REPORT

ON THE SOUTH PACIFIC COMMISSION

OUTER REEF FISHEIRIES

PROJECT

IN THE NEW HEBRIDES

by

HOWARD HUME

South Pacific Commission
Noumea, New Caledonia
May 1975

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(1 August 1974 — 28 February 1975)

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Condominium Assistance

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SUMMARY

It is considered that Lamap, Malekula, could be the base of a village-level fishing industry, as could also Lenakel, Tanna. The limitations of both Lamap and Lenakel, resulting from their isolation from the main centres and markets, lack of regular sea transport and lack of technical support facilities cream major problems at present for their being the base of larger scale industries. The organization of village-level fishing industries at centres such as the two mentioned and other, similar, selected sites would need to be of the step-by-step method described in paragraph 29. To initiate such a programme at too high a level of sophistication would greatly increase the possibilities of failure and the waste of considerable sums of money.

The building and use of the same or a similar design to the 28 ft FAO Western Samoan boat should prove suitable for local use and, if possible, these vessels should be built locally. In the long run it is considered that inboard diesel engines will prove more suitable than outboard motors. Once these vessels were operating it would be necessary to have one or more marine mechanics who would be available to tour the villages around the group that are operating these boats to ensure suitable and adequate maintenance and repair facilities. Without this service such a programme would not function for long.

A more sophisticated level of vessel similar to the Oregon dory design built from plywood or fibreglass and with an inboard diesel motor and a conventional shaft and propeller could form a Small fleet of vessels operating from Santo and Vila where a suitable base of technical support and a reasonably large market could sustain such vessels. The cast of these boats would, however, be three to four times that of the recommended 28 ft FAO design.

Bottom fishing, mainly at night, using electric and hand reels with stainless steel lines in depths of 75—330 m was found to provide the most consistent saleable catches throughout the period. Fishing for pelagic fish such as skipjack or yellowfin tuna, whether by trolling or pole fishing (without live bait), produced a smaller value of fish for a considerable increase in fuel costs. However, when these surface feeding fish are seen to be actively feeding close to, then it is possible that substantial and profitable catches could be made from time to time.

The widely held belief that New Hebrideans are not suitable for training as fishermen was shown not to hold true. Four New Hebridean trainees from Lamap who worked continuously with the project proved to be keen and capable fishermen, as did two other trainees from Tanna. It is hoped and expected that the New Hebrideans who operated with the project will form the nucleus of some commercial fishing development in the area. They will, however, require some managerial and administrative support, at least in the initial stages, for the ordering and maintenance of equipment and the marketing of fresh and frozen fish.

Introduction

1. The South Pacific Commission Outer Reef Artisanal Fishing Project was based at Lamap, Malekula Island, New Hebrides from 1 August 1974 till early March 1975. It was intended that the project would remain in the area for five to six months but because of a slow initial build-up of equipment the duration was extended to seven months.

2. The main aims of the Project were to assess the local resources, determine and demonstrate fishing techniques suitable to the area and train local fishermen to a level of competence where they could continue fishing operations on their own account on the departure of the project team. This would lead, if conditions proved suitable, to a local industry which would utilize coastal fish resources, and to the eventual satisfaction of local fresh fish demand, providing protein at a reasonable cost.

Area of operations

3. Lamap and the Port Sandwich region was selected as abuse for the project. Port Sandwich is situated on the Southeast coast of Malekula or Mallicolo Island, some 85 miles north of Port Vila. The main reason for the selection of Lamap by the Government of the New Hebrides appears to have been the need for the economic development of the region. Fishing grounds were extended out to about 35 miles to include:-

   (i) the East coast of Malekula up to Port Stanley;
   (ii) the South coast of Malekula and the Maskelyae Islands;
   (iii) the North and West coasts of Ambrym Island;
   (iv) the North and East coasts of Epi Island;
   (v) Paama and Lopevi Islands.

4. Port Sandwich is reputed to be the best and safest anchorage in the New Hebrides and gave adequate shelter until the penultimate day of the project when tropical cyclone Alison struck the area without warning. Port Sandwich's earliest claim to fame was that Captain Cook's crew suffered from severe fish poisoning during his voyage of discovery there.

5. The main disadvantage of Lamap as a base for fishing operations is its remoteness. Inter-island shipping is infrequent and irregular and there are no technical facilities for maintenance and repair work. A daily air service to and from Vila and Santo, however, provides a satisfactory service for the movement of personnel and the emergency supply of replacement parts.

