MALAYSIA
BASIC DESIGN STUDY REPORT
ON
FISHERIES RESEARCH
AND
TRAINING VESSEL PROJECT

October 1981

JAPAN INTERNATIONAL COOPERATION AGENCY

(JICA)

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PREFACE

In response to a request of the Government of Malaysia, the Japanese Government decided to conduct a survey on the Basic Design for Fishery Research and Training Project and entrusted the survey to the Japan International Cooperation Agency (J.I.C.A.). The J.I.C.A. sent to Malaysia a survey team headed by Mr. Takashi Yamamoto from August 9 to August 29, 1981.

The team had discussions with the officials concerned of the Government of Malaysia and conducted a field survey (in Sabah State). After the team returned to Japan, further studies were made and the present report has been prepared.

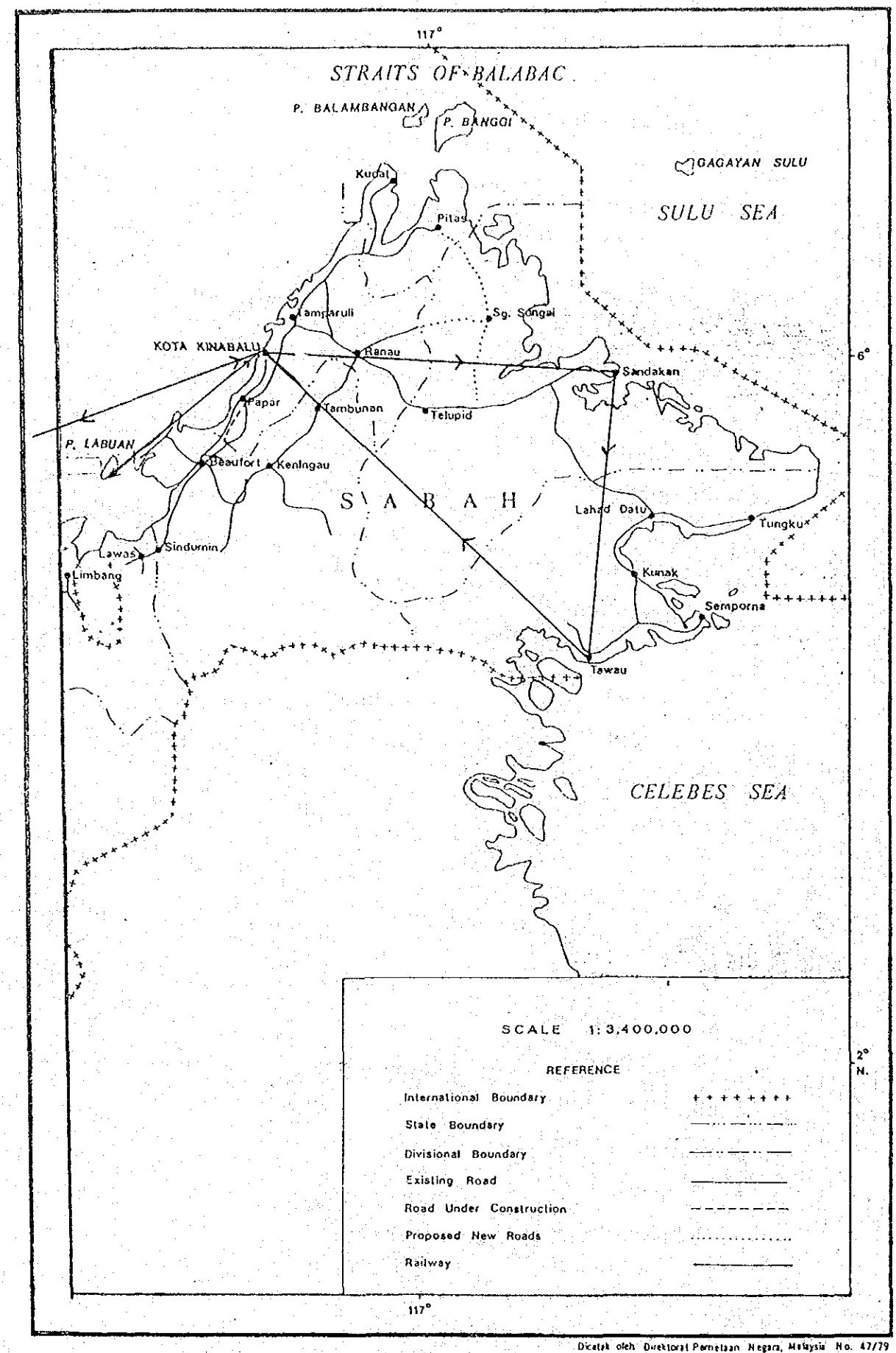
I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between the two countries.

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

October, 1981

Keisuke Arita

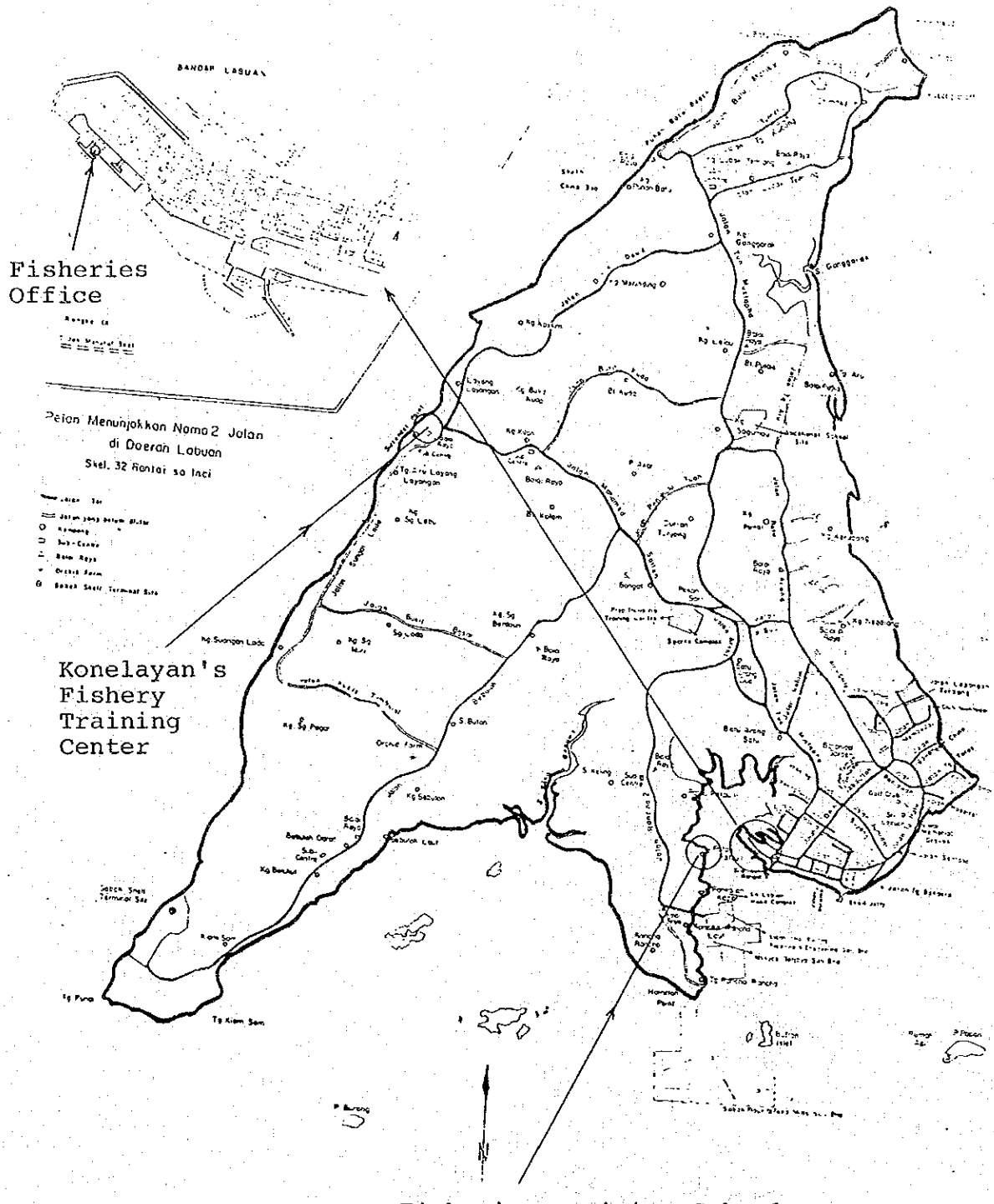
Keisuke Arita
President
Japan International
Cooperation Agency



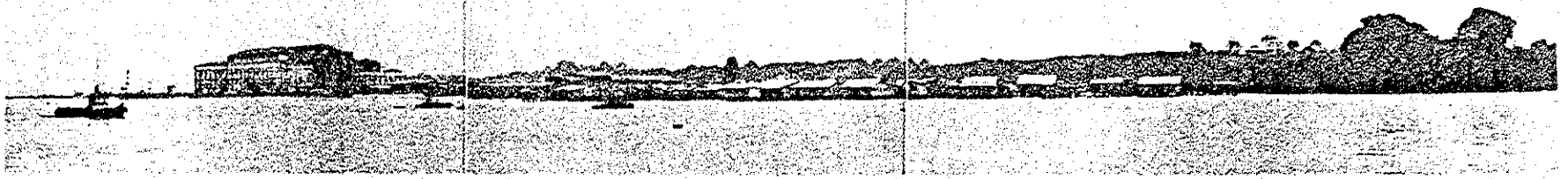
Dicetak oleh Direktorat Pemetaan Negara, Malaysia No. 47/79

Survey Route

LABUAN ISLAND



Construction Area of Fisheries Training School, Labuan



Largest Shipyard in
East Malaysia

Fisheries Training
School Project Area

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SUMMARY

SUMMARY

Sabah State was authorized as one of Malaysia's thirteen states in August, 1963. By active exploitation of its abundant natural resources, it has already succeeded in raising the per capita income of its inhabitants well above the national average. Furthermore, the State Government is planning other development projects to expedite the state's economic development.

In fisheries sector, which is one of the key industries of Sabah State, the Fisheries Development Program has been formulated as a national plan with the major objectives of supplying its people with food containing inexpensive animal protein and improving the livelihood of the low-income, small scale fishermen. The State Government's policy measures accordingly place particular emphasis on the research of fish resources in the waters off the coast of Sabah and training of fishermen, both of which are basic requirements for development of the fishing industry.

In implementing this Fisheries Research and Training Project as one of the policy measures of the State of Sabah, the Federal Government of Malaysia has requested the Government of Japan to provide a grant for a Fisheries Research and Training Vessel in order to ensure the successful implementation of the Project.

In response to this request, the Japan International Cooperation Agency (JICA) dispatched a Survey Team to carry out a basic design study. The Survey Team has conducted a field survey of the area covered under the proposed project and also discussed the contents of the request with Malaysian authorities concerned. As a result, it has become clear that the Fisheries Research and Training Vessel which is necessary for;

(i) the research of unexploited fish resources in the waters off the coast of Sabah, basically needed for the development of modern offshore fishery from the traditional inshore fishery;

(ii) test operations using appropriate fishing gear and methods aiming to exploit unutilized resources; and

(iii) training of modern fishing methods

is indispensable for the fisheries development of Sabah State. Therefore, it is clear that the State Government is in urgent need of the Fisheries Research and Training Vessel.

Accordingly, the Survey Team has prepared and signed the Minutes which contains the requirement of the Federal Government of Malaysia to the Government of Japan for the grant of an FRP Fisheries Research and Training Vessel of about 21.50 m in length and related Equipments

for oceanographic and fishery research, training and extension of modern fishing methods to the fishermen.

The Fisheries Research and Training Vessel and the required Equipments are as outlined below:

(1) One FRP Fisheries Research and Training Vessel of about 21.50 m in overall length,

(2) The complete set of fishing gears and spare parts mainly for eight different fishing methods; purse seine trawl net and other nets for offshore fishing, and audiovisual equipment for training,

(3) Materials and equipment for oceanographic research.

The executing agency for implementing this project is the Department of Fisheries of the Ministry of Agriculture and Fisheries Development in Sabah. The operational cost of the proposed vessel has already been allocated in the annual budget of the State Government compiled for this project and it is hoped that these expenses will hereafter be adequately secured on the part of the Federal Government so that its effective utilization will not be hampered.

The Malaysian Government as well as the Sabah State regard the Fisheries Research and Training Project as a priority policy measures from the viewpoint of supplying protein-rich food to the nation's growing population, fulfilling socio-economic needs to improve the livelihood of fishermen by expanding production through exploiting unexplored and unutilized resources.

Thus, effective utilization of the Project Vessel for these purposes will lead to the establishment of sound foundation of the fisheries development in Malaysia.

CHAPTER 1

PROJECT BACKGROUND

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PROJECT BACKGROUND

1-1. Project Background

1. General Circumstances

The Sabah State of Malaysia is located north of Borneo between 4° and 7° north latitude and 115° and 119° east longitude. It has a land area of 76,400 km² and is the second largest state in Malaysia following Sarawak. It is surrounded by sea on three sides and, 2/3 of the State's total population, which now stands at about one million live along the shore line extending 1,000 km.

The Sabah State is divided into four administrative districts, namely Interior, West Coast, Sandakan and Tawau. The state capital is Kota Kinabalu, where government offices are located.

The major products of Sabah are timber, petroleum, palm oil, copper, rubber and marine products. This indicates that the state largely depends on primary products. More than 86% of unprocessed wood and 80% of marine products (mainly frozen prawns) are exported to Japan. The State's largest imports are machinery and transportation equipment, which in 1979 accounted for 38% of total imports. Food imports are also high, standing at 14% of the total.

Japan is also its No. 1 source of imports, accounting for 22.2% of the total while especially in construction and carrying equipment (e.g., bulldozers) Japan dominates the market with an overwhelmingly high share of 71.5%. In these respects, Sabah and Japan have very close ties.

The State Government is aggressive in the development and utilization of its abundant natural resources. At the same time, as the types of industry in which foreign investment is welcome, the Government enumerates five types of industries - resource utilization type, agriculture related type, export oriented type, labor intensive type and technology oriented type - and is trying to promote these by providing governmental guidance and support to a wide variety of projects ranging from processing of agro-fisheries products to iron-manufacturing (steel making) and various other projects fall under each type of industry. Specific examples are large scale developmental projects in steel making, natural gas, shipbuilding, flour mill, etc. which are progressing on Labuan Island, being also the project area of this proposal.

The Government is also aggressive in the development and promotion of fisheries - one of the key industries of Sabah - and is formulating various developmental projects as one of its priority policy measures.

2. Fisheries Status

1) Structure of Fishery

The state fisheries system is not of a monostructure as it is with most developing fishing countries but of a dual structure. On one side is the capital intensive system under which some enterprises have completely systemized their businesses using modern fishing boats and fishing gear, process fish at factories equipped with modern facilities and export their finished products, as in the case of the foreign induced trawl fishing of prawn. On the other is the fishing of artisanal fishermen engaged in traditional coastal fishing using boats without power drive or with outboard engines. More than 80% of the 14,000 or so fishermen in all of Sabah belong to the latter category. Their standard of living is low and it is with a view to improving the livelihood of these fishermen engaged in conventional fishing that the Government is carrying forward various policy measures under the fisheries development program.

2) Fish Stock, Fishing Grounds and Fish Catches

The catchable stocks in the waters of Sabah State, estimated on a trial basis using FAO data, is about 62,800 M tons in coastal waters (50 m or shallower in depth), and about 49,600 M tons in offshore waters (50 m or deeper in depth), totalling some 112,400 M tons.

Meanwhile, according to the state's 1979 fish catch statistics, the total catch at sea was 40,200 M tons, with revenues amounting to 114,300 thousand Malaysian dollars, of which 41% was accounted for by prawns. Prawn fishing is carried out in the coastal inshore waters where the depth is 20 m or shallower. As fishing for other species is also carried out mostly in these same waters, we might say that fish production in Sabah State solely consists of catches through shore fishing. The fish stock in offshore waters therefore still remains unutilized and unexploited, and its exploration is much to be desired. In order to investigate the offshore fish resources and to exploit and utilize them, the introduction and extension of modern fishing methods and fishing gear and the training of fishermen in the use of these are necessary. However, of the offshore fishing grounds, the east coast area of Sabah facing the Sulu Sea, although a good fishing ground, is close to the boundary between the Philippines and has often been ravaged by pirate ships lately which are impeding the development of offshore fishing in the area. The west coast facing the South China Sea, on the other hand, not only abounds in fish stocks but is a promising fishing ground with no obstacles to the development of offshore fishing.

