Deep-water Bottom Hand and Longlining in the vicinity of Wewak, E. Sepik Province. A Preliminary Survey.

by

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INTRODUCTION.

In January 1982, the Fisheries & Survey Branch commenced a deep-water bottom fishing project. The main objectives of this project are to assess the potential for development of deep-water (80 - 300m) fish as a harvestable resource, and to gain basic biological information on the fish communities living at these depths.

Surveys have so far been carried out in Milne Bay, around Port Moresby and Manus Island (Research Report No. 82-3). This report presents the results of a deep-water bottom fishing survey carried out in the vicinity of Wewak, East Sepik Province from the 26th July to 10th September, 1982

THE FISHING AREAS.

Three main areas were fished as illustrated in Figure 1. In section 1 the bottom slopes gently from 60m with occasional steeper slopes, particularly on the northern side of underwater mountains. The bottom type is mainly rock, but some mud patches were found. Strong currents were only occasionally encountered in this section during the survey period. Handlining trips numbers: 1,3 to 5 and 8 to 11 (Table 1), were carried out in this section. In addition all longlining was undertaken in Section 1.

Section 2 is characterized by steep slopes between 60 and 250m and by strong currents (>3 knots) which made fishing either difficult or impossible during the survey period. Fishing in this section cannot be recommended if these currents are persistent. They may however change during the wet season when the direction of the prevailing winds are north-westerly. Fishing trips 6 and 7 were undertaken in this section (Table 1).

