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**REPORT OF SECOND VISIT TO
AMERICAN SAMOA**

3 February 1988 - 13 June 1988

by

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SUMMARY

The South Pacific Commission's Deep Sea Fisheries Development Project (DSFDP) operated in American Samoa for the second time between 3 February 1988 and 13 June 1988, under the supervision of South Pacific Commission Masterfisherman, Archie Moana.

The main objective of the visit was to conduct trials and demonstrations of vertical longlining around fish aggregation devices (FADs), targeting deep swimming tunas, with the aim of developing this fishing method in order to relieve the pressure on the local bottom-fishery which was reported to be in decline.

Fourteen vertical longlining trips produced a catch of twenty-seven tunas with a total weight of 664.6 kg (1,465.5 lb) and the technique, including baitfishing, was demonstrated to ten American Samoa Office of Marine Resources staff and fourteen private local fishermen. Fifteen of the twenty-seven tuna taken were *Thunnus alalunga* (albacore) a species rarely taken in inshore fisheries in American Samoa previously. The success of the longlining trials was largely consequential to the presence of abundant baitfish (*Selar crumenophthalmus* [big eye scad, akule] and *Euthynnus affinis* [mackerel tuna, kawakawa]) around the FADs, and the development of an effective technique to capture them.

Project operations ranged from Tutuila, and its offshore banks, to the Manu'a group and Rose atoll, and included the demonstration of flying fish scooping as a supplementary bait collecting activity, and the proper onboard handling of the catch, as well as bottom-fishing and trolling surveys. The objective of conducting further training in deep-bottom fishing was abandoned as unnecessary.

In all, twenty-three fishing trips were completed for a catch of 892 fish with a total weight of 2,166.2 kg (4,776.5 lb), excluding baitfish.

Note: Measurements throughout the report are given in metric with a rounded conversion figure to U.S. measure in parentheses.

RÉSUMÉ

Sous la direction du maître de pêche Archie Moana, la Commission du Pacifique Sud a conduit des activités aux Samoa américaines pour la deuxième fois, entre le 3 janvier et le 13 juin 1988, dans le cadre du projet de développement de la pêche au demi-large.

Il s'agissait de réaliser, autour de dispositifs de concentration du poisson (DCP), des essais et des démonstrations de pêche à la palangre verticale ciblant les thons évoluant en eau profonde, afin de développer l'emploi de cette technique de pêche, de façon à soulager la pression exercée sur les ressources halieutiques profondes de ce pays dont on a constaté l'appauvrissement.

Quatorze sorties de pêche à la palangre verticale ont permis de capturer 27 thons d'un poids total de 664,6 kg et de montrer à 10 agents du service des ressources marines et à 14 pêcheurs privés des Samoa américaines comment utiliser cette technique et pêcher des appâts. Sur ces 27 thons, 15 étaient des *Thunnus alalunga* (germon) une espèce rarement capturée par les pêcheurs côtiers des Samoa américaines. Le succès de ces essais de pêche à la palangre est très largement dû à l'abondance autour des DCP des poissons-appâts utilisés, *Selar crumenophthalmus* (maquereau à gros yeux, akule) et *Euthynnus affinis* (thonine, kawakawa) et à la mise au point d'une technique de pêche efficace.

Les opérations prévues dans le cadre de ce projet se sont déroulées de Tutuila et de ses bancs situés au large des côtes à l'archipel de Manu'a et à l'atoll Rose et elles ont notamment porté sur une autre technique de capture d'appâts, la pêche de poissons volants au haveneau, sur la manipulation du poisson à bord et sur des essais de pêche au fond et à la traîne associés à la recherche de nouveaux sites. L'un des objectifs du projet qui consistait à poursuivre la formation à la pêche profonde, devenu inutile, a été abandonné.

En tout, les 23 sorties réalisées ont permis de capturer 892 poissons d'un poids total de 2 166,2 kg, à l'exclusion des poissons-appâts.

Note: Les chiffres communiqués dans ce rapport sont en kilogrammes, l'équivalent en livres américaines étant indiqué entre parenthèses.

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1. INTRODUCTION

The South Pacific Commission's Deep Sea Fisheries Development Project (DSFDP) is a mobile, village-level rural development project which operates in Pacific Island nations at specific Government request, and which has the following broad objectives:

- To promote the development or expansion of artisanal fisheries throughout the region based on fishery resources which are at present under-utilised, and in particular the deep-bottom resources of the outer reef slope;
- To develop and evaluate new simple technology, fishing gear and techniques suitable for use by village fishermen, which will enable fishermen to increase catches substantially while reducing dependence on costly imported fuels; and
- To provide practical training in appropriate fishing techniques to local fishermen and government fisheries extension workers.

The Project was based at Pago Pago on Tutuila from 3 February, 1988 to 13 June 1988, with survey and demonstration trips also made to Rose Atoll and the Manu'a group islands of Ofu and Ta'u.

2. BACKGROUND

2.1 General

American Samoa consists of five principal islands and two small atolls (Figure 1) lying east of 170° west longitude. It is an unincorporated Territory of the United States of America with a land area of 197 km² (76 sq. miles) and a total population of around 37,000.

The main island of Tutuila (135 km²) (52 sq. miles), site of the capital, Pago Pago, extends 30 km (18.6 miles) from east to west and is about 6 km (3.7 miles) wide, while some 80 km (50 miles) to the east is the Manu'a Group, comprising the islands of Ofu, Olosega and Ta'u. Tiny Swain's Island lies 337 km (210 miles) to the north of Tutuila and Rose atoll 290 km (180 miles) to the east.

2.2 Existing Fisheries

The Territory's large-scale tuna canning and fish meal industry is almost entirely based on foreign offshore resources and, together with other marine-based produce, generates some \$200 million in export earnings annually.

Local contribution to the industry is small and generally sporadic, and while total production by local commercial fishermen in 1981 was estimated at 83 tonnes, valued at around US\$109,000 (*Pacific Islands Yearbook* (14th Edition), 1981), the main constraint on local entrepreneurs entering the industry on a larger scale is the substantial initial capital required.

Local private fishing boats have generally restricted their range of operations to 5-10 km offshore, both in trolling for pelagic species and, since the DSFDP visit of 1978, in deep-bottom fishing. However, a decline in catch rates for deep-bottom fishing in these inshore areas over the past few years has prompted local fishermen to begin exploiting offshore banks. A number of banks, up to 65 km offshore, are now fished when sea and weather conditions permit. Such relatively long-range trips involve high fuel consumption and a strong element of risk. Recent studies indicate, too, that bottom stocks on such banks may quickly decline under increased fishing pressure.

