, as described earlier, may serve to concentrate fish and enable the boats to operate effectively.

The introduction of mechanised haulers and snapper reels, again as described earlier, would enable the day boats to work both the limited shelf areas as well as to explore the deeper under exploited banks, lying off the coast. There is very little information about these banks which lie in waters in excess of 100 fathoms, but there may well be sufficient stocks to support a small-scale commercial fishery during the off season.

Squid are understood to be present in the waters around Barbados between the months of July to October. Small quantities are caught and used as bait by the fishermen. The gear technologist is currently engaged in an exploratory fishing programme, to establish whether a fishery exists for this species, utilising squid jiggers fitted to the Fisheries Division research vessel.

3.4 Boat Design

Day boats vary in size from 6 metres to 12 metres (20ft to 40ft). They are powered by inboard diesel engines ranging in size from 50 to 200 horse power. For the most part these engines are grossly overpowered, resulting in high fuel consumption and therefore high operating costs.

The design of the boats, which would appear to have evolved over the years and been influenced by a number of factors, few of which have anything to do with fishing efficiency, is far from ideal. The general layout is bad, with a large cabin and a small working deck. The area of the working deck is too small to accommodate a mechanical line and pot hauler or an artisanal long lining system as well as an insulated container of a size suitable for storing ice and fish during overnight trips. Given these limitations it would seem advisable to give some thought to the introduction of a new design of a multi-purpose boat which could engage in longer trips and undertake long-line fishing and/or deep water fishing. Such a scheme has been recommended in the past and would appear to be just as valid today if not more so.

The boat should be of about the same overall size, of 8 metres (26ft), but with the wheel house and accommodation forward, leaving a clear working deck of least 4 metres. This would provide ample space for iced fish containers and what-ever mechanised equipment was appropriate. Boats should be equipped with modern communication, navigational and fish finding equipment, and be powered by compact, economical, slow revving diesel engines of about 80 horse power. In view of the high cost of maintenance of wooden boats it would seem preferable to construct any new generation of boat in GRP which has considerably lower maintenance costs.

The essence of any such boat would be to provide an appropriately designed craft fitted out in such a way as to be able to prosecute a range of different fishing options but at the same time using simple and relatively low level technology in order to achieve the desired end.

4.0 CONCLUSIONS AND RECOMMENDATIONS

It is quite clear that the day boat fleet is in a serious condition and a continuing decline would seem probable if the current situation persists. In view of its importance, a number of actions need to be taken in an attempt to change the fortunes of this section of the fishing community:

- 1) Conduct a series of trials to establish if extended (overnight) trips result in a significant increase in catch. These trials would best be undertaken utilising the Fisheries Division in-shore boat, Diadema, and by monitoring the catches from the day boats fishing in the same area. Such a series of trials should be undertaken over an extended period of time to allow for seasonal fluctuations.
- 2) Conduct trials to determine the performance and suitability of different types of FADS. This would require a number of FADS being located in strategic locations around the island and their performance being monitored over a period of at least 12 months to allow for seasonal variation. Some of this work could be carried out by the Diadema but consideration should be given to the utilisation of a charter vessel for the more off-shore locations.
- 3) Conduct a survey of the deep water banks and undertake exploratory fishing trials to establish the viability of a demersal fishery.
- 4) Complete squid fishing trials.
- 5) Given satisfactory results from one or more of the above trials, introduce the new activities to the fishery through training and extension work.

- 6) If appropriate, complete a financial analysis of the introduction of a new boat design undertaking the new fishing systems. If satisfactory, look at schemes to provide incentives to encourage an influx of recruits to the fishery.
- 7) Government should monitor developments with fish prices and promote means of stabilising the situation.

APPENDIX 9

The Barbadian Ice Boat Fishing Fleet. A
Review of possible Alternative fishing
activities.

**THE BARBADIAN ICE BOAT FISHING FLEET
A REVIEW OF POSSIBLE ALTERNATIVE FISHING ACTIVITIES**

1 INTRODUCTION

One of the tasks of the Fisheries Institutional Strengthening Project Team (Technical Corporation ATN/SF-247/BA) has been to review problem areas within the Barbadian fishery in the hope of identifying alternative strategies. As part of this programme it was decided to examine the ice boat fishing fleet against the current back-drop of denial of access to their normal fishing grounds.

2 BACKGROUND

Recently Trinidad and Tobago has denied Barbadian fishing boats the right to fish in waters which have been declared to lie within their Exclusive Economic Zone (EEZ). It is quite probable that the neighbouring countries within the OECS may follow suit unless a regional alternative is found to the now customary approach to management of the EEZ which is provided for under the United Nations Convention on the Law of the Sea (UNCLOS).

The action of Trinidad and Tobago alone has resulted in the fishing activities of the ice boat fleet being seriously restricted, with the consequence that their catch of flying fish has been considerably reduced to that of previous years. This, in turn has resulted in a need for the processing and marketing sector of the industry to import flying fish from Trinidad and Tobago.

A further complication has been that catches of flying fish and the larger pelagics throughout the eastern Caribbean have declined considerably during the 1988/89 fishing season. It is generally believed that this decline has been a one off due to unusual environmental and climatic factors.

Barbadian fishermen over the years have developed a very successful technique for exploiting a mixed pelagic fishery. They steam against the current to Tobago to meet the fish, set their nets, then drift gradually with the current and fish north west towards the Grenadines then steam for home. They also troll or set drift hand lines for the larger pelagics.

The ice boat itself has evolved from the traditional Barbadian day boat and whilst far from ideal is now a boat of a size and type which is suited for catching flying fish and the larger pelagics in the relatively sheltered and easily navigated waters between Barbados, Trinidad and Tobago, the Grenadines and St Lucia.

In summary therefore, the observed and potential contraction of permitted fishing areas and the preference for adhering to locally proven fishing practices and boats are limiting the ability of the harvest sector to meet market demands. The effect of environmental factors has further exacerbated the problems of primary dependence upon traditional fishing.