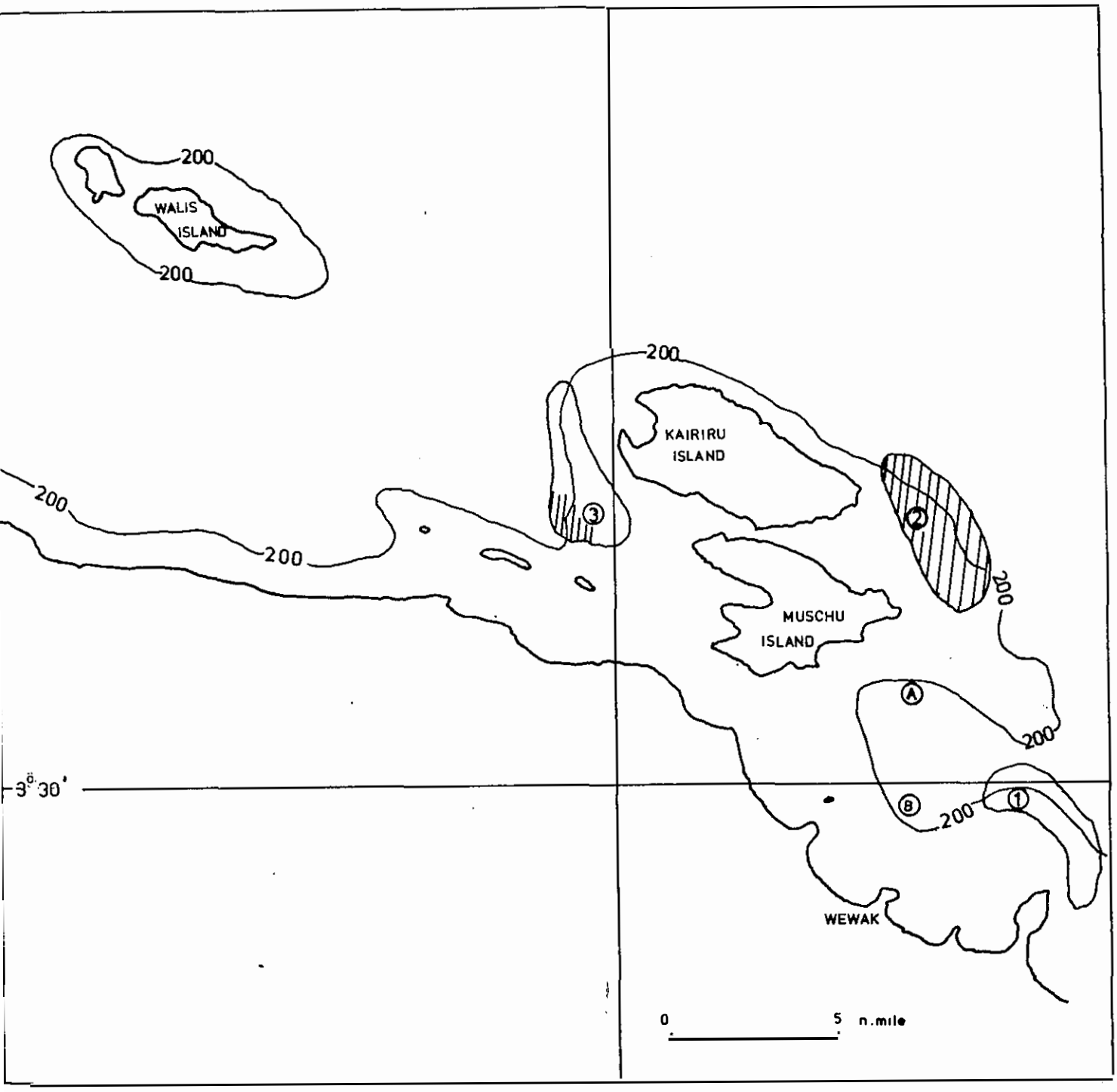

Fig.1. The sections surveyed (1-3), together with the locations of sites A and B. Shading indicates places where strong currents persisted during the survey period.

TABLE I. Details of the Bottom Handlining carried out in the Wewak Area.

Trip No.	Time of day	Hours fished	Trip hours	Depth (m)	Position Lat.	Position Long.	No. of fish	Weight (kg)	CPUE (kg/reel x hr)	Type of: Bait	Type of: Bottom
1	night	2.0	5.5	170	03 33.2'	143 43.3'	5	83.3	27.7	MT	rock
2a	day	0.7	4.5	240	03 27.2'	143 38.5'	1	0.7	1.1	MT	mud
b	day	0.8		160	03 31.8'	143 38.3'	1	4.0	4.8	MT	mud
3	day	3.6	7.5	160	03 31.6'	143 43.3'	2	36.0	5.0	MT	rock
4	night/ morning	5.2	16	110	03 30.1'	143 40.7'	26	77.3	7.5	MT	rock
5	night	2.0	10.5	100	03 31.8'	143 44.9'	3	6.1	1.5	DT	rock
6	night	4.5	22.5	210	03 21.3'	143 38.0'	6	42.6	4.7	MT	rock
7	day	*	*	150**	03 24.8'**	143 40.0'**					
8	afternoon/ night	10.3	13.5	170	03 30.2'	143 40.7'	22	98.3	3.3	MT	rock
9	afternoon/ night	*	*	170**	03 30.2'**	143 41.8'**					
10	morning	2.3	6.3	125	03 31.9'	143 44.3'	15	34.1	7.4	MT	?
11a	afternoon	0.8	25.0	100	03 32.8'	143 43.1'	0	0	0	MT	rock
b	afternoon	1.5		230	03 31.0'	143 45.0'	2	9.0	3.0	MT	mud
c	afternoon	3.3		150	03 30.6'	143 44.8'	7	25.0	3.8	MT	rock
d	night	1.2		80	03 31.5'	143 42.4'	0	0	0	MT	rock
e	night	1.9		120	03 30.6'	143 41.9'	0	0	0	MT	rock
f	night	1.3		95	03 31.5'	143 40.6'	1	1.0	0.4	MT	rock
g	morning	1.8		120	03 30.3'	143 40.6'	1	3.5	1.0	MT	rock
12a	night	2.8	41.5	220	03 19.7'	143 27.5'	2	7.0	1.2	MT	rock
b	night/ morning	4.0		160	03 20.0'	143 27.7'	3	10.7	1.4	MT	rock
c	afternoon	2.3		115	03 22.6'	143 40.1'	6	14.4	3.1	MT	rock
d	night	6.3		80	03 20.8'	143 26.7'	23	80.9	6.5	MT	rock
TOTALS		58.5	152.8				126	533.6			
MEANS (per trip)		4.9	12.7				10.5	44.5	4.2		

* Aborted because of strong currents.

