



REPORT ON THE DEEP SEA FISHERIES DEVELOPMENT PROJECT

IN KOSRAE

(17 April—27 May 1979)

by

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and

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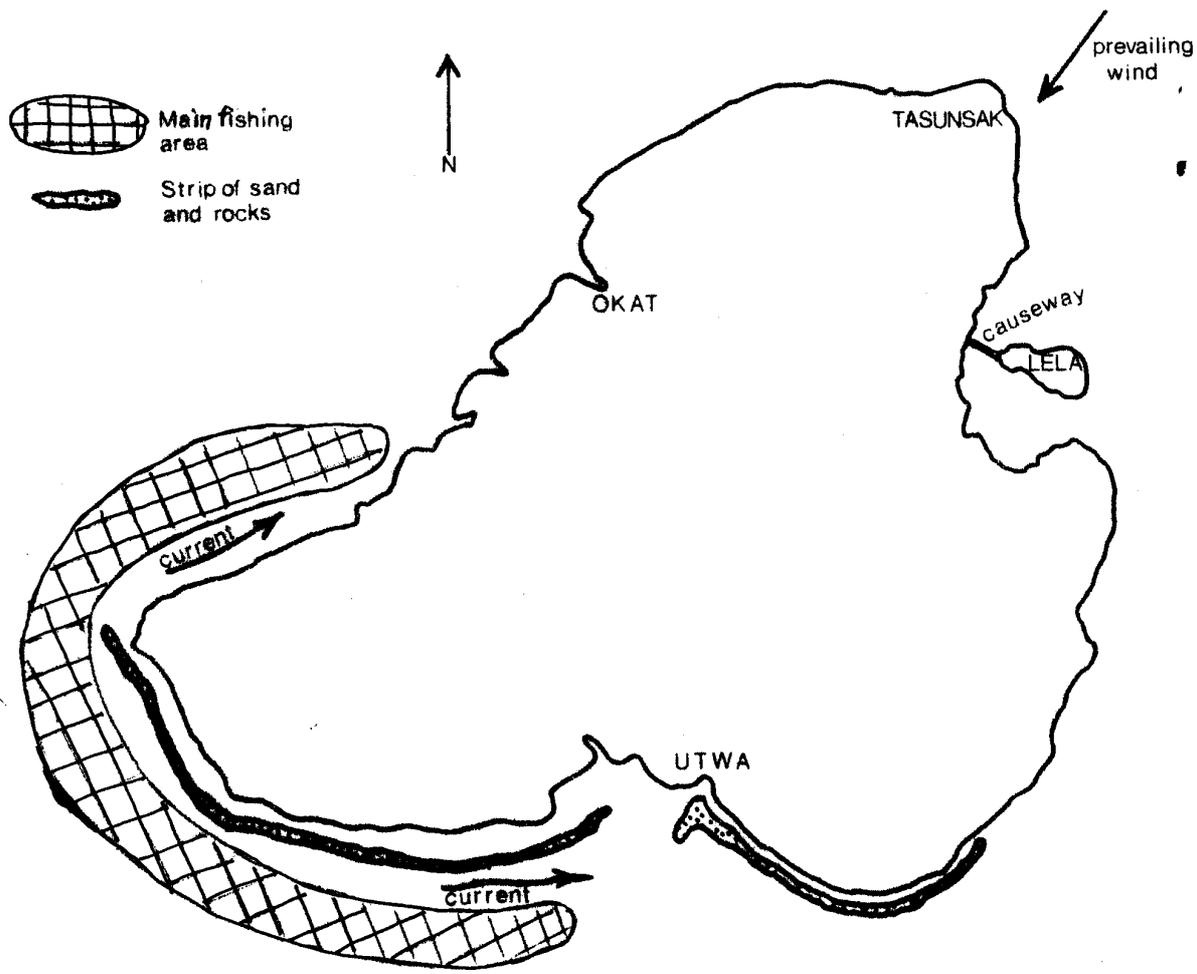


Figure 1: Kosrae island

INTRODUCTION

The main objective of the South Pacific Commission Deep Sea Development Project in Kosrae was to encourage bottom fishing in the unexploited deep water along the outer reef slope. This was to be accomplished by the introduction of gear and techniques used successfully in other Pacific Island countries.