All of the above tends to support the need to diversify and find alternatives to traditional fishing practices in terms of areas fished, species harvested and fishing methods. Unless diversification takes place serious economic dislocation may result.

3 ALTERNATIVE NEAR SHORE FISHING ACTIVITIES

3.1 Long-line Fishing

Over the past 18 months 9 boats have entered the long-line fishery targeting Swordfish and Tunas. However it is worth noting that only 3 of these boats are from the ice boat fleet. The other craft being new or imported boats, purpose built for long-line fishing, ranging in size from 15 to 24 metres with clear working decks and large capacity fish rooms for storing iced fish.

The fact that purpose built boats are being used in preference to converting ice boats confirms the opinion of the gear technologist that the vast majority of ice boats are too small and of such a design they cannot be readily converted to long-line fishing operations. (See report FGT4 Ice Boat Report).

There is also a certain reluctance amongst the ice boat fleet to enter the long-line fishery because, whilst the existence of Swordfish and other pelagic stocks off Barbados has been demonstrated, the viability of investing specifically in such a fishery has still to be fully demonstrated.

3.2 Demersal Fishery

There are a number of banks within a 30 mile radius of Barbados which might have sufficient stocks of demersal fish such as Snapper and Grouper to support a small commercial fishery.

The gear technologist had planned as part of his exploratory fishing programme, to undertake a survey of these banks to assess the nature and size of this resource. Unfortunately due to difficulty with funding, it has not been possible to undertake a survey so far but hopefully it will be possible to complete this work some time in the future.

3.3 Co-ordinated Fleet Fishing

It has been suggested that flying fish and other large pelagics may be present in the waters to the North and East of Barbados during all or part of the main fishing season. These grounds lying 50 miles or more away from Barbados are not currently fished by the ice boat fleet due to the ice boat crews not wishing to operate on their own at such a distance from the island in what are open and potentially dangerous waters.

A suggestion has been made that the Government should provide practical assistance in the form of a support vessel, possibly a Coast Guard Patrol boat, which would sail in support of groups of six or more ice boats so that they could explore the area and fish it as a fleet. Such a programme would have to be carried out over a large part of the fishing season in order to establish the availability of the fish and indeed the practicality of fishing in these waters.

4 OFF-SHORE DEVELOPMENTS

4.1 Fishery Resources

The Barbados EEZ stretches 200 miles into the Atlantic Ocean and covers an area in excess of 40,000 square miles. However the extent and nature of the fishery resource in the area is little known and certainly insufficient to provide a basis for the establishment of an off-shore fishery.

If the Government wish to develop a commercial fishery in the open Atlantic, it is first essential that an assessment of the resource be undertaken.

The objectives of such a programme would be to survey and evaluate the total fishery resource within the area and more specifically to:-

- locate possible fishing areas for flying fish.
- locate possible fishing areas for Swordfish, Tuna and large pelagics and to undertake experimental fishing with both long-line and surface drift-nets. Long-lines would need to be of the order of 30 to 40 miles long and gill nets of 10 to 20 miles long constructed of mono or multi-mono filament.
- Investigate the use of open water drifting fads such as Sea Kites for reducing the search time and improving the catch rate of the larger pelagics.
- Locate and survey sea-mounts to assess what stocks, if any of demersal species exist.

Such a survey would require a considerable period of time, certainly 12 months as a minimum, and would be an extremely costly exercise requiring a large and well equipped fisheries research vessel or well equipped commercial fishing vessel. As an estimate, such an activity would cost as a minimum US\$2m.

It is worth noting that there is currently a CARICOM resource assessment programme but it could be some time before the results of this programme are available and even then it is unlikely that they are going to be particularly relevant to the off-shore area in question.

In order to obtain at least an indication of whether or not commercial stocks of fish do exist in the area a series of surveillance flights possibly supported by some spot-checks by Barbados patrol vessels would indicate numbers and types of commercial fishing vessels operating in the area.

4.2 Development in the off-shore fishery

Should, at some future date, the Government elect to develop the off-shore fishery in the light of resource investigations then it would be essential for a new class of boat to be developed. The current ice boat fleet is essentially very unsuitable for operating in the open Atlantic, being too small, having the wrong hull form for operations in rough seas and not being readily convertible to other fishing methods. The type of craft required would be a 20 metre multi-purpose fishing vessel fitted with sophisticated fish finding and navigation equipment. Apart from the requirement for a new class of boat it would be essential to re-train the fishermen who would find the change to the new fishery quite considerable, also the infrastructure would have to be re-examined since the new fishing terminal would probably not be adequate to serve the new larger boats.

Another suggestion has been that the existing ice boat fleet could operate to a mother ship in open Atlantic. This is not considered a feasible option.

5. CONCLUSIONS

The ice boats are best suited for undertaking the fishery in which they are currently engaged, namely the flying fish fishery in an area between Barbados and Trinidad and Tobago.

They are not readily convertible to long-line fishing and the flying fish stocks around Barbados itself are unlikely to support the whole of the ice boat fleet and the day boat fishery. The boats are also inappropriate for prosecuting a fishery in the open Atlantic even if a resource could be identified. The only truly satisfactory solution at the moment is for access agreements to be agreed with Trinidad and Tobago and, if necessary, other OECS countries so that the ice boat fleet can continue to fish as previously.

6. RECOMMENDATIONS

- 1) Conclude as soon as possible satisfactory fishing agreements with neighbouring countries to enable the ice boat fleet to continue fishing in its traditional way.
- 2) Undertake fishing trials on the banks around Barbados in an attempt to identify a suitable demersal fishery which may be able to be prosecuted by the ice boat fleet.
- 3) Undertake aerial surveillance of the EEZ to establish the size and type of vessels fishing in it in an attempt to ascertain the availability or otherwise of a commercial resource.

APPENDIX 10

Workplan for Masterfisherman
counterparts for the period January 1990
to December 1991.

