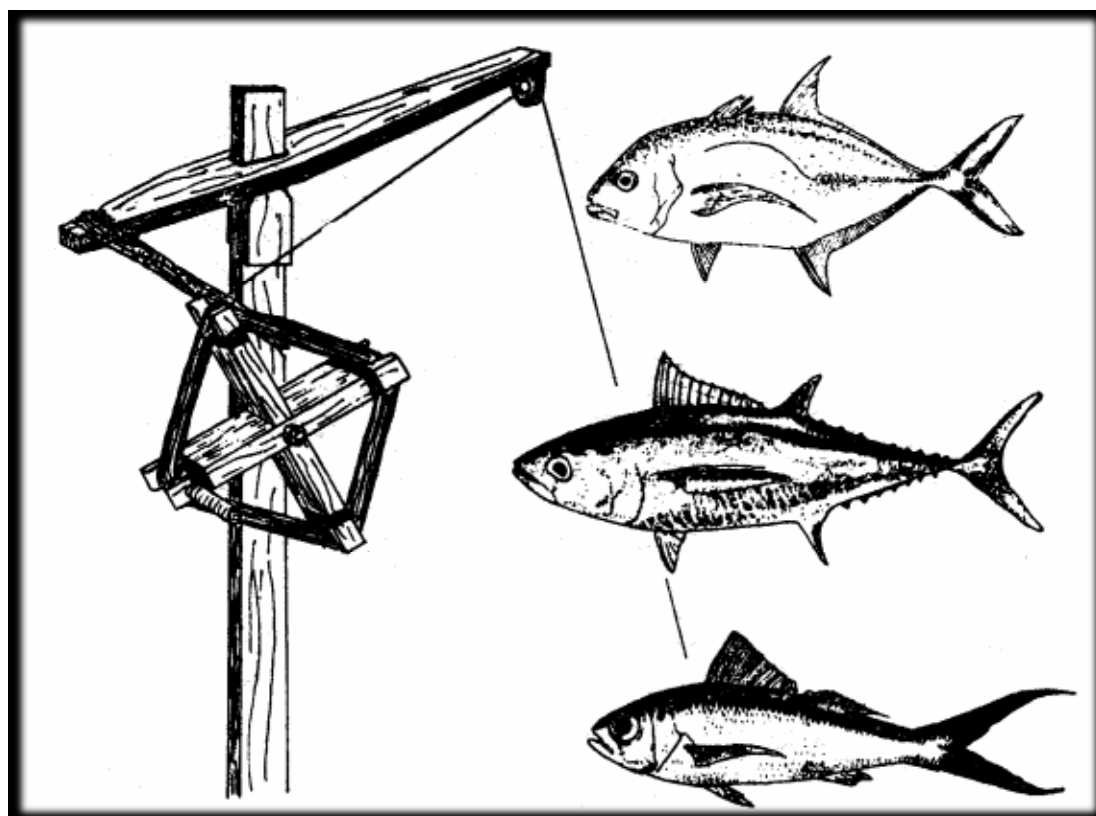


DEEP SEA FISHERIES DEVELOPMENT PROJECT

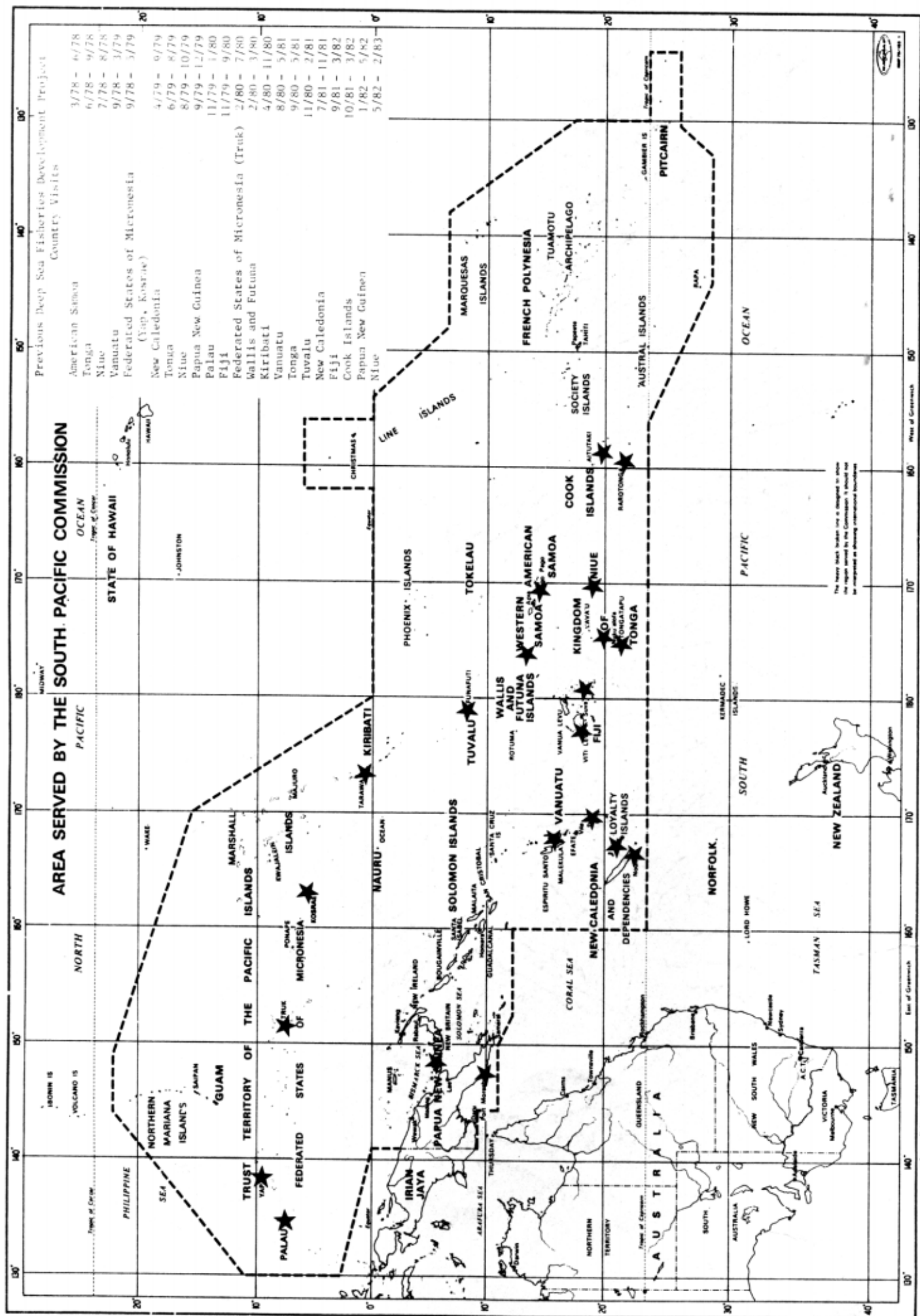
Report of visit to

KIRIBATI

23 April —18 November 1980



SOUTH PACIFIC COMMISSION
NOUMEA, NEW CALEDONIA



SOUTH PACIFIC COMMISSION

REPORT
ON
THE DEEP SEA FISHERIES DEVELOPMENT PROJECT'S
VISIT TO THE REPUBLIC OF KIRIBATI

(23 April — 18 November 1980)

by

Pale Taumaia,
Master Fisherman

and

Mark Gentle,
Assistant Fisheries Officer

South Pacific Commission
Noumea, New Caledonia
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1. INTRODUCTION

The South Pacific Commission's Deep Sea Fisheries Development Project 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.
- To provide practical training in appropriate fishing techniques to local fishermen and government fisheries extension workers.

