社会開発協力部報告書

No. 08

REPORT
ON
BASIC DESIGN SURVEY
FOR THE FISHERIES TRAINING VESSEL
IN
THE KINGDOM OF TONGA

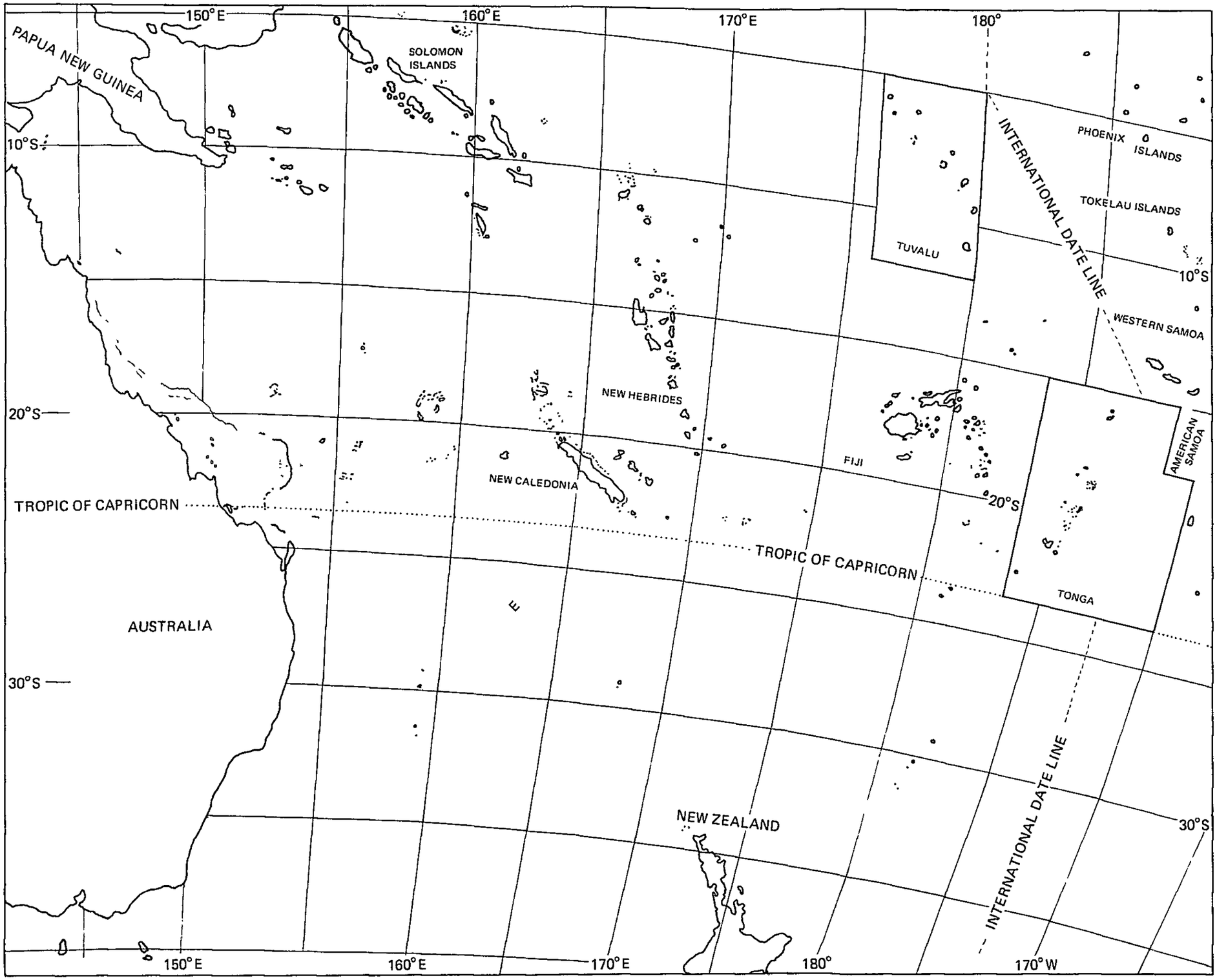
SEPTEMBER 1980

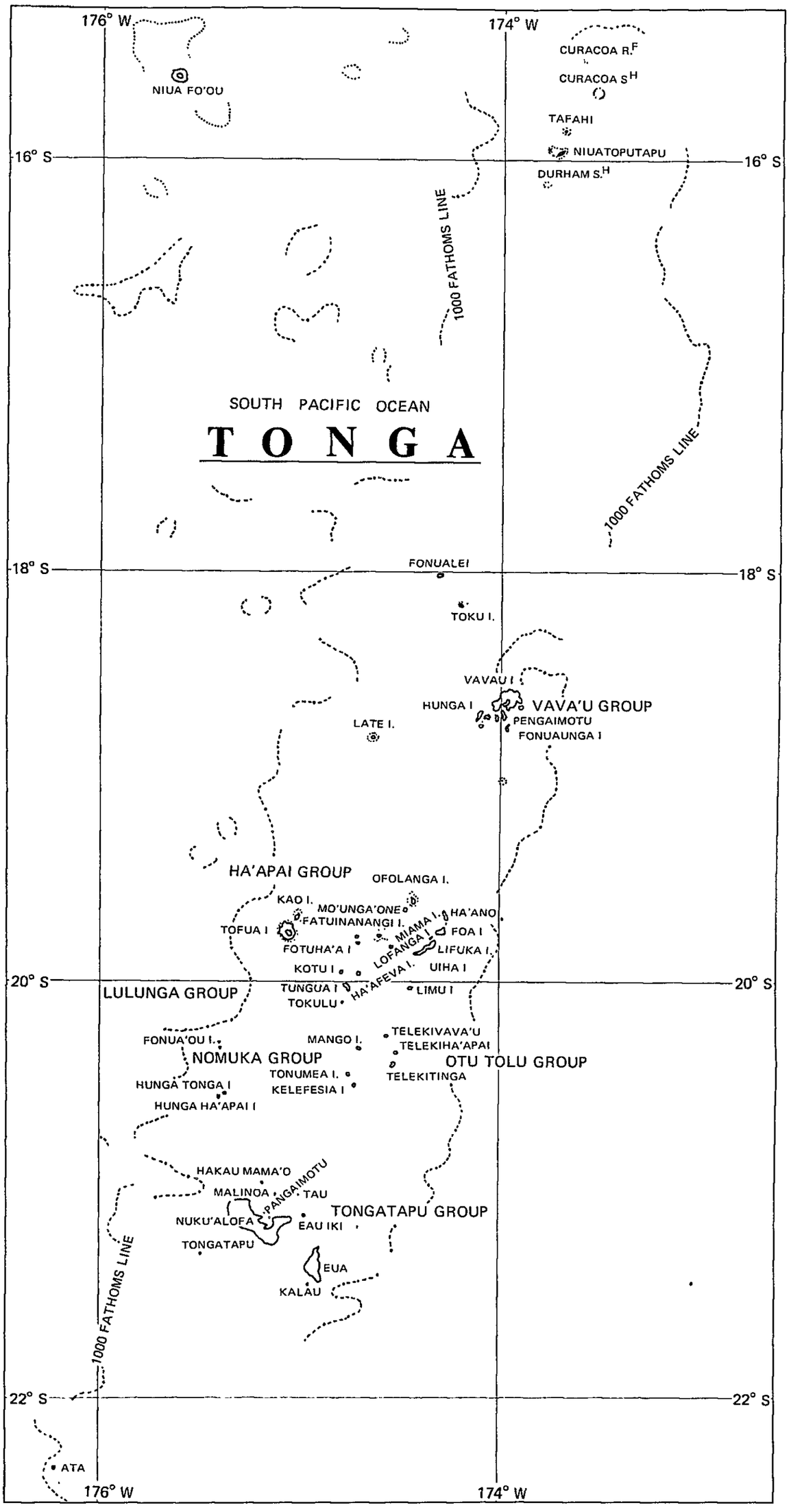
Japan International Cooperation Agency

REPORT
ON
BASIC DESIGN SURVEY
FOR THE FISHERIES TRAINING VESSEL
IN
THE KINGDOM OF TONGA

SEPTEMBER 1980

Japan International Cooperation Agency


150°E
160°E
170°E
180°
PAPUA NEW GUINEA
SOLOMON ISLANDS
10°S
PHOENIX ISLANDS
TOKELAU ISLANDS
TUVALU
INTERNATIONAL DATE LINE
10°S
WESTERN SAMOA
NEW HEBRIDES
20°S
AMERICAN SAMOA
FIJI
NEW CALEDONIA
TROPIC OF CAPRICORN
20°S
TONGA
AUSTRALIA
30°S
NEW ZEALAND
INTERNATIONAL DATE LINE
30°S
150°E
160°E
170°E
180°
170°W


176° W
174° W
16° S
18° S
20° S
22° S
NIUA FO'OU
CURACOA R.F
CURACOA S.H
TAFAHI
NIUATOPUTAPU
DURHAM S.H
1000 FATHOMS LINE
SOUTH PACIFIC OCEAN
TONGA
FONUALEI
TOKU I.
VAVAU I
HUNGA I
VAVA'U GROUP
PENGAIMOTU
FONUAUNGA I
LATE I.
HA'APAI GROUP
OFOLANGA I.
KAO I.
MO'UNGA'ONE
FATUINANANGI I.
HA'ANO
TOFUA I
MIAMA I.
FOA I
FOTUHA'A I
LOFANGA I
LIFUKA I.
KOTU I
HA'AFEVA I.
UIHA I
LULUNGA GROUP
TUNGUA I
TOKULU
LIMU I
FONUA'OU I.
MANGO I.
TELEKIVAVA'U
TELEKIHA'APAI
NOMUKA GROUP
OTU TOLU GROUP
TONUMEA I.
TELEKITINGA
KELEFESIA I
HUNGA TONGA I
HUNGA HA'APAI I
HAKAU MAMA'O
MALINOA
TAU
PANGAIMOTU
TONGATAPU GROUP
NUKU'ALOFA
EAU IKI
TONGATAPU
EUA
KALAU
ATA

PREFACE

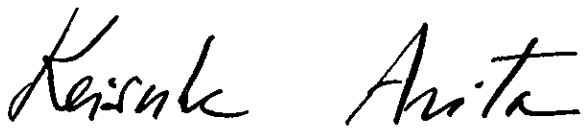
In response to the request of the Government of the Kingdom of Tonga, the Japanese Government decided to conduct a survey on Basic Design for the Fisheries Training Vessel Project and entrusted the survey to the Japan International Cooperation Agency. The J.I.C.A. sent to Tonga a survey team headed by Mr. Kenichi Kasai from August 2 to August 9, 1980.

The team exchanged views with the officials concerned of the Government of the Kingdom of Tonga and conducted a field survey in the Nuku' alofa area, Tongatapu. After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Kingdom of Tonga for their close cooperation extended to the team.

September, 1980



Keisuke Arita
President
Japan International Cooperation Agency

REPORT ON BASIC DESIGN SURVEY FOR THE FISHERIES TRAINING VESSEL

IN THE KINGDOM OF TONGA

TABLE OF CONTENTS

SUMMARY AND PROPOSALS

1. ITINERARY

The basic design surveys for fisheries training vessels for Tuvalu and Tonga were conducted from July 19, 1980 to August 11, 1980. From August 2 through August 9, the Survey Team held meetings with the Fisheries Division of the Tongan Ministry of Agriculture, Forests and Fisheries in the capital city, Nuku'alofa, on Tongatapu Island, to discuss the basic design survey.

2. PRESENT STATE OF THE FISHING INDUSTRY

Based on aid from the Japanese and Australian governments, the Tongan Fisheries Division of the Ministry of Agriculture, Forests and Fisheries already owns M/S TAVAKE, a tuna long-line fishing vessel (app. 200 G/T.), M/S TAKUO, a skipjack pole and line fishing vessel (app. 23 G/T.), and M/S KAHIKAHI, a skipjack pole and line fishing vessel (app. 39 G/T.); furthermore, as a result of JICA experts Mr. Kawakami's and Mr. Matsumoto's long years of technical guidance, these three vessels can now be fully operated by all Tongan crew. However, in 1979, M/S EKIAKI, a tuna long-line fishing vessel (app. 110 G/T.), which had been in operation up to that time, was found to have some parts of the shell plates deteriorated, when it docked in New Zealand, and since it was clear that necessary repairs would be exorbitantly expensive, the only course to be taken was to sell it to the private sector. The present request for the grant, therefore, incorporated the need for a replacement for this vessel.

3. DETAILS OF THE REQUEST

Prior to the departure of the Survey Team, the team obtained information through the Japanese Embassy in Fiji that the government of the Kingdom of Tonga requested a tuna long-line fishing vessel of app. 100 or 150 G/T., having 500 to 600 HP and equipped with modern fishing gears and equipments. Thus specifications and general arrangements of both 100 G/T. and 150 G/T. vessels were prepared in advance.

However, when the Survey Team visited Tonga and met with the authorities of the Fisheries Division, it was discovered that the request of the Tongan Government had been based on the Japanese standard for gross tonnage, while the Survey Team's calculations were based on the Oslo

Convention.. Thereafter, total agreement was reached on a tuna long-line fisheries training vessel of 135 G/T using the Japanese standard. The following chart compares the Survey Team's original proposals and the vessel according to the agreement.

PROPOSED DIMENSIONS OF THE SURVEY TEAM

	(Original)	(Original)	(Agreed)
Gross tonnage	app. 100 G/T (Oslo)	app. 150 G/T (Oslo)	app. 135 G/T (Japan)
Length	app. 29.5 m	app. 32.0 m	app. 38.0 m
Breadth moulded	app. 5.7 m	app. 6.2 m	app. 7.0 m
Depth moulded	app. 2.28 m	app. 2.6 m	app. 2.7 m
Designed draft moulded	app. 2.0 m	app. 2.2 m	app. 2.4 m
Main engine	400 HP	500 HP	500 HP
Fish hold capacity	app. 55 m^3	app. 80 m^3	app. 120 m^3
Fuel tank capacity	app. 50 m^3	app. 77 m^3	app. 100 m^3
Fresh water tank capacity	app. 10 m^3	app. 9.0 m^3	app. 15 m^3
Complement	19 persons	25 persons	24 persons

4. CREW

Since the sale of the M/S EKIAKI, there has been a surplus of crew in Tonga, so there should not be any problem with their recruit in the foreseeable future. Rather, the training of a management level of crew is crucial to the further development of the Tongan fishing industry. As there is no place in this country where training and education can be performed on land, training on board a vessel with the modern fishing gears and equipment with newest navigational instruments is, needless to say, all the more important to the further development of the fishing industry in Tonga.

5. PROPOSAL

It is needless to say that the smooth operations of the fisheries training vessel after the grant mainly depends upon the condition of maintenance and capability of crew.

Therefore, the Survey Team proposes to the Tongan government that the necessary budget should be assured for the fisheries training vessel to be granted, so that orderings of vessel parts and periodical repairs shall be satisfactorily made and the special attention will be paid by the Tongan government for the management of the vessel in order that the vessel will be fully operated at its maximum capacity as the fisheries training vessel.

6. BENEFITS OF THE GRANT

The immediate and main aim, as viewed by the Tongan Government, is the training of crew on board the training vessel, in the same way as was carried out with prior grants. Further, the Tongan Government hopes to develop its fishing industry into a profit-making operation with a commercial basis. Therefore, the present grant's use of the newest equipment and most economical means of operation are all important factors in realizing the above-mentioned goal.

The Survey Team additionally investigated the status of related facilities such as wharves and fuel storage facilities. While it was believed that a portion of vessel repairs would have to rely on facilities outside the country, the Survey Team confirmed that no particular problems or obstacles for proper maintenance of the training vessel were recognized. After the training vessel is granted to the Kingdom of Tonga, smooth operation will be assured by the assistance and guidance by the Japanese experts, which will further make a substantial contribution in the development of the Tonga fishing industry.

(1) SURVEY OBJECTIVES AND BACKGROUND OF THE REQUEST FOR GRANT

1-1 OBJECTIVES OF THE SURVEY

The survey activities were primarily concerned with the state of the fishing industry and related facilities in the Kingdom of Tonga, in connection with the granting of a fisheries training vessel to that country to help promote the development of its fishing industry. At the same time the justifiability of the grant and its expected benefits were properly evaluated in general to make the most appropriate grant plan and basic design as the main objectives of the survey.

1-2 BACKGROUND OF THE REQUEST

The present request is based first on the objective of the government of Tonga to increase fish production as effectively as possible so as to completely satisfy the local demand for fish. Further, the country aims to develop a commercially viable fish export industry.

The present request for a tuna long-line fisheries training vessel was made in consideration of all of these objectives.

1-3 MEMBERS OF THE SURVEY TEAM

Head of the Team

Kenichi KASAI

Fishing Boat Division, Oceanic Fisheries Department, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries.

Members

o Coordinator

Tadao SHIGA

Social Development Cooperation Department, Japan International Cooperation Agency

o Consultant (Marine Engineer, Engines & Electric)

Hirofumi IGARASHI

Maritime and Shipping Department, Taiyo Fishery Co., Ltd.

o Consultant (Tuna fisheries Expert in General)

Eiji HIGUCHI

International Relations Department, Taiyo Fishery Co., Ltd.

o Consultant (Fishing Vessel Designer)

Shunichi MORITA

Maritime and Shipping Department, Taiyo Fishery Co., Ltd.

1-4 PARTICIPATING TONGAN OFFICIALS

Mr. Tomasi T. SIMIKI
Director of Agriculture, Forests and Fisheries,
Ministry of Agriculture, Forests and Fisheries (M.A.F.F.)

Mr. B. SORRENSON
Project Economist, Central Planning Department

Mr. Clifford RATCLIFFE
Principal Fisheries Officer (M.A.F.F.)