TECHNICAL CO-OPERATION ATN/5F-2474-BA
INSTITUTIONAL STRENGTHENING OF THE FISHERIES DIVISION
OF THE MINISTRY OF AGRICULTURE, FOOD AND FISHERIES,
BARBADOS

WORKPLAN FOR MASTERFISHERMAN COUNTERPARTS
FOR THE PERIOD JANUARY 1990 TO DECEMBER 1991

WORKPLAN FOR COUNTERPART MASTERFISHERMEN
FOR THE PERIOD - JANUARY 1990 TO DECEMBER 1991

OUTLINE OF OVERALL PLAN

a) Using "Diadema"

- i) Monitor the FAD's.
- ii) Pot fishing, including searching for shells in deepwater.
- iii) Snapper fishing, using hydraulic reels.
- iv) Training fishermen, with instruction on satellite navigation, utilizing the "heading sensor and log interface", with the "log".
- v) Inshore bottom longline fishing.
- vi) Shallow water, up to 40 metres deep, bottom set gill net fishing.

b) Using "a chartered Iceboat"

- i) Open ocean squid fishing research.
- ii) Fishing on the South and East coasts using:- fish pots and hydraulic reels.

Note: Data gathering

- 1) The marine biologist and fisheries masterfisherman should work together to obtain the maximum data from the above programmes.
- 2) Work should also continue on evaluation of the "biodegradable" fish pot doors.

Notes on Further Training

The counterparts, Mr V Skeete and Mr G Dowrich, in the opinion of the masterfisherman, are fully competent to undertake the following:-

- 1) successfully command any vessel within the Barbados fishing industry and to complete a profitable fishing trip on any such vessel;
- 2) understand the "care of the catch" using ice and fishing cleaning methods;

3) be able to continue the research and development, exploratory fishing programme;

4) continue to give advice and training to the industry.

Whilst they have demonstrated their ability in assisting local owners and operators with such items as satellite navigation radars, echo sounders etc, further training in the electronic field will become necessary as the level of electronic sophistication within the industry grows.

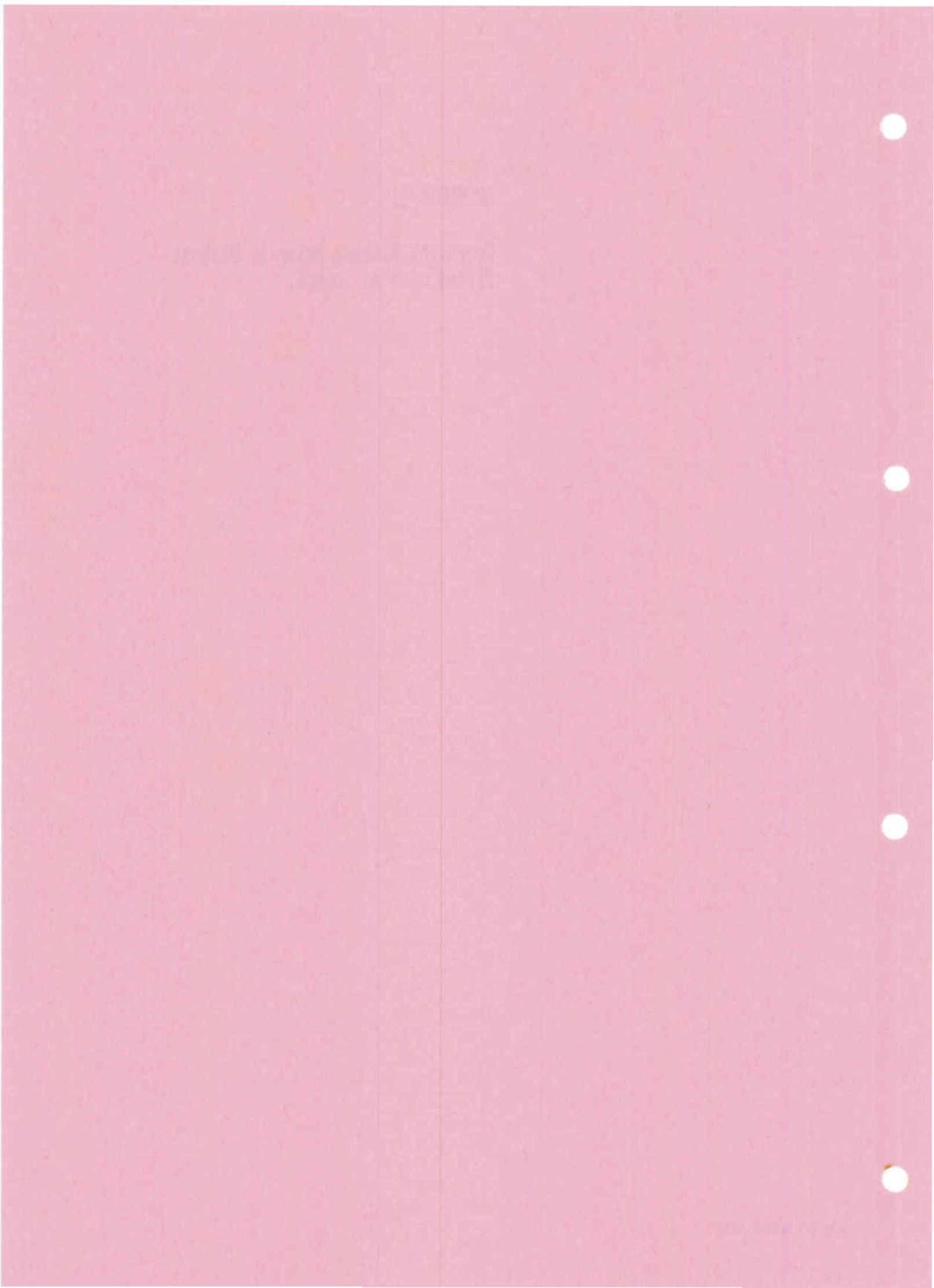
TIMETABLE FOR SEAGOING ACTIVITIES OF COUNTERPARTS - 1990 TO 1992

ACTIVITIES 1990	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	REMARKS
Fish	////	////	////	////	////								
Aggregating Device	////	////	////	////	////								
Fish Pots		////	////	////	////	Shrimp * pot 160ft							Deep water shell fishing *
Hydraulic Power Snapper Reels							////	////	////				
Ocean going Squid Fishing								////		////			
Training Fisherman									////				
Bottom Long Line Fishing											////	////	
Annual Leave											////	////	
Miscellaneous					Fitting Reels		Rig Longlines			Vessel Overhaul	Rig Bottom Set Gill Nets		If a net hauler arrives
Reporting						////						////	