Kiribati is the fifteenth country or territory in the region in which the project has operated since it commenced activities in 1978. (See map inside front cover.)

The project's visit to Kiribati followed a request from the Government for assistance in assessing the potential for an artisanal deep bottom fishery in local waters, and specifically:

- To identify and provide a preliminary assessment of the deep bottom fish resources of the outer reef slope.
- To provide practical training to local fishermen, with priority being given to the training of a Government Demonstration Team to provide follow-up training after the project's departure.
- To evaluate the economic viability of deep bottom fishing under local conditions.

In response to this request, one of the project's three master fishermen, Mr Pale Taumaia, was assigned to work in Kiribati for a period of four months from 23 April 1980. Subsequently, due to the great interest shown by local fishermen as well as the fact that considerable fishing time had been lost as a result of industrial unrest and consequent fuel shortages, the master fisherman's visit was extended by a further three months, up to mid-November. The project was based on the main island of Tarawa, and most fishing was carried out around this island, although several trips were also made to the islands of Maiana and Kuria.

2. BACKGROUND

2.1. General

The Republic of Kiribati (Figure 1), formerly the Gilbert Islands of the Gilbert and Ellice Islands Colony (UK), comprises thirty-three coral islands including the sixteen islands of the Gilbert group proper, Banaba (Ocean Island), and islands in the Phoenix and Line groups. The total land area is less than 800 square kilometres, but as the islands span over 3,000 kilometres the country's 200 mile exclusive economic zone gives it control of over 3.3 million square kilometres of ocean. The Gilbert group lies in the western portion of this area, in an archipelago running roughly North-west to South-east between 3.5°N and 3°S latitude and 172.5°E and 177°E longitude.

In 1978 the population of Kiribati was about 56,500, with some 53,800 resident in the Gilberts group proper, 20,100 living on urban Tarawa, where the commercial and administrative centre, Bairiki, is situated. (Govt of Kiribati, 1978.) While people in the outer islands still live by subsistence fishing and agriculture, supplemented by income from copra and remittances, in Tarawa the cash economy prevails, and population growth has resulted in a reliance on imported foods.

2.2. Fisheries

Following the cessation of phosphate mining on Banaba in 1979, marine resources have become the mainstay of the economy, and the Government thus places the highest priority on their development. At the time of this visit, a locally-based commercial pole-and-line fishery, using cultured milkfish as the primary source of bait, was in the process of being established, and at the artisanal level the Fisheries Division had an active extension programme designed to encourage fishermen to form themselves into small groups and fish as units rather than as scattered individuals. A marketing organisation is also to be developed to channel fish caught which is surplus to individual land requirements to the urban market of South Tarawa.

The men of Tarawa are by tradition good lagoon and offshore fishermen. Most fishing effort is directed towards poling and trolling for small surface schooling tunas using pearl-shell lures, the use of gill nets and encircling nets for catching mullet, milkfish, silverbiddies, etc., handlining for reef fish (rarely at depths greater than 50 m), underwater spearfishing, and scoopnetting for flying fish at night by the light of storm lanterns. Deep-water handlining, primarily for oilfish, is also carried out at night in depths of up to 150 metres.

In the majority of islands most fishing is conducted from traditionally styled sailing or, more rarely, paddling canoes. In Tarawa, however, these are being superseded by outboard-powered craft. A fleet of about thirty speed-boats currently operates, being mainly engaged in pearl-shell lure fishing for tuna.

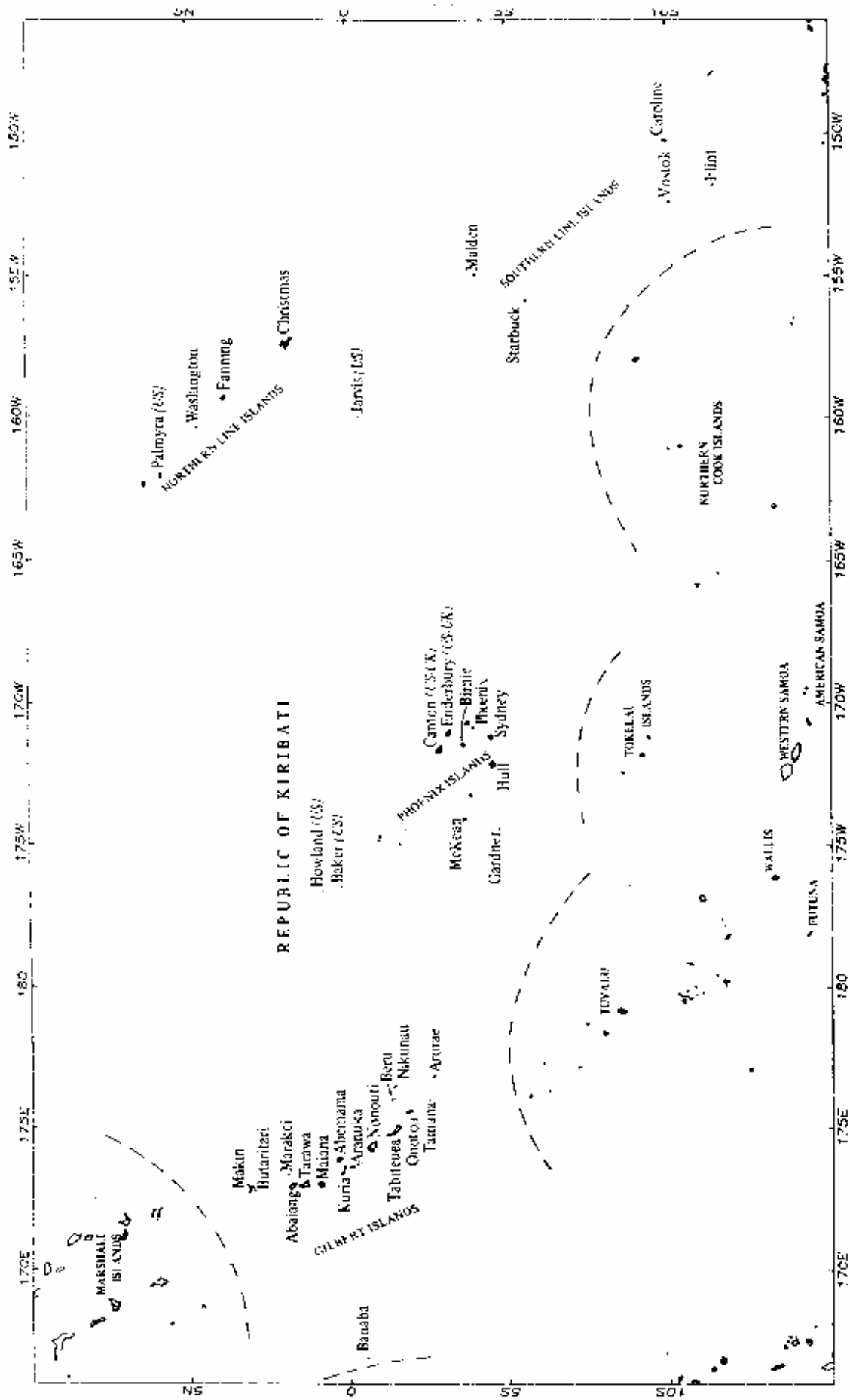


Figure 1: The Republic of Kiribati

According to Fisheries Division estimates (Marriott, personal communication), the total artisanal catch in South Tarawa is of the order of 1500 tonnes per year. No data are available for North Tarawa or the outer islands.