Mr. Antony HOPSON
Fisheries Research Officer

Mr. S. KAWAKAMI
Fisheries Technical Officer

1-5 SURVEY ITINERARY

July 19 (Sat):	Departed Tokyo
July 20 (Sun):	Arrived in Suva, Fiji
July 21 (Mon):	Paid a courtesy visit to the Japanese Embassy.
	Visited Fiji National Fishery Corporation (IKA Corp.) and greeted President Ochi of the Corporation.
July 22 (Tue):	Visited Pacific Fishing Company on Levuka Island
July 23 (Wed):	Observation tour of ship building and repair facilities in Suva
July 24 (Thu) through July 30 (Wed):	Tuvalu survey period
July 31 (Thu):	Return to Suva
Aug. 2 (Sat):	Departed Suva.
	Arrived in Nuku'alofa, capital of the Kingdom of Tonga
Aug. 3 (Sun):	Rest day
Aug. 4 (Mon):	A.M. – Visit and Meeting at Tongan Ministry of Agriculture, Forests and Fisheries.
	P.M. – Meeting at Fisheries Division
Aug. 5 (Tue):	A.M. – Audience with H.H. King Tupou IV.
	P.M. – Survey tour of wharves, fuel oil storage facilities, fish market, vessel repair yard etc.
Aug. 6 (Wed):	First meeting to discuss vessel specifications
Aug. 7 (Thu):	Second meeting to discuss vessel specifications
Aug. 8 (Fri):	Signing of Minutes of Discussion
Aug. 9 (Sat):	Departed Nuku'alofa; arrived in Suva.
	Reported to Japanese Embassy in Suva
Aug. 10 (Sun):	Departed Suva
Aug. 11 (Mon):	Arrived in Tokyo

1-6 SUMMARY OF DISCUSSION MINUTES AND COPY THEREOF

The Survey Team arrived in Nuku'alofa on August 2, 1980, and during its stay had substantial discussions through the meetings with the Government of Tonga concerning the grant of a tuna long-line fisheries training vessel. The results of the discussions were compiled in Minutes of Discussion, which was signed on August 8, 1980 by Mr. Kenichi KASAI, Head of the Japanese Basic Design Survey Team, and by Mr. Tomasi T. SIMIKI, Director of Agriculture, Forests and Fisheries, Ministry of Agriculture, Forests and Fisheries, the Kingdom of Tonga. A copy of the minutes is inserted after this page of the report.

MINUTES OF DISCUSSION
ON
THE BASIC DESIGN SURVEY FOR THE FISHERY TRAINING VESSEL FOR LONG LINE FISHERIES DEVELOPMENT PROJECT IN THE KINGDOM OF TONGA

At the request of the Government of the Kingdom of Tonga for assistance in providing a fishery training vessel (with fishing gear) for the purpose of promoting the Tuna Long Line Fisheries Development Project (hereinafter referred to as "the Project") in the Kingdom of Tonga, the Government of Japan, through Japan International Cooperation Agency (hereinafter referred to as "JICA"), has sent the Basic Design Survey Team (hereinafter referred to as "the Team") headed by Mr Kenichi KASAI to conduct a basic design survey for the Project from 2nd August, 1980 to 9th August, 1980.

During its stay in the Kingdom of Tonga, the team exchanged views and had a series of discussions with the authorities concerned of the Government of the Kingdom of Tonga in respect to the desirable measures to be taken by both Governments for the successful implementation of the above-mentioned Project.

As a result of the discussions, both parties agreed to recommend to their respective Governments the matters referred to in the document attached hereto.

8th August, 1980
NUKU'ALOFA
The Kingdom of TONGA

K. Kasai

Mr Kenichi KASAI
Head of the Japanese
Basic Design Survey Team.

Mr Tomasi T. Simiki
Director of Agriculture,
Forests & Fisheries
Ministry of Agriculture, Forests & Fisheries

TONGA GOVT MINISTRY OF AGRICULTURE FORESTRY AND FISHERIES TONGA

I.1 It was mutually confirmed that the proposed project is to be in accordance with the rules and regulations of Japanese Grant Aid.

.2 The team made a further explanation about the system of Japanese Grant Aid to the Central Planning Department, the Kingdom of Tonga, which is responsible Department for External Aid.

.3 The team was requested to accept Tongan nominees for training in connection with the project.

.4 The team has taken note of the importance of the project to the Kingdom of Tonga and will make effort to accelerate implementation of the project as far as is possible within the framework of the Japanese budgetary mechanism.

II.1 It was mutually agreed that the team would recommend to the Government of Japan to provide one (1) tuna long-line fishery training vessel with fishing gear as listed in Annex.

.2 It was also mutually agreed that items mentioned in Annex are subject to alterations or adaptations at a later date to meet the budgetary allocation provided by the Government of Japan as well as technical capabilities.

Annex

A. Principal Particulars of the Vessel

1. Type and Number

One (1) steel tuna long-line fishing type training vessel.

2. Rules and Regulations Applied

1) The regulations of the Kingdom of Tonga for wireless communication and shipping as applicable.

2) Regulation for Tonnage Measurement of ships in Japan.

3) Japanese ships safety rules and regulations.

3. Principal Dimensions

Length O.A.	abt. 38.00 m
Length P.P.	abt. 31.00 m
Breadth Moulded	abt. 7.00 m
Depth Moulded	abt. 2.70 m
Designed Draft Moulded	abt. 2.40 m

4. Gross Tonnage (Japanese) abt. 135 ton

5. Capacity

Fish Hold	abt. 120 m^3
Fuel Oil Tank	abt. 100 m^3
Fresh Water Tank	abt. 15 m^3
Quick Freezing Room	abt. 32 m^3

6. Main Engine

Slow speed 4 cycle diesel engine 500 PS 1 set

7. Service Speed abt. 8.0 knots

8. Duration of Cruise abt. 40 days

9. Complement 24 persons

10. Fishing Machinery

Line hauler, line winder and other labour-saving long line system 1 set

11.	Quick Freezing System	
	Capacity	3.0 tons/24 hours
	Refrigerant	R-22
12.	Anchoring and Mooring Equipment	
	Electrically driven windlass	1 set
	Electrically driven capstan	1 set
13.	Steering Gear	
	Electro-hydraulic type	1 set
14.	Nautical and Radio Equipment	
	Magnetic compass (Table type)	2 sets
	Gyro compass and Auto pilot	1 set
	Radar	2 sets
	Fish finder	2 sets
	Direction finder	1 set
	Sea water thermometer	1 set
	Navy navigation satellite system	1 set
	Electro-magnetic log	1 set
	Transmitter	1 set
	Receiver	1 set
	SSB Radio telephone	1 set
15.	Accommodation	
	Clear height	abt 1.90 m
	Bed size	abt 2.0 m length 0.7 m breadth

B. Fishing Gear and Tools ..... Supply for 3 years-Operations

C. Spare Parts ..... Supply for 3 years-Operations

D. The team was asked by the Kingdom of Tonga to consider the following items:

1. that the fuel Oil Tank Capacity be about 125 m^3
2. the provision of a F.R.P. boat, approximate length 4 m, 15 PS outboard motor and Boat Davits
3. the provision of a Bathythermograph (XBT type)
4. the provision/installation of Hydrographic winch, Davit and Depth meter
5. the provision of Spare propeller with nut
6. the provision of Spare stockless anchor and chain (100 metre)
7. the provision of V.H.F. transmission/receiving system (Channels 16, 12 and 26).

(2) STATUS QUO AND ORGANIZATION OF THE FISHING INDUSTRY

2-1 GOVERNMENT ADMINISTRATION OF FISHING INDUSTRY

On the cabinet level there exists a post of Minister of Agriculture, Forests and Fisheries. A Director of Agriculture, Forests and Fisheries serves as assistant to the Minister. Below the Director, the Ministry is divided into the following six Divisions: Forestry; Fisheries; Agriculture; Livestock; Development; and Research. The Division of Research is concerned only with agricultural activities and has no responsibilities concerning fisheries. The organization of the Fisheries Division is shown in Chart 1, below.

CHART 1
Organization of Fisheries Division

Position	Number of Person
Principal Fisheries Officer	1 person
Fisheries Officer	1 person
Fisheries Technical Officers	2 persons
Fisheries Technical Officers Grade II	6 persons
Fisheries Assistants	5 persons
Fisheries Instructors	7 persons
Laborers and Workers	app. 80 persons
Total	app. 100 persons

At the time of the survey the post of Fisheries Officer was vacant, and one of the Fisheries Technical Officers was studying abroad. Furthermore, up to today, there has been no person in charge of fisheries research, which duties have, in effect, been performed by foreign experts. In connection with this field of activities, the government plans to create a Fisheries Research Officer post in the near future.

The present equipment and facilities newly constructed by Japanese grant in 1979 at the Headquarters of the Fisheries Division, and the fisheries training vessels that have been granted by Japan and Australia, are shown in the following charts.

CHART 2
Facilities to Study Increased Fish Cultivation

Type	Size	Number
Cultivation pond	app. 30 x 40 m	1
Cultivation pond	app. 15 x 40 m	1
Outdoor fish farming water tank	20-ton concrete tank	6
Polyethylene indoor testing tanks		several

CHART 3
Fisheries Training Vessels

Name of Vessel	TAVAKE	TAKUO	KAHIKAHI
Granted by	Japan	Japan	Australia
History	(former name) CHISHIO-MARU	new	(former) shrimp trawler
Length	31.0 m	16.5 m	16.5 m
Breadth	6.5 m	3.69 m	4.6 m
Depth	3.1 m	1.55 m	1.65 m
Gross tonnage	200.77 G/T	app. 23 G/T	app. 39 G/T
Main engine	600 HP	200 HP	156 HP
Materials of vessel	Steel	FRP	Wood
Fishing method	Tuna long-liner	Skipjack pole & line, etc.	Skipjack pole & line, etc.
Crew	25	14	10
Fish hold capacity	app. 50 tons (tuna)	app. 7 tons (skipjack)	app. 10 tons (skipjack)
Fish hold temperature	−30°C	−5°C	
Freezing method	semi-airblast	brine	brine
Freezing temperature	−40°C	−18°C	−18°C

(Source) Tonga Fisheries Division

CHART 4
Refrigeration, Freezing, and Ice Making Facilities

Site	Type	Capacity
Tongatapu (Japanese grant)	refrigeration, freezer	10 tons 1 ton/day
Ha'apai	refrigeration ice maker	5 tons 0.5 ton/day (block ice)
Vava'u	refrigeration ice maker	10 tons 0.75 ton/day (block ice)
Total	refrigeration freezer ice maker	25 tons 1 ton/day 1.25 tons/day

(Source) Tonga Fisheries Division

In addition, three boats for the private sector are presently being constructed at the Fisheries Division Headquarters in Tongatapu. The dimensions of these boats are shown in Chart 5.

CHART 5
Dimensions of Boats under Construction

Type of vessel	boat	boat	catamaran
Length	9 m	9 m	10 m
Breadth	2.75 m	3 m	5 m
Depth	1.15 m	1.3 m	0.6 m
Engine	22 HP	22 HP	6 HP x 2 (2 outboard motors)
Material of vessel	wood	wood	wood

(Source) Tonga Fisheries Division

The only fish processing facility available is a primitive one for smoking fish, at the Fisheries Division Headquarters.

In addition to the above, the Fisheries Division owns two outboard motor boats, made of FRP, for use in fishing operations by stick-held dip net fishing gears, three set nets by Japanese grant, and stick-held dip nets.

2-2 IMPORTANCE OF FISHERY PROMOTION IN NATIONAL DEVELOPMENT PLAN

The people of the Kingdom of Tonga consume an exceedingly large amount and variety of fish. As an example, one may compare the consumption of great blue shark in Tonga and Japan. It is unlikely that a Japanese would eat this fish, but one can find it sold in the government markets in Tonga, and among the dishes served in the homes of the Tongan people.

Fish has always formed an important part of the staple diet of the Tongan people. In the past, the local demand for fish was satisfied by catches from the inner reef areas, lagoons and barrier reef stretches of the island groups. More recently, with the increase in the country's population, the amount of fish caught in these areas has been increased, resulting in declining catch rates. This has led to a problem of inability to satisfy the demand for fish, particularly in Tongatapu and 'Eua. As a result, the Tongan people have had to increase amounts of such alternatives as canned fish and imported meat in their daily diets.

To compound the problem of an insufficient fish supply, the export value of the Kingdom of Tonga equals only 1/4 to 1/3 the level of its imports. In 1976, Tongan international trade showed a deficit of app. 5,840,000 Tonga dollars. Further, as is apparent from Chart 6, the Gross Domestic Product of Tonga is far from satisfactory.

(Note: Monetary statistics contained in this report are given in Tonga dollars (T$)).

CHART 6
Gross Domestic Product in Tonga

	1974	1975
GDP	T$19,100,000.	T$25,200,000.
Per capita GDP	T$197.	T$252.

(Source) South Pacific Island Nations Economic Development, July 1978 issue.

In order to satisfy domestic fish demand as well as to raise production to a level that will make export viable with increasing employment opportunities, not only the reef and lagoon areas need

to be redeveloped, but also more especially, fishery in the approximately 910,000 sq.km of almost untouched ocean that comprises Tonga's territorial and 200 mile-limit waters, if declared, must be developed. The possibilities in these waters for tuna and skipjack fishing, varieties of fish which are in demand worldwide, are especially promising.

At present, the third National Development Plan has just ended (1976-1980) and the country has just entered its fourth five-year development plan. This is the most ambitious Tongan plan yet, and its long term development goal for the fisheries sector is to use the most economical and effective means to increase fish production to the level of maximum sustainable yields.

In conjunction with the fourth five-year plan, the Fisheries Division has set the following two goals for the next five years: Firstly, attainment of a level of fish production that can satisfactorily fulfill the domestic need at a reasonable cost; and secondly, the establishment of an export fishing industry which will grow in the future. As a short range goal, the Fisheries Division further aims to diffuse the concentration of fishing activities and strive for more balanced fishing efforts and exploitation of the available fishing areas.

In terms of concrete programs, the Fisheries Division already has several in progress. One of them is the completion of 60 boats with 20 horsepower engines, other programs aim to increase use of small boats equipped with insulated fish holds, and training of fishermen in the use of such boats. Furthermore, the Fisheries Division is also considering a new scheme of leasing its newly purchased boats and fishing gears to Tongan fishermen.

In order to promote better distribution, construction of a new fish market and related facilities are now being planned. They will be built near Queen Salote Wharf, which is Tonga's largest jetty, and is located in Tongatapu. Tonga has already begun negotiations with the European Economic Community (EEC) to obtain the funds necessary for this project.

2-3 PRESENT STATE OF PRIVATE SECTOR FISHINGS

There are no reliable statistics on the number of Tongan fishermen in the private sector. According to FAO estimates, in 1978 Tonga had approximately 5,800 fishermen, about 50% of whom were also involved in some other kind of work. A recent survey of the Fisheries

Division estimated that approximately 1,700 persons are self-employed exclusively in the fishing industry, but according to the national census, taken in 1976, only 219 people in Tonga earned their living by fishing alone.

Private sector fishing in Tonga is of the traditional small scale kind; there is no large scale private sector fishings. The fishermen are comprised of both artisanal fishermen and those who combine fishing with other occupations. The artisanal fishermen use small boats of under nine meters, and sell their catches on the several beaches of the towns. There is no organized fish market for the private sector. These catches sold along the beaches represent 90% or more of total fishery production in Tonga.

The only fishermen's cooperatives are the two located on Ha'apai Island: one is a private organization, and the other one is church-related. The functions of these organizations are concerned with the purchase of fishing gears, etc.

There being no suitable lakes, marshes, or rivers in Tonga, there exists no inland fishing industry. As for fish processing, there is only small scale smoking of Hong Kong octopus and sea cucumber (beche-de-mer), and is not of great significance.

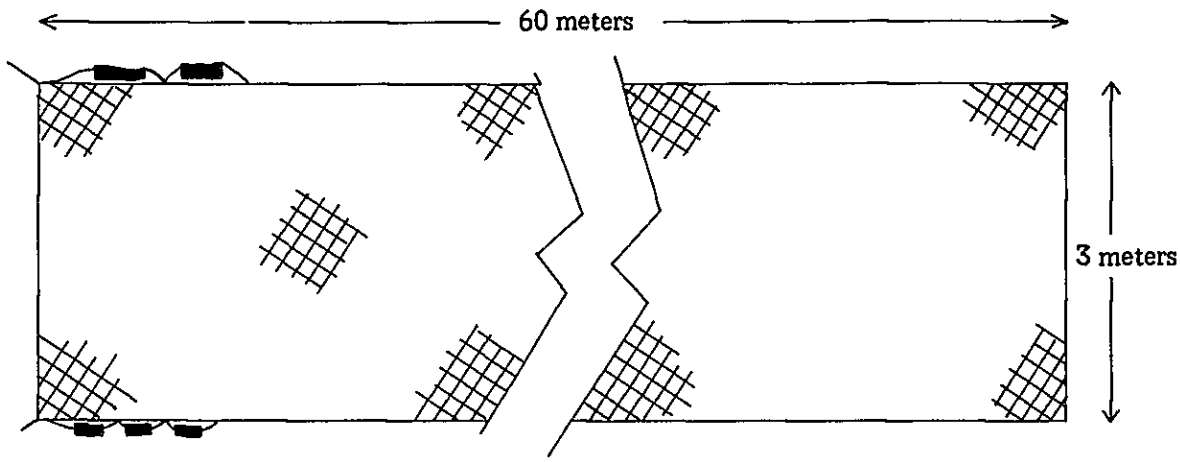
2-4 FISHING METHODS AND FISH SPECIES

2-4-1 FISHING METHODS

The fishing methods used by the vessels that are owned and operated by the Fisheries Division are: tuna long-line fishing; skipjack pole and line fishing; and bottom hand line fishing used for bottom fishing; In addition, set net fishing for bait for the tuna long-line fishing; night stick-held dip net fishing for live bait for skipjack pole and line fishing; and gill net used primarily in the reef areas and trolling line fishing are presently in use. In the private sector, a large sized coconut-frond net is still used, gill net fishing and bottom hand line fishing are prevalent in the reef areas, and casting, spear, and harpoon fishing are popular along the shoreline. The lack of a continental shelf and large schools of small-sized pelagic fish have caused net fishing to remain relatively undeveloped.

The various representative fishing gears are illustrated in Figs. 1 through 5.