** Approx. depth and position.

Bait: MT - Mackerel tuna. DT - Dogtooth tuna.

Section 3 is similar to 2 in bottom topography, but strong currents were only encountered in one area (marked by shading in Figure 1). Trip 12 was carried out in this section.

Two spots outside these three main sections were tried, A and B in Figure 1 (Trip 2). Both are situated on a gently sloping mud bottom In our experience rock bottom is more productive than mud and these two spots are not recommended for further fishing.

BOAT AND EQUIPMENT

Fishing was carried out from M.V. 'Tangir'. A plywood, 8.6m catamaran of Alia design, powered by a 25hp outboard motor. The handling gear consisted of two wooden hand reels each carrying 400m of 80-150kg test monofilament line. The design of the handreels and the terminal rig are illustrated in. Figures 2 and 3. A boat of this size could be fitted with four hand reels. A Furono 600 echosounder was used for finding suitable fishing spots.

The longlining gear used during this survey consisted of 10 PVC pipes attached to a submerged horizontal float line carried between two vertical main lines which had weights on the bottom and floats on the top (Figure 4a). Each PVC pipe carried 14 hooks attached to the PVC pipe by a swivel to reduce tangling (Figure 4b). The pipes were suspended from a float and weighted, at the bottom, by a 1kg lead weight. This arrangement caused the PVC pipe to stand vertically near the bottom. To avoid entanglement during transportation, each dropline (consisting of a PVC pipe, baited hooks, a float and a weight) was stored inside another, larger diameter, PVC pipe. Details of the method are given in Australian Fisheries, volume 41, number 2, February 1982.