3. PROJECT OPERATIONS

3.1. General

A total of eighteen fishing trips, some involving two vessels were conducted in three different areas. Weather conditions were generally favourable, but some fishing time was lost because of mechanical problems with the project vessels, and as a result of two general strikes (2—8 June and 10 July —5 August 1980).

3.2. Training programme

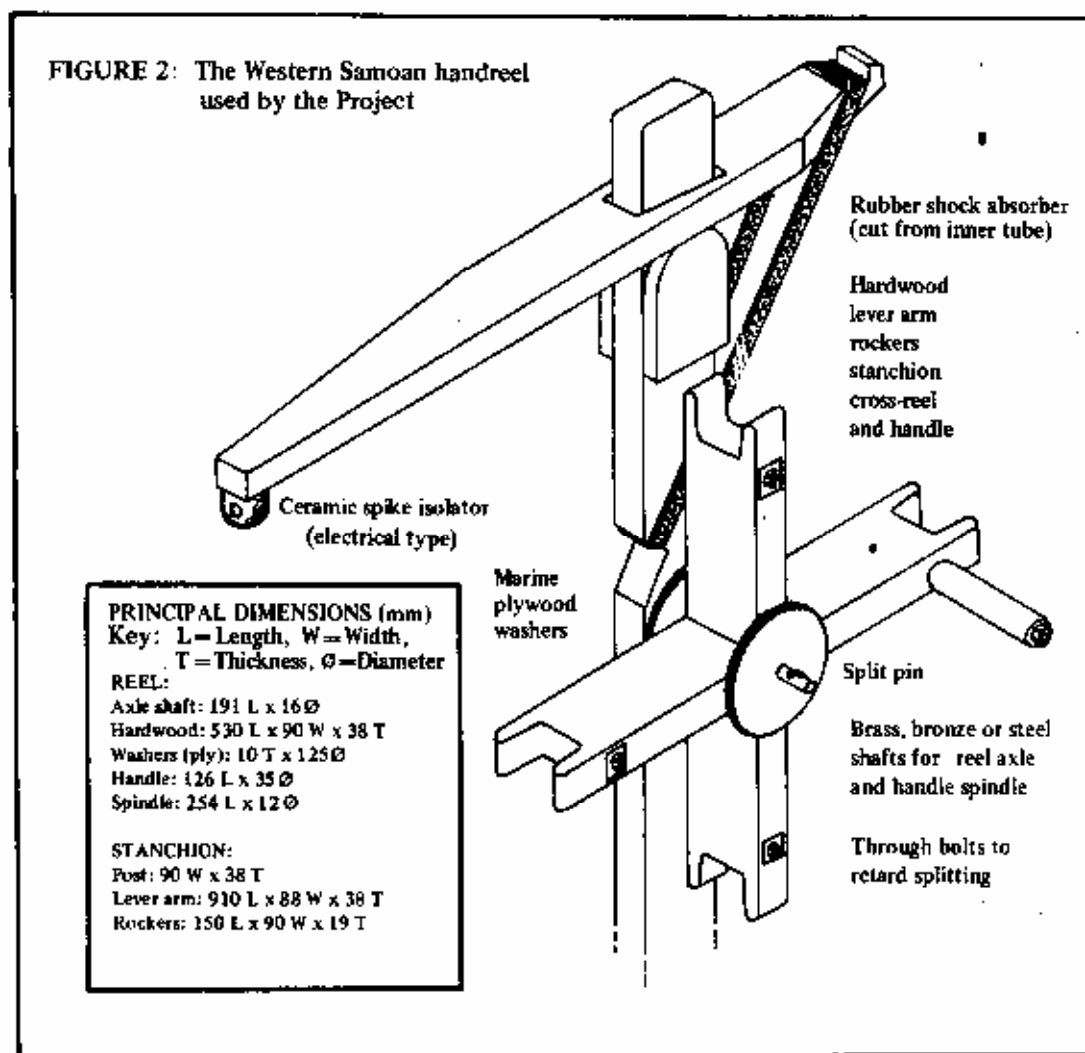
Conducted for the most part informally under actual fishing conditions, the training programme covered general seamanship and safe handling of a small boat at sea, the rigging and maintenance of fishing gear, deep bottom fishing techniques using the Samoan handreel, and the maintenance and operation of outboard engines. Instruction was also given in the handling and preservation of the catch. Further details of the subjects covered in the training programme are given in Appendix I.

While priority was given to the training of a five-man Government demonstration team who could continue to train local fishermen in deep bottom fishing following the project's departure, a total of thirty-six private fishermen selected by the Fisheries Division also received training.

3.3. Boats and equipment

Three different boats, all belonging to the Fisheries Division, were used during the project. The first fourteen trips were made aboard the training and experimental fishing vessel *Ang Rerei*, an 8 metre V-bottom GRP launch powered by a 110 hp Volvo-Penta engine (trips 1—10 and 13), and the fisheries extension vessel *Nei Tewenei*, a 14.5 metre steel hull powered by a 200 hp Cummins diesel engine (trips 11, 12 and 14). At the end of August, delivery was taken of an 8.6 metre FAO design aluminium 'alia' catamaran, powered by a 40 hp 2-stroke outboard with a spare 25 hp outboard as a reserve. This vessel also carried a small loose-footed Bermuda auxiliary sail with a mast stepped through the cabin roof. Four trips were made using the alia, each time in conjunction with one of the other two vessels: trips 15 and 16 were conducted using *Nei Tewenei* as a mother ship, and trips 17 and 18 in company with *Ang Rerei*, which fished close by.

Four Western Samoan-type hand reels (Figure 2) were used aboard the three vessels. Each reel held 500 m of 130 kg test nylon monofilament line and a wire terminal rig with three tuna circle hooks, as shown in Figure 3. For fishing in shallow water, plastic handcasting reels were used, each holding 500 m of 20 kg test monofilament. The terminal rigs for the plastic handcasters were similar to those used with the wooden reels, except that 35 kg monofilament was used instead of wire for the leader.



Except on board the *Nei Tewenei*, where the vessel's own echo-sounder was used, anchoring and positioning the boat was carried out using an echosounder belonging to the project (a Furuno FG11 portable sounder with a range of 0—650 m) and simple anchoring gear (Figure 4) which consisted of 440 m of 12 mm polypropylene line and a grapnel-type anchor.

Details of the basic equipment required for deep bottom fishing are given in Appendix 2.

3.4. Fishing techniques

Fishing methods were the same as those used successfully by the project during previous operations. All bottom fishing was carried out with the boat at anchor, locations being selected so that the prevailing wind and current caused the boat to lie offshore. Steep dropoffs usually permitted the anchor to be set in a depth of about 30 metres, the anchor line then being paid out until a depth and bottom type suitable for fishing were located on the echo-sounder. Generally depths of about 200 metres were aimed for, but vessel swing and bottom irregularities resulted in effective fishing being recorded in depths from 60 to 500 metres, with about 90 per cent of fishing effort occurring between 100 and 300 metres.