Fig. 1 Gill Net



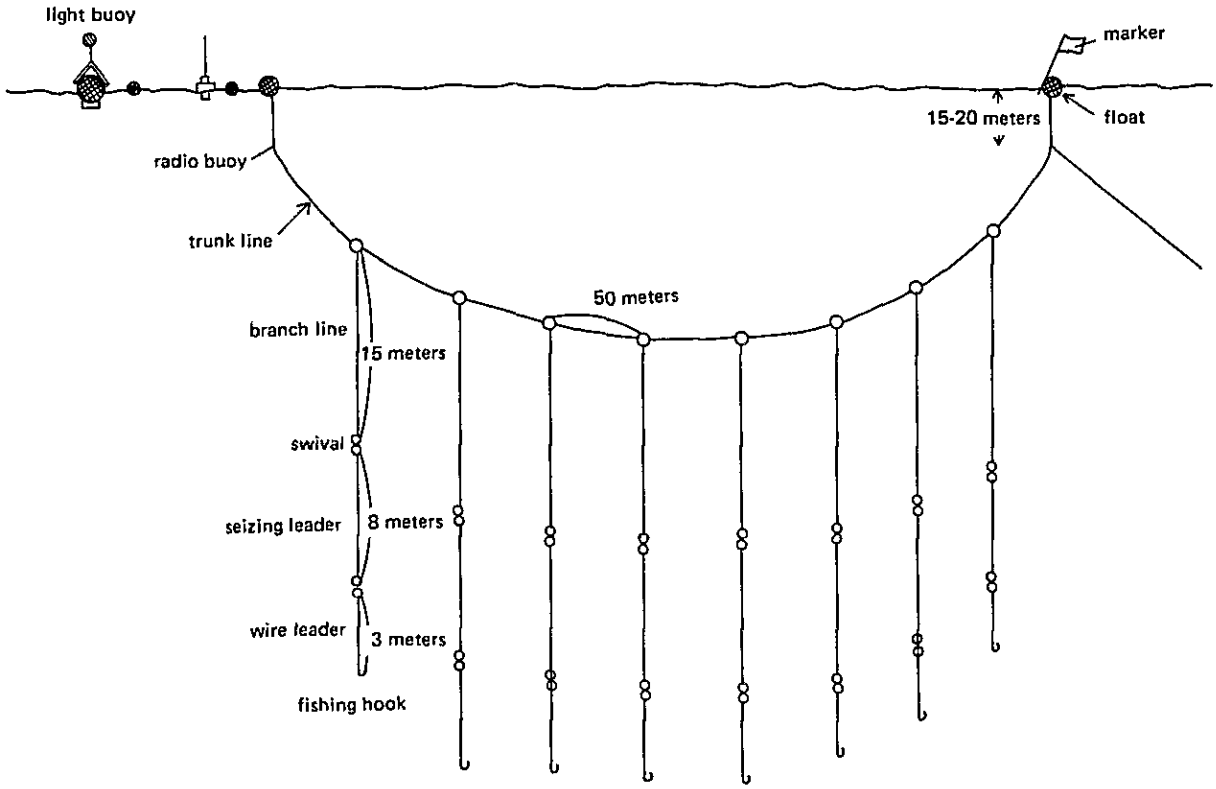
Floats: plastic

Weights: lead, 20-60 grams

Net material: monofilament nylon, 0.37 mm dia.
mesh size, 60 mm

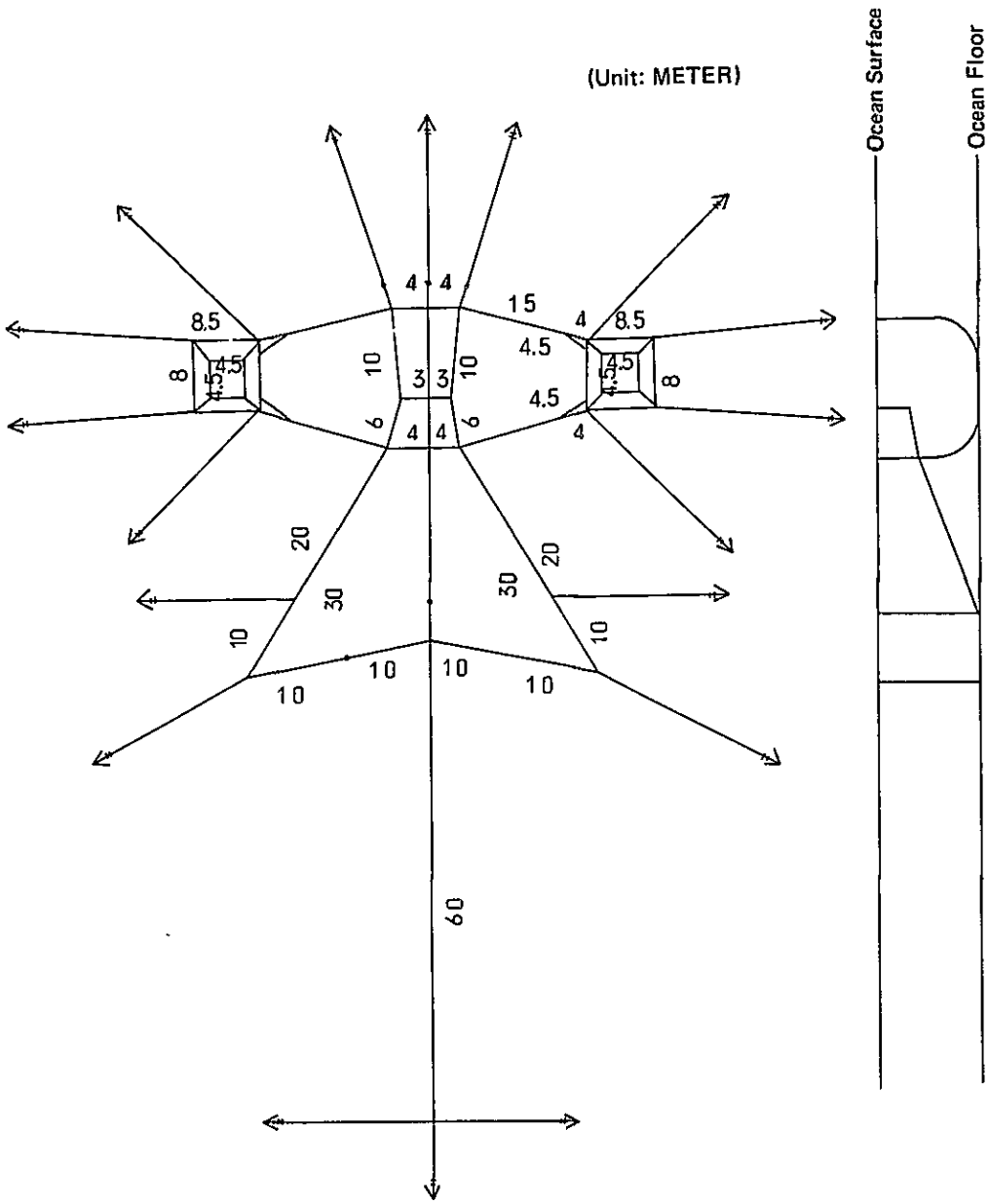
The gill net is used in synchronization with the tide.

Fig. 2 Tuna Long-line Fishing Gears



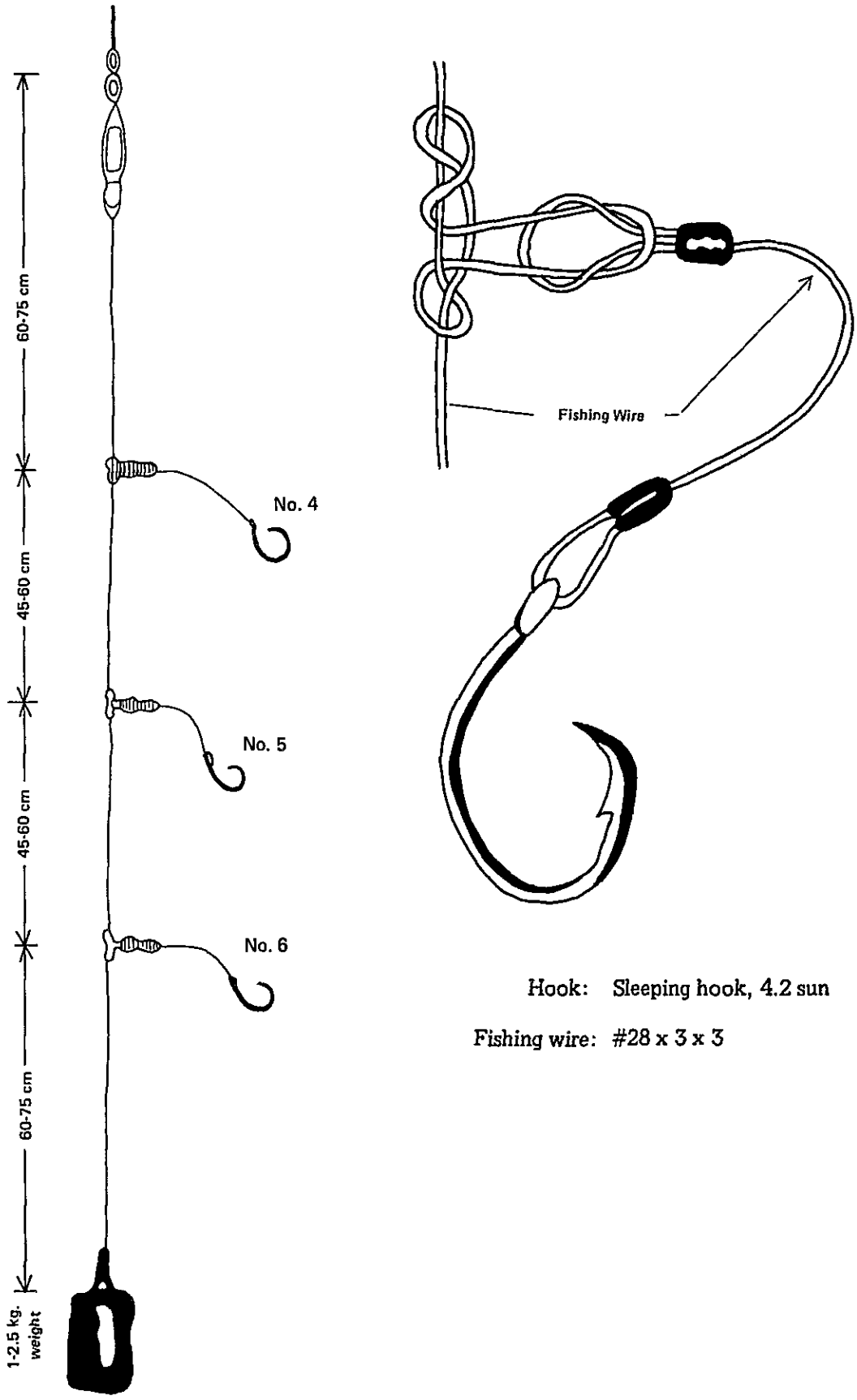
Trunk line:	6.5 mm dia., twisted polyester
Seizing leader:	#28 x 3 x 3
Wire leader:	#28 x 3 x 3
Number of units used:	200 (average)
Number of rods used:	1.600
Swivel:	38 grams
Hook:	3.2
Bait used:	mackerel, sardinella, sprat

Fig. 3 Set Net



The Fisheries Division owns and operates three set nets, using them one at a time in rotation. At present, they are in operation in the eastern area of the Bay of Nuku'alofa.

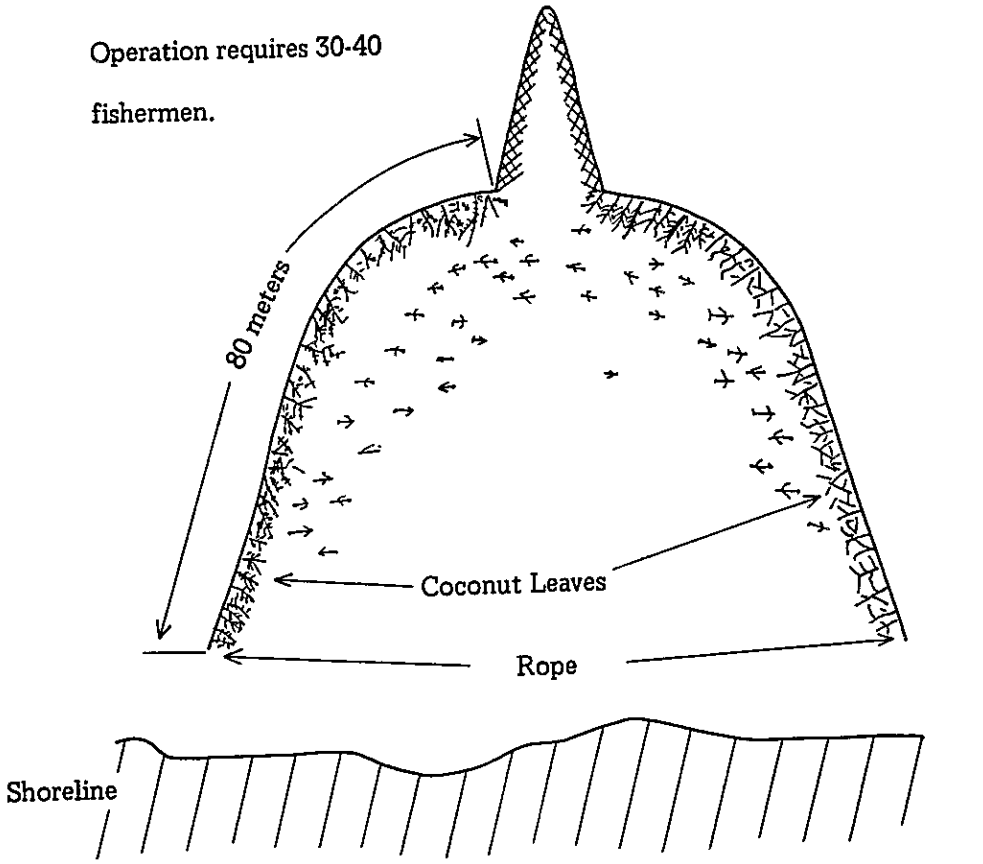
Fig. 4 Bottom Hand Line

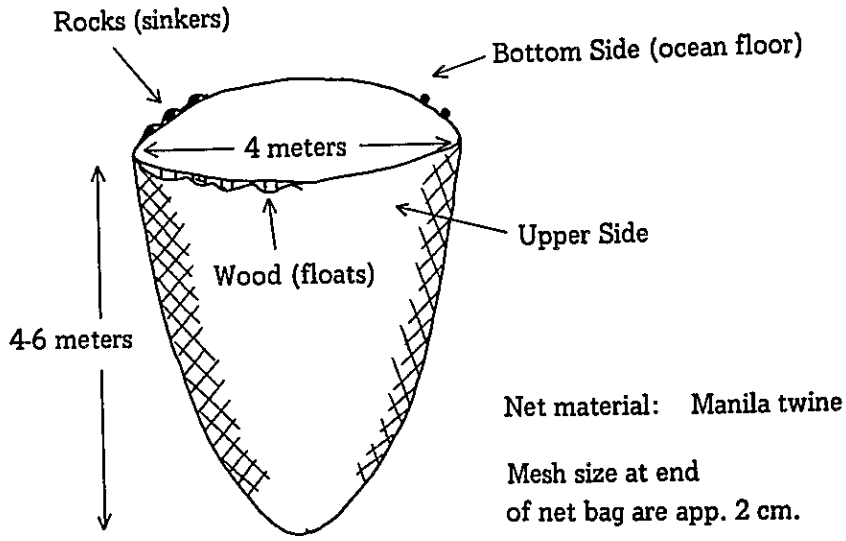


Hook: Sleeping hook, 4.2 sun

Fishing wire: #28 x 3 x 3

Fig. 5 Coconut-frond Net





2-4-2 FISH SPECIES

The varieties of fish caught by long-line fishing are primarily albacore and yellowfin tuna. Skipjack pole and line fishing is used for skipjack. Bottom hand line fishing yields: seer fish; oil fish; calotomus japonicus; barracuda; lethrinus spp; upeneus spp; etc. Catches from trolling line fishing include yellowfin and dolphinfish. Stick-held dip net fishing yields sardinella, hardyhead, sprat, etc. Set nets catch a variety of both demersal and pelagic fish. Thus, the Tongan waters can be seen to offer a vast variety of fish. Some of these fish, with their several names, are listed and shown in Charts 7 through 11, and in Fig. 6, divided according to the fishing method used.

CHART 7
Tuna Long-line Fishing

Japanese Name	English Name	Zoological Name
Binchōmaguro	Albacore tuna	Thunnus alalunga
Kihadamaguro	Yellowfin tuna	Thunnus albacares
Mebachimaguro	Bigeye tuna	Thunnus obesus
Shirokawakajiki	Black marlin	Istriomax indicus
Kurokawakajiki	Pacific blue marlin	Makaira mozoro
Mekajiki	Sword marlin	Xiphias gladius
Makajiki	Striped marlin	Makaira audax
Sugiyama	Short-nose spearfish	Teraptulus augstirostris
Bashōkajiki	Pacific sailfish	Istriophorus orientalis
Shiira	Dolphinfish	Coryphaena hipprus
Tsumuburi	Rainbow runner	Elagatis hipinnutatus
Same-rui	Shark	
Mandai	Opah	Lampris regius
Manbō	Sunfish	Mola ramsayi
Aburabōzu	Oil fish	Erilepio zonifer
Katsuo	Skipjack	Katsuwonus pelamis
Kamasusawara	Jack mackerel	Acanthocyhium solandri

CHART 8
Bottom Hand Line Fishing

Japanese Name	Zoological Name
Hitomihata	Epinephelus spp
Shirodai	Mylis latus
Kurodai	Mylis macrocephalus
Himedai	Pristipomoides sieboldi
Budai	Calotomus japonicus
Aburabōzu	Erilepio zonifer
Same-rui	
Baranata	Variola louti
Kanmonhata	Epinephelus spp
Iwahata	Epinephelus microdon
Baramutsu	Ruvettus pretiosus
Fuefukidai	Lethrinus spp
Hamadai	Etelis spp
Himeji	Upeneus spp
Ōguchiishichibiki	Aphareus rutilans
Aochibiki	Aprion virescons
Yoshikirisawara	Scomberomorus spp

CHART 9
Trolling Line Fishing

Japanese Name	English Name	Zoological Name
Kamasusawara	Jack mackerel	Acanthocybium solandai
Kamasu	Barracuda	Sphyraeaella flavicauda
Kihadamaguro	Yellowfin tuna	Thunnus albacares
Isomaguro	Dogtooth tuna	Gymnosarda nuda
Katsuo	Skipjack	Katsuwonus pelamis
Shiira	Dolphinfish	Coryphaena hipprus
Yaito	Mackerel tuna	Euthynnus affinis