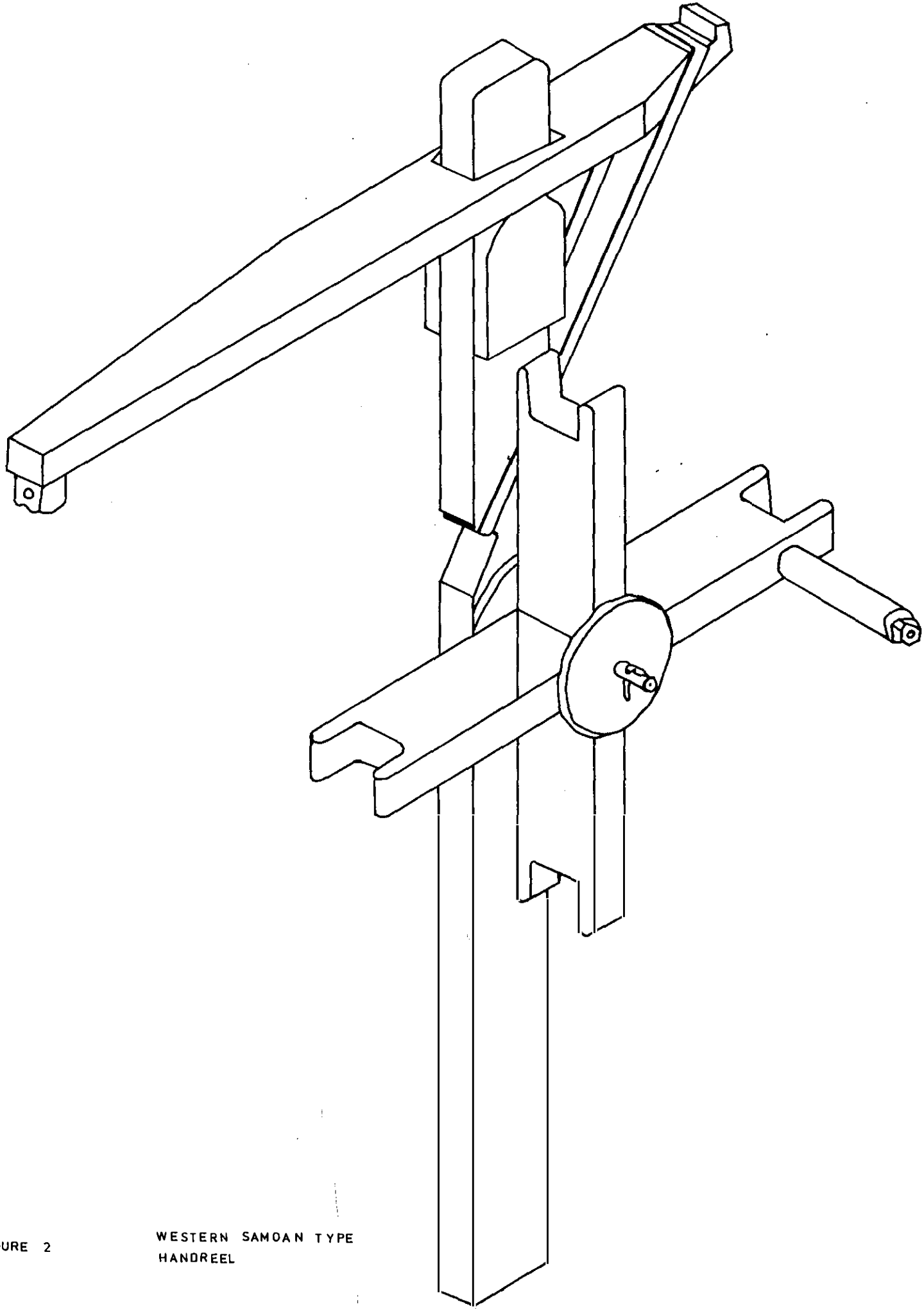

FIGURE 2 WESTERN SAMOAN TYPE HANDREEL