3. Marketing of Fish and its Supply and Demand

Fish is an important food - the source of inexpensive animal protein - for people there. For two-thirds of the people, who live near the coast, fish is readily obtainable, but for the one-third, who live in inland areas, the fish supply is still far from satisfactory although marketing channels are being opened gradually with the improvement of roads. Although there is no problem in the supply and demand balance of fish in the coastal areas, there tends to be shortage for the state as a whole. The demand for fish, however, will rise still further in Sabah in the future due to the generally rising income levels and population increases by the promotion of various industries, and increased earnings in foreign exchange by the promotion of fish exports, etc. The growth of fish catches during the five year period between 1975 and 1979 was about 2,000 tons per year on average, but a growth of this extent is considered as bringing about a shortage of supply, and some sort of measures to increase the state's fish catch is considered necessary.

4. Policy of State Government on Fisheries Development

The objectives of the State Government in developing the fishing industry in Sabah State are the attainment of self-sufficiency in fish as a food along the policy

for overall economic development of Sabah State, and improvement of the livelihood of its fishermen by firmly establishing fisheries as one of the key industries of the State and increase of employment opportunities.

The following are specific measures for attaining these objectives:

(1) Promoting fisheries development by introducing effective fishing methods and fishing gear, methods for handling, distribution and processing of fish, etc.

(2) Attainment of stable supply of fish to people living in the inland areas by introducing fish culture.

(3) Raising the economic effects of the industry through increasing of production and diversification of the marine products by promoting and extending the culture of marine fish and clams in the swamps along the coast.

(4) Making further intensive studies for effective utilization of fish stocks in the sea waters of Sabah State - such as compiling and analyzing fish catch statistics, investigating fish resources,

testing fish species suitable for fish culture and propagating and distributing fingerlings.

(5) Offering guidance to strengthen fisheries associations and extending loans to fishermen to finance for the construction of fishing boats and purchase of fishing gear.

(6) Formulating and implementing training programs for fishermen in the use of modern fishing gear and new fishing methods and encouraging them to shift from inshore fishing to offshore fishing.

Quite a number of fisheries projects are already being formulated and implemented along these lines.

These fisheries development projects of the State Government have been adopted for implementation under the Long Range National Development Plan, or the Fourth Malaysia Plan (for 1981-1985) and a combined total expenditure of 30 million Malaysian Dollars by both the Federal and State Governments have been appropriated as the budget necessary to carry out these and other projects still in progress under the Third Plan (1976-1980).

1-2. Purpose of the Project

1) Fisheries Research and Training Program

The fisheries research and training program of the State Government's fisheries promotion plan is as outlined below:

(1) Research program

The Department of Fisheries has set up the Fisheries Research Center under the direct control as an investigation and research institution at Likas District in the suburbs of Kota Kinabalu where various investigation and research activities are being conducted.

The themes for investigation and research have been determined under the Third Malaysia Plan (1976-1980) and a budget of 515,000 M Dollars has been appropriated.

The contents covered are:

i) Studies of red tide
ii) Toxicity study of sea foods
iii) Trial production of smoked fish and oysters
iv) Tests of frozen prawns
v) Survey of trash fish
vi) Freezing test
vii) Bacteriological studies
viii) Trial fish culture in small-scale cages

Under the Fourth Malaysia Plan (1981-1985), the following themes have been taken up for investigation and research at the Center:

i) Investigation of marine fish resources and feasibility study of culturing fish, crustaceans and algae in estuaries, mangroves and swamps,

ii) Analysis of fishery statistics for scientific study of fish resources; also to grasp trends and manage them,

iii) Technical research and investigation on the methods of handling and processing fish for their effective utilization,

iv) Guidance in experimental culturing of indigenous fish species,

v) Study on breeding and supply of post lavae and fingerlings of udang galah and Tilapia nilotica for the benefit of fish culturers.

For the above listed activities, a budget of 900 thousand M Dollars has been appropriated to the Center under the Fourth Malaysia Plan. Besides the above, another 500 thousand M Dollars has been appropriated for use as necessary in the investigation of fisheries resources in reefs along the east coast.

As mentioned above, the State Government has taken up investigation of marine fisheries resources as a top priority project in order to promote fisheries and is scheduling to implement the same. It is to accomplish this objective that the State Government is planning to effectively utilize the Research and Training Vessel which has been requested as a grant at the present time.

(2) Training Program

The need for training fishermen of Sabah State in fisheries had been strongly voiced since 1962 but has not been realized for a long time. Today, KO-NELAYAN (The Sabah Multipurpose Fishermen's Cooperative Ltd.)which was established in 1978 with the objective of improving the livelihood of artisanal fishermen of Sabah State under the Cooperative Association Law of Sabah State has been the only organized fisheries training institution in existence. The Cooperative set up its Fisheries Training Center on the west coast of Labuan Island in 1979 to educate and train the fishermen's successor in fishing and has gone into actual training since 1980.

Since May 1981, KO-NELAYAN has reorganized itself from fishermen's cooperative into a coorporation under the control of the Department of Fisheries, Ministry of Agriculture and Fisheries Development, and is actively carrying out such activities as extension of fishery loans, building of

fishing boats, construction of onshore fisheries facilities and such. The KO-NELAYAN Fisheries Training Center is providing basic and elementary education and training in fishing with emphasis on inshore fishery to the successor of the fishermen.

In view of the fact that fishing in Sabah State is confined to inshore fishery only while offshore fisheries resources are still untapped, the Department of Fisheries has planned to investigate offshore resources, introduce modern fishing methods to promote their utilization, and also to construct the Labuan Fisheries Training School in order to disseminate the introduced technology by training the fishermen. It is for this plan and purpose that the subject fisheries research and training vessel is being requested by the Malaysian Government.

2) Labuan Fisheries Training School Project

(1) Underlying Circumstances

The fisheries training program was initially taken up in the Second Malaysia Plan as a Federal project but did not materialize.

In the Third Malaysia Plan (1976-1980), the same project to set up a fisheries training school, was proposed again as a Sabah State project to promote fisheries through fisheries training and guidance aimed at artisanal fishermen

in the state, and as a result, it was decided that a fisheries training school would be built on Labuan Island off the west coast of Sabah during the latter half of the Third Malaysia Plan.

In the Fourth Malaysia Plan (1981-1985), the fisheries training school project is defined more specifically and the project is now underway.

(2) Purpose

The project aims to promote commercial pelagic fishery by giving short term training in modern fishing gear and fishing methods and disseminating same among the artisanal fishermen currently engaged in coastal fishery.

(3) Implementing Agency

The Department of Fisheries, Ministry of Agriculture and Fisheries Development of the Sabah State Government will directly implement the project.

(4) Construction Site of School

Patau Patau District, Port Victoria, Labuan Island, Sabah State.

(5) Project Implementation Schedule

F. Y. 1981	Construction of school buildings and lodgings, procurement of materials and equipment.
F. Y. 1982	Recruiting of teaching staff and administrative personnel (18 persons), and installation of equipment. School opening scheduled for the middle of the fiscal year.
F. Y. 1983-1985	*Continued expansion*

(6) Qualifications & Number of Trainees, Training Period

Qualifications: fishery managers aged 18 or above.

Training period: three months per term, with three terms per year. Number of trainees: The plan calls for training 20 trainees per term or an annual total of 60 persons.

(7) Curriculum of Training

Use of fishing gear and fishing methods, navigation and seamanship, fishing boats and engines, methods for handling fish, communication, fishing machinery; lectures, onshore practice and seafaring.

(8) Training Schedule

(i) Weekly Timetable

Curriculum	Lecture (hours)	Practical (hours)
Fishing gear and fishing methods	4.5	4.5
Navigation and seamanship	4	4.5
Engines	2	2.5
Internal combustion engine	2	2.5
Methods for handling fish	2	-
Auxiliary engines	2	-
Freezing and cold storage	2	-
Fish biology	2	-
Weekly total hours	20.5	14.0
Three month total hours	20.5 x 7 weeks = 143.5	14 x 7 weeks = 98

(As supplement to lectures, films on fishing will be shown).

(ii) Three Month Training Course Program

First month	First week	Orientation
		Lecture and practice
	Second week	Practice at sea

Second month	Fourth week	Lecture and practice
	Seventh week	Lecture and practice
	Eighth week	Fisheries investigation (field survey)
Third month	Ninth week	Practice at sea
	Tenth week	Fishing practice
	Eleventh week	
	Twelfth week	Final lecture and practice
		Commencement

(9) Planned Initial Budget (appropriated for 1981-1985 per Fourth Malaysia Plan)

(i)	Budget for construction costs	1,182,000 M$
(ii)	Budget for operating expenses	970,000
	Total	2,152,000 M$

Upon the above mentioned background the State Government has requested the Government of Japan to provide a grant for a Fisheries Research and Training Vessel to carrying out the Fisheries Research and Training Project.

CHAPTER 2

OUTLINE OF SURVEY

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2-1 Purpose of Survey

On the basis of the request of the Government of Malaysia, the Survey Team would conduct field surveys and attempt to gain a perspective of the current fisheries situation in Sabah State, confer with Malaysia's Federal Economic Planning Unit (E.P.U.), Sabah State Economic Planning Unit (S.E.P.U.), Department of Fisheries of the Sabah State Ministry of Agriculture and Fisheries Development and other authorities concerned regarding the grant of a Fisheries Research and Training Vessel requested by their Government, and develop understanding on the background and circumstances of the project and its specific contents as well as confirmation of the agency responsible for its implementation, operation, maintenance and custody of the vessel and the assurance of securing the necessary budget for its operating expenses.

On the basis of the results of above, the Survey Team would clearly define the appropriate scale, rigging and equipment, building cost and construction schedule of the Fisheries Research and Training Vessel and, at the same time, review its role and the effects on the Fisheries Development Program of Sabah State, and thereupon prepare the basic design survey report.

2-2 Policy of Survey

With due regard to the request of the Malaysian Government and the purpose and background of the Survey undertaken, the Survey works have been carried out in accordance with the following basic policies:

1) The contents of discussion and the intent of the Malaysian Government authorities shall be thoroughly digested, especially with respect to the contents of the Labuan Fisheries Training School Project in connection with the fisheries promotion and development program and the need for the requested economic cooperation in the form of a grant and its appropriateness will be examined upon rendering overall judgement on the findings of the Survey Team.

2) If the Survey Team is convinced that the grant of the Fisheries Research and Training Vessel will effectively contribute to the development of fisheries in Sabah State and can justifiably be regarded as establishing a basic foundation for fisheries development, the specific contents of the grant shall be thoroughly discussed with the Malaysian authorities concerned, the cooperation program be drafted and presented to them for their agreement.

3) In drafting the construction schedule of the Fisheries Research and Training Vessel, particular care shall be given to the following points when determining the principal particulars to be discussed, the basic conditions for specifications of the hull and the design of the vessel.

(1) Hull Part

The conditions of the waters in which research and training will be carried out shall be determined by ascertaining the current status and future propects of fisheries development of Sabah State such as fish species to be exploited, fishing methods, priority waters to be developed, contents of the training program, etc., and thereupon a hull with the highest safety and stability shall be selected.

(2) Machinery Part

Although main engine output directly affects fish catch to a large degree, the size of the engine for the subject vessel shall be the required minimum in view of the fact that it is a training vessel and therefore should be easy to handle and allow for as much space as possible in the engine room for the convenience of practical training.

(3) Fishing Gear and Equipment

Being a training vessel, it requires the mounting of various implements and machinery required for actual training in various fishing methods. This tends to cause some strain in the design and arrangement of the equipment, resulting in a reduction of the training effect and increasing the chances of accidents on board the vessel. Top priority, therefore, must be placed on safety.

Also, the fishing apparatus to be installed on the boat shall be suitable for local fishermen, their conventional fishing boats, fishing gear and fishing methods but also suitable for training in modern fishing methods that will set the foundation for future development of the fishing industry.

(4) Fish Finding Apparatus, Navigational Apparatus, Oceanographic Observation Apparatus, etc.

In selecting the apparatus and equipment, consideration must be given to the local conditions so that equipment that are easiest to handle, upkeep and control may be selected.

(5) Fish Storing Facilities

Although fish holds of reasonable size will be necessary for training in preservation of freshness, it has been decided that no onboard freezing system will be installed.

(6) Living Quarters, Onboard Accommodations and Facilities

Being a training vessel, it must provide space for a large number of crew and trainees to live in and, depending on how these spaces are arranged, the strength of the hull may be affected. Also, the living accommodations and details of other facilities must be systematically studied taking into account especially such aspects as the living style and customs of the local crew and trainees and the differences in their religious beliefs.

(7) Investigation and Survey Facilities

The vessel shall be capable of making oceanographic observations that have direct bearing on fisheries and accordingly facilities for collection of sea water samples, measurements of temperature, current and transparency of sea water, determination of sea water color, depth and sea bottom materials, chemical analysis of sea water and collection of marine life specimen, etc. and also research laboratories shall be provided.

4) The Survey Team has examined the necessary factors for designing the Research and Training Vessel with due consideration to the essentials enumerated above, rendered systematic overall judgement, and drafted an optimum plan for the project.

2-3 Organization of the Survey Team and Survey Schedule Itinerary

In conducting the field survey, a four-member Survey Team was organized with Mr. Takashi Yamamoto acting as Team Leader. The field survey was conducted for 21 days from August 9 to August 29, 1981.

Organization of the Survey Team, survey itinerary a brief description of major activities and the list of Malaysian personnel concerned are shown in the tables attached at the end of this report.

CHAPTER 3

BASIC DESIGN

CHAPTER 3

BASIC DESIGN

3-1 Basic Policy

It is most desirable that the granting of the equipment and materials requested for will effectively aid in implementation of the Fisheries Research and Training Project and lay the foundation for future fisheries development in Sabah State.

For this purpose, the Survey Team and the concerned personnel of the Department of Fisheries of Sabah State, the agency responsible for implementation of the project, have fully discussed relevant matters, the results of which are the following requests made by the Malaysian authorities concerned.

(1) The Fisheries Research and Training Vessel shall be about 65 to 70 feet in overall length to conform to the actual circumstances of fisheries in Sabah State. It must be equipped with functional capabilities for offshore fishing operations and oceanographic survey and be feasible both technically and economically for the Department of Fisheries itself to operate, maintain and control.

(2) The hull material shall be FRP for easy maintenance.

(3) The vessel shall be of a multi-purpose design with fishing gear capable of being used mainly for trawl and purse seine fishing.

(4) As for complement, the vessel shall accommodate 10 trainees and four crew members, totalling 14 persons.

(5) The waters for fishing operations and marine research shall be within 70 nautical miles off the coast of Sabah State, and the vessel shall be capable of crusing for four consecutive days covering a 700 nautical mile sailing range.

(6) The vessel shall be equipped with facilities for oceanographic survey.

(7) Maximum speed of the vessel shall be 11 knots.

(8) The vessel shall be equipped with observation apparatus, fishing gear and video educational aids necessary for survey and practical training (onboard apprenticeship)

As a result of reviewing the basic requirements proposed, the Survey Team has taken special note of the following two points in its basic policy.

(1) Work out the basic design upon further review of the functions and equipment that are considered necessary for the Fisheries Research and Training Vessel with due respect to the basic requirements proposed by the Department of Fisheries, Sabah State.

(2) Design the vessel to be 70 feet in principle in order to satisfy the basic requirements with adequate consideration to safety and stability. The vessel must also be designed with the required functions and fittings and the necessary materials and supplies.

3-2 Fisheries Research and Training Vessel

3-2-1 Basic Plan

1) Purpose

This vessel shall be planned as a fisheries research and training vessel for the purposes of survey and investigation relating to fish stocks in the coastal waters of Sabah State, exploratory test and survey of fishing grounds, fishing gear, and fishing methods as well as for various training activities such as fishing techniques, navigation and seamanship, technologies for handling, overhauling and repairing marine engines, equipment and fishing gear in order to qualitatively upgrade the skills of fishermen of Sabah State.

2) Duties to be Performed by the Vessel

Being a research and training vessel, it shall be capable of performing the following duties:

(1) Investigation and survey

i) Oceanographic observation

ii) Sampling of roe, fingerling and plankton

iii) Sampling of seawater and bottom sediment for environmental investigation of fishing grounds

iv) Exploratory survey of fishing grounds (fishing survey)

(2) Fisheries training

i) Purse seine fishing

ii) Trawl fishing

iii) Long line fishing

iv) Squid fishing

v) Troll fishing

3) Style of Vessel

To adequately satisfy the various performance requirements requested by the Department of Fisheries, Sabah State, the vessel was theoretically supposed to be about 23.0 m (75.5 feet) in length, but in order to comply with their particular request on length being between 65 and 70 feet long, the Survey Team has made studies on the basis of a maximum permissible length of 70 feet. The result is that the vessel would have to be of a "chubby" style with a small L/B ratio. As the vessel is to have aboard 10 trainees who are unaccustomed to the high seas, the vessel shall be a long, forecastle deck type for greater safety, stability and comfort.

