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**DESIRED CHARACTERISTICS  
OF A TUVALU  
BOTTOMFISHING VESSEL**

Pacific Islands Marine Resource Project  
Tuvalu Component  
Project No. 879-0020

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## **ACKNOWLEDGEMENTS**

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# **DESIRED CHARACTERISTICS OF A TUVALU BOTTOMFISHING VESSEL**

## **1.0 EXECUTIVE SUMMARY**

This report identifies the characteristics of the ideal or model vessel for bottomfishing on Tuvalu's distant seamounts. This report has been prepared by RDA International, Inc. (RDA), as part of the Tuvalu Component of the Pacific Islands Marine Resource (PIMAR) Project, Project No. AID 879-0020-C-00-1231-00, funded by the United States Agency for International Development (USAID/RDO/South Pacific).

The long distances required for fishing on these distant seamounts requires a fuel efficient vessel that can meet appropriate safety standards while having sufficient work, storage, and crew comfort space. It has been determined that a minimum length of about 10 m and minimum engine size of about 20 hp will be required. A slightly larger and more highly powered vessel is recommended, but commercial consideration may require meeting only the minimum suggested dimensions and power requirements. An array of characteristics are reviewed in this report in the effort to provide guidance to potential commercial operators who might desire to enter this distant seamount bottomfishery.

## 2.0 INTRODUCTION

The Tuvalu Bottomfish Project was originally designed with a component targeted to designing a bottomfishing vessel appropriate for Tuvalu's bottomfishing conditions. As the project implementation proceeded, however, it was recognized that there are many alternative vessel designs and many alternative vessels available throughout the South Pacific which would be appropriate for bottomfishing in Tuvalu. Hence, the funds initially budgeted for a vessel design component of the project were redirected to conducting export marketing trials and further project training exercises. The vessel design component of the project was recast as a much smaller component involving the RDA Master Fisherman, the author of this report, preparing a brief report identifying the characteristics of an "ideal" or "model" bottomfishing vessel for use in a Tuvalu bottomfishing industry.

The *Manau*, the Government of Tuvalu extension vessel, was used during most of the project resource assessment and fishing cruises. While it was an excellent training vessel with the capacity to carry a large crew along with training personnel for extended distant trips at sea, the *Manau*, at 18.6 m with a 163 hp Yanmar engine, is far too large a vessel to be a commercially feasible bottomfishing vessel in the Tuvalu bottomfish fishery. Accordingly, the bottomfishing vessel characterized in this report is much smaller and more economical to operate than the *Manau*.

Apart from the six islands and two known seamounts to the north and northwest of Funafuti, the main island and capital of Tuvalu, all the potential fishing grounds for Tuvalu deepwater bottomfish are situated to the south and southeast of Funafuti. The distance from Funafuti to the furthestmost seamount, Bayonnaise Bank, is about 250 miles to the southeast. Bayonnaise Bank, Tuvalu's largest seamount, also has almost 40% of Tuvalu's distant seamount bottomfish resources. Kosciusko Bank, which is only about 130 miles south of Funafuti, is Tuvalu's other major fishing ground. Roughly, about half of Tuvalu's bottomfish resources can be exploited by a vessel capable of traveling within about 140 miles of Funafuti. Exploiting the other half of Tuvalu's bottomfish resources will require a vessel capable of traveling about 250 miles from Funafuti.

The identification and recommendation for a model vessel to fish at these distant grounds should be made with due consideration given to the costs, capability and safety of the vessel. The size of the model vessel should be large enough to fish at the above areas safely and to make good returns. This report endeavors to make recommendations to meet all the necessary requirements of the model vessel, appreciating the fact that different fishermen have different views on what is considered the model fishing vessel. Throughout the remainder of this report, the model or ideal bottomfishing vessel for Tuvalu will be referred to as "Tuvalu-1."

### 3.0 BOTTOMFISHING VESSEL CHARACTERISTICS

A brief overview of the characteristics of the model bottomfishing vessel, Tuvalu-1, is summarized in Table 3-1 below. Detailed discussion of the various characteristics and features of the model bottomfishing vessel will follow.

Table 3-1. Specifications of the Tuvalu model bottomfishing vessel, Tuvalu-1.

