



**SOUTH PACIFIC COMMISSION**

**REPORT ON THE SOUTH PACIFIC COMMISSION  
DEEP SEA FISHERIES  
DEVELOPMENT  
PROJECT IN YAP DISTRICT  
(TRUST TERRITORY OF THE PACIFIC ISLANDS)**

**(25 September 1978 —29 March 1979)**

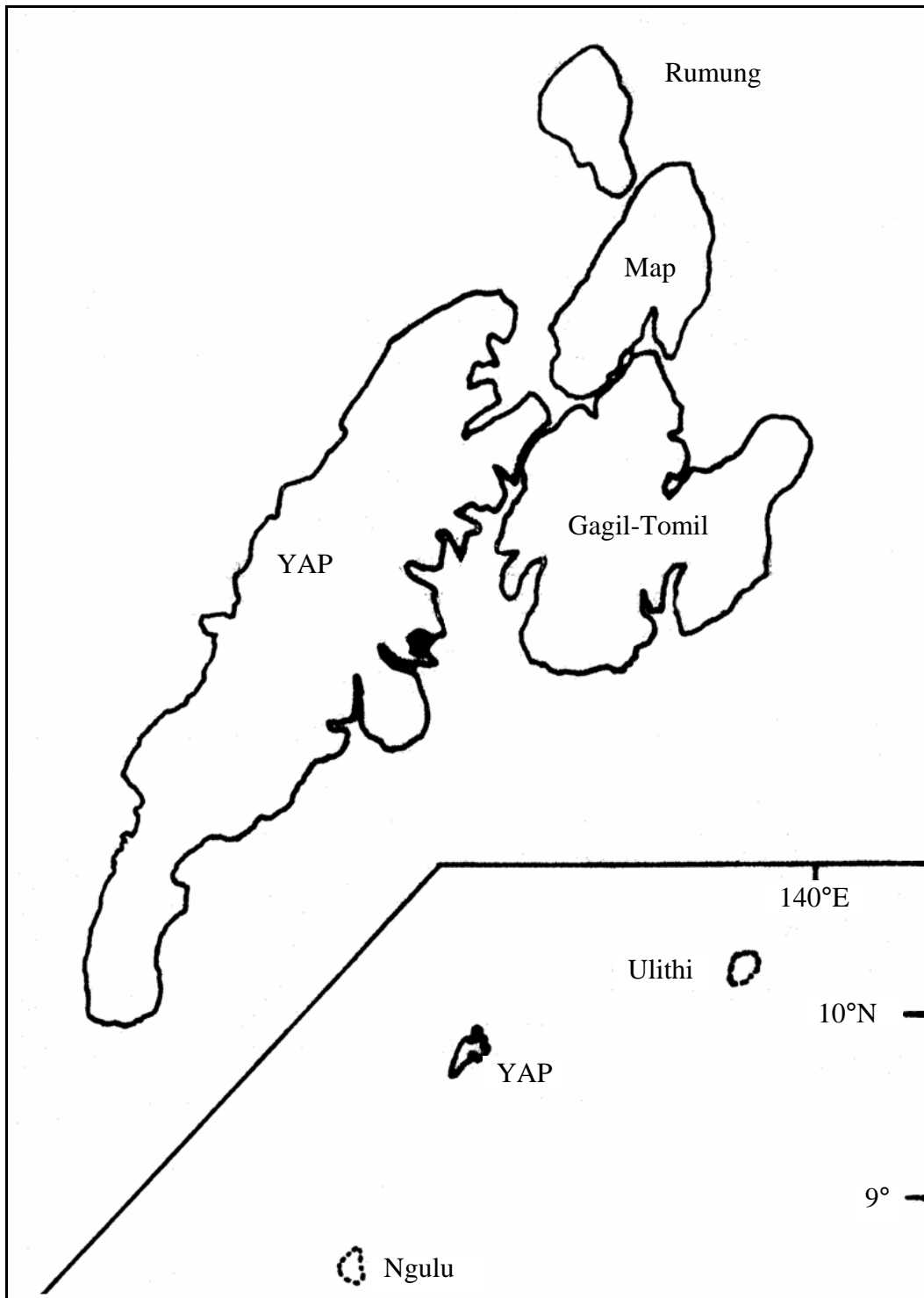
by

Paul Mead

and

James Crossland

Noumea, New Caledonia  
January 1980



**Fig.1: YAP**

## INTRODUCTION

The main objective of the South Pacific Commission Deep Sea Fisheries Development Project in Yap 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 arrived in Yap on 25 September 1978 for a three-month stay but because of many difficulties experienced with the fishing boats used, this time was extended for another three months until 29 March 1979. During this period 37 fishing trips were made, landing a total catch of 1,432 fish weighing 2,715 kg.

## BACKGROUND

Yap District, one of the four Federated States of Micronesia, is a widespread collection of high islands and atolls, most of which lie between 136° —148°E and 5° —12°N.

The areas fished in Yap District by the project were:

- (1) **Yap** itself which is composed of four different islands, Yap, Gagil-Tomil, Map and Romung, separated from each other by narrow canals. All four islands are high and hilly with the highest point (178 m) being on Yap. The four islands, large areas of mangrove swamp and large lagoons, are enclosed by a single reef.
- (2) **Hunter Bank**, a submerged reef 16 miles north of Yap, about one mile long by 1/4 mile wide and covered by 20—40 m of water.
- (3) **Ngulu**, a large atoll 70 miles south-west of Yap, comprising several small islands and an extensive lagoon.
- (4) **Ulithi**, another large atoll, made up of many islands, large submerged reefs, and a huge lagoon located 85 miles to the north-east of Yap.

The prevailing wind in Yap from October to March was from the northeast, averaging 10—15 knots most days, but usually dropping off at night to 3—10 knots. Fishing days were lost in December, January and February due to four different tropical storms moving through the District. Wind gusts reached 40 knots at times during heavy rain squalls.

In all areas fished there was a steady current setting east to north-east. In exposed areas this current flow into the prevailing wind resulted in rough sea conditions. Hunter Bank was too rough to fish any time the wind was from the north-east at more than 10 knots.

Impounding of fish using large arrow-shaped traps constructed of stone and netting was the most important traditional method of fishing around Yap. There are more of these traps at Yap than at any other island of its size in the Pacific but only a few are in use today. The outer islanders of Yap District have always been excellent seamen and fishermen. They are familiar with most methods of fishing used elsewhere in the region, such as netting flying fish, deep handlining for tuna and castor oil fish, and poling tuna on outrigger sailing canoes.

At the present time around Yap there are about 20—30 boats (14—16 ft) actively engaged in part-time fishing. These boats are mostly of wood or fibreglass and are powered by outboards. Most of the smaller wooden boats are used for spearfishing and gill netting inside the lagoon. Fibreglass boats with large outboards (35—60 H.P.) are used in trolling for pelagic fish outside the reef. Because of their small size fishing is greatly influenced by weather conditions. Most fishing is carried out between June and October, when large catches of yellowfin (*Thunnus albacares*) and skipjack (*Katsuwonus pelamis*) may be landed. In the season of the northeast trades a limited amount of trolling is done along the lee coast, but catches are never consistent. Small dolphin fish (*Coryphaena hippurus*) and wahoo (*Acanthocybium solandri*), both species averaging around 6 kg, make up most of the catches.

## **BOATS**

Five different boats were used during the project's stay but most fishing was done from two boats, a 7 m (23 ft) plywood motor launch (B-2) and an 8 m (26 ft) fibreglass whale boat. Details of the boats are given in Appendix 1.

## **METHODS AND GEAR**

As the outer slope of the reef around Yap drops off very steeply to depths of over 1,000 m there is a very limited area suitable for bottom fishing. The strong currents running parallel to the steep outer slope made anchoring difficult and dangerous, even in a strong offshore wind. Because of the difficult conditions other methods apart from bottom fishing were used. These methods were slow subsurface trolling by day and on moonlight nights using flying fish for lures, conventional trolling using lures and handreels instead of handlines, handlining in shallow lagoons (30—50 m), and netting flying fish.

**Deep bottom fishing.** Two handreels (Fig.2) fitted with 400 m of 113 kg test monofilament nylon and terminal rigs as shown in Fig.3 were used. Instead of using the brass leader sleeves shown in the figure the wire may be wrapped around to fasten it. Full details of the fishing gear are given in Appendix 2. Two experienced fishermen on board the seine boat (of reasonable size) will catch more than twice the catch of a single fisherman. This is because the fish are kept attracted to the bait provided one rig is kept on the bottom at all times.

