



**REPORT ON THE SOUTH PACIFIC COMMISSION DEEP SEA  
FISHERIES DEVELOPMENT PROJECT IN KOROR, PALAU,  
TRUST TERRITORY OF THE PACIFIC ISLANDS**

**(1 November 1979 —31 January 1980)**

by

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and

James Crossland

South Pacific Commission  
Noumea, New Caledonia  
May 1980

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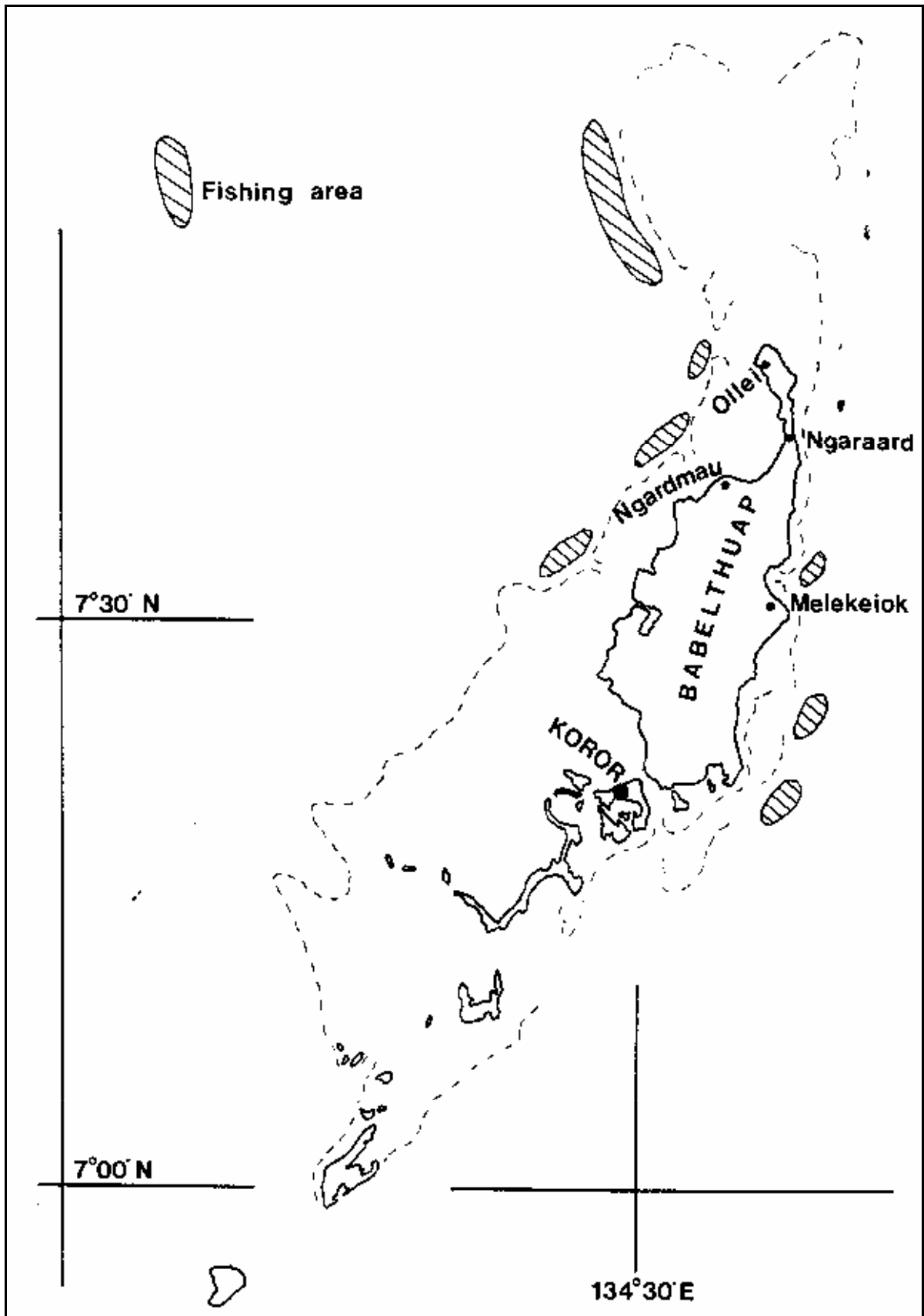


Fig.1: Chart of Palau Island showing areas fished and places mentioned in the text.

## INTRODUCTION

The objectives of the Deep Sea Fisheries Development Project in Palau were to demonstrate deep-bottom fishing techniques, to train local personnel and to investigate the commercial viability of deep bottom fishing under local conditions.

The Project arrived in Palau on 1 November 1979. It was not until 13 November that the first fishing trip was made, the delay being due to repairs and painting being carried out on the project boat, the *Oleyau*. Further time was lost to engine breakdowns and after seven trips the project transferred to the *Kizzy*. Despite these difficulties the project achieved 11 trips, landing 1,975 kg of marketable fish.