4) Living Quarters

Bunks for a total of 14 persons - four crew members and 10 trainees - shall be furnished. Also, because of the tropical climate, an air conditioning system shall be installed and adequate attention shall be paid to ventilation for the health of crew members and trainees.

5) Apparatus and Equipment to be Mounted

Adequate spare parts and supplies (sufficient for two years) shall be supplied for the apparatus and equipment to be mounted on the vessel. The apparatus and equipment shall be as simple in structural design as possible so that adequate and prompt repair work may be locally executed.

3-2-2 Studies to Determine Principal Particulars

The principal particulars suggested initially by the Sabah Fisheries Department were:

L (O.A.) = 20.55 m

B (O.A.) = 4.30 m

B (REG) = 3.88 m

D (MLD) = 1.60 m

However, use of the suggested L x B x D for both purse seine fishing and trawl fishing is difficult, and particularly with respect to purse seine fishing, we consider it advisable to widen the beam for greater safety.

Also, with the suggested L x B x D, it is impossible to secure living quarters for a complement of 14 persons.

The team, therefore, upon carefully study, has decided to recommend the following:

(1) Length

The overall length of the vessel, by adopting the largest value of the initially requested range of 65 feet to 70 feet, shall be approximately 21.50 m.

(2) Beam

With the consideration to operating safety during manipulation of purse seines and for securing adequate living quarters for 10 trainees, the breadth shall be approximately 5.80 m.

(3) Depth

The shallower the draught the better in view of the current condition of Port Labuan which is scheduled to become the home base of this vessel but for the living comfort of the crew and the safety of engine overhaul and other training in the engine room, the depth shall be approximately 2.35 m.

(4) Main Engine Output

To satisfy the request for maximum speed of 11 knots at the time of official test cruise, engine output must be at least 450 Hp or thereabouts from the L/B ratio of this vessel.

The ratios between each of the above principal particulars are as follows, all of which comply with the safety performance standards for powered fishing boats (purse seiner) of Japan:

L (overall) = approximately 21.50 m

L (between perpendiculars) = approximately 18.00 m

B (moulded) = approximately 5.80 m

D (") = " 2.35 m

L/B = 3.10 (performance standard : less than 4.60)

L/D = 7.66 (performance standard : less than 11.20)

B/D = 2.47 (performance standard : 2.10 or above but below 2.90)

As a result of thorough study as above, the principal particulars of this vessel were determined as follows and the basic design worked out accordingly:

3-2-3 Principal Particulars

1) Hull Part

Length (overall)	about 21.50 m
Length (between p.p.)	" 18.50 m
Breadth (Moulded)	" 5.80 m
Depth (moulded)	" 2.35 m
Draft (designed)	" 2.00 m
Grass Tonnage (by Japanese rule)	about 70 ton
Speed (trial max. speed)	about 11 knots
Cruising range	about 1,300 miles
Capacity of fish hold	about 8.00 m^3
Capacity of ice hold	" 3.00 m^3
Capacity of fuel oil tank	" 12.00 m^3
Capacity of fresh water tank	" 8.00 m^3
Complement (officers)	4 persons
Complement (cadets)	10 persons
Complement (total)	14 persons

(1) Deck Machinery

a. Steering gear (electro-hydrualic system, with automatic steering) 1 set

b. Bow capstan (hydraulic system) 2 ton x 30 m/min. 1 set

c. Boom winch (hydraulic system) 1 ton x 30 m/min. 1 set

(2) Fishing Gears (Hydraulic system)

a. Combination winch 1 set

main drum	1.5 ton x 60 m/min.
foreward drum	1.5 ton x 60 m/min.

b. Tow line winch 1.0 ton x 40 m/min. 1 set

c. Topping winch 2.0 ton x 30 m/min. 2 sets

d.	Vang winch	1.0 ton x 30 m/min.	2 sets
e.	Power block	2.0 ton x 40 m/min.	1 set
f.	Purse davit (hydraulic hinged type)		1 set
g.	Line hauler (electro-hydraulic system)		
h.	Gallows (hinged type, starboard side gallows to be removable)		1 set
i.	Squid fishing gears (hand operated and removable)		5 sets
j.	Skiff boat (F.R.P.)		1 set

Length (O.A.) about 6.00 m
Breadth (MLD) " 2.50 m
Depth (MLD) " 1.15 m
Main engine " 60 P.S.
Generator 5.0 kW
Fish finder (portable)

k.	Tender boat (F.R.P.)		1 set

Length (O.A.) about 5.50 m
Breadth (MLD) " 1.65 m
Depth (MLD) " 0.68 m
Outboard engine " 25 P.S.

(3) Nautical Equipment and Radio Equipment

a.	Magnetic compass (set in steering stand. with magnetic compass pilot)	1 set
b.	Clear view screen (250 mmø center motor type)	1 set
c.	Radio direction finder (190 Hz - 3,300 Hz)	1 set
d.	Radar (7 inches 10 kW range of not less than 48 miles)	1 set
e.	Fish finder (2 wave, recording type)	1 set
f.	Color fish finder	1 set
g.	Net watching apparatus (net sonde 1 point system)	1 set
h.	Searchlight sonar	1 set

i. SSB radio telephone 1 set

j. VHF radio telephone 1 set

k. SOS radio buoy 1 set

l. Public addressor (output 30 W, with speaker) 1 set

(4) Oceanographical Equipment and Research Equipment

(referred to 3-4).

(5) Fishing Equipment and Training Equipment

(referred to 3-3).

(6) Other Equipment

a. Life saving appliances

(Requirements by the Japanese Special Rules of the 3rd Class Fishing Vessel)
Inflatable life raft 15 persons x 2 sets
and other necessary equipments

b. Fire extinguishing appliance

(Requirements by the Japanese Special Rules of the 3rd Class Fishing Vessel)
Portable fire extinguisher, fire hydrant, fire hose and nozzle, and other necessary equipments

c. Mechanical ventilation

Engine room (axial ventilator) 1.5 kW x 2
Galley (") 0.4 kW x 2

d. Air conditioning unit (automatic)

Not less than 14,000 kCal/Hr x 3.7 kW 1 set

e. Principal equipments in galley

Gas rice cooker, gas range, sink and cooking table, electric refrigerator, gas water boiler, cooking utensil.

f. Principal equipment in laboratory

Dry table, wet table, sink, electric refrigerator, and others.

2) Machinery Part

(1) Main Engine

Main engine	:	4-cycle diesel engine 1 set
Output	:	Not less than 450 P.S.
Revolution	:	1,850 RPM and under
Reduction gear		

(2) Shafting

Propeller shaft	:	Class 1
Propeller	:	3 blade fixed pitch type
Intermediate shaft		
Stern tube	:	Sea water forced cooling system

(3) Generator Engine

Generator engine	:	4-cycle diesel engine 2 sets
Output	:	Not less than 62 P.S.
Revolution	:	1,500 RPM and under
Generator	:	50 kVA

(4) Air Compressor and Air Reservoir

Main air compressor	:	Sea water cooled, 2-stage compression type 1 set
		9 m^3/Hr x 30 kg/cm^2
		2.2 kW motor driven

Emergency air compressor	:	Sea water cooled, 2-stage compression type 3 P.S. diesel engine driven	1 set
Air resevoir	:	30 kg/cm^2 45 ℓ	1 set

(5) Pumps

a. *General service and fire pump* 1 set
30 m^3/Hr x 18 m x 3.7 kW motor driven

b. Bilge pump 1 set
5 m^3/Hr x 20 m x 1.5 kW motor driven

c. Fresh water transfer pump 1 set
3 m^3/Hr x 15 m x 0.75 kW motor driven

d. Fresh water service pump 1 set
1.2 m^3/Hr x 15 m x 0.4 kW motor driven

e. Sanitary pump 1 set
5 m^3/Hr x 20 m 1.5 kW motor driven

f. Fuel oil transfer and service pump 1 set
2.5 m^3/Hr x 15 m 0.75 kW motor driven

g. Portable bilge pump (under water type) 1 set
5 m^3/Hr x 20 m 0.75 kW motor driven

(6) Hydraulic Pump and Driving System 1 set

Hydraulic pump
Flexible coupling and clutch
Increasing gear

(7) Spares of Machinery Part

Two year's supply of the Builder's or Maker's standards.

3) Electric Part

(1) Main Generator — 1 set

3 ø A.C. drip-proof and self-excited type

A.C. 445 V x 3 ø x 50 Hz x 50 kVA x 1,500 RPM

(2) Auxiliary Generator — 1 set

3 ø A.C. drip-proof and self-excited type

A.C. 445 V x 3 ø x 50 Hz x 50 kVA x 1,500 RPM

(3) Transformer

445 V/220 V 1 ø 50 Hz

(4) Storage Battery

For emergency light 24 V 200 AH — 1 set

For radio equipment 24 V 200 AH — 2 sets

(5) Main Switchboard

Self-supported and dead front type

Main source 50 kVA + Auxiliary source 50 kVA + Shore source — 1 set

(6) Silicon Rectifier

Input : AC 445 V 3 ø 50 Hz

Output: DC 22 V - 35 V

(7) Lighting Device — 1 set

Searchlight 1 kW (Remote controle type)

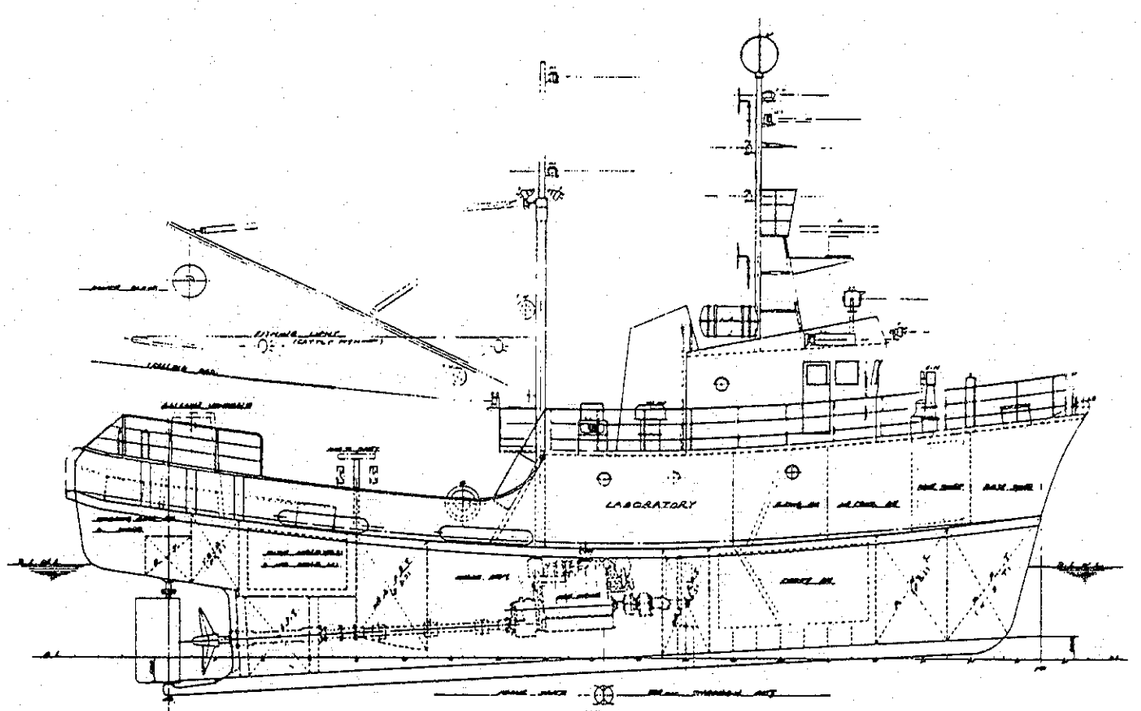
Other necessary device

3-2-4 General Arrangement Plan

The General Arrangement Plan of Project Vessel, Skiff boat and Tender boat are as shown in the plan below.

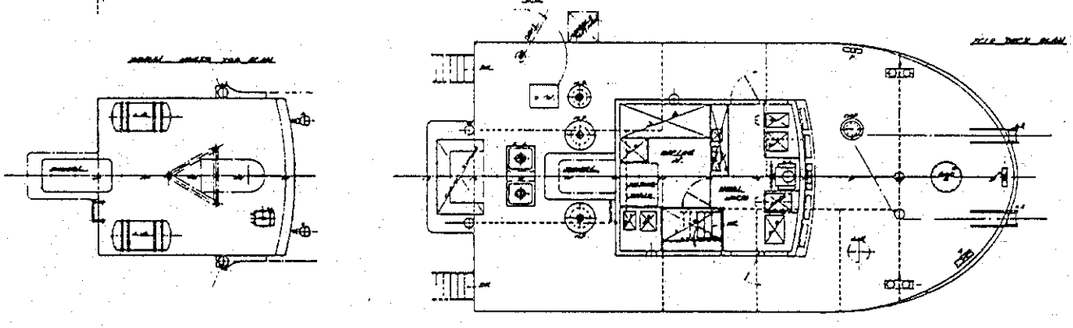
GENERAL ARRANGEMENT F.R.P. FISHERIES

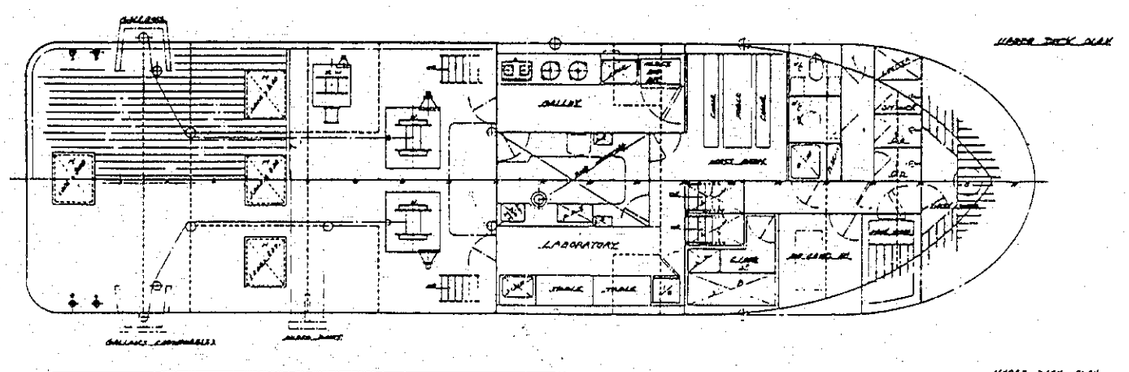
RESEARCH AND TRAINING VESSEL

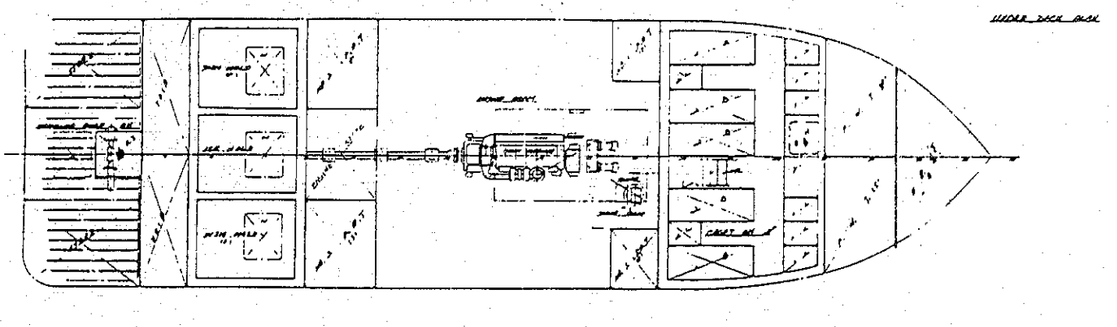


PRINCIPAL PARTICULARS:

LENGTH	(O.A.)	32
	(B.P.)	28.0
BREADTH	(MLD.)	7.00
DEPTH	(MLD.)	3.15
DRAFT	(MOULDED)	1.80
GROSS TONNAGE	(NO.)	99
		33
SPEED	(K.)	11
COMPLEMENT		9
CAPACITY	(MAIN HOLD) (CU.)	6
	(FISH HOLD) (CU.)	11
	(BUNKER)	4
	(F.W.)	1