ACTIVITIES 1991	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	REMARKS
Fish				////	////	////							This year may incorporate evaluation of a new vessel for the dayboat fishery.
Aggregating Device				////	////	////							
Fish Pots											////	////	
Snapper Reels		////	////										
Fishermen Training									////				
Annual Leave													
Miscellaneous		Evaluation of vessel							////	Vessel overhaul			
Bottom Set Long Lines							////	////					
Bottom Set Gill Nets	////	////											
Reporting						////						////	

APPENDIX 11

Overnight Fishing using a 'Dayboat'
fitted with an icebox.



TECHNICAL CO-OPERATION ATN/5F-2474-BA
INSTITUTIONAL STRENGTHENING OF THE FISHERIES DIVISION
OF THE MINISTRY OF AGRICULTURE, FOOD AND FISHERIES,
BARBADOS

OVERNIGHT FISHING USING A "DAYBOAT" FITTED WITH AN ICEBOX

OVERNIGHT FISHING USING A "DAYBOAT" FITTED WITH AN ICEBOX

INTRODUCTION

In his revised workplan the masterfisherman proposed to establish whether a new design of "Dayboat" could benefit from extended fishing trips. The proposal was to stay at sea overnight, extending the traditional day trip into a two day trip, using ice to keep the fish in good order. Savings were expected to be reflected in less fuel used for a greater catch.

PLANNED ACTIVITIES

Using the Fisheries Division's vessel, "Diadema" (which has an insulated ice box), the expert and his counterpart planned "overnight" fishing trips to be implemented whenever the opportunity arose, from December 1989 onwards.

CONSTRAINTS

Constraints, firstly during December with very poor fishing and secondly during January due to the poorest weather for a number of years (ref: Nation Newspaper late January 1990), the plan was not implemented as the "Diadema" is limited due to its design and size, which renders it unsuitable for use in poor sea conditions and high winds.

COMMENT

The banning of the Barbadian "Iceboats" from fishing within the EEZ of Trinidad and Tobago has in fact pre-empted the experts workplan to "overnight" fish with a dayboat. Without access to their usual fishing grounds the iceboats have been obliged to fish around Barbados. This activity has been in a similar pattern to that proposed in the workplan. However, the iceboats have been staying at sea for five or six days.

In view of the current fishing practice of the iceboats the masterfisherman and his counterpart sought information from the iceboat skippers, as to catch levels and fishing practices.

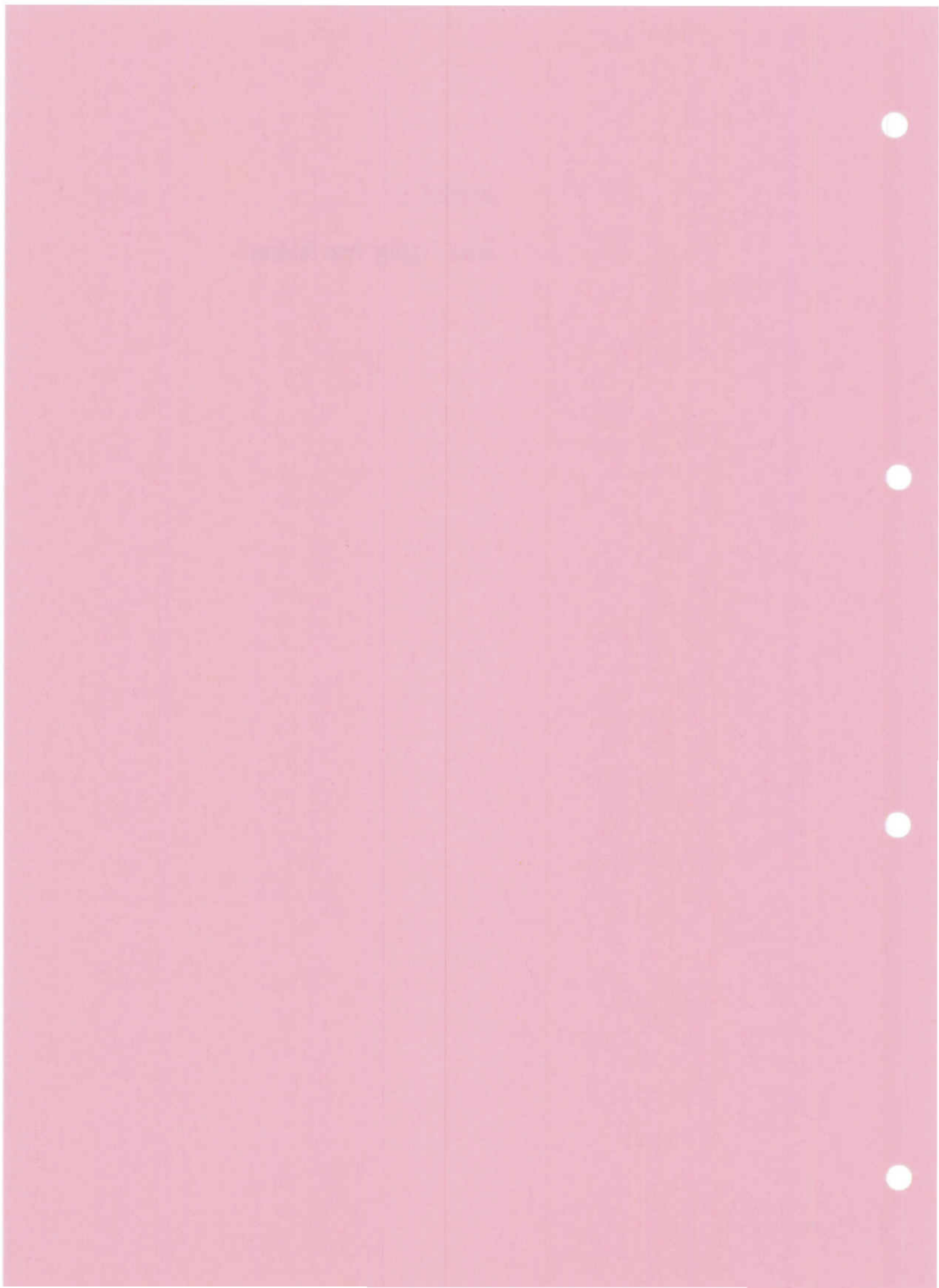
The initial survey produced information that fish catches were very poor for all vessels. Typically a five day trip, from one vessel in late December, resulted in 180 Flying fish, one 47lb Swordfish and two small Tuna. The vessel had reduced its crew level to two men from a usual level of 3 crew men in an effort to cut costs.