## BACKGROUND

Palau (Pelew) group consists of about 200 islands (Fig. 1). Babelthuap, formerly called Palau, is the largest (about 43 x 13 km). The islands are mainly volcanic with excellent channels where good catches of live bait for pole-and-line tuna fishing can be made. The group has a large lagoon but limited deep sea fishing grounds except to the North-North-East and South-South-West. Approximately 75 per cent of the 250 m depth contour is within 70 m of the barrier reef.

Before the arrival of the Project, local fishermen were bottom hand lining in depths down to 80 m. They used monofilament nylon of 20—36 kg (45—80 lb) breaking strain about 100 m long wound on a piece of bamboo 50 cm (18 in) long and 13 cm (5 in) in diameter. A wire loop with a 170 g (6 oz) lead weight on one end and a 40 cm (15 in) wire trace with a No. 9 hook at the other end is permanently fastened to the main line. Every time a fisherman hooks a fish he coils up the line using the bamboo as a kind of fishing reel.

The Palau Federation of Fishing Associations (PFFA) exports approximately 20 tons of fish per year and Van Camp is doing much more than that, but only about 10 per cent is from bottom hand lining. The work of the Project should help decrease the pressure on pelagic and reef fish.

## BOAT AND EQUIPMENT

The Project used the Palau Federation of Fishing Associations boat *Oleyau*, a 10.5 m (34 ft) V-bottom timber boat, powered by a 45 h.p. Yammar diesel. It was equipped with a Japan Marina model 707 A/B echo-sounder with a range 0—600 m, 2 gaff hooks, an anchor buoy, a Coleman lamp, 3 ice boxes, a 2.5 m (8ft) boat with a 25 h.p. Johnson outboard, and a stove.

The project's four wooden handreels (Fig. 2) were fitted on the *Oleyau*. Each hand reel held 500 m of 130 kg test monofilament nylon. For fishing in shallow water four plastic hand casting reels were used, with the same length of nylon but of 45 kg test. Terminal rigs as shown in Fig. 3 were used on the wooden handreels. A similar rig was employed for the plastic hand casters but with 40 kg test nylon in place of the wire.

Grapnel anchors (Fig. 4) were constructed and anchor rope obtained before fishing operations began.

The same equipment was transferred to the *Kizzy* when the *Oleyau* broke down. The *Kizzy* is 12.9 m (42 ft) long and powered by a 20 h.p. Yanmar diesel.

The equipment needed for deep bottom fishing is listed in Appendix 1.