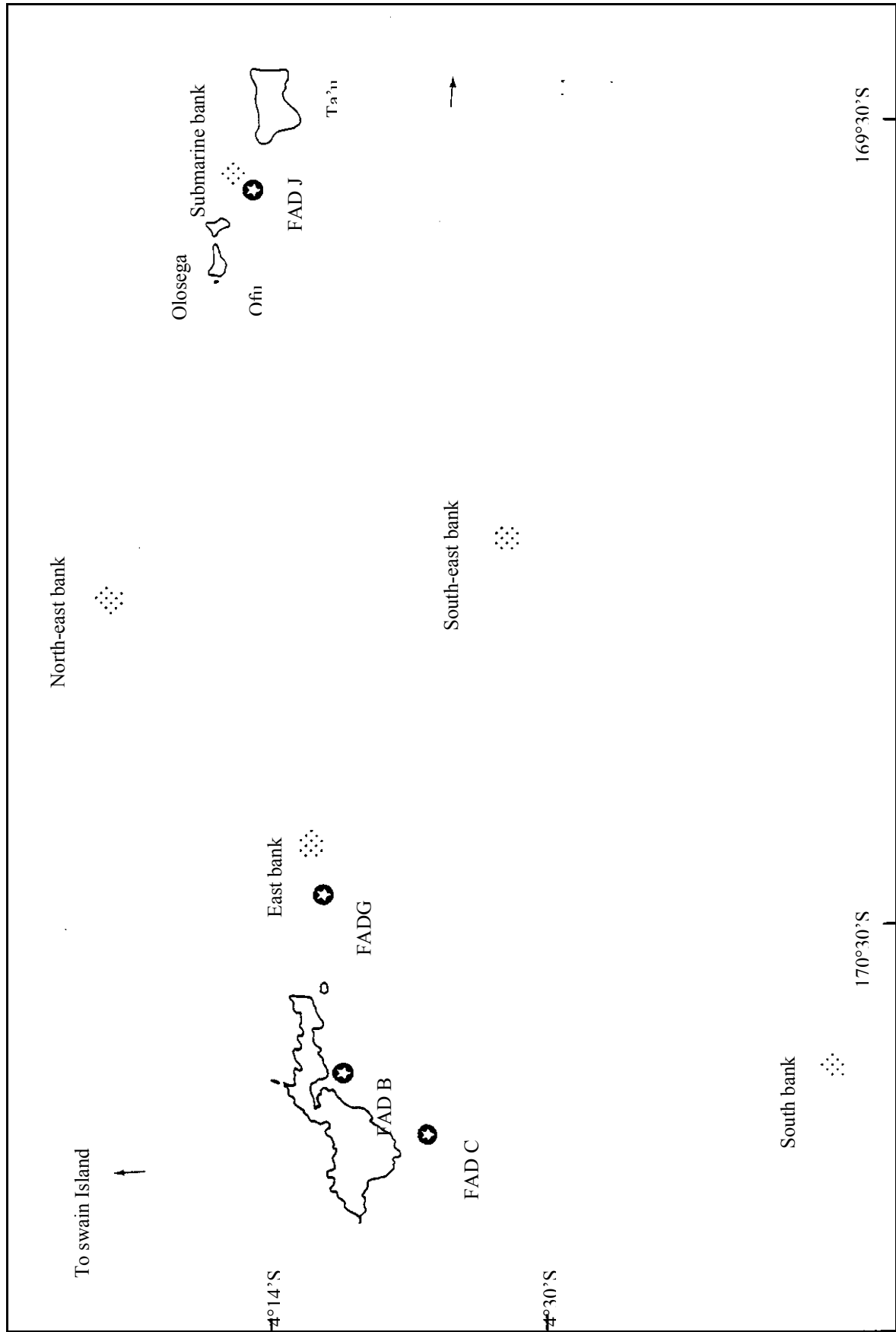


Figure 1: American Samoa, showing offshore banks and FADs

There are currently four FADs in place, located between 1 km and 8 km offshore, which are occasionally visited by local fishermen, especially during the skipjack season. The vertical longline technique developed by the DSFD Project which targets the deep-swimming tunas associated with FADs is a fishing alternative which can result in fuel savings and trips of shorter duration and range.

3. PROJECT OPERATIONS

3.1 General

A total of twenty-three fishing trips were completed during the Project's stay in American Samoa, including a five day trip to the Manu'a group and a seven day trip to Rose Atoll. Fourteen of these trips were devoted to trials and demonstration of vertical longlining, taking advantage of the ready availability of bait at the time. The balance of the trips completed comprised a combination of bottom-fishing, trolling and flying fish scooping.

3.2 Boats and equipment

A variety of vessels were employed during the visit, including two Office of Marine and Wildlife Resources (OMWR) craft, the 16.75 m (55 ft) fibreglass-hulled MFV *Sausauimoana* fitted with six FAO-Western Samoan type wooden handreels and an echo-sounder, and the 9 m (30 ft) *Masimasi*, a fibreglass catamaran equipped with two handreels and an echo-sounder.

Both of these vessels are normally engaged in research and fisheries support work under the direction of the OMWR, and the MFV *Sausauimoana* is also regularly engaged in general cargo carrying to the Manu'a group and to Swain's Island. On a number of occasions these vessels were unavailable for Project purposes due to these commitments.

Five training and demonstration trips were conducted aboard private fishing boats, usually alia catamarans, and an OMWR 3.5 m (12 ft) aluminium dinghy was used for three trips demonstrating flying fish scooping.

Details of gear employed for each of the Project's main fishing activities can be found in Section 4.

3.3 Fishing methods

A variety of fishing techniques were employed during the visit. In line with the Project's primary objective, most fishing effort was devoted to trials and demonstration of vertical longlining around local FADs.

Secondary effort was given to bottom handreeling using the techniques standard to the DSFD Project elsewhere in the region, (though at generally more shallow depths than is usual), to night time scooping of flying fish, and to opportunistic trolling.

A full description of the techniques employed in each fishing method can be found in Section 4.

3.4 Data collection

SPC Masterfishermen use a standard data form, shown at Appendix 1, to maintain detailed records of each fishing trip. During this Project visit, data collected on each trip included time spent steaming, anchoring and fishing; fishing area; fishing depth or depth range; number of crew; quantity and type of gear, fuel and bait used; the specific identification of each fish caught, where this could be determined; and the total number and weight of each species taken.

3.5 Training activities

Training, for the most part, was conducted at sea under actual fishing conditions. Both the two government vessels and private fishing boats were involved, with most effort given to demonstrating the rigging and deployment of the vertical longline. Training trips aboard the MFV *Sausauimoana* and the *Masimasi* generally involved only OMWR staff, with the exception of one trip aboard the MFV *Sausauimoana* which was conducted as an extension of a shore-side workshop in vertical longlining for five local fishermen. Other vertical longlining demonstrations were conducted aboard private boats, to individual skippers and crews. All these trips included demonstration of bait capture at the FADs.

Secondary training activity was carried out in flying fish scooping at night both at Tutuila and Manu'a.

As local fishermen were obviously very proficient in deep-bottom fishing techniques, and had developed their own gear configurations and methods, training in this activity was curtailed.

On all fishing trips trainees were shown the proper methods to kill, handle and ice the catch.

4. FISHING ACTIVITIES AND RESULTS

4.1 General

Fishing activities, and the gear and techniques used, varied from trip to trip, depending on the vessel and onboard equipment, the objectives of the trip, weather conditions and training requirements. Vertical longlining, jigging for bait, flying fish scooping, trolling and bottom handreeling were all carried out in a variety of combinations. Most trolling was conducted on an opportunistic basis or when making observation and assessment trips to offshore banks. Bottom handreeling was conducted off Tutuila to assess the bottom resource, and at Manu'a and Rose Atoll to explore the potential of offshore banks.

Vertical longlining was concentrated at FAD 'B' off Tutuila, where bait was abundant, and at FAD 'J' off Manu'a. Appendix 2 details the operational aspects of the twenty-three fishing trips completed from the eight different craft described in Section 3.2.

4.2 Vertical longlining

This fishing technique, presently under development by the DSFDP, targets deep swimming tunas associated with FADs and is derived from the mid-water downlining methods traditional in a number of South Pacific countries and territories, with the important variation that multiple hooks may be fished simultaneously. Apart from appropriate gear, the single most important ingredient for the success of this technique is the availability of suitable bait.

The primary gear component of the rig used by the Project during this visit was a mainline made up from 255 m (140 fathoms) of 225 kg (500 lb) test nylon monofilament, broken at intervals by crimping on heavy duty swivels of comparable breaking strain (the type used by the Project were Rosco barrel swivels size No. 12/0) as shown in Appendix 3A and 3B. Individual snoods made up from 3.5 m (12 ft) lengths of 180 kg (400 lb) nylon monofilament were fitted with a patent longline clip at one end for easy attachment to the mainline through the mounted swivel eyes, and terminated with a Mustad tuna circle hook (Sizes 3-5) or BKN circle hook (Figure 2).