CONCLUSION

It would be possible to use information from iceboat landings to establish if extended dayboat trips would be economical. This information will be available from the statistics of landings gathered at Oistins and Bridgetown markets at the end of the fishing season, July 1990. The Fisheries Division, should use this information to evaluate the idea of extended dayboat trips.

APPENDIX 12

Squid Jigging from Diadema.



TECHNICAL CO-OPERATION ATN/5F-2474-BA
INSTITUTIONAL STRENGTHENING OF THE FISHERIES DIVISION
OF THE MINISTRY OF AGRICULTURE, FOOD AND FISHERIES,
BARBADOS

SQUID JIGGING FROM DIADEMA

SQUID JIGGING FROM "DIADEMA"

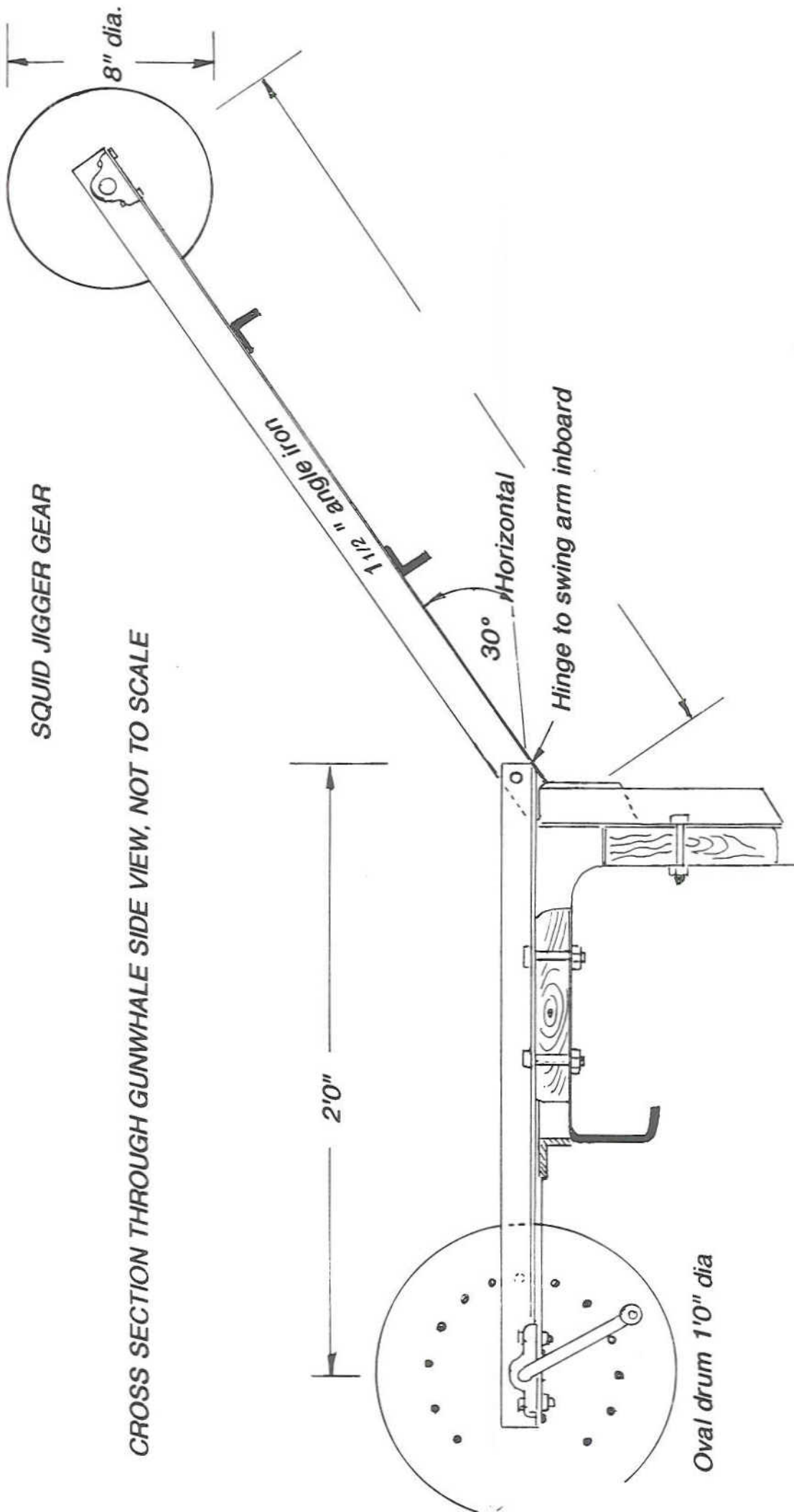
INTRODUCTION

In order to investigate squid stocks around Barbados the Fisheries Division vessel "Diadema" was fitted out with lights and jiggers.