Fishing was usually done from an anchored position. The anchor was let go in 40—60 m of water and the rope paid out as the offshore wind blew the boat into deeper water. Depths were measured by echosounder or by using the handreel and counting the number of turns until the sinker touched bottom. Fishing depth was adjusted by paying out or hauling an anchor rope. Most days there was a strong current flow parallel to the reef around Yap. On days of light winds the current was used to position the boat instead of the wind.

To reduce the effort of hauling from considerable depths the anchor was recovered by towing it with the boat. A buoy was then shackled onto the rope, sliding along it to be trapped near the anchor. The floating line could then be easily pulled aboard. Suitable anchoring equipment for deep bottom fishing is shown in Fig.4. The grapnel used at Yap was constructed without the galvanised pipe.

**Handlining in shallow water.** This method was used on only one fishing trip in Ulithi lagoon on a 5 m fibreglass Yamaha boat on which no reels had been mounted. Handlining from small boats in areas of sheltered water of less than 50 m can be a very effective and inexpensive means of fishing. In Ulithi lagoon this type of fishing was done from a drifting boat using hand lines of 60 kg test monofilament. The terminal rig, being lighter than the mainline, breaks away if it becomes fast as the boat drifts along. The rig in Fig.5 is the one recommended by the project for this type of fishing. Although there are many different variations of terminal rigs this one will hook as many fish as the others and very few will be lost due to broken or cut leaders.

**Netting flying fish.** This method was practised only from the whale hoar. Two 200W, 24V, reflector lights were mounted on poles, one on each side of the boat, 1.5 m back from the bow and 2 m above the deck. The nets were modelled on traditional ones. Several designs were tried~ the most effective one is shown in Fig. 6.

Two fishermen each with a net stood in the bow. Flying fish were scooped from the surface (or at times caught in the air) as the boat cruised along the outer edge of the reef at about 2 knots. This method worked very successfully on dark nights. Flying fish are especially susceptible to netting in the hours 2ust before sunrise.

**Subsurface trolling.** For this type of trolling, flying fish bait proved to be much more effective than feather lures, squid lures or 3ee heads, probably because of the slow towing speed. A modified handreel was used. This was fitted with a simple braking system, a pulley instead of an isolator on the arm, and held 500 m of No. 29 Turimoto wire. Thirty metres of 145 kg test monofilament with swivels at each end was clipped to the end of the wire as a shock absorber. Flying fish were mounted on a large double hook attached to a 1.5 m trace of No. 29 Turimoto wire.

The flying fish was trolled 150 to 200 m behind the boat approximately 100 m off the breakers. The weight of the long length of wire pulled the flying fish well down below the surface. Speeds of three to seven knots were tried, with best results at six to seven knots. This method gave good catches of dogtooth tuna (*Gymnosarda unicolor*) and barracuda (*Sphyraena* spp.) during daylight trips. Trolling by moonlight resulted in good catches of trevally (*Caranx* sp.) and barracuda.

**Trolling with lures.** This method was found to be most effective around Yap in boats with speeds of over 10 knots such as the B-2. Using the handreels the length of the trolling line could be quickly adjusted — lengthening the line on schools which were hard to troll and shortening it to within 40 m of the boat in good biting schools.

When properly used handreels will land double the amount taken by handline in good biting schools as the line can be hauled in much faster and there is no danger of tangles. It is nearly impossible to avoid tangles with handlines if two to four fish are pulled at once on 50 to 200 m lines. One large tangle can result in the loss of valuable fishing time in a good school. Also, because the handreels are much faster there is less chance of the hooked fish being taken by sharks.

## **PROJECT OPERATIONS**

While based in Yap the project was given the full support of the Yap District Fishing Authority and its manager, Mr Tony Ganingyan. Fishing Authority can be described as a government fishing company operated on a commercial basis. Neither its equipment nor personnel are regulated by normal government bureaucratic system. Equipment and facilities owned by Fishing Authority at the time of the project's visit were three boats (only one operational on the arrival of the project), a 3 t capacity walk-in freezer, a 500 kg/day ice-maker, a vehicle, a well equipped woodworking shop and all tools needed for basic engineering maintenance.

Fishing Authority personnel included two capable boat builders who had been trained at the FAO/DANIDA boat building project in Western Samoa, a mechanic and several fishermen with four to five years' experience. The manager, boat builders and the mechanic were also enthusiastic fishermen. All Fishing Authority personnel were on a low salary, but there is a good incentive to fish as much as possible as 50 per cent of the catch goes to the crew. On good fishing trips it was possible for crew members to earn as much as their two-weekly salary in only two or three days fishing. Fish were weighed upon return from a trip. The crew usually sold their share of the catch for 50c US/1b (\$1.10/kg) to Fishing Authority. Fishing Authority then marketed the catch at 65c/15. Most catches were sold within hours after being landed.

Rigging gear and the boat occupied the first week of the project stay. The two handreels were mounted on the Fishing Authority boat B-2 on a short trolling familiarisation trip was made on 29 September. The next three trips were all short, trolling trips to become acquainted with the fishing area. At this time the weather was unsettled with variable wind conditions. The first bottom fishing trip was made on 3 October. The next trips were mixed bottom fishing and trolling. Seventeen were aboard the B-2 and four aboard the FAO design boat.

The project moved to Falalop, one of the larger islands of Ulithi Atoll, for the period 25 November-6 December. Falalop, the main centre of the atoll, has an airfield and is the site of the outer islands high school. There are also a large walk-in freezer and ice-maker on the island, both in good condition but neither being used at that time.

Permission had been previously given for the project to operate there by Mr Belarmino-Hathey and other outer island chiefs who control the traditional fishing rights in the area. Mr Moses Marpa, Assistant District Vocational Supervisor, made arrangements through CETA funding to meet the expenses involved in transportation of equipment from Yap to Ulithi aboard the Micro Spirit, for boat rental and fuel costs. Mr Marpa also made arrangements for the project to work with the outer islands fishing class and their instructor Mr Pedro Yamalmal, under whose guidance instruction was given in the construction of handreels and their use in bottom fishing and trolling.

Four fishing trips were made from Falalop.

On 6 December the project returned to Yap from Falalop to find the B-2 had developed outdrive problems and the stern was rotten. Work was started on the reconditioning of a 1941 model US Navy whale boat. During the next six weeks a new engine, shaft, propellor, stern bearing and flexible coupling were installed. The building of a cabin over the engine and fitting of fishing gear took another two weeks. As Christmas, New Year and election celebrations held up work, the whale boat was not launched until 17 January 1979. Extremely bad weather conditions and a couple of severe tropical storms delayed fishing activities until the end of January. During this time of bad weather work began on a catamaran (FAO Alia design) which was completed in three weeks, except for the fibreglassing along the bottom of the hulls.

Strong north-east trades during February and early March prevented fishing except along the lee coast. As this side has a very steep slope, limited fishing area and strong current flow, bottom fishing was usually impossible. Experimental trips were begun netting for flying fish and subsurface trolling. Both methods proved very successful and economically worthwhile. Fishing trips concentrating on these two methods were carried out until the trade winds began to die down towards the middle of March. In mid-March two very successful fishing trips on the whale boat were made to the atoll of Ngulu, approximately 70 miles south-west of Yap. Fishing activities around Ngulu were outside the reef only, as negotiations on fishing rights had not been finalised. Ngulu proved to be an extremely productive fishing area.

During the project's stay 17 fishermen from Yap and 4 from Ulithi received training in fishing techniques and boat operation. The project left Yap on 29 March 1979.

## RESULTS

A total of 37 completed fishing trips (Table 1) was made during the project's stay in Yap District, with an average catch per trip of 73.4 kg (162 lbs). Catches comprised at least 30 species from nine families (Table 2). As in most places the project has visited, lutjanids (snappers) made up about half of the catch of bottom fish by weight (45.9%). The most important individual species was the red seabass *Lutjanus bohar* (27.0%). In many places in the Pacific this species is poisonous but it was not so in Yap, nor were any other fishes caught. Other important contributors to the bottom fishing catch were carangids (mainly *Caranx lugubris*, 15.6%), groupers (15.5%) and emperors (8.1%). The trolling catch was dominated by three scombrid species, yellowfin tuna (33.5% by weight), dogtooth tuna (27.9%) and wahoo (14.2%). Several species of barracuda, together contributing 12.8%, made up most of the rest of the catch by this method.

Altogether 660 fish weighing 2534 kg were caught by bottom fishing and trolling.

**Yap Island.** Details for the four different fishing methods are given in Tables 3, 5, 7 and 9 (individual trip records, total 31) and Tables 4, 6, 8 and 10 (catch composition). Not included in these results was one set of a vertical longline which was fished for eight hours and caught three fish totalling 29 kg. Tables 9 and 10 contain the results for netting flying fish.

