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JAPAN INTERNATIONAL COOPERATION AGENCY
THE REPUBLIC OF YEMEN
MINISTRY OF FISH WEALTH

BASIC DESIGN STUDY REPORT
ON
THE COASTAL FISHERIES DEVELOPMENT PROJECT
IN
THE REPUBLIC OF YEMEN

MARCH 1993

Fisheries Engineering Co., Ltd.

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PREFACE

In response to a request from the Government of the Republic of Yemen, the Government of Japan decided to conduct a basic design study on the Coastal Fisheries Development Project in the Republic of Yemen and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Yemen a study team headed by Mr. Hayashi Morita, Fishery Enforcement Officer, Setonaikai Fisheries Coordination Office, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries, and constituted by members of Fisheries Engineering Co., Ltd. from December 17th to 28th, 1992.

The team held discussions with the officials concerned of the Government of Yemen and conducted a field study at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

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

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Yemen for their close cooperation extended to the team.

March, 1993

A handwritten signature in black ink, reading "Kensuke Yanagiya". The signature is written in a cursive, flowing style with a long horizontal stroke at the end.

Kensuke Yanagiya
President
Japan International Cooperation Agency

March 26th, 1993

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

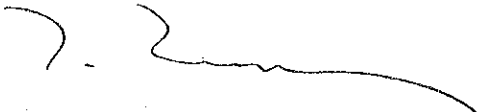
We are pleased to submit to you the basic design study report on the Coastal Fisheries Development Project in the Republic of Yemen.

This study has been made by Fisheries Engineering Co.,Ltd., based on a contract with JICA, from December 1st, 1992 to March 26th, 1993. Throughout the study, we have taken into full consideration of the present situation in the Republic of Yemen, and have planned the most appropriate project in the scheme of Japan's grant aid.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, Ministry of Foreign Affairs, and Fisheries Agency of Ministry of Agriculture, Forestry and Fisheries. We also wish to express our deep gratitude to the officials concerned of Ministry of Fish Wealth, Ministry of Planning, and Embassy of Japan in Yemen for their close cooperation and assistance during our study.

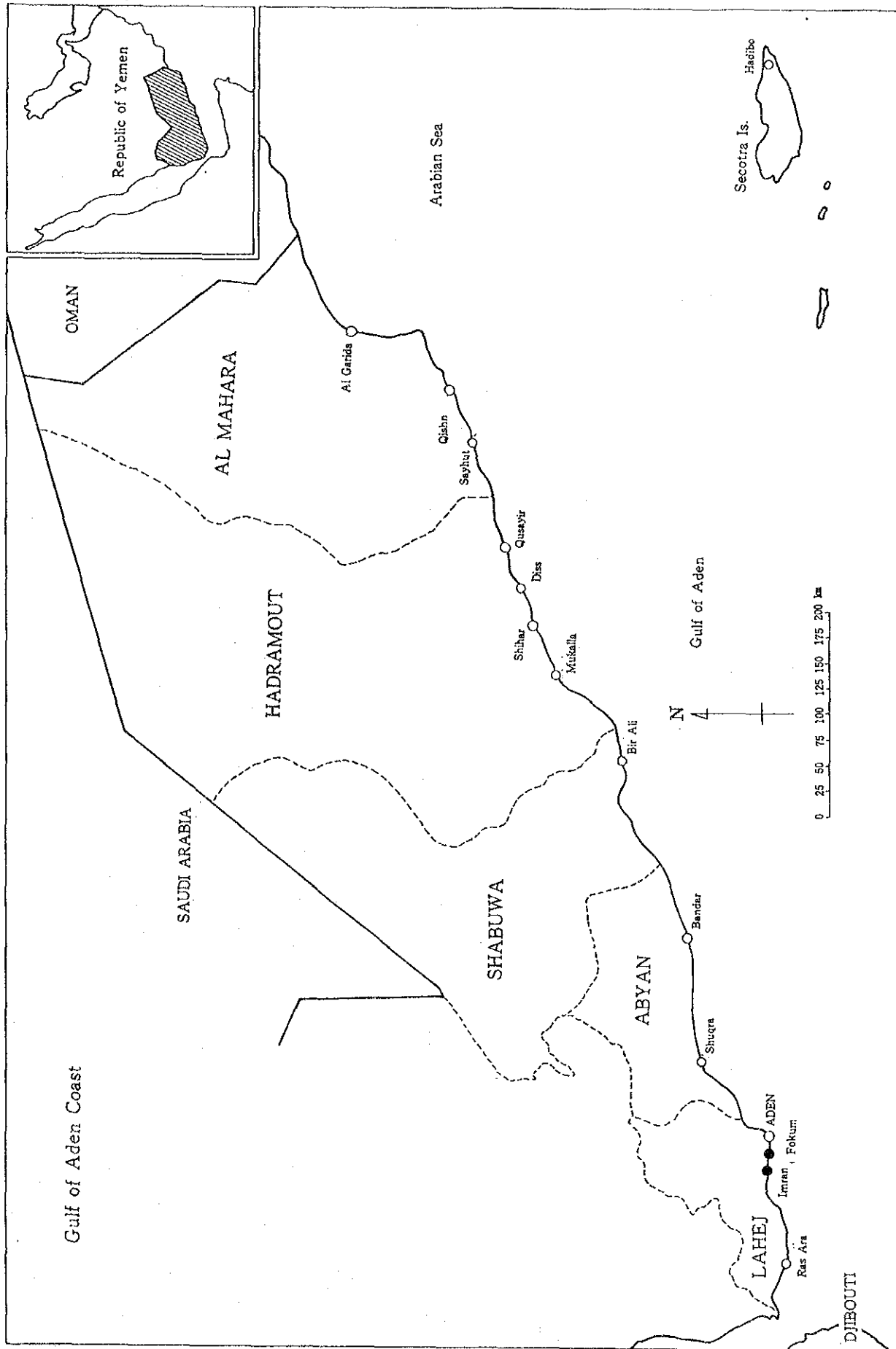
At last, we hope that this report will be effectively used for the promotion of the project.

