

**BASIC DESIGN STUDY REPORT
ON
QUELIMANE FISHING PORT
IMPROVEMENT PROJECT
IN
THE PEOPLE'S REPUBLIC OF MOZAMBIQUE**

JULY 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

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JAPAN INTERNATIONAL COOPERATION AGENCY

国際協力事業団	
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PREFACE

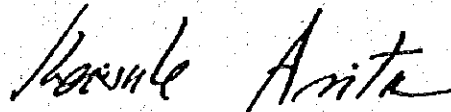
In response to the request of the Government of the People's Republic of Mozambique, the Government of Japan has decided to conduct a basic design study on the Quelimane Fishing Port Improvement Project and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Mozambique a study team headed by Mr. Shoichi Shikada, Deputy Director, Planning Division, Fishing Port Department, Fisheries Agency from February 23 to March 24, 1986.

The team had discussions on the Project with the officials concerned of the Government of Mozambique and conducted field survey in the Quelimane area. After the team returned to Japan, further studies were made, a draft report was prepared and a mission to explain and discuss it was dispatched to Mozambique. As a result, 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 People's Republic of Mozambique for their close cooperation extended to the team.

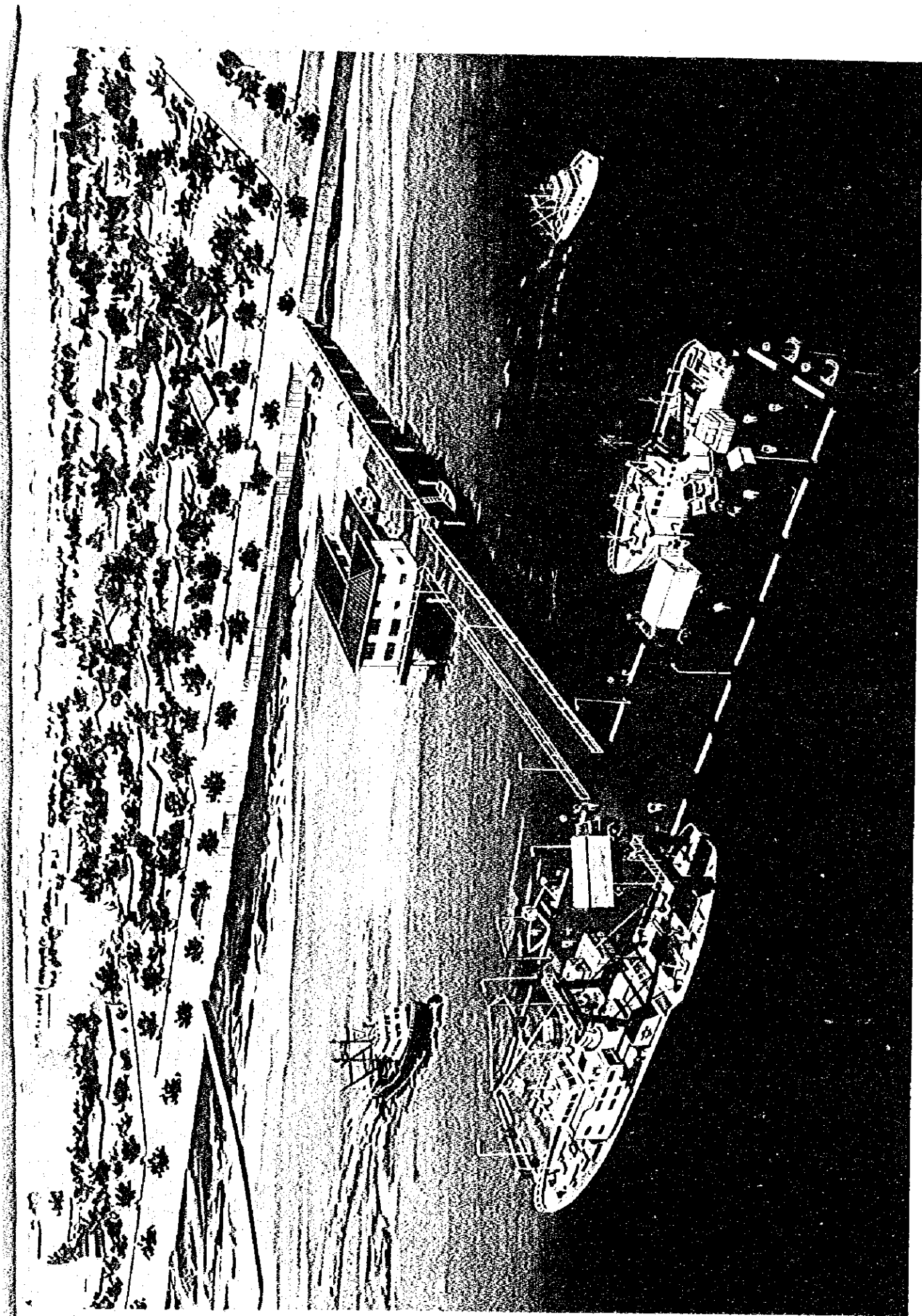
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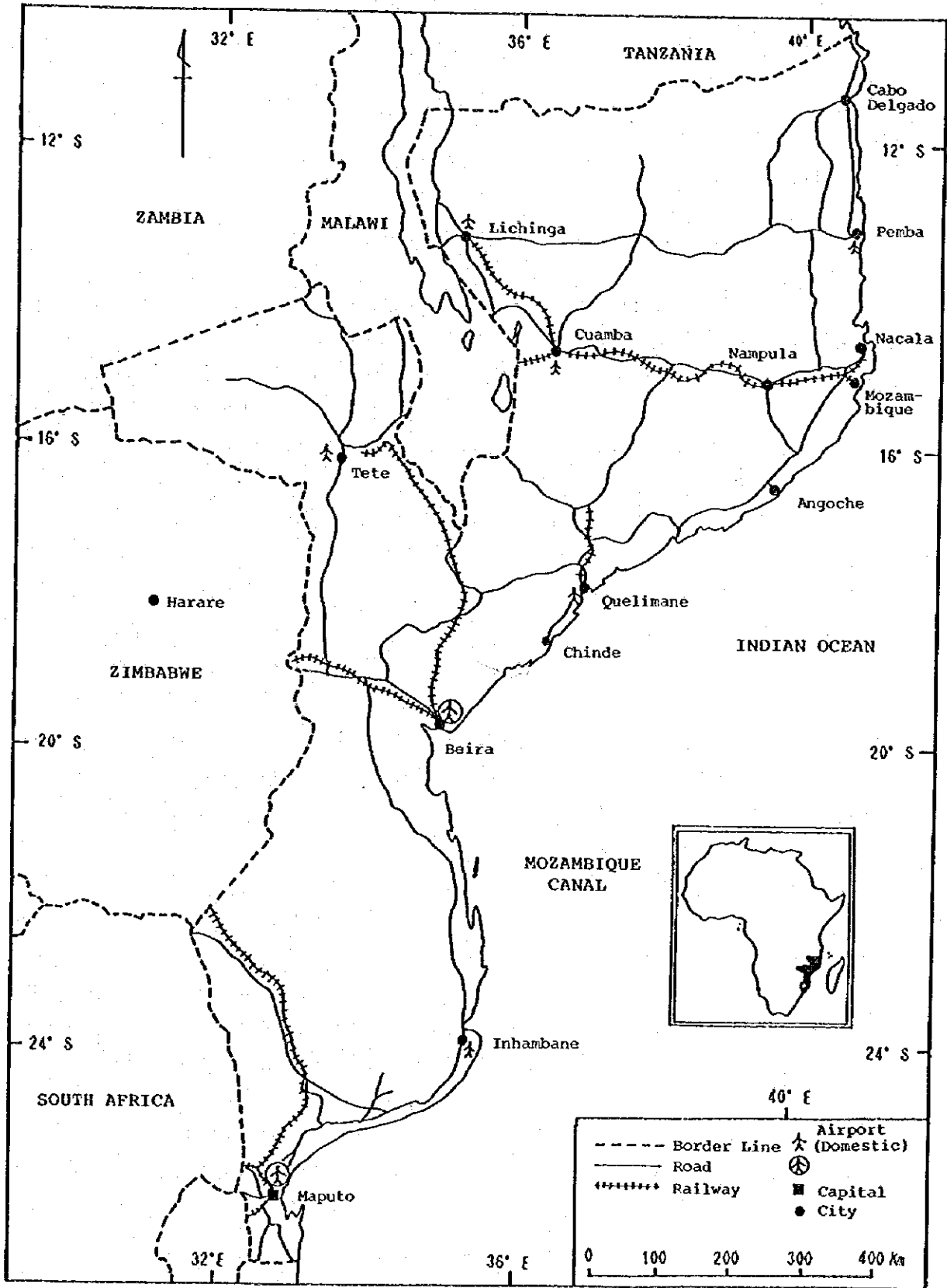


Keisuke Arita

President

Japan International Cooperation Agency





The People's Republic of Mozambique (Map)

Summary

The People's Republic of Mozambique became an independent nation in June, 1975 from Portugal.

Its national economy has developed imbalance among industrial sectors.

Agriculture, forestry and fishery account for about sixty percent of the exports and forty percent of the GDP (gross domestic product). Agricultural products are mostly produced for export. The country produces very small amount of rice, wheat and dairy products for domestic consumption, and it largely depends on imports for food supply.

Floods and droughts have affected the country every year since the great flood of Limpopo River in 1977, causing great damage to the economy of Mozambique.

To overcome this dilemma, the Mozambican government worked out "the Decennial Economic Development Plan" and put it into practice. The basic targets of the plan include achievement of the self-supply of food, promotion of exports and development of energy resources. Also in endeavoring to reconstruct and develop the national economy, it called for economic assistance from foreign countries, while promoting the nationalization of major economic sectors, group production of agricultural products and planned economy.

Under such circumstances, the Mozambican government has focused its attention on the fishing industry, since it is favoured by about 2,470 km of overall coastal line and by rich fishery resources in coastal waters. It is now considered to play a very important role as a means of earning foreign currencies, especially by export of shrimp. But the production by fishery sector cannot meet domestic demand, the shortfall still depending on imports.

To improve such situation, the Mozambican government is carrying into effect various fishery build-up policies as an integral part of the said "Decennial Economic Development Plan". The main targets of the government policies are;

1. To meet the national demand; and
2. To promote fishery exports, taking advantage of 200 nautical miles of economic waters.

Roughly speaking, to attain these targets, the government has planned to adopt such policies as follows;

1. Promotion/development of a fishing complex (improvement and expansion of small-scale fisheries).
2. Strengthening of large-scale fisheries.
3. Improvement of such fishery production infrastructures as fishing ports, cold store, processing facilities, etc.
4. Improvement of such companies related to fishery as shipyard, fishing net manufacturer, supplier of fishing equipment/materials.
5. Development of fishery resources.
6. Improvement/expansion of fishery training facilities.

The way to promote and develop the fishing industry in Mozambique as a means to overcome economic crisis can be summarized into the following two points: (1) Acquisition of foreign currencies through the development of large-scale fisheries, especially shrimp trawling, and (2) Improved production of fish through large-scale and small-scale fisheries to cover food shortage.

Thus the Government of Mozambique is placing importance on the development of small-scale and medium-scale fisheries. The most urgent task is to construct such port facilities as can commonly be used by small- and large-scale fishing boats.

Under such circumstances, the Government of Mozambique has requested the Government of Japan to extend a grant aid for a project to build up the Quelimane Fishing Port, where establishment of fishery facilities is most urgently needed, among the four projected ports of Maputo, Beira, Angoche and Quelimane.

Upon this, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team to Mozambique from February 23 to March 24, 1986. The above study team executed field survey regarding Sopinho's fishing complex, fishing net manufacturers, and fishing facilities in Maputo and Quelimane.

On the basis of the field survey and discussions with the persons concerned with Mozambique, the study team has concluded that it is indispensable to construct fishing port facilities in the Quelimane district.

The contents of the project include the following items.

1. Jetty Facility

- a. Body (80 m long)
- b. Mooring
- c. Ancillaries
 - o Connection bridge (100 m long in total, fixed and movable bridges)
 - o Fenders
 - o Mooring columns
 - o Water supply system
 - o Oil supply system
 - o Power supply system
 - o Lighting system

2. Features Functioning as a Fishing Port

- a. Apron
- b. Ancillaries
 - o Administration office
 - o Work shop
 - o Warehouse
 - o Cargo handling yard
 - o Ice makers and ice storages
 - o Refrigerators.

The construction site of the above facilities is located at the rivermouth where sufficient land area has been secured. A major part of materials and equipment are to be procured from Japan.

It is estimated that the designing, calculation, bidding and contract for the project will take five months, and procurement, production, transportation of the equipment/materials, and construction work will take eleven months.

After completion of construction work, the Quelimane Port Administration Bureau will be established in the main building under authorization of the Fishery Agency, and manage whole activities. It is estimated that the operational cost will be 2.43 Million MT (equivalent to 1 MT = ¥4.4 conversion) per annual.

The national economic benefit and convenience to be induced by this project will not only directly bring the increase of marine yield by way of high efficiency of fishing boats and port facilities, earning from sales of ice, but also facilitate vitalization of small-scale fisheries and increase the amount of distribution of marine products. All these will contribute to the national welfare. Consequently, it is concluded that Japan's Grant Aid for the project will be highly significant.

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Chapter 1
INTRODUCTION

The People's Republic of Mozambique is situated between about 10° and 27° south latitudes along the eastern coast of Africa. It has the overall coastal line length of 2,470 km. It is fringed with creeks, shales, and small islands. The area of the continental shelf where water depth is less than 200 m is more than 7,000 km². So, the country abounds in fishery resources.

Agriculture, forestry and fishery account for about sixty percent of the exports and about forty percent of the GDP (gross domestic product). However, agricultural products are produced mostly for export. The country domestically consumes very small amounts of rice, wheat and dairy products, and it depends largely on imports for food.

Floods and droughts repeated every year since the great flood of the Limpopo River in 1977 caused great damage to the economy of Mozambique, which mostly depends on agriculture, forestry and fishery. Since 1982, the national growth has been negative and economic distress has been serious because of: (1) Decrease in agricultural production due to droughts, (2) Depression of industrial production due to shortage of materials, (3) Decreased foreign currencies in income from transportation services such as railways and harbor facilities due to decrease in amounts of transportation caused by the change of transportation routes in the Republic of South Africa, and (4) Hovering export prices and shortage of foreign currencies due to the world's economic depression. Especially, the repeated droughts and floods have caused centralization of population in urban areas, and have been aggravating the food conditions in cities.

To overcome these difficulties, the Government of Mozambique implemented the Ten-Year Economical Development Plan (1981-1990). Great efforts have been made in the restoration and development of the national economy under the guidelines aiming at self-supply of foods, promotion of export industries, and development of energy resources. The government called for economic aids from many foreign countries. Thus, the country has been promoting nationalization of major economic sectors of the industry, conglomeration of agricultural products and planned economy.

Under these circumstances, the government executed various fishery promotion policies to promote development of the fishery industry in an attempt to increase food production under the Ten-Year Development Plan. These policies have two objectives: (1) To acquire foreign currencies by promotion of large-scale fisheries and save foreign currencies by decrease of imported fish through efficient use of fish caught, (2) To increase catch, extend commercialization and meet the domestic shortage of fish by improvement of fishery tools and methods and by establishment of suitable circulation routes for improved productivity of small- and medium-scale fishery enterprises. For these objectives, the government puts the greatest emphasis on the build-up of fishing ports which can be utilized by boats for both small-scale and large-scale fisheries.

In this background, the Government of Mozambique asked the Government of Japan for a grant aid for a project which consists of construction of jetty, fishing port control facilities, fishery training centers, fishery market, fishery gear warehouse, slipway, work shop, land development for port site and build-up of refrigerator trucks and equipment for trawling so as to build up the Quelimane Fishing Port, where establishment of fishery facilities is most urgent among the four fishing ports of Maputo, Beira, Angoche and Quelimane. Upon this, the Japanese Government decided to carry out research for a basic design, and JICA dispatched a study team headed by Mr. Shoichi Shikada, harbor planning officer, Planning Division, Fishing Port Department, Fishery Agency, the Ministry of Agriculture, Forestry and Fisheries, to the site for thirty days from February 23 to March 24, 1986.