The project was based in Kosrae from 17 April to 27 May 1979. During this period twenty fishing trips were made, landing a total catch of 407 fish weighing 1510 kg. This catch comprised at least 36 species, 12 of which had never been caught in Kosrae before and were without local names.

BACKGROUND

Kosrae, formerly known as Kusaie or Uala Island (Figure 1) is one of the four states in the Federated States of Micronesia. Its position is approximately 163°E and 5°N. The island is generally hilly and covered with dense forest. Mount Crozer, 628m (2,061 ft) situated in the middle of the island, is the summit. The coast is bordered by a wide belt of mangroves into which many small fresh water streams empty. The reef never extends more than a mile offshore and in most areas is only 200—400 m off the beach; The outer reef slope is steep, dropping off to over 40 m within 800 m of the reef.

The prevailing wind in Kosrae during April and May was northeasterly, 10 to 15 knots, with brief periods of 20 to 25 knot gusts during rain squalls which occurred frequently. The sky was generally overcast, with periods of heavy rain. The main current flow along the lee side was easterly with the rate being influenced more by wind than tide. Generally the current increased as wind speed increased and lessened as wind speed lessened.

In the past the women of Kosrae carried out most fishing activities. This tradition has changed gradually in the last 50 years. At the present time the breakers seem to be a dividing line — women doing most of the fishing inside the reef and men doing most of the fishing outside. Fishing methods used outside the reef are spear fishing, netting of flying fish using lights and scoop nets handlining in depths of 150 m or less, and trolling. Canoes and small launches (6 m or less), usually powered by outboards, are used.

BOAT AND EQUIPMENT

The only boat used by the project was a 4.3 m (14 ft) aluminium De Havilland runabout, powered by a 15 H.P. Johnson outboard (Figure 2). Fuel consumption was approximately 3.3 l (0.75 US gallons), per hour. Two handreels (Figure3) fitted with 400 m of 113 kg test monofilament nylon and terminal rigs as shown in Figure 4 were mounted between the first and second seats in such a way as to be operated from a sitting position. A wooden fishbox filled the space between the second and third seats. The anchor and anchor rope were stowed forward of the first seat. Two 26 l (6 gallons U.S.) fuel tanks were carried behind the third seat, just in front of the engine. A full list of the equipment used is given in the Appendix.

When loaded with all the gear the boat's top speed (5 knots) proved to be too slow for trolling. Most of the time (even unloaded) the boat was unsuitable for trolling in the choppy sea conditions experienced during the project's stay.

TRAINING PROGRAMME

Approximately 65 Kosraeans had filed applications with the Agriculture Department for training. As time available was limited, only those applicants who owned boats or were presently engaged in some form of fishing were selected to make training trips. It was decided that one local person should act as boat skipper and that he would accompany the project master fisherman on every trip. As well as being responsible for the boat and equipment he would also assist in training other applicants in both fishing techniques and rigging gear. Because of his past fishing experience, keen interest and the location of his home close to the fishing area Mr Marston Nena was selected. Mr Nena proved to be a very resourceful fisherman and after two weeks of deep bottom fishing he became an essential part of the programme. The small size of the boat limited the number aboard to three, usually the master fisherman, the local skipper and one trainee. Trainees made only one trip each and a total of 18 were taken out during the project's stay.

FISHING METHODS

As the prevailing wind from the north-east made fishing along that side impossible, the boat was based in the village of Utwa on the southern coast of Kosrae. All fishing trips were made along the southern or southwestern coast.

Bottom fishing was always done from an anchored position. Positioning the boat was usually accomplished by dropping the anchor in 100—150 m, then paying out anchor rope, letting the offshore wind blow the boat out to deeper water. Because of the steep slope the echo sounder was very seldom used. Depths were taken by using a fishing reel and counting the number of turns for the sinker to reach the bottom. Kosrae resembles Yap (Western Caroline Islands) in that there is usually a strong ($\frac{1}{2}$ to 2 knot) current setting east or north-east along the coast. On days of light offshore winds the current had more effect than the wind on proper positioning of the boat. Fishing effort was concentrated on bottom fishing in depths of 140—200m, the most productive depth range. Fishing was usually done by day but the three night fishing trips carried out were very successful.