Very truly yours,



Project Manager, Toyomitsu Terao
Basic Design Study Team on
the Coastal Fisheries Development
Project in the Republic of Yemen,
Fisheries Engineering Co.,Ltd.

Map of Project Area



SUMMARY

Dominated by a desert climate, the eastern part of the Republic of Yemen has a very limited supply of arable land. Thus, along the Gulf of Aden coast, fishing is one of the key industries supporting the regional economy. As seen in the 1st to 3rd Fisheries Development Plans, implemented during the 1970s and 1980s and targeted at the Gulf of Aden coastal area, the Government of Yemen has been making a determined effort to develop coastal fisheries through a series of fisheries development programs, which have achieved a good measure of success in several areas, such as the building of fishery-related infrastructure and the supply of fishery equipment and materials.

As the distribution of fishery equipment has been carried out as part of the coastal fisheries assistance policies implemented by the public sector, marine engines and replacement parts, fishing gear, and other items of basic fishery equipment have been distributed to fishermen through the related departments of the Ministry of Fish Wealth and fishermen's cooperatives along the Gulf of Aden coast. As a result of these public-sector activities, a considerable amount of equipment has already been supplied to fishermen, and the program has indeed been given high marks for the important role it has played in coastal fishery development.

During the 1980s, however, prior to unification, both North and South Yemen relied on imports for almost all of their consumer and capital goods. As a consequence, they ran continuing large trade deficits which had to be offset by private transfers and the proceeds of foreign loans. After unification in 1990, these chronic deficits still remained a fixture in the country's economy, with foreign debt relentlessly increasing. As a result of this economic deterioration, it has become difficult to import industrial equipment, and the situation has imposed serious constraints on equipment imports for the fishery sector as well. For this reason, the Government of Yemen has formulated the Coastal Fisheries Development Project designed to stimulate fish production by maintaining the supply of fishery equipment to fishermen and fishermen's cooperatives along the Gulf

of Aden coast. A Request has been submitted to the Government of Japan for a grant aid to realize this Plan.