The purpose of the study team was to discuss the details of the Quelimane fishing port improvement project with those concerned with Mozambique, conduct site research, and determine the basic design for establishment of fishing port facilities based on the results of the site research. The names of the members, schedule and names of those who participated in the discussions are shown in the Appendix.

Chapter 2
BACKGROUND OF
THE PROJECT

2-1 Outline of Fisheries in Mozambique

2-1-1 Outline

The fisheries in Mozambique, prior to the independence from Portugal, was not positive because of (1) import of canned foods and Bacalhau (a kind of codfish) from Portugal, and (2) import of frozen fish from Angola (a colony of Portugal in the day). Except for partial fishery, the establishment of union organization in the industrial level in Mozambique was legally prohibited to protect the Portuguese Industry in Portugal and Angola. Due to this, the days of colony, except for the shrimp trawl fisheries by his native country, was left undeveloped in the industrial scale and there was no administrative organization for local fisheries in each state.

After independence as a socialist state in 1975, Mozambican Government established the Fishery Bureau at first and then the Fishery Agency, and had been promoting its policy by trial and error. For example, in 1979, Mozambique tried to exercise all of 45,000 coastal fishermen in the country, setting a major base in Maputo. From the above experiences, the Fishery Agency gradually planned the fishery industry development and promotion, and concentrated into both the acquisition of foreign currency by export of a high quality fish product and the fishery industry development at the main coastal area due to the food supply to their own country people as temporary policy target. In the former, they promoted the acceptance of many foreign country's investment as mainly shrimp trawl for the fishery industry development at the industrial level and the maintenance and expansion of national fishery industry companies, meanwhile in the latter, executed the maintenance of an administrative organization, establishing a small-scale fishery division, and provided fishery industrial complex in each area, using idle facilities of Portugal which can be the bases of coastal fishery, and has been planned for the expansion. For the related industries such as material supply, ship building, etc., they have established national companies by merger of private companies, and positioned under the administrative organization of the Fishery Agency.

For shrimp which is already commercialized, the Government of Mozambique has secured the resource quantity, maximum potential yield to be 13,000 t/year, and 10,000 t of shrimp have been caught by a total of 6 companies which are 3 state enterprises and 3 joint venture companies with foreign countries (Japan, Spain and Soviet Union), and the licenced ships from foreign countries (Japan, Spain, East Germany and Soviet Union).

Meanwhile, for fish, the production base is poor because the powered ships including the attachable engine ships are only 300 of 18,000 in total, and therefore it is not commercial base production but undeveloped condition. For the status of fishery resources, it is gradually defined with the fishery resources study and cooperation of Norway and other countries, and from total evaluation of investigation performed by each country, the possible production will be 50,000 t for demarsal fish and 200,000 t for pelagic fish such as anchovy, scad, mackarel and sardine. However, the haul in the past two to three years has been lowered extremely to 7,500 to 15,000 t per year (three sectors under the control of the Fishery Agency). In this regard, they want to increase the catch to be 15,000 t, one or two years later.

These fish products are handled by the national company named PESCO which differs from the organization of the Fishery Agency as well as domestic distribution of the said products and trade of that in Mozambique, and the selling price is politically determined (The organization of PESCO INTERNATIONAL for trade).

All the fish are sold domestically, and part of them are processed for canned foods (tomato sauce processing) and dried foods. Most of the crustacea is exported, and the amount of exports reached approximately \$29,000,000 in 1984, and is the highest ranked export product which is the most important item (29 percent of total export output).

The joint-venture business with foreign countries are well controlled, contributes greatly to obtain foreign currency, and the Government of Mozambique is positively tackling this.

Presently, they allow the catch of surplus shrimp and other fish, but this catching denotes trial operation or resource investigation in order to move into joint-venture merger systems in the future, and they are particularly interested in the fish.

The fishery industry in Mozambique has just started the system, grouping about in the dark for many years after independence, but owing to the use of idle facilities used to belong Portugal and cooperation from the United Nation and other foreign countries, they are taking underway of organization of local fishermen, maintenance of fishing boats and fishery equipment, maintenance of fishing ports, investigation of fishery resources and training people for the fishery industry in order to maintain the increase of foreign currency acquisition and self-supporting of fish protein foods.

2-1-2 Administrative Organization

The Fishery Administration of Mozambique is controlled by the Fishery Agency (Secretaria de Estado das Pescas) under the National Planning Committee. The Secretariat, Economic Financial Bureau, Engineering Bureau, Personal Management Bureau, Small-scale Fishery Bureau (UDPPE), Maputo City Fishery Service Bureau (SPCM), Sofala Fishery Service Bureau (SPS) and Fishery Research Center (IIP) are organized under the Fishery Agency.

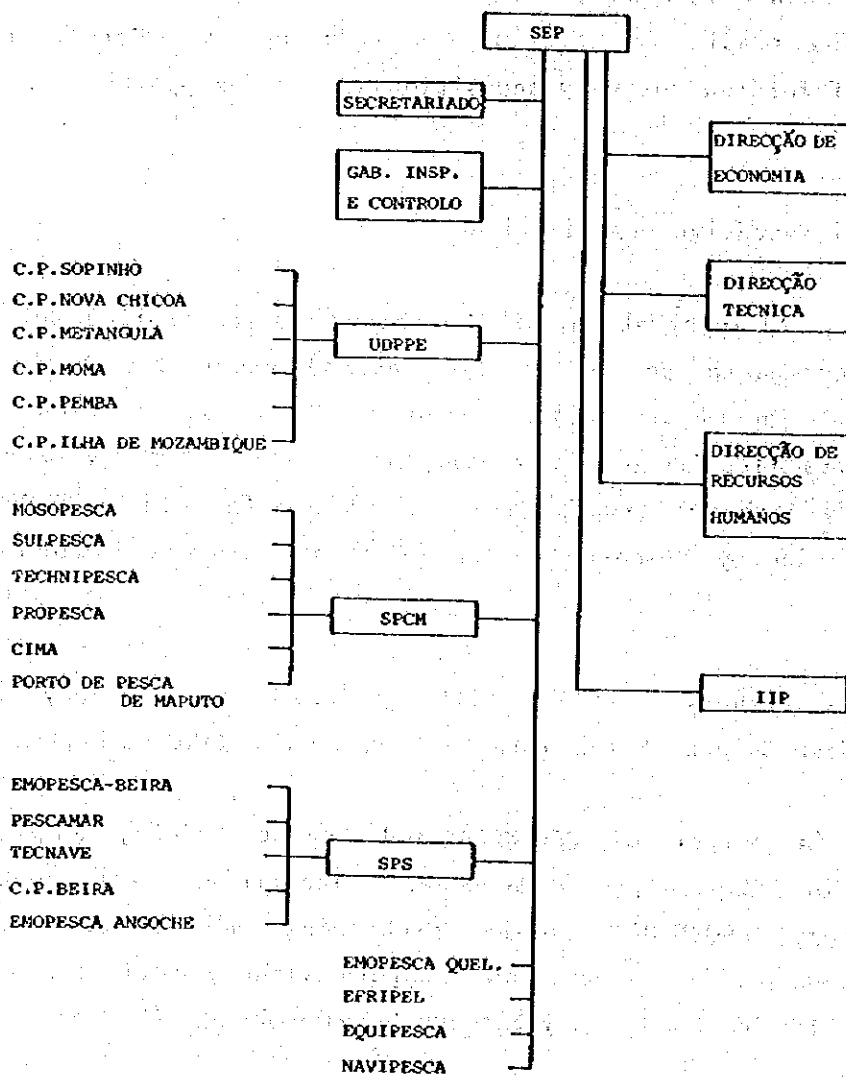
Small-scale Fishery Bureau (UDPPE) controls the fishery complexes of Sopinho, Nova Chicua, Metangula, Moma, Pemba and Ilho de Mozambique.

MOSOPESCA (a merger of EMOPECA and Soviet Union), SULPESCA (fishery complex in Maputo), TECHNIPESCA (facilities construction public corporation), PROPECA (marine processing public cooperation), CIMA (fishing net public corporation), Maputo fishery port management company are controlled by Maputo City Fishery Service Bureau (SPCM).

EMOPECA (state enterprises of both Beira and Angoche), PESCAMAR (a merger of EMOPECA and Spain) and TECNAVE (fishing boat and equipment company) are controlled by Sofala Fishery Service Bureau (SPS).

EMOPESCA QUELIMANE (state enterprise in Quelimane), EFRIPEL (a merger of EMOPESCA and Japan), EQUIPESCA (supply public corporation) and NAVIPESCA (shipbuilding company) are organized as the direct public corporation of the Fishery Agency.

For the distribution of marine products, PESCOM (marine products distribution public corporation) and PESCOM INTERNATIONAL which performs trade business with foreign countries as lower organization of Ministry of Trade other than the Fishery Agency are also organized.



- IIP : Instituto de Investigação Pesqueira
- UDPPE: Unidat de Direcção de Pequena Escala
- SPCM : Serviço de Pesca da Cidade de Maputo
- SPS : Serviço de Pesca de Sofala

Fig. 2-1 Administrative Organization

2-1-3 Environment of Fishery

(1) Ocean Environment

The coast lines in Mozambique extends from approx. 10 degrees south latitude of the east coast in Africa continent to approx. 27 degrees south latitude, and are enveloped by creeks, shoal and small islands in the length of 2,470 km. (See Fig. 2-2.)

It faces Madagascar at a distance of Mozambique Strait with width of approx. 300 to 500 nautical miles, and in the said strait, the south down current which is one branch of the South Equatorial Current makes the Mozambique Current. This current speed is particularly large in the south area, called Agulhas Current in the extent from 25 degrees south latitude to 40 degrees south latitude, and varies from a minimum of 20 cm/sec to a maximum of 60 cm/sec depending on the season.

The surface sea water is 22°C to 30°C in temperature and less than 35.2% in salinity, and it is considered that low salinity contained water in the tropical area is transported from the Indian Ocean due to the South Equatorial Current. In the coast area, the saltinity is lowered by the inflow of inland pure water, and particularly in the middle sea, the low saltinity of water less than 30% occurs in February and March which becomes the maximum river water inflow. The periodic year variation of water temperatures in the coast area is between 4°C to 6°C, and annual difference is larger in the south areas.

The tide excels in half day cycles. The tide ranges from 1.5 to 2.0 m in the south area, and more than 5.5 m in the central and north areas.

(2) River

As for the main rivers in Mozambique, there are eight rivers such as Rovuma and Lurio rivers in the north, Zambeze, Pungue, Buzi and Save rivers in the central area, and Limpopo and Incomati rivers in the south. (See Fig. 2-2.) The inland water volume which flows into the Mozambique strait from the above rivers is tremendous, and the nutriment salt and floating silt mud have been seriously affecting marine life of the continental shelf as well

the summer and winter seasons in the Southern Hemisphere respectively. The south side is affected by south-east trade winds, east or south-east wind excels in periodic years. In the central and south areas, strong south winds occur sometime in the summer season in the Southern Hemisphere particularly, therefore this affects fishery industrial production.

The swell of the strait is comparatively quiet, but is affected by south-east trade winds, particularly when cyclones heading north with trade winds, causes the wave height to become high.

(4) Environment of Fishery

The continental shelf area less than 200 m in depth reaches 70,000 km²; the Sofala Bank which extends from Angche to Beira offshore occupies 60% of the area; the south sea area from the Save river occupies little less than 30% of the area; the north sea area from Angoche occupies little over 10%. In the Northern sea and Southern sea areas, generally, due to submarine valley and coral, submarine topography is not suitable for trawl fishery, but in Sofala Bank in the central area, the slant of continental shelf is comparatively gently-sloping, and therefore, it can be seen that the possible sea area for trawl fishery will be many. (See Fig. 2-2 and Table 2-1.)

Table 2-1 Continental Shelf

Area		Northern	Sofala	Bazaruto	Delagoa	Inhaca	Total
Depth (m)							
10-50	Including		38020	4240	4570	320	
51-100	St. Lazarus		7380	1350	3020	290	
101-150	Bank 133 km ²		490	960	1280	160	
151-200			490	960	1280	160	
10-200		6190	46380	7510	10150	930	71160
200-400			1960	1420	7900	950	

(The Marine Fish Resources of Mozambique 1979)

(5) Fishing Port

Mozambique has a rich land configuration, and the commercial ports such as Maputo, Beira and Quelimane with well-maintained railway from the days under Portugal had been well-developed, as ocean trade routes for the inland countries such as Zimbabwe, Zambia, Zaire and Botswana in Africa Southern areas. There are no independent fishing ports but only use these commercial ports. Figure 2-3 shows the main ports in Mozambique.

2-1-4 Fish Resources

(1) Pelagic fish resource

Table 2-2 shows that the existing quantity for fish resources and potential yield of Mozambican coastal area, based upon the report of joint Mozambique/NORAD seminar etc.. This status for fish resources is referred from the above reports.

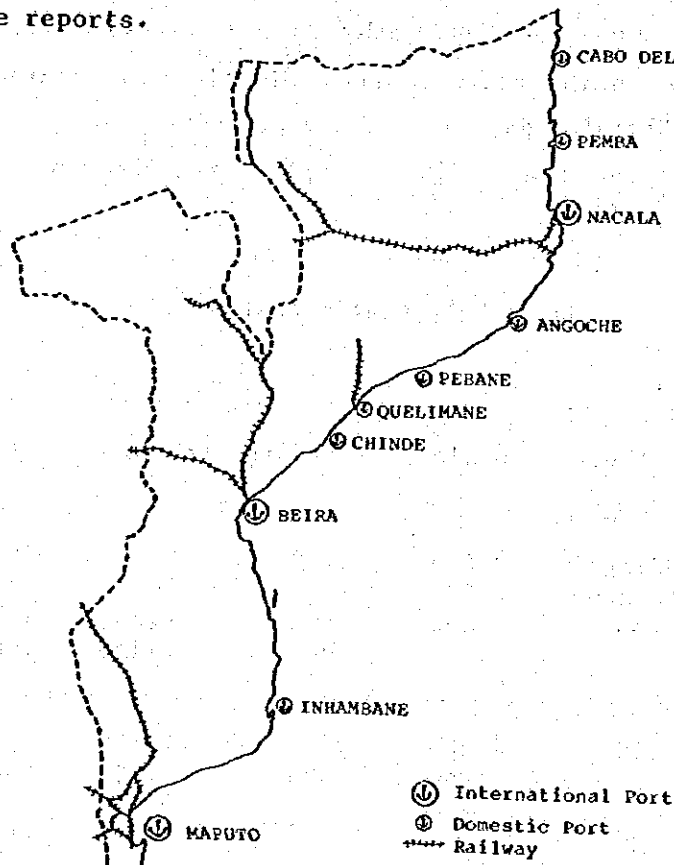


Fig. 2-3 Main Ports in Mozambique

Table 2-2 Outline of Fish Resources in Mozambican Sea Area

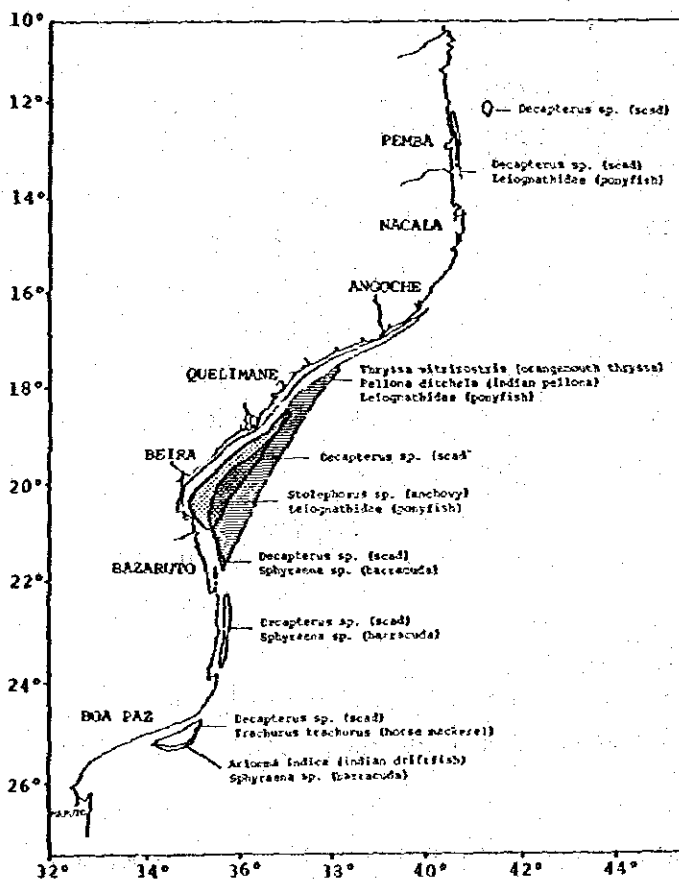
(Unit: 1000 t)