CHART 10
Stick-held Dip Net Fishing

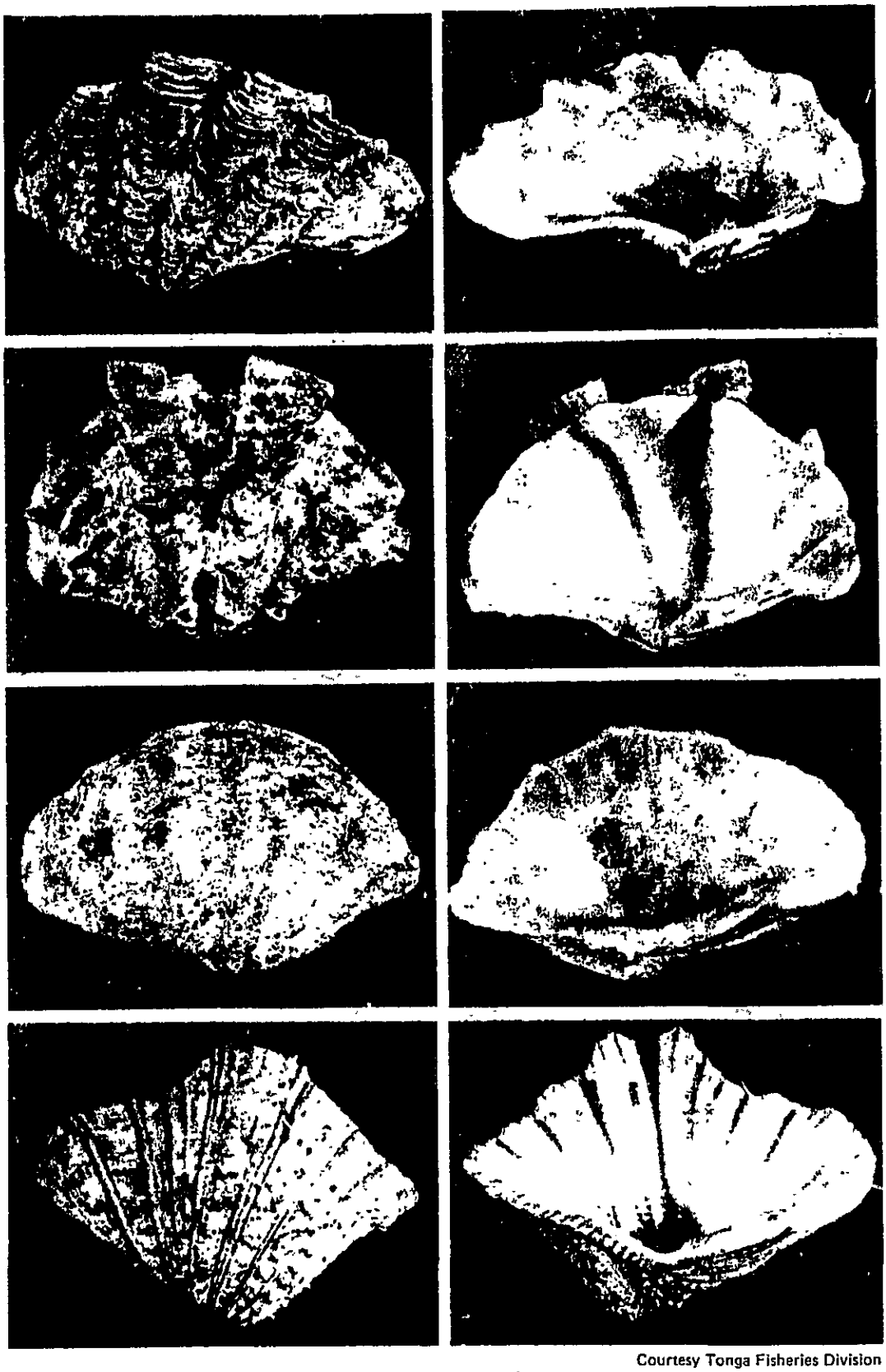
Japanese Name	English Name	Zoological Name
Yamatomizun-shu		Sardinella sirm
Tōgorōiwashi	Hardyhead	Pranesus duodecimalis
Gurukuma	Striped mackerel	Rastrelliger kangurta
Meaji	Big-eye scad	Selar crumenophthalmus
Tarekuchi		Engraulis japonica
Ishimochi	Cardinal fish	Angyrosomus argentatus
Urumeiwashi	Sprat	Sprattus antipodum
Minamikibinago	Blue-backed sprat	Spratelloides delicatulus
Muro-shu		Decapterus pinnulatus
Piruchādo	Australian pilchard	Sardinops neopilchardus

CHART 11
Other Coastal Fishing

Japanese Name	Zoological Name
Hatanpo	Pempheris vanicolensis
Mizudako	Octopus hongkongensis
Tachiuo	Trichiurus lepturus
Kuroshibikamasu	Promethichthys prometheus
Aoriika	Sepioteuthis lessoniana
Nishikiebi	Panulirus ornatus
Manguroobugani	Portunus trituberculatus SP
Bora	Mugil cephalus
Utsubo	Gymnothorax kidako
Akagai	Scapharca broughtonii
Shako	(listed in Fig. 6)
Chōsensazae	Turbo argyrostomus
Harisenbon	Diodon holacanthus
Senninfugu	Pleuranacanthus sceleratus
Tengugai	Chicoreus ramosus
Ōguchiishichibiki	Aphareus rutilans

Fig. 6 Kinds of Shakogai

	Japanese Name	Zoological Name	Shell Length
(1)	Siranami	Tridacan maxima	162 mm
(2)	Hirejako	Tridacan squamosa	189 mm
(3)	Hirenagajako	Tridacan derasa	235 mm
(4)	Shagō	Hippopus hippopus	89 mm



(1) Shiranami

(2) Hirejako

(3) Hirenagajak

(4) Shago

Courtesy Tonga Fisheries Division

2-5 TYPES OF FISHING VESSELS AND YEARLY CATCHES OF FISH

The vessels presently owned by the Tongan artisanal fishermen are shown in Chart 12.

CHART 12
Types of Fishing Vessels

Type	Number
6-8 m boats	20
Dinghies with outboard motors	200
Sailboats	50
Outrigger canoes	450
Total	720

(Source) Tonga Fisheries Division

The total catch by artisanal fishermen for 1979 is estimated at 1,929 tons. Adding to this figure the 81 tons of fish brought in by the three fisheries training vessels of the Fisheries Division, puts the total 1979 Tongan catch at 2,010 tons. In this year, the average price for one kilogram of fish was T$0.75; that is, the total value of the 1979 catch was app. T$1,507,500. Further, in 1980, the price of fish per kilogram is estimated at T$1.00.

2-6 FISH RESOURCES AND FISHING GROUNDS

Recent statistics on Tonga's marine resources have been compiled in an FAO report entitled "Tonga Marine Resource Development," based on the Fisheries Investigation Project conducted from 1975 to 1977. According to this report, Tonga's marine resources at shallow waters are as follows.

The potential fish productivity of the Tongan reefs was estimated by comparative analogy with similar tropical waters in the Caribbean, assuming the same potential productivity for the better fishing grounds around Tonga. The results of this analogy are shown by the following equation which gives 1,000 tons as the maximum sustainable yield per year.

Equation

1,500 sq.km x 0.7 ton = app. 1,000 tons

Assumptions

1,500 sq.km is the total area of the fishing grounds within Tongan reef areas.

0.7 ton represents yearly maximum sustainable yield of fish per sq.km.

Tonga's eastern islands have an accumulation of volcanic ash due to the volcanic activities in its western islands. Tonga is therefore considered to have a higher fertility than other tropical and semi-tropical countries. Visual proof of this can be seen in the lush mangroves that grow along the Tongan shoreline. Moreover, yearly rainfall in Tonga ranges from 1,500 mm to app. 3,000 mm. Because of this, it is thought that a considerable amount of nutritional salts are washed from the land into the sea, which would increase the potential productivity of the coastal marine resources. Unfortunately, even though the surrounding waters do receive plentiful salt nutrients, there is no continental shelf, which is also essential to create superior fish productivity. Therefore, even if Tonga is considered to have richer coastal marine resources than other island nations, it cannot be said that Tonga has exceptionally abundant fish resources in absolute terms. This is especially true in the case of demersal fish resources.

Of particular note is the abundance of pelagic fish, particularly highly migratory species such as skipjack and tuna. The abundance of primarily albacore and large amounts of yellowfin tuna has already made these waters known to tuna long-line vessel fishermen as a good albacore fishing ground. At present, the Kingdom of Tonga has not declared exclusive rights to its seas within 200 miles. However, should it do so, it is estimated that some 910,000 sq.km of fishing grounds would be exclusively available to Tongan fishermen. These waters constantly receive the Sub-Equitorial Current throughout the year, as the current travels from east to west of the Tongan islands. Furthermore, since Southeast Trade Winds preeminently pass over the Tongan islands, there appear to be upwelling. However, judging from the fact that the currents are comparatively simple, the area is not considered to be a large scale fishing ground.

The above-mentioned FAO project report also included the following statement:

"The Skipjack Masterfishermen who had participated in this survey project of untouched fishing grounds, estimated that the abundance of skipjack in and around Vava'u from Home-Reef in the south to Toku Island in the north, covering about 25 miles from Vava'u entrance, was 1,000 to 1,500 tons. Similarly, in southern

waters off Hunga Island, Kao and Tongatapu Groups, a few large and smaller schools were sighted by M/S TROPAC and M/S KAHIKAHI during their scouting cruises, and total abundance was estimated at 600 to 800 tons."

The report also makes a point of mentioning that the schools of skipjack and tuna that are considered part of Tonga's marine resources are part of a larger stock and that therefore, potential catches around Tonga will depend on how the stock is fished throughout its range. That this is true, should be apparent to all concerned.

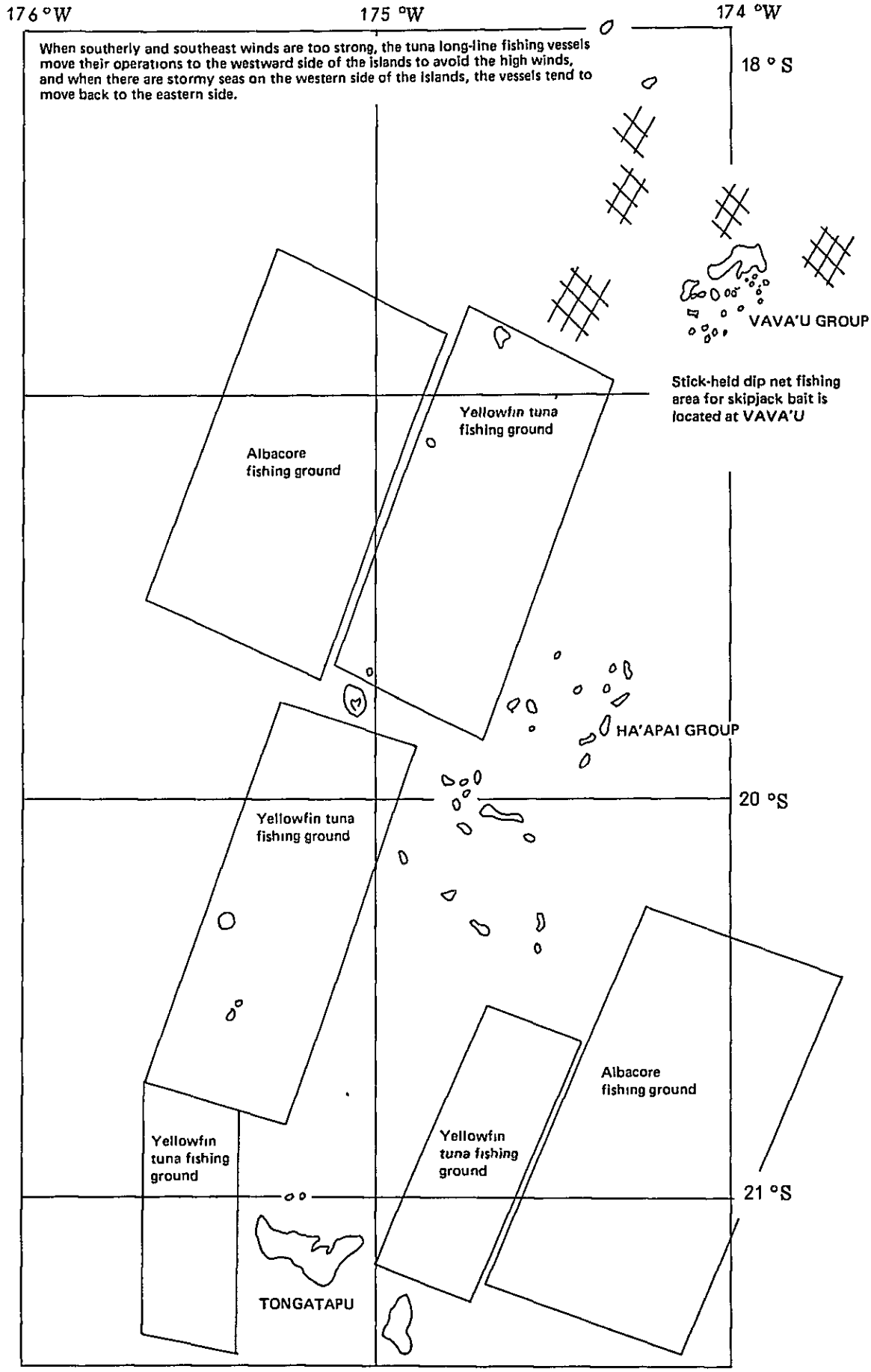
The results which have been coming in steadily from the three fisheries training vessels in the fishing grounds around Tonga also provide information about the skipjack and tuna resources there. The results of the activities of these three vessels are shown in Fig. 7.

The ocean current which flows around the Tongan islands is the South Sub-equatorial Current. Compared to the South Equatorial Current, the speed of the Sub-equatorial is slow, rarely exceeding 0.75 knots. Recent paths of the equatorial currents are shown in Figs. 8 through 11.

The ocean surface temperature is high from October to April or May. This is the period when the pelagic skipjack can be observed. The climate of Tonga is determined primarily by the Southeast Trade Winds. On a yearly average, 60% of the winds are southeasterly, and 20% are easterly. The southeasterly winds are stablest during the Tongan summer. Bottom hand line fishing is operated in the lagoons and around barrier reefs. The southern Minerva Reef (Lat. S23°45′, Long. W179°) offers the best fishing ground.

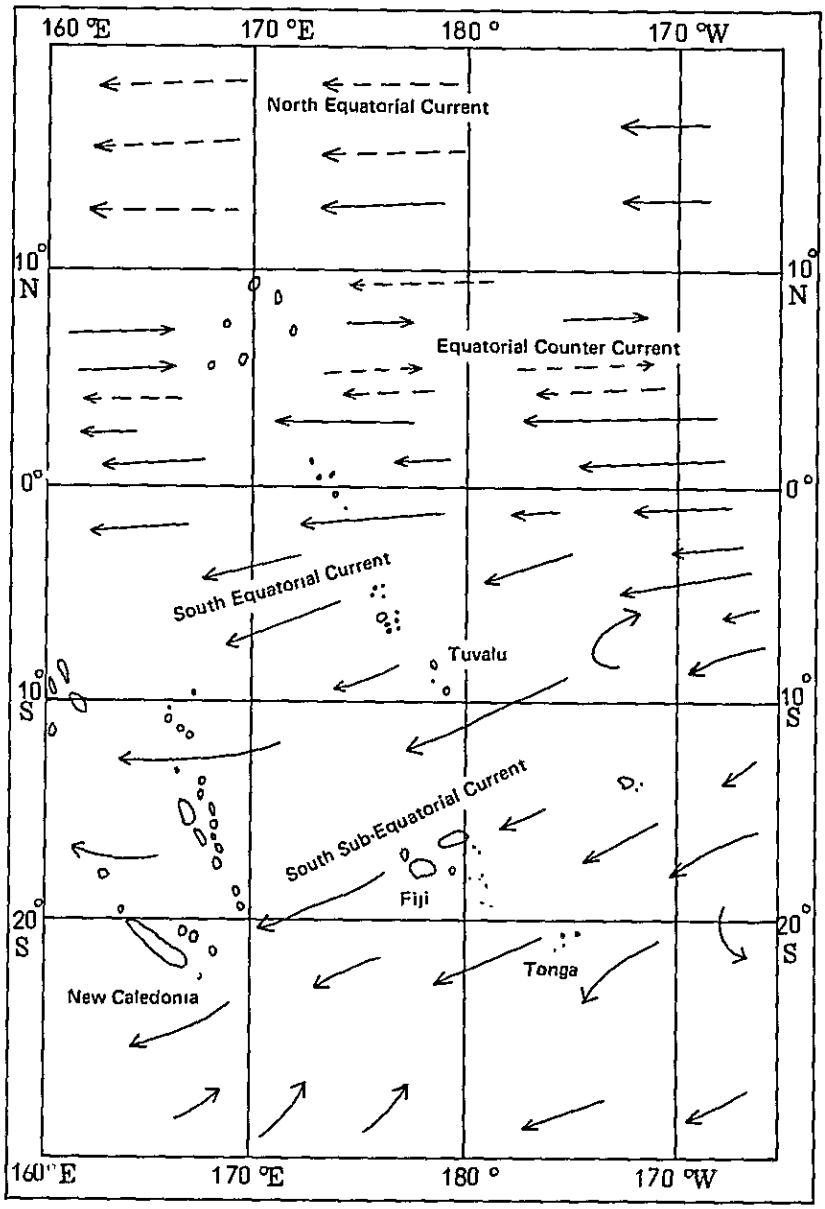
Japanese companies are also conducting pearl cultivation tests in Tongan waters. These tests are being performed off Vava'u Island and Pangaimotu Island of the Tongatapu Island Group.