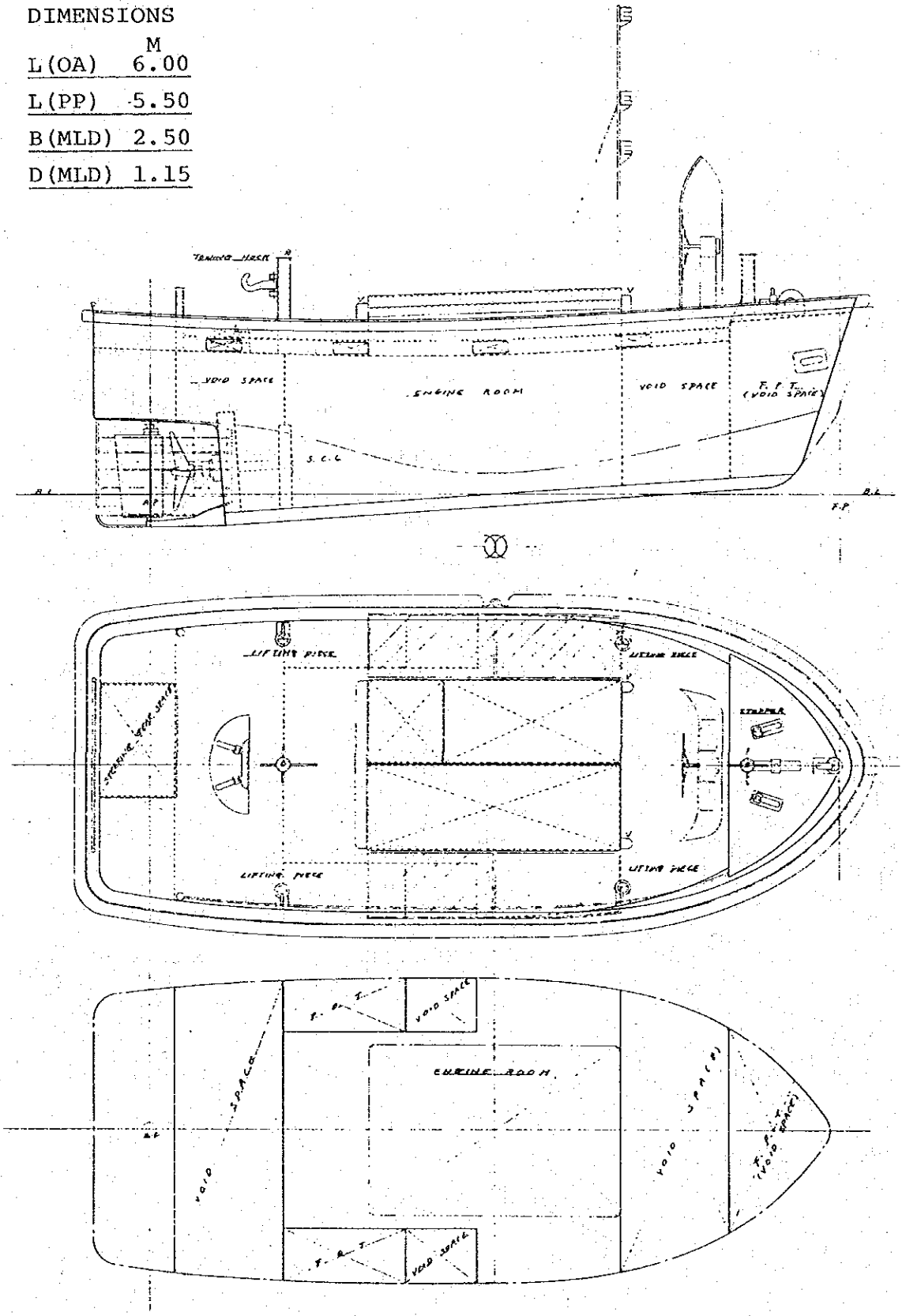


GENERAL ARRANGEMENT OF

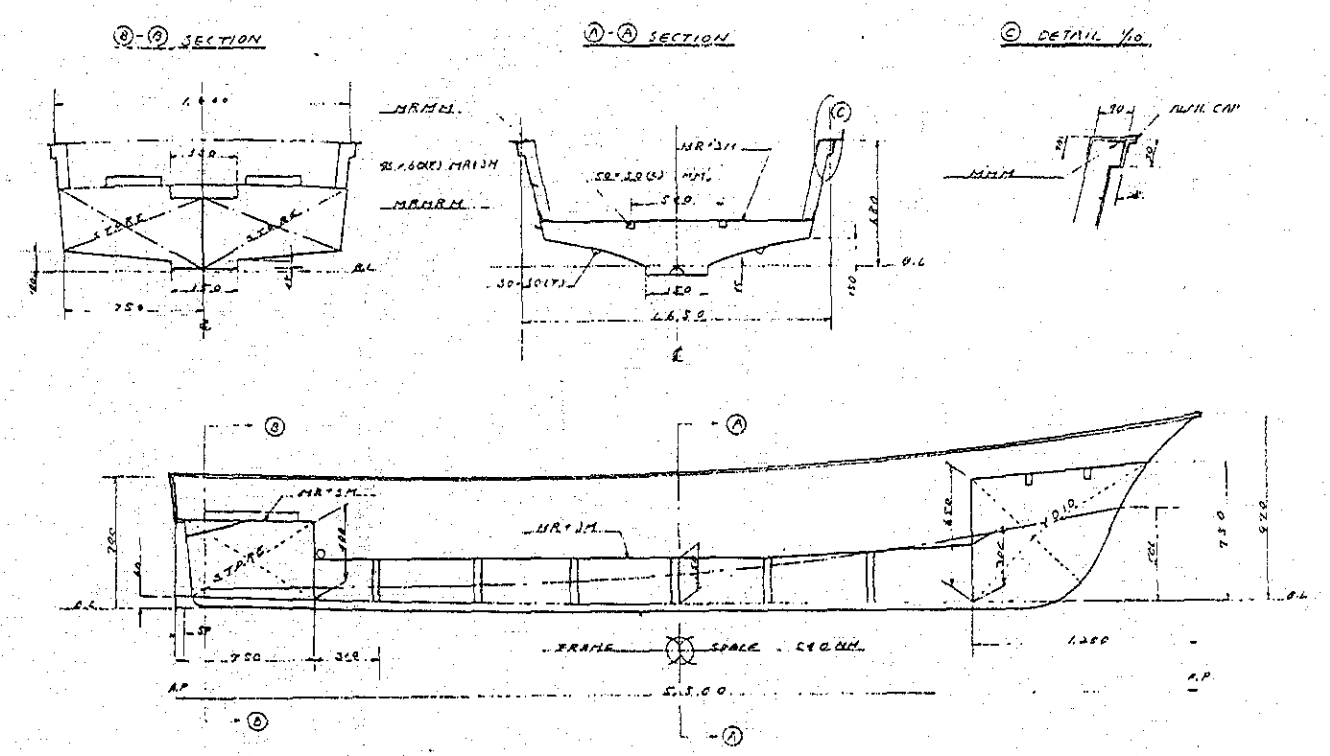
F.R.P. SKIFF BOAT

DIMENSIONS

	M
L(OA)	6.00
L(PP)	5.50
B(MLD)	2.50
D(MLD)	1.15



GENERAL ARRANGEMENT OF F.R.P. TENDER BOAT



3-3 Training Equipments

3-3-1 Basic Plan

Materials and Equipments initially requested by the Malaysian Government include those which will be used for other object than this project but in this basic plan only fishing gears and audio-visual equipments for practical education of the Fisheries Research and Training Vessel are adopted.

In choosing fishing gear, modernized fishing methods and their fishing gears for exploitation of offshore fishery resources are considered so as to catch the resources effectively, beside trawling gear and purse seiner. Adopted fishing gears for this plan are as follows.

1. Fishing Gears (shown illustration below)

    1) Trawl Fishing Gears
    2) Purse Seine Gears
    3) Trolling Gears
    4) Tuna Long Lines
    5) Vertical Long Lines
    6) Bottom Long Lines
    7) Squid Jigging Gears
    8) Lobster Pots

2. Audio-visual Equipments

1) Video tape deck and T.V.

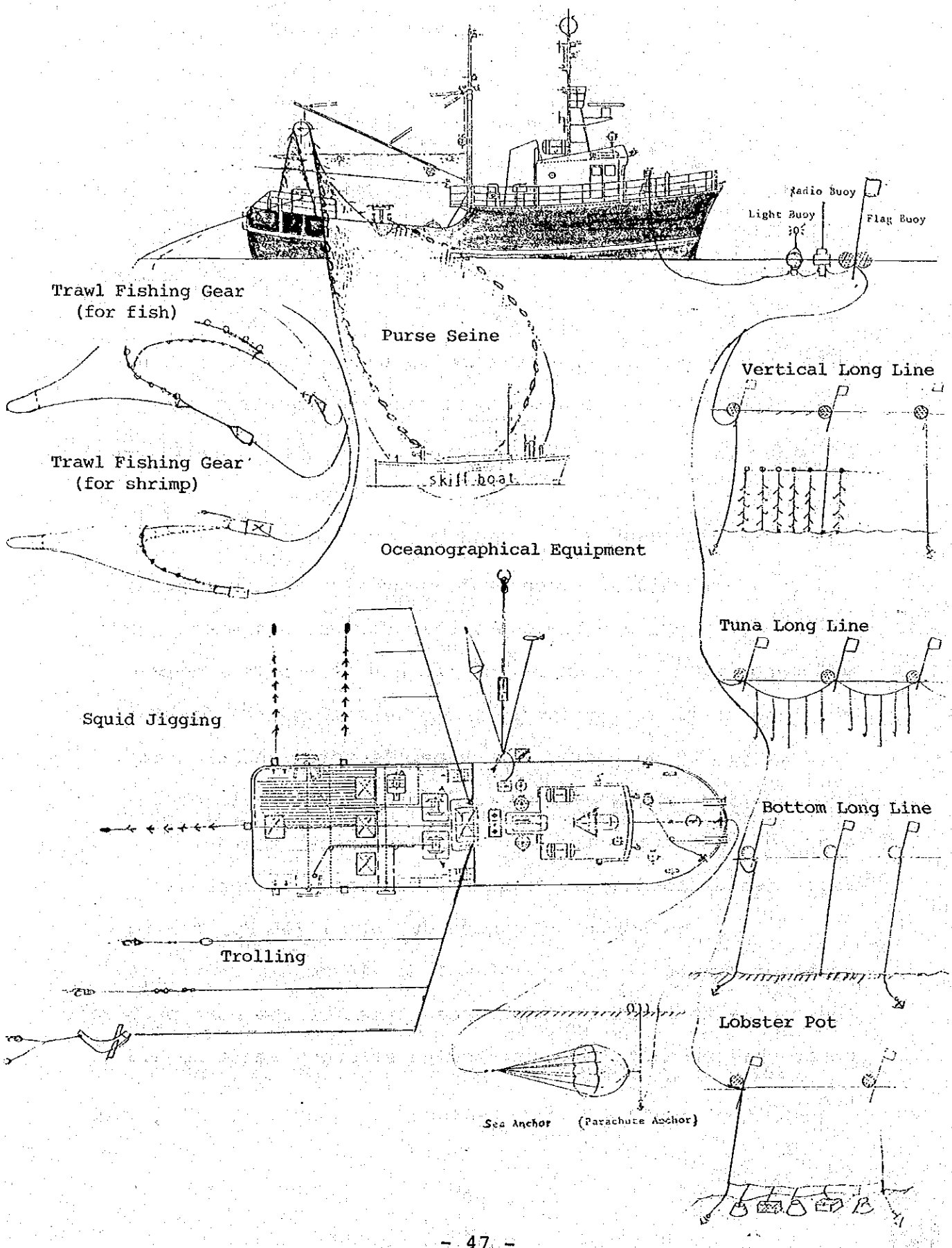
2) Slide projector

3) Movie projector

4) Over-head projector

ILLUSTRATION OF FISHING GEAR AND RESEARCH EQUIPMENT OPERATION

FOR FISHERIES RESEARCH AND TRAINING VESSEL



3-3-2 Technical Review for Determination of Principal Fishing Gear

For the fishing gear to be used for research and training, it was decided that a trawl net and purse seine net smaller than those used for commercial fishing should be adopted because the boat is a multi-purpose training vessel and its length limited, while adequate space must be secured for fishing operations.

To determine the scale of the principal fishing gear, the following studies were made on trawl and purse seine.

1) Trawl Fishing Gear

The towing strength of a trawler varies depending on the main engine horsepower, ship design, diameter, pitch and expanded area of propeller and also the ship's trim, so it is difficult to figure out the scale of the fishing gear simply by computing with these factors. Accordingly, the survey team has decided to determine the scale of the gear to be mounted on this boat by referring to the experimental formula of various researchers as follows:

If we assume an engine output of 450 Hp, towing speed of 3 knots, warp of 100 m long (16 mm diameter), and the engine to be of the high speed type for the boat proposed under this project, then the towing strength would be 2.3 tons.

In other words, fishing gear should be designed to have a total resistance of 2.3 tons. Further, this total resistance can be broken down as follows:

(1)	resistance of netting gear	2,110 kg
(2)	resistance of otter board	140 kg
(3)	resistance of warp	50 kg
	Total	2,300 kg

Although the scale of fishing gear for a trawler can be determined by the above trial calculations, it is desirable in the case of designing the fishing gear for this project vessel - because its main purpose is research and training rather than commercial fishing - to make its scale smaller at about 80% of the values calculated above.

2) Purse Seine Fishing Gear

(1) Determination of Length and Depth of Net

Purse Seiners can be broadly classified into those which are operated during the daytime and those during the night using fish lamps to attract schools of fish.

Because the schools of fish make swift horizontal moves during the daytime, the depth of the net is generally made shallower relative to the length of the buoy line so that the fish may be surrounded as rapidly as possible. In the case of nighttime operations, however, a net long

enough to surround a school of slow moving fish that have collected around the fish lamp will suffice. Accordingly, the length of the net at night may be made shorter than the one used in the daytime, but it is advisable that it be made deeper compared to its length since the majority of the fish remain at considerable depths although those on the top may be close to the water surface.

Whether there is any catchable school of fish in the sea areas of Sabah State for purse seine fishing in the daytime remains unknown, therefore, it seems advisable to adopt the system of collecting fish at night. As for the method for collecting them, the use of palm leaves, which is now prevalent on the Malaysian Peninsula, is unfit for deep seas. The use of the fish attracting lamps for nighttime operations is considered appropriate, and the ratio of the depth of the net (at the deepest part) to the length should be 17%.

(2) Determination of the Type and Construction of the Net

It is desirable to adopt the one-boat seine-type net with a buoy line longer than the foot rope by 10 to 15%.

(3) Determination of Netting Material

In this case, it is necessary to make the volume of the netting smaller because the fishing deck is small

and reduce its fluid resistance in view of the planned capacity of the fishing equipment, so that materials with goods dripping property and as less containment of water in the netting fiber and with the required strength will be considered for selection.

(4) Determination of Mesh Size and Gauge of Netting Cord

Generally speaking, the mesh size and gauge of the netting cord are determined by the fish species to be caught by the purse seine net and the fishing conditions. Assuming that the fish considered under this project are the families of horse mackerel and mackerel of above 20 cm in body length, a 38 mm mesh size seems appropriate. Because the frequency of use is not large and the volume of net must be reduced, slightly thinner netting cord will be considered for selection.

(5) Determination of Wieght of Purse Seine Fishing Gear

As the net must be stored in the cramped stern part because of the ship's style and the center of gravity of the net acts on the upper part of the hull because of the ship's structural design, the weight of the net, when wet, will be within the range of 4-5 tons.

3) Other Fishing Gear

Aside from trawl and purse seine fishing gear, there is no particular need to make the size of gear smaller than usual, but the quantities used in operation should be made less than the quantities used by commercial fishing vessels of comparable scale.