Kind of fish	Stock size		Catch 1983	Potential yield
	Maximum	Minimum		
Demersal fish				
St. Lazarus Bank	10		0	1
Sofala Bank	150	100	15-20	40
Rest of the coast	50			10
Pelagic fish				
Small anchovy	300	30	0	100
Other small pelagic	260	130	18	95
Mid depth fish resource	1,000			1,000
Crustaceans				
Shallow-water shrimp	15	10	8	8-13
Deep-water shrimp	4	2.5	1.5	2
Spiny lobster	1.6	0.8	0.2	0.4
Coral reef area				5-10
Coast vicinity				5-10
(Depth: less than 10 m)				

(The Marine Fish Resources of Mozambique, 1984)

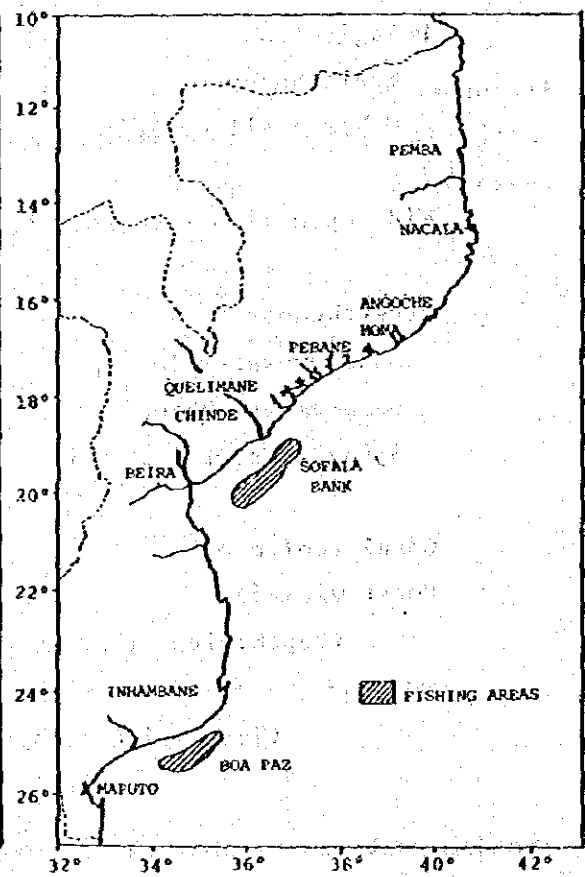
The demersal fish resources are mainly snapper in the St. Lazarus Bank, and the potential yield will be 1,000 t/year. Due to the land configuration problem, suitable fishing methods are handline fishing and trap fishing. In the coast area other than the above, possible haul will be approx. 50,000 t.

The pelagic fish are mainly anchovy in the Sofala Bank, the haul in seasonal change varies from 30,000 to 300,000 t. This fish is not caught very much at the present time, but in the future, it will be possible to obtain a large amount of haul, by using mid-water trawl and purse seine fishing. Other pelagic fish including the potential yield for scad and holly are estimated at 100,000 t. The lantern fish which lives between the pelagic fish and demarsal fish is also caught by the trawl, but this type of fish lives all over the world, particularly in the northern part of the Indian Ocean.



(Revista de Investigaçao
Pesqueria ano 1985 No. 13)

Fig. 2-4 Distribution of Small
Pelagic Fish

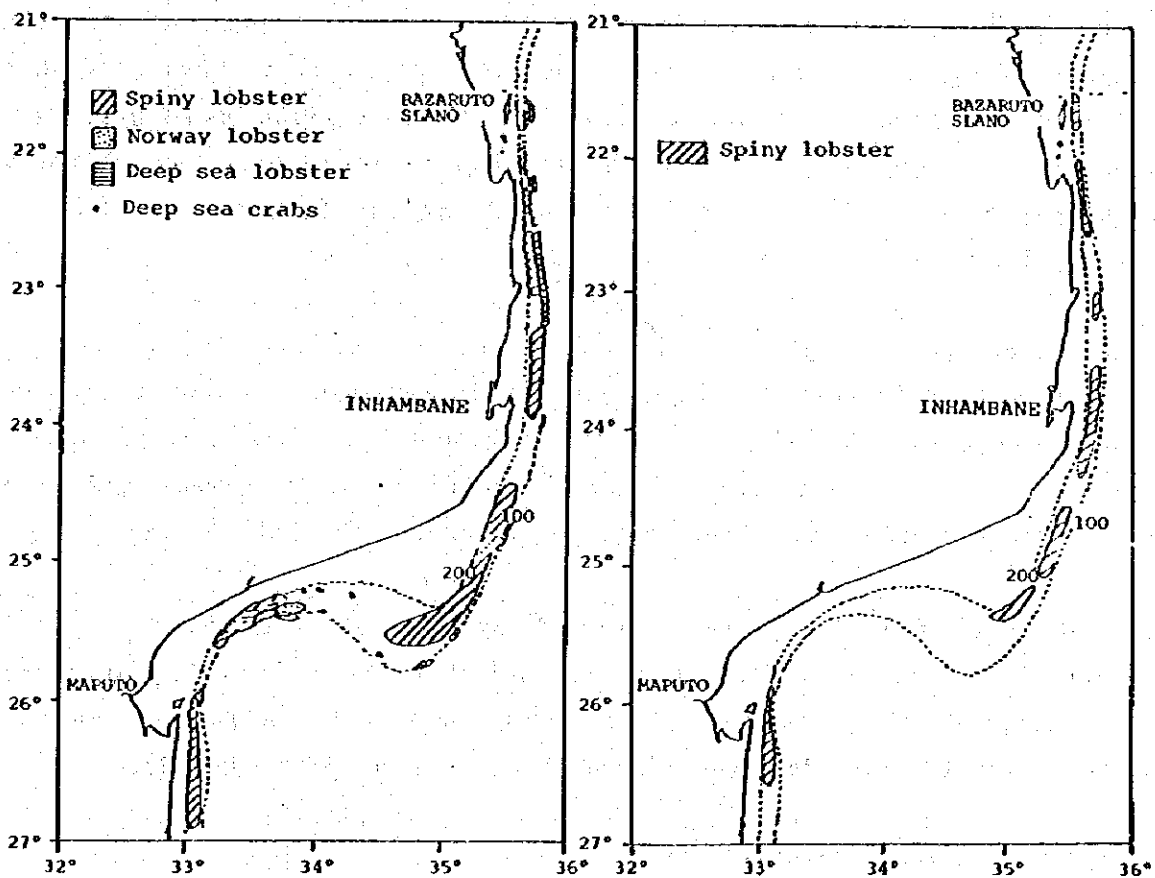


(Revista de Investigaçao
Pesqueria ano 1984 No. 12)

Fig. 2-5 Distribution of
Mackerel and Scad

Therefore the potential yield is estimated to be 1 million ton, but it is not considered to be an important resource because there is no catching technique in commercial base at the present time, and because of distribution characteristics of this fish (day time : bottom, night time: surface).

Annual potential yield for crustacea is estimated as follows; Shallow-water shrimp 8-13,000 t, deep-water shrimp only in Bazaruto islands - 4,000-5,000 t. The stock size of lobster is estimated to be 100 to 500 t, and it is said that this lobster depends on mixed catching with deep sea shrimp. (See Figs. 2-6 and 2-7.)



(The Marine Fish Resources of Mozambique, 1979)

Fig. 2-6 Deep Sea Crustacea in Summer

(The Marine Fish Resources of Mozambique, 1979)

Fig. 2-7 Deep Sea Crustacea in Winter

For coral reef sea areas, the area will be estimated to be 1,000 to 2,000 km², and since productivity in other similar sea areas is 5 ton/km², potential yield in the aforesaid area is estimated to be 5 to 10,000 t. For bay, the sea area will be estimated to be 2,000 to 5,000 km² in the same manner, and since productivity is 2 t/km², it is estimated to be 5 to 10,000 t.

At the present time, the research vessel of the Cabo Velde has been carrying out 3 years of study since 1984. Judging from the report and the fact that Mozambican Government allowed a Japanese fishery company to perform trial operation of tuna by trawl, it is defined that these areas including the cyclonic area of Mozambican Strait are the best seas for tuna fishing (This study report was announced at Indian Oceans Fishery Conference in November 28 to December 2, 1985, Revista de Investigacao Pesqueira ano 1984. No. 11). The kinds of fish found here are skipjack, yellowfin, bigeye, albacore, and the most prevalent fish is considered to be the yellow skin tuna.

Moreover, according to the report made by research vessel, it is confirmed that the anchovy is to be an important resource (minimum 30,000 t, maximum 300,000 t). Since Mozambique has not had suitable resources to produce fish-meal, it draws attention as food resources for fish-meal and dried fish. This resource development requires to employ the purse seine.

The catching of mackerel is performed by trawler ship of large-scale fisheries industry, therefore it is assumed that there is a lot of chance for resource development, nominating Sofala Bank and Boa Paz as the main fishing areas (Revista de Investligacao Pesqueira ano 1984, No.12).

(2) Fish resources of inland water

Mozambique has many rivers and lakes, and according to the statement made by the Fishery Agency, the potential yield is estimated to be 17,000 to 20,000 t. It is also estimated that the production by small-scale fisheries will reach 5,000 to 8,000 t/year, assuming that the production from Niassa lake located at the border with Malawi (water area of Mozambican side is 7,440 km²) and the artificial lake Cabora Bassa of upstream of Zambeze river (total length : approx. 250 km, maximum width :

approx. 30 km) reaches a maximum of 4,000 t alone. As for the supply sources of fish for the inland sections such as the Niassa province and Tete province where these lakes are located, a great deal of interest has been shown by the Fishery Agency, and therefore a fishery investigation is being performed for both lakes, receiving assistance from FAO and MONAP (Agricultural Promotion Project by NORDIC countries).

2-1-5 Fishery Production

The Mozambican fishery production body is divided into three categories by scale of production method: 1) Three state enterprises dealing especially with shrimp trawling and three joint venture companies comprised by large-scale fisheries (enterprise fishery), 2) quansi-enterprises fisheries comprised of fishery complex and private enterprises, and 3) small-scale fisheries comprised of fishermen cooperatives and artisanal fishery with regard to production statics are classified by the said three categories. However, fishery development project-wise, quansi-enterprise fishery and artisanal fishery are said to be as small-scale fishery in one term. Table 2-3 summarizes the amount of recorded fish and shrimp production for 1981 according to the data presented by the Fishery Agency excluding the small-scale fisheries. In the artisanal fisheries, the recorded yearly production is almost 19,000 t. Total production, however, is believed to be about 40,000 t.

Table 2-3 The Amount of Marine Production

	(Unit: t)			
	Fish	Shrimp	Others	Total
Enterprise Fishery	9,546	8,678	-	18,224
Small-Scale Fisheries	197*)	397*)	-	594
Artisanal Fisheries	18,788	-	284	19,072
Amount Total	28,531	9,075	284	37,890

*) Only the Province of Sofala

(Fishery Agency)

(1) Artisanal fisheries

Artisanal fisheries traditionally have been developed by self-consumption and through exchange of goods, as fish-supply resources, developed all over sea-side and in deep water in Mozambique. Main traditional fishing methods are purse seining, basket fishing, gillnet, handling, etc., which makes use

of natural conditions such as topography in coastal area and tidal time differences. And they have variations by region. The "gamboa", a type of fishing method, is executed in the fishing ground which has long-distant shallow beach and big tidal time difference. The number of workers in artisanal fisheries is approx. 44,000, and registered catch is 19,000 t. Total number of fishing boats is 18,000 and diesel engine boats and boats with outboard engines are at least less than two percent of the total number, and boats with sails about eighteen percent and the residual eighty percent are log boats. However, the organizing of fishermen's cooperatives are still in the introduction stages, and financing of operation funds is just beginning.

(2) Quasi-enterprises fisheries

Quasi-enterprises are comprised of fishing complex and private enterprise,

- a) The Fishery Development Centers, for development and consolidation of fishing cooperation and artisanal fisheries by local fishermen was organized under the authorization of the Fishery Agency. Table 2-4 indicates the seven active places and shallow marine fishery points and two inland fisheries, therefore, nine Fishery Development Center are placed to consolidate.

SULPESCA, who plays an important role as the model of small-scale fisheries, is located in the Maputo fishing port. It also has local branch in Inhaca. They have regular-basis yield by owner's boat, and are working broadly, so that the introduction of a new fishing method is developed and test-run. Here we have one of the lately developed fishery development center's future image. The following are facilities and description of the activities.

SULPESCA's objective is to support from the aspect of technological prevalence, seven fishing cooperatives located in Maputo to nearby local small fishermen classes. In regards to the fishing techniques and skills, improvements in processing technique and introduction, they receive instruction from FAO and Cuban experts and result in stable accomplishment. The number of ships belonging to SULPESCA are 27 sets of wooden boats, 17 sets of FRP boats, totalling 44 sets.

Table 2-4 Fishery Development Center

Fishery Development Center	Location State	Base	Foundation
Combinado Pesqueiro do Ibo, E. E	Cabo Delgado	Ibo	1981
Combinado Pesqueiro de Moma, E. E	Nampula	Moma	1982
Combinado Pesqueiro de Metangula, E. E	Niassa	Metangula	1982
Combinado Pesqueiro da Beira, E. E	Sofala	Beira	1982
SULPESCA, E. E	Maputo	Maputo Inhaca	1980
Combinado Pesqueiro da Sopinho, E. E	Zambezia	Sopinho	1983
Combinado Pesqueiro da Nova Chicoa, E. E	Tete	Nova Chicoa	1983
Combinado Pesqueiro da Pemba, E. E	Cabo Delgado	Pemba	1983
Combinado Pesqueiro da Ilha da Mozambique E. E	Maputo	Ilha	1983

(Figures from Fishery Agency)

(Refer to Table 2-5). By gillnet, trawl fishing and handling, they catch approx. 1,200 t/year.

Table 2-5 SULPESCA Owner's Boats

Belonging to	Type	Number	Length	Engine Spec. (p.s.)	Main Fishing
Maputo head office	Wooden boat	7	9.5	75	gillnet
	FRP boat	15	8.45	75	
	Wooden boat	9	12.0	170	trawling
	"	3	17.6	240	handling
			(average)	(average)	
Inhaca branch	Wooden boat	2	7.6	17	gillnet
	FRP boat	2	6.4	(outboard engine 9PS)	handling
	Wooden boat	6	6.7	9	trawling

(SULPESCA figures, 1982)

b) Private enterprises

The private enterprises management bodies as quasi-enterprises are 42 companies in number and total fishing boat numbers amount to more than 70. (Refer to Table 2-6 references.)