The mainline was supported at the surface by a suitable float and weighted at the lower end with a 2 kg (4.5 lb) lead sinker.

An important advantage of using a monofilament mainline rather than the heavier lines commonly in use was that this less bulky line could be stored on the drums of the FAO-Western Samoan-type

wooden handreels which are standard equipment for the DSFD Project. The only modification required was that the usual insulator-type line guide be replaced with a pulley-wheel wide enough to allow the swivels mounted on the mainline to pass through easily (Figure 3). The baited snoods were clipped on as the mainline was paid out. A full list of materials required to make up a similar longline is given in Appendix 3C.

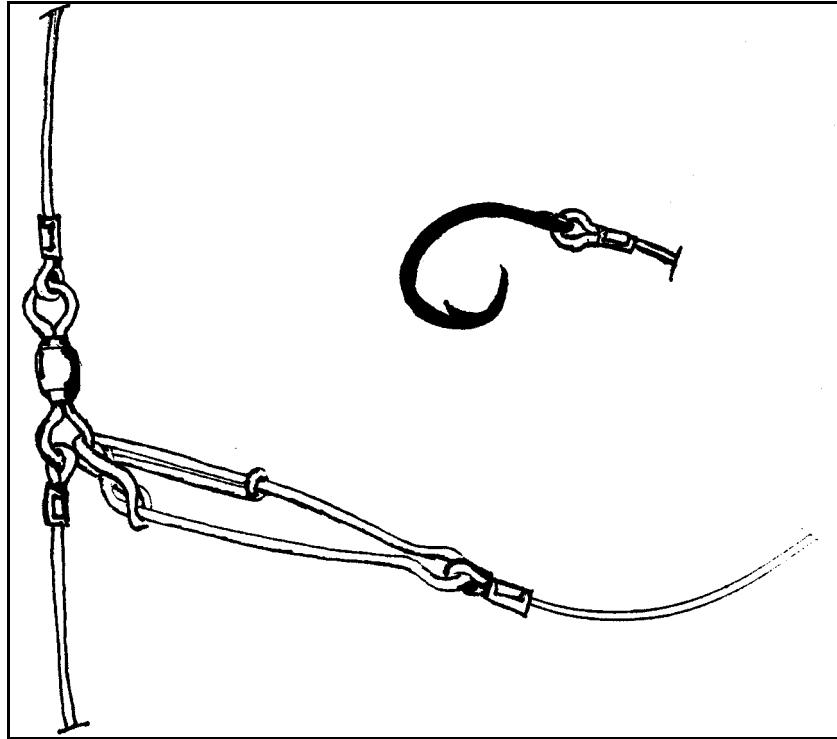


Figure 2: Snood arrangement on vertical longline

When possible, longlining operations were commenced at first light with the capture of bait around the FADs. *Selar crumenophthalmus* (big-eye scad, **akule**) and *Euthynnus affinis* (mackerel tuna, **kavakava**) were taken by slow trolling or drifting with light nylon monofilament lines rigged with multiple small jigs. These jigs can be made up using No. 5–8 hooks and a variety of skirting material such as small feathers, cotton, plastic strips or tinsel, but commercial Japanese sabiki rigs, which are cheap, effective and readily available in many areas, were used by the Project. These rigs appeared to be most effective if fitted with fluorescent 'glo' beads.

Baitfishing was usually discontinued when sufficient bait had been taken to make the first longline set. If more bait was required later in the day it was necessary to lower the jigs to a depth around 30 m using a sinker below the jigs, and the lines worked by hand to attract bites.

It proved worthwhile to keep some bait fish alive if possible by placing them in a container of fresh seawater, as live baits used on the uppermost longline hooks were especially effective and usually produced strikes quickly. All other bait fish not used immediately were placed on ice.

Before deploying the longline, the boat was tied up to the FAD and allowed to drift off with wind or current. The distance from the FAD was sufficient so that the longline would not foul on the FAD mooring if carried toward it by current or by hooked fish.

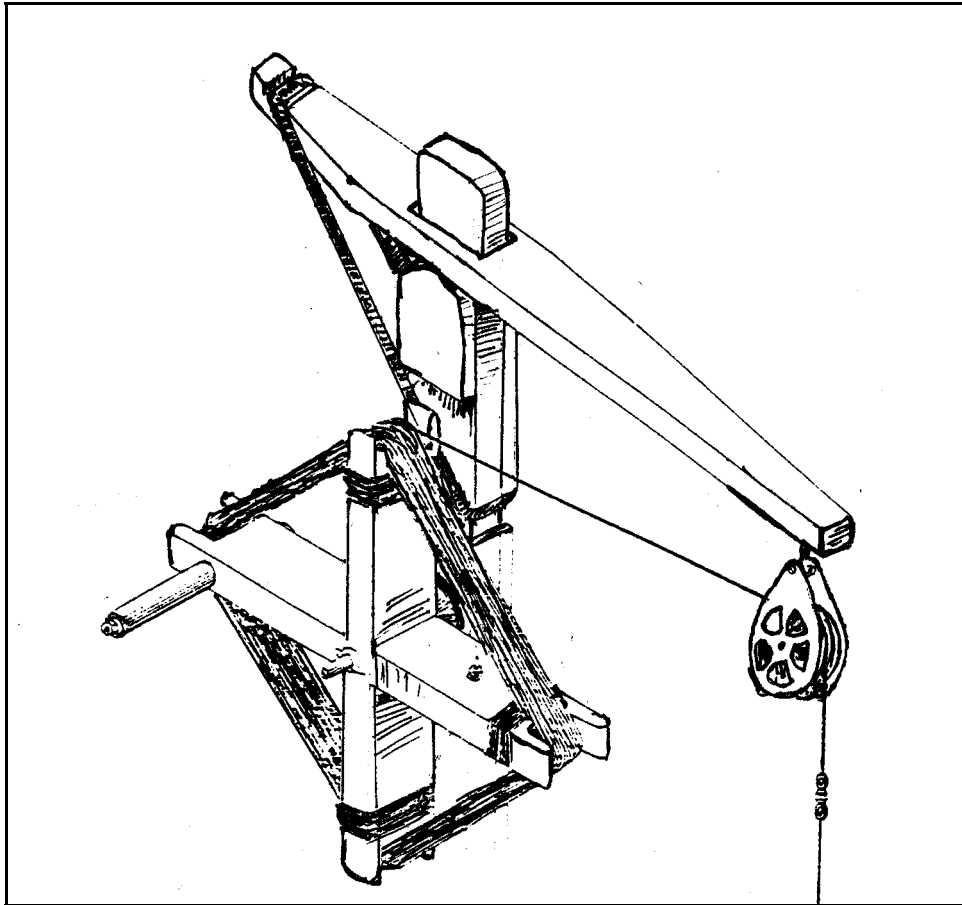


Figure 3: Wooden handreel in use to set longline

When in position, the bottom end of the longline was passed through the pulley mounted on the handreel and the sinker attached. As the longline was paid out slowly from the handreel, the baited snoods, which were stored separately, linked clip to hook, on a handcaster, were clipped on as each swivel appeared. Once the full length of the longline was in the water the float was clipped on and the line allowed to drift 15–20 m (50–65 ft) from the boat, retained by 12 mm (1/2 in) floating line. Although various methods of hooking on the bait were tried, the most successful was to pass the hook point in just behind the head (hook eye toward the bait's mouth) and roll the hook until the shank extended perpendicular to the bait (see Figure 4).

Soak time was usually 1.5–2 hours before hauling unless it was obvious that a good catch had already been made. Hauling times varied from 30 minutes, to haul and stow a line without fish, up to 2 hours to retrieve a line carrying heavy, struggling fish. Fish landed were killed and placed on ice immediately. While waiting for strikes on the longline, extra bait could usually be fished using the deep jigging method described earlier.