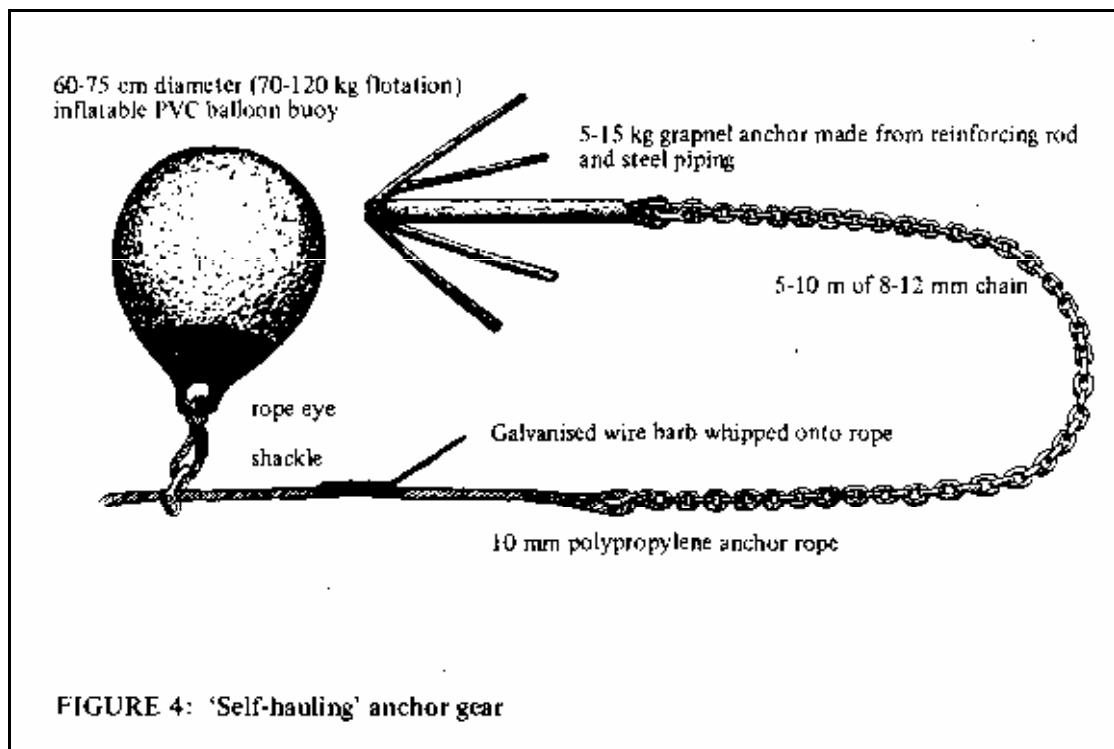
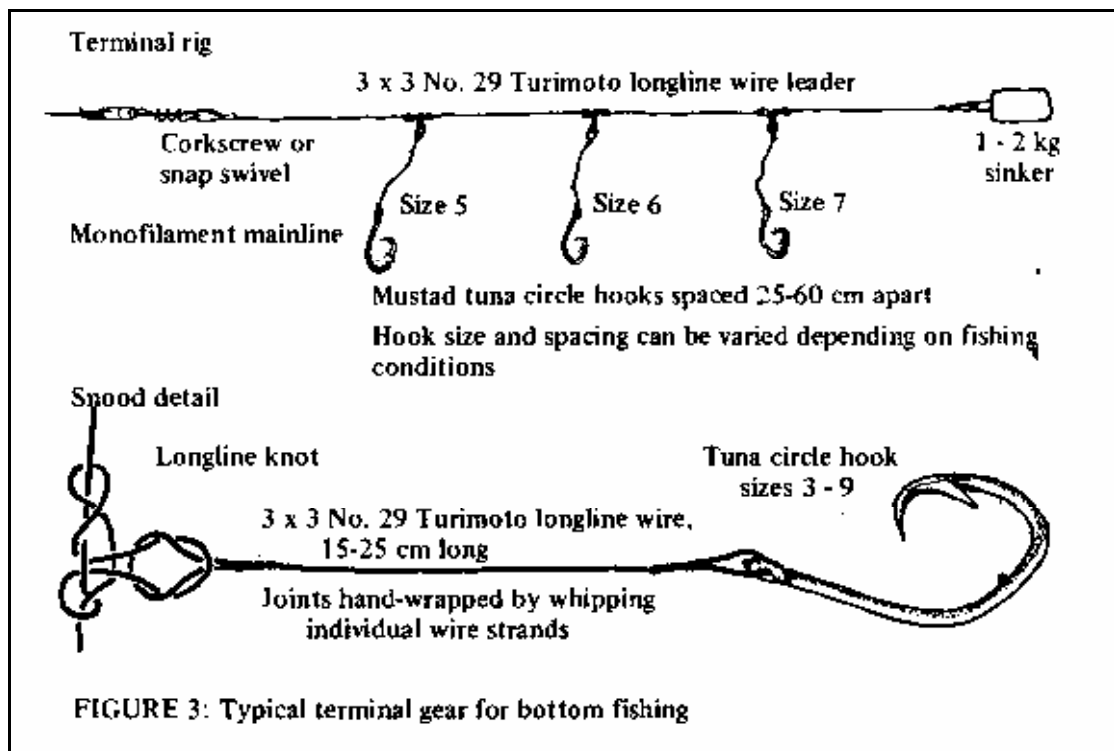
Most fishing was carried out using the project's wooden handreels, with shallow water handlining (60—100 m) using the handcaster reels being performed on an opportunistic basis, usually when a change of wind or current carried the boat into shallow water at times when it was considered unsafe to re-anchor.

Skipjack tuna is considered the best bait for deep bottom fishing and was used almost exclusively. Ample supplies were available from the Fisheries Division's freezer and consequently very little trolling was carried out.

After fishing, a simple method was used to retrieve the anchor, greatly reducing the effort involved. The anchor line was transferred from the bow to the stern and the boat motored quickly ahead to break out the anchor, continuing until, aided by the buoyancy of the polypropylene anchor rope, it streamed behind the boat. A free-running buoy was clipped or shackled onto the line and was forced back along it by water resistance, to be trapped near the anchor by a 'no-return' barb of galvanised wire whipped onto the line (see Figure 4). The boat was then run back along the anchor line with one crew member feeding the rope inboard until reaching the anchor, which, suspended at the sea surface by the buoy, could be lifted easily into the boat.

3.5. Handling and preservation of the catch

All fish were gutted and gilled and put into ice as soon as possible after capture, usually within one or two hours. On board the *alia* and the *Ang Rerei* fish and bait were stored in two portable ice boxes belonging to the project. On board *Nei Tewenei*, the vessel's own ice boxes were used. At the end of each trip, fish were identified and individually weighed before handing over to the Fisheries Division for storage and subsequent sale to the public. Round weights were estimated by adding 25 per cent to the gutted and gilled weight.



4. RESULTS

4.1. General

Eighteen fishing trips were completed during the survey period with a total of 503 hours spent at sea. Twelve trips were made at Tarawa, four to Maiana and two to Kuria. All trips around Tarawa were overnight and averaged 15 hours in duration. Those to the other more distant islands were necessarily longer, with trips to Maiana varying from 28 to 47 hours in duration, while the two trips to Kuria (using the alia catamaran with *Nei Tewenei* as mother ship) each lasted three days. Full details of all trips are presented in Appendix 3.