The mean catch rate for bottom fishing was 4.6 kg/reel/fishing hour. Both trolling methods gave the same catch rate, 3.5 kg/reel/fishing hour, but subsurface trolling with flying fish uses less fuel because it is effective at a slower speed than trolling with lures.

**Ulithi.** Details for the different methods used are given in Tables 11 and 13 (individual trip records, total 4) and Tables 12 and 14 (catch composition). The catch rate for deep bottom fishing (14.4 kg/reel/fishing hour) was considerably higher than at Yap but trolling catches were similar (4.0 kg/reel/hour).

**Ngulu.** Details for the different methods are given in Tables 15 and 17 (individual trip records, total 2) and Tables 16 and 18 (catch composition). The catch rate for deep bottom fishing (13.2 kg/reel/fishing hour) was again considerably higher than at Yap; the trolling catch rate was also much higher (12.3 kg/reel/fishing hour).

## **DISCUSSION**

The deep bottom catch rate around Yap Island (4.6 kg/reel/ fishing hour) was about average for places where this type of fishing has been tried (Table 19). However, the difficulty of fishing Yap's outer reef slope because of the fresh prevailing winds and strong nearshore currents means that opportunities for bottom fishing are limited and a successful fishing enterprise needs to combine this method with trolling, and netting for flying fish. The possible economics of such an operation based on the catch rates obtained during the project's stay are given in Table 20. These show that compared to the current wage rate in Yap (approximately 85c/hour) fishing would be quite profitable. Calculations similar to those in Table 20 but based on the operation of an 8.6 m Alia catamaran costing \$4,500 fully equipped show a slightly lower balance (\$188 less) because of increased fuel costs. However this type of craft can fish in rougher weather and has a higher speed, which is an advantage when trolling with lures.

An enterprising fisherman based at Yap could also profitably fish as far away as Nguiu Atoll, as the results of trips 35 and 36 show. For these long trips it would be an advantage to increase the fish carrying capacity of the whale boat or use a boat with a bigger pay load.

The possibilities for developing small-scale fisheries in Yap District are encouraging and should be followed up. The regular air services to Guam also make it possible to export any surplus catch.



## **ACKNOWLEDGEMENTS**

The project acknowledges the helpful support of Mr Tony Ganingyan and the entire staff of the Yap Marine Resources and Yap District Fishing Authority. The friendly and enthusiastic help of the people of Yap District and the Yap Government Administration was also much appreciated.

**Table 1: Individual trip records of the Deep Sea Fisheries Development Project in Yap District (BF = bottom fishing with handreels, HL = handlinig, TL = trolling with lures, TF = trolling with flying fish, VL = vertical longline, NF = netting for flying fish).**

| Trip Number   | Catch (numbers) | Catch (kg)  | Trip hours  | Fishing hours | Engine hours | Fuel (US gals) | Methods  | Area        | Boat       |
|---------------|-----------------|-------------|-------------|---------------|--------------|----------------|----------|-------------|------------|
| 1             | 6               | 35          | 6           | 6             | 6            | 8              | TL       | Yap         | B-2        |
| 2             | 6               | 25          | 3           | 3             | 3            | 4              | TL       | Yap         | B-2        |
| 3             | 2               | 8           | 5           | 5             | 5            | 6              | TL       | Yap         | B-2        |
| 4             | 26              | 78          | 5           | 5             | 2            | 2              | RF       | Yap         | B-2        |
| 5             | 9               | 20          | 8           | 8             | 6            | 6              | TL BF    | Yap         | B-2        |
| 6             | 9               | 33          | 9           | 6             | 4            | 3              | TL BF    | Yap         | B-2        |
| 7             | 3               | 12          | 8           | 8             | 6            | 5              | TL BF    | Yap         | B-2        |
| 8             | 8               | 11          | 2           | 2             | 1            | 1/2            | BF       | Yap         | B-2        |
| 9             | 1               | 22          | 4           | 4             | 4            | 2              | TL       | Yap         | B-2        |
| 10            | 12              | 33          | 16          | 11            | 10           | 4              | TL BF    | Hunter Bank | 28ft       |
| 11            | 7               | 65          | 12          | 9             | 12           | 5              | TL       | Hunter Bank | 28ft       |
| 12            | 7               | 60          | 8           | 6             | 8            | 6              | TL       | Hunter Bank | 28ft       |
| 13            | 5               | 89          | 8           | 4             | 4            | 6              | TL BF    | Yap         | B-2        |
| 14            | 12              | 73          | 6           | 5             | 4            | 8              | TL BF    | Yap         | B-2        |
| 15            | 31              | 59          | 9           | 4             | 6            | 8              | TL BF    | Yap         | B-2        |
| 16            | EngineBreakdown |             |             |               |              |                |          | Yap         | B-2        |
| 17            | 25              | 126         | 4           | 3             | 4            | 5              | TL       | Yap         | B-2        |
| 18            | 0               | 0           | 7           | 7             | 7            | 10             | TL       | Yap         | B-2        |
| 19            | 14              | 66          | 10          | 8             | 7            | 10             | TL BF    | Yap         | B-2        |
| 20            | 17              | 91          | 8           | 7             | 8            | 2              | TL       | Yap         | B-2        |
| 21            | 12              | 40          | 10          | 8             | 5            | 8              | TL BF    | Yap         | B-2        |
| 22            | 12              | 45          | 8           | 7             | 5            | 13             | TL BF    | Yap         | B-2        |
| 23            | 147             | 69          | 5           | 3             | 2            | 3              | HL       | Ulithi      | 16ft       |
| 24            | 18              | 68          | 7           | 4             | 3            | 4              | BF       | Ulithi      | 23ft       |
| 25            | 4               | 20          | 3           | 2             | 2            | 2              | TL BF    | Ulithi      | 23ft       |
| 26            | 99              | 212         | 12          | 7             | 6            | 8              | TL BF    | Ulithi      | 23ft       |
| 27            | 38              | 53          | 18          | 9             | 14           | 6              | TL TF BF | Yap         | Whale boat |
| 28            | 277             | 136         | 19          | 17            | 18           | 5              | NF TF    | Yap         | whale boat |
| 29            | 89              | 119         | 19          | 13            | 18           | 4              | NF TF    | Yap         | Whale boat |
| 30            | 11              | 80          | 12          | 11            | 12           | 4              | TF       | Yap         | Whale boat |
| 31            | 22              | 13          | 18          | 13            | 13           | 6              | NF TF    | Yap         | Whale boat |
| 32            | 13              | 115         | 43          | 16            | 13           | 3              | VL BF TF | Yap         | Whale boat |
| 33            | 273             | 63          | 13          | 12            | 12           | 5              | NF BF TF | Yap         | Whale boat |
| 34            | 13              | 110         | 8           | 7             | 8            | 5              | TF       | Yap         | Whale boat |
| 35            | 41              | 274         | 38          | 11            | 25           | 16             | BF TF    | Ngulu       | Whale boat |
| 36            | 55              | 326         | 42          | 13            | 30           | 18             | BF TL TF | Ngulu       | Whale boat |
| 37            | 8               | 40          | 7           | 5             | 7            | 5              | TF       | Yap         | Whale boat |
| 38            | 100             | 26          | 8           | 2             | 8            | 2              | NF       | Yap         | Whale boat |
| <b>Totals</b> | <b>1432</b>     | <b>2715</b> | <b>430</b>  | <b>270</b>    | <b>308</b>   | <b>220</b>     |          |             |            |
| <b>Means</b>  | <b>38.7</b>     | <b>73.4</b> | <b>11.6</b> | <b>7.3</b>    | <b>8.3</b>   | <b>5.9</b>     |          |             |            |

**Table 2: Species composition of the total catches by the Deep Sea Fisheries Development Project in Yap District. A number of sharks was also caught but the details were not recorded.**