In response to this Request from the Government of Yemen, the Government of Japan decided to conduct a Basic Design Study on the subject Plan. The Japan International Cooperation Agency (JICA) then dispatched a Study Team, headed by Mr. Hayashi Morita, Fishery Enforcement Officer, Setonaikai Fisheries Coordination Office, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries, to the Republic of Yemen from December 17 - 28, 1992 to carry out this study. The Study Team confirmed the Plan contents through discussions with concerned officials of the Yemen Government and, in order to evaluate the background and appropriateness of the subject Plan as well as composition of the required fishery equipment, conducted a field survey and interviews relative to the present state of fish production along the Gulf of Aden coast and Plan implementation structure.

Upon returning to Japan after completion of the field survey, the Team analyzed and reviewed the survey findings, evaluated the need for the requested equipment, and prepared a Basic Design relative to the contents, technical specifications, and quantities of the planned equipment and materials. Following is an summary of the equipment items considered necessary to Plan implementation:

1. Gasoline outboard motors and spare parts:

15 PS	300 units
25 PS	150 units
Spare parts	1 lot
2. Diesel inboard engines and spare parts:

50 PS	10 units
70 PS	6 units
Spare parts	1 lot
3. Container-type workshops 6 sets
4. Gill net materials 1 lot

- | | | |
|----|----------------------------------|------------|
| 5. | Trolling and hand-line materials | 1 lot |
| 6. | Beach seines | 4 sets |
| 7. | Purse seines (2 types) | 1 set each |
| 8. | Fish aggregation devices | 1 set |
| 9. | 4 WD, 3 ton insulated vans | 2 units |
| | 4 WD, 4 ton insulated vans | 2 units |

It is anticipated that 3 months will be required for the implementing design, 5 months for equipment manufacture, and 3 months for shipment and delivery.

The responsible organization for the Plan will be Ministry of Fish Wealth of the Yemen Government. Distribution of the planned equipment will be carried out by the Extension and Cooperative Department and the Aden Branch Office of this Ministry. Among the equipment items to be delivered in the course of Plan implementation, the outboard motors, gill net materials, and hand-line and trolling line materials are to be distributed to fishermen. The inboard engines will be installed in new fishing vessels built at existing shipyards and as replacements for superannuated engines on existing vessels. The container type workshops, purse seines, beach seines, and insulated van trucks will be supervised and operated by the fishermen's cooperatives, as was the case with related equipment distributed under antecedent programs including the 3rd Fisheries Development Plan (1985/89).

Through implementation of the subject Plan, it is expected to limit a possible stagnation, under existing economic conditions, in the supply of fishing equipment by government assistance programs. It is considered that the subject Plan will make a definite contribution to the regional economy along the Gulf of Aden coast through distribution of the fish production equipment that constitutes the Plan objectives. It has, accordingly, been concluded that there is ample significance in implementing the subject Plan on the basis of a grant-aid from Japan.

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SECTION 1: INTRODUCTION

In May, 1990, the Yemen Arab Republic (North Yemen) combined with the People's Democratic Republic of Yemen (South Yemen) to give birth to the Republic of Yemen. From the 1970s to the 1980s, Yemen had carried out a series of fishery development programs, such as the 1st to 3rd Fishery Development Plans targeted at the Gulf of Aden coast.

As part of the support policies for coastal fisheries from the public sector, government agencies distributed marine engines, replacement parts, fishing gear, and other types of basic fishing equipment to fishermen through related departments of the Ministry of Fish Wealth and the various fishermen's cooperatives along the Gulf. On the basis of this public assistance, a considerable amount of equipment has been supplied to fishermen, playing a key role in developing the coastal fisheries in this area.

Throughout the 1980s, both North and South Yemen relied on imports for virtually their entire supply of consumer and capital goods, leading to huge trade deficits which were offset by transfer payments (overseas remittances) and capital inflows. After the 1990 unification as well, the new country inherited these chronic trade deficits and, as a result, the total external obligations of the Republic of Yemen in that year were almost equal to its entire GNP, having increased to a level more than 10 times the country's exports. Also, the Gulf crisis, which erupted in August, 1990, dealt a major economic blow to Yemen, and this was one of the factors leading to aggravation of the country's overall balance of payments. The deterioration in the nation's economic environment has hampered imports of industrial equipment, with the fisheries sector suffering serious constraints in procuring equipment and supplies. Given the above circumstances, in February, 1992, the Government of Yemen submitted a Request to the Government of Japan for a grant-aid to implement its Coastal Fisheries Development Project. This Plan has been formulated to promote the development of artisanal fisheries operating along the Gulf of Aden coast through the stable supply of fishery equipment and materials.