4.2. Areas surveyed

Fishing grounds surveyed around each of the three islands are shown in Figure 5. Because of the prevailing north-east winds and the westward setting South Equatorial Current, most fishing was carried out on the west (lee) sides of the islands. In a number of locations strong currents also ran parallel to the reef edge, usually southerly, and complex eddy effects were noted, particularly on prominent points on the reef. At Tarawa, most of the west coast of the atoll was surveyed, as well as an area of Bairiki, on the south-west side of the atoll. At Maiana, fishing was carried out off the north-west coast. Attempts to fish an offshore bank about 5 miles towards Tarawa were frustrated by strong currents and rough seas which made anchoring impossible. At Kuria, only reef areas on the west and north-west sides of the island were fished.

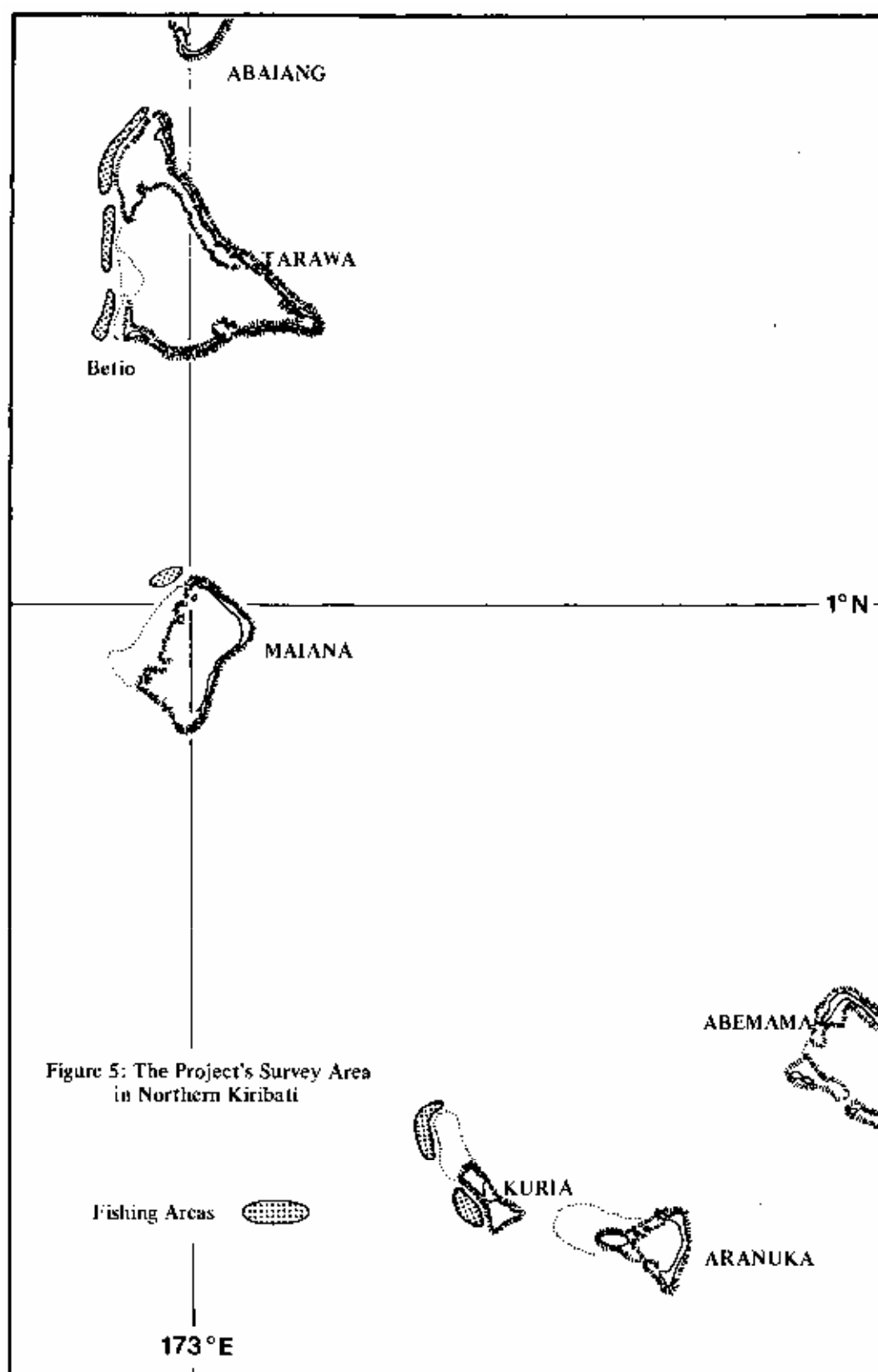
4.3. Catch and effort

The total deep bottom fishing effort was 998 reel hours, and yielded a total catch of 8,823 kg, of which 7,176 kg or 81.3 per cent were saleable, most sharks and snake mackerel being unacceptable. (These figures refer to round weights calculated by adding 25 per cent to gutted weights, as described in Section 3.5.) Table 1 summarises catch and effort data for each of the islands surveyed. More detailed catch records of catch and effort can be found at Appendix 3.

Table 1: Project catch and effort in Kiribati

Island	Effort (reel-hours)	Catch (kg)		CPUE (kg/reel-hour)	
		Saleable	Total	Saleable	Total
Tarawa	368	2,543	3,641	6.9	9.9
Maiana	314	2,313	2,580	7.4	8.2
Kuria	252	1,871	2,020	7.4	8.0
Total	998	7,176	8,823	7.2	8.8

Note: Trip number 2, in which fishing was carried out at Tarawa and Maiana, is included in the total figures but is excluded from figures for individual islands as separate records were not kept for the two locations