Features	Dimensions
Length overall	11 m
Beam	3.18 m
Depth	1.23 m
Cab. Number	43 m
Engine, Yanmar	30 hp
Maximum speed	8 knots
Fuel consumption	7.7 l/hr = 0.96 l/nm
Cruising speed	7 knots
Fuel consumption	5 l/hr
Fuel capacity	500 l
Fresh water capacity	500 l
Ice box capacity	1.2 mt - 1.5 mt
Maximum range	700 miles at cruising speed

These specifications appear to be larger than what the financial analysis suggest can be afforded by a commercial operation. Given the long distances and long duration of fishing trips, however, there are certainly some minimum dimensions which can be tolerated while ensuring economy, convenience, and safety. For example, a vessel of only 10 m in overall length would be satisfactory, with only a small sacrifice in working space. A 20 hp rather than a 30 hp Yanmar engine would be adequate, while requiring 40% less fuel, using only 3 l/hr instead of 5 l/h while cruising. A cruising speed of 6.0-6.5 knots would be sufficient, but a slower vessel will require extra cruising hours to and from the distant seamounts. If a new vessel is acquired for a bottomfishing operation, then the owner may have to settle for a vessel with the somewhat smaller and more fuel efficient features. On the other hand, a used vessel may be available in neighboring South Pacific countries which can be had for a sufficiently low price that some sacrifice in operating economy could be tolerated.

Depending on the final choice of dimensions, the hull and superstructure for the model vessel could be built in Tuvalu at an estimated cost of A\$20,000 - A\$25,000. This does not include engine, fishing and navigational equipment, sails and other gear that are needed onboard. The construction of the model vessel in Tuvalu would be time consuming due to the unavailability in Tuvalu of suitable materials and equipment. It would perhaps be more advantageous if a similar type of vessel now available in other Pacific countries could be brought in to start the bottomfishery in Tuvalu.

The traditional 9 m "Alia" type vessel is available in the South Pacific, but it is viewed as marginally too small to be appropriate for bottomfishing on Tuvalu's distant seamounts. The Alia design has a limited fishing range and would have a relatively high delivery cost. A slightly enlarged Alia type vessel, with an inboard diesel engine and enclosed cabin might be designed to be appropriate for this fishery, but it would require special design and construction. The readily available 10 m steel hull vessels available in New Zealand are somewhat too expensive to purchase, maintain, and operate. Furthermore, they would have high delivery costs.

After examining various vessel options, it has been concluded that the most appropriate type of already-designed vessel is the 10 m diesel-powered VAN-1, built in Vanuatu. Unfortunately, these vessels have not been mass produced. As noted above, the vessel dimensions actually recommended here are slightly larger than the originally designed VAN-1. The VAN-1 is considered to be at about the minimum size for bottomfishing on Tuvalu's distant seamounts, and a slightly enlarged VAN-1 model would be ideal. Once the minimum safety requirements are met, the choice of vessel will depend on a balancing of economy, efficiency, and comfort considerations.

Attention now turns to a brief examination of the various features identified.

### 3.1 Hull shape and material used

A displacement type hull with a V-bottom is recommended. Good quality marine 12 mm plywood would be used throughout and sheathed with epoxy resin and dyel cloth. For high grade marine plywood, rot treated, Khinki Duraply from Papua New Guinea or marine dakua plywood from Fiji could be used.

### 3.2 Marine engine and power supply

A 30 hp Yanmar 3 QM 20/2000 rpm with 3.21:1 reduction is recommended. Yanmar is the clear choice in Tuvalu because of servicing opportunities. The 30 hp Yanmar is only slightly more expensive than the 20 hp Yanmar. However, a key constraint on the development of this fishery is the long distances to the fishing grounds. While the 30 hp is recommended, a commercial operator may have to use a 20 hp for economy reasons. A set of heavy duty batteries chargeable from the main engine should be used to operate navigational and fishing equipment and to supply lights. A small emergency sail should be provided.

### 3.3 Ice boxes

Two 600 kg insulated ice boxes should be provided and stowed on deck. Ice box sizes can be increased if needed, up to a maximum capacity of 750 kg per box. A fish killing box of 0.3 m x 0.3 m x 1.0 m should also be provided. Ice box dimensions are roughly 1.2 m x 1.2 m x 1.0 m.

### 3.4 Fuel capacity

Up to 500 l of diesel fuel is recommended and could be carried in one or two tanks, but a minimum fuel capacity of 400 l is recommended. The carriage of extra fuel in plastic containers on deck is not recommended.