**A. Bottom fishing<sup>1</sup>**

| Scientific name                 | English name        | Number | Weight (kg) | Percent by numbers | Percent by weight | Mean weight per fish (kg) |
|---------------------------------|---------------------|--------|-------------|--------------------|-------------------|---------------------------|
| <b>SERRANIDAE</b>               |                     |        |             |                    |                   |                           |
| <i>Epinephelus</i> spp.         | groupers, rockcods  | 21     | 128         | 4.7                | 13.8              | 10.9                      |
| <i>Variola louti</i>            | lunartail cod       | 6      | 16          | 1.3                | 1.7               | 2.7                       |
| <b>CARANGIDAE</b>               |                     |        |             |                    |                   |                           |
| <i>Caranx lugubris</i>          | trevally, jack      | 59     | 145         | 13.2               | 15.6              | 2.5                       |
| <i>Elegatis bipinnulata</i>     | rainbow runner      | 24     | 25          | 5.4                | 2.7               | 1.0                       |
| <i>Seriola purpurascens</i>     | amberjack           | 5      | 24          | 1.1                | 2.6               | 4.8                       |
| <b>LUTJANIDAE</b>               |                     |        |             |                    |                   |                           |
| <i>Aphareus rutilans</i>        | smalltooth jobfish  | 2      | 6           | 0.4                | 0.6               | 3.0                       |
| <i>Aprion virescens</i>         | green jobfish       | 9      | 26          | 2.0                | 2.8               | 2.9                       |
| <i>Etelis carbunculus</i>       | deep snapper        | 10     | 55          | 2.2                | 5.9               | 5.5                       |
| <i>Lutjanus bohar</i>           | red seabass         | 73     | 251         | 16.4               | 27.0              | 3.4                       |
| <i>L. argentimaculatus</i>      | mangrove jack       | 2      | 12          | 0.4                | 1.3               | 6.0                       |
| <i>L. gibbus</i>                | paddletail seaperch | 46     | 42          | 10.3               | 4.5               | 0.9                       |
| <i>L. kasmira</i>               | buelined seaperch   | 1      | 2           | 0.4                | 0.1               | 0.5                       |
| <i>L. monostigma</i>            | one-spot seaperch   | 1      | 1           | 0.2                | 0.1               | 1.0                       |
| <i>Pristipomoides auricilla</i> | jobfish             | 9      | 10          | 2.0                | 1.1               | 1.1                       |
| <i>P. filamentosus</i>          | jobfish             | 4      | 9           | 0.9                | 1.0               | 2.3                       |
| <i>Tropidinius zonatus</i>      | flower snapper      | 10     | 14          | 2.2                | 1.5               | 1.4                       |
| <b>LETHRINIDAE</b>              |                     |        |             |                    |                   |                           |
| <i>Lethrinus chrvsostomus</i>   | sweetlip emperor    | 6      | 6           | 1.3                | 0.6               | 1.0                       |
| <i>L. miniatus</i>              | longnosed emperor   | 4      | 6           | 0.9                | 0.6               | 1.5                       |
| <i>L. nebulosus</i>             | spangled emperor    | 139    | 59          | 31.2               | 6.3               | 0.4                       |
| <i>L. sp.</i>                   | emperor             | 2      | 7           | 0.4                | 0.8               | 3.5                       |
| <b>PENTAPODIDAE</b>             |                     |        |             |                    |                   |                           |
| <i>Gymnocranius japonicus</i>   | large-eyed bream    | 2      | 3           | 0.4                | 0.3               | 1.5                       |
| <b>SPHYRAENIDAE</b>             |                     |        |             |                    |                   |                           |
| <i>Sphyraena</i> spp.           | barracudas          | 2      | 13          | 0.4                | 1.4               | 6.5                       |
| <b>GEMPYLIDAE</b>               |                     |        |             |                    |                   |                           |
| <i>Ruvettus pretiosus</i>       | castor oil fish     | 2      | 20          | 0.4                | 2.2               | 10.0                      |
| <b>SCOMBRIDAE</b>               |                     |        |             |                    |                   |                           |

|                            |               |            |            |     |     |     |
|----------------------------|---------------|------------|------------|-----|-----|-----|
| <i>Gymnosarda unicolor</i> | dogtooth tuna | 6          | 51         | 1.3 | 5.5 | 8.5 |
| <b>Totals</b>              |               | <b>446</b> | <b>930</b> |     |     |     |

**B. Trolling**

|                               |                |            |             |      |      |      |
|-------------------------------|----------------|------------|-------------|------|------|------|
| <b>SERRANIDAE</b>             |                |            |             |      |      |      |
| <i>Plectropomus leopardus</i> | leopard cod    | 1          | 7           | 0.5  | 0.4  | 7.0  |
| <b>CARANGIDAE</b>             |                |            |             |      |      |      |
| <i>Caranx</i> sp.             | trevally, jack | 6          | 55          | 2.8  | 3.4  | 9.2  |
| <b>CORYPHAENIDAE</b>          |                |            |             |      |      |      |
| <i>Coryphaena hippurus</i>    | dolphin fish   | 14         | 77          | 6.5  | 4.8  | 5.5  |
| <b>SPHYRAENIDAE</b>           |                |            |             |      |      |      |
| <i>Sphyrna</i> spp.           | barracudas     | 34         | 206         | 15.9 | 12.8 | 6.1  |
| <b>SCOMBRIDAE</b>             |                |            |             |      |      |      |
| <i>Acanthocybium solandri</i> | wahoo          | 27         | 228         | 12.6 | 14.2 | 8.4  |
| <i>Gymnosarda unicolor</i>    | dogtooth tuna  | 35         | 447         | 16.4 | 27.9 | 12.8 |
| <i>Katsuwonus pelamis</i>     | skipjack       | 12         | 47          | 5.6  | 2.9  | 3.9  |
| <i>Thunnus albacares</i>      | yellowfin tuna | 85         | 537         | 39.7 | 33.5 | 6.3  |
| <b>Totals</b>                 |                | <b>214</b> | <b>1604</b> |      |      |      |

<sup>1</sup>. Includes results from the one set of the vertical longline.

**Table 3: Details of deep bottom fishing trips at Yap (two handreels were used).**

| <b>Trip No.</b> | <b>Catch<br/>(numbers)</b> | <b>Catch<br/>(kg)</b> | <b>Fishing<br/>hours</b> | <b>Bait<br/>(kg)</b> |
|-----------------|----------------------------|-----------------------|--------------------------|----------------------|
| 4               | 26                         | 78                    | 5                        | 6                    |
| 5               | 8                          | 16                    | 2                        | 4                    |
| 6               | 7                          | 23                    | 5                        | a                    |
| 7               | 0                          | 0                     | 2                        | 0.5                  |
| 8               | 8                          | 11                    | 1                        | 1                    |
| 10              | 10                         | 27                    | 5                        | 3                    |
| 13              | 3                          | 73                    | 4                        | 4                    |
| 14              | 1                          | 1                     | 2                        | 2                    |
| 15              | 30                         | 47                    | 3                        | 10                   |
| 19              | 4                          | 12                    | 3                        | 2                    |
| 21              | 10                         | 32                    | 4                        | 2                    |
| 22              | 5                          | 7                     | 3                        | 2                    |
| 27              | 5                          | 30                    | 2                        | 1                    |
| 32              | 8                          | 52                    | 3                        | 1                    |
| 33              | 2                          | 5                     | 1                        | 1                    |
|                 | <b>127</b>                 | <b>414</b>            | <b>45</b>                | <b>52.5</b>          |

4.6 kg/reel/fishing hour  
7.8 kg fish/kg bait

**Table 4: Deep bottom fishing at Yap: catch composition**

| Species                            | Catch (numbers) | Catch (kg) | Percent by numbers | Percent by weight | Mean weight per fish (kg) |
|------------------------------------|-----------------|------------|--------------------|-------------------|---------------------------|
| <i>Aphareus rutilans</i>           | 2               | 6          | 1.6                | 1.5               | 3.0                       |
| <i>Aprion virescens</i>            | 1               | 10         | 0.8                | 2.4               | 10.0                      |
| <i>Caranx lugubris</i>             | 21              | 60         | 16.5               | 14.4              | 2.8                       |
| <i>Elegatis bipinnulata</i>        | 24              | 25         | 18.9               | 6.1               | 1.0                       |
| <i>Epinephelus</i> sp.             | 2               | 91         | 1.6                | 22.1              | 45.5                      |
| <i>Epinephelus</i> spp.            | 11              | 15         | 8.7                | 3.5               | 1.3                       |
| <i>Etelis carbunculus</i>          | 10              | 55         | 7.9                | 13.2              | 5.5                       |
| <i>Gymnocranius japonicus</i>      | 2               | 3          | 1.6                | 0.6               | 1.3                       |
| <i>Lethrinus chrysostomus</i>      | 5               | 5          | 3.9                | 1.2               | 1.0                       |
| <i>Lethrinus miniatus</i>          | 4               | 6          | 3.2                | 1.5               | 1.5                       |
| <i>Lutjanus argentimaculatus</i>   | 2               | 12         | 1.6                | 2.9               | 6.0                       |
| <i>Lutjanus bohar</i>              | 9               | 43         | 7.1                | 10.4              | 4.8                       |
| <i>Lutjanus gibbus</i>             | 1               | 1          | 0.8                | 0.2               | 1.0                       |
| <i>Pristipomoides auricilla</i>    | 9               | 10         | 7.1                | 2.4               | 1.1                       |
| <i>Pristipomoides filamentosus</i> | 4               | 9          | 3.2                | 2.2               | 2.3                       |
| <i>Ruvettus pretiosus</i>          | 2               | 20         | 1.6                | 4.9               | 10.0                      |
| <i>Seriola purpurascens</i>        | 5               | 24         | 3.9                | 5.8               | 4.8                       |
| <i>Sphyraena</i> sp.               | 1               | 1          | 0.8                | 0.2               | 1.0                       |
| <i>Tropidinius zonatus</i>         | 10              | 14         | 7.9                | 3.4               | 1.4                       |
| <i>Variola louti</i>               | 2               | 4          | 1.6                | 1.0               | 2.0                       |
|                                    | <b>127</b>      | <b>414</b> |                    |                   |                           |