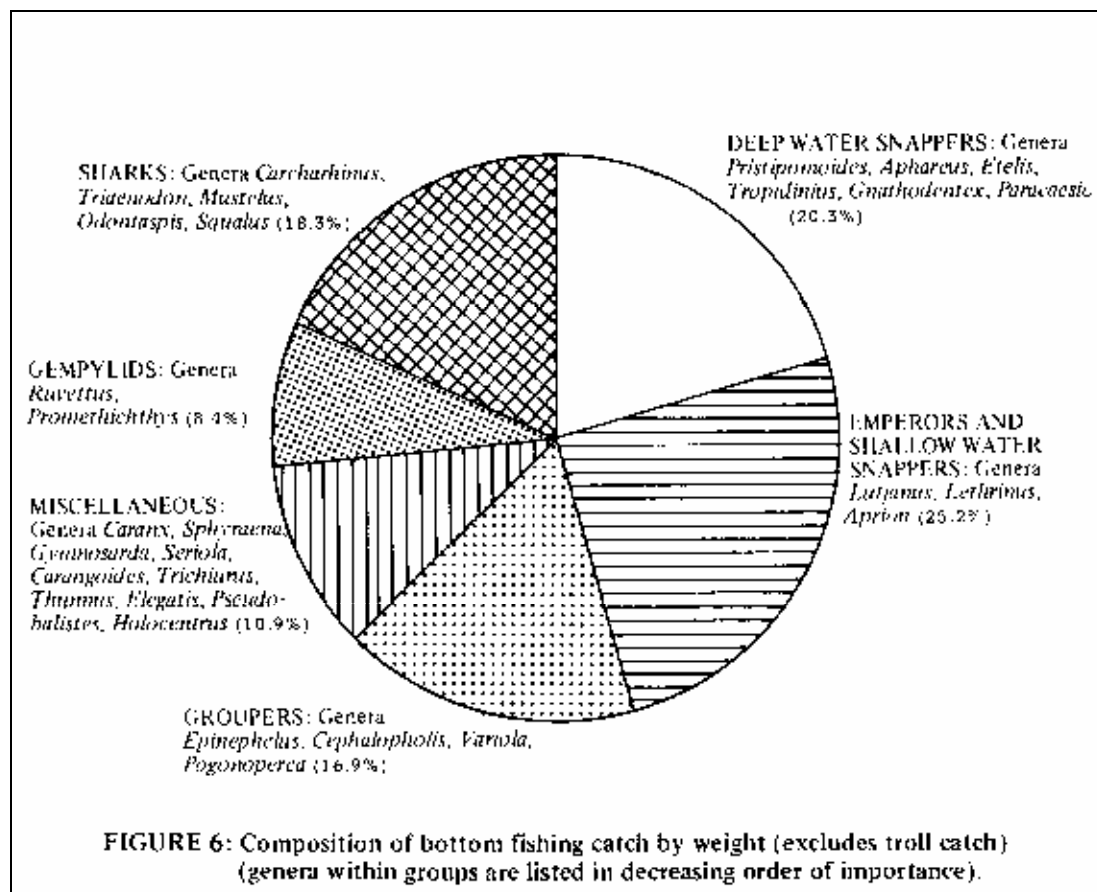


The overall catch rate was 8.8 kg/reel hour for all species, and 7.2 kg/reel hour for saleable species only. Somewhat greater numbers of sharks were caught at Tarawa, hence total CPUE was higher, and CPUE of saleable species lower, than at the other two islands.

As noted in Section 3.4., ample supplies of tuna were available for bait from the Fisheries Division's freezer, and consequently very little effort was directed towards trolling. On one occasion (trip 7) a catch of 25 kg (gutted and gilled) for four line hours was recorded when a school of yellowfin was fished. This is not included in Table 1.

4.4. Species composition of the catch

The catch composition by major species groupings is summarised in Figure 6, and detailed in Appendix 4.



The most important components of the catch (as percentages of total catch weight) were: shallow water snappers and emperors (families Lutjanidae (sub-family Lutjaninae), Lethrinidae), 25.2 per cent; deep water snappers and sea breams (families Lutjanidae (sub-family Etelinae), Lethrinidae), 20.3 per cent; sharks (various families), 18.3 per cent; and groupers (families Serranidae, Grammistidae), 16.9 per cent. A notable feature of the catch was the unusual abundance of the red seabass *Lutjanus bohar*, which was the commonest species taken and comprised 20.5 per cent by weight of the total catch. In many parts of the Pacific this species is ciguatoxic, or reputed to be so, but there were no reports of its being toxic in Kiribati and it was readily saleable. Other common species were the rosy jobfish, *Pristipomoides filamentosus* (10.6 %) and the black trevally, *Caranx lugubris* (4.8%). The deep-water red snappers (*Etelis* spp.) were caught in only relatively small quantities (2.2% of total landings) despite the fact that extensive fishing was carried out at depths where they might be expected to occur.

It is interesting to note that local fishermen were not familiar with the *Etelis* and *Pristipomoides* species, which apparently do not have local names, although oilfish and snake mackerel were well known to them.

4.5. Sale of the catch

All fish were sold from the Fisheries Division's freezer in Tarawa for an average price of A\$0.80/kg, with good quality fish such as groupers and snappers fetching up to A\$1.12/kg, and low grade species such as dogfish as little as A\$0.44/kg. Only snake mackerel and, on some occasions, large sharks were unacceptable to local consumers. No difficulties were experienced in selling the catch as demand always exceeded supply, nor were there any problems with ciguatera poisoning. Even the red seabass, *Lutjanus bohar*, found a ready market, despite its reputation for ciguatoxicity elsewhere in the Pacific.

5. DISCUSSION AND CONCLUSIONS

5.1. The resource

The mean catch rate for this survey, 7.2 kg of saleable fish/reel hour, compared well with those achieved by the Project at other small islands in the region, as shown in Table 2.

Table 2: Catch rates achieved by the DSFD Project at small Pacific Islands.

Locality	Island type	Effort (Reel hours)	Saleable fish (kg/reel hour)
Kiribati	Atoll	998	7.2
Tuvalu (Funafuti)	Atoll	400	6.7
Niue	Elevated Reef Island	116	7.0
Yap	Continental High Island	90	4.6
Kosrae	Volcanic High Island	144	9.6
Truk	Volcanic High Island	516	4.1

As noted in Section 4.4. the most striking features of the catch were the abundance of the red bass, *Lutjanus bohar*, which made up a fifth of total landings, and the relative scarcity of the deep-water red snappers, *Etelis* species. While a similar pattern was seen during project operations at Truk and Yap in the Federated States of Micronesia, it is noteworthy that at Funafuti, in Tuvalu, *Etelis* species were an important component of project catches, comprising 16.2 per cent by weight of total landings, and *Lutjanus bohar* was relatively uncommon, comprising only 2.8 per cent.

As is typical of atolls and coral islands, the outer reef slopes at Maiana and Kuria drop away steeply and the total area of deep bottom fishing grounds immediately adjacent to their lagoons is therefore relatively limited. Judging from available charts this pattern can be found at many other islands within the group, but at least one exception is seen at Tarawa, where the reef slope off the western edge of the atoll is more moderate, and as a result provides a more extensive fishing ground. Additionally, a saddle of relatively shallow water (120—250 m) runs from Maiana to Tarawa, and from Tarawa to Abaiang, and may extend further north, again providing potential deep bottom fishing areas. Bottom topography within the group is not well known and available charts give only limited coverage of most areas, but the presence of shoals and banks within the survey area suggests that as yet undiscovered deep bottom fishing grounds may exist in unsounded waters within the Gilbert Islands group.

5.2. Fishing economics

To assess the potential for a small-scale artisanal commercial deep bottom fishery based in Tarawa, a simple economic assessment balancing expected yearly earnings against estimated yearly costs (Table 3) is presented using the following assumptions, which are based on the conditions prevailing during this survey:

- that deep bottom fishing is carried out using an alia catamaran bought new, fully equipped, for A\$6,000 and operated by an owner skipper and two crew;
- that the boat and gear have been obtained under a full cost loan to be paid back over a period of 5 years at an interest rate of 10 per cent reducing annually;
- that an average of three overnight trips a week are made for forty weeks a year. This is seen as a reasonable assumption in view of the latitude and generally mild weather conditions experienced at Tarawa. Estimates of returns on greater and smaller numbers of trips have also been made;
- that an average catch rate of 7.2 kg/reel-hour of saleable fish (5.8 kg gutted and gilled) can be sustained;
- that the gutted and gilled catch is sold on the local market for an average price of A\$0.80/kg, the average sale price at the time of this survey.

Table 3: Economics of deep bottom fishing in Kiribati (Values in Australian dollars)

	Number of trips				
	80	100	120	140	160
(a) Annual earnings					
Gutted and gilled catch, 5.8 kg/reel/fishing hour, 8 hours/trip, at A\$0.80/kg.	8,910	11,136	13,363	15,590	17,820
(b) Annual expenses					
Repayment on loan	1,583	1,583	1,583	1,583	1,583
Fuel (6 gal/trip at A\$2.00 gal)	960	1,200	1,440	1,680	1,920
Oil and grease	150	175	200	225	250
Maintenance and repairs	500	550	600	650	700
Fishing gear replacement	250	300	350	400	450
Ice	150	200	250	300	350
Bait	530	700	800	930	1,060
Wages (33% of total catch)	2,970	3,710	4,410	5,200	5,940
TOTAL	7,093	8,418	9,633	10,968	12,253
(c) Balance to owner-skipper	1,857	2,718	3,730	4,622	5,567

This simple treatment predicts that an enterprising fisherman operating under the assumed conditions would generate a reasonable income from full-time deep bottom fishing around Tarawa. Diversification into other fishing methods (trolling, flying-fish netting) at appropriate times would likely enhance the profitability of the operation. The good catch rates achieved at Maiana and Kuria also suggest a potential for deep bottom fishing, either as a supplement to subsistence catches or for commercial purposes.