Table 2-6 Private Enterprises Management Body

Company Name	Target Fish	Number of Boat	Type of Boat	Total Tonnage (Min.)(Max.)	
MAPUTO	Shrimp Fish	13	Shrimp & Ice Storage Boat	6	19
		5	Handling & Ice Storage Boat	17	39
	Magumba	11	Gillnet & Ice Storage Boat	4	15
	Sub-total	29			
BEIRA	Shrimp	36	Shrimp & Ice Storage Boat	5	49
		12	Shrimp refrigerator & Trawl Boat	53	133
	Sub-total	48			
QUELIMANE	Shrimp	2	Shrimp & Ice Storage Boat	18	20
ANGOCHÉ	"	6	Shrimp & Ice Storage Boat		22
Total		85			

(Fishery Agency 1980)

(3) Large-scale fisheries

Large-scale fisheries is comprised of 3 state enterprises and 3 joint venture companies with foreign countries. (Table 2-7 references).

Table 2-7 Composition of Large-Scale Fisheries in Mozambique

Company Name	Target Fish	Number of Boat	Type of Boat	Total (Min.)	Tonnage (Max.)	1981	1982	1985
EMOPESCA (BEIRA)	Shrimp	7	Trawler	109GT	189GT	1,059t	455t	354t
	Fish	4	"	"	"	-	-	-
EMOPESCA (QUELIMANE)	Shrimp	7	"	124		399	308	109
EMOPESCA (ANGOCHE)	"	8	"	117		690	389	83
Total		26				2,148	1,149	546
EFRIPEL (Japan+ EMOPESCA)	Shrimp	14	Trawler	149		3,060	2,575	2,785
	"	2		345	365	475		
	"	2		220				
PESCAMAR (Spain+ EMOPESCA)	Shrimp	12	"	251	292	284	2,283	2,690
	Fish	5	"	286	573	-	-	-
MOSOPESCA (USSR+ EMOPESCA)	Fish	7	"	648		6,747	5,923	7,254

(Fishery Agency)

The state enterprises EMOPECA has been conducting fishing operations since the retreat of Portugal and taken over sleeping assets and main fishing zones of shrimps such as Angoche, Quelimane, and Beira. It has been administered under the control of the Fishery Agency as each independent company. The catch are shrimp and fish that are caught by shrimp trawlers. The shrimp through PESCOM International is exported to Portugal, France, and Spain and the fish is sold through PESCOM in the domestic market.

EFRIPEL and PESCAMAR are joint venture companies stationed in Quelimane and Beira as their bases, executing trawl fishing for shrimp as export products in the fishing area of Sofala Bank.

MOSOPESCA is located in Maputo as the base and executing trawl fishing for fish in main fishing areas such as Sofala Bank and Delagoa Bay in Maputo. It is said that all these three enterprises compared to the boats belonging to EMOPECA are highly efficient and have made a remarkable contribution to the increase on production of enterprises fisheries in Mozambique.

2-1-6 Main Fish Category

Table 2-8 indicates main useful fish that are caught at present.

Table 2-8

Local Name	Academic Terminology
Magumba	Hilsa Kelee
Sardinha	Pellona ditchela
ditto	Sardinella gibbosa
Ocar	Thryssa sp.
Carapau torpedo	Megalaspis cordyla
ditto	Trachurus trachurus
Xareu	Caranx sp.
Barracuda	Shyraena sp.
Tubarao	Carcharhinus sp.
ditto	Mustelus sp.
Corvina real	Otolithes ruber
Corvina	Johnius hololepidotus
Garoupa	Epinephelus sp.
Salmonete pequeno	Upeneus sp.
Pedra	Pomadasys sp.
Peixe banana	Saurida sp.

(Fishery Agency)

The main shrimp types are shown in Table 2-9.

Table 2-9 Main Shrimp Types

Local Macantile Name	Academic Terminology
Camarao encarnado	Metapenaeus monoceros
Camarao branco	Penaeus indicus
Camarao lagostim	P.monodon Fabricius
Camarao tigrè	P.semisulcatus de Haan
ditto	P.japonicus bate
Lagosta de rocha	Parulirus homarus

(Fishery Agency)

Besides the above two tables, Mangrove crab (Caranguejo do mangal, Scylla serrata), Venus meretrix, Perna perna, shellfish; cuttlefish and trepangs are added as yield targets. And also in inland water fishery, Tilapia sp. are produced in the inner continent of East Africa, plus Hydrocynus vittatus and Limnothrissa sp. etc. are main marine product targets.

2-1-7 Marine Products Distribution and Fish Eating Circumstances

(1) Fish supply and cooking methods in tight food shortage

According to the WFP (World Food Plan), food aid for Mozambique had been put into practice to overall states since 1979, which involves the aid for emergency, food aid in accordance with development, school meal projects, and the food stock, and the substances to be aided include milk powder, canned fish, corn meal, canned meat, cooking oil, etc. According to the survey by the WFP, the food supplied for a worker per day is as described in Table 2-10.

Table 2-10 Food Supplied for a Worker per Day

(Unit: g)				
Classification	Breakfast	Lunch	Take home	Total
Corn	100	150	1,600	1,850
Beans	40	60	40	140
Canned fish	-	-	100	100
Cooking oil	5	25	65	95

(WFP documents)

(Note) This food is supplied for workers as part of wages, in which those taken home are consumed in their home.

The average meal consists of bread and tea for breakfast, corn meal, sugar and steamed potatoes for lunch and supper. A family of three can buy 2 kg of fish by the official distribution route.

Around 1978 to 1979, salt-dried fish occupied 35 through 40% of fish consumption. However, fresh fish have been consumed much at present. Besides, frozen fish have been consumed very little except the bay area because the transportation, preservation measures are not provided.

Fish is mostly consumed upon preparing in the following cooking methods; (1) curry (with dried fish, rice and corn), (2) sandwiches (dried fish between bread) and (3) after defrosting, frozen fish is opened and dried, fried with coconut oil and seasoned (boiled), or dipped into the oil and grilled. People do not eat raw fish. Annual fish consumption per person was 2.2 kg in 1984. In 1980, when the fish consumption was the largest ever, it was 3.3 kg. It is found, therefore, that the consumption has been reduced by approximately 1 kg in the past five years.

(2) Marine products distribution

1) PESCO (marine products distribution public corporation) function

The Fisheries Agency founded EMOPESCA as the production facility and established PESCO as its commerce facility. PESCO domestically sells fish and the PESCO INTERNATIONAL was established to export lobsters, shrimp, etc. to Portugal, France, Spain, etc. PESCO and PESCO INTERNATIONAL, at present, are managed by the Ministry of Trade, separate from the Fisheries Agency.

PESCO owns a refrigerator in Quelimane city (approximately 400m³, 100m³ of which is being repaired due to trouble. Another rapid refrigerator room is also provided) as the fresh fish preserve facility. PESCO purchases the fish from the catch of EFRIPEL and EMOPESCA except lobsters and shrimp for export. Through directly-managed stores and city markets, PESCO distributes and sells as well as supplies them. From PESCO, refrigerator trucks come to the Sopinho fishery complex to transport the fishery to the above refrigerator. The capacity of two PESCO refrigerator trucks is limited to 6 t in total, so that EFRIPEL employs large-sized trucks to transport frozen fish to PESCO.

Also, PESCO owns directly-managed stores referred to as CORPERATIV which sells high-class fish such as lobsters mainly to foreigners residing in the city. In addition, PESCO deals in exported fish. For example, horse mackerels imported from the Soviet Union are shipped and sold. Selling (including distributing) these fish is planned and directed by the Ministry of Trade. Also, fish transported by ferries from neighboring fishing villages are received at the wharf and delivered to the refrigerator by the refrigerator trucks.

Although the official price of dry fish set by the government is 125 MT (product) and 146 MT (wholesale) at the maximum (refer to the item on the marine product distribution system and prices), PESCO purchases dry fish at 1,000 MT per kilogram. It is not clear whether the district is specified as a free sales price permission area.

In the Gazelas fishing village, an average of 40 kg of fish are caught per day by the trawl (7 crew members per boat). Additionally, shrimp are also caught. PESCOM, therefore, is very useful for the village as a fish distribution organization. The operating ratio, however, is low because the transportation measures including refrigerator cars are less.

2) Function of SULPESCA on marine product distribution

SULPESCA, the fishery complex established on Maputo, is developing favorably as the model of that established in each district. In addition to the fishery product business, it manages the distribution of port of marine products. SULPESCA owns warehouses and sales centers which sells fishing implements, fishery materials, food, clothes and other consumer products, as well as a refrigerator to purchase fish which fishermen cannot sell directly. Also, a small repair workshop is provided to help repairing their fishing implements. Furthermore, SULPESCA has their own fishing boats and favorable results have been obtained. Because of these functions, fishermen call SULPESCA as an aid, sales and purchase center.

(3) Marine product distribution system and prices

According to the government report as of May 11, 1985, marine product distribution and prices are determined as follows.

- 1) Fresh fish prices should be set by the competition between each government within the range specified in 2). The state government is allowed to ask for cooperation from the Ministry of Trade or Fisheries Agency with respect to the survey and examination to fix the price.
- 2) The upper limit of the fresh fish price set by the state government is shown in Table 2-11.

Table 2-11 Fresh Fish Prices Set by the Government

(Unit: MT/kg)

Sale Price	1st category		2nd category		3rd category	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Producer	75.00	125.00	37.50	62.50	18.50	31.00
Wholesaler	88.00	146.00	44.00	73.00	22.00	36.00
Consumer	100.00	158.00	47.50	79.00	23.50	39.00

(Fishery Agency, 1986)

- 3) In accordance with the trend of consumption by each state, the price is allowed to vary between different fish species even if they belong to the same class.
- 4) Moreover, according to the regionality of each prefecture in each state, the price will vary corresponding with local conditions.
- 5) When wholesaler organizations which comprises several purchase groups joins as a distribution route, the handling charge to be paid should be divided among them.
- 6) The price of frozen fish produced by processors is determined by the Fisheries Agency after the coordination between the Ministry of Trade and the Ministry of Finance.
- 7) The price of dried fish cannot exceed four times the price limit set in Table 2-11.
 - a) For gradation, dried fish should be ranked as the first or second class (the second and third species should be treated as the second class) before dealings.

b) The conditions in articles 3), 4) and 5) are applied to dried fish.

8) After asking opinions of the Fishery Agency and the Ministry of Trade, the state government can determine the area where sales of free-price fish are approved depending on the situations.

In this case, the ratio to be supplied for general consumers at the set price and the type of products which bring a profit to producers, must be considered.

As said in the above, the Mozambican Government should authorize to fix maximum and minimum prices of fish marketed nationwide by regulation. Each state (prefecture) government can sell fish to fix the national price within this price zone. At present, in Mozambique, only fish have regulation of quota, and with this three family members can bring 2 kg/month.

However, in cities, intermediaries and peddlers visit to sell fish from door to door. It can be possible that people buy directly through fishermen, from the spot where catch are unloading, and at bazaars.

In the case of EFRIPEL, wholesale price of frozen fish is shown in Table 2-12.

UDPPE (small-scale fishery division, Fishery Agency) should fix production sale prices by each state, by dried fish, by fish category by shrimp (big, medium, small), etc. Prices are divided into three categories: entrepreneur's purchasing prices (intermediary/no intermediary) (In Sopinho, fishing development center acts as broker.), general sale prices and retail prices (hotel and restaurant). However, they are more expensive, compared with other sale prices. Fishermen in small-scale fisheries can sell directly to retailers (no intermediary), or can sell it themselves in the retail business.

Table 2-12 Wholesale Loading Price Schedule

1st class

40 MT/kg (in medium scale boat 75 MT/kg)

2nd class

30 MT/kg (in medium scale boat 40 MT/kg)

3rd class

15 MT/kg (in medium scale boat 20 MT/kg)

(Fishery Agency 1986)

Remarks: Cuttlefish - 65 MT/kg

In this case, production price in Sopinho for fresh fish,

1st class-40 MT/kg

2nd class-30 MT/kg

3rd class-15 MT/kg

1st class corresponding to 1st category

2nd class corresponding to 2nd category

3rd class corresponding to 3rd category

In the Quelimane district, the dealing with fish caught by small-scale fisheries and the selling, generally, is thought as follows,

- 1) Self-consumption
- 2) Selling to enterprises like in other districts
- 3) Direct sales to consumers (state government should fix the upper limit price zone)
- 4) Selling through PESCOM
- 5) Direct sales to city market and COOPERATIVO.

In special areas in the Quelimane district, aquatic products caught get free pricing (in places of authorized small fisheries). Free market prices are opened in retail market such as bazaars in fishermen's village.

2-2 Outline of the Fishery Development Plan

Traditionally, the people of Mozambique are rather fond of eating fish and their demand for sea products is deep-rooted. But as is the case with other foodstuffs, national supply is at a lower level than the demand, which forces them to depend largely upon foreign production. On the other hand, the long droughts since 1978 have sharply decreased the agricultural production, with 50% of products lost and livestock reduced even down to one-tenth. Foodstuff supply thus became very tight. Further, the daily necessities to be given to farmers in exchange of agricultural products fell short, which brought obstacles to the governmental purchase of foodstuffs. It is further said that shortage of transportation means such as trucks and delayed railway transportation, often interrupted the food distribution.

Furthermore, import of cereals on the commercial basis is difficult to realize because of the shortage of foreign currencies. Although food aid by international organizations and foreign countries are making up for the food shortage, they cannot always contribute to emergency needs because of delayed shipping or late arrival of foodstuffs. Foreign currencies fell short because of frequent calamities such as flood, seed shortage, poor crop of cashew nuts or sharp break of international prices of sugar and cotton. These circumstances make it very difficult to import the living necessities to be supplied to the agricultural zones. The food situation in Mozambique thus remains critical.

The role of fishery is very important under these bad conditions. First, it should be considered as a precious source for obtaining foreign currencies. In the overall amount of export, that of shrimp reaches about 30%. Secondly, marine products should be counted as an important supply source of animal protein for the people of Mozambique. It is said that the intake per capita is 1.8 kg/year for meat and 3.3 kg/year for fish. A considerable part, thereof, is dependent on imports in exchange for meager foreign currency.

In order to develop the fishery industry in Mozambique, the Government prescribed the years 1981-1990 as "10 years to overcome the low development" and worked out the Decennial Economic Development Plan (1981-1990) (Plano Prospectivo Indicativo). In order that the fishing industry can be positively promoted within the framework of increased production of foodstuffs, the said plan aims:

- 1) To meet the national demand; and
- 2) To promote exports, gaining 200 nautical miles of economic waters.

Roughly speaking, to attain these targets, they are going to adopt such policies as follows:

- (1) Promotion/Development of a Fishing Complex (improvement and expansion of small-scale fisheries)

To organize nationwide about 45,000 local fishermen in Mozambique, instructions/diffusion of fishing techniques shall be executed for fishermen, together with cargo collection, purchasing, processing, sales of equipment/materials, in selecting such suitable places where the fishermen are concentrated, where fish are much consumed and considering them as strategic points for small-scale fisheries. The final objective thereof is to contribute to self-supply all the imported fish which is said to amount to 15,000 t.

- (2) Consolidation of State Enterprises in Large-scale Fisheries

For large-scale fisheries depending on crustaceans, the number of enterprises shall be limited to the actual 6 (3 state enterprises, 3 joint ventures), and increased production shall be aimed by way of the expansion of these state enterprises.

- (3) Improvement of Such Fishery Production Infrastructures as Fishing Ports, Cold Storage and Processing Facilities, etc.

They shall be improved/consolidated with increased production by large-scale fisheries and fishing complexes.

(4) Consolidation of Such Companies Related to Fishery such as Shipyard, Fishing Net Manufacturer, Supplier of Fishing Equipment/Materials

Fishery-related companies shall be consolidated to smoothly supply fishing gears and equipment/ materials, which enables them to cope with the supply of fishing boats necessitated by the establishment of the fishing complex and to meet with increased demand from consolidated small- and large-scale fisheries.

(5) Development of Fisheries Resources

Not only national development but also those with foreign aid shall be promoted for the utilization of un-used fishery resources.