3-3-3 Description and Quantity

1. Trawl Fishing Gears

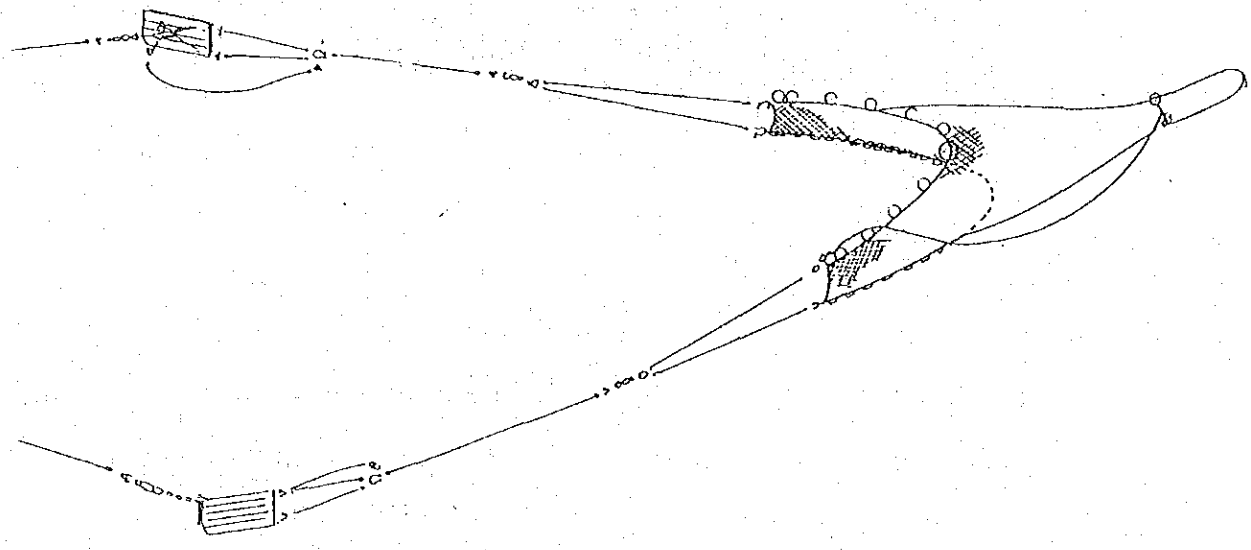
1) Trawl fishing gear consists of complete set, accessories and spare parts which are satisfied with the below-mentioned conditions:

(1) Object fish	:	Demersal fish and shrimp
(2) Fishing method	:	Stern trawler type
(3) Main engine power	:	about 450 P.S.
(4) Type of net	:	4-seam type for fish semi-baloon type for shrimp
(5) Net twine	:	Polyester twine 360-400 denier
(6) Fishing ground	:	Quality of bottom mud sand Depth; 50m - 150 m
(7) Otter board	:	Wooden otter board
(8) Trawling warp	:	Diameter 16 m/m 500 m
(9) Trawl winch	:	1.5 ton x 60 m/min x 2 dram

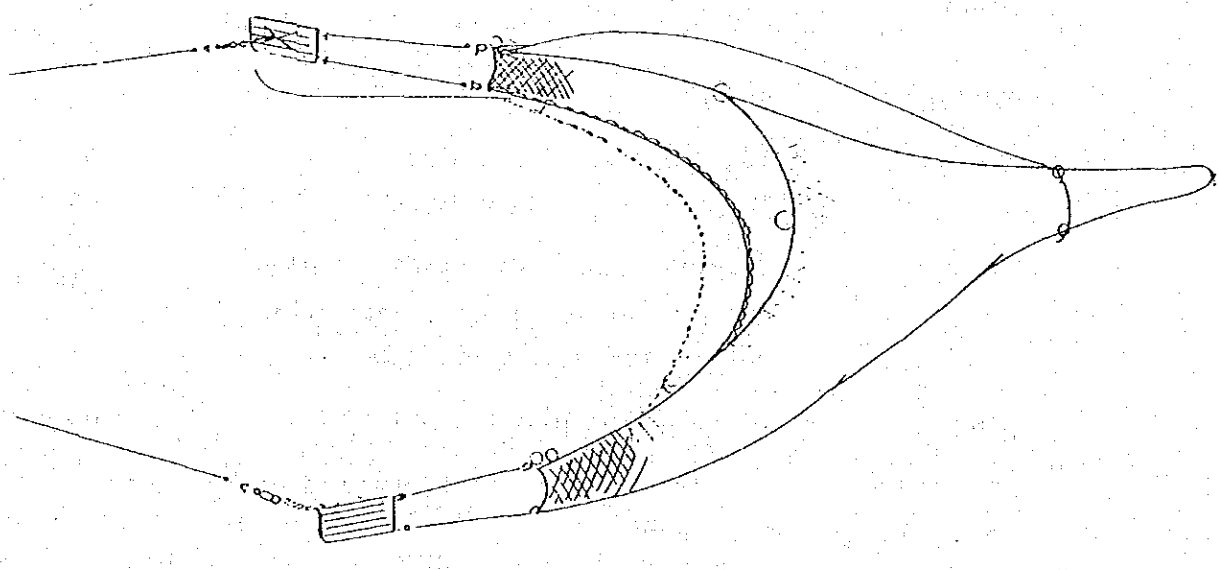
2) Specification and quantity

Item	Description	Quantity
Complete set	Bottom trawl net for fish, including accessories & warp	1 set
	For shrimp trawl net	1 set
Spare net	Net cut for making 1 complete set for fish	1 set
	Net cut for making 1 complete set for shrimp	1 set
	Spare net for main net 100 mD x 200 m	1 pc
	Spare net for cod net 100 mD x 50 m	1 pc
Mending twine	2.5 kg/coil Assorted	30 coils
Spare warp rope	16 m/m dia. 500 m/coil	2 coils
	Vinylon C.P.R. for ground rope	2 coils
	for head rope	2 coils
	Polyethylen rope Assorted	10 coils
	Vinylon rope Assorted	10 coils
Other board	spare	1 set
Shackle	6, 9, 13, 16	each 30 pcs
Swivel	16 m/m	30 pcs
Float	150 m/m dia. 500 m depth	60
	240 m/m dia. 500 m depth	60
Others	Netting needle, Band knife, Spike, Wire cutter, Fish hook, Rain coat, Helmet, Cotton gloves, Scoop	each 15 trainee
Fish box	Plastic fish pan, for 30, 50 kg	each 30 pcs

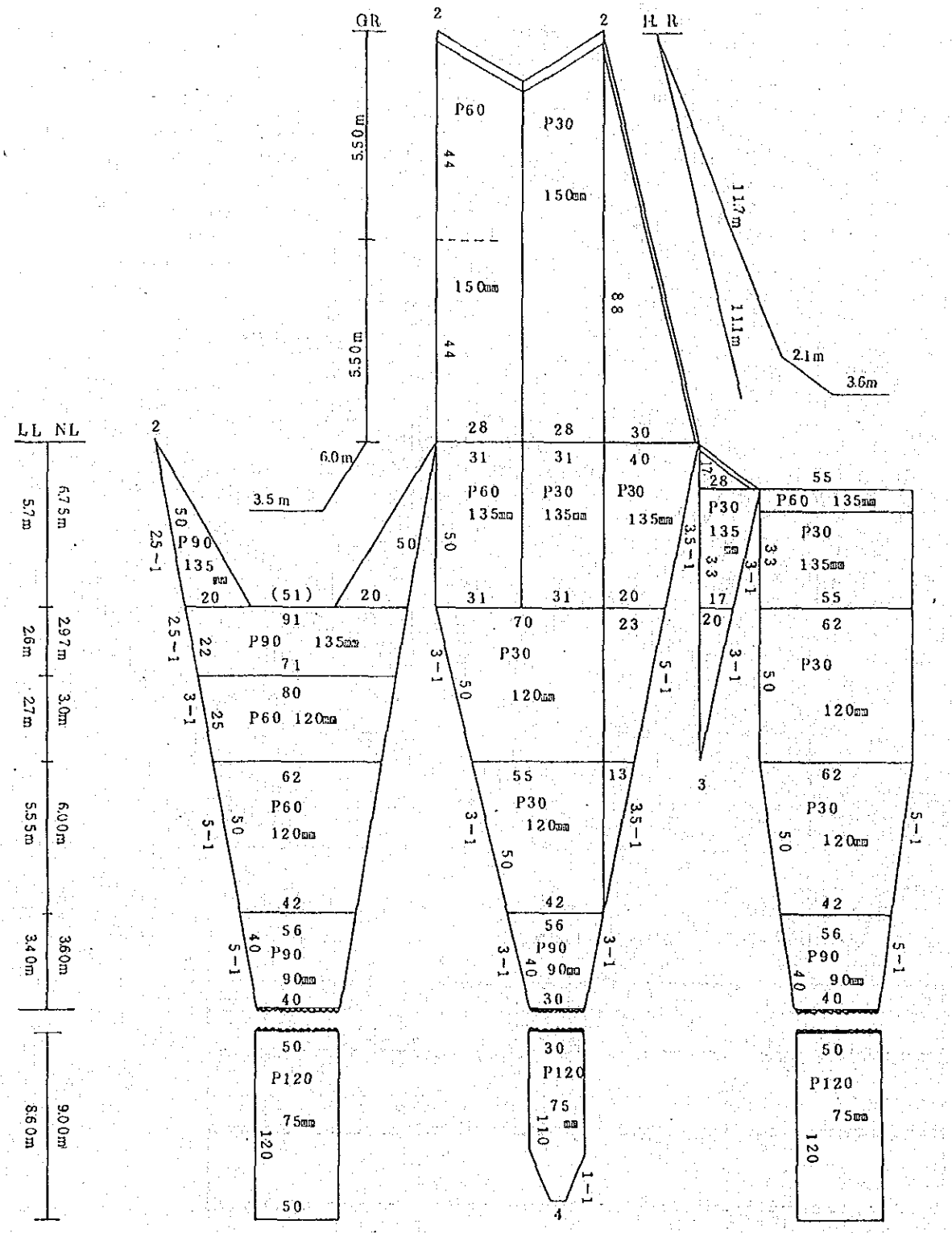
Gear Arrangement (for Fish)



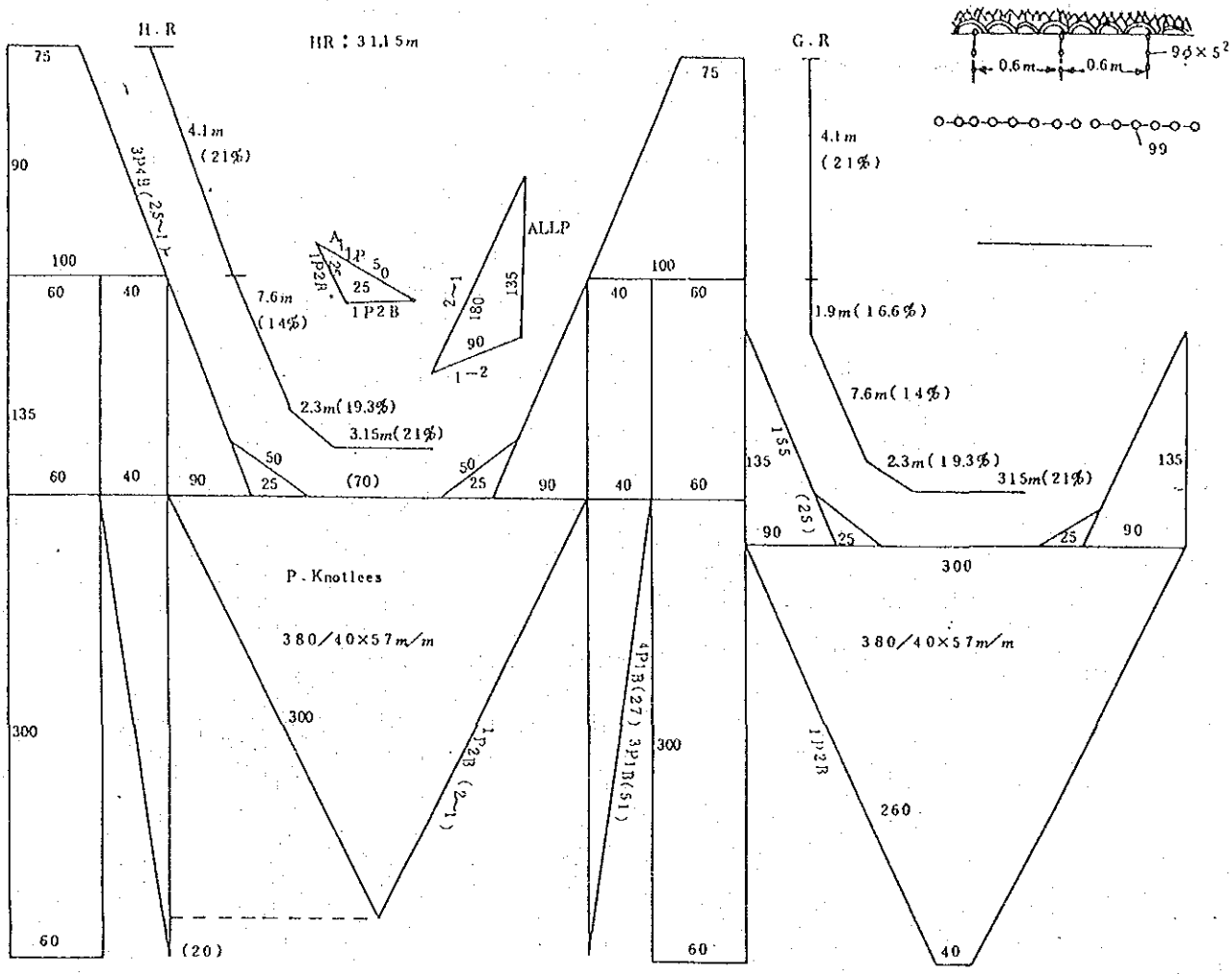
Gear Arrangement (for Shrimp)



Arrangement of Trawl Net (for Fish)

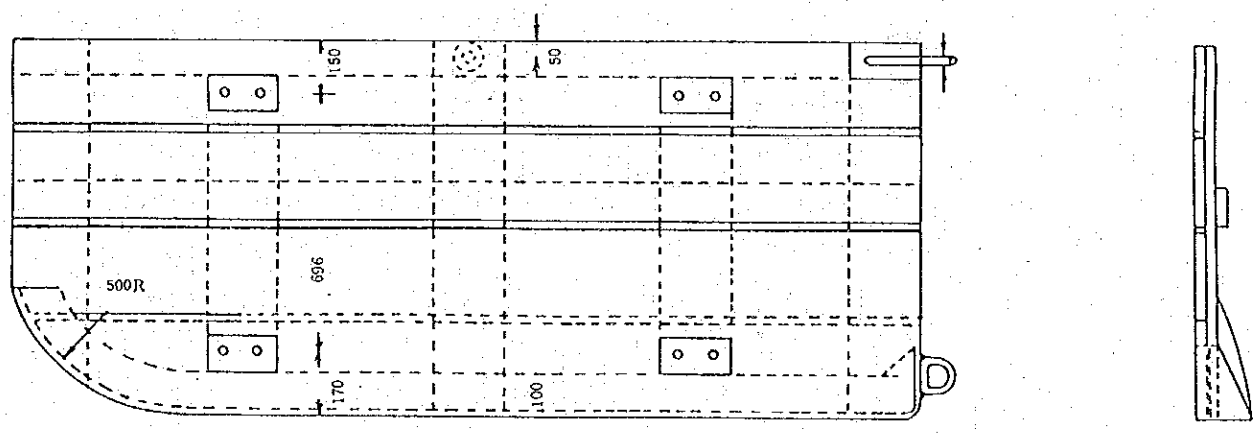


Arrangement of Trawl Net (for Shrimp)



200 E.K	125 E.K
200 P 380/72×45m/m cod end	125 P380/120×75m/m Protector net

Otter Board 2500m/m × 1,000m/m



2. Purse Seine Gears

1) Purse Seine fishing gear consists complete set, accessories and spare parts which are satisfied with the below-mentioned conditions;

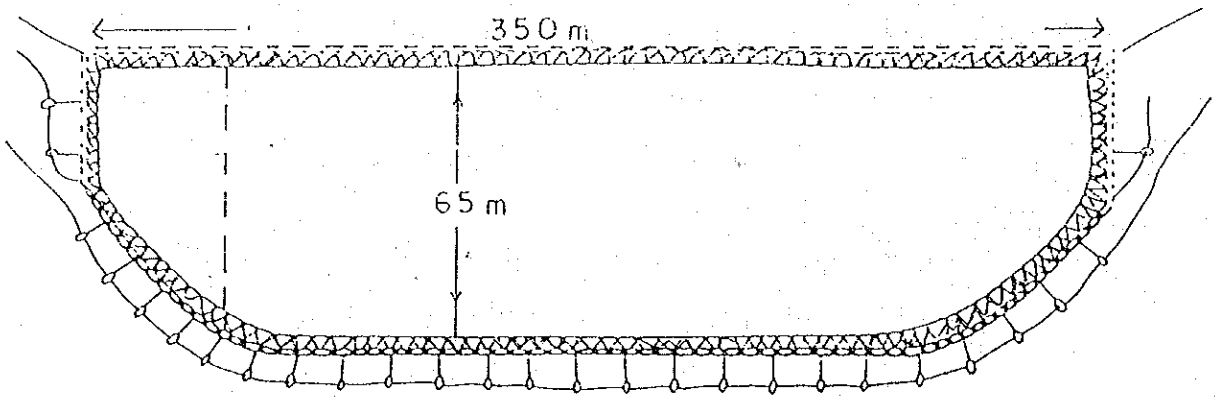
(1) Object fish	:	Pelagic fish (Mackerels, Jacks)
(2) Net length and depth	:	350 m x 60 - 70m
(3) Net type	:	One boat purse seiner type
(4) Net twine	:	Nylon twine (main net)
(5) Mesh size and No. of twine	:	Main net, 210 d/12-15 1-1/2' (38m/m)
		Cod end , 210 d/18 1-1/2' (38m/m)
(6) Hanging in	:	Main net 23-25%
		Cod-end 30%
(7) Purse wire	:	16 m/m dia
(8) Float	:	Synthetic float
(9) Sinker	:	Lead sinker