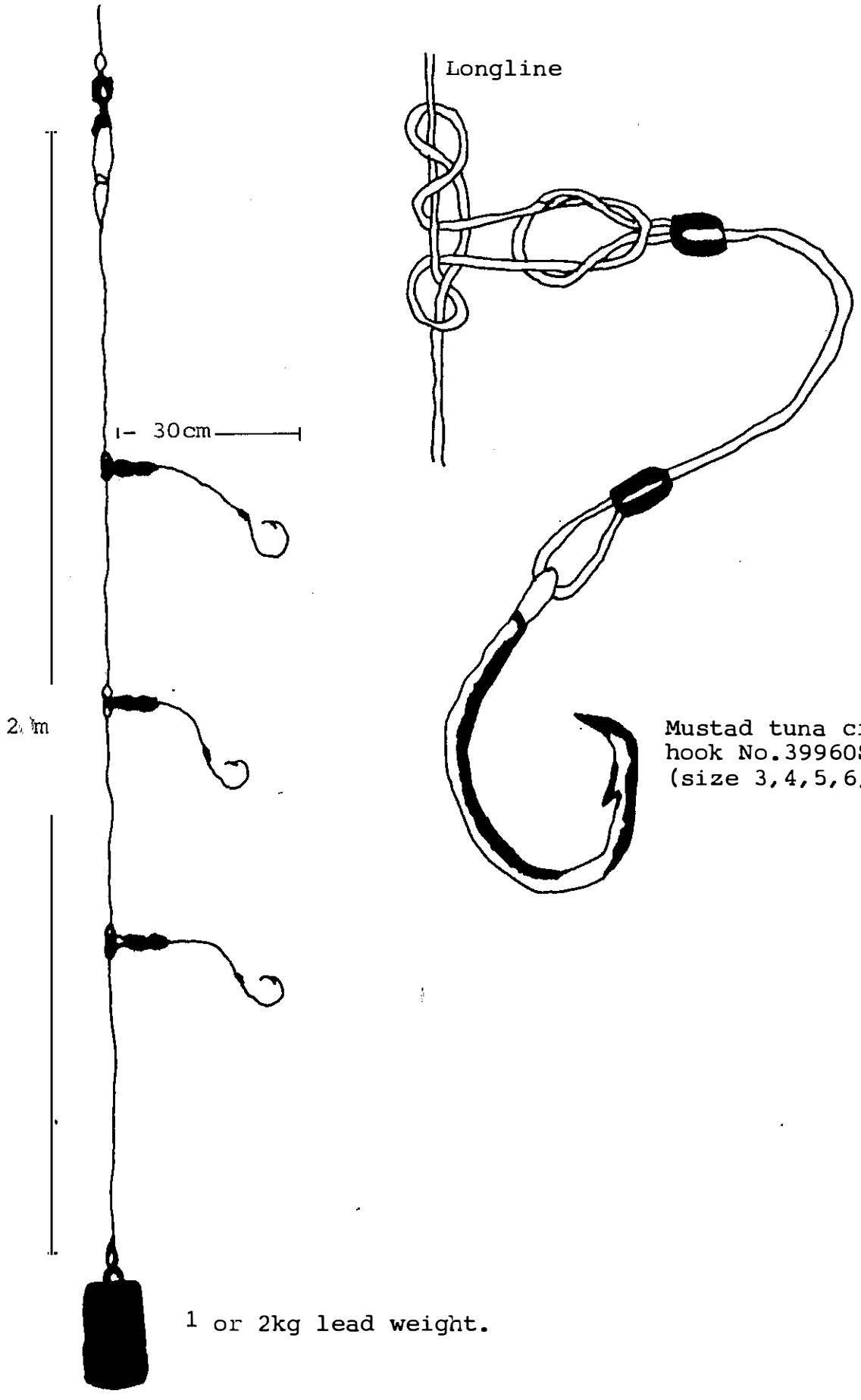

Fig.3. Terminal rig for deep bottom fishing.