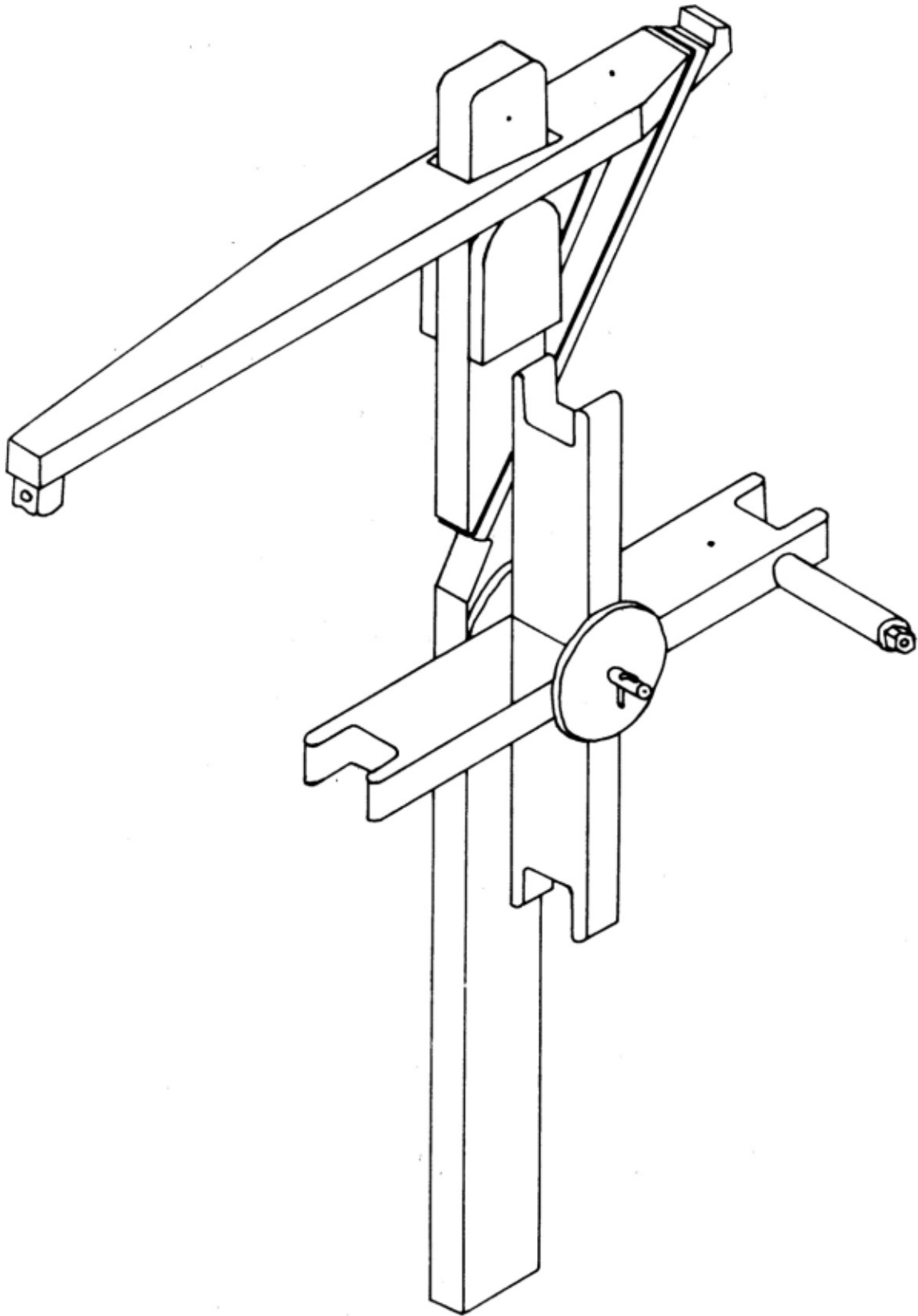
## **FISHING OPERATIONS**

Most fishing trips lasted two days, departing around 15.00 and beginning fishing at dusk. Fishing was carried out mainly at night but some was also done during the day. After locating the outer reef drop-off with the echo-sounder the anchor was let go in shallow water and the anchor rope paid out until the boat drifted out to the desired fishing depth. When the bottom is very uneven care should be taken not to drop the anchor in a trough where the anchor rope will catch or rub against the coral and may part.

All fishing was carried out around Babelthuap Island, most often near passages in the reef (Fig. 1). Between five and seven trainee fishermen took part in each trip.

The project put the emphasis on the bait attraction fishing method. If fish stopped biting only the two bottom hooks were used for fishing and the head and skeleton of a bait fish were attached to the top hook. Usually the fish stopped biting when the wind or current moved the boat away from the fish. The boat might get to a shallower or deeper spot and then the fishermen had to change their gear, according to the kind of fish expected from the fishing depth.

Bait was a problem at Palau because it was not possible to get any of good quality. The bait used was frozen mackerel tuna which was very soft and sometimes rotten. It therefore did not stay on the hooks well and a much larger amount was needed than usual for this type of fishing. Trolling for bait was carried out while travelling to and from the fishing grounds but very few fish were caught.