**Table 5: Details of trolling trips using lures at Yap (two trolling lines were used).**

| <b>Trip No.</b> | <b>Catch<br/>(numbers)</b> | <b>Catch weight<br/>(kg)</b> | <b>Fishing<br/>hours</b> | <b>Boat</b> |
|-----------------|----------------------------|------------------------------|--------------------------|-------------|
| 1               | 6                          | 35                           | 6                        | B-2         |
| 2               | 6                          | 25                           | 3                        | B-2         |
| 3               | 2                          | 8                            | 5                        | B-2         |
| 4               | 0                          | 0                            | 2                        | B-2         |
| 5               | 1                          | 4                            | 6                        | B-2         |
| 6               | 2                          | 10                           | 1                        | B-2         |
| 7               | 3                          | 12                           | 6                        | B-2         |
| 9               | 1                          | 22                           | 4                        | 28'         |
| 10              | 2                          | 6                            | 5                        | 28'         |
| 11              | 7                          | 65                           | 9                        | 28'         |
| 12              | 7                          | 60                           | 6                        | B-2         |
| 13              | 2                          | 16                           | 4                        | B-2         |
| 14              | 11                         | 72                           | 3                        | B-2         |
| 15              | 1                          | 12                           | 1                        | B-2         |
| 17              | 25                         | 126                          | 3                        | B-2         |
| 18              | 0                          | 0                            | 7                        | B-2         |
| 19              | 10                         | 54                           | 5                        | B-2         |
| 20              | 17                         | 91                           | 7                        | B-2         |
| 21              | 2                          | 8                            | 4                        | B-2         |
| 22              | 7                          | 38                           | 4                        | B-2         |
| 27              | 0                          | 0                            | 4                        | Whale boat  |
| <b>Totals</b>   | <b>112</b>                 | <b>664</b>                   | <b>95</b>                |             |

3.5 kg/reel/trolling hour

**Table 6: Trolling with lures at Yap: catch composition.**

| Species                       | Catch (numbers) | Catch (kg) | Percent by numbers | Percent by weight | Mean weight per fish (kg) |
|-------------------------------|-----------------|------------|--------------------|-------------------|---------------------------|
| <i>Acanthocybium solandri</i> | 10              | 106        | 8.9                | 16.0              | 10.6                      |
| <i>Gymnosarda unicolor</i>    | 5               | 41         | 4.5                | 6.2               | 8.2                       |
| <i>Katsuwonus pelamis</i>     | 12              | 47         | 10.7               | 7.1               | 3.9                       |
| <i>Sphyrna spp.</i>           | 9               | 42         | 3.0                | 6.3               | 4.7                       |
| <i>Thunnus albacares</i>      | 76              | 428        | 67.9               | 64.5              | 5.6                       |

**Table 7: Details of trolling trips using flying fish at Yap (two trolling lines were used).**

| Trip No.      | Catch (numbers) | Catch (kg) | Fishing hours | Boat       |
|---------------|-----------------|------------|---------------|------------|
| 27            | 1               | 15         | 3             | Whale boat |
| 28            | 7               | 68         | 9             | "          |
| 29            | 9               | 98         | 11            | "          |
| 30            | 11              | 80         | 11            | "          |
| 31            | 2               | 9          | 12            | "          |
| 32            | 2               | 34         | 6             | "          |
| 33            | 1               | 4          | 1             | "          |
| 34            | 13              | 110        | 7             | "          |
| 37            | 8               | 40         | 5             | "          |
| <b>Totals</b> | <b>54</b>       | <b>458</b> | <b>65</b>     |            |

3.5 kg/line/trolling hour



**Table 8: Trolling with flying fish at Yap: catch composition.**

| Species                       | Catch (numbers) | Catch (kg) | Percent by numbers | Percent by weight | Mean weight per fish (kg) |
|-------------------------------|-----------------|------------|--------------------|-------------------|---------------------------|
| <i>Acanthocybium solandri</i> | 3               | 26         | 5.6                | 5.7               | 8.7                       |
| <i>Caranx</i> sp.             | 6               | 55         | 11.1               | 12.0              | 9.2                       |
| <i>Coryphaena hippurus</i>    | 7               | 33         | 13.0               | 7.2               | 4.7                       |
| <i>Gymnosarda unicolor</i>    | 13              | 176        | 24.1               | 38.0              | 13.5                      |
| <i>Plectropomus leopardus</i> | 1               | 7          | 1.9                | 1.5               | 7.0                       |
| <i>Sphyraena</i> spp.         | 23              | 146        | 42.6               | 31.9              | 6.4                       |
| <i>Thunnus albacares</i>      | 1               | 15         | 1.9                | 3.3               | 15.0                      |

**Table 9: Details of trips netting for flying fish at Yap (two nets were used).**

| Trip No.      | Catch (numbers) | Catch (kg) | Fishing hours | Boat       |
|---------------|-----------------|------------|---------------|------------|
| 27            | 32              | 8          | 4             | Whale boat |
| 28            | 270             | 68         | 8             | "          |
| 29            | 80              | 21         | 2             | "          |
| 31            | 20              | 4          | 1             | "          |
| 33            | 270             | 54         | 9             | "          |
| 38            | 100             | 26         | 2             | "          |
| <b>Totals</b> | <b>772</b>      | <b>181</b> | <b>26</b>     |            |

7.0 kg per fishing hour  
3.5 kg per net/netting hour

**Table 10: Netting flying fish at Yap: catch composition**

| Species     | Catch (numbers) | Catch (kg) | Percent by numbers | Percent by weight | Mean weight per fish (kg) |
|-------------|-----------------|------------|--------------------|-------------------|---------------------------|
| Flying fish | 702             | 161        | 90.9               | 89.0              | 0.23                      |
| Needle fish | 70              | 20         | 9.1                | 11.0              | 0.29                      |

**Table 11: Details of bottom fishing trips at Ulithi. On trip 23 four handlines were used in shallow water; on trips 24 and 26 two handreels were used for deep bottom fishing.**

| Trip No.      | Catch (numbers) | Catch (kg) | Fishing hours | Bait (kg) | Boat       |
|---------------|-----------------|------------|---------------|-----------|------------|
| 23            | 147             | 69         | 3             | 3         | 16' Yamaha |
| 24            | 18              | 68         | 4             | 4         | 23'        |
| 26            | 97              | 192        | 5             | 8         | 23'        |
| <b>Totals</b> | <b>262</b>      | <b>329</b> | <b>12</b>     | <b>15</b> |            |

5.8 kg/handline/fishing hour  
14.4 kg/reel/fishing hour  
22 kg fishing/kg bait

**Table 12: Bottom fishing at Ulithi: catch composition**

| Species                       | Catch (numbers) | Catch (kg) | Percent by numbers | Percent by weight | Mean weight per fishing (kg) |
|-------------------------------|-----------------|------------|--------------------|-------------------|------------------------------|
| <i>Aprion virescens</i>       | 5               | 7          | 1.9                | 2.1               | 1.4                          |
| <i>Caranx lugubris</i>        | 31              | 61         | 11.8               | 18.5              | 2.0                          |
| <i>Epinephelus</i> spp.       | 6               | 12         | 2.3                | 3.6               | 2.0                          |
| <i>Gymnosarda unicolor</i>    | 4               | 34         | 1.5                | 10.3              | 8.5                          |
| <i>Lethrinus chrysostomus</i> | 1               | 1          | 0.4                | 0.3               | 1.0                          |
| <i>L. nebulosus</i>           | 139             | 59         | 53.1               | 17.9              | 0.4                          |
| <i>L. sp.</i>                 | 2               | 7          | 0.8                | 2.1               | 3.5                          |
| <i>Lutjanus bohar</i>         | 38              | 103        | 14.5               | 31.3              | 2.7                          |
| <i>L. gibbus</i>              | 29              | 31         | 11.1               | 9.4               | 1.1                          |
| <i>L. kasmira</i>             | 2               | 1          | 0.8                | 0.3               | 0.5                          |
| <i>L. monostigma</i>          | 1               | 1          | 0.4                | 0.3               | 1.0                          |
| <i>Variola louti</i>          | 4               | 12         | 1.5                | 3.6               | 3.0                          |