(6) Improvement/Consolidation of Fisheries Training Facilities

Training ships belonging to the training center shall be constructed and training facilities shall be consolidated, to improve fishing techniques.

Nowadays the Mozambican Government considers that shrimp fishing as a means for acquisition of foreign currencies (the most important means for the country) has reached approximately the limit of potential yield. The production thereof shall therefore be maintained, for the time being, at the actual level, with efforts being concentrated on the improvement of fishing productivity and profitability instead.

Thus the actual policies for the development of fisheries lay stress on the self-supply of marine products now imported in exchange of meager foreign currencies. To that effect, it is considered as of greater importance to envisage the consolidation and development of state enterprises, to organize a cooperative association of small-scale fisheries in accordance with the Decennial Plan and resolution of the 4th Committee of FRELIMO and to train Mozambican fishing engineers, thus improving local productivity.

The said cooperative association based on the Decennial Plan intends to make farmers (fishermen) participate in the common life of rural community so as to promote the switching-over from family works into works under a co-op system. Although the main activities in cooperative association

underline the collective activities of production, able members thereof are to be allowed to contribute a part of their activities to individual production. National support will be given to the co-op in the domain of: a certain amount of investment, supply of fishing equipment as productive elements, supply of living necessities at prices of preferential favor, financing or allowance of subsidy, phased introduction of machinery, technical assistance, guarantee of distribution for products and other means to improve production.

Thus the establishment and upbringing of the fishing complex such as represented by SULPESCA is considered as a mainstay of the fishery development program.

2-3 Outline of the Fishery in Quelimane District

(1) General

Quelimane is the capital of the Province of Zambezia.

The Province of Zambezia ranks second in terms of land area (105,008 km² over the total land area of 799,380 km²) (13.1%). Its population reaching 2,736,540 accounts for about 20.6% of the total population of 13,284,174 (second in Mozambique, as of January 1st, 1984). The population concentrates on coastal areas, and the coastal line, thereof, is long.

In this province, production of agricultural and forest products is rich, especially rice, tea and copra, etc.

However, the actual plowed area of 77,000 km² is too small as compared with the overall arable area of 493,000 km² (about 16%).

(2) Outline of Fishery in Quelimane District

1) Ascendancy of Fishery Viewed from the General Standpoints of Hydrographic Conditions and Geography

Zambeze and several other rivers, large and small, exist in Zambezia Province. The nutritive salt carried by these rivers from upstream enriches their estuaries and the whole neighboring coastal areas, thereby, contributing to the formation of good fishing grounds. The basin of Zambeze River (1,400 km) is one of the five most important basins of rivers in Mozambique. Also the River Dos Bons Sinais which flows through Quelimane City is an important one for Zambezia Province, where freshwater fish are abundant. The whole area near the basin is useful as a good fishing ground where zooplanktons and phytoplanktons are rich.

When viewed from the standpoint of hydrographic conditions, the waters near Quelimane is an intersecting point of the Southern Equatorial Current which flows in from the North and the Agulhas current which flows south along the east coast of Africa.

When considering the surface water temperature off-shore, a cyclonic area is formed favorably between the coasts and Madagascar.

This cyclonic area varies its scale in winter and in summer. The symbols a, b, c and d in Fig. 2.8 represent respectively a cyclonic area discovered by an investigation on blue-fin tuna resources. It is generally said that in this area the occurrence of cyclonic area is frequent in the surface layer, which depends on geographical conditions, the Agulhas Current and its tributaries. It can therefore be said that coastal and off-shore areas of Quelimane are favorably situated from geographical viewpoints.

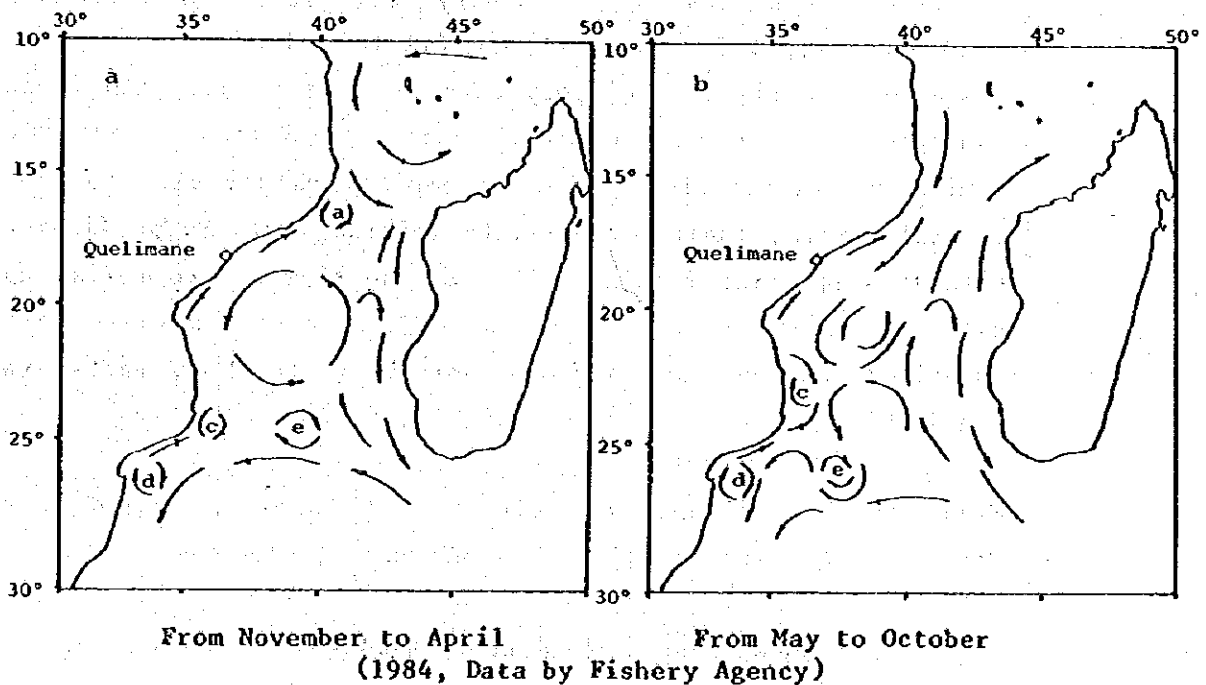


Fig. 2-8 Current Conditions in Surface Layer at the Straits of Mozambique

2) Outline of Fishery in Quelimane District

(a) Small-Scale Fisheries

According to the census on small-scale fisheries executed in 1979, the number of persons engaged in fishing, that of fishing boats and fishing production in Zambezia Province are as indicated as follows:

<u>Total</u>	<u>Zambezia Province</u>	<u>Ratio</u>
(Number of persons engaged in fishery)		
43,743 pers.	7,706 pers.	17.6%
(Number of fishing boats)		
17,886 sets	4,047 sets	22.6%
(Fishing production)		
13,060 t	998 t	7.6%

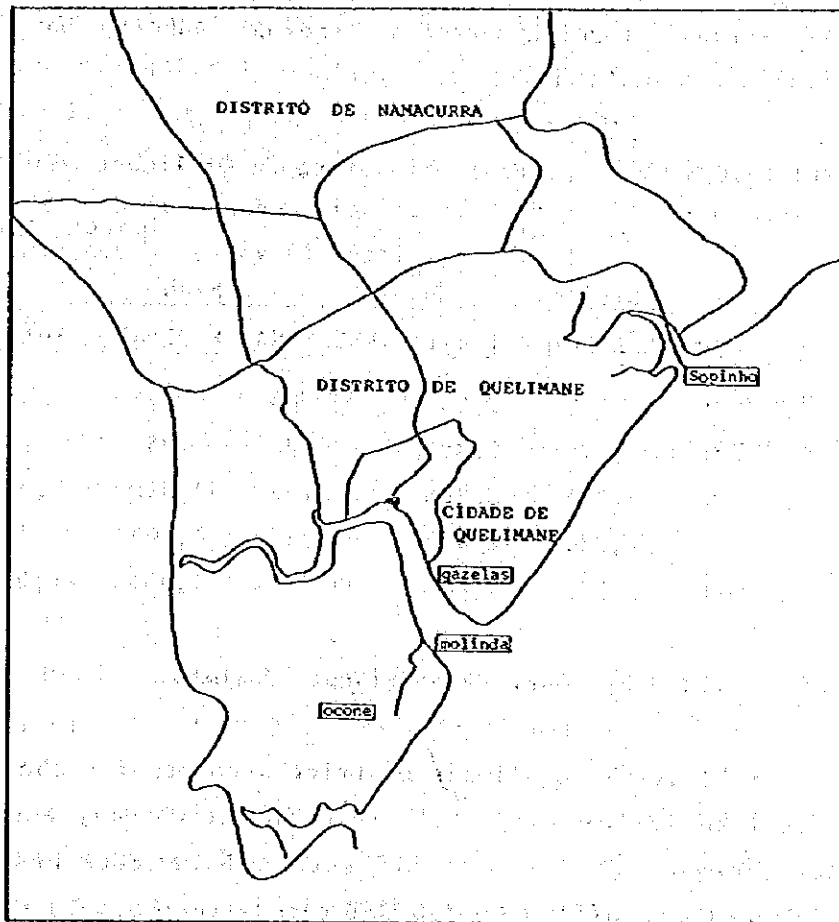
The number of small-scale fishing boats registered in Quelimane District is 843 sets (as of January 1st, 1986). They are 0.1 to 9.5 G/T type, 99% of which are 0.1 to 0.3 G/T type canoes. Boats with outriggers are very rare as is the case with those equipped with outboard motors. Since their fishing area is limited to in-bay rivers with low wave-height or else to near coastal waters, their productivity remains low. Major fishing methods are: line fishing, gillnet, and trawl. Fresh fish as catch are small in quantity, the largest part are dried fish (unsalted, salted and partially smoked fish). Most parts are sun-dried.

Major fishing villages are situated at Gazelas, Molinda and Ocene, among which Molinda is the nearest to the river-mouth.

Figure 2-9 shows the main fishing villages in the Quelimane District.

(b) Medium-Scale Fisheries

In this district, there exists private fishing enterprises (medium-scale) which hold about 10 shrimp fishing boats (with cold store). This number, when compared with Beira and Angoche, when considered as inferior to Quelimane from the viewpoint of access conditions to fishing ground, is considerably small. At Beira and Angoche, about 50 medium-scale fishing boats are in operation.



(Data by Fishery Agency)

Fig. 2-9 Major Fishing Villages near Quelimane District

It is presumed that this small number in Quelimane is caused by the fact that such small-scale boats cannot easily make use of the quay wall of the Commercial Port of Quelimane.

(c) Large-Scale Fisheries

In the Quelimane District, there are two sorts of large-scale fisheries. One of them is the national enterprise EMOPESCA and the other is EFROPEL which is a joint-venture composed of EMOPESCA and a Japanese fishery company. Both enterprises hold shrimp trawlers. The catch in 1985 was on the order of 4,000 t,

among which shrimps consisted 2,894 t. The shrimp trawling is the largest foreign-currency earning industry in Mozambique (refer to Table 2-1).

Table 2-13 Catch by Large-Scale Fisheries in Quelimane District

(unit: tons)

Year	Shrimp			Fish		
	EMOPESCA	EFRIPEL	Total	EMOPESCA	EFRIPEL	Total
1981	399	3,060	3,459	80	475	555
1982	308	2,575	2,883	126	855	981
1983	195	2,081	2,266	197	1,390	1,587
1984	225	2,388	2,613	155	1,167	1,322
1985	109	2,785	2,894	73	1,039	1,112

(Data by courtesy of Fishery Agency)

The yield at the Quelimane District accounts for about a little more than 10% of the total yield in Mozambique, and about 65% for shrimp. EFRIPEL holds 18 sets and EMOPESCA has 7 sets of fishing boats of 110 to 350 G/T type. Further, there are about 87 sets of fishing boats in operation with Beira as a fishing base, which arrive from time to time at Quelimane. Their trawling is not included in the figures in Table 2-13 because most part of their catch is forwarded to Beira Port.

(3) Recent Utilization of the Commercial Port of Quelimane

When the utilization of mercantile ships and fishing boats in 1984 is taken as 100, that in 1985 is as follows:

	Increase Rate of Vessels	Increase Rate of Tonnage
Mercantile Ships	133.3%	95.2%
Fishing Boats	106%	103.7%

The average tonnage per ship (gross tonnage) is 1,807 t for mercantile ship and 159.9 t for fishing boats in 1984, while in 1985 the former becomes 1,290.5 t and the latter 156.5 t, which implies that the tonnage per ship has been largely reduced and inversely the number has increased for the mercantile ship. Though, for fishing boats, their tonnage has somewhat diminished and their number increased, this is considered to be by increased frequency of entry at port.

Quelimane Commercial Port has not been dredged for the past 10 years, which allowed earth and sand to heap up. Furthermore, interruption of land traffic (road and railroad) made it necessary to transport goods only by way of marine transportation.

This accelerated the increase of mercantile ships in port, while their tonnage became smaller and smaller.

On the other hand, the utilization of the port by fishing boats increases year by year, with their tonnage becoming larger and larger.

At present, in this port, priority is given to utilization by mercantile ships and the cargo work. In the event that the wharf is occupied by mercantile ships, the fishing boats must wait at berth. Under these conditions, utilization of the port by newly-built fishing boats has been prohibited or limited for the past two years.

Table 2.14 indicates the recent utilization of the Commercial Port at Quelimane.

The number of large-scale and medium-scale fishing boats now utilizing the commercial port is 25 and 10, respectively. Besides, from time to time the large- and medium-scale fishing boats with Beira or Angoche as their mother port utilize the Port of Quelimane.

Though small-scale fishing boats, 800 sets or more in number function near Quelimane, they are too small to utilize the port.

Table 2-14 Utilization of Quelimane Commercial Port in the Last Two Years

Top figure in each row: sets
Bottom figure in each row: t

Item	1	2	3	4	5	6	7	8	9	10	11	12	Total
1984													
Mercantile ship	5	6	6	10	6	10	6	4	10	4	7	6	81
	13,839	11,747	10,767	9,471	17,028	13,425	17,069	12,443	13,677	11,506	10,600	4,802	146,374
Fishing boat	21	22	23	19	23	20	21	23	19	20	19	20	250
	3,240	3,790	3,940	3,140	4,140	3,090	3,240	3,540	2,740	3,090	2,940	3,090	39,980
1985													
Mercantile ship	8	6	8	8	14	10	7	14	7	9	6	11	108
	16,118	7,006	2,833	8,527	15,137	8,518	11,545	14,720	10,063	23,783	13,337	7,794	139,381
Fishing boat	21	22	20	19	22	21	23	24	22	25	23	23	265
	3,440	3,390	3,090	2,940	3,390	3,240	3,540	3,630	3,530	3,920	3,680	3,680	41,470

(EPRPEL Documents, 1986)

(Note) Number of ships means frequency of entry. The tonnage mentioned herein is unitary frequency of entry, multiplied by tonnage of each vessel, without taking into consideration the entry days.

2-4 Background and Contents of the Request

2-4-1 Background

In the economy of Mozambique, about 60% of the exported amount and about 40% of the Gross Domestic Product (GDP) are occupied by agricultural and fishing industries. However, it should be noted that emphasis lies on the agricultural products intended for export. So the self-sustenance ratio of rice, wheat and dairy products for consumption remains low, the most part of which must depend on imports. In particular, the floods and long droughts occurring every year since the inundation of the River Limpopo in 1977, stroke disastrous blows to the Mozambican economy centered on the agricultural and fishing industries. From the year 1982 onward, its real economic growth rate has remained negative for these years because of:

- (1) Reduced agricultural production by long droughts;
- (2) Steep decline of industrial production due to insufficient supply of raw materials;
- (3) Reduced foreign currency income through transportation services by railway, ports, etc. which accompany the reduced transportation volume caused by the change of route by the Republic of South Africa, and
- (4) Sluggish export prices and shortage of foreign currencies by worldwide depression in business.