Boats and Equipment

6. Two 24 ft. boats were used by the project. The first was a New Zealand built aluminium boat driven by a 105 H.P. Nissen Datsun diesel engine and a 1011 jet unit. Although a satisfactory vessel for bottom fishing, its slow speed was a major limitation in surface fishing for skipjack tuna as it was unable to keep pace with the fast moving school. The second vessel, which was delivered in mid-October, was a Pago Pago built plywood boat driven by a 135 H.P. Lees Marine Ford Falcon petrol engine and a Hamilton 750 jet unit.

7. An 18 cubic metre Soconair modular freezer chamber with a Wisconsin petrol motor and a Westinghouse compressor was installed on the outskirts of Lamap village. A Resco block icemaker was also installed nearby but, because of continuous supply misfortunes, it was not used by the project. A large assortment of fishing equipment from the United States, Japan, Australia and New Zealand was assembled at Port Sandwich.

Project Personnel

8. The original project team consisted of a Project Manager, Master Fisherman two Boat Skipper/Fishermen, a Marine Biologist and a trainee Mechanic. Four New Hebrideans were recruited from the Lamap region and worked with the team throughout the period. The Master Fisherman, Mr R. Eginton, suffered a bad attack of malaria and was absent in Australia from early November to early February. In his absence the two Boat $kipper/Fishermen, Messrs P. Mead and C. Scott continued the fishing effort. The Marine Biologist returned to New Zealand m November.

9. The trainee mechanic returned to New Zealand at the end of February. It has become obvious that to keep the project's boats and equipment fully operational in an area as remote as Lamap, an experienced, qualified Marine Mechanic with a knowledge of refrigeration equipment and electrics is essential.

Fishing techniques

Gill netting

10. Two nylon gill nets 50 m x 3 m x 7 cm were used to catch fish suitable for bait for line fishing. These were set at the mouths of streams entering Port Sandwich.

Trolling

11. While under way, 2 to 4 lures were trolled behind the boat. Both feathered and plastic lures are used at speeds up to 12 knots. The electric reels mounted for bottom fishing have been found to be very suitable, when used mechanically, for the recovery of the larger skipjack and yellowfin tuna. Apart from schooling tuna the area showed a poor return from surface trolling techniques.

Pole fishing

12. Bamboo poles 4—5 m long were used with pearl-shell lures or Japanese feather lures in feeding schools of skipjack or yellowfin tuna.

Electric-feel fishing

13. Bottom fishing mainly at night, was done in depths of 75—330 m (40—180 fathoms) using stainless steel lines with 3 to 5 hooks and a weight of up to 4 kgs. The reels were also frequently used manually. Reel fishing provided the most consistent catches throughout the period.

Poisonous Fish

14. Ciguatera poisoning is a major problem when fishing for reef fish in tropical waters. Although much research has been done in this field, no reliable physical or chemical test has yet been found to determine whether or not any particular fish is toxic. As a result, the only practical approach is to utilize local empirical knowledge and discard all species known to be, or reputed to be, poisonous in the area at any time. This results in approximately 25% of the catch being thrown away. This is a wasteful method as many of the fish destroyed are probably edible, but the alternative is to take unjustifiable risks and undermine the customer's confidence in the product sold.

15. It is strongly recommended that a list of all fish known to be poisonous be identified and listed for all local areas throughout the New Hebrides. This information is essential before locally caught fish are transported and sold in the main population centre. Whilst several species are recognized as poisonous in the Lamap/Maskelyne area, the fishermen of Tanna report that only the sea bass or *anglaise* is toxic in their waters (*Lutjanus bohar*).

Training

16. Four men from the Lamap region were recruited to work with the project throughout its duration in the New Hebrides. Despite the widely held belief that New Hebrideans would not make good fishermen because of the lack of any cultural traditions in this field, it was found that this myth was unsupported in fact. The men trained by the project would be capable of continuing a local village-based fishing industry using simplified boats and equipment, provided some managerial supervision was also made available.

17. Additional trainees were called for the latter part of the project. One man from the Masknlyne Islands, one from Norsup and two from Tanna were given three weeks training each, and once again proved keen and enthusiastic fishermen, especially the two men from Tanna who, on return to their island, formed a fishermen's co-operative and are anxious to purchase suitable boats and equipment. It was later discovered that there were several other volunteers from Tanna for training with the project but they were under the impression that Tanna's allocation was only two persons.

18. It is hoped that the knowledge gained by the fishermen trained will be passed on to others in the Lamap, Masknlyne and Tanna areas. It is strongly recommended that every assistance, both financial and technical, be given to these men to enable the enthusiasm and interest generated to materialize into actual fishing ventures.