A typical fishing day would be as follows:

0800—0900	pick up lee and trainee from Agriculture Station in Lela
0900—1000	drive the 15 miles to Utwa
1000—1030	launch boat, load ice, bait and gear
1030—1630	fishing
1630—1730	return cruising time to Utwa
1730—1830	unload and clean gear, sort out catch
1830—2000	drive back to Lela, take trainee home

RESULTS AND DISCUSSION

Catches at Kosrae comprised at least 36 species from 11 families of fishes (Table 1). The total catch of bottom fish (excluding sharks) was 1,388 kg (Table 2A). Fishes of the family Lutjanidae, represented by 13 species, made up 45.4 per cent of the catch by weight, of which *Pristipomoides filamentosus* was the most important (14.5%). Carangids (2 species) contributed 25.8 per cent by weight with *Caranx lugubris* (17.2%) being the most important individual species of all those caught. The castor oil fish *Ruvettus pretiosus* comprised 9.4 per cent of the catch by weight although only six specimens of this large species were caught. Large numbers of small groupers, more than at any other country the project had visited, made up most of the remainder of the catch. Troll-caught fish totalled 72 kg, mostly skipjack (Table 2B).

The number of species caught at Kosrae was greater than recorded from any other place the project has visited. Another interesting feature of the catches was the large size of the fishes compared to other parts of the Pacific (Table 3). For all species where it was possible to make a comparison, except one, the fishes caught at Kosrae were larger, often markedly so. The absence of previous fishing on the deep water stocks in Kosrae may partly explain this, but cannot be the whole reason, because it applies also to other places the project has visited. Another possible reason may be the scarcity of sharks at Kosrae; only five were caught during the project's stay (see Table 2A). Also, because Kosrae is a high island with a very heavy rainfall there is considerable runoff of nutrient-rich water into the surrounding sea.

Seventeen trips were devoted solely to bottom fishing, two to trolling (for bait) and one trip combined both methods (Table 4). All bottom fish was sold on shore soon after landing. Troll-caught fish was used for bait. The average catch per bottom fishing trip was 77 kg, giving a catch rate of 9.6 kg per reel per fishing hour. This rate is considerably higher than has been achieved in other places where the project has operated (Table 5). Some caution should be observed if projecting from these data because they represent catches from an unexploited stock, and also because suitable areas for bottom fishing around Kosrae are limited.

ECONOMICS

Based on the results obtained during the project's stay the economics of this type of fishing in Kosrae are shown in Table 6.

RECOMMENDATIONS

1. It was proposed to the Agriculture Department that a boatbuilder from Yap come to Kosrae to train two local builders in the construction of the Alia type catamarans. This proposal has already been carried out and two catamarans have been constructed.
2. It is further proposed that the catamarans be sold to experienced fishermen under a suitable loan scheme.
3. Each fisherman should have at his home an insulated ice box of at least 2 m³ for storage of ice and fish. A box of 1 m³ should be carried on board during fishing operations, and could be purchased and delivered from the Agriculture Department in Lela once or twice a week.

Any prospective deep water fisherman must be instructed in proper safety procedures. These include: the provision of a spare outboard motor for emergencies, which should be tested before each fishing trip; the provision of oars, at least two flares, a spare container of fuel, and an emergency radio beacon marker; adequate fresh water should always be carried. These points are particularly important at Kosrae because of its isolated position far from any other land.

Because of the limited outer slope area, other methods besides deep bottom fishing should be tried. Small boat methods such as handlining (ika shlbi) for large tunas, and other pelagic species and deep or midwater trolling should be tried.

ACKNOWLEDGEMENTS

The project acknowledges the capable assistance of Mr George Nakanishi, the Agriculture Department staff and the enthusiastic support of the people of Kosrae. Mr Marston Nena should also be commended for his part in the operation of the training programme.