The economic destitution of the country has reached its utmost. For example, incessant droughts and successive floods as well as other disasters have accelerated severe concentration of the population into urban areas and worsening of food situation. Starting from March 1981, distribution control of food has been in practice under these circumstances.

Speaking generally, however, Mozambique is abundant in reserves of resources, thus occupying an important geographical situation in Southern Africa. It has even the possibility to become a major power from a reserve

resources viewpoint. It is, however, considered that a huge amount of financing and technical cooperation from developed countries are indispensable to exploit them.

Under these circumstances, the Mozambican Government worked out the "Decennial Economic Development Plan" (1981-1990) and put it into practice in making every effort for self-supply of food, promotion of export type industries and development of energy resources (these being the basic target of the plan). In every endeavoring to re-construct and develop the state economy, it calls for economic aid from foreign countries. It is promoting the nationalization of major economical sectors, group production of agricultural products and planned economy.

In such a background, the Mozambican fishing industry which is favored by about 2,470 km of overall coastal line and by rich fishery resources in coastal waters (FAO presumed the volume of them to be about 500,000 t) is playing a very important role, both as a precious means for earning foreign currencies, especially by export of shrimp (in 1984, shrimp occupied about 29% or more of the total income in foreign currencies) and as one of the important supply sources of foodstuffs (per capita intake of fish 3.3 kg/year which is superior to 1.8 kg/year (1980) for meats). But the production by fishery is on the order of 30,000 t which corresponds only to less than 1/10 of the volume of fishery resources in their utilization, and further about 7,000-8,000 t, thereof, are exported, while about 50,000 t of domestic demand cannot yet be met, but must be made up for in exchange of meager foreign currencies.

As a result, the Mozambican Government is carrying into effect various fishery buildup policies, as an integral part of the said Decennial Economic Development Plan for increased production of foodstuffs, in order to positively promote the fishing industry. Among these, re-construction of small-scale and large-scale fisheries, which have become the most important industry in Mozambique, is considered as an essential means to overcome the food and economic crises of the country. The most required item to that effect now is the development and improvement of fishing port facilities, especially those which can be commonly used by both small-scale and large-scale fisheries. This requirement is a very urgent one.

Actually, four ports of Maputo, Beira, Angoche and Quelimane are being used as large-scale fisheries bases, among which that of Quelimane is not duly equipped at all as a fishing port. Thus improvement and consolidation of Quelimane Port as a central port in the Northern coastal region is strongly desired.

In the background as mentioned above, Japan received a request, from the Mozambican Government, for the grant of a non-reimbursable fund that will allow term to construct jetty facilities, to prepare the site for a fishing port, to construct administrative installations, fishing training facilities, fish market, warehouse for fishing gears, slipway and work shop and other fishing port facilities as well as to supply such fisheries equipment and materials as a refrigerating van, insulated van, trawler, etc.

2-4-2 Contents of the Request

The items of facilities mentioned in the request from the Government of Mozambique are the following:

(1) Jetty

It shall be 80 m in length and allow small and large fishing boats to berth at the same time. Auxiliary facilities are equipment for fuel, fresh water, lighting and others required.

(2) Preparation of Fishing Port Site

In parallel with the construction of jetty, the site shall be prepared for constructing fishing port facilities.

(3) Administration Center

A building shall be constructed which will house several branch offices of related government agencies required to control and operate the fishing port (such as Ports and Harbors Bureau, Customhouse, etc.).

(4) Disposal Center
Intended for distribution and sale of catch to local inhabitants. This center shall contain a small processing plant equipped with an ice making facility, refrigerator, cold store, fish dryer, etc.

(5) Warehouse of Fishing Gears
This warehouse, which will store fishing gears, etc., shall supply to large and small fishing boats equipment and materials required for fishing.

(6) Vans (2-ton refrigerating vans (2), 4-ton refrigerating van (1), and insulated vans (2))

These vans shall be used to distribute fresh and frozen fish to the districts near the fishing port and to cities and towns near Quelimane City.

(7) Slipway/Workshop

This item shall include facilities and equipment to repair the fishing boats based on the Fishing Port of Quelimane.

Although the Mozambican Government intends to construct, at Quelimane, a new fishing port which will include all such facilities as above, it is impractical to plan to construct them all at once.

It is therefore viable to phase this equipment plan in several stages and complete the construction, within a certain period, according to a sequential priority.

Chapter 3
CONTENTS OF
THE PROJECT

3-1 Purpose

The People's Republic of Mozambique has planned the development of fishery resources for the purpose of making more efficient use of existing resources such as shrimp in near fishing areas. Shrimp should be exported for getting foreign currency, and other species of fish including small fish should be consumed by native people to take more animal protein. First of all, the Fisheries Agency has organized a State Enterprise in Mozambique. And it also has established a joint venture with foreign countries including Japan, with the prospect of dominating the well-established fishery in this country as well as to encourage small-scale fisheries by means of modernization and organization. As far as the fishing boats and fishing equipment are concerned, they are favorably supplied by foreign countries. But in the meantime, improvement of fishing ports which should be the major part of the land distribution system for fishery products has never been put in action except for the one in Maputo.

Unfortunately, even in Quelimane city, most favorably located as a place for the base of shrimp fishery which might be regarded as the biggest jack-pot industry obtaining foreign currency in this country, the fishing boats, use the commercial port since there is no fishing port equipped with necessary facilities. Under such circumstances, the Government of Mozambique made a request to the Japanese Government for a Grant Aid for providing the fishing port facilities for promoting the development of small-scale fisheries as well as large-scale fisheries.

By increasing fishery production the Government of Mozambique aims at earning foreign currency from export and at the same time providing more animal protein to its people. This will help to reduce the import of fishery products, thus contributing greatly to the nation's foreign currency saving. For those purposes the Government has planned to construct an exclusive fishing port equipped with a jetty, supervisory facilities and processing facilities in Quelimane area.

This Plan intends to promote the fishing industry of Mozambique as a means to overcome the food and economic crises into which it has fallen.

The way to promotion and development of the fishing industry in Mozambique can be summarized into the following two points:

(a) Acquisition of foreign currencies by promotion of large-scale fisheries

The volume of imported fish is to be reduced and foreign currencies saved by earning foreign currencies through development of shrimps trawling and through effective use of coarse fish which is caught together with the shrimp trawling.

(b) Countermeasures against food shortage by improving productivity in small-scale fisheries

Since the small- or medium-scale fisheries occupy the most part of the fishing industry in this country, the yield shall be increased laying stress on coarse fish through improvement of fishing gears/methods and putting in order of the distribution mechanism, etc., thus paving the way for the commercialization intended for coping with domestic shortage of fish.

Thus the most important factor for Mozambique at present is the development of small- and medium-scale fisheries. To prepare, improve and complete such port facilities as can be commonly used by small- and large-scale fisheries is the task to be undertaken most urgently.

At present four ports of Maputo, Beira, Angoche and Quelimane are in use as bases for large-scale fisheries. This Plan intends to develop the Port of Quelimane whose most facilities should be improved urgently.

The necessity of the facilities of Quelimane Port is broken down into the followings:

(1) Necessity of a Port for Exclusive Use

The actual commercial port constructed under the Portuguese colonialization has been commonly used by mercantile ships and fishing boats, but such a utilization is coming near to its limit. Since priority thereof is given to mercantile ships, the fishing boats must often wait uselessly at berth, which bring obstacle to their exploitability.

(2) Merits of Location Conditions of the Fishing Port

Since the Port is situated near the main fishing ground for shrimps (about five hours from Quelimane and about 24 hours from Beira) and also near Sofala-Bank which is a fishing ground for pelagic fish, the position of the port is advantageous equally for development of fishing grounds other than for shrimps.

(3) Importance of Zambezia Province

The Zambezia Province with Quelimane as its state capital city ranks second with regard to its area (about 100,000 km²), first for population (2,730,000). Furthermore, its situation is second to Maputo, the Capital, from the viewpoint of population density. Agricultural, forest and fishery products are also abundant there.

(4) Development of Small-Scale Fisheries

Far small estuarine fishing has been effectuated towards the river-mouth with Quelimane as its center. Most part of the estuarine fishing boats are canoes of 0.5 to 2.0 G/T class, boats with outboard motor being very rare. The number of registered boats amounting to about 900 sets are dispersed into three major fishing villages and several fisheries cooperative associations. The yield, for the most part, is self-consumed, the remaining part being delivered as dried fish, to the Governmental Public Corporation for Distribution.

There are some quantity of crabs and shrimps as yield. The volume of landed fish can be expected to increase in supposing that the distribution network and fishing gears, etc. as well as fishing techniques be improved in the future together with consolidation of the fishing port. The increase of brailing in small-scale fisheries will further contribute to the solution of the domestic food shortage, and moreover it is expected to consolidate its solidarity with the existing fishing complex of Sopinho.

(5) Increased Utilization of Medium-Scale Fisheries (Quasi-enterprises Fisheries)

About ten sets of fishing boats among medium-scale fisheries whose base ports are Beira and Angoche now utilize the Port of Quelimane. This number will increase to 20 to 25 after the improvement project of Quelimane Fishing Port is completed.

This Plan envisages, as a result of the considerations mentioned above, to construct fishing port facilities including wharf facilities, preparation of port site, administrative facilities, training facilities, fish market, warehouse of fishing gears, thus allowing it to develop as a main fishing port in central waters of Mozambique.

3-2 Examination of Request Items

(1) The necessity of improving fishing ports

- a) Because of the first priority being given to a mercantile ships in the commercial port now, there are so many disadvantages for fishing boats such as taking up a berth that it brings about enormous interferences in the case of unloading and preparation for leaving.
- b) Normally, the commercial port consists of one-way fixed quay for landing to suit for a mercantile ship of 5000 G/T. The tidal difference between the ebb tide and the flowing tide is so large in this water (max. 5.3 m) that it is very inconvenient and dangerous for fishing boats of 150-350 G/T to reach the port.
- c) The enormous demand for ship transportation as well as cargo boats is attributed to closure of road transportation. And because of the recent figure of ship with shallow draft--so as to accommodate to the sand sedimentation around the jetty--the capacity of cargo boat becomes less than before. It accounts for the increasing necessity number of cargo boats.
- d) The size of fishing boats is becoming larger, an increasing number of boats are based on Quelimane, and each boat comes to and goes out from this port more and more frequently.
- e) Quelimane is close to the main fishing ground of shrimp (about five hours from Quelimane and one day from Beira) and also close to the Sofala Bank, a good fishing ground of demarsal fish. If a port is constructed there exclusively for fishing, therefore, an increased use of chartered boats is expected in future.
- f) Quelimane is provided with a large refrigeration facilities as well as water, oil, and power supply systems. For marine transportation to other districts, the commercial port of Quelimane can be used. (Domestic assignment of boats includes those for Beira and Maputo, while ocean routes include Japanese and European lines).

(2) Signification of Fishing Port Construction in Quelimane District

a) Large-scale fisheries (EFRIPEL and EMOPESCA)

- o It is vital for improvement in efficiency of shrimp fishing, the largest foreign currency earning industry in Mozambique.
- o It allow for the effective use of coarse fish additionally caught by shrimp trawling to make up for the shortage of domestically provided albuminous foods.

b) Medium-scale fisheries

- o It contributes to the development of shrimp fishing and gill net fishing for demersal fish in such ground as Sofala Bank.
- o It helps to meet increased unloading at Quelimane and registration transfer by boats based on Beira and Angoche.

c) Small-scale fisheries

- o It helps to establish a base exclusively for more than 800 small-scale fisheries boats to meet domestic demand for fish.
- o It helps to form a basis for the fishing complex in Quelimane district with it fishing port facilities.

(3) Estimate of Use of Fishing Boats after Construction of Fishing Port

State of utilization of Quelimane commercial port by fishing boats is examined to estimate the degree of utilization of the fishing port after its construction.

Fishing boats using Quelimane commercial port at present include 25 sets of fishing boats of large-scale fisheries and ten sets of fishing boats of middle-scale fisheries, and no boat of small-scale fisheries uses it.

After construction of a new fishing port, about 40 sets of fishing boats of large-scale fisheries, 20 sets of fishing boats of medium-scale fisheries, and 80 sets of fishing boats of small-scale fisheries are expected to use it. Description will be given for each class of the fishing industry hereinafter.

a) Large-scale fisheries

At present, 25 sets of fishing boats of large-scale fisheries are based on Quelimane, 14 sets of 150 G/T, two sets of 220 G/T, and two sets of 350 G/T belonging to EFRIPEL, and seven sets of 110 G/t belonging to EMOPECA. All these boats are shrimp trawlers of double rigger type, with a total catch of 4000 t in 1985.

Operating conditions of fishing boats of large-scale fisheries are as follows:

- o Fishing ground: From the open sea of Pebane at the northern end to Beira at the southern end, at the depth from 8 to 40 m
 - o One voyage: 26 or 27 days
 - o Haul per operation: 400 to 440 kg of shrimp per day, 300 kg of fish (horse mackerel, flatfish, etc.) per day
 - o Haul per voyage: 10 to 12 t (max. 16 t), big catch from March to May, poor catch from August to November
 - o Stoppage of boat: four days (1 day for unloading of catch, one day for supply of fuel, water, and food, two days for rest)
 - o Unloading method: Unloading to the quay with the derrick of the boat for direct loading on the truck, or loading on the refrigerating truck with the forklift. Shrimp is stored in the refrigerator of EFRIPEL and fish in that of PESCOM.
- Unloaded volume: 7 to 8.4 t of shrimp (frozen), 3 to 3.6 t of fish (frozen)

7 to 8.4 t of shrimp (frozen) in the refrigerator of EFRIPEL

3 to 3.6 t of fish (frozen) in the refrigerator of PESCOM

In addition to the 25 sets of boats based on Quelimane at present, the following are to use the newly constructed fishing port.

- o EFRIPEL un-officially announced construction of two boats of 150 G/T
- o EFRIPEL has a plan for entering three shrimp boats of 350 G/T in the fishing ground.
- o Ten boats based on Beira or Angoche at present are expected to transfer registration (estimation by Fishery Agency). (See Table 3-1.)

The haul is expected to reach 6,400 t by 40 boats after construction of a new fishing port provided the present level per GT (1 t/GT-year) is attained.

Table 3-1 Boats Based on Beira and Angoche

Port	Boats	Capacity	Number
Beira	Shrimp refrigerating trawler (state enterprise)	109-189 t	11
	Shrimp refrigerating trawler (joint ventures)	251-573 t	17
	Shrimp refrigerating trawler (private enterprise)	53-133 t	12
	Shrimp refrigerating boat (private enterprises)	5-49 t	36
			(76)
Angoche	Shrimp refrigerating trawler (state enterprise)	117 t	8
	Shrimp refrigerating boat (state enterprise)	9-22 t	6
			(14)
Total:			90

(Fishery Agency, 1986)

b) Medium-scale fisheries

About ten boats of medium-scale fisheries are based on Quelimane at present. In reference to about 50 sets of fishing boats of medium-scale fisheries based on Beira and Angoche which are worse in conditions as fishing ports, an increased number of fishing boats is expected, ten at least, as a result of construction of a new fishing port at Quelimane.

Operating conditions are estimated generally as under.

o The operating cycle is set as ten days for voyage and two days for stoppage. Two days are necessary for going and returning and movement within the fishing ground respectively, hence six actual operating days.

o Ninety days are set for suspension of business per year due to arrangement and maintenance of boats and holidays.

o Therefore, actual operating days are:

$$(365-90)/12/\text{one voyage} \times 6 \times 0.8 = 110 \text{ (days)}$$

o The haul by fishing boats of this scale is estimated as under in reference to records of fishing boats belonging to SULPESCA in Maputo district (headquarters). The haul of 50 kg of shrimp per boat and 200 kg of fish per boat per operating day is reported by SULPESCA.