**Table 13: Details of trolling trips using lures at Ulithi (two trolling lines were used).**

| Trip No.      | Catch (numbers) | Catch (kg) | Fishing hours | Boat        |
|---------------|-----------------|------------|---------------|-------------|
| 25            | 4               | 20         | 3             | 23' plywood |
| 26            | 2               | 20         | 2             | 23' plywood |
| <b>Totals</b> | <b>6</b>        | <b>40</b>  | <b>5</b>      |             |

4.0 kg/reel/fishing hour

**Table 14: Trolling with lures at Ulithi : catch composition.**

| Species                       | Catch (numbers) | Catch (kg) | Percent by numbers | Percent by weight | Mean weight per fish (kg) |
|-------------------------------|-----------------|------------|--------------------|-------------------|---------------------------|
| <i>Acanthocybium solandri</i> | 4               | 20         | 66.1               | 50.0              | 5.0                       |
| <i>Thunnus albacares</i>      | 2               | 20         | 33.3               | 50.0              | 10.0                      |

**Table 15: Details of deep bottom fishing trips at Ngulu (two handreels were used).**

| Trip No.      | Catch (numbers) | Catch (kg) | Fishing hours | Bait (kg) | Boat       |
|---------------|-----------------|------------|---------------|-----------|------------|
| 35            | 19              | 12         | 3             | 5         | Whale boat |
| 36            | 35              | 86         | 3             | 3         | Whale boat |
| <b>Totals</b> | <b>54</b>       | <b>158</b> | <b>6</b>      | <b>8</b>  |            |

13.2 kg/reel/fishing hour

**Table 16: Deep bottom fishing at Ngulu: catch composition.**

| Species                 | Catch (numbers) | Catch (kg) | Percent by numbers | Percent by weight | Mean weigh per fish (kg) |
|-------------------------|-----------------|------------|--------------------|-------------------|--------------------------|
| <i>Aprion vireocens</i> | 3               | 9          | 5.6                | 5.7               | 3.0                      |
| <i>Caranx lugubris</i>  | 7               | 24         | 13.0               | 15.2              | 3.4                      |
| <i>Epinephelus</i> sp.  | 2               | 10         | 3.7                | 6.3               | 5.0                      |
| <i>Lutjanus bohar</i>   | 26              | 105        | 48.1               | 66.5              | 4.0                      |
| <i>Lutjanus gibbus</i>  | 16              | 10         | 29.6               | 6.3               | 0.6                      |

**Table 17: Details of trolling trips at Ngulu. On trip 35 both flying fish and lures were used; on trip 36 only flying fish.**

| Trip No.      | Catch (numbers) | Catch (kg) | Fishing hours | Bait (kg) | Boat       |
|---------------|-----------------|------------|---------------|-----------|------------|
| 35            | 30              | 250        | 10            | 5         | Whale boat |
| 36            | 12              | 192        | 8             | 5         | Whale boat |
| <b>Totals</b> | <b>42</b>       | <b>442</b> | <b>18</b>     | <b>10</b> |            |

12.3 kg/reel/fishing hour

**Table 18: Trolling at Ngulu : catch composition**

| Species                       | Catch (numbers) | Catch (kg) | Percent by numbers | Percent by weight | Mean weight per fish (kg) |
|-------------------------------|-----------------|------------|--------------------|-------------------|---------------------------|
| <i>Acanthocybium solandri</i> | 10              | 76         | 23.8               | 17.2              | 7.6                       |
| <i>Coryphaena hippurus</i>    | 7               | 44         | 16.7               | 10.0              | 6.3                       |
| <i>Gymnosarda unicolor</i>    | 17              | 230        | 40.5               | 52.0              | 13.5                      |
| <i>Sphyraena</i> sp.          | 2               | 18         | 4.8                | 4.1               | 9.0                       |
| <i>Thunnus albacares</i>      | 6               | 74         | 14.3               | 16.7              | 12.3                      |

**Table 19: 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    |
| Tanna (New Hebrides) | 3.1    |
| Yap Island           | 4.6    |
| Ulithi Atoll         | 14.4 * |
| Ngulu Atoll          | 13.2 * |
| Yap District (mean)  | 6.9    |

\* Based on limited data.

**Table 20: Economics of fishing in Yap using an 8.6 m (28 ft) FAO design single hull displacement boat bought new (fully equipped, plus 12 H.P. Yanmar diesel) for US\$ 5,000 depreciated over 5 years and operated by an owner skipper.**

**Earning/year**

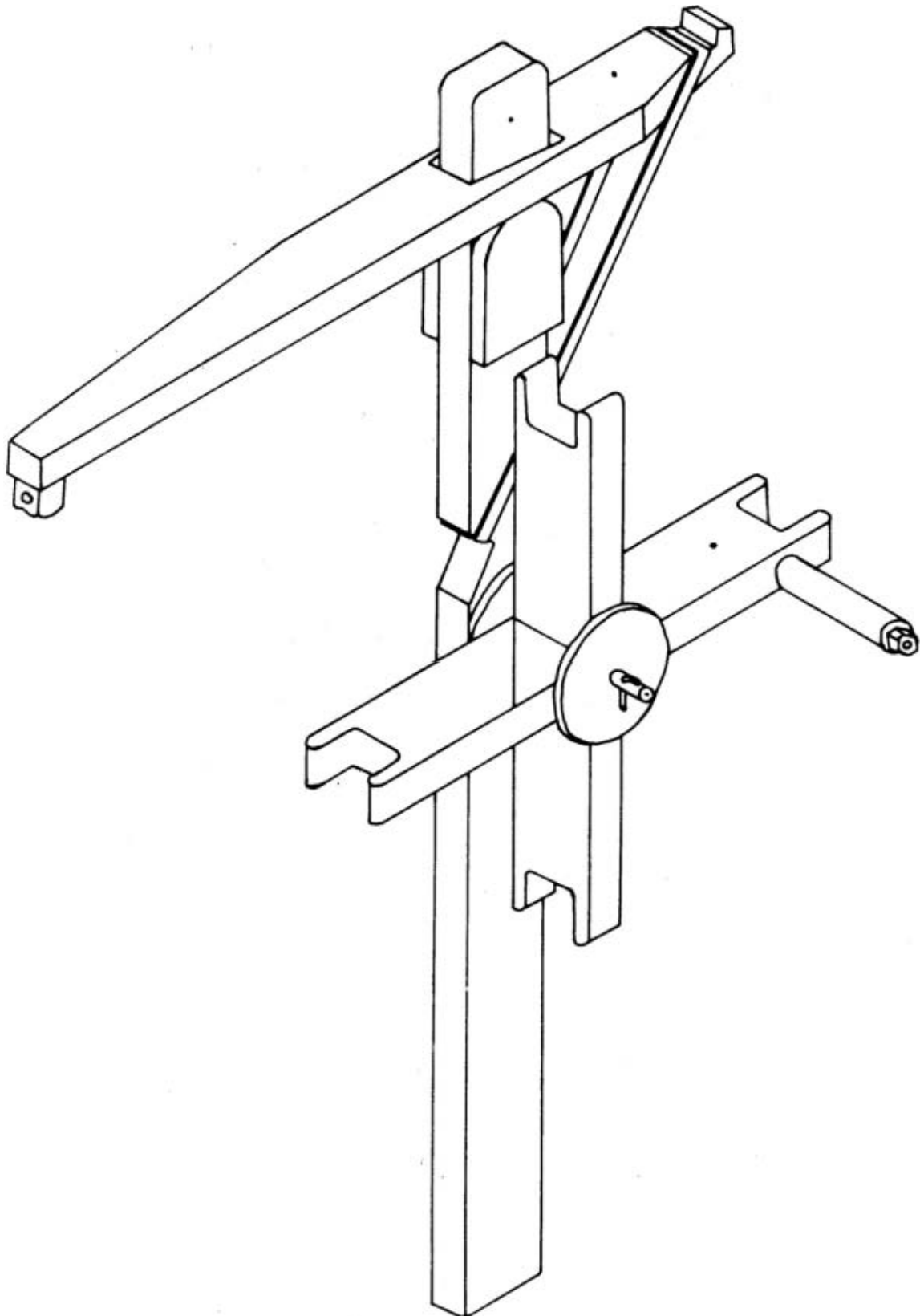
4 fishing trips/week, 40 weeks/year, 160 trips/year  
 3 hours bottom fishing and 5 hours trolling (two reels)/ trip  
 62.6 kg/trip, 10,016 kg/year, \$ 1.43/kg<sup>1</sup> US\$14,323