In response to this Request from the Yemen Government, the Government of Japan decided to conduct a Basic Design Study on the subject Plan. In order to carry out this study, the Japan International Cooperation Agency (JICA) dispatched a Study Team, headed by Mr. Hayashi Morita, Fishery Enforcement Officer, Setonaikai Fisheries Coordination Office, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries, to the Republic of Yemen from December 17 to 28, 1992. The Study Team confirmed the contents of the Plan through discussions with concerned individuals in the Yemen Government and, for purposes of evaluating Plan background and appropriateness as well as the composition of the required fishing equipment, conducted a field survey and interviews on the present status of fishery production along the Gulf of Aden coast as well as on Plan implementation and operating structure. The Team visited some of landing ports during its stay, including Imran, Fokum, and Shuqra.

The basic points of agreement reached between the Yemen Government officials and the Study Team regarding Plan implementation were incorporated into Minutes of Discussions, which was signed by and exchanged between both parties. After returning to Japan upon conclusion of the field study, the Study Team analyzed and reviewed the survey findings, assessed the need for the requested equipment, and prepared a Basic Design on the contents, technical specifications, and quantities of the subject equipment items.

Based on the results of the survey and evaluation, the present Report has been prepared, containing a Basic Design for the planned equipment, an implementation plan, and a Plan evaluation. The composition of the Study Team, its itinerary in Yemen, a list of discussants, and the Minutes of Discussions have been included as Appendices following the main body of the report.

SECTION 2: BACKGROUND OF THE PLAN

2.1 Profile of Yemen's Economy and Society

(1) Principal Industries

Pursuant to the unification of North and South Yemen in May, 1990, the Republic of Yemen was born on the southwest corner of the Arabian Peninsula with a combined population of 12,180,000. The western section of the country (former North Yemen, the Yemen Arab Republic), with the exception of the Tihamah coastal plain extending in a north-south direction along the Red Sea, is characterized by a topography of hills and highlands. Climate varies by area but may be generally described as one with moderate rainfall, with a temperate climate in the highlands. Thanks to this favorable climate, the major arable areas on the Arabian peninsula are located principally in the western highlands.

On the other hand, the climate in the eastern part of the country (former South Yemen, the People's Democratic Republic of Yemen) is almost entirely desert. Rainfall is sparse, with less than 1% of the land area arable, making large-scale irrigation a prerequisite for agricultural development.

According to the 1990 Statistical Year Book, published by the Central Statistical Organization, the GNP of the Republic of Yemen in 1990 was 78,817 million Yemen Rials (about US \$6,568 million at the official exchange rate in that year of 12.0 Rials per dollar). With per-capita income quite low at 6,468 Rials (\$539), the country has been classified by the OECD as an LLDC. Some 21% of the 1990 GNP was derived from agriculture, 9% from mining, 9% from manufacturing, 12% from commerce, and 8% from transport and communications. Agriculture is thus the mainstay industry, absorbing an estimated 70% of the total labor force.

(2) Balance of Payments

During the 1980s, the trade balances of both North and South Yemen evidenced massive import surpluses. The following Table 2-1 traces the

balance of payments of former South Yemen over the 1981-1987 period. As may be seen from this table, during the first half of the decade, the trade deficits were barely offset primarily by remittances from expatriates working abroad (transfer payments) and by the proceeds from foreign loans (capital account).