Fig. 7 Skipjack and Tuna Fishing Grounds



(source): Tonga Fisheries Division

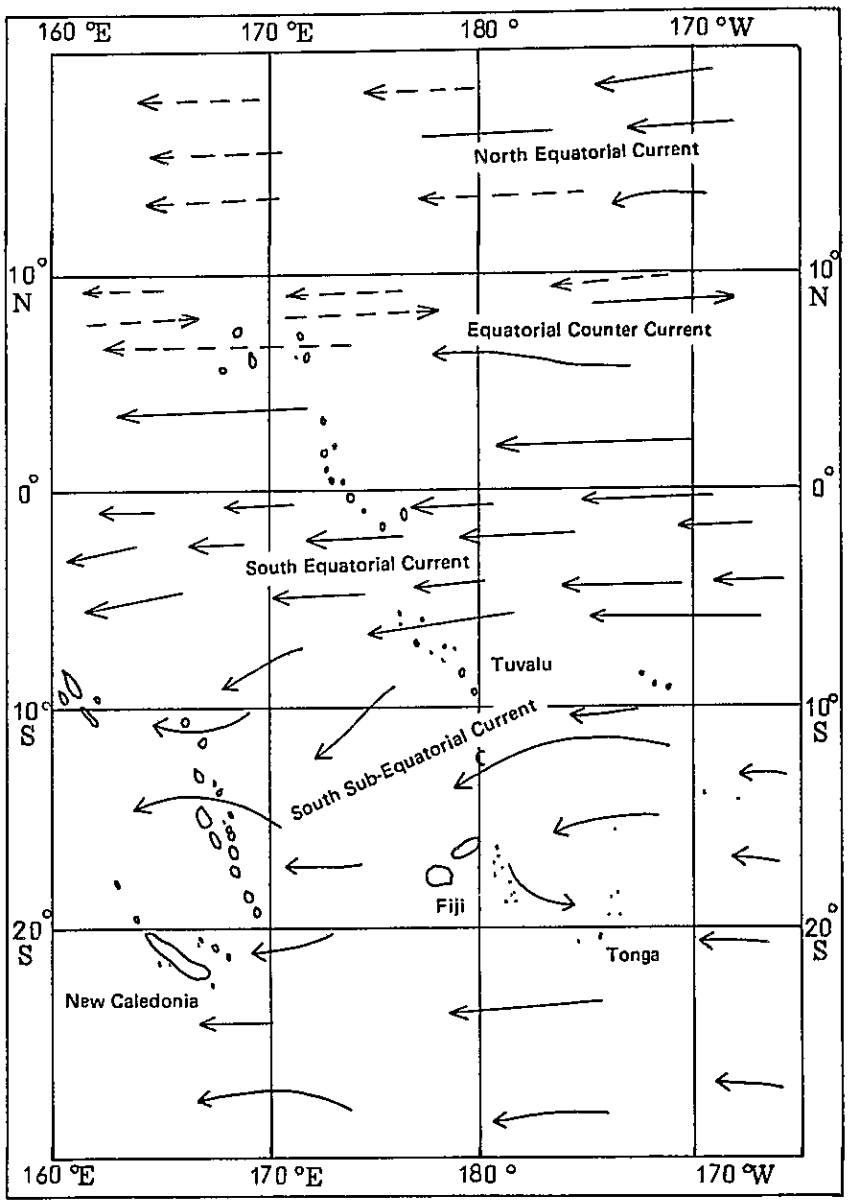
Fig. 8 Currents Chart (Dec.-Feb.)



(source) *The Pilot Book* of English Edition

Broken line indicates that current had only a small number of observations.

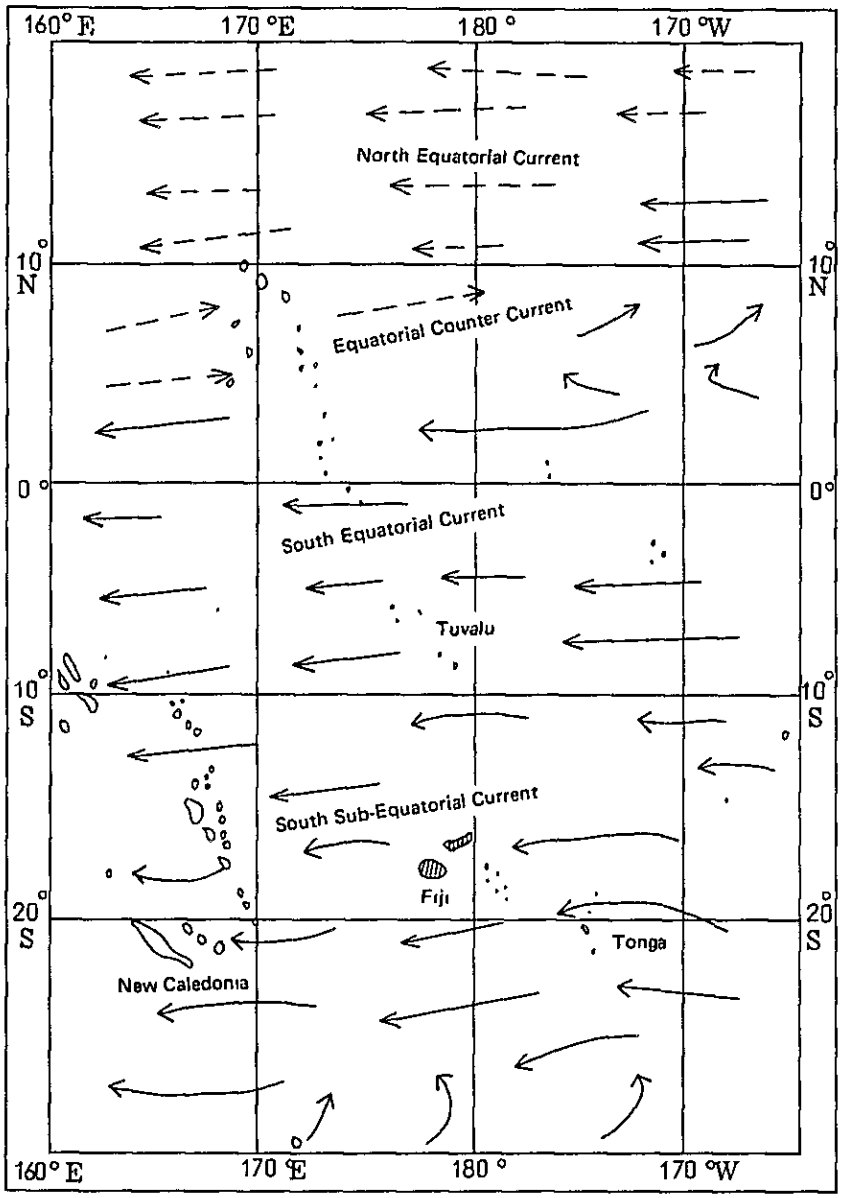
Fig. 9 Currents Chart (March-May)



(source). The *Pilot Book* of English Edition

Broken line indicates that current had only a small number of observations.

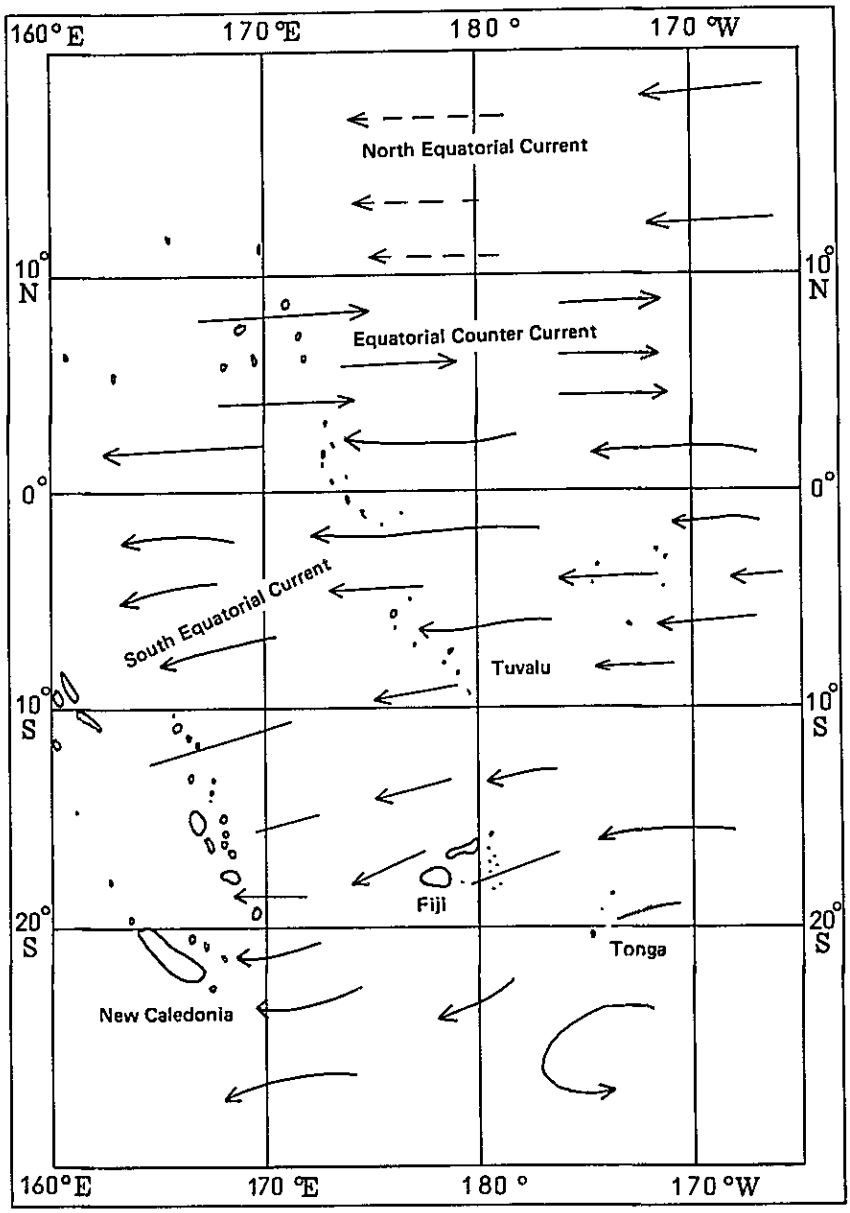
Fig. 10 Currents Chart (June-Aug.)



(source). The *Pilot Book* of English Edition

Broken line indicates that current had only a small number of observations

Fig. 11 Currents Chart (Sept.-Nov.)



(source) The *Pilot Book* of English Edition

Broken line indicates that current had only a small number of observations.

2-7 CONSUMPTION AND DISTRIBUTION

The FAO Fisheries Investigation Project of 1975 to 1977 included a survey of fish consumption in the Kingdom of Tonga. This survey was conducted by asking a series of questions to 1,565 persons of 395 households, chosen by region and social standing. People in the towns were found to have an annual per capita consumption of 16 kg. of fish, while those in fishing villages had an annual per capita consumption of 50 kg. Taking into consideration the fact that consumption also varies with the available supply, the survey report concluded that Tonga had an approximate per capita fish consumption of 30 kg.

In 1979, the catch for the year was 2,010 tons. Since the population is estimated at 96,491 persons, the fish supply from domestic sources was app. 21 kg. per person. This cannot be considered a satisfactory level for a nation whose people depend heavily on fish as a food source.

It is estimated that by 1985 the population of Tonga will be increased to 102,212 persons. The number of tourists visiting the islands is also expected to increase in the future. Chart 13 shows the expanding gap in demand and domestic fish supply levels over the next five years, if production remains at its present level (consumption set at 30 kg., and 40 kg. per person).

CHART 13
Projected Fish Demand

1979	Domestic production	2,010 metric tons
	Total demand (@ 30 kg. per person)	2,900 metric tons
	Extent of supply insufficiency	890 metric tons
1985	Total demand (@ 30 kg. per person)	3,100 metric tons
	Extent of supply insufficiency	1,090 metric tons
1985	Total demand (@ 40 kg. per person)	4,000 metric tons
	Extent of supply insufficiency	1,990 metric tons

(Source) "Tonga Marine Resource Development" FAO, 1978

In the private sector, distribution is simply a matter of the fisherman selling his catch as soon as he returns to shore. The majority of artisanal fishermen bank their boats on the beach, remove their catches and sell them on the beach. As there is no actual market, the selling of fish is an individual concern. There are two or three places along the beaches of Nuku'alofa where such a fish selling is practiced. The catches of the three fisheries training vessels of the Fisheries Division are entirely distributed through the government-run fish and meat markets. There are two such markets, one located on Tongatapu and the other on Vava'u Island. Chart 14 shows the facilities of the two government-run markets.

CHART 14
Facilities of Government-run Markets

Site	Facilities
Tongatapu	6 unit coolers having a total capacity of 30 tons including cold storage for 10 tons; flake ice making machine capable of producing 0.75 ton per day (not in operation at present)
Vava'u	10 ton capacity refrigerator; 10 ton capacity cold storage unit

(Source) Tonga Fisheries Division

The Vava'u market does not appear to be fully used. The Fisheries Division plans construction of a new fishing port and related facilites to be built near Queen Salote Wharf.

Examples of the prices of various fish sold at the government-run markets are shown in Chart 15.

CHART 15
Fish Prices at the Government-run markets

Variety	Price per kilogram
Albacore, Bigeye tuna	T$1.32
Yellowfin tuna, Skipjack	T$1.10
Shark	T$0.44
Shark liver	T$0.66

(Source) Government Market of Nuku'alofa

2-8 FUTURE OF THE FISHING INDUSTRY

At present, the Kingdom of Tonga has only one industry, that of producing coconuts and bananas. While in the past the Tongans relied on the sea as a major source of animal protein, in recent years the fish caught in the lagoons and on the reefs have become smaller in size, and the catch rate has dropped. It would be unwise to put much hope in the future productivity of these fishing areas.

Even Tonga's outer waters do not have an exceptionally large concentration of schools of fish. However, the country is surrounded by vast skipjack and tuna fishing grounds. Thanks to boats granted to Tonga by the government of Japan, and the guiding efforts of JICA experts, the door to development of Tonga's skipjack and tuna resources has been opened, and as the people of Tonga will make the efforts to continue along this path, the fishery industry of the Kingdom of Tonga should progress at a steady pace.

(3) MONITORING THE STATE OF THE GRANTED VESSELS

3-1 OPERATING CONDITIONS

M/S TAVAKE is a tuna long-line fisheries training vessel, and the M/S TAKUO is used as a skipjack pole and line fisheries training vessel in summer, turning to bottom hand line fishing during winter months. The catches in the past years for these two vessels are shown in Chart 16.

CHART 16
Actual Catches of Granted Vessels

Name of Vessel	1977	1978	1979
M/S TAVAKE			
Fishing days	117	115	73
Total catch (tons)	86	116	50
Average daily catch (tons)	0.7	1.0	0.7
M/S TAKUO			
Fishing days		59	58
Total catch (tons)		8	27
Average daily catch (tons)		0.1	0.5

(Source) Tonga Fisheries Division

3-2 VESSEL PERSONNEL

With the exception of the JICA experts, all of the personnel on board both ships are Tongan citizens. An example of the various posts and number of persons holding them is shown in Chart 17.

CHART 17
Distribution of Vessel Personnel

Title	Number of Persons	
	M/S TAVAKE	M/S TAKUO
Master	1	1
Master Fisherman	1	
Chief Engineer	1	1
Officers	2	1
Operator	1	
Boatswain	1	1
No. 1 Oiler	1	
Wire Hand	1	
Greaser		1
Crew and others*	16	10
Total	25	15

*JICA experts and government representatives are included under the heading "crew and others."

3-3 ACTUAL CATCH RESULTS

As shown in Chart 16, the average daily catch of M/S TAVAKE is approximately one ton. As for M/S TAKUO, it is generally assessed that operations have finally begun running smoothly and satisfactorily this year.

3-4 GENERAL ASSESSMENT

Firstly, the fact that the vessels are manned by Tongan fishermen should be particularly appraised, as such a situation is rare among the developing nations. There has thus been great merit attributable to the fisheries training of the vessel grant. The adaptability of the Tongan people as fishermen has, of course, been crucial to this effort, however, the advice, guidance, and assistance of Mr. Kawakami and Mr. Matsumoto, fishing experts from JICA, as well as of young volunteers of Japan Overseas Cooperation have been considerably invaluable. The activities of the granted vessels in near and distant waters in exploitation of skipjack and tuna fishing grounds have become the focus of attention, and it is believed that the granted vessels should be given a substantial assessment. Further, it is hoped that the same spirit will prevail in the exploration of valuable fishing grounds for Tongan people.

(4) PRESENT STATE OF FISHING INDUSTRY RESEARCH ACTIVITIES

Since last year, the Fisheries Division has begun investigations into the state and future of the Tongan fishing industry, especially concentrating on those kinds of fishing that are to be the mainstay of the fishermen of its coastal areas. The survey has been undertaken in synchronization with the trawling and bottom long-line fishing operations of M/S TAKUO and M/S KAHIKAHI. Therefore, all of the catches from these vessels are first brought to the Fisheries Division, dissected, and along with their bait, subjected to a variety of tests. Moreover, even more detailed information is being gathered from the daily catches of the Japanese-made set net at Nuku'alofa. The purposes of these investigations are as follows:

1. To determine the site of the most important fishing grounds with records of the present catch levels;
2. To learn the life cycles of the different varieties of fish, i.e., their breeding habits, baits, distribution, and movement, all of which affect the growth and concentration of fish.

These data are necessary to achieve a clear understanding of the direction that the fishing industry should follow in the future.

The Fisheries Division has pointed out the varieties of fish on which interest should be focused as important species for Tongan people, and divided them into three groups, as listed below.

A) 20 to 200 Fathoms Deep Bottom Fish

Zoological Name	Japanese Name
Epinephelus spp.	Kanmonhata
Variola louti	Barahata
Lethrinus spp.	Esofuefuku
Lutjanus spp.	Fuedai
Aphareus rutilans	Ōguchiishichibiki
Aprion virescens	Ōchibiki
Etelis spp.	Hamadai
Ruvettus pretiosus	Baramutsu
Various carangids	Hatarui

B) Large Pelagic Fish

Katsuwonus pelamis	Katsuo
Thunnus albacares	Kihadamaguro
Gymnosarda unicolor	Isomaguro
Acanthocybium solandri	Kamasusawara
Coryphaena hippurus	Shiira
Istiophorus orientalis	Bashōkajiki

C) Small-sized Pelagic Fish

Sardinella sirm	Mizun-rui
Selar crumenophthalmus	Meaji
Decapterus pinnulatus	Muroaji-rui
Scomberoides lysan	Ikegatsuo
Rastrelliger kangurta	Gurukuma
Euthynnus affinis	Yaito

The Survey Team further questioned the Fisheries Division about the results of its investigations concerning the test fishing operations. However, since the Fisheries Research Officer was only appointed for the first time at the end of last year, he still has a great deal of investigative work to catch up on, and therefore any other concrete findings will not be available until sometime in the future.