**Expenses/year**

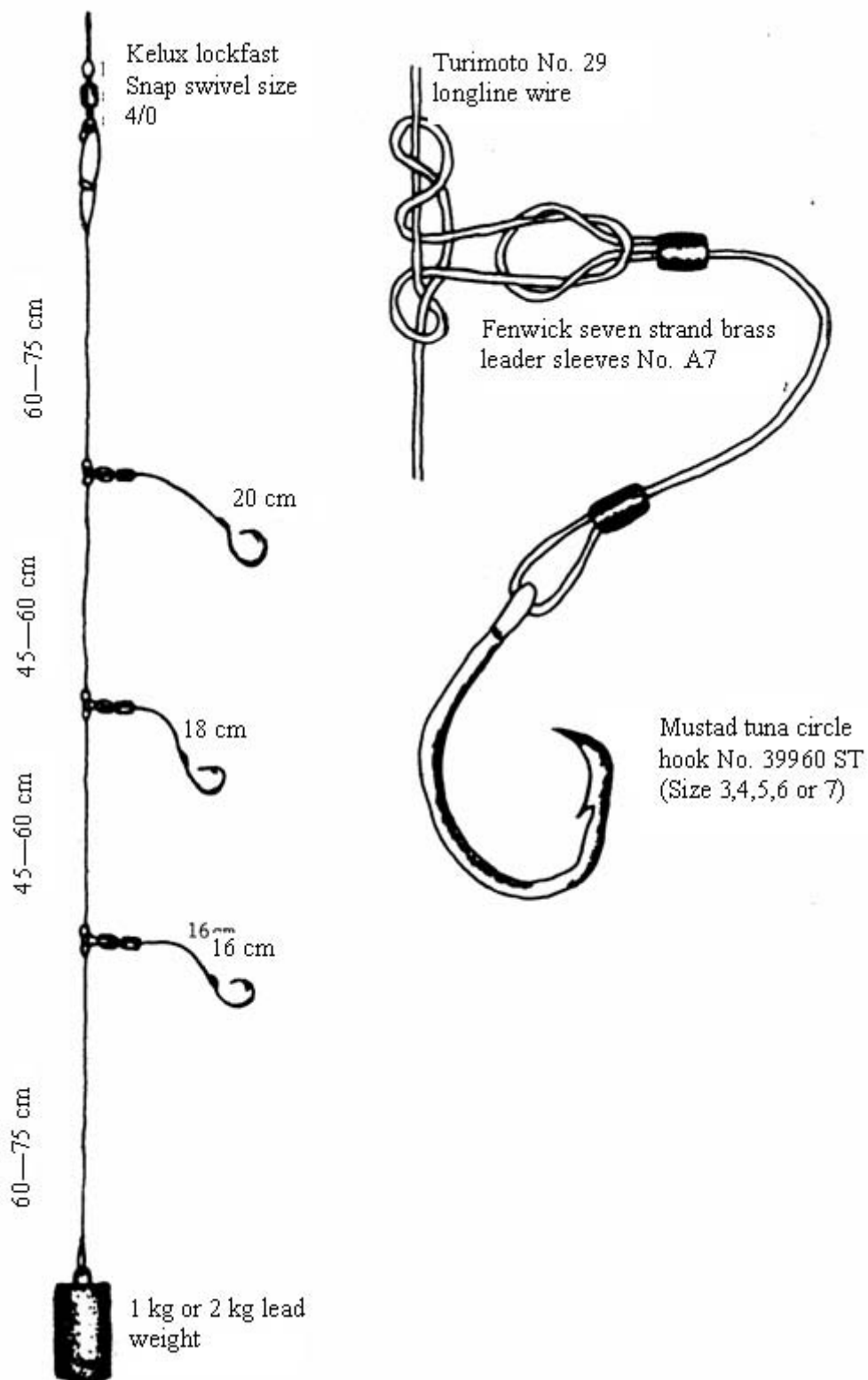
|                                  |                  |           |
|----------------------------------|------------------|-----------|
| Depreciation of boat             | 1,000            |           |
| Interest on loan <sup>2</sup>    | 319              |           |
| Fuel 3.5 gal/trip, 50 c/gal      | 280              |           |
| Maintenance and repairs          | 200              |           |
| Replacement of fishing gear      | 200              |           |
| Bait (estimate)                  | 500              |           |
| Ice (estimate)                   | 400              |           |
| Wages (1 crew, ¼ share of catch) | 3,581            |           |
| <b>Total expenses/year</b>       | <b>US\$6,480</b> |           |
| Balance                          |                  | US\$7,843 |

1. 65 c/lb

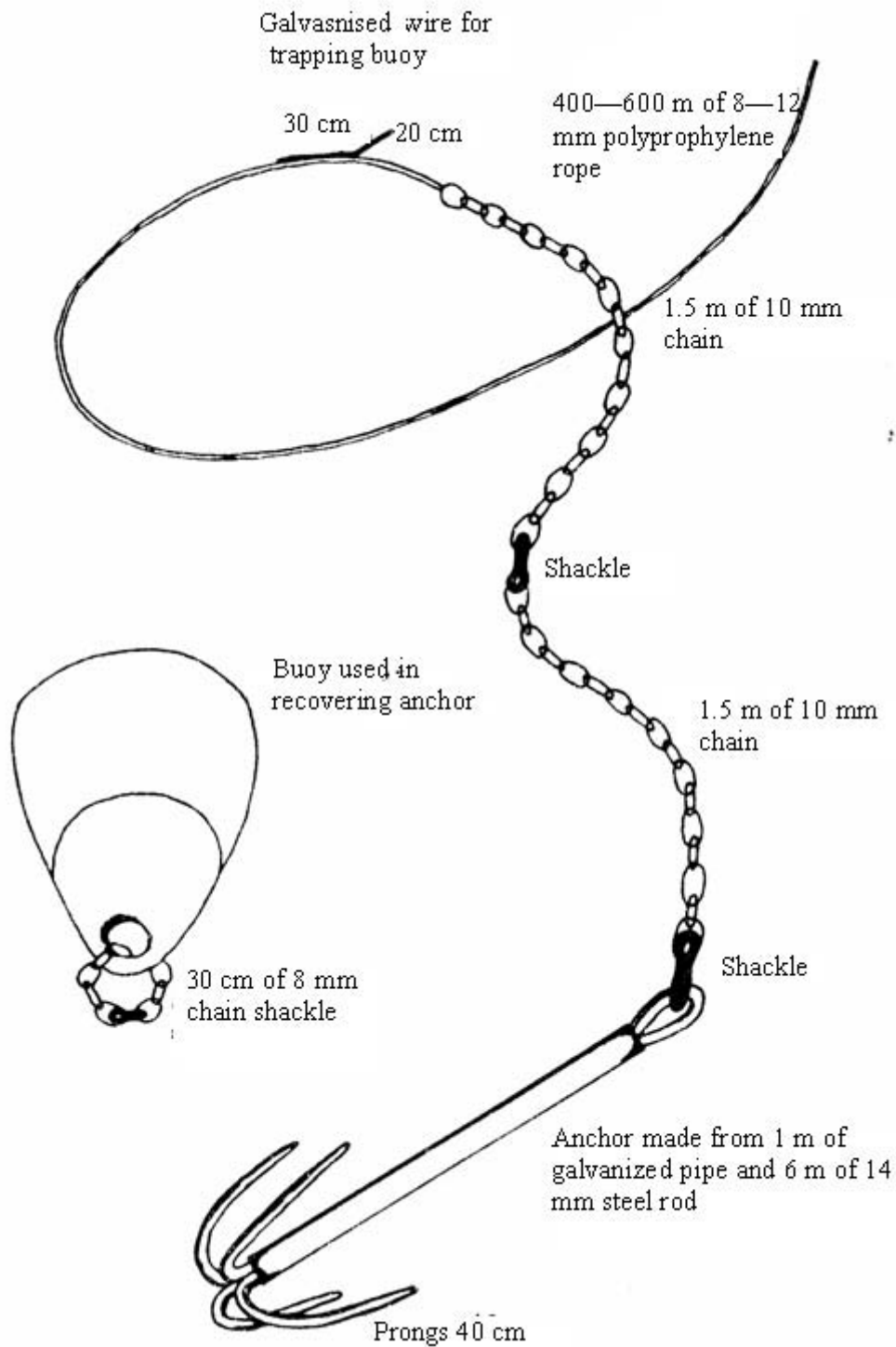
2. 10%/year, reducing annually.