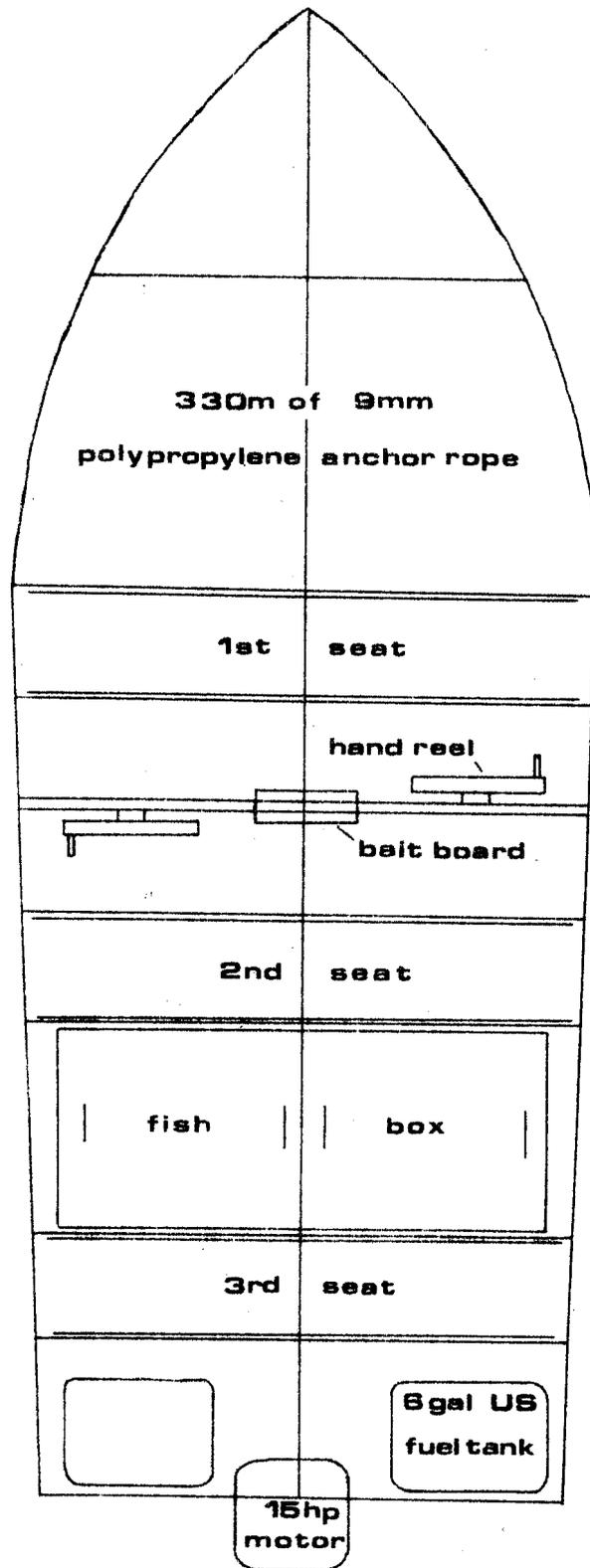


Figure 2: Layout of 4.3 m (14 ft) aluminium dinghy for deep bottom fishing.