The topics presently under investigation by the Fisheries Division are as follows:

1. Dissection and analysis of catches from the Division-owned M/S TAVAKE;
2. Study of the live bait to be used in skipjack pole and line fishing;
3. Study of giant clams in cooperation with the New Zealand Ministry of Agriculture, Forestry, and Fishery;
4. Study of sea cucumbers in cooperation with the South Pacific Committee;
5. Testing of private sector coastal fishing boats that rely mainly on sail power;
6. Study of whale varieties in cooperation with the New Zealand Ministry of Agriculture, Forestry, and Fishery;
7. Study of using buoys as a method of rounding up fish; and

8. Study of kilns for smoking fish as a means of preservation.

The Survey Team learned that Study No. 3, has already been completed. Further, the team members sampled a fish smoked at the small kiln of Study No. 8. Thus a number of investigations by the Fisheries Division of the Kingdom of Tonga are now well under way. In addition, since the Fisheries Division was granted a building containing much valuable testing and study equipment, by the Japanese government in 1978, it has been using these facilities, and it is greatly expected that the research works being done there will bear fruitful results in the next few years. It can also be anticipated that the equipment and facilities to be aboard the fisheries training vessel presently under consideration for grant by the Japanese Government, and which are so earnestly desired by Tonga, will be fully used and become an active and worthwhile part of the facilities there.

(5) QUALIFICATIONS FOR OFFICERS AND CREW AND PRESENT TRAINING OPPORTUNITIES

5-1 RULES AND QUALIFICATIONS

Officers of the Kingdom of Tonga who have passed the requisite examinations, are granted certificates of competency for each of the following grades, in accordance with the Merchant Shipping Act of 1972:

Master of a foreign going ship;

First mate of a foreign going ship;

Second mate of a foreign going ship;

Master of a home-trade ship;

Mate of a home-trade ship;

Master restricted;

First-class engineer;

Second-class engineer;

Engineer or Engine Driver;

Skipper of a fishing vessel; and

Second hand of a fishing vessel.

All officers to be aboard every Tongan vessel must hold valid certificates of competancy or a license, as the case may be, or hold similar or equivalent valid certificates from a competent authority and recognized by the government of Tonga, according to the following scale.

(a) In the case of a foreign going ship of three hundred tons gross or more there shall be a master, a first mate, a second mate and, if propelled wholly or in part by engine, two duly certificated engineers. The master and the first mate shall hold certificate of a foreign going ship.

(b) In the case of a foreign going ship of less than three hundred tons gross, there shall be a master and a first mate holding certificate of a foreign going ship and, if propelled wholly or in part by engine, at least one duly certificated engineer.

(c) In the case of a home trade ship of fifty tons or more there shall be a master and a mate

holding home trade certificate and, if propelled wholly or in part by engine, two duly certificated engineers or engine drivers.

(d) In the case of a home trade ship of less than fifty tons, there shall be a master holding home trade certificate and, if propelled wholly or in part by engine, a duly certified engineer or engine driver.

(e) In the case of a ship engaged exclusively in coastal trade, there shall be at least a master holding a master restricted certificate.

(f) In case of a ship engaged in fishing of fifty tons gross or more, there shall be a duly certified skipper and a second hand and,

(g) if propelled wholly or in part by engine, a duly certificated engineer or engine driver; if the ship is less than fifty tons, there shall be a duly certified skipper and a certified engineer or engine driver.

At present, the three fisheries training vessels owned by the Tonga Fisheries Division, i.e., M/S TAVAKE, M/S TAKUO, and M/S KAHIKAHI, are entirely operated by Tongan crew. With such precedents to follow, it is therefore thought that the hiring of satisfactory officers and crew to man the proposed grant vessel should cause no problem from the viewpoint of qualifications, eventhough there is no nautical training institute for officers or crew in Tonga. Furthermore, since maritime licenses granted by nations other than Tonga are also acceptable, the possibility of training Tongan fishermen at a nautical institute outside of Tonga should also be considered. There is, for instance, the School of Maritime Studies at Suva, Fuji, which is open to students from abroad, and where some students from Tonga are already said to have studied. The licenses of this school are in keeping with the International Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW) of the IMCO; the school's curriculum is divided into the three courses of navigation, engineering, and shipbuilding.

The various licenses held by the present officers of the M/S TAVAKE are listed below, for the sake of example.

Master	Master Pacific Islands Certificate
Chief Mate	Local Mate Home Trade Certificate

Chief Engineer	Local Marine Engineer
Second Engineer	Local Marine Engineer
Third Engineer	(none)
Fishing Master	Local Master Restricted Certificate
Wireless Operator	Australian Certificate in Wireless

*Note: M/S TAVAKE is manned by 23-25 persons, including officers and crew, all of whom are natives of Tonga.

5-2 PRESENT TRAINING OPPORTUNITIES

As mentioned above, there is no nautical training institute in Tonga. Therefore, all maritime trainings must be pursued either at schools such as the Suva School of Maritime Studies, or on board the training vessels. In reply to questions of the Survey Team, the Fisheries Division proposes to the Tongan Government to establish a Nautical Training Section within the Fisheries Division, at some future date. In conjunction, the introduction of internationally recognized Local Fishing Certificates for Deck and Engineering Officers will also be considered.

5-3 COMPOSITION OF CREW OF PROPOSED TRAINING VESSEL

The composition of the crew of the proposed grant vessel will most likely follow closely the composition of the above-mentioned M/S TAVAKE, except that the planned total number of crew members has been set at 24 persons. It should also be noted that since the sale of the M/S EKIAKI in February, 1979 due to that vessel's deterioration as discovered while docked in New Zealand and the estimated exorbitant cost of repairing it, the crew of that vessel have been out of work. If these crew are employed for the proposed grant vessel, almost all of the positions will be satisfactorily filled thereby.

Furthermore, since there are quite a number of certificate-holding persons registered at the Fisheries Division, difficulty is not anticipated in choosing a crew for the proposed grant vessel.

(6) FISHING INDUSTRY RELATED FACILITIES, AVAILABLE EQUIPMENT AND MATERIALS

6-1 FISHING PORT FACILITIES

The Fisheries Division maintains offices on Tongatapu Island where the capital, Nuku'alofa, is located, Vava'u Island, and Ha'apai Island. The Division Headquarters is in Nuku'alofa. Fishing port facilities belonging to the government exist at these three sites, and the government-owned vessels use these facilities. The major port is at Nuku'alofa where the proposed grant vessel will be home based. The port of Nuku'alofa is separately discussed below.

6-1-1 WHARVES

Nuku'alofa has three wharves. The largest is Queen Salote Wharf, followed by Vuna Wharf and Yellow Pier Jetty. All three are over seven meters deep. In particular, Queen Salote Wharf serves as Tonga's main jetty, through which all import and export goods of the nation pass. This port can handle merchant ships of the 10,000 ton class, and is fully equipped with warehouse, water replenishment, loading facilities, etc. The other two Nuku'alofa jetties do not have any port facilities like those of Queen Salote, and are used only for berth and loading and unloading purposes. The location of these three jetties are shown on the accompanying map of Nuku'alofa.

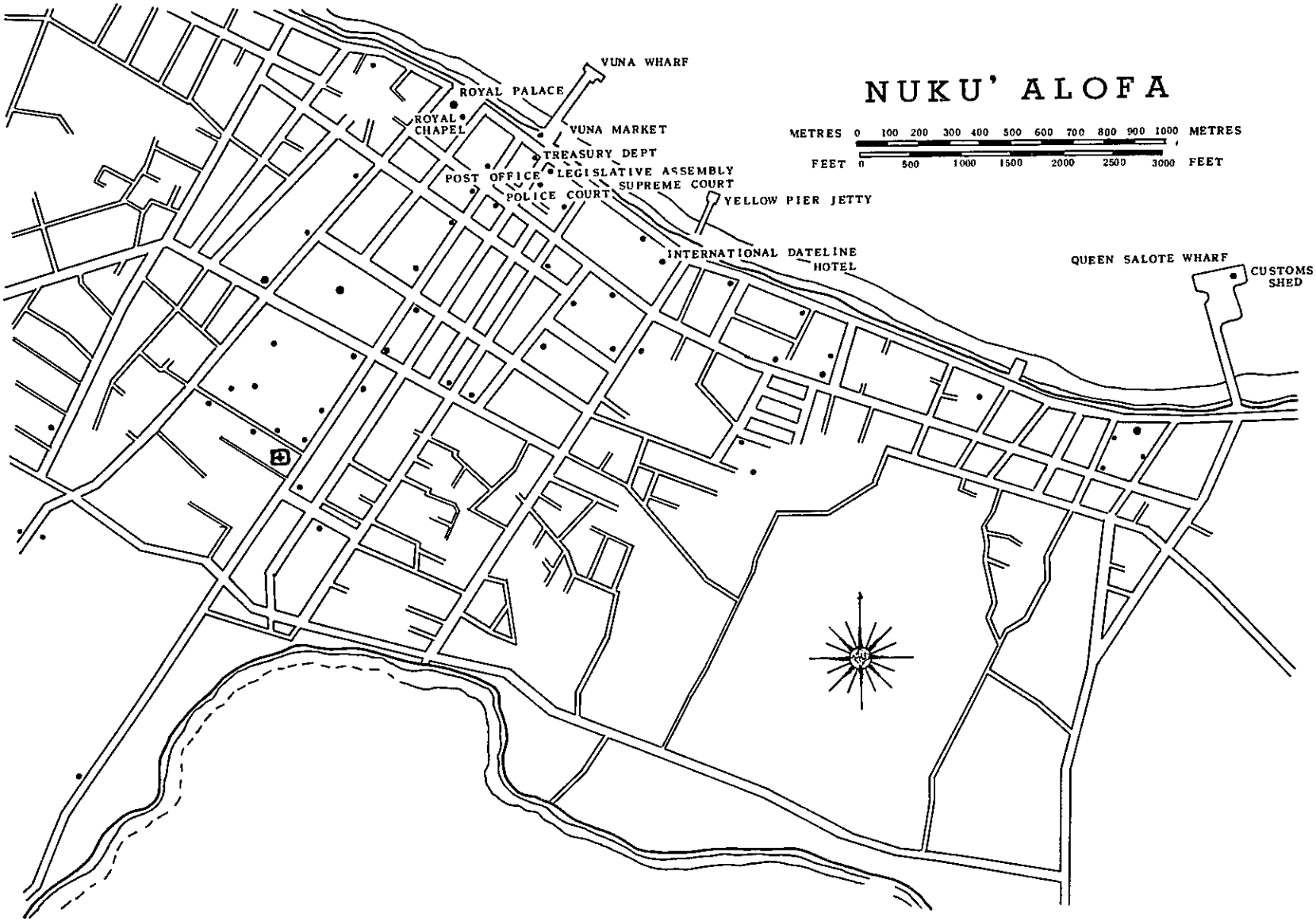
In addition, on the eastern side of Queen Salote Wharf there is the Tonga Coast Guard Base, and next to the base a wharf for the exclusive use of the Fisheries Division. This wharf is also used as a fishing port, but it has no port related facilities.

6-1-2 WATER REPLENISHMENT FACILITIES

The only water replenishing facility is at Queen Salote Wharf, which facility is an exceedingly convenient one. A fresh water pipe is buried beneath the wharf, so that it is in proximity to the berthing position of vessels, and the water supply of berthed ships can therefore be replenished directly. The diameter of the pipe is approximately 50 mm.

6-1-3 REFUELING FACILITIES

Shell and B.P. oil companies have oil storage facilities on the eastern side of Queen


NUKU' ALOFA
METRES 0 100 200 300 400 500 600 700 800 900 1000 METRES
FEET 0 500 1000 1500 2000 2500 3000 FEET
VUNA WHARF
ROYAL PALACE
ROYAL CHAPEL
VUNA MARKET
TREASURY DEPT
LEGISLATIVE ASSEMBLY
SUPREME COURT
POST OFFICE
POLICE COURT
YELLOW PIER JETTY
INTERNATIONAL DATELINE HOTEL
QUEEN SALOTE WHARF
CUSTOMS SHED

Salote Wharf. The government of Tonga seems to depend mostly on fuel oil from Shell. There is no direct pipe-line from the tanks for refueling, so refueling must be done by a tank lorry, but the storage tanks are replenished via a pipeline from tankers. Shell maintains six oil tanks at Queen Salote, for a total storage capacity of 900 kl.

According to the investigations of the Survey Team, the available fuel oil being stored there is "gas oil". The characteristics of a sample of the gas oil are listed below. The price was app. T$390 per kiloliters.

Specific gravity	@15°C	0.820-0.87
Cetane rating	(lowest)	50
Viscosity	@ CST 40°C	1.5-5.8
Copper sheet deterioration	3 hrs @100°C	No.1 or less
Water content	% by vol.	0.05
Sulpher content	% by wt.	0.50 (highest level)
Carbon sediment	% by wt.	0.05 (highest level)
Impurities	% by wt.	0.01
Ash content		0.01
Ignition point	in °C PMCC	65
Shell code no.	44258	

As for lubricating oil, the Survey Team was told that any brand of Shell lubricant can be obtained in Tonga through the Shell Oil sales office, and therefore the most suitable lubricating oil can be chosen.

6-1-4 NAVIGATIONAL COURSES AND VESSEL MARKINGS

Since a number of vessels presently come in and go out at the Tonga jetties, there should be no perceivable traffic problems.

6-1-5 WIRELESS FACILITIES

There are no wireless facilities at the jetties, but in Nuku'alofa proper the telephone and telegraphic company has full wireless, telephone, and telex facilities. The following

frequencies are used in Tonga for ship to shore communication:

Morse (CW): 428 and 500 KHz

Telephone (USB): 2,080, 2,182, and 4,125 KHz

6-1-6 REFRIGERATION AND OTHER FACILITIES

The Survey Team visited the refrigeration facilities of the government-run market on Tongatapu and at the Fisheries Division Headquarters. The Fisheries Division refrigerator was granted to Tonga by the Japanese government. These facilities are used to store fish from government-owned vessels that is not sold on the day of the catch. The stored fish is later sold to the townspeople of Nuku'alofa.

According to the Tonga Fisheries Division, the cold storage facilities in Tonga are as follows.

Locations	Stored Foods	Capacity
Tongatapu		
Government Market	meat/fish	30 tons (includes 10 tons at 0°C)
Fisheries Division	fish	10 tons 0.5 tons/day x 2 (contact freezer)
Ha'apai		
Fisheries Division	fish	5 tons
Vava'u		
Fisheries Division	fish	10 tons
Government Market	meat/fish	10 tons 10 tons (chill room)

In addition there appear to be some refrigeration facilities in the private sector as well. These were not, however, confirmed by the Survey Team, and are therefore ommited here.

Below is a list of the ice making facilities in Tonga. It should be noted that at the time of the survey, the Tongatapu facility was not in operation, due to a malfunction.

Tongatapu Government Market 0.75 tons/day (Flake ice plant)

Ha'apai Government Market 0.50 tons/day (block ice plant)

Vava'u Government Market 0.75 tons/day (block ice plant)

6-2 DOMESTICALLY AVAILABLE EQUIPMENT AND MATERIALS

Gas oil, lubricating oil, fresh water, foodstuffs, and any other necessities for vessel operations can be obtained locally. On the other hand, spare parts, vessel stores and materials, and fishing gears must, in general, be imported. Advance ordering of such supplies is necessary to insure unhindered operation of vessels.

6-3 SHIPBUILDING AND REPAIR FACILITIES

6-3-1 SHIPBUILDING YARD

The Fisheries Division has a wooden boat shipbuilding yard within its compound, where an FAO expert has been guiding operations since the later half of 1979. Organizationally, this shipbuilding yard is a part of the Fisheries Division, however, it is also engaged in building boats for general and private sector fishing. At present, the boats under construction are wooden boats of about nine meters in length. Some of these boats are to be equipped with sails, so as to keep operating costs at a minimum, and have diesel engines for auxiliary power. The boats under construction there are all based on FAO designs. The wood for these boats is domestic red cedar and oak from 'Eua Island. Plywood is imported from Papua New Guinea, and coating resins and textiles are brought in from New Zealand.

6-3-2 REPAIR YARD

Japan has granted Tonga the following equipment, which is installed at the above-mentioned shipbuilding yard:

a) Hitachi Precision Co.-made MS all-purpose milling machine;

b) Hitachi desktop electric grinder, model CBT 5, 400 W,

c) Takizawa-brand high speed precision lathe, model TAL 510; and

d) Kiwa Tekko Co.-made upright drilling machine, model KUD-520N.

These machines arrived in Tonga in May, 1980. They have already been set up, but because the necessary electrical lines are still under construction the machines are not yet in operation. As soon as these machines become operative, which should be in the near future, they will enable the Tongans to produce a variety of fishing vessel parts domestically.

The Tonga government also owns an automobile repair plant in Nuku'alofa, where all automobiles are repaired. The automobile plant has an approximately eight meter long distance lathe, in addition to several others, a shaper, a drilling machine, and gas and arc welding machines, etc., making it capable of handling a good deal of mechanized work. However, as Tonga has neither a slipway nor a dry dock, thorough vessel survey, overhauls, and repairs must be done at the shipbuilding facilities in Aukland, New Zealand or Suva, Fiji. Suva's shipbuilding facilities are as follows.

1. Fiji Marine Shipyard

   This is a government-owned shipbuilding yard, and a repair ship yard with slipways. The shipbuilding yard has two 500 deadweight tonnage slipways, and one 250 deadweight tonnage slipway. A landing slip for cargo and passengers intended for the Solomon Islands is presently under construction at this yard. As for the repair ship yard, it has one 1,000, one 500, and one 200 deadweight tonnage slipway, and a 1,000 ton and a 500 ton winch. The water depth at high tide here is about three meters This shipyard is also engaged in shipbuilding and repairs for the private sector.

2. Carpenters Industrial Co., Ltd.

   This privately owned yard handles both shipbuilding and repairs. It has just one 100 deadweight tonnage slipway.

3. Bish Co., Ltd.

   This is a privately owned repair specialist. It does not own any slipways, but it does engage in iron foundry work.

Since the above three shipbuilding yards have quite an impressive array of facilities, they can do any type of work, provided that the necessary parts are available. It can be said that they are probably the number-one group of facilities in the South Pacific area.

(7) RULES AND REGULATIONS CONCERNING FISHING, AND MARITIME AFFAIRS

All vessels and maritime personnel are governed by The Merchant Shipping Act of 1972 (Kingdom of Tonga, Law No. 11). This is a general law, and does not include particulars about vessel performance, specifications, equipment, or other details or standards. Likewise, the law does not specify any requirements for fishing vessel wireless facilities. Therefore, the proposed grant vessel will be well accepted within the bounds of Tongan law, if it meets the requirements for Japanese vessels of its class.

(8) BASIC DESIGN OF THE FISHERIES TRAINING VESSEL FOR THE KINGDOM OF TONGA

8-1 BASIC PLAN

As this report has indicated, the Kingdom of Tonga is surrounded by tuna and skipjack vast fishing grounds. It is thus certain that these fish varieties will be the major objectives of future Tongan off-shore fishing operations. For the past several years, the Tonga Fisheries Division has concentrated its development efforts in the area of tuna resources through the continuous investigations performed by M/S EKIAKI and M/S TAVAKE.