5.3. Development potential

An important factor which should be taken into consideration when assessing the likely contribution of this type of fishing to the local economy is the marketability of the catch. During this survey, demand exceeded supply and sale of the catch presented little problem. However, increased numbers of fishing boats unloading their catches at Tarawa might lead to local oversupply, and an associated depression of prices, adversely affecting the economics of vessel operation. It is hard to envisage the domestic market absorbing the production of more than a small number of vessels operating full time, and there appear to be serious constraints to the development of an export market. Not least among these is the high proportion among the catch of *Lutjanus bohar*, whose reputation for ciguatoxicity would render it unsaleable on most overseas markets. The *Etelis* species, which have the highest export value, appear to be uncommon in local waters, and many of the other species taken would attract only marginally profitable export prices.

Thus it seems that, although the techniques demonstrated by this project were appropriate and adequate for the effective harvesting of local deep bottom fish stocks, the development of a fishery based on these stocks is likely to be constrained, at least in the short term, by lack of market opportunities. Furthermore, while the true extent of suitable fishing areas is not known, these may well be relatively limited. As very little is currently known about the sustainable yields which could be expected from deep bottom fish stocks, development of this fishery should take these factors into account and proceed in a planned and phased manner, with at least basic catch statistics being collected (and processed) as the fishery expands, to enable catch and effort to be monitored.

Finally, it should be noted that fishing activities conducted during this project were restricted to three localities within the northern Gilbert Islands. Substantial distances lie between the Gilberts and the other island groups of Kiribati, and it is likely that environmental conditions, and consequently the extent and type of the resource, differ in these areas.

6. RECOMMENDATIONS

Suitable fishing techniques for the exploitation of the deep bottom resource in the Northern Gilbert Islands group were demonstrated during the project, and a number of factors were noted which may hinder effective development of this fishery. These can be summarised as:

- a shortage of suitable vessels and support services to enable fishermen to enter the fishery;
- a lack of adequate marketing outlets for substantial production;
- a lack of knowledge of the extent of the resource.

These constraints are not unique to the development of the deep bottom fishery, nor are they insurmountable. The following recommendations are made under the assumption that expansion of this fishery is in line with the Government of Kiribati's overall fisheries development objectives.

1. That financial assistance be made available, in the form of soft loans or other incentives, to enable a limited number of fishermen to enter the fishery. Where possible, this should be by encouraging existing fishermen to diversify their current operations.
2. That sustained Government support be made available to operators within the fishery. This should include:
 - (i) a workshop facility, preferably mobile, equipped to carry out routine repairs to small boat engines, and carrying a stock of spare parts;
 - (ii) advice and instruction to fishermen on minor repairs and fault finding;
 - (iii) demonstration of fishing and fish handling techniques by the team trained during this project visit.

- (iv) establishment of a small store making available essential fishing gear at cost or near-cost.
- 3. That Government attempt to standardise the range of engine types in use in conjunction with recommendations 1 and 2.
- 4. That Government or an appropriate agency explore the economics of storing and exporting the higher-value components of the catch, and identify suitable export markets.
- 5. That the Fisheries Division undertake further work aimed at determining the extent of the resource. This should include:
 - (i) establishment of a simple sampling programme to monitor landings of deep bottom species, and collection of related information on fishing area and effort;
 - (ii) opportunistic soundings (by Fisheries Division or other vessels) of poorly charted areas, in order to locate offshore banks and seamounts.
- 6. That by experimental trials the Fisheries Division assess the potential costs and benefits, in the form of fuel savings, which may accrue from the use of sails in local fishing operations currently using fossil fuels.

ACKNOWLEDGEMENTS

The Commission gratefully acknowledges the friendly assistance afforded by the staff of the Fisheries Division. Particular thanks are due to then Chief Fisheries Officer Mr Brendan Dalley, Captain Stone, electrician Mr Lowther and Extension Officer Mr Tekabu Tikai, for their efforts on behalf of the project and their hospitality to the master fisherman during his stay.

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Topics covered in the Project's training programme

1. Handling a fishing boat

- (a) Safety at sea
- (b) Knots and splices for mooring and anchor lines
- (c) Making a grapnel anchor
- (d) Use of equipment checklist before departure
- (e) Anchoring in order to fish at the right depth
- (f) Compass use
- (g) Marking of good fishing spots by landmarks or compass bearings
- (h) Simple method of anchor retrieval
- (i) Boat care and maintenance after fishing trip.

2. Handling equipment and fishing gear

- (a) Personal safety during fishing operations
- (b) Use of Western Samoan handreel
- (c) Use of handcasting reel
- (d) Knots and rigs for monofilament line, wire leaders and traces
- (e) Techniques for handling large fish
- (f) Operation of the echo-sounder
- (g) Care of gear and rust prevention
- (h) Rigging of gear in tackle-balance (appropriate matching of hooks, line and swivels).

3. Handling an outboard motor

- (a) Starting procedures
- (b) Fuel mixture
- (c) Emergency spares and tool kit
- (d) General care and maintenance procedures
- (e) Lay-up procedure
- (f) Treatment for engine accidentally dropped in sea.

Basic equipment for deep bottom fishing

1. Western Samoan-type wooden handreels
2. 115 kg or 130 kg test monofilament, 500 m per reel
3. Turimoto No. 29 longline wire or equivalent (3 x 3 braided, 120 kg test)
4. Sizes 3—9 Mustad 39910ST tuna circle hooks
5. Size 4/0 Berkeley-McMahon swivels or equivalent
6. Size 4/0 Kelux stainless lockfast swivels or equivalent
7. 1 kg and 2 kg sinkers
8. 400—500 m polypropylene anchor rope, diameter appropriate to boat size
9. Grapnel anchor and chain or wire
10. Large buoy for anchor retrieval
11. Standard pliers
12. Side cutting pliers
13. Crimping pliers
14. 15 cm bait knife.

Appendix 3

Summary of individual trip records.

Trip	Vessel	Fishing area	Total hours	Fishing hours	Reel hours	Bottom Catch		
						Sale-able (kg)	Total (kg)	Bait (kg)
1	Ang Rerei	Tarawa	17	9	27	109	243	15
2	Ang Rerei	Maiana/ Kuria	47	16	64	359	465	18
3	Ang Rerei	Tarawa	17	8	32	176	253	20
4	Ang Rerei	Tarawa	16	9	36	140	192	19
5	Ang Rerei	Tarawa	15	8	32	157	203	20
6	Ang Rerei	Tarawa	14	8	32	319	524	25
7	Ang Rerei	Maiana	47	25	100	503	651	34
8	Ang Rerei	Tarawa	14	8	24	90	96	27
9	Ang Rerei	Tarawa	19	9	36	98	111	11
10	Ang Rerei	Tarawa	25	15	45	178	420	29
11	Nei Tewenei	Maiana	39	31	124	985	1,020	170
12	Nei Tewenei	Tarawa	16	11	44	334	334	30
13	Ang Rerei	Tarawa	23	6	24	158	158	12
14	Nei Tewenei	Maiana	28	18	90	363	393	36
15a	Catamaran	Kuria	21	6	24	116	116	25
15b	Catamaran	Kuria	19	9	36	227	250	27
15c	Catamaran	Kuria	12	8	32	111	111	13
16a	Catamaran	Kuria	11	7	28	191	191	4
16b	Catamaran	Kuria	18	16	32	282	378	15
16c	Catamaran	Kuria	48	25	100	570	570	19
17a	Catamaran	Tarawa	12	6	12	118	121	11
17b	Ang Rerei	Tarawa	13	6	12	95	183	10
18a	Catamaran	Tarawa	6	3	6	28	39	3
18b	Ang Rerei	Tarawa	6	3	6	34	36	5
TOTAL			503	270	998	5,741	7,058	598

Fish weights given in kg, gutted and gilled.