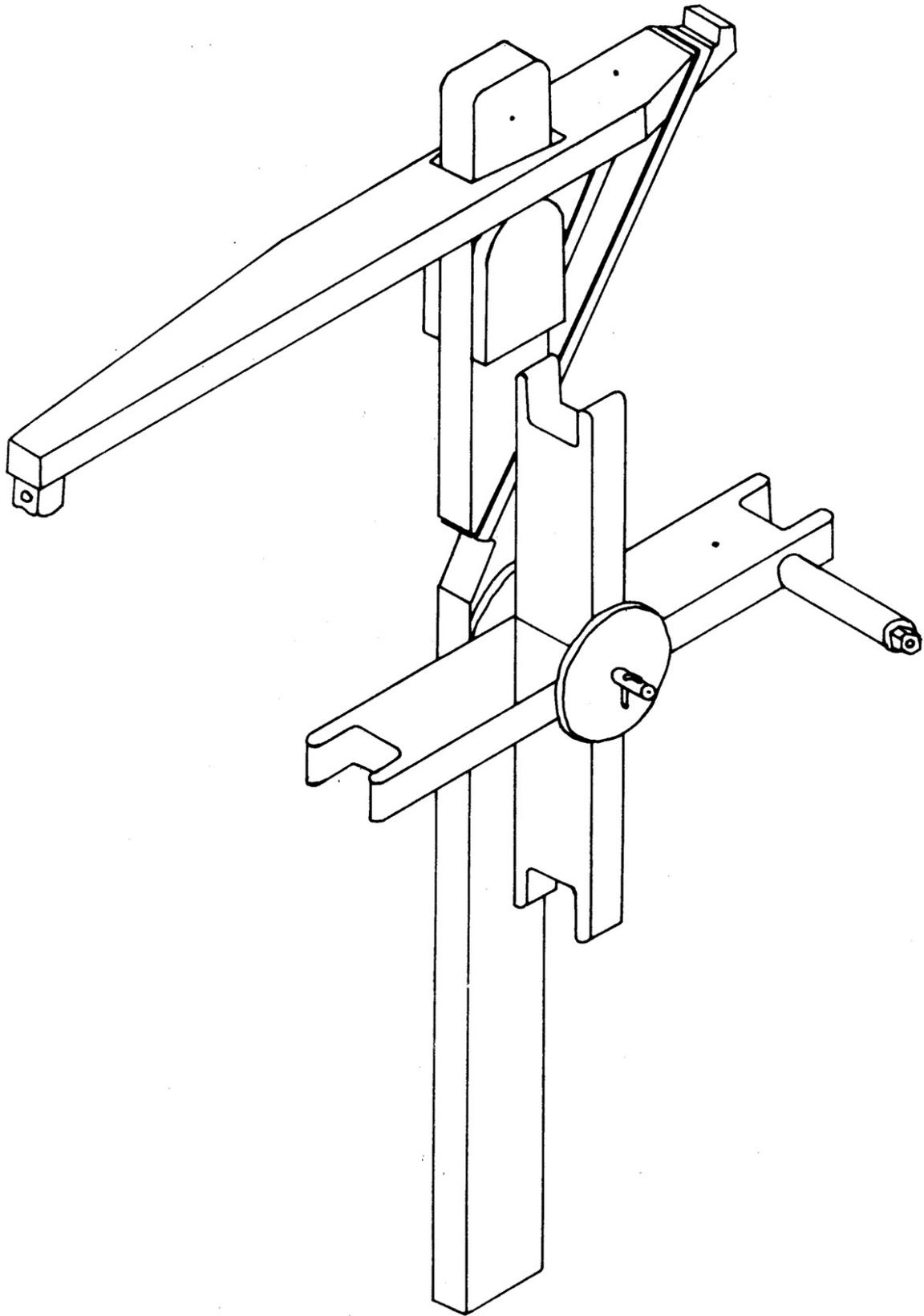


Figure 3: Wooden handreel

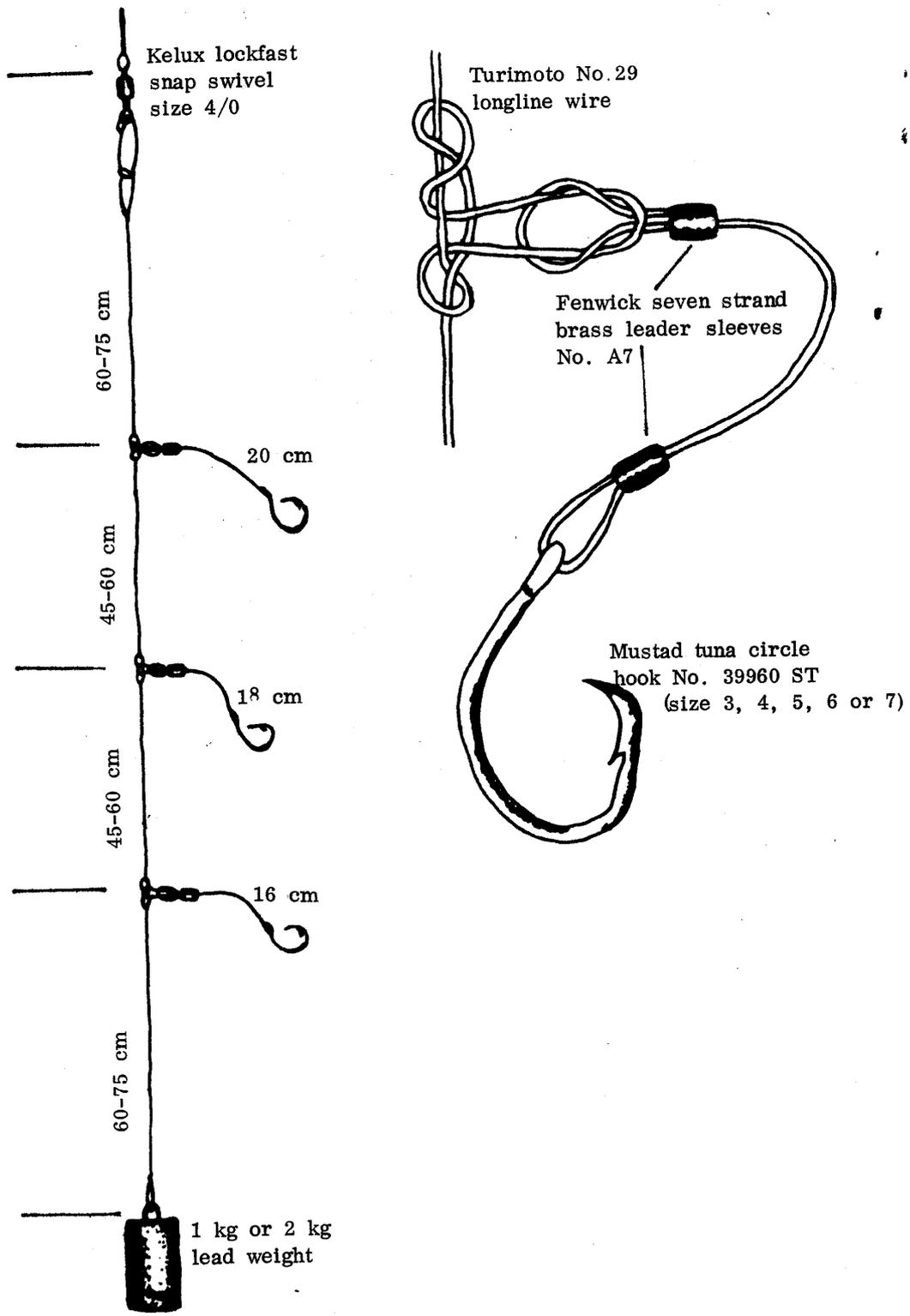


Figure 4: Terminal rig used for deep bottom fishing in Kosrae. Turimoto No. 29 longline wire and Mustad tuna circle hooks (sizes as shown) were used.

Table 1 : Species caught while the Deep Sea Fisheries Development Project was in Kosrae.

Scientific name	Kosraean name	English name
CARCHARINIDAE		
<i>Carcharhinus amblyrhynchos</i>	pako	grey reef shark
SQUALIDAE		
-	pako	dog shark
<i>Echinorhinus</i> sp.	pako	bramble shark
SERRANIDAE		
<i>Epinephelus dictyophorus</i>	kallusruk	grouper, rock cod
<i>E. morrhua</i>	kallusruk	grouper, rock cod
<i>E. retouti</i>	kallusruk	grouper, rock cod
Unidentified spp.	kaliusruk	groupers rock cods
<i>Variola louti</i>	kaliusruk	lunartail cod
CARANGIDAE		
<i>Caranx lugubris</i>	*	trevally, jack
<i>Seriola purpurascens</i>	*	amberjack
LUTJANIDAE		
<i>Aphareus rutilans</i>	*	smalltooth jobfish
<i>Aprion virescens</i>	kiyuf	green jobfish
<i>Etelis carbunculus</i>	*	deep snapper