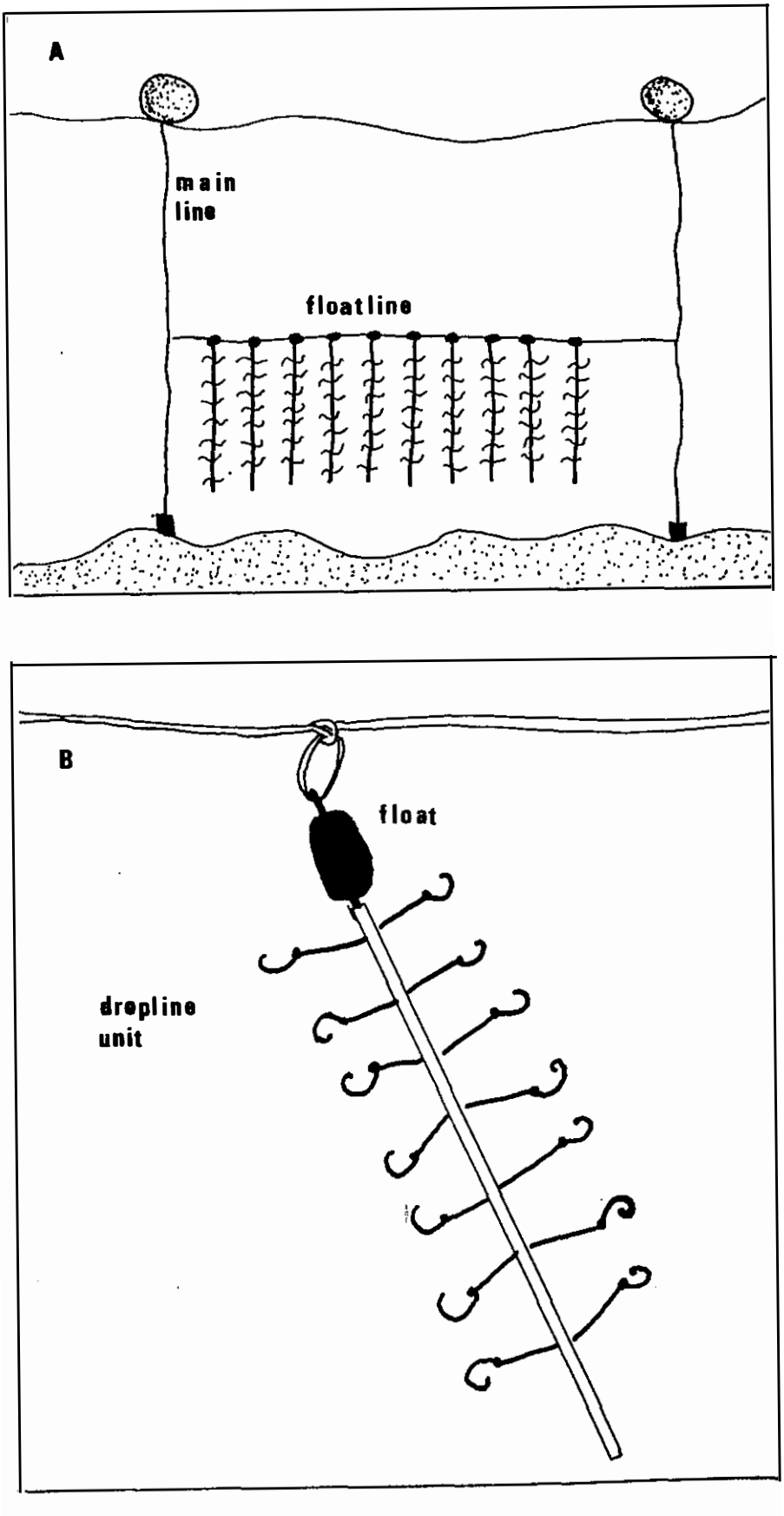

Fig.4. Bottom longlining gear.
A. Showing the main, float and drop lines.
B. Showing a 14 hook, PVC pipe dropline.

FISHING PROCEDURE.

All handling was carried out from an anchored position. Depending on wind and current direction, anchoring was done on the shallow or deep part of the slope, so that by paying out anchor rope, a suitable fishing depth was reached. The terminal rig was allowed to reach the bottom, and an extra one or two meters of fishing line was then paid out to make sure that the hooks were always close to the bottom.

The longlines were set whilst the boat drifted and the ready baited droplines were removed from their containers one at a time, and snapped on to the mainline loops as they passed over the stern. It took about 10 minutes to set a 140-hook set, and between 15 and 20 minutes to haul it. Although much more rapid than the conventional longline, the system has some drawbacks, the main one being that the droplines became entangled in the mainline when hauled from great depths.

Locally caught tuna, mainly mackerel tuna, was used for bait and when possible these were caught by trolling whilst steaming to and from the fishing grounds. Unfortunately the M.V. 'Tangir' was too slow to keep up with the majority of the schools of mackerel tuna, which are abundant in the area, and tuna was only occasionally caught.

The deep-water fish were identified to species, or to the nearest higher group, whichever was possible, and weighed. The gutted fish were stored on ice and sold fresh on arrival in Wewak.

RESULTS AND DISCUSSION.

A total of 58.5 hours of bottom handling and 3.5 soak hours of longlining was completed during the survey. Details of the trips are given in Tables I and II. The combined total catch was 121 bony fish, representing 17 species (Table III), with a total weight of 362 kg.

TABLE II. Details of the Longlining carried out during the Survey in the Wewak Area.