Table 2-1 Balance of Payments for South Yemen (1981 - 1987)
(in \$ million)

Accounts	1981	1982	1983	1984	1985	1986	1987
Foreign Trade:	671.7	-738.3	-727.9	-793.9	-664.4	-545	-443
Exports	48.6	37.9	40.2	30.7	36.2	46	54
Imports	720.3	776.2	768.1	824.6	700.6	591	497
Non-trade :	557.6	596.5	494.2	523.2	428.8	355	N.A.
Services	56.7	31.6	4.3	2.6	-7.2		
Overseas remittances	500.9	564.9	489.9	520.6	436.0		
Capital :	155.0	151.6	245.3	199.5	119.3	103	N.A.
Foreign loans	175.8	175.2	194.0	139.0	109.1		
Other	-20.8	-23.6	51.3	60.5	10.2		
TOTAL	40.9	9.8	11.6	-71.2	-116.3	-87	N.A.

Source: Economic and Social Conditions in South Yemen, 2nd Edition

Since 1985, import restrictions have been intensified, which has lowered the value of imports, but the overall balance of payments has shown a deficit since 1984. In 1985, for example, the main imports of South Yemen were foodstuffs (accounting for 29% of total imports by value), followed by machinery and transport equipment (22%), industrial manufactures (16%), and mining and petroleum products (15%). The principal export commodities in that year were fishery products (representing some 41% of total exports by value), followed by tobacco (9%) and mining and petroleum products (7%). Thus, while exports are effectively limited to such products as fish

and tobacco, virtually all essential products must be imported, resulting inevitably in a chronic import surplus.

The trends observed in South Yemen's trade accounts during the 1980s were almost totally mirrored by those of North Yemen. Apart from a difference in major export commodities (crude oil, foodstuffs, and livestock), North Yemen too has had to rely almost entirely on imports sources for consumer and capital goods, resulting in a perennially large trade deficit offset by overseas remittances and capital inflows. As a consequence, the balance of payments structure of both North and South Yemen evidenced a steady increase in external debt, with their combined foreign debt rising from \$2.7 billion in 1984 to \$3.8 billion in 1987.

Following unification in 1990, the new Republic of Yemen carried over this economic structure weighted by heavy import surpluses. As shown in the Table 2-2 from the previously referenced Statistical Year Book, the 1990 balance of payments pattern of the Republic of Yemen is unchanged from pre-unification days, with the trade deficit continuing to be offset by overseas remittances and capital inflows. In both 1989 and 1990, the share of total export value accounted for by crude oil was 86% and 88% respectively, indicating that this commodity is now making a bigger contribution to exports than in the 1980s. The large increase in transfer receipts in 1990 was due to a four-fold increase from the previous year in private-sector capital inflows. It is considered that this reflected the fact that, starting in 1990, estimates of private capital transfers, which had hitherto not been reported to the government, are now included in the official statistics.

Table 2-2 Balance of Payments of the Republic of Yemen
(1989/1990; in millions of Rials)

Account:	1989	1990
Trade :	-11,532	-13,797
Exports	6,765	7,066
(Oil)	(5,802)	(6,188)
Imports	18,297	20,863
Non-trade:	1,679	12,086
Services	- 3,839	- 5,432
Transfer payments	5,518	17,518
Capital :	8,215	4,849
Errors & omissions	767	197
BALANCE OF PAYMENTS	-869	3,335

Source: Statistical Year Book (1990)

As a result of the above balance of payments pattern, the external debt of the new Republic of Yemen has further increased, according to estimates based on the official rate of exchange, to \$5.6 billion in 1989 and \$6.1 billion in 1990. The total foreign debt as of 1990 was almost equal to the country's total GNP, and more than 10 times Yemen's total exports.

(3) Political Conditions:

Given the difficult economic conditions confronting the Republic of Yemen, the Gulf crisis, set off on August 2, 1990 by Iraq's invasion of Kuwait, created difficulties of a diplomatic nature for the Republic, which had had just been created only a few months earlier in May. Saudi Arabia imposed sanctions against the Republic of Yemen for the policies that Yemen had taken, under which more than 1,000,000 Yemen expatriates were stripped of the special privileges they had been enjoying in Saudi Arabia, while Yemen's diplomatic representatives were expelled and economic aid halted. As a result, some 800,000 Yemen expatriates were forced to return

home. There was also a stoppage in the flow of oil consignments from Iraq and Kuwait for refining at Aden as well as a cut-off in economic aid from the latter two countries, accompanied by a drastic drop in remittances from Yemen workers in the Gulf countries. The Gulf crisis thus dealt a major economic blow to the Republic of Yemen.