<i>E. oculatus</i>	*	squirreleyed snapper
<i>Lutjanus bohar</i>	kū	red seabass, red snapper
<i>L. arsentimaculatus</i>	long	mangrove jack
<i>L. gibbus</i>	tāp	paddletail seaperch
<i>L. kasmira</i>	srinae	bluelined seaperch
<i>L. rufolineatus</i>	*	rufous seaperch
<i>Mcolor niger</i>	kuwual	black-and-white seapereh
<i>Pristipomoides auricilla</i>	*	jobfish
<i>P. filamentosus</i>	*	jobfish
<i>Tropidlnius zonatus</i>	*	flower snapper
LETHRINIDAE		
<i>Lethrinus mlniatus</i>	kātuk	longnosed emperor
<i>L. chrysostomus</i>	kātuk	sweetlip emperor
PENTAPODIDAE		
<i>Gnathodentex mossambicus</i>	*	large-eyed bream
SPHYRAENIDAE		
<i>Sphzraena</i> sp.	towel	barracuda
GEMPYLIDAE		
<i>Gempylus serpens</i>	*	snake mackerel
<i>Ruvettus pretiosus</i>	ik fauk	castor oil fish
SCOMBRIDAE		
<i>Gymnosarda unicolor</i>	seelo	dogtooth tuna
<i>Katsuwonus pelamis</i>	katsu	skipjack
<i>Thunnus albacares</i>	olwel	yellowfin tuna
SCORPAEIDAE		
<i>Helicolenus rufescens</i>	*	scorpionfish
unidentified species;	* no Kosraean name.	