19. It is recommended that consideration be given to sending further personnel to the British Solomon Islands Fisheries Training School, where courses in basic fishing techniques are scheduled to commence this year.

Fishing Effort

20. The fishing effort was much handicapped until late October because of the dangers inherent in operating with only one boat in remote areas. With the advent of the second boat in November, the catch increased to a total of 2,293 kg, of which 1,757 kg was edible, for the month. Catches dropped to 700 kg of good fish for December and 600 kg for January. The wooden dory was but of action with mechanical defects for most of this period and a two-week Christmas recess occurred in the middle of the two-month period. Catch totals for the six months September to February were a total of 5,733 kg with 4,275 kg edible fish. The first total does not include many of the numerous sharks caught which were not landed, in general, 25% of the total catch was thrown away as species known to be, or reputed to be poisonous. The overall catches could be doubled if shark meat could be utilized. There appears to be a general aversion to shark flesh throughout the New Hebrides; if this meat could be used for animal stock food there would be another major source of income for local fishermen as sharks are abundant throughout the region. A simple method of processing shark meat for human consumption is described in an extract from a Tropical Products Institute pamphlet. This extract appears as Appendix III.

21. *By the continuous fishing of the more abundant areas in the region the catch levels could have been considerably increased*, but as the catches could not always be processed and sold it was considered that this would antagonise the local population who had expressed a concern that their fishing grounds might be over-fished. Weather and sea conditions were a major limiting factor during the first three months, with fishing possible one day in two. Conditions improved from November through till mid-January, with fishing in small boats feasible two days out of three.

22. Catches of tuna averaged 21.2 fish (total weight 57.6 kg) per trip. Approximately 80% were skipjack and most of the remainder yellowfin. The overall average daily catch was 53.4 kg (night fishing 71.1 kg, day fishing 42.2 kg, both excluding sharks and poisonous species).

Marketing

23. Fish were sold in Port Vila, Saute, Lamap, Norsup, Lakatoro and North Ambrym for a total of $1,440. Because of a limited supply of ice and periodic breakdown of the freezer, considerable quantities of fish had to be either sold cheaply or given away before it went bad. For overnight fishing a supply of ice is essential, and for the transport and sale of fish in Vila or Santo a freezer is a necessity.

24. There was a substantial demand shown for bottom fish in all areas where these were offered for sale. The *poulet* or rosy jobfish, red snapper and scarlet sea perch were the most popular. Mangrove Jack were also bought, but as many people had difficulty in distinguishing between this fish and the poisonous sea bass or *anglalse* these were less in demand. Approximately half the catch sold was frozen, then transported by Air Melanesia to Vila where it was collected and delivered to one of the major commercial stores. Although no fish were lost, there were some near misses using this form of transport as the co-ordinating had to be arranged by radio in advance. The Co-operative Society's freezer in Vila was still not quite operational at the completion of the project. It is recommended that fish be received by and sold through the Co-operative Societies

in Vila and Santo in future.

25. The present price of 100 francs per kg would be a realistic return for bottom fish to the fishermen of Lamap, less the 5 francs/kg airfreight. The situation as regards the sale of tuna differs in that the boat running costs are considerably higher and the South Pacific Fisheries Company, Paillcolo, can sell tuna at 75 francs/kg in Vila. In the face of this competition tuna would best be sold locally and bottom fish, which are more in demand, airfreighted to Vila and Santo.

Economics of Fishing in the Lamap Region

26. Fuel costs for the six-month period September to February were approximately $1,550 ($1.00 = 100 FNH).* This included the running costs for two boats, the freezer motor and supporting land vehicles. Crew wages and catch bonuses for four men for the same period were $1,450. If all fish caught had been sold in Vila for $0.85/kg ($1.00 less $0.15 airfreight), a profit of $633 would have been made without any consideration of the cost of boat and equipment depreciation, engine spares and replacement fishing gear. If the entire catch had been sold in Lamap at the acceptable local price of $0.70/kg, the running costs would have just equalled the return on fish, while the overall catch could have been increased considerably by intensive fishing of a few selected areas rather than by endeavouring to survey a much larger region.

27. The project boats were designed as sophisticated high speed boats capable of testing as many types of fishing as possible and ranging considerable distances for exploratory fishing.

28. One of the major results of the project in Lamap was that it demonstrated conclusively that fishing vessels as sophisticated as those used could not be fished economically in such a remote area with the absence of any technical and support facilities. To fish economically at the village level it has become obvious that a low-cost fishing vessel is necessary with a power unit that is relatively easy to operate and maintain and has low operating expenses. Suggestions for such a vessel will be covered in the next section.