2.2 Fisheries in the Republic of Yemen

2.2.1 Fishery Resources

Based on the unification of North and South Yemen, the coastline of the new nation was extended to some 2,000 km. The continental shelf, however, is extremely small, with an area of only 38,000 km². The area from Ras Ara on the west, bordering the Gulf of Aden, to Aden as well as the waters off Al Mahara is relatively broad, at 20-30 miles. On the other hand, the coastal area along the Arabian Sea, which extends from Pakistan to the western Indian Ocean off the Gulf of Aden, is known for its high primary production. During the summer months, when there are strong trade winds from the southwest, upwelling is prevalent in coastal waters, bringing in large amounts of nutritive salts. From eastern Yemen to Oman, the distribution of primary production is equivalent to that of the world's leading fishing grounds, such as those off the western coast of South America. The potential value of production in the coastal areas of the Gulf of Aden has been estimated by the FAO at about 310,000 tons. Abundant demersal species reside on the rough ocean bottom near the edge of the continental shelf, which provide good grounds for hand-line and bottom long line vessels. In the offshore waters beyond the continental shelf, the resources includes large pelagic fish, such as skipjack, tuna, and kingfish, while, on the shore side, are found such small pelagic species as sardines and horse mackerel.

2.2.2 Fishermen's Organizations and Fishery Management Bodies

There are reported to be about 9,000 artisanal fishermen in the Republic of Yemen, of whom some 4,000 are on the Red Sea coast and the remaining 5,000 along the Gulf of Aden. They are engaged in small-scale fishing operations using small vessels. As shown in Table 2-3, fishermen's

cooperatives have been established at 13 locations along the coast and on the islands of the Gulf of Aden. No information is available on cooperatives on the Red Sea coast. Membership in these cooperatives has been variously estimated at 40% and 70%.

Table 2-3 Fishermen's Cooperatives in the Republic of Yemen

<u>Governorates</u>	<u>Name of Cooperative</u>
Lahej	Ras Ara
Aden	Gulf of Aden
Abyan	Shuqra
	Bandar
Shabawa	Bir Ali
Hadramout	Mukalla
	Shihar
	Diss
	Qusayir
Al Mahara	Al Garida
	Sayhut
	Qishn
Sectora Is.	Sectora

Source: Ministry of Fish Wealth (1992)

Among the public corporations formed by the Government of Yemen in the fishery sector are the Yemen Fisheries Corporation (YFC), Coastal Fisheries Corporation (CFC), and the National Corporation for Fish Marketing (NCFM). The YFC operates the trawl fisheries, which catch mainly cuttlefish and deep-sea lobsters for the export market. The CFC is dedicated mainly to supporting the artisanal fisheries, collecting their catches and supplying them with fishing equipment while also building FRP fishing vessels, as discussed below. The NCFM is concerned with distributing fish products both to domestic wholesalers and export markets as well as with quality control. There are another 3 public corporations in such areas as fish canning and processing. These six corporations all come under the jurisdiction of the Ministry of Fish Wealth; all predate

unification. Thus, the present government is giving active consideration to the possibility of reorganizing these organizations through privatization and other means.

2.2.3 Fishery Production

(1) Types of Fisheries

Yemen's coastal fisheries operate chiefly within 3 miles of shore. Industrial fishermen, such as those serving on the fishing vessels of public corporations and foreign countries, are not permitted to fish inside the 3-mile line. The most common coastal fisheries are gill net, hand-line, and trolling line. They generally go out on one-day trips, manned by a crew of about 4 and equipped with outboard motors of 15 - 25 PS output. Their catches are mainly skipjack, tuna, and shark. While the fishing grounds are relatively close by in offshore waters about 20 miles from shore, when around-the-clock operations are conducted and demersal species are targeted during the day and large pelagic species at night, it is clearly necessary to minimize travel time to and from the grounds. Recently, in this connection, there has been a trend toward engines of higher output, with one vessel having installed two outboard motors of 15-20 PS.