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

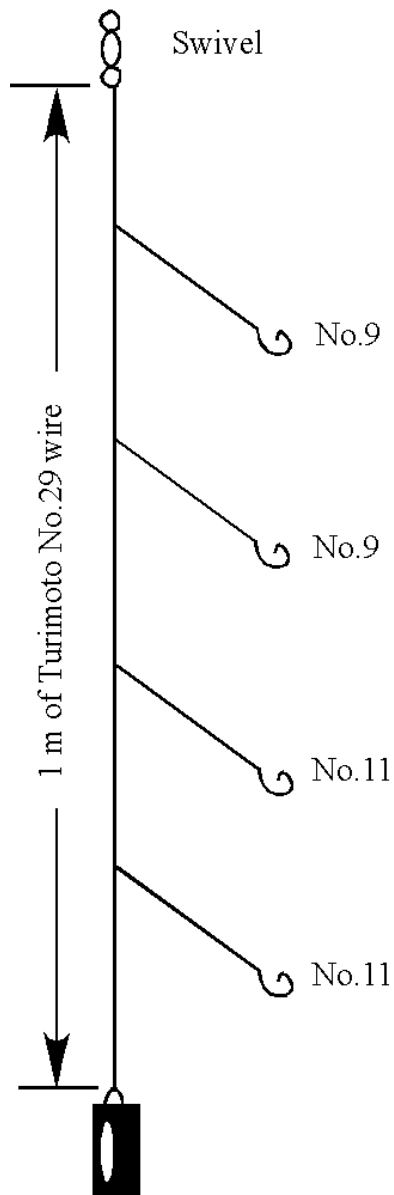


**Fig. 3: Suitable terminal rig for deep bottom fishing**

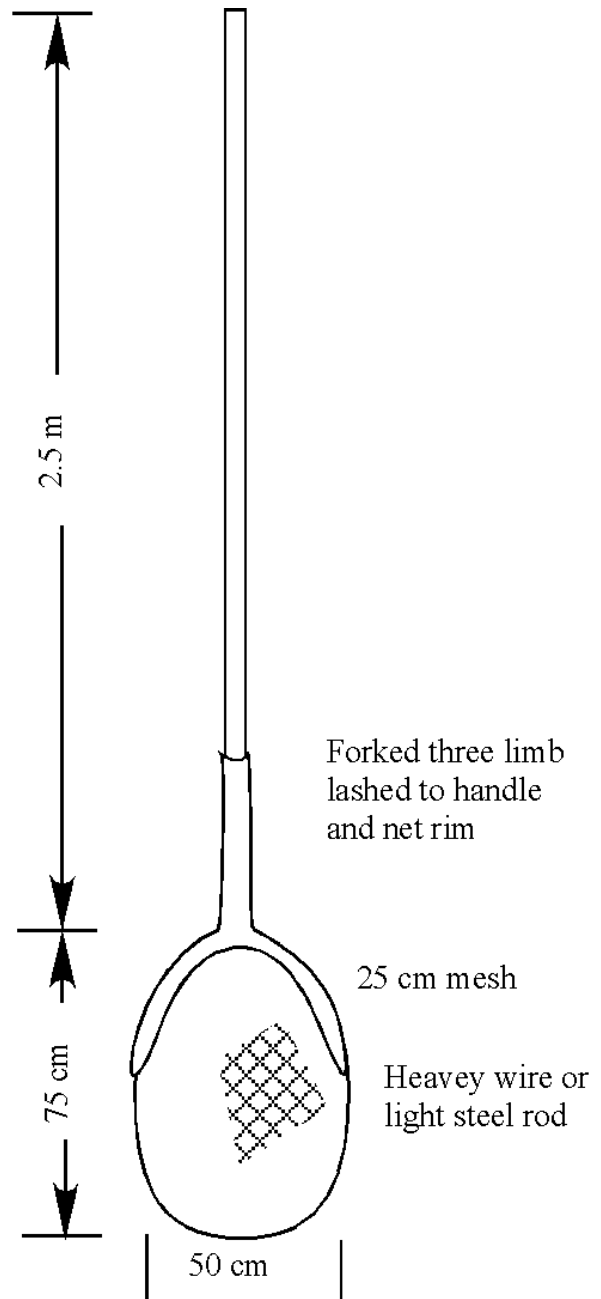


**Fig. 4: Anchoring system suitable for deep bottom fishing. Rope diameter depends on size of boat. All shackles should be seized.**





**Fig. 5: Terminal rig for handline fishing. Snoods were 8 cm long and made from 3 strands of the 9 stranded Turimoto No. 29 wire. Mustad tuna circle hooks were used (sizes as shown).**



**Fig. 6: Hand net used for catching flying fish.**

## Appendix 1: Boats used by the project.

### 1. B-2

|                  |   |
|------------------|---|
| Owner            | Yap Fishing Authority   |
| Origin           | Built in Yap by Fishing Authority   |
| Type             | 7 m (23 ft) plywood, planing hull   |
| Power            | 72 H.P. Volvo Penta diesel driving a Volvo Penta outdrive (stern drive)   |
| Fuel consumption | 5—2.0 gal per hour at planing speeds depending on the load (she would plane at 8 knots)   |
| Crew             | 2 to 4  |
| Gear             | Two handreels<br>Furuno echo sounder<br>440 m of 11 mm polypropylene anchor attached to 3 m (10 ft) of 10 mm (3/8 inch) chain on a grapnel anchor made from 12 mm (1/2 inch) steel rod<br>Compass |

Used for trolling and bottom fishing around Yap Island and at Hunter Bank (17 trips).

### 2. Whale boat

|                  |  |
|------------------|--|
| Owner            | Yap Fishing Authority  |
| Origin           | United States Navy   |
| Type             | 8 m (26 ft) fibreglass, displacement hull  |
| Power            | 2 twin engine 22 H.P. Yanmar diesels   |
| Fuel consumption | 5 gal/hour at cruising speed   |
| Crew             | 2 to 4   |
| Gear             | SSB radio (with limited range)<br>Compass<br>2 handreels<br>1 handreel modified to use wire instead of monofilament and fitted with a braking device<br>2 bamboo outriggers for trolling<br>2 0.7 cu.m. (24 cu.ft.) insulated boxes for ice and fish.<br>24 volt power system capable of running the three 200 watt reflector lights used for night fishing. |

The whale boat was used for 12 trips including two from Yap to Ngulu and back, a round trip of approximately 150 miles. It was used for netting flying fish, trolling with lures, trolling with flying fish (subsurface), vertical longlining and bottom fishing. It was an excellent fishing boat, seaworthy and economical.

**3. 8.6 m (28 ft) Western Samoan FAO design**

|                  |   |
|------------------|---|
| Owner            | Lamotrek Islanders                              |
| Origin           | Built in Yap by Fishing Authority               |
| Type             | Plywood, semi-displacement                      |
| Power            | 12 H.P. Yanmar diesel                           |
| Fuel consumption | 0.35 gal per hour at cruising speed (6.5 knots) |
| Crew             | 2 to 4  |
| Gear             | Two handreels, hand lines                       |

Made four trips around Yap Island and was used for trolling with lures and bottom fishing.

**4. 7 m (23 ft) boat**

|                  |  |
|------------------|--|
| Owner            | Private boat hired by C.E.T.A. (U.S. organisation) for short bottom fishing training programme in Ulithi |
| Origin           | Built in Ulithi  |
| Type             | Exactly same design as B-2   |
| Power            | 40 H.P. Johnson  |
| Fuel consumption | 1 to 4 gal/hour depending on speed and load  |
| Crew             | 2 to 4   |
| Gear             | Same anchoring gear as B-2<br>Two handreels  |

Was used for trolling and bottom fishing at Ulithi (3 trips).

**5. 5m (16 ft) Yamaha**

|                  |   |
|------------------|---|
| Owner            | Ulithi High School fishing class            |
| Origin           | Japan                                       |
| Type             | Fibreglass, planing type hull               |
| Power            | 20 H.P. Johnson                             |
| Fuel consumption | 1 gal/hour at medium speeds (half throttle) |
| Crew             | 2 to 4                                      |
| Gear             | Hand lines                                  |

Was used for only one fishing trip, handlining in Ulithi lagoon.

**Basic equipment for deep bottom fishing.**

1. Western Samoan type wooden handreels.
2. 115 or 156 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. 39960 ST, sizes 3, 4, 5, 6, 7.
5. Fenwick sevenstrand brass leader sleeves No. A7, or equivalent.
6. Berkley - McMahon swivels size 4/0 or equivalent.
7. Kelux stainless lookfast snap 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 sidecutting pliers.
14. Pair of crimping pliers.
15. 15 cm bait knife.

## **OTHER 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