**Fig. 2: Samoan type wooden handreel**

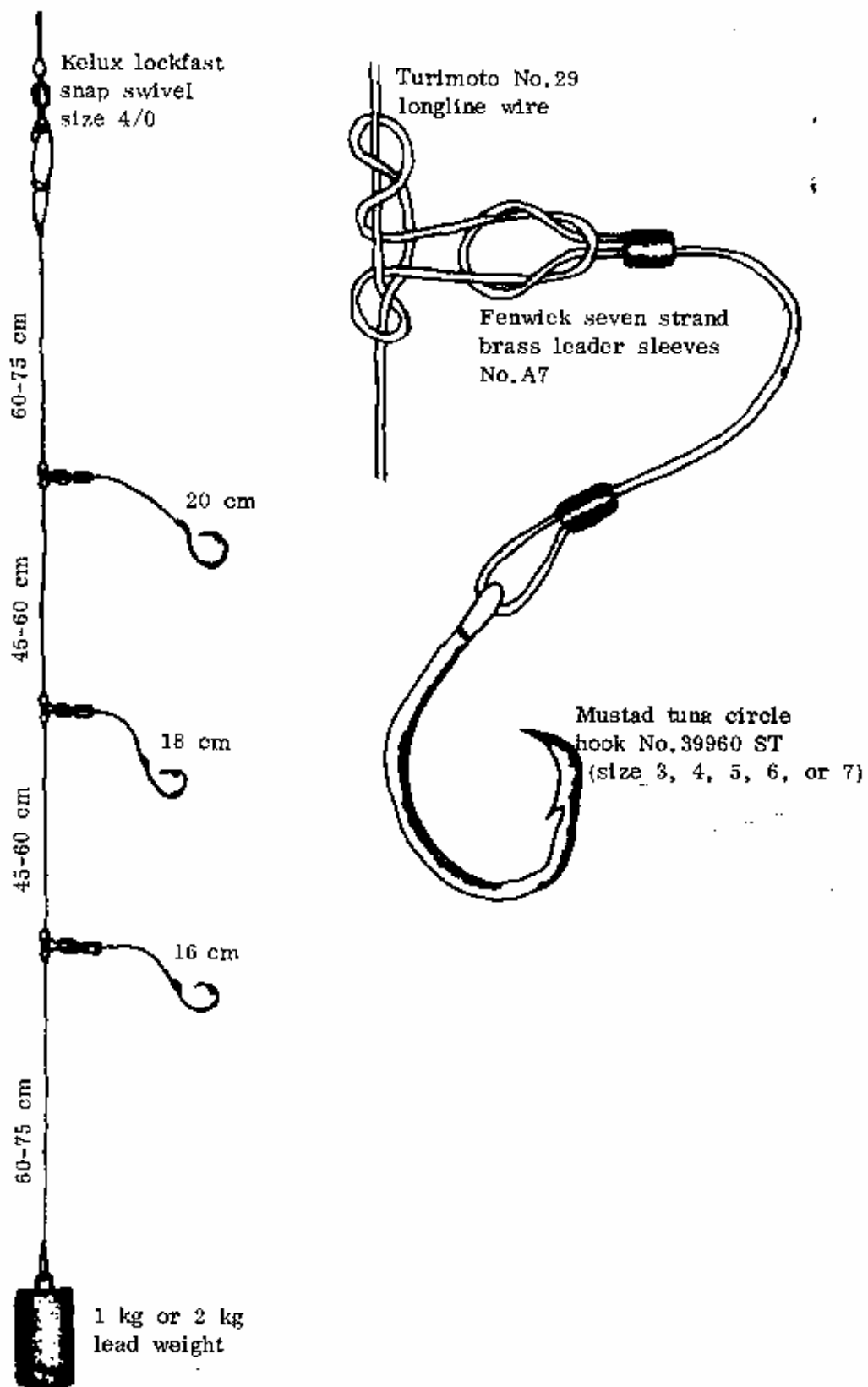
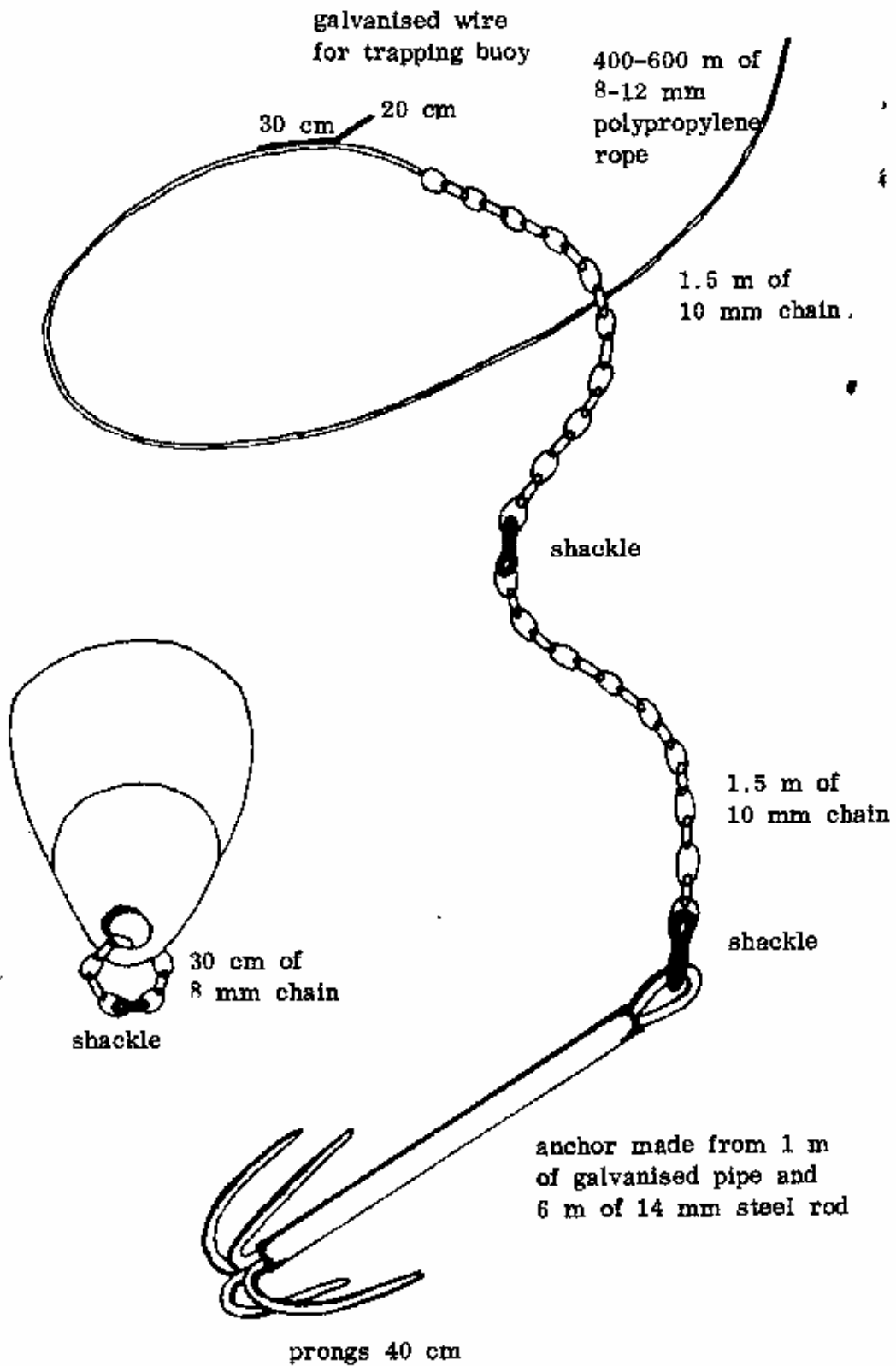


Fig.3: Suitable terminal rig for deep bottom fishing.