A total of fourteen trips devoted to vertical longlining were made, with most trips concentrated on FAD 'B' (refer Figure 1), which held good stocks of baitfish throughout the Project visit. Nine of these trips were made aboard the government vessels MFV *Sausaumoana* or *Masimasi* carrying OMWR trainees, including one demonstration set made at FAD 'B' off Tutuila and one off the Manu'a group at FAD 'J' involving local fishermen. The five other longlining trips were made aboard private fishing boats with the aim of demonstrating the technique as it could be applied to each owner's set-up.

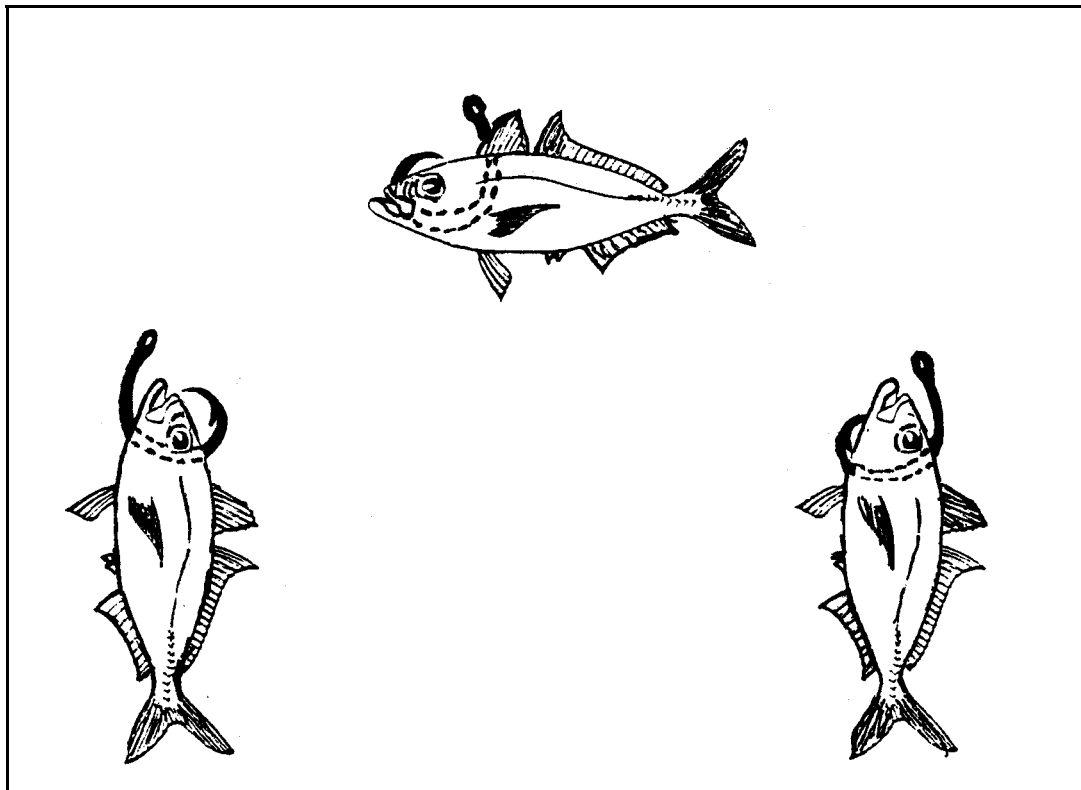


Figure 4: Bait rigging methods

A total of 50.5 hours were spent longlining for a catch of 27 fish totaling 664.6 kg (1,465 lb). The catch comprised 12 *Thunnus albacares* (yellowfin tuna, **asiasi**) with a total weight of 383 kg (844.5 lb), making up 57.62 per cent of the total weight, and 15 *Thunnus alalunga* (albacore tuna) totalling 281.6 kg (621 lb) or 42.38 per cent of the total catch.

Approximately 48 kg of bait was used in this operation, with the fresh-caught *Selar crumenophthalmus* and *Euthynnus affinis* being most used. Trials using frozen Japanese longline bait (saury) were unsuccessful. Fresh-caught flying-fish were also used in one set at Manu'a without success, but as this bait has been effective elsewhere the lack of success probably reflects local fishing conditions at the time rather than the bait's unsuitability. Appendix 4A details the operational aspects and catch of each vertical longlining trip.

4.3 Bottom handreeling

Five trips devoted to bottom-fishing were completed: one overnight trip to the South Bank aboard the MFV *Sausauimoana*; two overnight trips to the Submarine Bank and the South-east Bank off Manu'a; one trip to Cape Taputapu on Tutuila and one overnight trip to the South-east Bank aboard a private vessel (refer Appendix 4B). Most bottom-fishing was restricted to the 35–70 m (20–40 fathoms) depth range due to very abrupt drop-offs and relatively shallow waters over the banks.

The equipment used was that standard for the DSFD Project operations elsewhere in the SPC region, and a full description of equipment and techniques may be found in the South Pacific Commission reports of previous Project visits (Chapman & Cusack, 1997 and Taumaia & Cusack, 1990).

The most important gear components for this fishing method are the wooden handreel and the terminal rig set-up, these are illustrated in Figures 5 and 6.

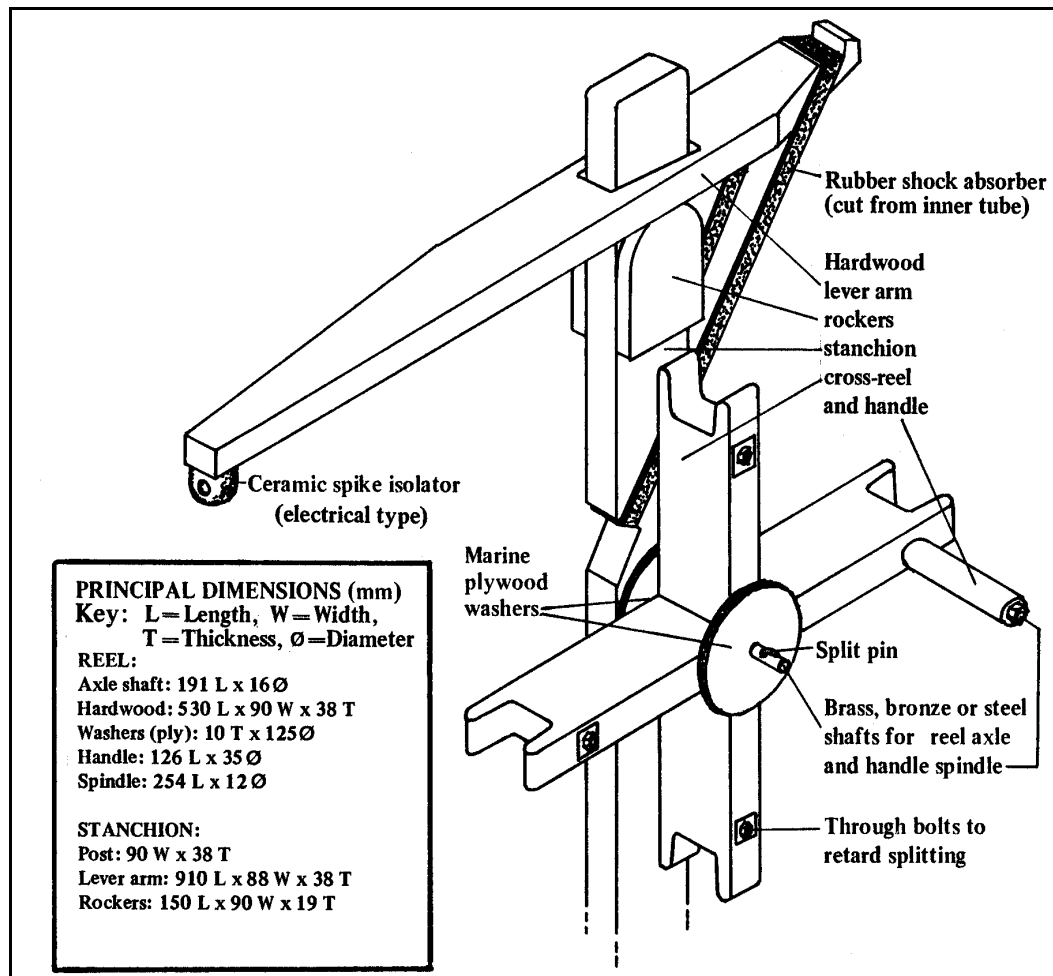


Figure 5: Western Samoan wooden handreel

For the reasons outlined in Section 3.5, operations utilising this fishing method were limited largely to exploring the potential of offshore banks and to observing the reported decline in deep-bottom resources close to Tutuila. The unavailability of the government fishing vessels on occasion further restricted this activity.