Set No.	No. of hooks	Soak time (mins)	Depth (m)	Position Lat.	Position Long.	No. fish	Weight (kg)
1	140	20	210	03 31.0'	143 43.3'	6	11.1
2	140	25	180	03 31.0'	143 42.9'	0	0
3	100	50	190	03 30.9'	143 42.7'	0	0
4	100	50	160	03 30.2'	143 42.2'	1	3.2
5	80	55	190	03 30.2'	143 41.8'	0	0
TOTALS		200				7	14.3
MEANS (per set)		40				1.4	2.9

Soak time is the time between when the first dropline was set and the last was hauled.

TABLE III. List of the species, number of fish for each species, weight (in kg), percentage of total weight, mean weight and depth distribution for the species encountered in the survey around Wewak.

		No. of fish	Total weight (kg)	% of total weight	Mean weight (kg)	Depth distribution (m)
Pristipomoides multidens	Large-Scaled Jobfish	71	196.1	35.8	2.8	80-210
Caranx spp	Trevally	13	33.8	6.2	2.6	80-170
Lamniformes	Sharks	12	181.6	33.2	15.1	95-240
Elelis carbunculus	Short-tailed Red Snapper	11	33.6	6.1	3.1	210-240
Lutjanus malabaricus	Scarlet Sea-Perch	6	11.2	2.0	1.9	80-140
Epinephalus compressus	Black-Banded Rock-Cod	4	25.0	4.6	6.3	80-170
E. magnicuttis		3	12.8	2.3	4.3	160-210
Macolor niger	Black-and-White Rock-Cod	2	6.8	1.2	3.4	80
Epinephalus morrhua	Brown-Striped Grouper	2	4.0	0.7	2.0	80-170
Etelis oculatus	Long-Tailed Red Snapper	1	3.2	0.6	3.2	210
Pristipomoides filamentosis	Rosy Jobfish	1	7.0	1.3	7.0	170
Seriola dumerilii	Deep-Water Amberjack	1	6.0	1.1	6.0	230
Lutjanus sp.		1	2.5	0.5	2.5	125
Elegatis bipinnulatus	Rainbow Runner	1	3.6	0.7	3.6	80
Lutjanus bohar	Red Sea-Bass	1	4.0	0.7	4.0	80
Lethrinus miniatus	Long-Nosed Emperor	1	4.4	0.8	4.4	80
Callosphyraena toxeuma	Foster's Sea-Pike.	1	4.5	0.8	4.5	80
Lethrinidae		1	3.2	0.6	3.2	115

In addition 12 sharks were caught and these weighed 18lkg. The average weight per fish was 2.9kg which is very similar to the 2.6 average weight reported by Fusimalohi & Crossland (1980) from an earlier survey in Papua New Guinea. It is however lower than the average fish weight 3.6kg reported by Sundberg & Richards (Research Report No. 82-3). However, Sundberg & Richards fished generally in deeper water, and in their report noted that mean weight tends to increase with depth.

The species composition varied between the three sections and the greatest diversity was found in Section 3 (Figure 1). The catch in Section 1 (Figure 1) mainly consisted of *Pristipomoides multidens*, whilst the dominant species in Section 2 was *Etelis carbunculus*. However the number of hours spent fishing is insufficient to draw conclusions concerning species diversity.

The mean catch rate, including sharks, for the survey was 4.2kg ungutted weight/reel x hours. This figure is similar to those obtained in earlier surveys in Papua New Guinea; Fusimalohi & Crossland, (1980): 4.9kg, Sundberg & Richards, (*op. cit*): 3.7kg (excluding sharks). The mean catch rate in this survey was slightly lower than those obtained in other areas of the South Pacific, 5.6kg, Table IV.

A feature of the fishing, especially in Section 1, was the large number of sharks caught. They caused problems by attacking hooked fish and by damaging the gear, but there is a good market for sharks in Wewak and it may be profitable to actively fish for them. We found the most effective method of catching sharks was to attach a baited hook on a two meter long leader wire (or better still a chain) to a float with a diameter of around 30cm. The float was connected to the boat by a 20m long rope. The sharks, having followed the fish which were caught on the handline upto the

TABLE IV. Average catch per unit effort in countries where the South Pacific Commission Deep Sea Development Project has operated (from Mead, 1980).