Appendix 4

Species composition of the catch Classification follows Johnson, G.D., 1980

Scientific name, English name, I-Kiribati name (where known)	Weight (kg)	Number	% of total weight	% of total number
<i>LUTJANIDAE (S.F. ETELINAE)</i>				
<i>Aphareus rutilans</i> Small-tooth jobfish	189	79	2.7	3.9
<i>Etelis carbunculus</i> Short-tailed red snapper	99	19	1.4	0.9
<i>Etelis coruscans</i> Ribbon-tailed red snapper	55	12	0.8	0.6
<i>Paracaesio kusakarii</i> Saddled fusilier	13	3	0.2	0.2
<i>Pristipomoides auricilla</i> Gold-tailed jobfish	53	50	0.8	2.5
<i>Pristipomoides filamentosus</i> Rosy jobfish	747	401	10.6	20.0
<i>Pristipomoides zonatus</i> Banded flower snapper	143	126	2.0	6.3
<i>Aprion virescens</i> Green jobfish, awai	80	18	1.1	0.9
<i>LETHRINIDAE</i>				
<i>Gnathodentex aureolineatus</i> Yellow-lined sea bream, neia	28	11	0.4	0.6
<i>Gnathodentex mossambicus</i> Large-eyed sea bream	106	58	1.5	3.0
<i>Lethrinus miniatus</i> Long-nosed emperor, ikamatoa	100	48	1.4	2.4
<i>Lethrinus variegatus</i> Variegated emperor, roubaneawa	1	1	0.1	0.1
<i>Lethrinus kallopterus</i> Yellow-spotted emperor	2	1	0.1	0.1
<i>Lethrinus reticulatus</i> Reticulated emperor, maoka	2	1	0.1	0.1

Species composition of the catch (continued)

Scientific name, English name, I-Kiribati name (where known)	Weight (kg)	Number	% of total weight	% of total number
<i>LUTJANIDAE (S.F. LUTJANINAE)</i>				
<i>Lutjanus argentimaculatus</i> Snapper, ingo	29	2	0.4	0.1
<i>Lutjanus bohar</i> Red bass	1444	420	20.5	20.9
<i>Lutjanus gibbus</i> Paddletail, ikanibong	75	49	1.1	2.4
<i>Lutjanus malabaricus/timorensis</i> Scarlet sea perch	21	22	0.4	1.2
<i>Lutjanus monostigma</i> One-spot snapper, baweina	27	18	0.4	0.9
<i>SERRANIDAE</i>				
<i>Epinephelus dictyophorus</i> Grouper	103	109	1.5	5.4
<i>Epinephelus chlorostigma</i> Brown-spotted grouper	31	26	0.4	1.4
<i>Epinephelus fasciatus</i> Black-tipped grouper	15	23	0.2	1.2
<i>Epinephelus hoedti</i> Purple rock cod, baru	77	31	1.1	1.5
<i>Epinephelus fuscoguttatus</i> Flowery cod, kuaubani	6	1	0.1	0.1
<i>Epinephelus morrhua</i> Curve-banded grouper	130	29	1.8	1.4

Species composition of the catch (continued)

Scientific name, English name, I-Kiribati name (where known)	Weight (kg)	Number	% of total weight	% of total number
<i>SERRANIDAE (cont.)</i>				
<i>Epinephelus merra</i> Wire netting cod, kuau	6	5	0.1	0.3
<i>Epinephelus</i> spp. Grouper	806	26	11.4	1.3
<i>Cephalopholis miniatus</i> Blue-spotted rock cod	3	5	0.1	0.2
<i>Cephalopholis sexmaculatus</i> Grouper	16	11	0.2	0.6
<i>Variola louti</i> Lunar-tail cod	1	1	0.1	0.1
<i>GRAMMISTIDAE</i>				
<i>Pogonoperca punctata</i> Soapfish	5	1	0.1	0.1
<i>CARANGIDAE</i>				
<i>Caranx ignobilis</i> Giant trevally, urua	150	15	2.1	0.8
<i>Caranx lugubris</i> Black trevally	341	103	4.8	5.1
<i>Caranx melampygus</i> Bluefin trevally, rereba	1	1	0.1	0.1
<i>Caranx sexfasciatus</i> Bigeye trevally, barebu	131	91	11.9	4.5
<i>Carangoides</i> sp. Trevally	7	4	0.1	0.2
<i>Elegatis bipinnulatus</i> Rainbow runner, kamaa	3	6	0.1	0.3
<i>Seriola rivoliana</i> Deepwater amberjack	17	2	0.2	0.1

Species composition of the catch (continued)

Scientific name, English name, I-Kiribati name (where known)	Weight (kg)	Number	% of total weight	% of total number
<i>SCOMBRIDAE</i>				
Gymnosarda unicolor Dogtooth tuna, tawatawa	35	3	0.5	0.2
<i>THUNNIDAE</i>				
Thunnus albacares Yellowfin tuna, baiura	6	1	0.1	0.1
<i>SPHYRAENIDAE</i>				
Sphyraena barracuda Great barracuda, baniniua	64	46	0.9	2.3
Sphyraena sp. Barracuda	5	9	0.1	0.5
<i>HOLOCENTRIDAE</i>				
Holocentrus sp. Soldier fish	1	2	0.1	0.1
<i>BALISTIDAE</i>				
Pseudobalistes flavimarginatus Trigger fish	2	1	0.1	0.1
<i>GEMPYLIDAE</i>				
Ruvettus pretiosus Oilfish, idanibeka	545	35	7.7	1.7
Promethichthys prometheus Snake mackerel	41	31	0.6	1.6
<i>TRICHIURIDAE</i>				
Trichiurus lepturus Hairtail	7	2	0.1	0.1

Species composition of the catch (continued)

Scientific name, English name, I-Kiribati name (where known)	Weight (kg)	Number	% of total weight	% of total number
<i>CARCHARHINIDAE</i>				
Carcharhinus melanopterus Blacktip shark, bakoa	163	5	2.3	0.3
Carcharhinus amblyrhyncos Grey reef shark, bakoa	59	1	0.8	0.1
Carcharhinus sp. Shark, bakoa	663	7	9.4	0.4
Triaenodon obesus Whitetip reef shark, bakoa	378	30	5.4	1.5
<i>MUSTELIDAE</i>				
Mustelus sp. Dogfish, bakoa	18	2	0.3	0.1
<i>ODONTASPIDAE</i>				
Odontaspis sp. Offshore sand shark, bakoa	9	2	0.1	0.1
<i>SQUALIPAE</i>				
Squalus sp. Deepwater shark, bakoa	3	1	0.1	0.1
TOTAL	70575	2007	0.0	0.0