29. Fishing at the village level in an area like Lamap should be undertaken step by step. The first step would be for the provision of a low cost vessel and the basic fishing equipment as listed in Appendix II. Fish caught would be sold on the beach or around the villages. A weekly catch of 280 kgs would return to two fishermen a gross $100 each (71 cents/kilo or 32 cents/lb.). Once the ability to fish at this level had been demonstrated then it would be necessary to provide ice-making equipment to keep fish caught overnight fresh so that it could be sold through the local stores which might also have kerosene driven deep-freeze units. The third and final stage would be when the local market had been saturated. A freezer unit, preferably with its own electric generator, would be required. This could be a village co-operative project with the freezer also doubling for the storage of meat. Frozen fish could then be packaged and flown to the main population centres where it would be handled and sold through the Co-operative Societies.

* SPC exchange rate during period of operation.

Boats required for further operations

30. At the time of writing the project is being re-established in Asau, Western Samoa. The Fisheries Division of the Agriculture Department there h as loaned the project two its newly constructed wooden fishing vessels, one 28 ft in length and the other 18 ft, both driven by a 20 H.P. outboard motor. Initial impressions are that the 28 ft narrow beamed vessel fitted with 2 or 3 mechanical bottom-fishing reels would be suitable for village level fishing in the New Hebrides. Both these vessels are built locally in Apia to an FAO design using locally-grown hardwood. The price of the 28 ft hull is $WS650 ($A835) and the 18 ft hull $WS350 ($A450). A further report will be made on these vessels when they have been fully evaluated. It is intended, if additional funds are forthcoming, to purchase one of the 28 ft hulls for further project use and fit a 15 H. P. Inboard diesel engine which, it is considered, would give less maintenance problems than a high-powered outboard motor.

31. A faster vessel similar in design to the Pago Pago dory constructed of plywood or fibreglass and powered by a diesel engine and a shaft drive may be more suitable for Vila and Santo where an adequate base of technical support exists.

32. The need for such consideration of boat types and designs has been widely recognised in the Pacific. The International Centre for Aquatic Resource Management (ICLARM) has arranged to fund, in collaboration with the South Pacific Commission, a "Small Boat Workshop" it, mediately following the SPC Seventh Technical Meeting on Fisheries in October.

Follow-up operations

33. It is strongly recommended that early financial assistance be given to the fishermen trained at Lamap to enable them to continue fishing in that area. They have all expressed a keen interest in making a livelihood from fishing. In addition to suitable boats and fishing equipment they would require some managerial assistance in the ordering of fuel and equipment and in the processing and marketing of their fish. If Government assistance is not readily available, two local entrepreneurs from Efate have expressed an interest in hiring these men and others trained by the project for small commercial fishing ventures.

34. Just prior to the completion of the project, the Project Manager visited Tanna where an active Fishing Co-operative Society, backed by the British District Agent, expressed a strong interest in purchasing two fishing boats and the associated fishing equipment and operating their own fishing enterprise, expanding to several more boats as more money becomes available. It is strongly recommended that enterprises like this be given every encouragement. A list of suitable fishing equipment was left with the Co-operative Secretary. As the FAO Fisheries Adviser to the Western Samoan Government has agreed to forward plans of the FAO 28 ft vessel to M. Boileau, it is recommended that two of these boats be built locally in Vila for the Tanna Co-operative.

SUMMARY OF RECOMMENDATIONS

1. It is strongly recommended that the New Hebrides appoint a Fisheries Officer to co-ordinate further Fisheries Development. Without such an appointment the following recommendations would probably not be effective as fishing in the New Hebrides would continue to operate in a vacuum.

2. It is strongly recommended that financial and technical support be made available to the New Hebrideans trained by the South Pacific Commission Fisheries Project to enable them to continue employment as fishermen and pass on their experience to other would-be fishermen.

3. It is recommended that consideration be given to utilizing the Fisheries Training School being established in the British Solomon Islands this year for short training courses at an elementary level.

4. It is recommended that the possibility of building low-cost,, locally-constructed fishing vessels similar to the 28 ft FAO design at present being constructed in Apia, Western Samoa, be urgently investigated.

5. It is recommended that an FAO boat-building consultant be invited to visit Vila to advise on the most suitable boat design and construction materials for local fishing.

6. It is recommended that all local knowledge of ciguatera fish poisoning be collected throughout the Group and catalogued.

7. It is recommended that selected fishing bases be chosen in the outer islands for early future aid and development at the village level.

8. It is recommended that the marketing possibilities for fish in Vila and Santo be investigated by the Co-operative Societies and an organization established using air transport.