On the basis of the above, the haul per year is:

$$250 \text{ kg/day} \times 20 \text{ (boats)} \times 110 \text{ (days)} = 550 \text{ t/year}$$

The ratio of shrimp and fish is 1:4, therefore,

Shrimp 110 t

Fish 440 t

o The average haul is calculated on the assumption of 365 days for operation in the fishing ground and about 1.5 t per day.

c) Small-scale fisheries

The number of fishing boats of small-scale fisheries registered in Quelimane district is 843 sets, in the range from 0.1 to 9.5 G/T. Most of these boats (99 percent or over) drop in the range from 0.1 to 0.3 G/T. Although it is difficult to estimate the number of boats to use the newly constructed port at Quelimane, the case of Sopinho Complex will furnish an information. At present, 20 sets of canoes of dragnet fishing and 50 to 60 sets of boats of pole-and-line fishing are operating around this base, and eight sets of these or about 10 percent use it. About 80 sets of boats will use the new base provided the same level is attained at Quelimane.

Operating conditions are estimated as under.

- o Most of the small-scale fisheries operate on rivers, and their yearly operating is estimated as 70 percent on the basis of wind velocity 4 in Beaufort coefficient (5.5-7.9 m/sec in wind velocity).
- o As they do not operate on Sunday in principle, the non-operating days are set as 80 days per year in consideration with holidays and meetings in the fishing ground.
- o It is said they are engaged in farming in the rainy season, and their non-operating days in this season are set as 60 days or two months.
- o The yearly operating days are calculated to be 150 days from the above.
- o The haul expected for the new fishing port at Quelimane per year, provided the haul per fisherman is 0.3 t per year (haul per fisherman, JICA report, 1983), two fishermen work on a boat, and 80 boats engage in the operation, is:

$$0.3 \text{ t/fisherman/year} \times 2 \text{ (persons)} \times 80 = 48 \text{ (t)}$$

The daily haul averages:

$$48 \text{ (t)} / 365 \text{ (days)} = 0.10 \text{ (t)}$$

The daily haul by fishing boats of small-scale fisheries is thus estimated as 0.10 t on the basis of actual records.

The ratio of shrimp and fish is 1:9 in actual records, and the haul by type of catch is calculated as under.

Shrimp $0.10 \text{ (t)/day} \times 0.1 = 0.01 \text{ (t)/day}$

Fish $0.10 \text{ (t)/day} \times 0.9 = 0.09 \text{ (t)/day}$

(4) Jetty in the Proposed Port

Jetty is urgently required for trawlers of 350 G/t and 150 G/t to come alongside the jetty at the same time, to unload and make preparation for fishing. It is also required to function satisfactorily as a jetty for boats of small and medium-scale fisheries. The sea level is as high as about 5.3 m at the project site. The jetty will be constructed in the floating structure in the place with sufficient water volume so that future sand accumulation will not prevent its use with full consideration also for mooring.

The jetty will be as wide as to meet the requirements of 6 t refrigerating truck and provided with lighting facility as well as power, water and oil supply service. The project site is down the river from the center of Quelimane City, so sufficient consideration shall be made for movement of trucks to and from the river as well as appearance in designing.

(5) Functional Facilities of the New Fishing Port

The 25 sets of boats belonging to EFRIPPEL and to EMOPECCA, both large-scale fisheries, are all provided with the rapid freezer on board and refrigerators of 400 m^3 and 300 m^3 are located by EFRIPPEL and EMOPECCA respectively near the planned fishing port.

Therefore, ice making and storing facilities and refrigerators will be designed to meet demands of fishing boats of small and medium-scale fisheries. For refrigerator, it is necessary to note one owned by PESCOM which is located in the city. For oil supply, the tank located in the commercial port will be used by designing piping from it with valves

provided. For water supply, the water way under the river shore will be used by designing piping from it to the machinery. It is also necessary to provide tanks to supply each boats with required volume of water when they leave the port. In addition, lighting and wireless facilities are required.

The necessity and propriety of constructing a new fishing port at Quelimane immediately are well understood in view of acquirement of foreign currency and improvement of domestic food supply. There are no problems for this plan including maintenance and management of the facilities after construction. However, the planned location involves several severe problems.

- 1) Very severe natural condition (sea level difference and flow) in the place planned for the jetty.
- 2) To say nothing for environments, not only machinery for port construction but also general equipment are out of operation. It is very difficult to prepare these.
- 3) It is difficult to procure such main materials as gravel, sand and cement.
- 4) Materials imported are landed at Maputo. Land transportation from Maputo to Quelimane is practically impossible. Marine transportation, only possible means, has a problem of unstable arrangement of vessels.
- 5) It may be considered to carry all necessary materials and machinery by vessels to the site of Quelimane. This requires a high technique for transportation to the site 30 km up from the river-mouth and installation.

A high technology must be introduced to meet such severe conditions as described above for planning and construction work. To prevent any problem from occurring in maintenance and management, the capacities of facilities and machinery should be carefully set. A maintenance free system is desired to be designed as far as practicable.

Chapter 4
BASIC DESIGN ON
QUELIMANE FISHING PORT
IMPROVEMENT PROJECT

4-1 Basic Plan

The Quelimane Fishing Port Improvement Plan was established considering the socio-economical situation of the People's Republic of Mozambique as mentioned so far, especially the existing circumstances of fishing, large- or small-scale fisheries development plan promoted by the Government, and on the basis of the following principles:

- (1) The Port shall be a completely equipped fishing port which will be able to fully display its functions as a central port in the development of the fishing industry in Mozambique.
- (2) The fishing port facilities should take into full consideration the local climate and natural features. With harmonization and compatibility with the existing facilities taken into account, the facilities are to be conceived so as to facilitate, as much as possible, the future maintenance and control thereof.
- (3) The plan shall not only resolve the existing problem of insufficient facilities and equipment, but also fully cope with the development of the fishing industry in the future.
- (4) The fishing port facilities are to be planned so that they can accommodate the growing large-scale fisheries promoted by Mozambique (national corporation or fishery enterprise as a joint venture of a national corporation and a foreign country) and also be useful also for the small-scale fisheries existing in the Quelimane District.
- (5) The execution plan is to be established after due consideration of the local construction circumstances such as construction materials and equipment, etc.
- (6) The plan shall be made on the basis of the preliminary deliberations with the Mozambican Government at the stage of the basic engineering study as well as the results of the site survey.

4-2 Selection of the Proposed Site

The projected geographical point of the fishing port facilities to be constructed according to the request from the Mozambican Government is on the riverside of Bons Sinais near the Commercial Port of Quelimane. Figure 4-1 shows the topography near the said port. The Mozambican Government proposed, at the time of site survey, to select, in synthesizing the whole situation, one site of the fishing port facilities among the five candidate spots which had formed the subject of preliminary study made in 1981 by a Portuguese consultant firm.

Outlines of these five sites are as follows (refer to Fig. 4-2):

- Site I Riverside from the end of the commercial port quay to the north end of the tributary of Chuabo-Dembe
- Site II Riverside from the end of the commercial port quay up to the ferry boat jetty
- Site III Riverside from about the ferry boat jetty to the official residence of the Provincial Governor
- Site IV Riverside from the said residence of the governor to the place used by the navy
- Site V Left riverside of Bons Sinais at the Gazelas district situated midway between the river-mouth and the Commercial Port.

Among the above five sites, Site V did not form the subject of the present study because of such problems as infrastructures and access. As a result of concerted discussions including site survey, on Site I to IV, it has been concluded that the projected district of Site III is the most suited as the site of the fishing port facilities. Main reasons consisted of the following:

- Site I Earth and sand have heaped up remarkably. Since yearly accumulation is presumed to be about 50 cm, constructed jetty would not work without maintenance and dredging. Further, there existed too much restrictive conditions for construction because this point is too near to the commercial port.
- Site II There is considerable accumulation of earth and sand, as Site I above. So connecting bridges should be prolonged substantially far off-shore in order to ensure the water depth required for the fishing boats to haul alongside. This will bring obstacles to possible future expansion of the commercial port, because this point is near this port.
- Site III The water depth, though having become a little shallower recently, is the most stable when compared with the other Projects. The depth required for fishing boats to haul alongside can be obtained at a place comparatively near to the riverside.
- Site IV The river stream runs swiftly because of limited width, which may prevent the smooth navigation of ships. Moreover, the navy projects to expand its facilities at this district include that of the riverbank.

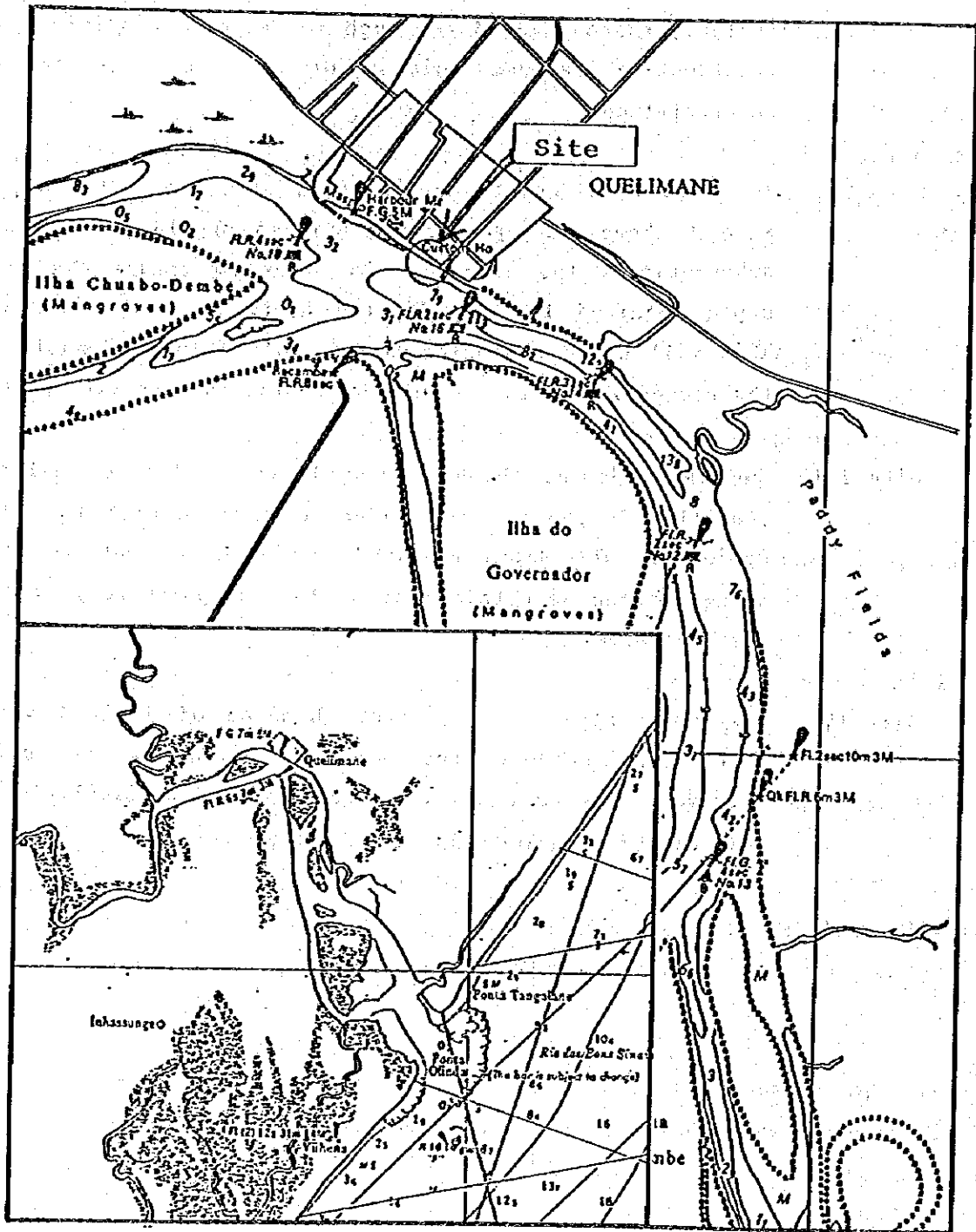


Fig. 4-1 Topography near the Commercial Port of Quelimane

Table 4-1 Comparative Table of Projected Sites

Item	Site I	Site II	Site III	Site IV
Distance between riverside and the water depth (4 - 5 m) required for mooring	Required depth not obtainable	Required depth not obtainable	About 100 m	About 20-30 m
Stream velocity at rivermouth	3 knots	3 knots	3 knots	3 knots or more
Accumulation of earth and sand or scour at riverbed	Accumulation about 50 cm/year	Accumulation about 50 cm/Year	Water depth is stabler than others	Scour
Disturbance of Navigation Channel	Null	Null	Null	Severe repercussion
Existence of other development projects	Null	Expansion project of the commercial port	Null	Expansion project of navy facilities
Possibility of future expansion	Problematical	Problematical	No problem	No problem
Supply of electricity and waters	No problem	No problem	No problem	Problematical
Distance from fuel oil tank	Nearest	Farther than I	Farther than II	Farthest
Distance from existing related fishing facilities	Near	Near	A little far	Farthest
Influence on urban environment	No problem	Problematical	Problematical	No problem

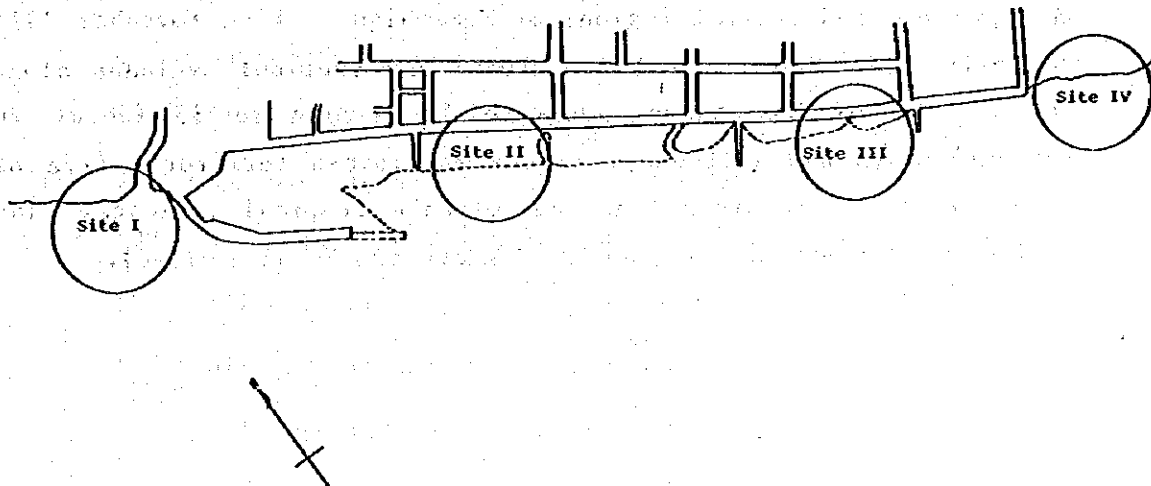


Fig. 4-2 Proposed Construction Site of Quelimane Fishing Port

4-3 Site Conditions

(1) Climatic Conditions

1) Rainfall (Source: Fishery Agency)

Average over 30 years: 1,429 mm (at Beira)

Monthly average precipitation:

Rainy season (Nov.-Apr.) 133-265 mm

Dry season (May -Oct.) 27- 58 mm

2) Wind (Source: Fishery Agency 1971-1980)

	Wind Speed	Wind Direction
Average over 10 years	15.1 km/hr	SE
Yearly average maximum	16.9 km/hr	SE
Monthly maximum	22.3 km/hr	E

3) Cyclone and Tropical Cyclone

Cyclones and tropical cyclones occur in the dry season (summer) in the northern and central regions of Mozambique. From November 1911 to April 1961, there were 157 cyclones and tropical cyclones along the straits of Mozambique among which there were 35 (about 20 percent) which had influences on the Mozambican territory, five of which are to be considered as medium-scale tropical cyclones. The maximum wind speed ranges from 48-63 knots (24.7- 32.4 m/sec).