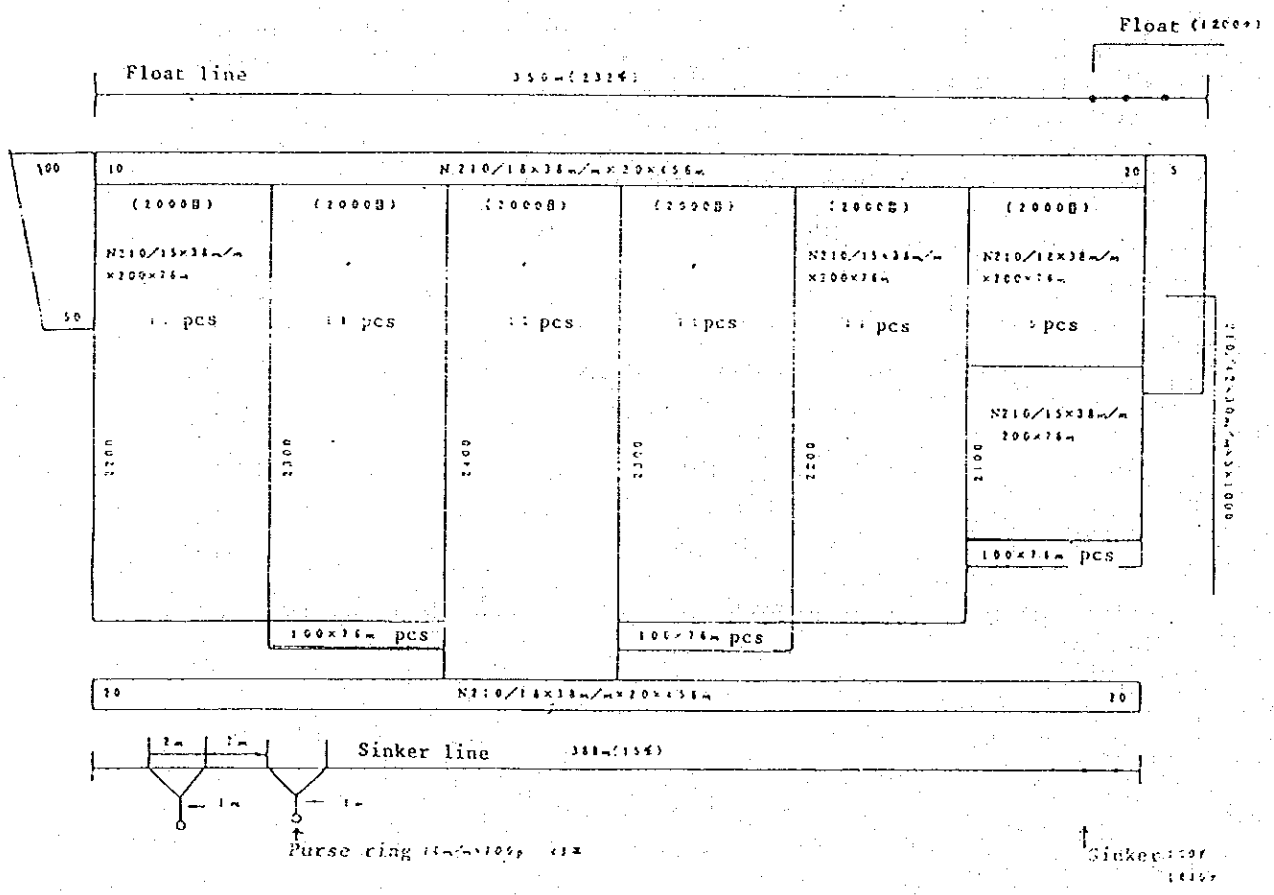
2) Specification, spare parts and quantity

As for reference material, specification, accessories and quantity shall be listed.

Item	Description	Quantity
Complete set	Length 350m, Depth 65m, Complete set	1 set
Spare net	Net cut for making 1 complete set	for 1 set
Accessories	Float, sinker, sinker rope, float rope, purse ring, ring rope, shackle, swivel, bridle rope, triangle, rope, wire	for 1/2 set
Mending twine	Assorted 2.5 kg/coil	30 coils
Netting needle, scissor		each 20 pcs
Underwater light	For skiff boat cord 30 m	1 set

Arrangement of Purse Seine Net





3. Trolling Gear

1) Trolling gear consists of complete set

Accessories and spare parts which are satisfied with the below-mentioned conditions:

(1) Object fish : Bonitos, Skipjacks, Spanish Mackerels, Small tuna

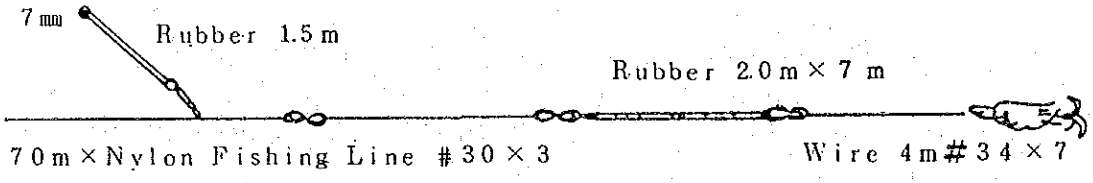
(2) Fishing method : 3 set trolling/pol

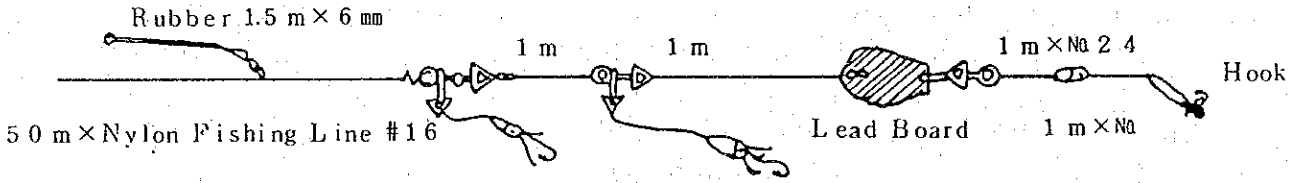
Trolling speed 4-5 knots

2) Specification, and quantity

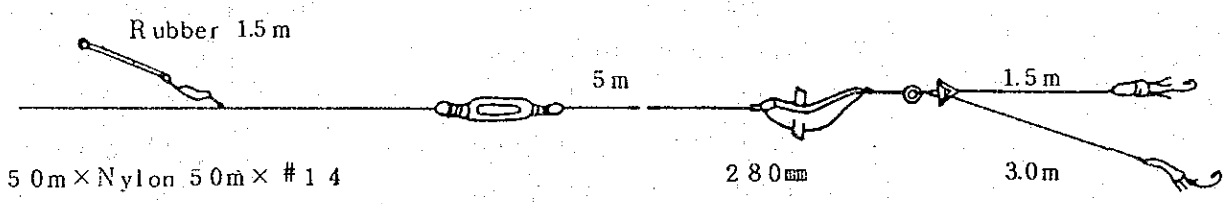
Item	Description	Quantity
Complete set	Trolling line 50 m	6 sets
Spare	Main line Nylon #40	500 m
	Sekiyama wire 100 m/coil	1 coil
	Swivel,	50 pcs
	Trolling board	10 pcs
	Article bait Octopus type	25 pcs
	Feather type	25 pcs
	Rubber 1.5 m	5 pcs
	2.0 m	5 pcs
	Trolling float	5 pcs

Arrangement of Trolling





Pearl Octobus



4. Tuna Long Lines Gear

1) Tuna Long Line gear consists of complete set, accessories and spare parts which are satisfied with the below-mentioned conditions;

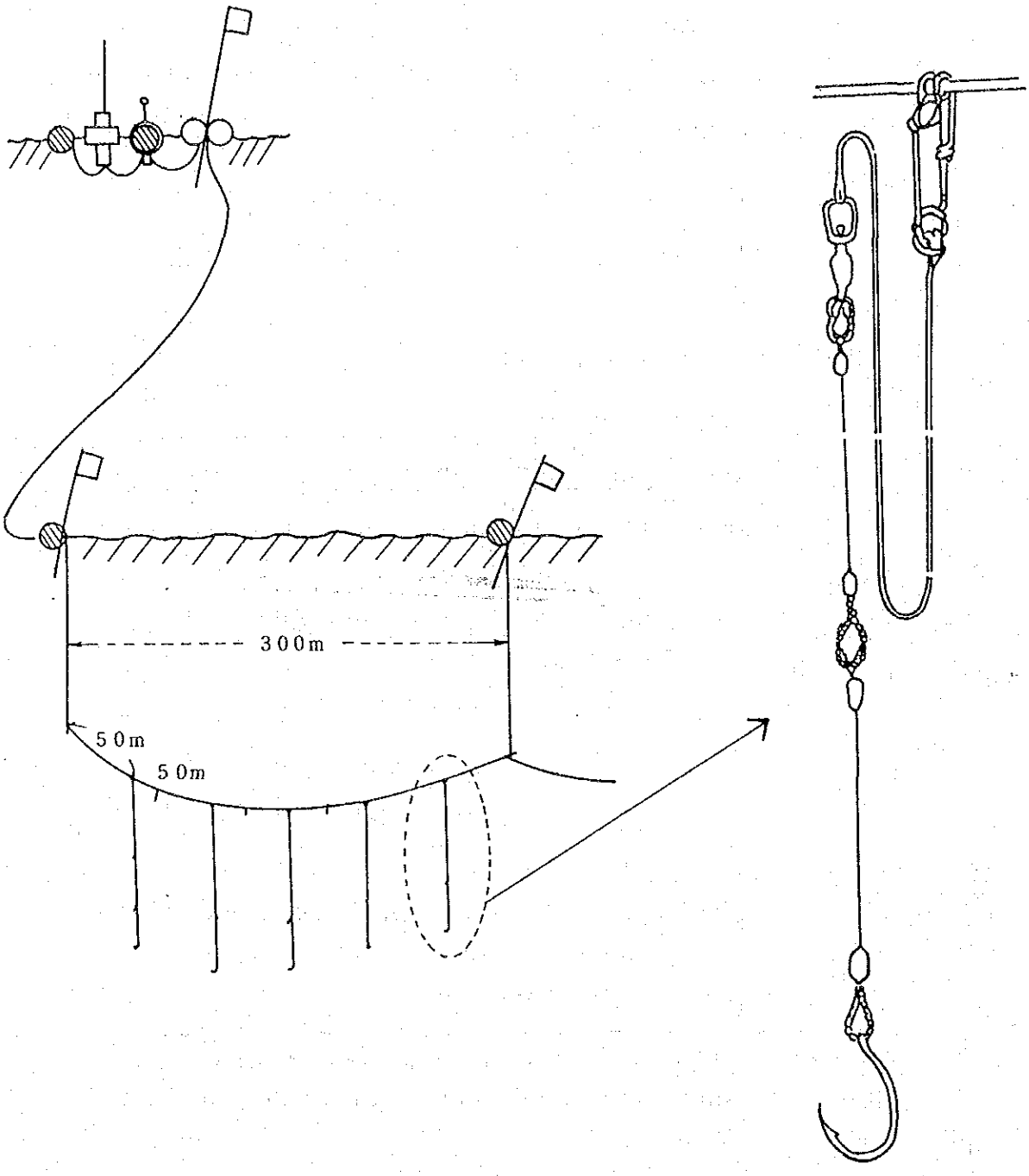
(1) Object fish : Yellowfin tuna, Big-eyed tuna

(2) Fishing method : Five hook, snap type for blanch line

2) Specification and quantity

Item	Description	Quantity
Complete set	Complete set for 5 branch line (line set only)	100 set
Accessories of spare	Float 300 m/m dia. Synthetic float	200 pcs
	Flog role FRP rod	150 pcs
	Light buoy Dry battery	4 sets
	Radio buoy Dry battery	2 sets
	Hook 3.4, 3.6 sun	each 250 pc
	Main line 55 m/pces	300 pces
	Float line 25 m/pces	1,100 m
	Hook wire 10 m/pces	2,500 m
	Sekiyama 12 m/pces	3,000 m
	Snap, sekiyama lock, pressure, spring for hook, swivel, spike	for 50 sets

Arrangement of Tuna Long Lines



5. Vertical Long Line Gear

1) Vertical Long Line gear consists of complete set, accessories and spare parts which are satisfied with the below-mentioned conditions:

(1) Object fish : Snapper, Grouper, Bream

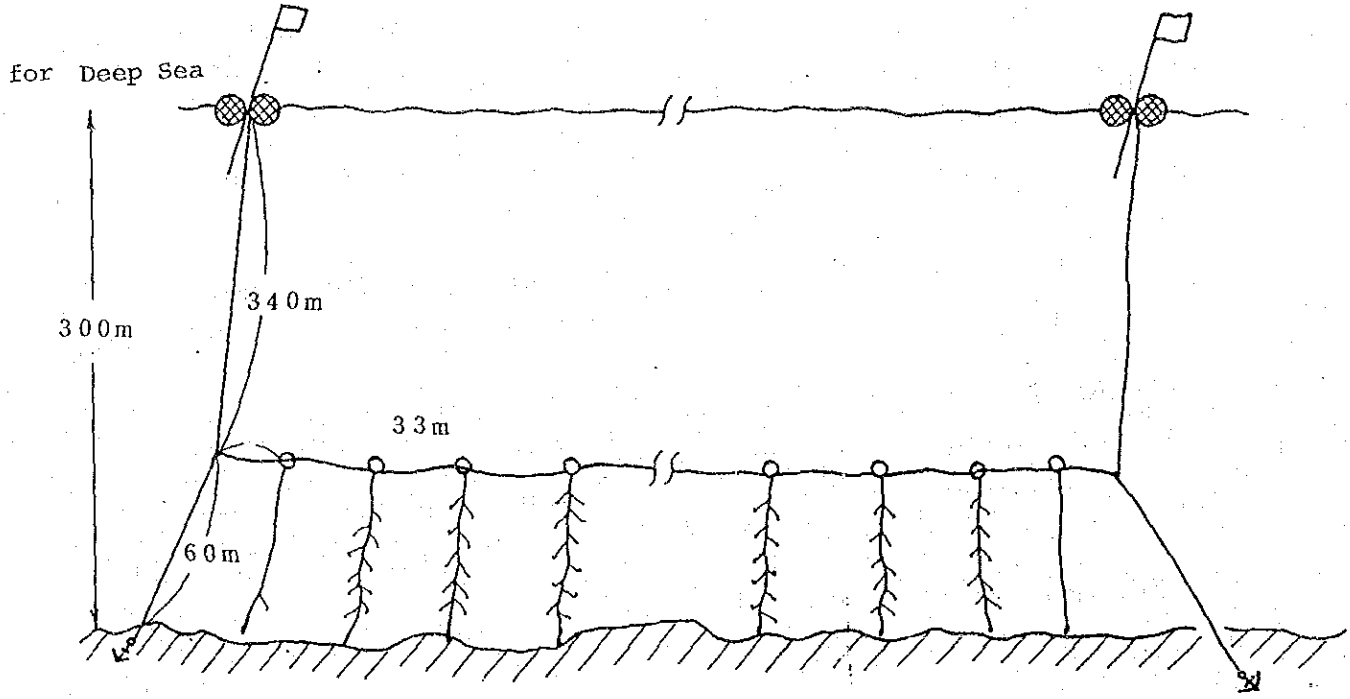
(2) Fishing method : Two types (see gear arrangement)