**Fig. 4: Anchoring system suitable for deep bottom fishing. Rope diameter depends on size of boat. All shackles should be seized.**

## **TRAINING PROGRAMME**

A comprehensive programme of training covering the proper handling of a fishing boat, care of equipment and fishing gear and the operation and maintenance of outboard motors was carried out. Full details are contained in Appendix 2.

In addition to Marine Resources and Federation personnel, 30 local fishermen were trained. There were five from Melekeiok, three from Ngardmau, 10 from Ngaraard and 12 from Ollei. Nearly all were keen and showed good aptitude in learning new techniques.

## **RESULTS**

A total of 11 trips was made (Table 1), landing 2210 kg of fish of which 1975 kg were marketable<sup>1</sup>. The average catch per trip of marketable fish was 180 kg (390 lbs) and the average catch (all fish) per reel per fishing hour was 3.3 kg (7.3 lbs).

At least 50 species from 9 different families were caught (Table 2). This was the greatest diversity so far recorded by the project in the nine countries it has visited. Fishes of the family Lutjanidae (snappers), represented by 16 species, made up just over half the catches (53.2 per cent). Other important contributors to the catches were Serranidae (13.5 per cent) and Carangidae (13.1 percent).

## **MARKETING**

The Palau Federation of Fishing Associations has been buying and selling fish for quite a long time. The Federation also sells ice and fuel to fishermen, with a special price to members. The SPC Project also used these facilities. Fish prices were set according to customer demand. The highest was 50c/lb (\$1.05/kg) for mullets and the lowest 25c/lb (52c/kg) for groupers. Taking 35c/lb as an average price the Project's highest catch was worth \$295 and the lowest \$79.

There have been no reports of ciguatera fish poisoning from Palau.

## **DISCUSSION**

The catch rate at Palau was low compared to other places the Project has visited (Table 3) but it is considered that it could be doubled within six months with a constant effort to improve fishing abilities. In particular, when fish are biting well, as little time as possible must be lost removing fish, rebaiting hooks, or admiring the catch.

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<sup>1</sup> Sharks, castor oil fish and snake mackerel were not marketable.

Despite the comparatively low catch rate, fishing potential is good around Palau because there is a large area for deep bottom fishing. Also, the sizes of fishes are larger than at many other places and good size specimens of the short-tailed red snapper *Etelis carbunculus* could be taken in shallower water than elsewhere (as shallow as 150 m). During night fishing large numbers of fishes, mainly trevallies, were attracted to lights and these were often caught while hauling up lines from the bottom.

A factor making fishing difficult at Palau is the strength of the currents which run north or south along the coast, depending on the tide. Because of them, fishing is only possible for about half the available time.

## **ECONOMICS**

Based on the results obtained during the Project's stay the economics of this type of fishing in Palau shown in Table 4.

These figures show that deep bottom fishing would not be very profitable at the present time. The main reason for this is the low selling price of fish in Palau, which is considerably less than at other places in the Pacific. However, economics can change, and as the resource itself has good potential deep bottom fishing may become viable in the future.

## **ACKNOWLEDGEMENTS**

The project gratefully acknowledges the friendly and helpful assistance afforded by Marine Resources, and is particularly grateful to the third and the first District Fisheries Specialists, Mr Toshio Panlis and Mr Augusto Naruo, for the arrangements made before taking local and overseas leave, and to the second District Fisheries Specialist, Mr Serge Birk, for his support. Thanks are also due to the present and former Managers of the Palau Federation of Fishing Associations, Mr Guy Davenport and Mr Paul Sardina, and to Mr Rashide S. Kebekol, President of PFFA and Mr Ruddy Titiml, Chairman of PFFA, for showing personal interest in the Project. Special thanks to the other Federation and Marine Resources staff who provided assistance, in particular, Mr Marcus Ngiramengior, Trade Technician, and Mr Scott McEntire, Peace Corps Volunteer and Marine Resources Fisheries Biologist, for their close collaboration in fishing arrangements and activities.

**Table 1: Individual trip records; trips 1—7 were on the *Oleyau* and 8—11 on the *Kizzy*.**

<b>Trip</b>	<b>Number of fish</b>	<b>Catch (kg)</b>	<b>Total hours</b>	<b>Fishing hours</b>	<b>Engine hours</b>	<b>Fuel in US gal.</b>	<b>Bait (kg)</b>	<b>Number of crew</b>
1	58	108	18	12	6	7	23	7
2	64	103	16	12	4	10	25	7
3	28	110	25	16	9	10	20	5
4	90	164	20	13	7	7	11	5
5	118	228	19	10	6	12	61	5
6	23	147	28	6	9	7	25	5
7	124	322	45	22	14	12	25	4
8	41	133	50	7	16	13	25	5
9	72	267	57	20	13	20	45	7
10	39	245	63	10	18	-	23	7
11	139	383	96	37	28	32	86	7
<b>Totals</b>	<b>796</b>	<b>2210</b>	<b>437</b>	<b>165</b>	<b>130</b>	<b>-</b>	<b>369</b>	<b>-</b>
<b>Averages</b>	<b>72</b>	<b>201<sup>1</sup></b>	<b>40</b>	<b>15</b>	<b>12</b>	<b>-</b>	<b>34</b>	<b>-</b>

Average catch per reel per fishing hour = 3.3 kg (all fish)

= 3.0 kg (marketable fish)

<sup>1</sup> Average marketable catch was 180 kg.