	Kg/reel x hours
American Samoa	4.4
Trust Territory of the Pacific Islands	9.6, 3.3, 4.1, 6.9
New Caledonia	7.6
Niue	2.8, 7.0
Vanuatu	3.1
Tonga	3.6, 5.7
Fiji	9.3
MEAN VALUE:	5.6

surface, circled around the boat for a while and were easily caught on the baited hook hanging from the buoy. Sharks caught in this way are not included in the catch rates reported in this paper.

Only about 30% of the trip hours were actually spent fishing. This was due to several reasons, the main ones being: the long distances to the fishing grounds, a slow boat, bad weather, and also because the crew were unfamiliar with both the fishing technique and the area. One way of increasing the catch per trip would be to increase the proportion of time spent fishing. This can be done by using faster boats, spending more time at the fishing ground per fishing trip and by basing the fishing vessels closer to suitable reefs. This proportion will also increase with increasing experience and knowledge of both fishing techniques and fishing areas.

RECOMMENDATIONS.

There seems to be a commercial number of bottom fish in the surveyed areas, but before any final conclusions are made on the viability of a year round commercial or artisanal fishery, we recommend that:

1. Bottom fishing trials, preferably from a commercially operated vessel, should continue over at least one full year, and the results be carefully monitored.
2. More trials should be carried out with the type of bottom longlining used in the survey.
3. Other areas, for example the Tarawai and Wallis Islands, should be surveyed together with the ones discussed in this report.
4. Methods of increasing the ratio of fishing time to total trip time should be investigated.
5. Marketing and handling of sharks should be fully investigated.

An economic analysis is presented in Table V. This shows that it is possible, with the catch rate obtained during the survey, to support a crew of three using a plywood catamaran of the Alia design provided that the same catch rate can be achieved throughout the year.

ACKNOWLEDGEMENTS.

It would not have been possible to carry out this survey without the help and support of Otto Abu, Andrew Gobikambe, Mongop Waramapi, Andrew Panjap, Konni Bakan and Bo Alexander and we thank them all for the interest they have shown.

REFERENCES.

Fusimalohi T & J. Crossland. 1980. Report on the South Pacific Commission Deep Sea Fisheries Development Program in West New Britain, Papua New Guinea. S.P.C. Noumea, March 1980. 14 p.

Mead, P. 1980. Report on the Visit of the South Pacific Commission Deep Sea Fisheries Development Project to Fiji. S.P.C. Noumea, December 1980. 21 p.

TABLE V. Cost benefit analysis of 8.6m Alia-type catamaran bottom fishing from an island in the East Sepik Province.

ASSUMPTIONS.

1. Vessel operating in deep water close to a village.
2. Five vessels serviced three times a week by a 8.6m inboard diesel powered collection vessel.
3. Fishing vessels powered by 15hp outboard motors. Total construction cost (including motor) of K4300/fishing vessel.
4. Vessel depreciated over five years.
5. Vessel operated by three crew using three reels.

EARNINGS/YEAR.

- 3 trip/week, 40 weeks/year, 120 trips/year	
- 10 hours bottom fishing/trip	
- Total hours/boat using three reels	3600 hours
- Catch rate of 4.2kg/reel and hour	
- Total catch/year ungutted fish	15120kg
- Total gutted fish (80% recovery)	12096kg
- Sold at 80t/kg.	K9676.

EXPENSES/YEAR.

- Replacement cost of vessel and motor over 5 years.	K860
- Fuel costs/year (120 trips at K5/trip)	K600
- Vessel maintenance and repair	K360
- Fishing gear replacement	K300
- Bait K8/trip	K960
- Ice costs (10,000kg at 6t/kg)	K600
Total expenses	K3680
Returns to crew/year	K5996

NOTE.

For a family crew this return gives approximately K76 per man per fortnight which is a reasonable rural wage. A vessel operated on a family basis may also exceed 120 trips per year by rotating crews, thereby increasing the gross family income.