Now that the Tonga Government had to sell the deteriorated M/S EKIAKI, it has requested a new tuna long-line fisheries training vessel on the experiences gained through the operations of the above-mentioned vessels. The aim of the proposed grant vessel is as given below.

1) The specifications should be suited to the particular needs of the Kingdom of Tonga. In terms of fuel oil supply, since it is expected that the vessel will refuel in American Samoa, the vessel should be capable of storing as much fuel oil as possible at a single refueling which will be more than enough for one fishing voyage. Further, in terms of refrigeration on board the vessel, the three different types of uses to which the fish will be directed, upon return of the vessel to Tonga, should be taken into consideration. Some fish will be delivered to canneries, some will be sold at the Tonga fish market, and some will need to be stored on board the vessel for its crew.
2) The vessel must be operatable as economically as possible. This means not only that the navigational operation of the vessel itself should be economical, but also the fishing operation. Therefore, maintenance of the equipment and instruments, and the economy of the machinery models should be taken into consideration as well.

The representatives of both governments who analyzed and discussed the above-mentioned important points, reached an agreement on the specifications of the proposed grant vessel and summarized their meetings in Minutes of Discussion.

8-2 CONTENTS OF DISCUSSION AND TONGAN SPECIAL REQUESTS

1) Before its departure for Tonga, the Survey Team had been able to obtain information that the Tongan request was for a 150 or 100 ton type tuna long-line fisheries training vessel. The 100 ton type vessel was based upon some consideration of fuel oil cost for its fishing operations. Assuming that these figures were based on the Oslo Convention, the Survey Team prepared specifications for such two vessels to be proposed to the Tongan government. However, the Tongan request had been based on the Japanese standard. Thus, while the Tongan request was for a vessel of 135 G/T, the team's specifications for a vessel of the Oslo Convention 150 G/T was only equivalent to 100 G/T on the Japanese standard. Therefore, revision of the original specifications for 150 G/T was necessary; the summary revisions contained in the Minutes decided upon after extensive discussions among the Survey Team members, were proposed to the Tongan government. The Survey Team was especially careful as to the vessel specifications on the selection of equipment and facilities for the vessel and importance of the ease of maintenance of the engine and equipment of the proposed grant vessel.

2) The essential results of discussions with the Fisheries Division of the Tongan government are as follows:

   (1) The capacity of the fish hold shall accommodate a load of approx. 70 tons of tuna and keep a temperature of $-30°C$ (i.e., approx. 120 m^3 as loading factor of 0.6 ton/m^3)

   (2) Since a part of the fish hold has to maintain and keep the fish for exportation, the fish hold shall be divided into three (3) compartments in order to keep separately fish for exportation, bait and others.

   (3) The construction of a hold serving both as fish hold and fuel oil tank is not adopted.

   (4) The service speed of the vessel is 8.0-8.5 knots under navigation.

   (5) The main engine of approx. 500 Horse Power is probably acceptable, however, final decision shall be made after careful evaluation with regard to above-mentioned speed and economy of fuel consumption.

   (6) Temperature of quick freezing room shall be $-40°C$ and the capacity of the

quick freezing room shall be 3 tons/24 hours.

(7) The complement shall be 24 persons.

(8) The capacity of the fresh water tank shall be approx. 15 tons assuming consumption within 1 month and a Fresh Water Generator is not necessary.

(9) The fuel oil tank shall have sufficient capacity to enable as much refueling as possible to be done in a port where fuel oil is inexpensive. If possible, approx. 125 m^3 for consumption within 48 days is preferable and at least approx. 100 m^3 for 40 days is necessary.

(10) The crew's quarters shall be decided to be of sufficient size to accommodate general Tongan physique.

Bed : approx. 2.0 m in length and 0.7 m in width.

Height : approx. 1.9 m between floor and ceiling.

Because the crew will usually eat their meals on deck, the dimensions of the sleeping area will be made wider while the mess room will be more narrow.

(11) The room of the master fisherman shall be a private room because sometimes the King will be on board.

(12) An air conditioning system for the crew's quarters is not necessary, but mechanical ventilation shall have sufficient capacity.

(13) It is hoped to supply enough spare parts, stores and fishing gears for three (3) years of operations.

(14) With regard to vessel regulations in principle, the vessel will be built according to the Regulations in Japan.

3) Special Requests submitted by the Fisheries Division of the Tongan government.

It was requested that the following items be installed subject to the budgetary allocation provided by the Japanese government as well as technical capabilities.

(1) F.R.P. boat (approx. 4 m length)

with 15 HP outboard motor and boat davits. 1 set

(2) Oceanographic equipment

	Bathy-thermograph (XBT type)	1 set
	Hydrographic winch, davit and depth meter	1 set
(3)	Spare propeller with nut	1 set
(4)	Spare anchor, spare chain of 100 meters	1 set
(5)	V.H.F transmission/receiving system	1 set

8-3 SPECIFICATIONS

The following specifications were determined through discussions between the overnment of the Kingdom of Tonga and the Survey Team.

8-3-1 GENERAL DESCRIPTION

1) Type of vessel

Steel tuna long-liner type fisheries training vessel.

2) Rules and regulations applied.

(1) The Merchant Shipping Act-11 of 1972.

(2) International conventions

(a) International Convention on Load Lines, 1966

(b) International Regulations for Preventing Collisions at Sea, 1972

(3) Japanese rules and regulations

(a) Japanese Ships Safety Rules and Regulations

(b) Japanese Regulations on Tonnage Measurement of Ships

3) Inspection and certificates

(1) The following certificates shall be issued by the classification society, NIPPON KAIJI KYOKAI (NK), after surveys thereby.

(a) Certificate for safety equipment

(b) Radio-telephone certificate

(c) Calculation sheets of tonnage

(d) Calculation sheets of free board

(e) Seaworthiness certificate

(2) The necessary documents for taking the vessel from Japan to Tonga, such as a provisional nationality certificate, provisional radio station license etc. shall be issued by the Government of the Kingdom of Tonga.

4) Principal particulars

(1) Principal dimensions

Length over all	approx. 38.00 m
Length registered (Japan)	approx. 31.00 m
Length between perpendiculars	approx. 31.00 m
Breadth (moulded)	approx. 7.00 m
Depth (moulded)	approx. 2.70 m
Draft designed (moulded)	approx. 2.40 m

(2) Gross tonnage (Japanese) approx. 135 ton

(3) Main engine

Slow speed diesel engine 500 PS	1 set

(4) Capacity

Fish hold (bale)	approx. 120 m^3
Quick freezing room	approx. 32 m^3
Preparation room	approx. 15 m^3
Fuel oil tank	approx. 100 m^3 (approx. 125 m^3, if possible)
Fresh water tank	approx. 15 m^3
Lubricating oil tank	approx. 2 m^3

(5) Speed

Maximum trial speed	approx. 10 knots
Service speed (85% output, 10% sea margin)	approx. 8 knots

(6) Cruising range approx. 40 days

(7) Complement 24 persons

(8) Deck height (clearance) approx. 1.90 m

5) Others

(1) Language

English shall be used for all documents, plans, drawings, marks etc.

Instruction books shall be written in both English and Japanese.

(2) Unit of measure

The metric system shall be used.

(3) Spare parts and stores

Spare parts and stores shall be provided for three (3) years operation.

8-3-2 HULL PART

1) Material, etc.

All materials used for the vessel shall be of good quality and the electric welding method shall be used.

2) Hull construction

The transverse framing system shall be adopted.

Spares of sleeves and bushes of propeller shaft and rudder shaft shall be provided.

3) Stores

(1) Boatswain's stores, fishing gear stores, line stores, deck stores etc. shall be arranged.

(2) Provision stores

(a) Provision stores

(b) Refrigerating chambers

Meat	:	−15°C
Vegetables	:	+2°C
Refrigerating system	:	unit type system with automatic start-stop device
Refrigerant	:	R-22

(3) Stores shall be provided with solid locking devices.

4) Anchoring and mooring equipment

(1) Electric windlass with 2-warping drum : 1 set

Spare brake lining shall be provided.

(2) Electric capstan : 1 set

(3) Chain locker

(4) Bollard, roller fairleader, mooring pipe : as necessary

(5) Davit with accessories for stowing anchor : 1 set

5) Anchors, anchor chains, mooring ropes etc.

The following shall be provided in accordance with the rules and regulations and special requests. Also, spare ropes shall be provided.

(1) Bower anchor : stockless type x 3 (including spare x 1)

(2) Stream anchor : Japanese type x 1

(3) Chain cables for bower anchor : 1 set (including spare 100 m)

(4) Steel wire cable for stream anchor

(5) Tow line

(6) Mooring rope

(7) Sea anchor with rope : 1 set

6) Steering system

Electro-hydraulic steering gear : 1 set

Steering stand in wheel house : 1 set

Rudder angle indicator : 1 set

7) Ladder

Portable ladder of aluminum alloy : 2 sets

Wharf ladder of aluminum alloy (6 m length) : 1 set

8) Mast

Fore mast, radar mast and aft mast shall be installed and be provided with necessary accessories.

Flagstaffs shall be fitted at fore and aft end.

9) Awning

Awnings shall be fitted over upper deck, aft part of poop deck and fore part of compass deck.

10) Cargo gear

(1)	Electric hoist	: 0.5 ton 2 sets
(2)	Span stay with triangle plate	: 1 set
(3)	Cargo wire	: 2 sets and spare shall be provided
(4)	Hook, shackle etc.	: as necessary and spare shall be provided.

11) Life saving appliances

Life raft A-type 15 persons	: 2 sets
Life jacket	: 24 sets
Life buoy	: 6
Radio beacon for indicating emergency position	: 1 set
Self-igniting light	: 2
Buoyant self-starting smoke	: 2
Rocket signal	: 2
Parachute signal	: 12

12) Fire fighting equipment

Bucket	: 1
Portable extinguisher	: 9
Hydrant with hose and nozzle	: 2 sets
Sand box	: 1
Safety light	: 1
Axe	: 1
Breathing apparatus	: 1
Life line	: 1

13) Piping

All pipes except pipes contacting oil shall be galvanized steel pipes.

Bilge pipe, scupper pipe and soil pipe shall be thick steel pipes.

1-fixed electric pump (10 T/H) and 2-hand pumps shall be provided as bilge pumps.

Fresh water shall be supplied to the necessary position by home pump, and fresh

water shall be supplied to the galley also by a hand pump installed in the galley.

Hand pumps shall be installed in the galley and toilet for supplying sea water.

14) Communication and signaling

(1) Buzzer	:	wheel house – engine room wheel house – cabin
(2) Interphone	:	wheel house – engine room steering gear room
(3) Air horn	:	1 set
(4) Daylight signal	:	60 W portable type 1 set
(5) Electric engine telegraph	:	1 set

15) Window and ventilation

(1) Square window	:	for wheel house one of them shall be provided with a clear view screen
(2) Scuttle	:	for cabins, galley, toilet, engine room etc.
(3) Mechanical ventilation	:	for wheel house, cabins, galley, provision stores, engine room etc.
(4) Natural ventilation	:	for necessary spaces

16) Nautical equipment

(1) Gyro-compass and auto-pilot system : 1 set

Remote-control of steering shall be controllable by cable extension at both sides of wheel house and on compass deck. Holder and receptacle for repeater compass shall be installed in starboard side of wheel house, and repeater compass shall be provided.

(2) Magnet compass	:	table type 2 sets
(3) Radar	:	2 sets
(4) Fish finder	:	2 sets
(5) Direction finder	:	1 set
(6) Clock	:	as necessary
(7) Sea water thermometer	:	recording type 1 set
(8) Navy navigation satellite system	:	1 set
(9) Electro-magnetic log	:	fixed type 1 set

17) Radio equipment

(1) Radio telephone apparatus : 1 set

(2) Receiver : 1 set

(3) Public addressor : 1 set

(4) Radio buoy for fishing : 5 sets

(5) VHF radio telephone : 1 set

18) Fishing equipment

(1) Line hauler : 1 set (including spare of head)

(2) Side roller : 1 set

(3) Slow conveyor : 1 set

(4) Marol transmitter : 1 set

(5) Line winder : 1 set

(6) Line thrower : 1 set

(7) Hyd. oil pump unit : 1 set

(8) Line tank

(9) Line throwing speed meter : 1 set

(10) Meter box : 1 set

(11) Hooking master : 1 set

(12) Chute : 2 sets

(13) Line belt conveyor : 1 set

(14) Store for fishing gears

(15) Guide roller, guide pipe : as necessary

(16) Working table : 1 set

19) Fish hold and quick freezing room

(1) Cooling temperature

Fish hold −30°C (Coil)

Quick freezing room −40°C (Semi air blast and coil)

Preparation room −25°C (Coil)

(2) Insulation

Insulation shall be of spot-foamed polyurethane foam.

Lining of fish hold shall be of waterproof plywood and coated by 3 layers of phenol resin paint.

(3) Hatch cover and door

(a) Fish hold:	Steel water tight cover with insulated inner cover	3
(b) Quick freezing room:	Wooden insulated door	4
(c) Preparation room:	Steel watertight door	1
	Wooden insulated door	1
	Wooden cover with insulated inner cover	1

(4) Others

(a) Fish hold

Partition board, grating and sparring	
Electric thermometer sensor	4
Temperature measuring pipes	
Closing apparatus	
Chutes	

(b) Quick freezing room

Pipe cooling shelf (1.5 ton)	2 sets
Electric thermometer sensor	2 pieces
Cooling fan	4 sets

(c) Preparation room

Grating	
Electric thermometer sensor	1

Indicator of electric thermometer shall be installed in engine room.

20) Deck covering

Compass deck	Painting
Poop deck	50 mm wooden plank
Forecastle deck	non-slip paint
Upper deck	65 mm wooden plank

Bridge and living room	8 mm latex composition
Mess room	6 mm epoxy composition
Galley	6 mm epoxy composition
W.C.	6 mm epoxy composition

21) Living Quarters

Appropriate insulation shall be provided in necessary parts.

Dimensions of beds shall be approx. 2 m length and 0.7 m breadth.

22) Galley

Oil cooking range (including spare of top plates and burner nozzle)	1 set
Sink and cabinet	1 set
Electric heater (including spare coil)	2 sets
Electric rice cooker	1 set
Electric refrigerator (200 ℓ)	1 set
Water cooler with sterilizer (including spare lamp)	1 set
Electric water boiler (20 ℓ)	1 set

Others

23) Painting and anti-corrosion system

(1) Painting

Shell plate	chlorinated paint
Lining of fish hold, quick freezing room and preparation room	phenol resin paint
Fresh water tank	pure epoxy paint
Under wooden plank	tar epoxy paint
Floor of fish hold	tar epoxy paint
Floor of engine room	tar epoxy paint
Cofferdam	tar epoxy paint
Ballast tank	tar epoxy paint
Others	oil paint

Spare paint shall be provided.

(2) Anti-corrosive zinc plate shall be fitted on bilge keels, false keel, stern frame, rudder trunk and sea chest.

3 sets spare zinc plates shall be supplied.

24) Working boat

F.R.P. boat (approx. 4 meter length, 15 PS long shaft outboard-engine) and one boat davit shall be provided.

Ropes shall be provided as necessary.

25) Oceanographic biological research equipment

(1) Bathy thermograph (XBT-type) 1 set

(2) Hydro-graphic winch, davit, and depth meter 1 set

8-3-3 MACHINERY PART

1) Design condition

Design condition of machinery are as follows:

	summer	winter
ambient air temperature	32°C	10°C
sea water temperature	30°C	21°C

2) Main engine

(1) Type 4 cycle slow speed diesel engine (with turbocharger) 1 set

Horse power approx. 500 p.s.

Fuel oil gas oil

Cooling system sea water cooling

(2) Reversing gear shall be attached.

(3) The following pumps shall be driven by main engine directly.

sea water cooling pump

lubricating oil pump

fuel oil service pump

(4) The following accessories shall be installed.

tachometer

lubricating oil press. gauge

cooling water press. gauge

(5) Start and stop shall be operated by engine side.

3) Shafting and propeller

(1) Shaft: forged steel

Propeller shaft: with rubber lining

(2) Stern bearing shall be of rubber bearing type.

(3) Propeller: fixed pitch propeller

4) Auxiliary engines

(1)	Type and number	4 cycle diesel engine	2 sets (parallel running)
	Output	approx. 145 p.s. x 2	
	Rev/min	1,500 rpm	
	Cooling system	sea water cooling	
	Generator	approx. 120 kVA x 2	

(2) The following pumps shall be driven by aux. engine directly.

Cooling water pump

Lubricating oil pump

(3) Start and stop shall be operated by engine side.

5) Air compressors, Air reservoirs

(1)	Main air compressor (motor driven)	1 set
	11 m^3/hr x 30 kg/cm^2	
(2)	Aux. air compressor (3 p.s. diesel driven)	1 set
	9 m^3/hr x 30 kg/cm^2	
(3)	Main air reservoirs	2 sets
	Aux. air reservoir	1 set

6) Automatic operation, remote control

(1) Essential machinery

Main engine: remote control with various alarms

Main air compressor: automatic start and stop

Fresh water pump: automatic operation

(2) Remote control system for main engine

(a) in wheel house

control: revolution, reversing, clutch, emergency stop

watching: running indication, control position, ahead and astern, tachometer, electric source indication etc.

alarm: various alarms

(b) in alarm panel in engine room

watching: running indication, control position, electric source indication etc.

alarm: various alarms

(3) Alarm for other machinery

The following alarm devices shall be incorporated in alarm panel in engine room.

Aux. engine: low lubricating oil press and high cooling water temp.
Fuel gravity tank: high and low level.
Others: lamp test switch, alarm bell, bell stop switch, etc.

7) Refrigerating plant

(1) Quick freezing room

Semi air blast	1.5 ton 2 sets
Capacity	3 tons/24 hours
Fans	4 sets
Temperature	−40°C

(2) Fish hold

Capacity	approx. 120 m^3
System	cooling coil system
Temperature	−30°C

(3) Refrigerant R-22 (supplied with enough spare)

(4) Other equipment

Compressor	2 sets
Condenser	1 set

Receiver 1 set

Others

8) Pumps

(1) Motor driven pumps

stand by lub. oil, fire and bilge, G.S., bilge, portable bilge, fresh water service, fuel oil transfer and etc.