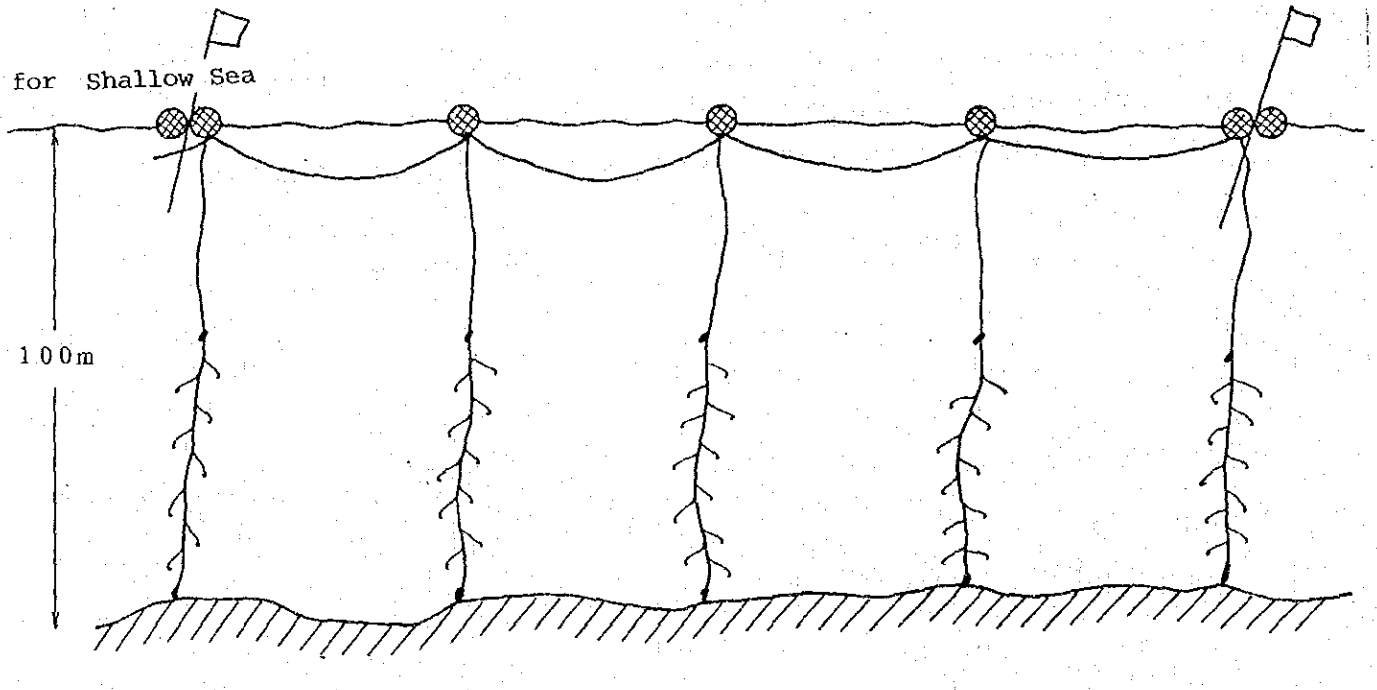
2) Specification and quantity

Item	Description	Quantity
Complete set	Branch line 20 pcs (20 hooks/branch)	1 set
Spare	Float line 8 m/m 200 m/coil	5 coils
	Anchor line 6 m/m 200 m/coil	1 coil
	Main line 8 m/m 200 m/coil	15 coils
	Branch line Polyester/Nylon #100 x 100m	20 coils
	Hook line Nylon #100 x 100m	5 coils
	Hook Mutsu type # 20, 25, 30	each 150 pcs
	Snap	100 pcs
	Sinker for branch line 1.5 kg/pcs	25 pcs
	Sinker for buoy line 1.5 kg/pcs	25 pcs
	3 way swivel	250 pcs

Accessories (float, float line, light buoy, radio buoy, flag pole) shall be used both as Tuna Long Line gears and Bottom Long Line.

Arrangement of Vertical Long Lines





6. Bottom Long Line Gear

1) Bottom Long Line gear consists of complete set, accessories and spare parts which are satisfied with the below-mentioned conditions;

(1) Object fish : Grouper, Snapper, Bream, Shark

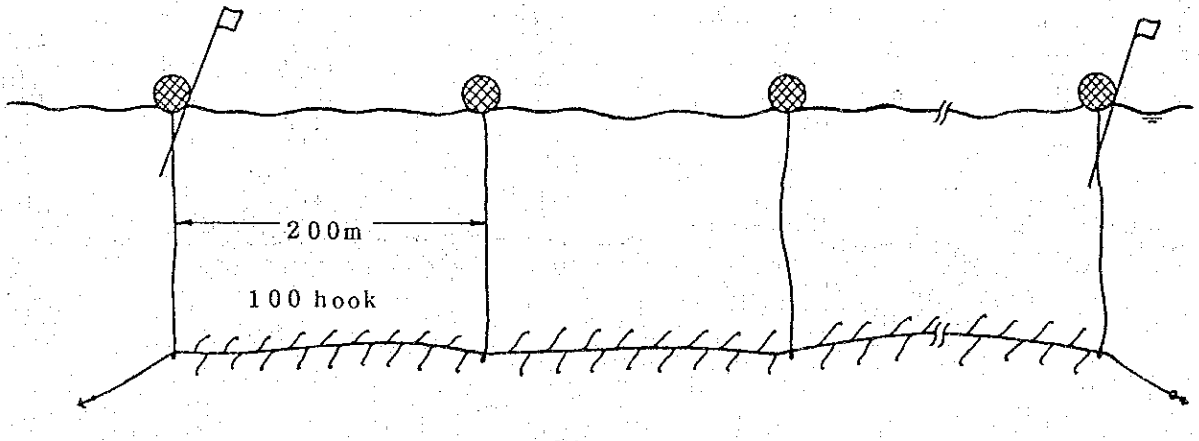
(2) Fishing ground : Deep sea (depth 50 m more)

2) Specification and quantity

Item	Description	Quantity
Complete set	100 hook/set	30 sets
Spare	Main line Vinylon 5/150 200 m/set	6,000 m
	Branch line Nylon #10	3,000 m
	Hook (Mutsu type) #6, 18, 20	each 1,000 pcs
	Basket Plastic	30 pcs

Accessories (float, float line, ancher, flag pole, etc.) should be used both as Tuna Long Line & Vertical Long Line.

Arrangement of Bottom Long Lines



7. Squid Jigging Gear

1) Squid Jigging gear consists of complete set, accessories and spare parts which are satisfied with the below-mentioned conditions;

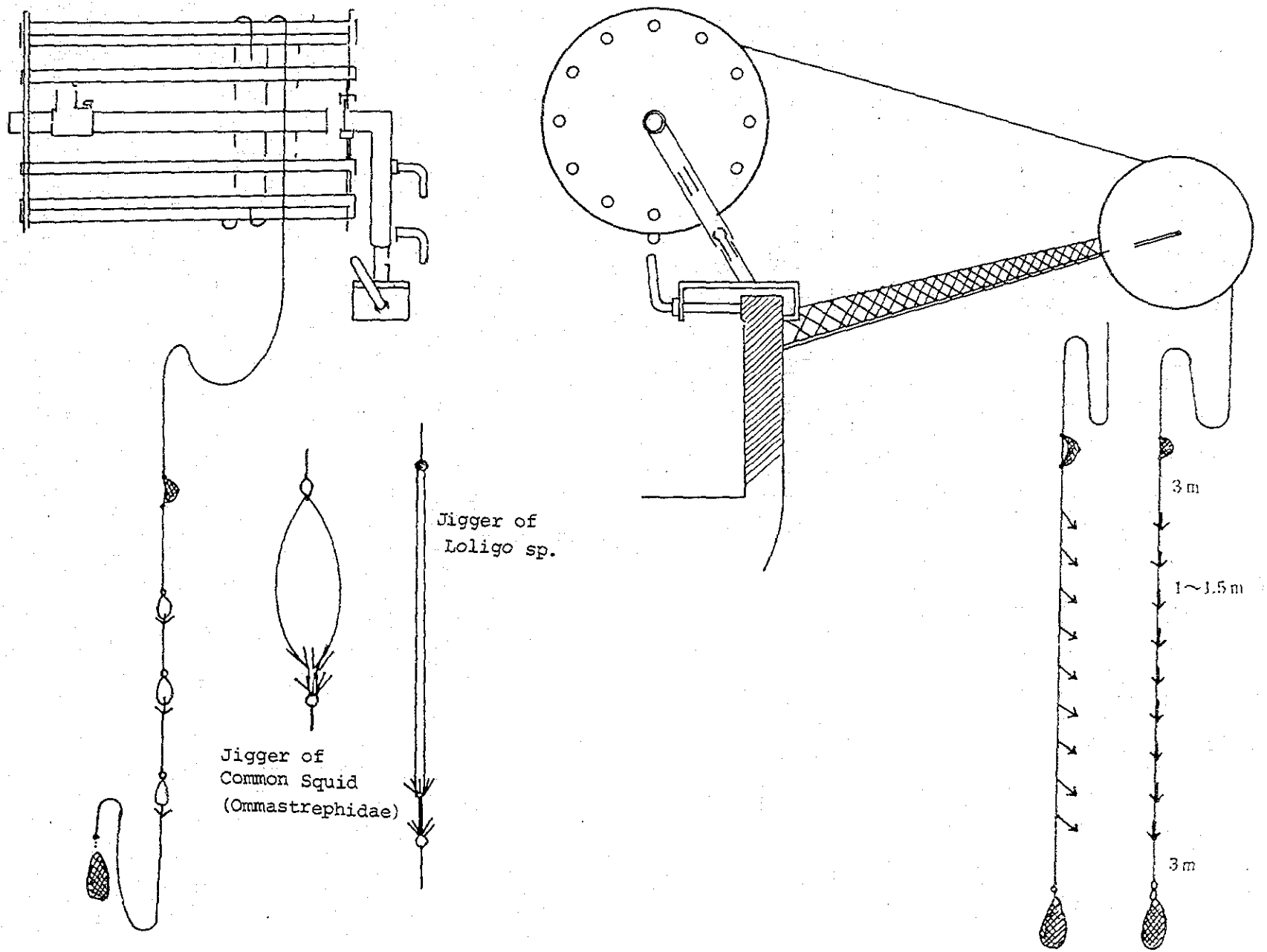
(1) Object fish : Loligo sp., Common squid

(2) Fishing method : Hand operated jigging dram

2) Specification and quantity

Item	Description	Quantity
Complete set	Hand operated jigging drum with fishing line and 25 article bait	5 sets
Spare	- Jigger for Loligo sp.	125 pcs
	Jigger for common squid	125 pcs
	- Angling line Nylon #30	200 m
	" #50	500 m
	- Sinker 1 kg/pces, middle sinker #50	each 10 pcs
	- Swivel	20 pcs
Parachute anchor	20 m dia. with accessories	1 set

Arrangement of Squid Fishing Gear



8. Lobster Pot

1) Lobster pot gear consists of complete set, accessories and spare parts which are satisfied with the below-mentioned conditions;

(1) Object fish : Rock lobster

(2) Fishing method : Pot long line method

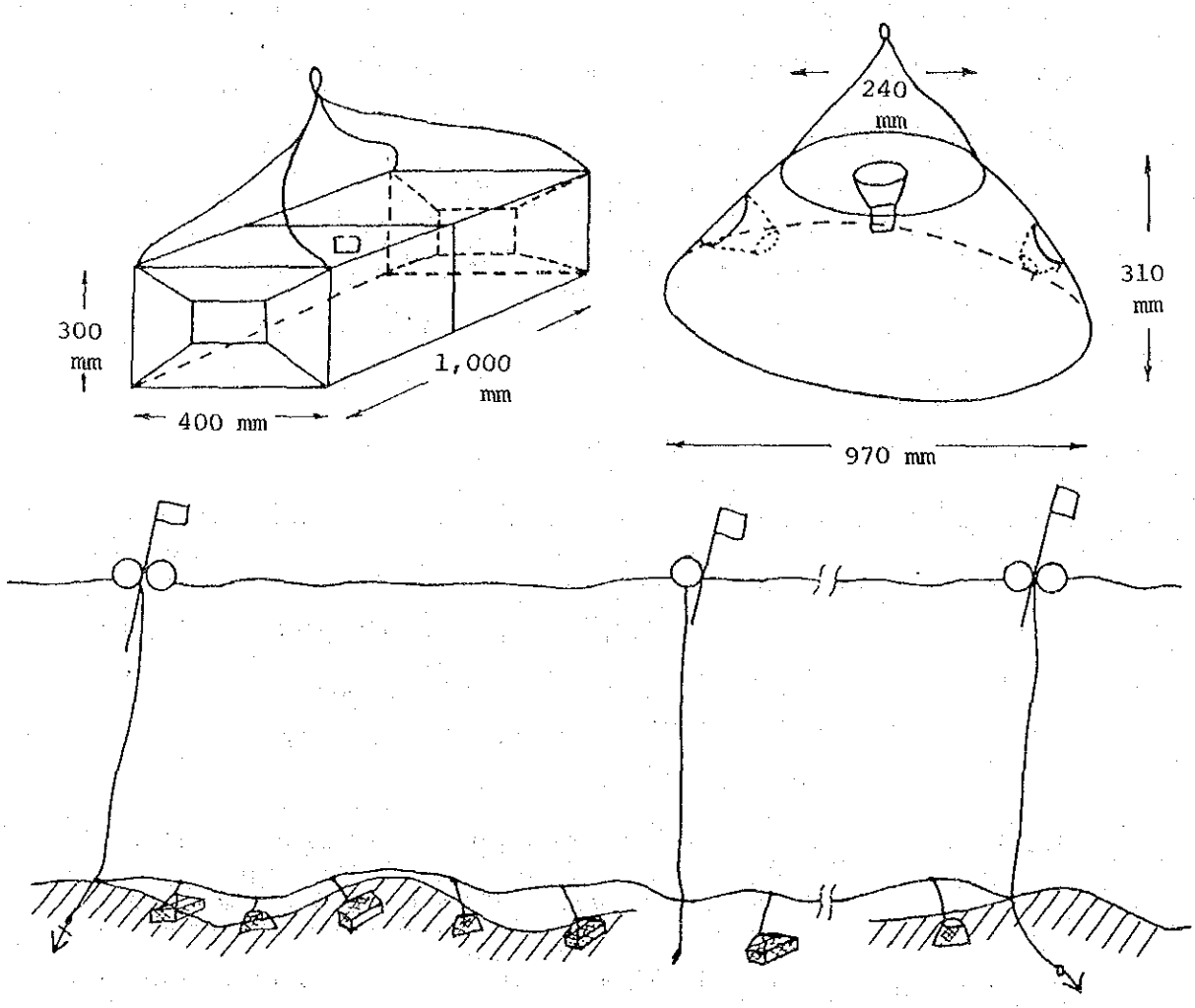
(3) Fishing ground : Rocky bottom near reef

2) Specification and quantity

Item	Description	Quantity
Complete set	5 pot/set (3 round type, 2 box type)	5 sets
	Float, float line, anchor, and main line are used both for vertical long line and tuna long line	
Spare pot	Round type 980 m/m x 240 m/m x 310 m/m	15 pcs
	Box type 300 m/m x 400 m/m x 1,000 m/m	15 pcs

Accessories (float, float line, ancher, flag pole, etc.) should be used both as Vertical Long Line and Bottom Long Line.

Arrangement of Lobster Pot



9. Audio-Visual Equipment

Specification and quantity of the Audio-Visual equipment are as follows:

ITEM	QUANTITY
1. Over-head projector	1 set
2. Slide projector	1 set
3. Movie camera (for 16 m/m) variable speed control	1 set
4. Movie projector (for 16 m/m)	1 set
5. Screen	1 set
6. Film for teaching materials	20 pcs
7. Film for movie camera	20 pcs
8. T.V. (color)	1 set
9. Video tape deck	1 set
10. Video tape	20 pcs

3-4. Research Equipment

3-4-1 Basic Plan

Oceanographical survey which is directly related to the fishing consists of the following:

(1) Water bottling

(2) Temperation measuring

(3) Current measuring

(4) Measuring of transparency of sea water

(5) Measuring of color of sea water

(6) Sounding

(7) Bottom sampling

(8) Chemical analysis of sea water

(9) Collection and measuring of plankton and fish larva

3-4-2 Oceanographical Equipment

Specification and quantity of oceanographical equipment are as follows:

No.	Description	Specification	Q'ty
1	Water Sampler	Nansen Reversing Water Bottle (With Frame for Holding 2 Reversing Thermometer)	1 set
		Rack for Resting 5 Nansen Reversing Water Bottles	1 pcs
		Sea Water Bottle 30 pcs/1 Wooden Box	5 boxes
		Underway Bucket for Surface Water	2 pcs
2	Surface Themometer with Protector	-5 to 35°C	10 pcs
3	Reversing Protected Thermometer	-2 to 30°C	5 pcs
	Reversing Unprotected Thermometer	-2 to 30°C	5 pcs
4	Thermometer Reversing Frame for Holding	2 Reversing Themometers	2 sets

No.	Description	Specification	Q'ty
5	Messenger	280 gr	10 pcs
6	Digital Bathy Thermometer	Range : 0 to 35°C Maximum Observation : 635 m With Accessories & Spare parts	1 set
7	Current Meter	Electric Current Meter i) Current Velocity Range : 0.03-9.99 knot Accuracy : 0.01 knot Inpelleter starting speed : 0.03 knot ii) Current Direction Range : 0-360°C Accuracy : ±7.5°	1 set
8	Transparency Disk	With 30 Mts Rope & Accessories	2 sets
9	Forel Standard Water Color Set		2 sets
10	Bottom Sampler	Marukawa's Bottom Sampler	1 set
11		SK Type Bottom Sampler	1 set
12	Dredge	Niino's Dredge	1 set
13	Salino Meter		1 set
14	Equipment for Measuring BOD		1 set
15	DO Meter		1 set
16	pH Meter	Range : 2-12 pH	1 set
17	Hydrometer		1 set
18	Plankton Net	Mesh size : 366 mm/1,000 158 mm/1,000 76 mm/1,000 Drawing type	each 1 set
19	Larva Net	With spare net	1 set

No.	Description	Specification	Q'ty
20	Dissection		1 set
21	Fish Measuring Board		2 pcs
22	Balance 3 Type	200 gr 30 kgs 100 kgs	each 1 pc
23	Microscope	M type Spectacle type	2 sets
24	Sounding Machine, Hand Operated	With Meter Gauge & Clinometer Wire rope 2.2 mm dia. 500 m Sounding Load 50 kg	1 set
25	Sample Bottle	Capacity : 500-10 cc	each 5 pcs (50 pcs)

3-5. Implementation Plan

Actual operation of the Fisheries Research and Training Vessel is planned as follows:

3-5-1 Operation and Management Plan

1) Executing Agency

The Department of Fisheries, Ministry of Agriculture and Fisheries Development, Sabah State Government will be directly responsible for the operation and management of the vessel.