A total of 39.5 hours of bottom-fishing produced a catch of 598 fish with a total weight of 844.4 kg (1,861.6 lb), giving a catch rate of 5.7 kg (12.7 lbs) per reel hour. Important species, in order by weight, were: *Sphyrnaidae* spp. (barracudas, **sapatu**), 17.3 per cent of the total; *Lutjanus bohar* (red bass, **mu**), 12.0 per cent; *Etelis coruscans* (ribbon-tail red snapper, **palu-loa**), 9.4 per cent; *Elegatis bipinnulata* (rainbow runner, **samani**), 8.9 per cent; *Aprion virescens* (green job-fish, **asoama**) 8.3 per cent; and emperor, 7.6 per cent. Dominating the catch numerically was *Lutjanus kasmira* (blue-lined snapper, **savane**), with 175 individuals landed, making up 29.2 per cent of the total by number. Next most numerous were the *Sphyrnaidae* spp. (barracudas) with 110 individuals (18.4% of the total). Appendix 5 gives the species composition by number and weight of the deep-bottom catch.

The catches of deep-water snappers (family Lutjanidae, sub-families Etelinae and Apsilinae) the prime target species for this fishing method, was 99 fish with a total weight of 243.95 kg (538 lb), comprising 16.5 per cent of the total bottom catch numerically and 28 per cent by weight. During the Project's previous visit in 1978, deep-bottom snappers accounted for 54 per cent of the bottom catch and the change in species composition during this visit may be explained in part by more bottom-fishing being conducted in shallower waters.

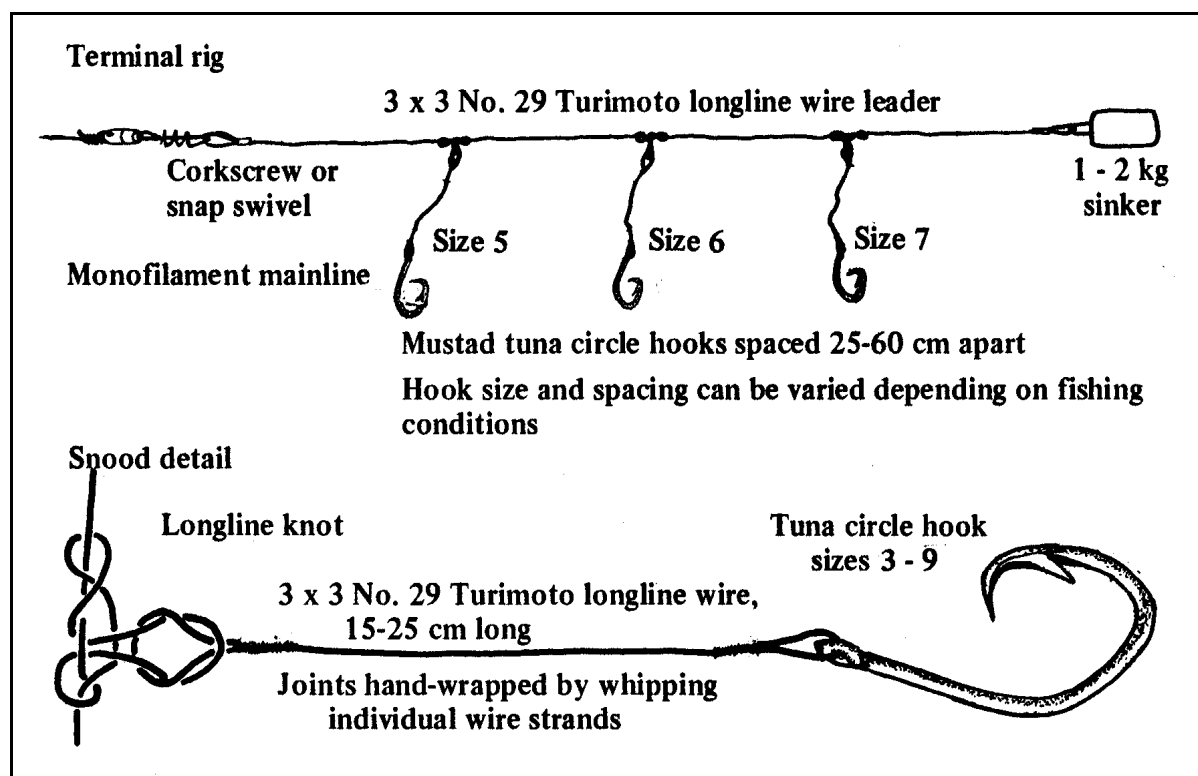


Figure 6: Typical terminal rig for deep-bottom fishing

The bottom catch rate of 5.7 kg per reel hour compares well with catch rates recorded by the Project elsewhere in the region (see Table 1).

Table 1: Deep-bottom catch rates recorded by the DSFDP in selected Pacific countries and territories

Location	Year and report (see back over)	Deep-bottom catch rate (kg/reel hour)	
		Total	Excluding sharks
American Samoa (this visit)	1988	5.7	5.7
American Samoa	1978	-	4.9
Western Samoa	1975	-	4.1
Tonga	1978	-	3.6*
Tonga	1979	7.6	5.7
Tonga	1980/81	3.3*	3.0**
Cook Islands (Rarotonga)	1981/82	1.9	1.9
Fiji	1981/82	7.6	7.1

* Estimate only - excludes *Lutjanus bohar*.

** Handreel fishing only (excludes handlining).

4.4 Trolling

Most trolling was conducted on an opportunistic basis while travelling to and from bottom-fishing sites and during surveys of the offshore banks. Part of the catch was used as bottom-fishing bait.

Eighteen hours of trolling produced 148 fish (refer Appendix 4C) with a total weight of 657.2 kg (1,449 lb). Important species caught were *Thunnus albacares* (yellowfin tuna, **asiasi**), 48.5 per cent of the total numerically and 59.7 per cent by weight; *Gymnosarda unicolor* (dogtooth tuna, **tagi**), 7 per cent numerically and 10.8 per cent by weight; *Katsuwonus pelamis* (skipjack tuna, **atu**), 9.8 per cent numerically and 9.3 per cent by weight; and *Acanthocybium solandri* (wahoo, **paala**), 6.3 per cent numerically and 8.3 per cent by weight. The balance of the catch comprised *Elegatis bipinnulata* (rainbow runner, **samani**), *Euthynnus affinis* (mackerel tuna, **atualo**), *Sphyraenidae* spp. (barracudas, **sapatu**), and *Coryphaena hippurus* (dolphin fish, **masi masi**).

4.5 Flying fish scooping

As the capture of flying fish is seldom practised in American Samoa, a secondary aim of the Project visit was to demonstrate a simple technique for night time scooping of this fish, with a view to providing supplementary or alternative longlining bait.

Basic equipment used was a small manoeuvrable powerboat, a light source to attract and blind the fish, and a long-handled scoop net to take the fish from the water.