9. It is recommended that if Government funds are not initially available for assistance in financing fishing projects at either the village level or at the main population centres, encouragement be given to local entrepreneurs to establish fishing ventures giving employment to trained fishermen who do not yet have the finance to purchase their own boats and equipment. Funds could perhaps be sought for the establishment of a revolving loan fund for assisting fishermen purchase boats and equipment. Great care must be exercised in the management of such funds.

APPENDIX I

FISH SPECIES CAUGHT

1. Trolling

Scientific name	Common names	No
Acanthocybrium solanderi	wahoo	1
Gymnosarde unicolor	dog tooth tuna	2
Euthynnus alletteratus affinis	mackerel tuna, little tuna	4
Grammatorcynus bicarinatus	salmon or shark mackerel	2
Katsuwonus pelamis	skipjack	54
Elagatis bipinnulatus	rainbow runner	1
Carangidae spp.	trevally	4
Agrioposphyraena bararcuda	barracuda	20
Lutjanus sp. (*rivulatus* ?)	(poisonous)	1
Thunnus albacares	yellowfin tuna	30
Coryphaena hippurus	dolphin fish	1
Gempylus serpens	snake mackerel	1
Auxis thazard	frigate mackerel	1

2. Pole—Fishing

Scientific name	Common names	No
Lutjanus malabaricus	scarlet sea-perch	483
Lutjanus argentimaculatus	mangrove jack	117
Lutjanus sanguineus	saddled-tailed sea-perch	3
* *Lutjanus bohar*	red bass *anglaise*	97 Poisonous
Lutjanus sebae	red emperor	8
Aprion virescens	green job-fish	17
Pristipomoides microlepis	rosy job-fish, *poulet*	427
Aphareus rutilans	small-tooth job-fish	10
Etelis carbunculus	deep water red snapper	24
Lethrinella miniata	long-nosed emperor	24
Lethrinus fletus	red-finned emperor	5
Lethrinus chrysotomus	sweet-lip emperor, red throat	7

* Several specimens of these species not recorded.

Scientific name	Common names	No
Lethrinus mahsena	yellow-spotted emperor	1
Other *Lethrinidae*	emperors, species unknown	17
Scolopsis margaritifer	pearly monocle bream	2
	unidentified bream-like species No.1	1
	unidentified bream-like species No.2	2
Variola louti	coronation trout, lunatailed cod	6 poisonous
Other *Epinephelidae*	unidentified cod, 4 species	54 reputed poisonous
Caranx sexfasciatus	great trevally	19 reputed poisonous
Muraenesox sp.	pike eel	1
Gymnosarda nuda	dog-tooth tuna	2
Seriola purpurascens	amberjack	12
Sharks	sharks	137
Sphyrna lewini	hammerhead shark	1

* Several specimens of these species not recorded.

We are indebted to M. P. Fourmanoir of the ORSTOM laboratory in Noumea for checking and bringing up to date the nomenclature used.

APPENDIX II

LIST OF BASIC FISHING EQUIPMENT FOR AN FAO 28 FT, OR SIMILAR DESIGN FISHING VESSEL

	$A
2 Manual Snapper winch Reels (or 2 Electric Snapper winch Reels $590)	200
4 x 1000 ft 3/64" stainless steel wire (sufficient wire for reels to fish in depths to 200 fathoms)	216
1 No. 00 Hand Swager	16
200 3/64" cable connectors	16
6 rubber snubbers	11
1 x 6 lb tube 150 lb test mono filament line	51
1 x 6 lb robe 250 lb test mono filament line	51
100 No.6 Tuna circle hooks	8
100 No.7 Tuna circle hooks	8
100 No.8 Tuna circle hooks	8
24 Kelux s/s Lockfast swivels	20
24 300 lb test swivels	3
200 ft stainless steel 200 lb test trace wire	15
Anchors	
Ropes	
Sinkers	

APPENDIX III

SHARK CAKES

Excerpt from Tropical Produce institute (London) Pamphlet

Many species of shark are caught in the tropics. They tend to be unpopular as a source of food because of the development of ammoniacal odours during storage or processing. Consequently, quantities of shark are often wasted.

A product has been developed at the Tropical Products Institute which convert this material into an acceptable food product. Shark flesh is minced with salt to give a paste containing 10 to 15% salt. Using a hamburger press, this paste is formed into fish cakes which are then dried. The cakes can be stored for many months before use, and they are eaten after soaking, to remove some of the salt, and boiling for 10 to 15 minutes. In many situations overseas, where salted fish traditionally forms part of the diet, the product is readily acceptable. It is hoped that large scale trials will be carried out in the near future.