4) Other Conditions

Table 4-2 Average Temperature/Humidity, Percentage of Cloudy Days, Hours of Daylight

	Average Temperature (°C)	Average Humidity (%)	Percentage of Cloudy Days (%)	Hours of Daylight (H)
Rainy Season (Nov. - Apr.)	27	76	65	7.5
Dry Season (May - Oct.)	23	74	40	8.5

(2) Topography

Figure 4-3 represents a depth curve chart based on the result of the site survey. According to this chart, the relationship between the water depth near the site where the jetty is to be installed and the distance toward offshore from the alignment of revetment is approximately as below.

<u>Distance Towards Offshore from Alignment of Revetment</u>	<u>True Height(m)</u>
Levee Crown (Walkway)	+7.130 (+6.650)
Below Revetment	+4.140
65 m offshore from the alignment of revetment	-3.000
95 m offshore from the alignment of revetment	-4.000
100 m offshore from the alignment of revetment	-5.000
125 m offshore from the alignment of revetment	-6.000
145 m offshore from the alignment of revetment	-7.000
250 m offshore from the alignment of revetment	-7.000
330 m offshore from the alignment of revetment	-6.000
420 m off shore from the alignment of revetment	-5.000

(Datum level: +0.000)

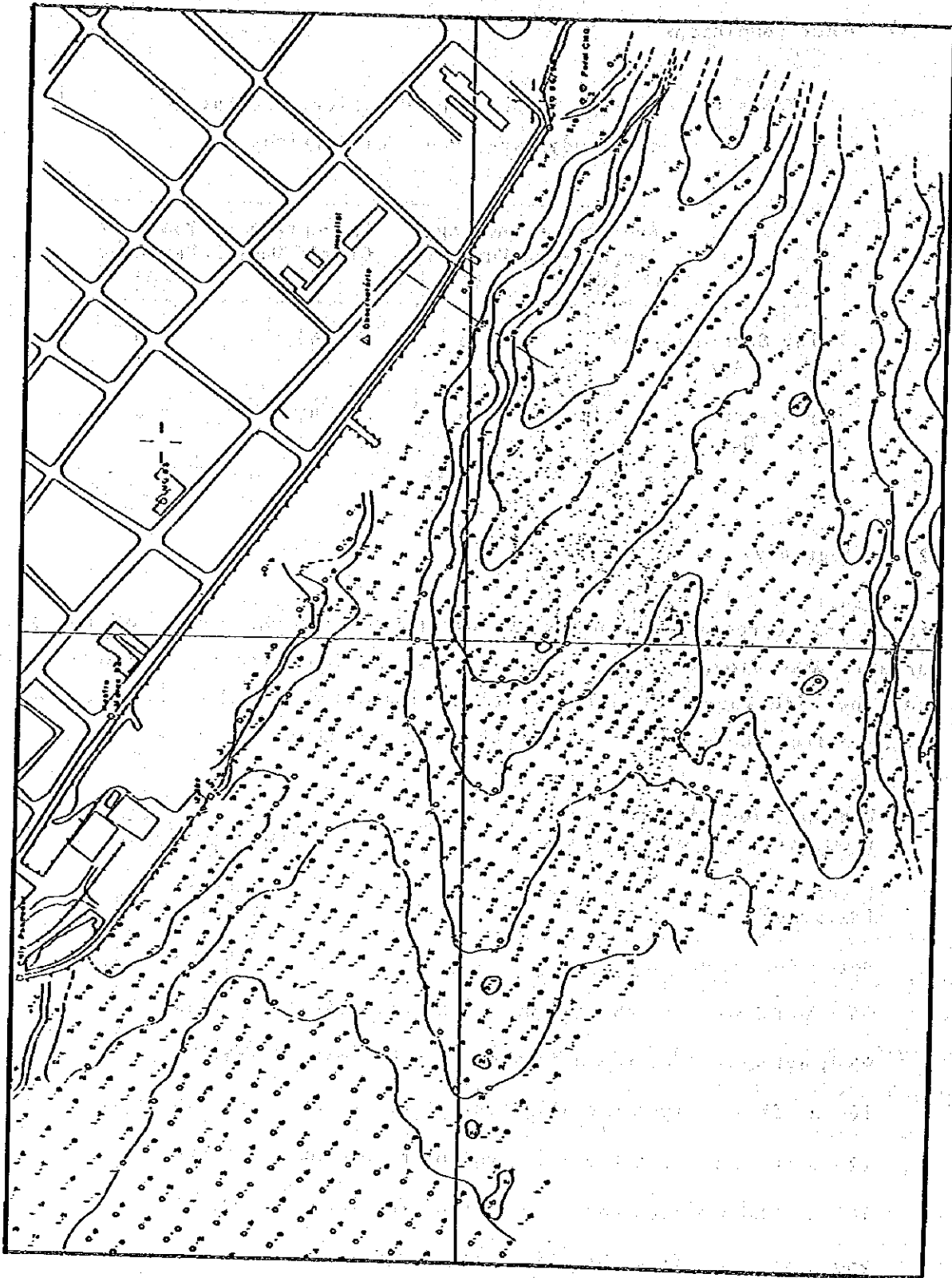
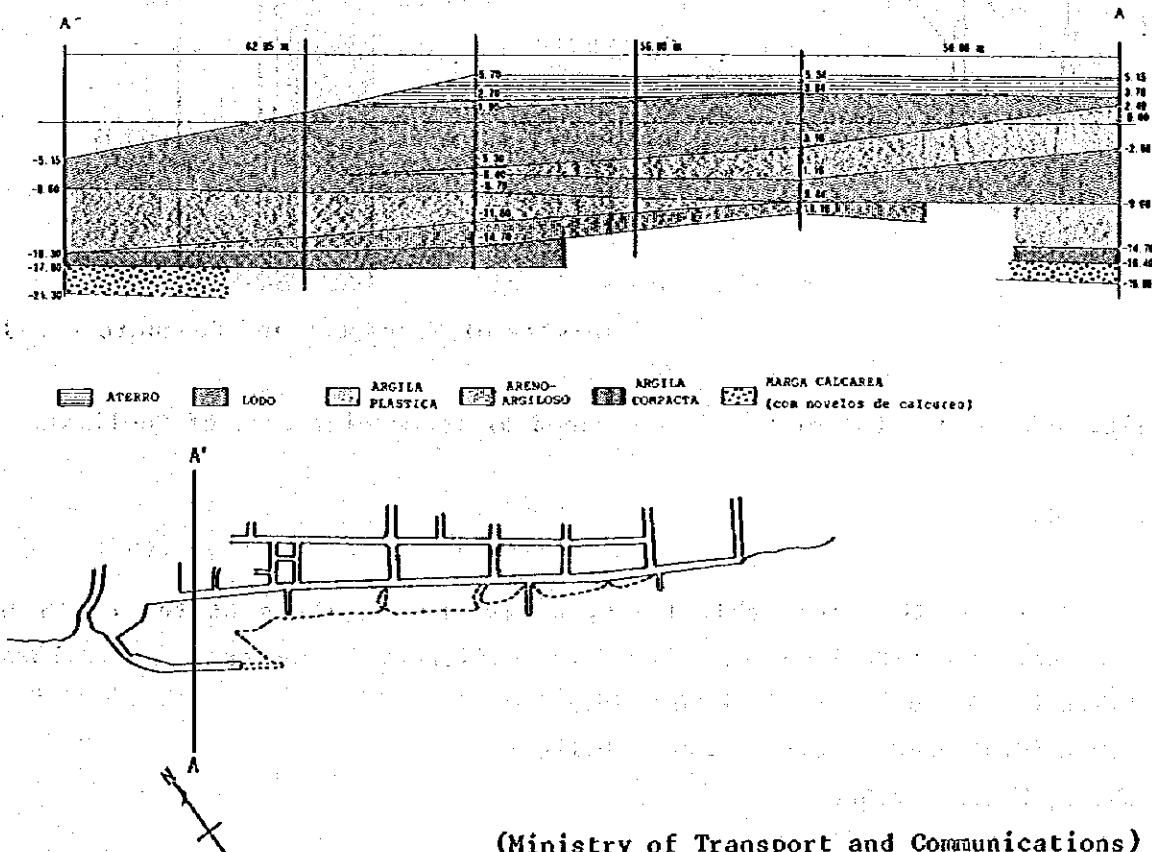


Fig. 4-3 Depth Curve Chart

(3) Soil Conditions

There is no geological data of the construction site. The results of the site location survey and local data show that the river-mouth and the outside seabottom are formed by mud and sand. The neighborhood of the commercial port is predominantly muddy. According to the geological survey executed at the slope in front of the customhouse, and Ports and Harbors Bureau, there is a compact clay layer on which exists a mixed layer of clay, sand and mud, at a point of -25.0 m in true height. The boring carried out in 1959 at the time of construction of the commercial port indicates that there exists alternate layers of compact clay and sand at a true height of -29.0 m or deeper.

The penetration of piles at the quay of the port is deeper towards upstream, true height being -13.5 m to 21.0 m. Though it is conceivable that the soil conditions at the construction site are almost the same, boring data will be necessary at the stage of execution engineering, for the selection of construction processes such as piling.



(Ministry of Transport and Communications)

Fig. 4-4 Stratum near Commercial Port of Quelimane

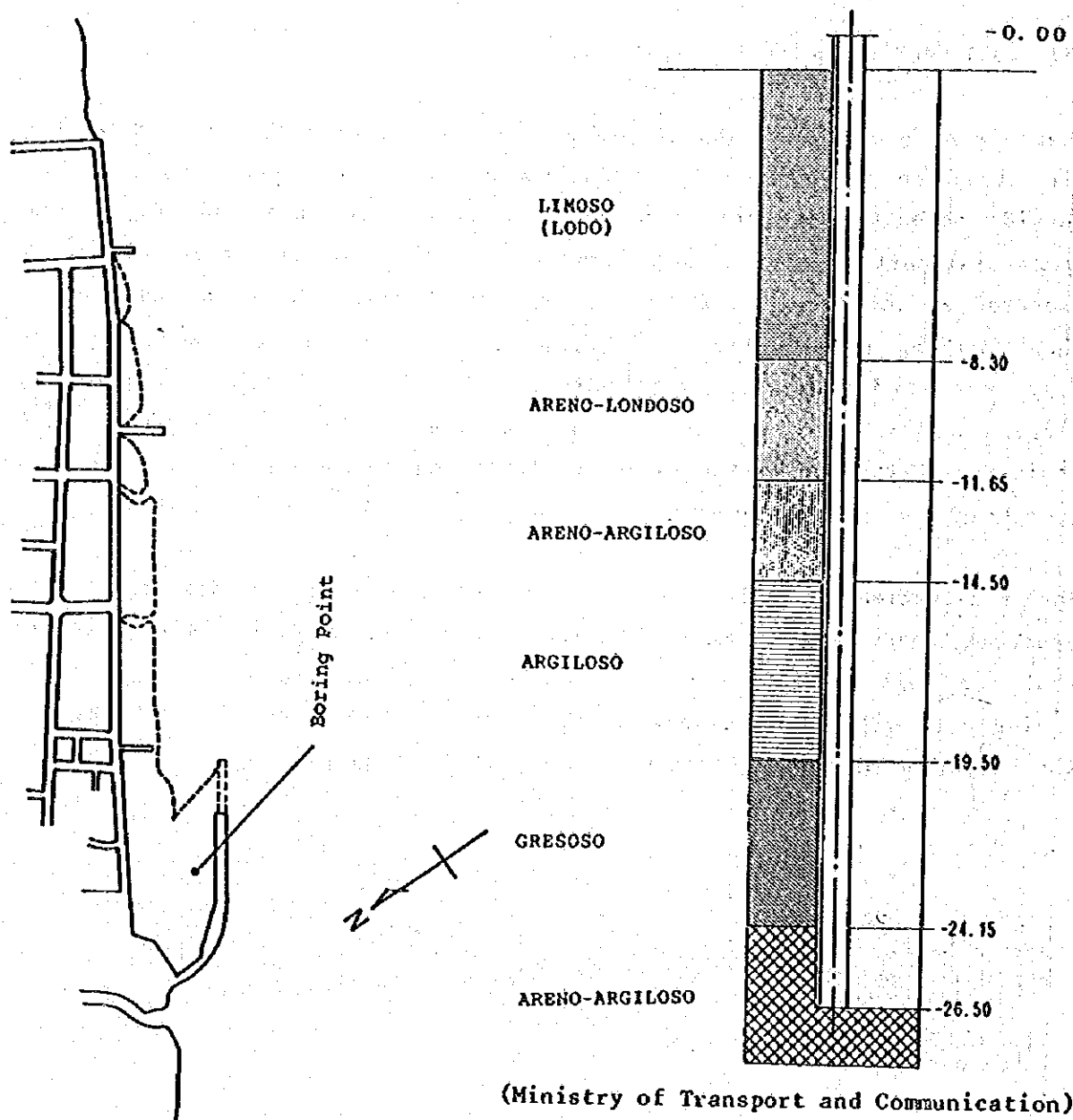


Fig. 4-5 Boring Log of the Neighborhood of Commercial Port of Quelimané

(4) Tide

The figures in the tide table takes, as reference, those at the mouth of Morrubune. The tide level near the Commercial Port is converted as follows:

$$\text{H.W.L } (5.06-2.60) \times 1.1 + 2.60 = +5.306 \text{ m}$$

$$\text{L.W.L } (0.34-2.60) \times 1.1 + 2.60 = +0.114 \text{ m}$$

Where, M.S.L = 2.600

$$\text{D.L } = +0.000$$

Tide time lag is by 30 minutes later than at the mouth of Morrubune.

(5) Wave

- 1) Channel: Width 400 m, Average water depth 12.5 m
- 2) Wind Direction: South-South South East (same direction with the axis of passage)
- 3) Wind Speed: Maximum Average Speed: 45 km/hr
Wind Speed by Cyclone: 70 km/hr

Given the above conditions, the waves are presumed on the basis of wind.

The maximum effective fetch of South-South South East wind is:
 $F_e = 4 \times 0.26 = 1 \text{ km.}$

Taking into consideration the minimum continuing time of wind $t = 1.0 \text{ hr}$, the values as indicated in Table 4-3 can be obtained.

Table 4-3 Significant Wave Height and Cycle

Wind Speed (km/hr)	Significant Wave Height (m)	Cycle (sec)
45	0.30	2.0
70	0.50	2.5

(6) Tidal Current (River Stream)

The stream near the Commercial Port of Quelimane corresponds to the tidal current plus river stream. The swiftest stream is as indicated in Table 4-4.

Table 4-4 Velocity near Commercial Port

	At Low Water	At High Water
Normal	5.2 km/hr (1.44 m/sec)	3.2 m/hr (0.90 m/sec)

It is presumed that the stream is swifter than the above when flooding.

(7) Flood Water Level

Since the Bons Sinais River flows through a flat district with low riverside, the riverbank plays the role of flood controller. The rising water level (abnormal water level) resulting from combination of such factors as flood and cyclone is assumed to be 0.35 m.

(8) Turbidity of the River

With the clay grains mingling into the river water, the transparent depth is presumed to be 30 cm or less.

4-4 Plan of Basic Facilities

4-4-1 Facilities to be projected

The facilities which form the subject of the Quelimane Fishing Port requested from the People's Republic of Mozambique are jetty, port functional facilities and others that are to be considered as basic installations.

Details of these facilities are as follows:

- (1) Jetty
- (2) The ground of the necessary area is to be secured to provide connecting bridge from the riverside to the jetty as well as the fishing port administration bureau and goods disposal center which are described hereafter.
- (3) Complete Equipment of Fishing Port Related Facilities
 - Ice maker and ice storage
 - Refrigerator
 - Water reservoir
 - Water supply, oiling, power supply equipment
 - Administration bureau
 - Warehouse
 - Cargo handling yard

Since the highest priority is to be given to the jetty facilities, the items (2) and (3) above shall be limited to the minimum scale/content with construction/works costs, necessity and maintenance/management projects taken into due consideration.