A 3.5 m (12 ft) aluminium dinghy was fitted with a light standard about 2 m (6 ft) high, mounted toward the bow and angled to extend out slightly over the bow. The upright was fitted with a metal clamp and hook arrangement at the top to firmly secure a Coleman 500 candle-power pressure lantern and with a reflecting plate of bright, galvanised metal sheet, about 30 x 60 cm (1 ft x 2 ft), mounted behind the lantern.

The scoop net was fabricated from a 3 m (10 ft) length of aluminium tubing 5 cm (2 in) in diameter, to which was lashed a net frame shaped from a 2 m (6 ft) length of 12 mm (0.5 in) diameter aluminium tubing. The net bag was shaped from 25 mm (1 in) nylon mesh and sewn onto the frame.

This fishing technique requires a crew of at least two, one man steering and one or two handling the net or nets. Careful co-ordination between helmsman and net handlers and a good deal of skill, usually born of long practice, is necessary to use this technique effectively.

One trip was made off the western coast of Tutuila and two trips off Manu'a. A total of eight fishing hours produced a catch of 119 fish with a total weight of 29 kg (64 lb).

5. DISCUSSION AND CONCLUSIONS

The main objective of the Masterfisherman's visit was to test and demonstrate vertical longlining around FADs. In terms of both catch and training this aspect of the visit was quite successful. Of the three FADs in place off Tutuila during the visit, only FAD 'B' held abundant stocks of baitfish consistently, and subsequently most tunas were taken there. It is significant that during a brief period when this FAD's appendages were lost, baitfish were not observed in the vicinity, but re-appeared shortly after new appendages were set in place. It is noteworthy too that only FAD 'B', located closer inshore and nearer the main harbour than the other FADs, in an area where baitfish have historically been observed, held bait stocks in any abundance. It is possible that plentiful bait stocks are seasonal, but from experience elsewhere bait seasonality may well match that of the tunas.

The fact that of the 27 tunas taken, 15 were *Thunnus alalunga* (albacore tuna), a species rarely captured in artisanal fisheries around American Samoa, indicates that vertical longlining at the deep levels fished by the Project (down to 240 m [130 fathoms]) gave access to a little exploited resource.

In order to further develop this fishery it would appear important to maintain a strong programme of FAD deployment and maintenance (including the maintenance of appendages in good condition), as well as siting FADs in areas of suitable depth where baitfish are known to occur. In order to take advantage of the readier catchability of tunas common at first light, it would be useful to establish a low-maintenance location light system for the FADs.

Although all bait taken during this visit were captured by trolling and deep-jigging with Japanese sabiki rigs, it may be worthwhile to explore other methods of bait collection, such as Hawaiian-style hoop nets or traps set at the FADs.

As there appears to be considerable leakage from the offshore tuna fishery into both the retail and wholesale market in Tutuila, local fishermen should aim to land a high-quality product which would perhaps capture the high-value end of the local market. With regular air services to Hawaii and other Pacific destinations the potential for the export of a high-quality fish product is also worth investigating, especially of the good quality larger tunas (30 kg + <60 lb+>) preferred in the Hawaiian market. Careful onboard handling of the catch, effective chilling and proper shore storage must be encouraged in order to produce a high quality product.

Despite the limited survey of bottom-fishing conducted during the visit, sufficient anecdotal evidence exists to indicate that bottom resources close to Tutuila have declined recently. To relieve pressure on this fishery, alternatives should be encouraged.

The offshore banks surveyed appear to hold good stocks of both pelagic and bottom species. Any encouragement of this fishery, however, must take into account fuel and man-hours spent travelling, the dangers inherent in small boat voyages over relatively long distances offshore and the possibility that bottom stocks at these banks may be quite limited. Vertical longlining development may offer a more worthwhile alternative.

The capture of flying fish, both as a food source and as a supplementary bait, appears to have good potential. The small boat/low technology flying fish scooping carried out during the Project visit may not be suitable for the typical boat in use in American Samoa. However, flying fish capture could be combined with other fishing activities. On boats such as the alia catamarans it may be more appropriate to mount an elevated light source amidships and have two net handlers, one stationed at each bow, equipped with helmet-mounted spotlights.

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STANDARD FISHING DATA COLLECTION FORM

LOCATION:		Trip number:		Departure time:		Return time:		Fishing area:		Boat:		Fuel:													
										Skipper:		Amount:													
DATE	TIME	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
METHODS																									
ENGINE HOURS																									
Trolling																									
Bottom fishing																									
Handreel																									
Handline																									
FISHING DEPTH (m)																									
CATCH RATE																									
Numbers																									
Weight (kg)																									
WEATHER																									
WIND																									
SEA																									
CURRENT																									
CREW (Names):																									
No. of trainees:																									
BAIT																									
Type																									
Wt (kg)																									
No. of trolling lines																									
No. of handreels																									
No. of handlines																									
FISHING EFFORT																									
REMARKS:																									
TROLL CATCHES																									
Species																									
No.																									
Wt (kg)																									
TOTALS:																									
CATCHES OTHER METHODS																									
TOTALS																									
TOTALS																									
TOTAL CATCH PER TRIP																									
No.																									
Wt (kg):																									