¹. Three species were subsequently identified: *Saloptia powelli*, *Cephalopholis aurantius*, *C. igarasiensis*

Table 2: Catch composition: numbers, weights and percentage by species, while the Deep Sea Fisheries Development Project was at Kosrae.

A. Bottom fishing

Species	Number	Percent by numbers	Weight (kg)	Percent by weight
SERRANIDAE				
<i>Epinephelus dictyophorus</i>	37	9.4	31	2.2
<i>E. morrhua</i>	2	0.5	11	0.8
<i>E. retouti</i>	6	1.5	6	0.4
Unidentified spp. ¹	77	19.6	59	4.3
<i>Variola louti</i>	8	2.0	12	0.9
CARANGIDAE				
<i>Caranx lugubris</i>	62	15.8	238	17.2
<i>Seriola purpurascens</i>	7	0.3	120	8.6
LUTJANIDAE				
<i>Aphareus rutilans</i>	8	2.0	20	1.4
<i>Aprion virescens</i>	5	1.3	39	2.8
<i>Etelis carbunculus</i>	1	0.3	3	0.2
<i>E. oculatus</i>	8	2.0	76	5.5
<i>Lutjanus bohar</i>	9	2.3	91	6.6
<i>L. argentimaculatus</i>	15	3.8	98	7.1
<i>L. gibbus</i>	4	1.0	4	0.3
<i>L. kasmira</i>	2	0.5	1	0.1
<i>L. rufolineatus</i>	2	0.5	2	0.1
<i>Macolor niger</i>	1	0.3	5	0.4
<i>Pristipomoides auricilla</i>	37	9.4	54	3.9
<i>P. filamentosus</i>	50	12.7	201	14.5
<i>Tropidinius zonatus</i>	18	4.6	35	2.5
LETHRINIDAE				
<i>Lethrinus miniatus</i>	5	1.3	24	1.7
<i>L. chrysostomus</i>	1	0.3	5	0.4
PENTAPODIDAE				
<i>Gnathodentex mossambicus</i>	12	3.0	37	2.7
SPHYRAENIDAE				
<i>Sphyraena</i> sp.	1	0.3	3	0.2
GEMPYLIDAE				
<i>Gempylus serpens</i>	6	1.5	7	0.5
<i>Ruvettus pretiosus</i>	6	1.5	130	9.4
SCOMBRIDAE				
<i>Gymosarda unicolor</i>	2	0.5	32	2.3
<i>Thunnus albacares</i>	1	0.3	44	3.2
TOTALS				
	393	100	1388	100
SHARKS				
<i>Carcharhinus amblyrhynchos</i>	2		35	
Dog shark	2		15	
<i>Echinorhinus</i> sp.	1		100	
B. Trolling.				
SCOMBRIDAE				
<i>Katsuwonus pelamis</i>	9		64	
<i>Thunnus albacares</i>	1		8	
GRAND TOTALS				
	408		1610	

¹. Also includes *Helicolenus refescens*.

Table 3: Comparative mean weights (kg) of fishes from different places where the Deep Sea Fisheries Development Project has worked. Sample sizes are shown in brackets; — indicates no or insufficient data.