ACTIVITIES

As illustrated in Fig 3, the precise height of lights and the outboard extent of shadow in conjunction with the size of the jigger (Fig 1) is very important with this fishing method. The lights were rigged on the vessel and two jiggers were constructed as in Fig 1 and 2 (these are further illustrated by the appended photographs Fig 4 to 7). In addition to outfitting the vessel as seen in Fig 7, the vessel was already equipped with a videograph type echo sounder. To complete the equipment list a sea anchor was designed and constructed as in Fig 8. A sea anchor is used in order to maintain the fishing lines in the vertical position, (this is achieved by the anchor holding the vessel "head to wind". An insulated ice box (Fig 5) completed the outfitting of "Diadema".

Information regarding possible squid fishing locations was gained, both from talking to fishermen and from the Bellairs Research Institute. Numerous night fishing trips from May to September showed the squid, on the inshore grounds, to be too small for capture by the jigging method. The expert now recommends that a chartered Iceboat be used to investigate reports of sightings of larger squid, offshore, during the (Hurricane) season of August and October 1990.



SQUID JIGGER GEAR

CROSS SECTION THROUGH GUNWHALE SIDE VIEW, NOT TO SCALE

Fig. 1

CROSS SECTION THROUGH GUNWHALE PLAN VIEW, NOT TO SCALE

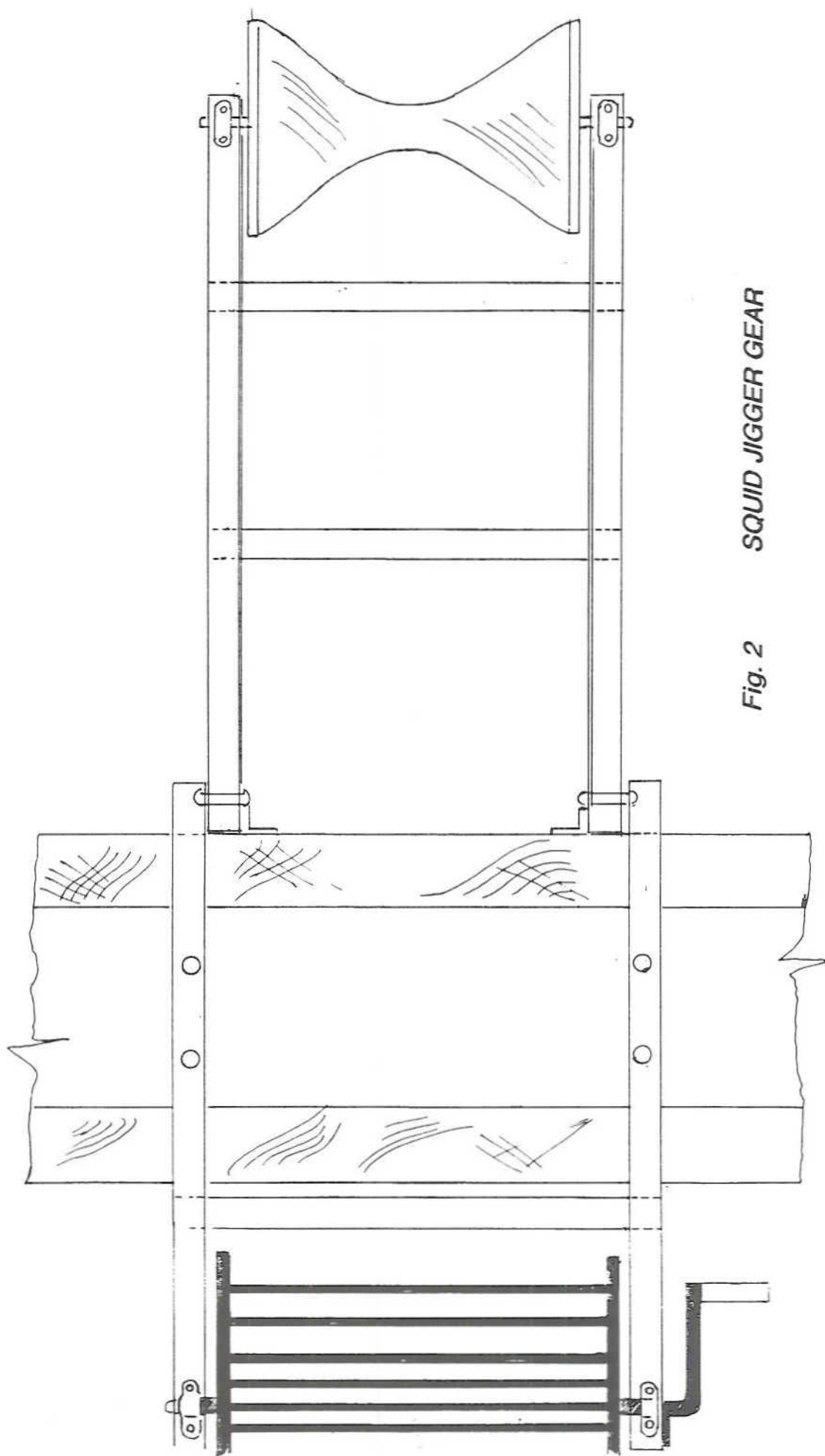


Fig. 2 SQUID JIGGER GEAR

Fig. 3 DIADEMA MIDSHIP SECTION

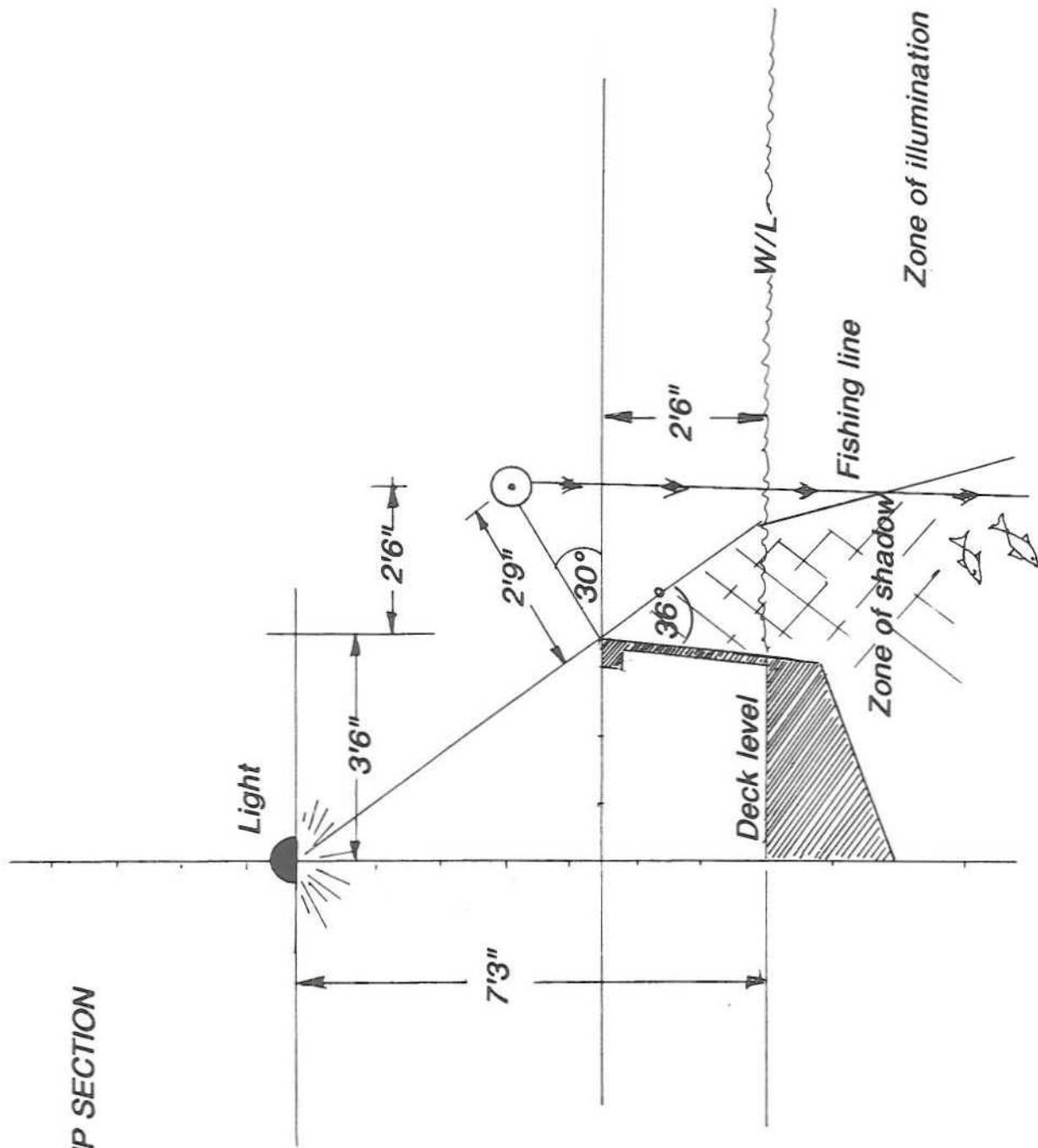


FIG 4
JIGGERS

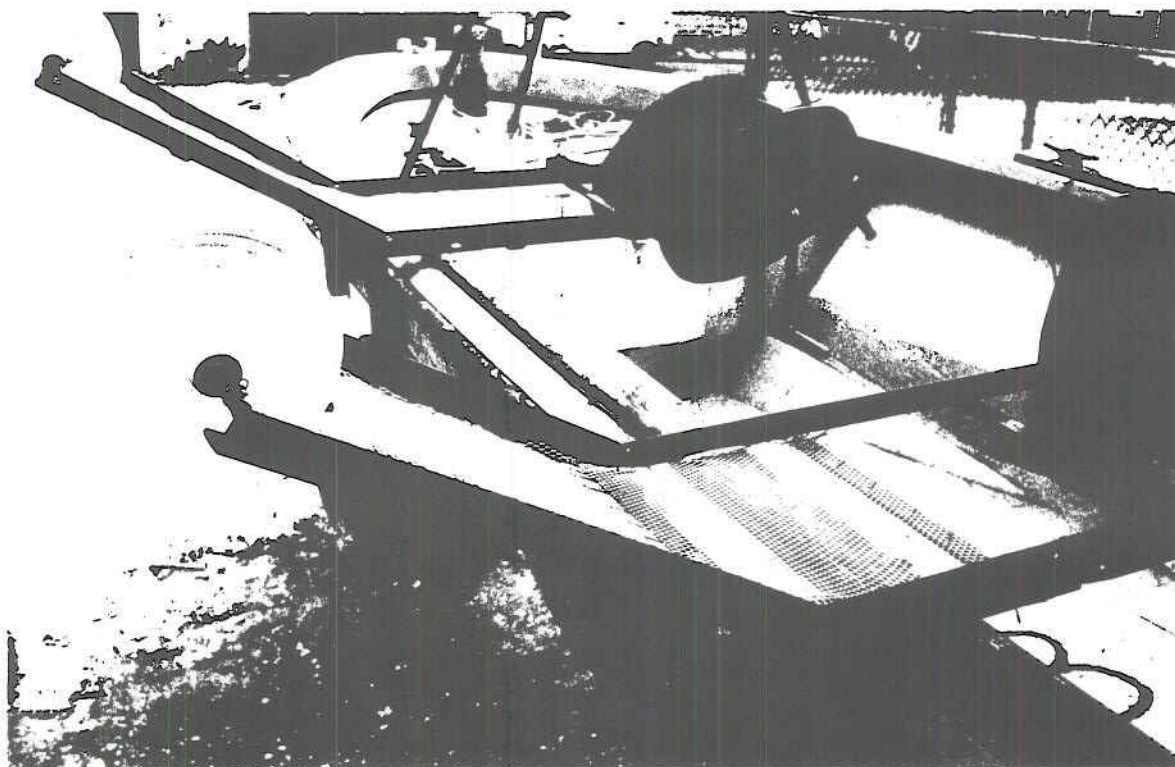


FIG 5
JIGGERS
OUTBOARD

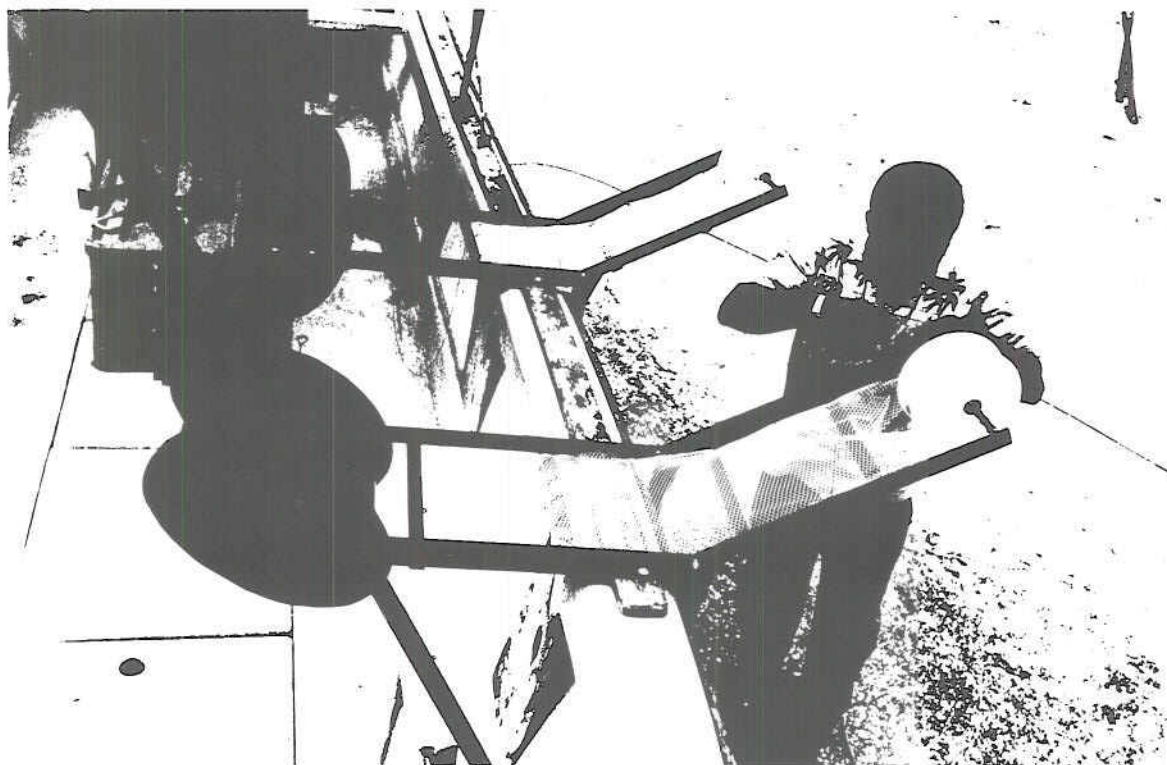
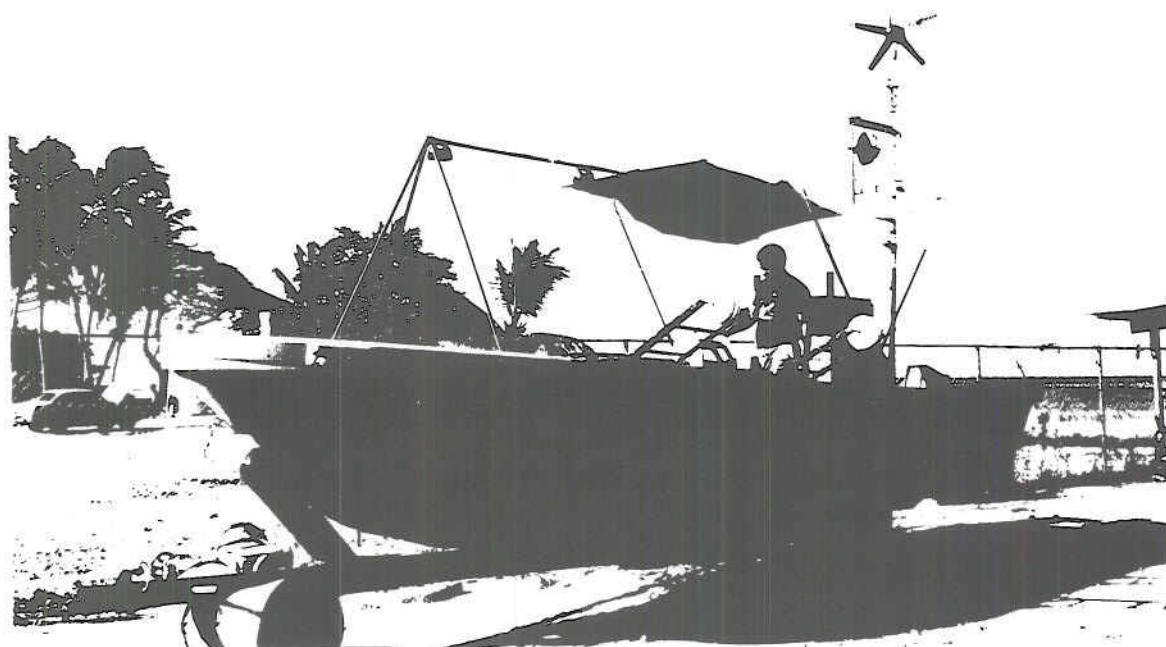


FIG 6



FIG 7



BOAT COMPLETED FOR AGED FISHING

Fig. 8

SEA ANCHOR FOR SQUID JIGGER