APPENDIX 2

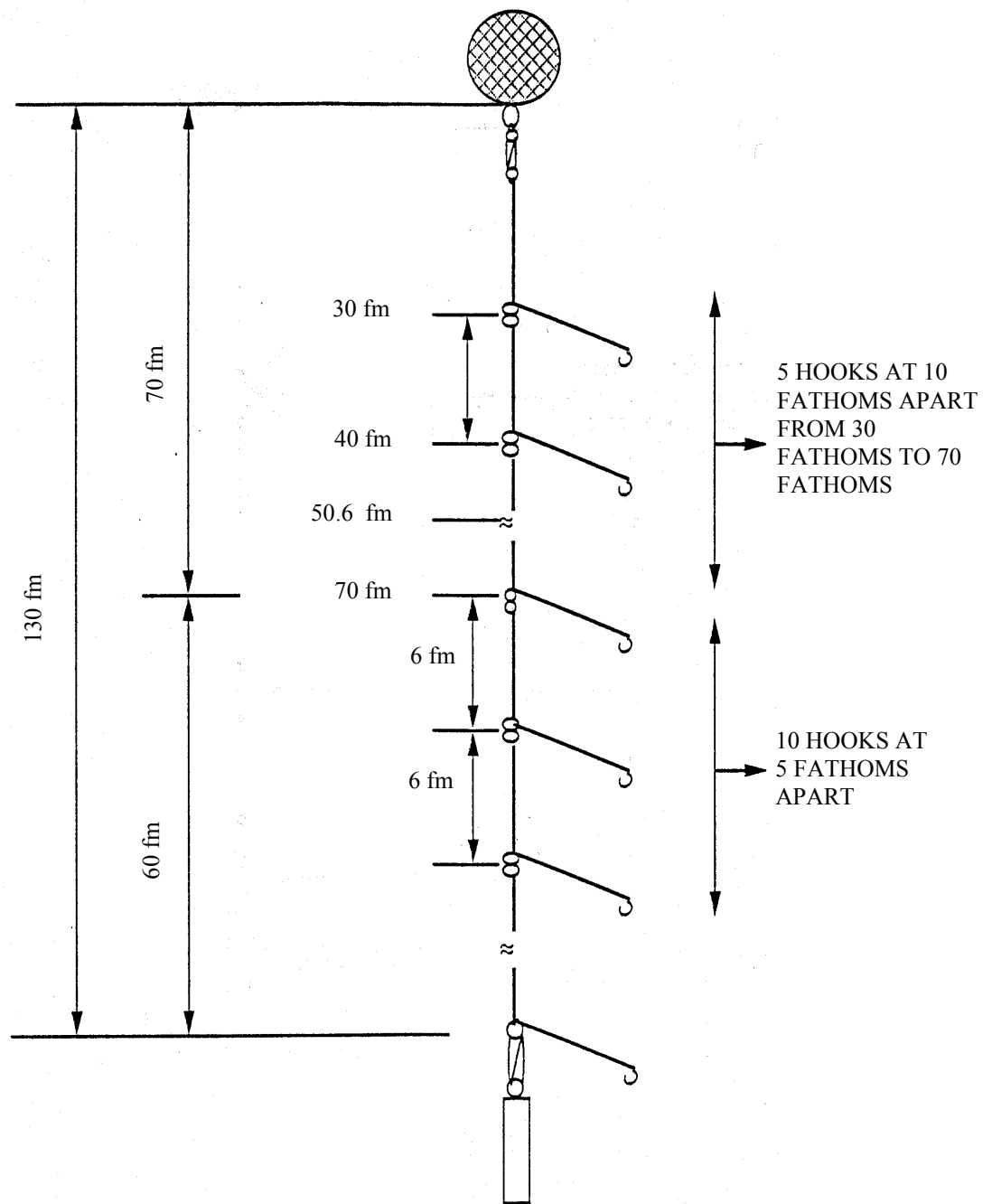
SUMMARY OF OPERATIONAL ASPECTS OF FISHING TRIPS

No.	Vessel	Fishing methods	Trip hours	Fishing hours	Number	Catch Weight (kg)	Fishing area
1	3–6 m dinghy	Flying fish scooping	6.0	3	28	6.0	SW coast
2	<i>Masimasi</i>	Bait jigging	5.0	3	Not recorded		FAD B
3	<i>Sausauimoana</i>	Vertical longlining	14.5	6	1	20.0	FAD B/FADA
4	<i>Sausauimoana</i>	Trolling	12.5	4	26	147.0	South bank
5	<i>Sausauimoana</i>	Bait jigging	5.5	3.5	Not recorded		FAD B
6	<i>Sausauimoana</i>	Trolling Bottom-fishing	92.0	3.5 7.5	57 Not recorded	306.0	Rose Atoll Rose Atoll
7	<i>Masimasi</i>	Bait jigging Vertical longlining	10.0	1.5 6	Not recorded 2	45.5	FAD B FAD B
8	<i>Masimasi</i>	Vertical longlining	9.0	6	6	143.6	FAD B
9	Private alia	Vertical longlining	6.0	4	1	20.0	FAD B
10	<i>Masimasi</i>	Trolling Vertical longlining Bait jigging	12.5	0.5 4 3.5	1 1 Not recorded	8.0 19.0	FAD B/FAD A FAD B/FAD A FAD B/FAD A
11	<i>Masimasi</i>	Vertical longlining Bait jigging	6.0	2.5 2.0	1 Not recorded	56.0	FAD B FAD B
12	Private alia	Vertical longlining Bait jigging	6.0	4 2.5	1 Not recorded	16.0	FAD B FAD B
13	<i>Masimasi</i>	Vertical longlining Bait jigging	6.0	2.5 5	0 Not recorded	0.0	FAD B FAD B
14	Private alia	Vertical longlining Bait jigging	9.0	6 1	13 Not recorded	324.5	FAD B FAD B
15	Private alia	Vertical longlining Bait jigging	6.0	2 3	1 Not recorded	20.0	FAD B FAD B
16	<i>Masimasi</i>	Vertical longlining Bait jigging	7.5	2.5 2	0 Not recorded	0.0	FAD B FAD B
17	<i>Masimasi</i>	Bait jigging Trolling	5.0	2 1	0 2	0.0 4.0	FAD B FAD B
18	<i>Sausauimoana</i>	Vertical longlining Trolling Bottom fishing	27.0	2 3 7	0 8 130	0.0 37.0 180.5	FAD B South Bank South Bank
19	<i>Sausauimoana</i> 3.6 m dinghy	Bait jigging Flying fish scooping	5.0	2 3	0 53	0.0 13.0	Ofu-Manu'a Ofu-Manu'a

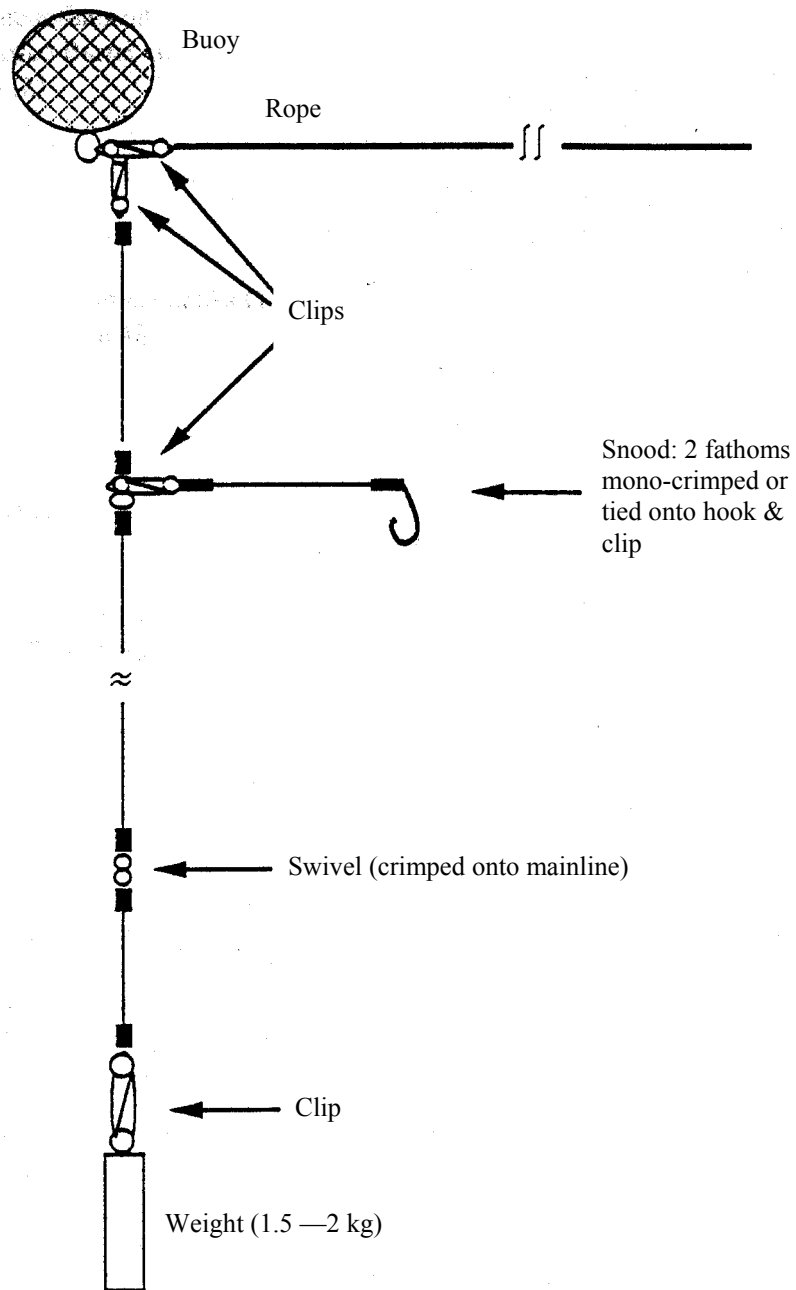
20	Sausauimoana	Vertical longlining	24.0	23	0	0.0	FAD J/ Manu’a
		Trolling		1	0	0.0	Ofu-Manu’a
		Bottom-fishing		11	114	114.25	Submarine bank/Manu’a
	3.6 m dinghy	Flying fish scooping		2	38	10.0	Ta’u/Manu’a
21	Sausauimoana	Trolling	20.5	1	6	15.0	SE bank
		Bottom -fishing		7	292	385.5	SE bank
22	Masimasi	Trolling	8.5	4	25	51.7	Shelf-west. Coast of Tutuila
		Bottom-fishing		2.5	2	7.5	Shelf-west. Coast of Tutuila
23	Private launch	Trolling	38.0	2	23	88.5	East bank/SE bank
		Bottom fishing		12.5	60	156.6	SE bank
		Vertical longlining		1.5	0	0.0	Demonstrat.
TOTAL			341.50	172.0	889	2,179.65	