### 3.5 Fishing gear

Based on past experience in the Tuvaluan fishery, 3 or 4 FAO Samoan-type removable hand reels are recommended. Given the long hours of fishing that will be required, more effective fishing may be possible if 2 or more hydraulic reels were used, supplemented by an extra Samoan-type hand reel for use by the skipper when fishing is very good. Tuvaluan fishermen enjoy fighting the fish as they use the Samoan reels. However, these reels are very labor intensive. Hydraulic reels have become much less expensive in recent years. A commercial operator may choose to use hydraulic reels because fishing can be conducted for longer periods and they appear to justify their extra cost. All related fishing line, hooks, and gear for deepwater bottomfishing and trolling should be supplied.

### 3.6 Stores

For stores, the following boxes are recommended: 1 box to stow the fishing anchor and line, 1 box to stow the main anchor and chain, and 1 box to stow the spare anchor, chains and lines.

### 3.7 Mast

For safety backup in case of engine failure and for fuel economy when the trade winds can be appropriately used to supplement the engine power, a backup sail is recommended. A mast with a diameter of 100 mm tapered to 60 mm at top is recommended. It should be 6.0 m in length and made with wood with a specific gravity of 0.5. The forestay and shrouds should employ stainless steel wire, 1 x 19 mm. A rigging screen, stainless with toggle, will be required. An emergency 15 m sail will also be required.

### 3.8 Crew accommodations

Three or 4 wooden bunks should be provided, the number depending on the crew size. A fourth crew member will make for crowded quarters and work space on a small vessel.

### 3.9 Navigational and fishing equipment

An array of navigational and fishing equipment will be required, including the following:

- 1 Radar, 24 miles range
- 1 GPS
- 1 Fish finder, color sounder
- 1 Autopilot and compass
- 1 SSB radio
- 1 Weather fax (optional)

The owner/skipper will be expected to provide a sextant and tables for navigational purposes.

### 3.10 Pump

A manual bilge pump, 115 l/minute, fitted with loose suction and delivery to drain out bilge and ice boxes, will be required.

### 3.11 Cooking equipment

A small 2 burner gas stove and a gas cylinder should be provided. Pots, plates, and related cooking and kitchen equipment will be supplied by owner.

### 3.12 Vessel superstructure

The vessel superstructure and general layout should be similar to the 10 m diesel VAN-1, as recommended by the FAO/UNDP Regional Fishery Support Programme (Gulbrandsen and Savins, 1987).

### 3.13 Fresh water

It is essential that adequate amounts of water are carried to ensure maximum utilization of time on fishing activities. The return of a vessel to port due to a shortage of fresh water should not occur. The total amount of fresh water should be at least 500 l.

### **3.14 Tools**

A small tool box with all the required tools should be provided to maintain the engine and/or make necessary engine repairs at sea. All other tools for deck and sail repairs should also be provided.

### **3.15 Safety equipment**

The vessel should meet all safety standards, by carrying the required fire extinguishers, life vests, rafts, emergency lights, and so forth.

#### **4.0 SUMMARY AND CONCLUSIONS**

It is a common belief that no single design is appropriate to all fisherman or even to different fisherman in the same fishery. The recommendations in this report for the model or ideal Tuvalu bottomfishing vessel were therefore made with utmost care to minimize costs and at the same time maintain high standard of performance and safety.

This report has suggested the desired vessel characteristics and associated gear and equipment that are most appropriate for a commercial bottomfishing venture in Tuvalu. While a variety of vessels could be successfully employed in this fishery, a vessel similar to a slightly enlarged VAN-1 appears to meet most of the requirements for a Tuvaluan bottomfishing vessel identified during the course of the test fishing and commercial fishing trial cruises.

## 5.0 REFERENCES

Gulbrandsen, Ø. and Savins, M. Artisanal Fishing Craft of the Pacific Islands. FAO/UNDP Regional Fishery Support Programme, Suva, Fiji. Document 87/5. Food and Agriculture Organization of the United Nations. RAS/87/002. 1987.

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**COVER SHEET FOR FACSIMILE TRANSMISSION**

FAX NUMBER: 011-688-20800

January 12, 1995

TO: Department of Fisheries

ATTN: Loto Pasefika

PAGE 1 OF 14

FROM: John Rowntree

Clearance:

Dear Loto:

Thank you for the attached report. Before I send out the final version, please look it over and make any necessary changes and fax back to the home office. Thank you for all your hard work.

Regards,

**RDA INTERNATIONAL, INC.**

John Rowntree