**Table 2: Catch composition while the Deep Sea Fisheries Development Project was in Palau**  
 (\* indicates less than 0.5 kg, — indicates less than 0.1%).

Scientific name	English name	Palauan name	Number	Percent by numbers	Weight (kg)	Percent by weight
ORONTASPIDIDAE						
<i>Carcharias kamoharai</i>	sand shark		1	0.1	3	0.1
CARCHARHINIDAE						
<i>Mustelus manazo</i>	smooth dogfish shark		3	0.4	14	0.6
<i>Carcharhinus amblyrhynchos</i>	grey reef shark		1	0.1	50	2.3
<i>Carcharhinus</i> sp			1	0.1	91	4.1
SQUALIDAE						
<i>Centrophorus scalpratus</i>	dogfish shark		2	0.3	6	0.3
SERRANIDAE						
<i>Cephalopholis aurantius</i>	orange rock-cod	temekai	2	0.3	1	-
<i>C. sexmaculatus</i>	grouper, rock-cod	"	1	0.1	1	-
<i>Epinephelus chlorostigma</i>	brown-spotted grouper	"	2	0.3	7	0.3
<i>E. dictyophorus</i>	spotted-finned grouper	"	12	1.5	19	0.9
<i>E. fuscoguttatus</i>	flowery cod	"	3	0.4	5	0.2
<i>E. maculatus</i>	grouper, rock-cod	"	6	0.8	40	1.8
<i>E. morrhua</i>	brown-striped grouper	"	17	2.1	42	1.9
<i>E. poccilonotus</i>	brown-striped grouper	"	4	0.5	16	0.7
<i>E. septemfasciatus</i>	grouper, rock-cod	"	1	0.1	70	3.2
<i>Unidentified species</i>	grouper, rock-cod	"	8	1.0	100	4.5
<i>Variola louti</i>	lunartail rock-cod	"	2	0.3	2	0.1

**Table 2 (cont'd.)**

Scientific name	English name	Palauan name	Number	Percent by numbers	Weight (kg)	Percent by weight
<b>CARANGIDAE</b>						
<i>Carangoides hemigymnostethus</i>	trevally	esbii	45	5.7	23	1.0
<i>Caranx ignobilis</i>	lowly trevally	eropk	6	0.8	14	0.6
<i>C. lugubris</i>	black trevally	omok tutan	24	3.0	45	2.0
<i>Caranx sp.</i>	trevally	eropk	14	1.8	16	0.7
<i>Scomberoides lysan</i>	leatherskin		3	0.4	11	0.5
<i>Selaroides leptolepis</i>	smooth-tailed trevally		1	0.1	*	-
<i>Seriola rivoliana</i>	deep water amberjack	mekeem	33	4.2	182	8.3
<b>LUTJANIDAE</b>						
<i>Aphareus furcatus</i>	small tooth jobfish	metengui	9	1.1	37	1.7
<i>A. rutilans</i>	small tooth jobfish	metengui	37	4.6	199	9.0
<i>Aprion virescens</i>	green jobfish	udel	21	2.6	74	3.3
<i>Caesio chrysozonus</i>	black-tipped fusilier		6	0.8	13	0.6
<i>Etelis carbunculus</i>	short-tailed red snapper	sebus	35	4.4	262	11.9
<i>E. oculatus</i>	long-tailed red snapper	sebus	13	1.6	68	3.1
<i>Paracaesio xanthurus</i>	southern fusilier		24	3.0	15	0.7
<i>Pristipomoides auricilla</i>	gold-tailed jobfish	metengui	9	1.1	11	0.5
<i>P. flavipinnis</i>	yellow jobfish	metengui	22	2.8	115	5.2
<i>Lutjanus argentimaculatus</i>	mangrove jack	menges	50	6.3	156	7.1
<i>L. bohar</i>	red seabass, red snapper	kedesau	38	4.8	71	3.2
<i>L. fulviflamma</i>	blackspot seaperch		1	0.1	*	-
<i>L. erythropterus</i>	red snapper	keremlal	114	14.3	81	3.7
<i>L. kasmira</i>	yellow and blue seaperch		30	3.8	7	0.3
<i>L. russelli</i>	moses perch		1	0.1	*	-
<i>Tropidinius zonatus</i>	banded flower snapper		42	5.3	64	2.9