2) Operation and Management

For research and survey works, the vessel will be operated by the Likas Fisheries Research Center, one of the organizations of the Department of Fisheries. The number of planned operating days for research duties is to be twenty days per voyage, with two voyages per year.

For training duties, it will be operated based on the training program of the Labuan Fisheries Training School Project. The number of operating days is planned as 72 days per year. The vessel will be stationed under the direct custody of the Marine Fisheries Division of the Department of Fisheries and the major mooring ports will be Victoria, Labuan and Kota Kinabalu.

3) Operational Cost

Operational cost will be paid out of the budget for fisheries research and also the budget of the Labuan Fisheries Training School.

3-5-2 Estimated Operational Cost of the Fisheries Research and Training Vessel

The number of days at sea for training and research were calculated on the basis of the training program planned by the fisheries training school. Based upon the total number of days at sea, annual operational cost was computed on a trial basis. Being a Fisheries Research and Training Vessel, the operational cost cannot be recovered by the sales of fish catch. Accordingly, it is necessary to estimate the required expenses in advance in order that an adequate budget may be secured to enable continuous operation.

Annual operating days:

(1) Operating days for training:

24 days/course x three courses/year = 72 days

(2) Operating days for fisheries research and extension services:

20 days/voyage x two voyages/year = 40 days

Total 112 days

As for annual expenses, by calculating each of the labor costs, fuel costs, fishing gear expenses, repair and maintenance cost, food expenses, insurance and ice costs as the following chart shows the required annual operational cost will total to approximately M$250,000.

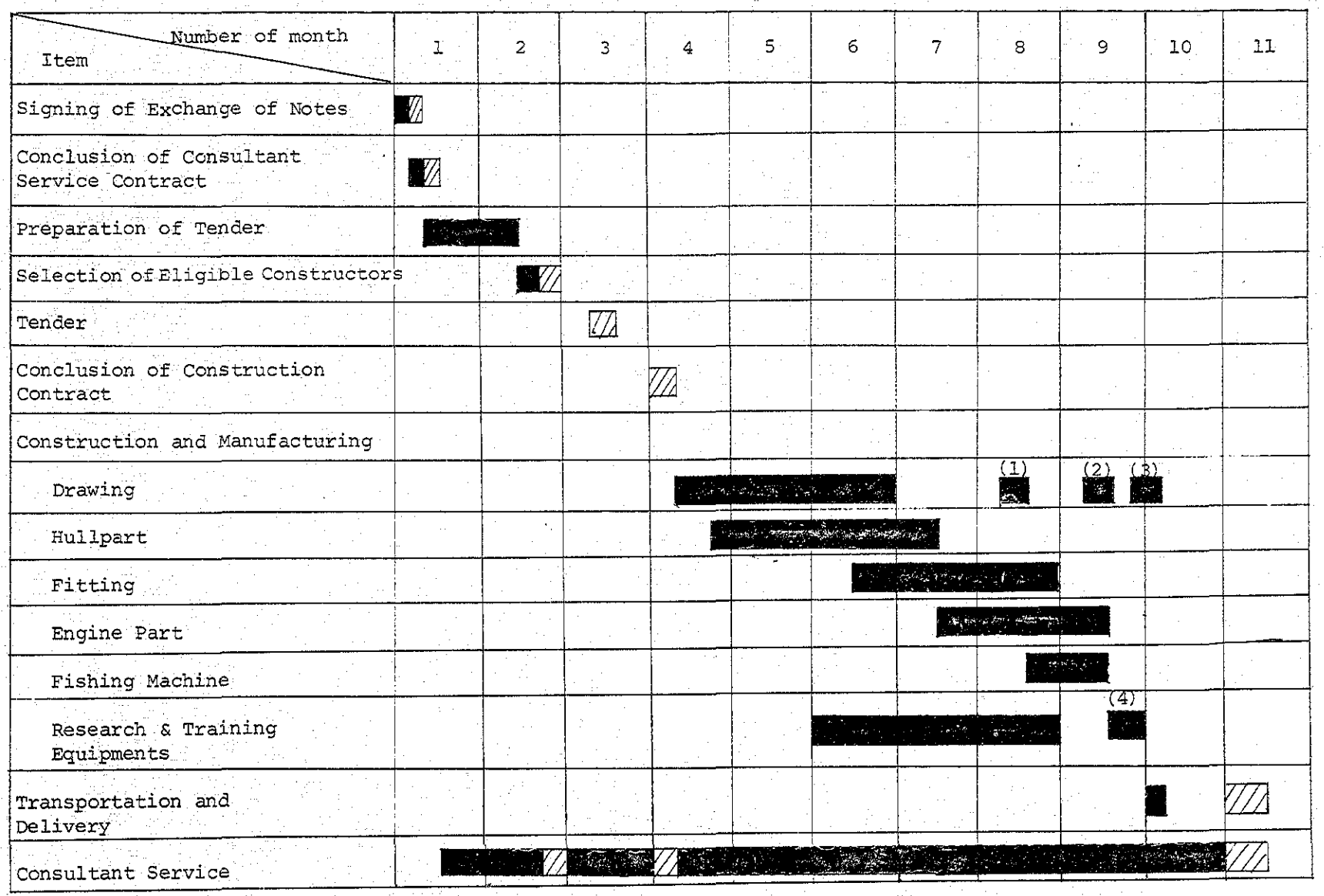
Annual Operation and Maintenance Cost of Fisheries Training and Research Vessel

Item	Basic Data	M$
1. Salaries & Wage	Captain (Master Fisherman) M$1,200 x 12 months	M$14,400
	Chief Engineer M$1,200 x 12 months	M$14,400
	Crew M$500 x 12 months x 2 persons	M$12,000
	Crew (Research and Extension Service Voyage) M$500 x 1.5 months x 5 persons	M$ 3,750
2. Fuel Oil	M$560/kl x (0.2kg/hr/PS x 450PS x 24hr x 0.6 x 112 days x $(\frac{1}{0.83kg})$	M$97,934
3. Lubricant Oil	M$1,200/kl x (174.88kl x 0.02)	M$ 4,197
4. Fishing Gear	Not calculated, because of 2 years spareparts stocking. (After exhausting spareparts: Fishing gear cost x 0.05)	(M$22,250)
5. Maintenance Repair	Vessel construction cost x 2% (M$2,500,000) x 0.02	M$35,000
6. Foods	M$10/day x 14 persons x 112 days	M$35,000
7. Insurance	Vessel's construction cost x 1.4% (M$2,500,000 x 0.014)	M$35,000
8. Ice	M$60/ton x 3 ton x 20 voyage	M$ 3,600
Total		M$250,961 (273,211)

3-6. Implementation Schedule

The implementation schedule of the Project is expected to be as shown in the following table:

Implementation Schedule of the Project



Remarks: ■ in Japan, ▨ in Malaysia

(1) Launching, (2) Trial navigation, (3) Trial fishing, (4) Loading of equipments

CHAPTER 4

EFFECTS OF IMPLEMENTING PROJECT

AND ITS APPRAISAL

CHAPTER 4

EFFECTS OF IMPLEMENTING THE PROJECT AND ITS APPRAISAL

Implementation of this Project is intended to increase fisheries production and improve the livelihood of fishermen through fish stock survey of Sabah State, Malaysia and training of its fishermen in modern fishing technologies.

Its anticipated technical effects are as follows:

4-1 Technical Effects

Since Sabah is a major timber producing area, the existing fishing boats in Sabah are mostly made of wood. Service life of wooden boat is usually short and they lack seaworthiness, maneuvarability and safety.

The material for this Project Vessel is planned to be durable FRP and this design will cover the defects of wooden boats as mentioned above.

The technology used in building FRP boat differs from that of steel vessel and owes much to the technology used in building wooden boats. In this sense the current technology of building for wooden boats in Sabah will contribute to the future development of FRP shipbuilding in Sabah. (There are already small scale FRP shipyards in Sabah State.)

Although the State Government plans to introduce modern fishery for the research of offshore fish resources and development of offshore fisheries, it has no qualified fishing vessel for this purpose and so its efforts to improve fishery productivity are greatly limited.

In the current planning, therefore, studies have been made regarding the equipment which can demonstrate the largest possible effects within the limits of the requested requirements. Specifically, the vessel will be equipped with modern fishing gear considered suitable for offshore fishing with primary emphasis on trawl and purse seine. Through training in operating the Project Vessel, the vessel can be expected to become the trigger for the concerning development of modern fishing methods in Sabah State.

Planned fishing gear will be provided in complete sets and also with adequate volume of spare parts and repair materials. This arrangement is expected to have the effect of enhancing the technical interest of fishermen in the fabrication of modern fishing gear, and training in the use of such will no doubt help popularize modern fishing gear and fishing methods throughout the entire fishing community.

Also, exploratory surveys of useful fish species in the waters of Sabah State, resource surveys, oceanographic research and other activities implemented in coordination with the Likas Fisheries Research Center are expected to

effectively contribute to the development of the state's future fishing industry.

4-2 Overall Appraisal

If Sabah State is to promote and develop its fishing industry from the present condition, it must urgently shift its target from inshore fishing to offshore fishing. As a measure to achieve the purpose, the State Government is pushing forward the Labuan Fisheries Training School Project under which fishermen may acquire modern fishing technologies within a short period through actual practice. The vessel provided under this Project is to be used for this practical training at sea.

This vessel also has the functional capability to perform investigation work, and through effective and appropriate utilization it can be expected to play a critical role in leading the way towards increasing protein food supply to inhabitants and exploiting the state's unutilized fisheries resources.

The operational cost for this Project have already been appropriated in the budget of the Malaysian Government. The Fisheries Research and Training Vessel as well as the Research and Training Equipments are of a size that can be operated and managed by the Malaysian recipient alone, and it has made no further request for technical experts from Japan especially for this Project.

For the management and operation of the vessel and equipments proposed under this Project, the Government has planned to recruit qualified people from the technical staff of the Department of Fisheries of Sabah State Government having been either educated and trained abroad or at the Training Department of the Southeast Asian Fisheries Development Center, Penang Fisheries Training Institute, etc.

For implementing this Project, the Malaysian personnel concerned have shown wishes in training and studies in Japan at the earliest possible time. As we consider it quite appropriate and reasonable, we recommend its realization.

As stated above, this Project is intended to lay the foundations for the development of fisheries in Sabah State and we believe that it is quite significant and effective for Japan to extend the requested grant on the above described plan for the future development of Sabah State.

APPENDICES

I. MINUTES

II. MEMBER OF THE SURVEY TEAM

III. PERSONS CONCERNED OF THE MALAYSIAN SIDE

IV. SURVEY ITINERARY

I. MINUTES

MINUTES OF DISCUSSION

ON

THE FISHERY TRAINING AND RESEARCH VESSEL PROJECT

In response to the request of the Government of Malaysia, the Government of Japan has sent, through the Japan International Cooperation Agency which is an official agency implementing the technical cooperation of the Government of Japan, a team headed by Mr. Takashi Yamamoto, Fishing Boat Inspector, Fishing Boat Division, Fisheries Agency, to conduct a basic design survey on the Fishery Training and Research Vessel Project (hereinafter called the "Project") for 21 days from August 9, 1981.

The Team had a series of discussion and exchanged views with the officials concerned of Sabah State Government and the Government of Malaysia.

Both parties have agreed to recommend to their respective Governments and the authorities concerned to examine the result of the survey attached herewith toward the realization of the Project.

August 22, 1981.

T. Yamamoto

TAKASHI YAMAMOTO
HEAD, JAPANESE SURVEY TEAM

for ASKALANI ABD.RAHIM
STATE DIRECTOR OF ECONOMIC
PLANNING UNIT, KOTA KINABALU

WITNESS BY

(JOSEPH WONG TUNG SANG)
DIRECTOR OF FISHERIES
SABAH

ATTACHEMENT

1. The objective of the Project is to provide a Fishery Training and Research Vessel for encouraging the Fisheries development in Sabah State, Malaysia.

2. The Malaysian side is expecting that the vessel will contribute for the training, research and extension activities of Sabah Fisheries Department and especially for the training of artisanal fishermen of Sabah State at the Fisheries Training School which has been established at Labuan by Sabah State Government.

3. The Japanese Survey Team will convey the desire of Sabah State Government and the Government of Malaysia to the Government of Japan to take necessary measures for cooperation in implementing the project and provide a Fishery Training and Research Vessel (the specifications are shown in ANNEX I) with the necessary training and research equipments as listed in ANNEX II.

4. The Japanese Team confirmed that the Malaysian side under-stood the system of Japan's Grant Aid Programme, especially the arrangements to be taken by the Malaysian side.

ANNEX I

The specifications of vessel requested by the Malaysian side are shown as follows :

1. Principal Particulars

1) Hull Material	F.R.P.	
2) Length (O.A.)	Approx.	21.50 m
3) Length (B.P.P.)	"	18.00 m
4) Breadth (mld)	"	5.80 m
5) Depth (mld)	"	2.35 m
6) Draft (Designed)	"	2.00 m
7) Gross Tonnage	"	70 GT
8) Fish Hold	"	8 m3
9) Ice Hold	"	3 m3
10) F.O.T.	"	12 m3
11) F.W.T.	"	8 m3
12) Main Engine	"	450 ps.
13) Speed, Max. at Trial	"	11 kts.
14) Complement	-	14 persons

2. Propelling Machinery

1) Main Engine : 4 cycle, single-acting, turbo-charged, vertical marine diesel engine, with reduction gear. Continuous rated output 450 ps. at 1850 rpm.

2) Propeller : Fixed pitch propeller with 3 blades.

3. Diesel Generator

1) Aux. engines : 4 cycle, single-acting, vertical diesel engines.

Continuous rated output 62ps. at 1500 rpm.

2) Alternators : AC 450 volts, 50 Hz, 3 - phase, 50 KVA

4. Auxiliary Machinery

1) Air Compressor
2) Air Reservoirs
3) General Service and Fire Pump
4) Bilge Pump
5) Water Pumps
6) Oil Pumps

5. Deck Machinery

1) Steering Gear
2) Fishing Winch
3) Power Block
4) Topping Winch
5) Purse Davit
6) Gallows
7) Net Platform
8) Line Hauler
9) Skiff Boat (6m in lenght, 25 ps. inboard engine)
10) Tender Boat with Outboard Engine
11) Oceanographic Winch

6. Air-conditioning System

7. Ventilation

8. Navigation and Communication Equipments

1) Magnet Compass
2) Public Addressor System with Speakers
3) Clear View Screen
4) Direction Finder
5) Radar
6) VHF
7) SSB -
8) Fish Finders (Color and Black-white)
9) Net Zonde
10) Sonar

9. Life Saving Appliances

10. Fire Fighting Equipments

11. Lighting

1) General Lighting
2) Emergency Lighting (D.C. 24 volts, 200 AH)
3) Navigation Lights
4) Working Lights
5) Fishing Lights
6) Search Lights

12. Tools and Spare Parts

ANNEX II

The training and research equipments requested by the Malaysian side are as follows :

1. Training Equipments

1) Trawl Fishing Gears
2) Purse Seine Gears
3) Trolling Gears
4) Tuna Long Lines
5) Vertical Long Lines
6) Bottom Long Lines
7) Squid Jigging Gears
8) Lobster Pots
9) Audio-visual Equipments

2. Research Equipments

1) Bottom Sampler
2) Water Bottles
3) Temperature Measuring Apparatus
4) Current Meter
5) Apparatus for Testing Transparency, Color and Specific Gravity of Water
6) Instruments for Chemical Analysis of Water
7) Plankton Nets and Larva Nets
8) Apparatus for Measuring Plankton and Fishes