Species	A. Samoa	Tonga	Yap District	Kosrae
<i>Caranx lugubris</i>	-	-	2.5 (56)	3.8 (62)
<i>Seriola purpurascens</i>	3.1 (8)	-	4.8 (5)	17.1 (7)
<i>Aprion virescens</i>	2.5 (62)	2.8 (33)	4.4 (5)	7.8 (5)
<i>Etelis oculatus</i>	4.1 (229)	4.7 (35)	-	9.5 (8)
<i>Lutjanus bohar</i>	-	-	3.5 (72)	10.1 (9)
<i>Pristipomoides auricilla</i>	-	-	1.1 (9)	1.5 (37)
<i>Tropidinius zonatus</i>	0.5 (21)	-	1.4 (10)	1.9 (18)
<i>Lethrinus miniatus</i>	-	2.8 (9)	1.5 (4)	4.8 (5)
<i>Ruvettus pretiosus</i>	-	23.3 (6)	-	21.7 (6)

Table 4: Individual trip records

A. Bottom fishing (two handreels were used)

Trip	Number of fish	Catch (kg)	Total hours	Fishing hours	Engine hours	Fuel in U.S. gal.	Bait (kg)	Number of Crew
1	17	90	6	3	3	2	2	3
2	9	53	15	6	3	1	2	3
3	34	190	11	8	3	2	5	3
5	9	31	8	4	4	2	2	4
7	15	41	7	3	4	3	3	4
8	21	94	9	5	4	3	4	3
9	10	41	7	4	3	1	3	3
10	17	70	7	2	5	4	2	3
11	9	81	4	2	2	1	2	3
12	19	73	4	2	2	3	3	3
13	14	55	6	3	3	3	2	3
14	13	39	9	4	5	5	3	2
15	54	109	8	4	4	3	2	3
16	30	166	13	8	5	3	4	2
17	42	82	7	3	4	2	4	3
18	24	73	6	4	2	3	3	3
19	30	47	9	4	5	4	3	3
20	26	53	5	3	2	2	2	3
Totals	393	1388	141	72	63	47	51	

Average catch per trip 77 kg
Average catch per reel per fishing hour 9.6 kg

B. Trolling

4	0	0	5	4	5	7	2
6	8	64	4	4	4	6	1
10	2	8	1	1	1	1	3
Totals	10	72	9	9	10	14	

Table 5: Average catch in kg per reel per fishing hour in places where the Deep Sea Fisheries Development Project has operated.

American Samoa	4.4
Tonga	3.6
Niue	2.8
Yap (TTPI)	6.9
Tanna (New Hebrides)	3.1
Kosrae (TTPI)	9.6

Table 6: Economics of deep bottom fishing in Kosrae using an 8.6 m (28 ft) catamaran bought new (fully equipped) for US\$6,000, depreciated over five years and operated by an owner skipper.

Earnings/year

4 fishing trips/week, 40 weeks/year, 160 trips/year;
 19.2 kg/fishing hour (two reels), 5 fishing hours/trip,
 96.0 kg/trip, 15,360 kg/year, \$1.10/kg.

US\$16,896

Expenses/year

Depreciation of boat	1,200
Interest on loan (10% reducing annually)	383
Fuel (4 gal/trip, \$1.00/gal)	640
Maintenance and repairs	200
Replacement of fishing gear	200
Bait (0.71 kg/fishing hour, 3.55 kg/trip, 568 kg/year)	625
Ice (estimate)	500
Wages (crew, ¼ share of catch)	4,224

Total expenses/year US\$7,472

Balance US\$9,424

Boat and equipment used by the Deep Sea Fisheries Development Project in Kosrae

A. Supplied by Kosrae Agriculture Department

1. 4.3 m (14 ft) aluminium De Havilland runabout
15 H.P. Johnson Outboard
0.7 cu.m (25 cu. ft) fish and ice box
330 (180 fathoms) of 9mm (3/8") polypropylene anchor rope
9 mm (3/8") grapnel anchor
2. 2 m (6 ft) of 9 mm (3/8") chain
Fuel and oil
Toyota pick-up.
3. Assorted sizes of sinkers made from 30 mm (1¼") reinforcement rod, 1— 2.5 kg

B. Supplied by SPC.

1. Two Western Samoan handreels holding 400 m (220 fathoms) of (250 lb) test monofilament line
2. Turimoto #29 longline wire for terminal rigs.
3. Mustad tuna circle hooks, quality No.39960ST, assorted size (Nos. 9, 6, 5, 4, 3's)
4. Size 4/0 Berkley-McMahon swivels
5. Size 4/0 Resco Stainless Coastlock snap swivels
6. Japan Marine Company model 707 echo sounder