APPENDIX 3A

MAKE-UP AND MATERIALS FOR VERTICAL LONGLINE



VERTICAL LONGLINE MAINLINE ARRANGEMENT



APPENDIX 3C**MATERIALS FOR A VERTICAL LONGLINE (15 HOOKS)****Mainline**

499–500 lbs monofilament
Heavy duty Rosco Barrel swivels size 9 (14)
Longline clips (2)

Snoods

400 lbs monofilament
Longline clips (15)
BKN or Mustad tuna circle hooks (15)
(BKN hook w/ring size 48)

Accessories

Floats 1 or 2
Rope 30–40 metres
Longline clips 2
Weight 1½–2 kg
Pulley (Kolstrand 6½” diameter)
Sleeves (size to fit 400–500 lbs monofilament)

APPENDIX 4A

SUMMARY OF CATCH AND EFFORT BY TRIP
A. VERTICAL LONGLINING

Trip No.	Hours		Effort (1)	Bait used (kg)	Catch		CPUE (2)
	Total	Fishing			Number	Weight(kg)	
3	14.5	6	8	3.0	1	20.0	2.5
7	10.0	6	8	5.0	2	45.5	5.7
8	9.0	6	5.5	6.0	6	143.6	26.1
9	6.0	4	4	5.0	1	20.0	5.0
10	12.5	4	8	4.0	1	19.0	2.4
11	6.0	2.5	4.9	3.0	1	56.0	11.4
12	6.0	4	4.8	3.0	1	16.0	3.3
13	6.0	2.5	3	3.0	0	0.0	0.0
14	9.0	6.0	13.2	4.0	13	324.5	24.6
15	6.0	2.0	2.4	3.0	1	20.0	8.3
16	7.5	2.5	6.0	0.0	0	0.0	0.0
18	4.0	2.0	6.0	3.0	0	0.0	0.0
20	2.0	2.0	6.0	3.0	0	0.0	0.0
23	1.5	1.5	4.5	3.0	0	0.0	0.0
TOTAL	100.0	51.0	84.3	48.0	27	664.6	7.9

1. The unit of effort used is ten hook-hours, indicating a 10-hook longline set for 1 hour, or a 20-hook longline set for ½ hour, etc.
2. CPUE is (in kg) calculated as the catch per 10 hooks per hour.

APPENDIX 4B

SUMMARY OF CATCH AND EFFORT BY TRIP
B. BOTTOM FISHING

Trip No.	Fishing hours	Reel hours (1)	Catch		CPUE (2)
			Number	Weight (kg)	
18	7.0	28	130	180.5	6.4
20	11.0	55	114	114.3	2.0
21	7.0	35	292	385.5	11.0
22	2.5	5	2	7.5	1.5
23	12.0	24	60	156.6	6.5
TOTAL	39.5	147	598	844.4	5.7

1. Reel hours are calculated as number of hours fishing by number of handreels in use.
2. CPUE is calculated by dividing total catch by effort (i.e. reel hours).

APPENDIX 4C

SUMMARY OF CATCH AND EFFORT BY TRIP
C. TROLLING

Trip No.	Fishing hours	Reel hours (1)	Catch		CPUE (2)
			Number	Weight (kg)	
4	4.0	24	26	147.0	6.1
6	3.5	14	57	306.0	21.9
10	0.5	1	1	8.0	8.0
17	1.0	1	2	4.0	4.0
18	3.0	12	8	37.0	3.1
20	1.0	2	0	0.0	0.0
21	1.0	3	6	15.0	5.0
22	4.0	24	25	51.7	2.2
23	2.0	4	23	88.5	22.1
TOTAL	20.0	85	148	657.2	7.7

1. Line hours are calculated as number of hours fishing by number of lines trolled.
2. CPUE is calculated by dividing total catch by effort (i.e. line hours).

SPECIES COMPOSITION OF THE BOTTOM CATCH

FAMILY			
<i>Species</i>			
English name			
Samoa name	Number	Weight (kg)	
LUTJANIDAE (sub-family ETELINAE, APSILINAE)			
<i>Aphareus furcatus</i>			
Blue jobfish			
Palu-aloalo	1	0.8	
<i>Aphareus rutilans</i>			
Small-tooth jobfish			
Palu-gutusiliya	2	5.2	
<i>Aprion virescens</i>			
Green jobfish			
Asoama	25	70.5	
<i>Etelis carbunculus</i>			
Short-tail red snapper			
Palu-malau	7	26.0	
<i>Etelis coruscans</i>			
Ribbon-tail red snapper			
Palu-loa	19	79.8	
<i>Paracaesio xanthurus</i>			
Southern fusilier			
Palu-tuasama	2	1.0	
<i>Paracaesio kusakarii</i>			
Saddled fusilier			
Palu-tuauli	2	11.5	
<i>Paracaesio stonei</i>			
Stones fusilier			
Manifi	1	1.5	
<i>Pristipomoides auricilla</i>			
Gold tailed jobfish			
Palu-i'usama	2	1.1	
<i>Pristipomoides zonatus</i>			
Banded flower snapper			
Palu-sega	9	7.1	
<i>Pristipomoides filamentosus</i>			
Rosy jobfish			
Palu-ena'ena	13	17.5	
<i>Pristipomoides flavipinnis</i>			
Yellow jobfish			
Palu sina	16	22.0	

LUTJANIDAE (sub-family LUTJANINAE)

<i>Lutjanus bohar</i> Red bass Mu	28	100.8
<i>Lutjanus gibbus</i> Paddletail Mala'i	1	0.5
<i>Lutjanus kasmira</i> Blue-lined snapper Savane	175	50.0

LETHRINIDAE

<i>Gymnocranius rivulatus</i> Deep-water emperor Filoa-Gutupu'u	1	1.0
<i>Lethrinus rubrioperculatus</i> Emperor Apa mumu	76	64.3
<i>Lethrinus miniatus</i> Long-nose emperor Filoa va'a	2	9.0

SERRANIDAE

<i>Cephalopholis</i> sp. Unidentified rock cod Gatala	10	12.0
<i>Cephalopholis aurantius</i> Orange rock cod	7	7.8
<i>Cephalopholis sonnerati</i> Tomato grouper Velo	2	1.0
<i>Epinephelus morrhua</i> Curve-banded grouper Ata'ata-tusitusi	1	2.0
<i>Saloptia powelli</i> Grouper	1	1.0
<i>Variola louti</i> Lunar-tailed cod Papa-tuauli	1	0.5

CARANGIDAE

<i>Caranx lugubris</i> Black trevally Taufauli	17	47.9
<i>Caranx ignobilis</i> Giant trevally Sapo'anae	1	9.0
<i>Caranx sexfasciatus</i> Big eye trevally Malauli-matalapo'a	7	10.8
<i>Elegatis bipinnulata</i> Rainbow runner Samani	28	75.3
<i>Seriola rivoliana</i> Amberjack	1	4.0

HOLOCENTRIDAE

<i>Adioryx spinifer</i> Armoured squirrel-fish Tamalau	18	12.5
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SPHYRAENIDAE

<i>Sphyraena</i> spp. Barracuda Sapatu	110	146.8
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SCOMBRIDAE

<i>Gymnosarda unicolor</i> Dogtooth tuna Tagi	4	30.7
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GEMPYLIDAE

<i>Promethichthys prometheus</i> Snake mackerel Palu-kamuro	7	9.0
<i>Ruvettus pretiosus</i> Oilfish Palu-talatala	1	4.5

TOTAL	598	844.4
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