**Table 2 (cont'd.)**

Scientific name	English name	Palauan name	Number	Percent by numbers	Weight (kg)	Percent by weight
<b>LETHRINIDAE</b>						
<i>Lethrinus harak</i>	thumb-print emperor		6	0.8	5	0.2
<i>L. kallopterus</i>	yellow-spotted emperor	metengui	3	0.4	5	0.2
<i>L. miniatus</i>	longnosed emperor	metengui	16	2.0	34	1.5
<i>L. nematacanthus</i>	threadfin emperor		1	0.1	*	-
<i>L. reticulatus</i>	reticulated emperor		9	1.1	8	0.4
<i>L. variegatus</i>	variegated emperor	mlangmud	15	1.9	22	1.0
<i>L. xanthocheilus</i>	emperor		1	0.1	2	0.1
<b>SPHYRAENIDAE</b>						
<i>Sphyraena barracuda</i>	barracuda	cheduii	8	1.0	16	0.7
<b>GEMPYLIDAE</b>						
<i>Thyrsitoides marleyi</i>	snake mackerel		11	1.4	14	0.6
<i>Promethichthys prometheus</i>	snake mackerel	beterturch	17	2.1	26	1.2
<i>Ruvettus pretiosus</i>	castor oil fish	babii	7	0.9	68	3.0
<b>UNIDENTIFIED SPECIES</b>			58	7.3	79	3.6
<b>Totals</b>			<b>796</b>	<b>-</b>	<b>2210</b>	<b>-</b>

**Table 3: Average catch in kg per reel per fishing hour in places where the Deep Sea Fisheries Development Project has operated**

American Samoa	4.4
Kosrae	9.6
New Britain (Papua New Guinea)	4.9
New Caledonia	7.6
Niue (1978)	2.8
Niue (1979)	7.0
Tanna (New Hebrides)	3.1
Tonga (1978)	3.6
Tonga (1979)	5.7
Yap District	6.9
Palau	3.3



**Table 4: Economics of deep bottom fishing in Palau using an 8.6 m (28 ft) *Alia* aluminium catamaran bought new (fully equipped plus 35 h.p. and 8 h.p. outboard motors) for US\$ 6,000, depreciated over five years and operated by an owner skipper and two other crew members**

**Earnings/year**

4 fishing trips/week, 40 weeks/year, 160 trips/year  
 10 hours bottom fishing/trip, 3.0 kg/reel/fishing hour  
 9.0 kg/fishing hour (3 reels)  
 90.0 kg/trip, 14,400 kg/year, 77 c/kg

**Total earnings      US\$ 11,088**

**Expenses/year**

Depreciation of boat and engine	1,200
Interest on loan <sup>1</sup>	383
Fuel (6 gal/trip, 160 trips/year, 96 c/gal)	922
Oil and grease	180
Maintenance and repairs	500
Fishing gear replacement	300
Ice	250
Bait	660
Wages (2 crew, 20% catch value each)	4,435

**Total expenses      US\$ 8,830**

**Balance to owner skipper      US\$ 2,258**

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<sup>1</sup> 10% reducing annually.

**Basic equipment for deep bottom fishing**

1. Western Samoan type wooden handreels
2. 113 or 136 kg test monofilament line, 500 m per reel
3. Turimoto No.29 longline wire or equivalent (three stranded, three wires per strand, 120 kg test)
4. Mustad tuna circle hooks quality No.39960ST, sizes 3—7
5. Fenwick sevenstrand brass leader sleeves No.A7, or equivalent
6. Berkley - McMahon swivels size 4/0 or equivalent
7. Kelux stainless lockfast map swivels size 4/0 or equivalent
8. 1 kg and 2 kg weights
9. 600—800 m of polypropylene rope (rope diameter appropriate for size of boat)
10. Grapnel anchor and chain
11. Buoy for retrieving anchor
12. Pair of standard pliers
13. Pair of side-cutting pliers
14. Pair of crimping pliers
15. 15cm bait knife

**Topics covered in the training programme**

**1. Proper handling of a fishing boat**

- (a) Safety first
- (b) Cleanliness and tidiness, especially the engine
- (c) Suitable knots and splices for mooring and anchor ropes
- (d) Making a suitable grapnel
- (e) Checking of equipment before departure to ensure that a sufficient supply of everything required is on board
- (f) Safety during fishing operations
- (g) Anchoring in order to fish at the right depth
- (h) Compass use, especially when it is dark
- (i) Marking of good fishing grounds by means of land marks or compass bearings
- (j) Simplest way of heaving the anchor
- (k) Boat to be left clean and tidy and moored properly in a safe place after each fishing trip

**2. Proper handling of equipment and fishing gear**

- (a) Safety first
- (b) Use of the Western Samoan type hand reel.
- (c) Use of the plastic hand reel
- (d) Applicable knots and rigs for monofilament nylon, wire leaders and traces
- (e) A huge fish on the line
- (f) Operation of an echo-sounder
- (g) Equipment must be free from rust
- (h) Fishing gear must be clean and in tackle-balance (appropriate sizes of hooks, line, swivels together)