(2) Hand pumps

bilge, sea and fresh water for galley, sea water for lavatory, fuel oil shift, lub. oil pump and etc.

9) Fresh water generator

F.W.G. shall not be installed.

8-3-4 ELECTRIC PART

1) Electric source

for power	AC 415 V 50 Hz 3 phase
for lighting	AC 240 V 50 Hz single phase
for emergency	DC 24 V (battery)

2) Illumination

(1) General

Fluorescent lamp shall be used for interior illumination in principle

Incandescent lamp shall be used for exterior illumination in principle

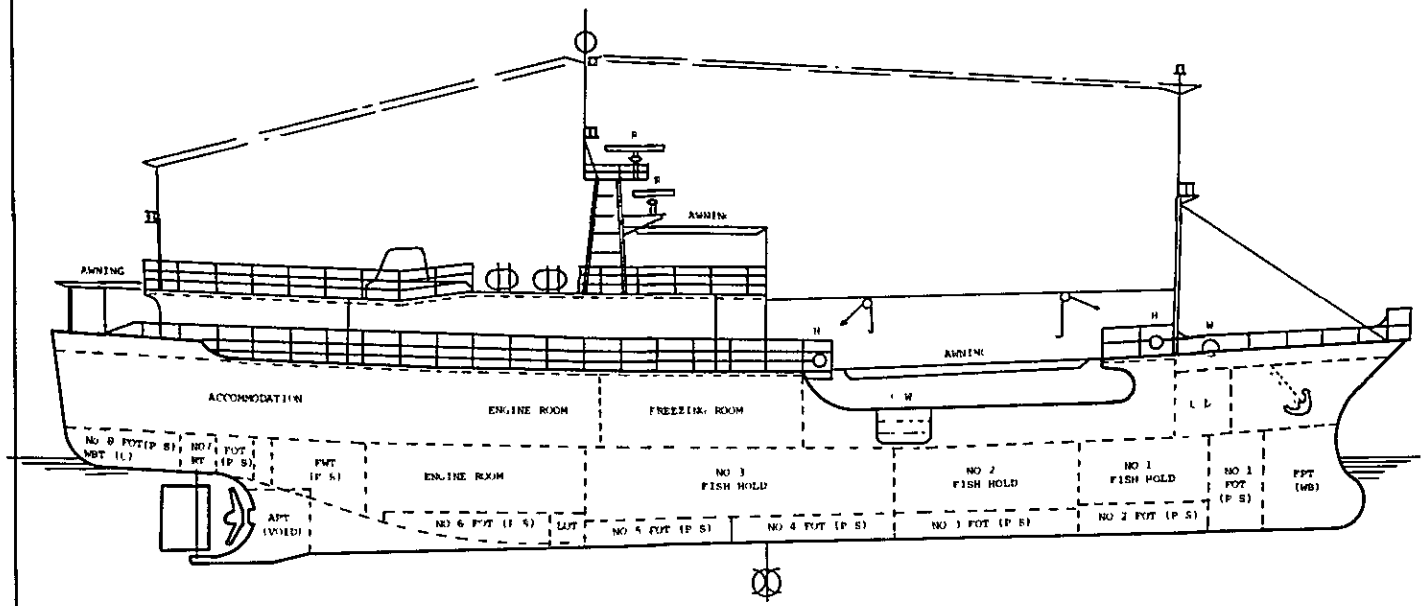
(2) Working light

Search light	2 kW 2 sets (both side on compass deck)
Projector	300-500 W abt. 8 sets
Portable light	60 W 5 sets (with 10 meters cord)

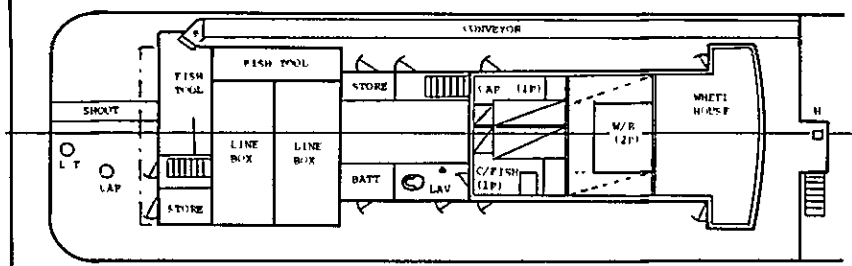
8-4 GENERAL ARRANGEMENT

PRINCIPAL PARTICULARS

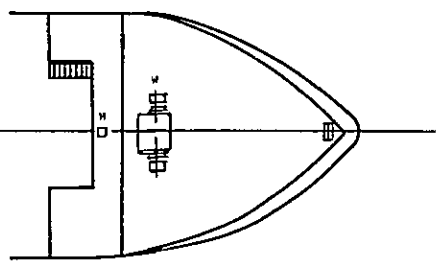
LENGTH (O.A.)	ABT.	38.00 M
LENGTH (REG.)	ABT.	31.00 M
LENGTH (P.P.)		31.00 M
BREADTH (MLD.)		7.00 M
DEPTH (MLD.)		2.70 M
DRAFT DESIGNED		2.40 M
GROSS TONNAGE (JAPAN)	ABT	135 T
MAIN ENGINE		500 PS
SERVICE SPEED	ABT.	8 KNOTS
CAPACITY		
FISH HOLD (BALE)	ABT.	120 M^3
FREEZING ROOM	ABT.	32 M^3
LOBBY	ABT	15 M^3
F.O.T.	ABT.	100 M^3
F W.T.	ABT.	15 M^3
L O T.	ABT.	2 M^3
COMPLEMENT		24 P.



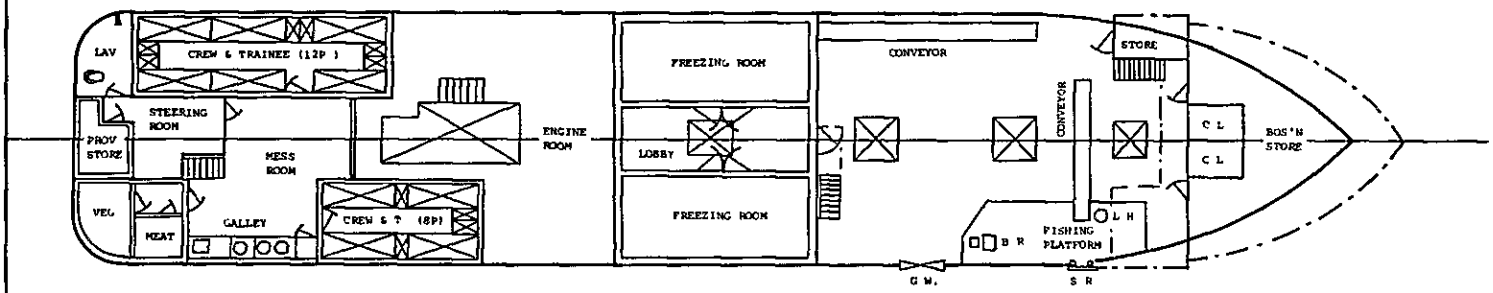
POOP DECK



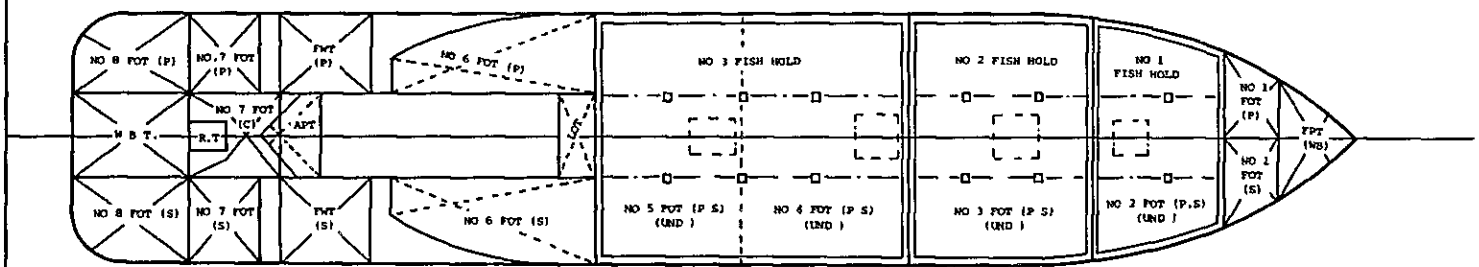
F'CLE DECK



UPPER DECK



HOLD PLAN



GENERAL ARRANGEMENT
OF
FISHERIES TRAINING VESSEL
FOR
LONG LINE FISHING

(9) CONSTRUCTION COST AND SCHEDULE FOR THE FISHERIES TRAINING VESSEL

9-1 CONSTRUCTION COST

1.	Basic cost of vessel	¥367,000,000.
2.	Cost of delivering vessel	¥18,000,000.
3.	Fishing gears (for 3 years)	¥40,000,000.
4.	Consultant fee	¥25,000,000.
	TOTAL	¥450,000,000.

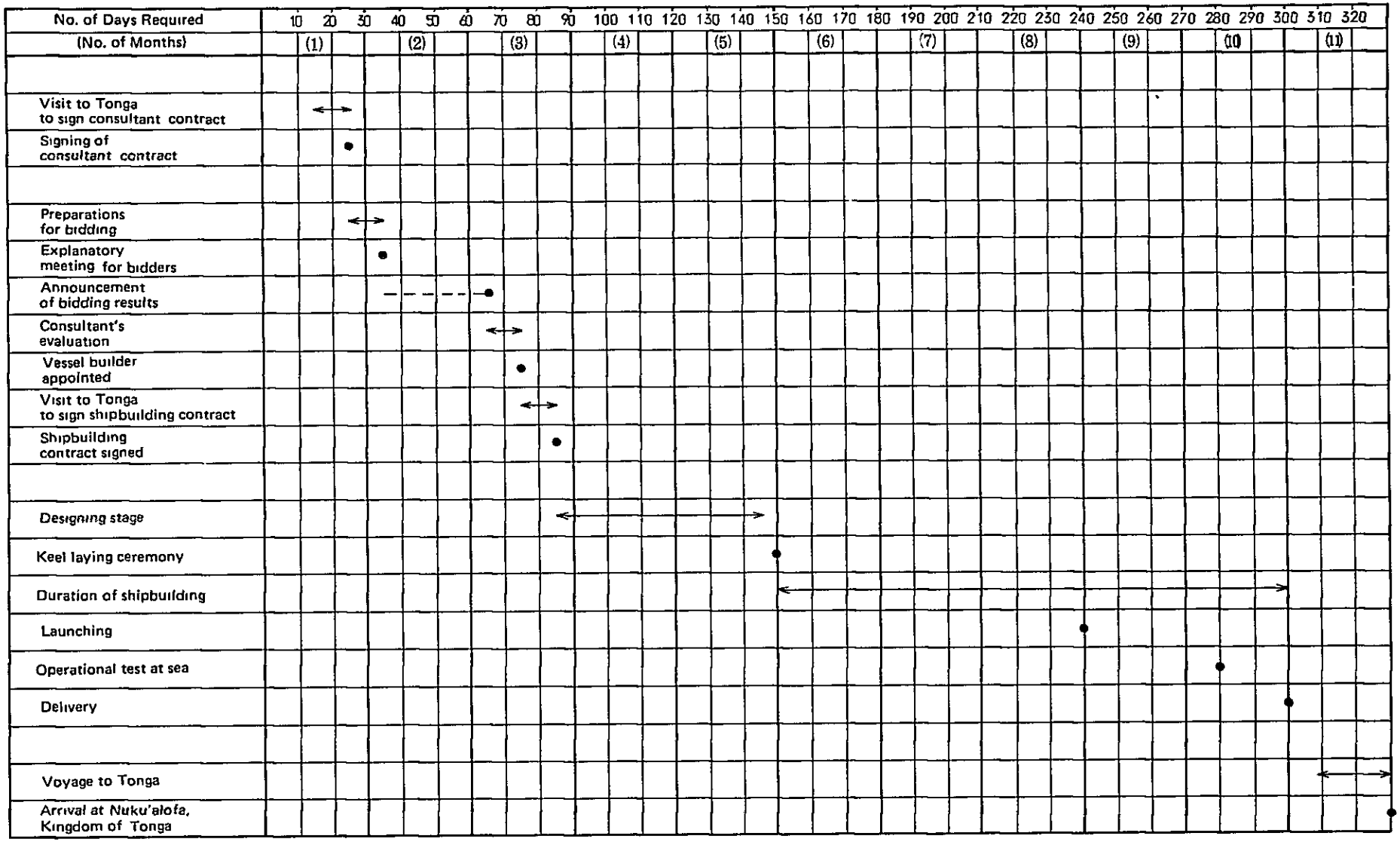
Note: The above figures are estimated at present 1980 cost.

9-2 CONSTRUCTION SCHEDULE

The schedule of the vessel construction is shown in the table on the next page.

9-2 CONSTRUCTION SCHEDULE

* Note From the date of the signing of the Discussion Minutes



(10) JUSTIFIABILITY AND BENEFITS OF THE GRANT

10-1 JUSTIFIABILITY OF THE GRANT

As stated in the first section of this report, marine resources have always formed an important part of the diet of the people of Tonga. Furthermore, while in the past this need was satisfactorily filled by fishing at the reefs and the lagoons, the increase in the Tongan population and the decrease in the catch rate have made the catches from these areas insufficient. As a result, the people have been forced to rely increasingly on imported canned fish and imported meat, in their daily diet.

In addition, according to the FAO survey, the gap between supply and demand of fish is already as high as app. 1,000 tons per year. It is further estimated that by 1985, the insufficiency will double to app. 2,000 tons per year.

Still further, in 1979, the Tongan government-owned tuna long-line fishery vessel M/S EKIAKI was discovered to have a deteriorated shellplate, while it was docked in New Zealand for its third-year inspection. Since the cost of repairs would have been exorbitantly high, Tonga had no choice but to sell the vessel to the private sector.

Because the government has thus lost one tuna long-line fishery vessel, the annual catch of the government-owned vessels has, for example, dropped from 234 tons in 1978, to 81 tons in 1979, a very substantial decrease. Therefore, a newly built fisheries training vessel is necessary to help meet the needs of the Tongan people for fish.

Tongan international trade is also said to be showing a drastic increase in imports; in 1977, the deficit for the year was T$11,000,000. The majority of the imported goods are foodstuffs, including meat and fish, and manufactured goods. Therefore, the possibility of exporting part of the fish caught by the fisheries training vessels must also be considered in plans.

Lastly, there is the question of greater and timely development of human resources. Human resources are an essential part of the fostering and development of large scale fisheries operations, and the nurturing of an officer class is especially important. Up until the present, the guidance of the Japanese experts has not occurred primarily on land, because there is no place for training and practice in Tonga. Instead, the Tongan officers have thus far been trained by actual participation

on board a vessel. Thus, it goes without saying that training for off-shore fishing aboard a newly built fisheries training vessel with the newest fishing equipment is more important than ever to the future of the development of the fishing industry of the Kingdom of Tonga.

10-2 BENEFITS OF THE GRANT

The Tongan government is presently operating M/S TAVAKE, and in the past, has also had the experience of operating M/S EKIAKI. It can thus be said that the Tongan government has completed the groundwork for tuna fishing operations. However, as stated above, the nurturing of a competent crew is essential to the progress of the fishing industry. In order to create this force of fishermen, the Fisheries Division of the Tongan government wishes that the kind of training on board the fisheries training vessels that has been performed heretofore will be continued, and this is one of the primary objectives of the present request.

In connection with this question of training opportunities, during the course of discussions with the Survey Team, the Tonga Fisheries Division repeatedly requested that Tongan trainees be sent to study and practice in Japan. The Tongan idea is to send as many Tongan trainees as possible to Japan during the shipbuilding stage. In addition to studying about the vessel at the ship yard, they would participate in study courses of the various relevant makers, especially main and auxiliary engines, refrigeration facilities, fishing equipment and gears, and navigational instruments, etc. In addition to becoming conversant with the functions of these various apparatus, the trainees also would have an opportunity to study the maintenance methods of the equipment.

As is apparent from the specifications of the vessel to be granted which are included in this report, the fisheries training vessel has the most advanced equipment and instruments, all of which are to be Japanese made. With the future maintenance of the grant vessel in mind, the above Tongan request for training opportunities is considered to be reasonable and of great value. The Survey Team highly recommends and proposes that all parties concerned with this grant project seriously consider dispatching Tongan trainees to study and practice in Japan.

Another important factor in nurturing a force of Tongan fishermen is the establishment of the fishing industry as an actual enterprise. However, the three fisheries training vessels now in operation by the Fisheries Division are operating at a loss. For example, the balance sheet for the 1978/79 fiscal year showed an income of T$181,000. and expenditures totaling T$282,000.

Thus there was a T$101,000 deficit for the year. Therefore, another objective of the Tongan government with respect to the proposed grant vessel is how to improve the efficiency of the vessel operations while at the same time continuing training operations. With this objective in mind, when the Survey Team visited Tonga, the Tongan government made several requests in order that the fisheries training vessel to be granted should be operatable as economically as possible. This point was discussed in detail.

If the efforts to improve the operational efficiency of the fisheries training vessel are successful, it will most likely lead to a proposal for an independent enterprise, which could, according to the Fisheries Division, take one of several forms. It is certain that such a development would be beneficial to the further promotion of Tongan off-shore fishing industries.

10-3 BUDGETARY MEASURES

During the discussions between the Survey Team and the Tongan Fisheries Division, the question of budgetary measures was raised. The Fisheries Division replied that the budget would be similar to that of M/S TAVAKE now in operation. The 1980 budget of M/S TAVAKE is listed below for reference purposes.

	Unit: T$
Master	3,452
Master Fisherman	2,637
Officer	2,456
First Engineer	3,684
Second Engineer	2,032
Third Engineer	944
Operator	1,489
Quartermaster	765
Greaser	680

Cook/Steward	624
Leading Hand	700
Fishermen (15 persons)	9,704
Leave allowance	700
Bonus	9,000
Board	10,000
Insurance	7,500
Port charges	900
Telegraph/telephone Expenses	600
Maintenance costs for deck and engine	10,800
Drydock	12,000
Uniforms	1,000
Fuel oil, lubricating oil	45,000
Bait	12,000
Stores and equipment	7,500
Total	146,167

(Source) Revenue, Expenditure, and Development Estimates 1980-81, Kingdom of Tonga

It is, of course, understood by the Tongan government that maintenance costs, fuel oil, bait costs, etc. will vary with the actual fishing results of the proposed grant vessel, and such variations should cause no problem.

JICA