**3. Proper handline of an outboard engine.**

- (a) Safety, always take spare spark plug, shear pin, cotter pin, split pin, etc.
- (b) Before starting:

- plug fuel hose properly
  - open air vent
  - squeeze fuel pump until it becomes hard
  - check if in neutral gear
  - check if throttle in starting position
  - choke (if engine is cold) until engine starts, then unchoke at once; if engine stops, start it again without choke or engine overflows. This procedure must be followed or you will end up in disassembling engine parts which are perfectly alright.
- (c) It is important to know your engine fuel mixture. Obtain it from your local dealer or your engine manual service book.
- e.g. Tohatsu engine fuel mixture: one herring can full of outboard super oil to 5 gallons petrol, except for the first 10 gallons the oil is double.
- (d) During running hours always check if engine water pump functions.
- (e) Always use your fingers **NOT A TOOL** in putting on spark plugs.
- (f) Rinse engine both interior and exterior with fresh water after fishing trips.
- (g) Treatment for your engine when you are not going to use it for a long time.
- (h) Treatment for your engine when dropped into the sea.

## **REPORTS ON SPC BOTTOM FISHING PROJECTS**

### **Outer Reef Artisanal Fisheries Project.**

Hume, H. 1975 : New Hebrides

Hume, H. 1976 : Cook Islands

Hume, H. and Eginton, R. 1976 : Western Samoa

Eginton, R. and Mead, P. 1978 : Tuvalu

Eginton, R. and James, R.H. 1979 : Solomon Islands

### **Deep Sea Fisheries Development Project**

Fusimalohi, T. 1978 : Niue

Mead, P. 1978 : American Samoa

Fusimalohi, T. 1979 : Tanna (New Hebrides)

Mead, P. 1979 : Tonga (first visit)

Mead, P. and Crossland, J. 1979 : Kosrae (TTPI)

Mead, P. and Crossland, J. 1980 : Yap (TTPI)

Fusimalohi, T. and Grandperrin, R. 1980 : New Caledonia

Fusimalohi, T. and Crossland, J. 1980 : West New Britain (PNG)

Mead, P. 1980 : Tonga (second visit)

Mead, P. 1980 : Niue (second visit)

Book Palau Pacific Resort, Koror on Tripadvisor: See 954 traveller reviews, 1,278 candid photos, and great deals for Palau Pacific Resort, ranked #4 of 35 hotels in Koror and rated 4.5 of 5 at Tripadvisor. This luxury resort features 165 rooms decorated in an island motif setting including amenities of a world class resort. Read more. What are some of the property amenities at Palau Pacific Resort? Some of the more popular amenities offered include free wifi, free breakfast, and a pool. See all property amenities. Pacific deep coral research has expanded greatly over the last four decades, primarily as a result of the establishment of commercial fisheries for black, pink, and gold coral off the main Hawaiian Islands, and subsequent development of fishery management plans for these resources by the State of Hawaii and the Western Pacific Fishery Management Council. The coral supports a portion of a \$70 million Hawaii-based industry that employs roughly 650 people in its manufacturing facility and 50 retail stores (Carl Marsh Maui Divers pers. comm.) Commercial beds of black coral were first discovered at a depth of 30-75 m off Lahaina, Maui in 1958. Some of the earliest ecological work on black corals was carried out in the 1960s in the channel waters off Maui using SCUBA (Grigg 1965). The South Pacific is big place - incredibly vast and blue, covering 11 million square miles stretching from the top of Australia to the Hawaiian Islands. Celebrated by artists and writers, from Paul Gauguin to James Michener, these thousands of tiny coral and volcanic-stone dots are home to fascinating peoples and cultures. While collectively called the South Pacific, these islands are divided into three regions: Polynesia, Melanesia, and Micronesia, each with its own cultural traditions, language variations, and culinary specialties. TripSavvy / Jamie Ditaranto. Polynesia. This easternmost South Pacific region, which includes Hawaii, counts idyllic Tahiti and mysterious Easter Island among its treasures. The trust territory's seat of government was Saipan in the Northern Marianas. Portuguese and Spaniards first began to explore the Micronesian region in the 16th century. Later explorers, traders, and whalers included the British, Germans, Russians, Japanese, and Americans. The Republic of Palau entered into a compact of free association with the United States and became a sovereign state in 1994. Learn More in these related Britannica articles: Northern Mariana Islands: Events since c. 1950. as a district within the Trust Territory of the Pacific Islands in Micronesia. Britannica, The Editors of Encyclopaedia. "Trust Territory of the Pacific Islands". Encyclopedia Britannica , 5 Mar. 2019, <https://www.britannica.com/place/Trust-Territory-of-the-Pacific-Islands>. Ten Pacific Island countries which are members of the World Bank have a population of about 3.4 million people, scattered across an area equivalent to 15 percent of the globe's surface, with a development trajectory that will be shaped by their economic geography. The World Bank Group works in every major area of development. We provide a wide array of financial products and technical assistance, and we help countries share and apply innovative knowledge and solutions to the challenges they face. Development Projects.