1) The hook and line fishery

According to oral reports from the Gulf of Aden Fishermen's Cooperative, catches by the hand-line fishery period average 200-400 kg per day, comprising such species as kingfish and red snapper. The vessels have crews of about 4 persons, making the per-capita catch 50-100 kg per day, a level that is said to be much higher than 30-50 kg for hand-line fisheries in Japan and Southeast Asia. The long line fishery is mainly of the bottom long line type. Both main line ends are anchored, with the setting depth of the line adjusted in accordance with the target species.

2) The gill net fishery

The gill net fishery operates on a small scale with fishing boats called Hourri (described below) and on a small-to-medium scale with vessels known

as Sambuk. The nets may or may not be equipped with legs for the sinker line, though few of the small-to-medium size nets have these legs. In the majority of the gill nets, a side float line, attached directly to the net web with a double selvage of 1/2 mesh, is connected to the float line. Only a small number attach the net web to the side float line by using a hanging line.

The sinker side has a similar construction to the float side, with most using a side sinker line, but, rather than attaching the netting to the side sinker line through hanging line, the net web with a double half-mesh selvage is directly attached to the side sinker line. Both the float and sinker line have almost the same thickness. The twining directions of both are in the same Z direction. Most of the nets are hauled up manually and so the twisting direction does not seem to present much of a problem. In most cases, both the sinker and float lines are made of polyethylene (PE) material. In the case of the bottom gill nets, some boats use natural fiber ropes in the sinker lines, in which case the diameter is thick, presumably as a countermeasure against severe wear and tear from friction with the sea bottom.

3) The purse seine fishery

The purse seine fishery targets a wide range of pelagic fish, ranging from such large species as skipjack and tuna to small fish like sardines. At present, this fishery does not appear to be practised in a particularly large number of operating units. Sambuk-type fishing vessels are used for operations directed at large pelagic species, such as skipjack, tuna, and kingfish, but, in most operations of this type, the vessels do not limit themselves only to the purse seine fishery but also conduct bottom long line and gill net operations, depending on the fishing season.

As to the size of net in this fishery, hanging length is 350 - 480 m and net depth is 40 - 45 m. Though certain vessels have net hauling gear, as seen in the case of the Noba, attached to the Gulf of Aden Cooperative (to be discussed in a later section), the majority seem to haul up their nets by hand. Crews range from 6-12 persons. Small-to-medium size purse seine nets are found on small Houra and Sambuk vessel but these boats too are not exclusively devoted to the purse seine fishery, conducting gill net

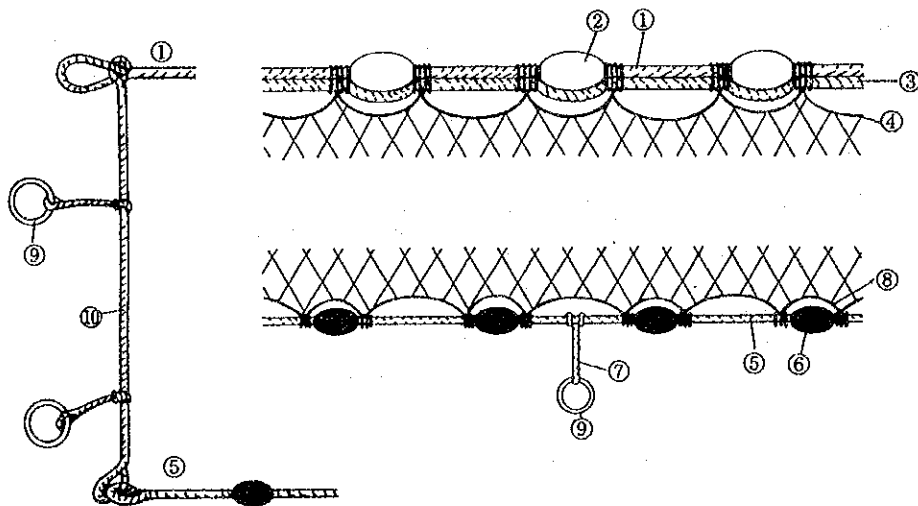
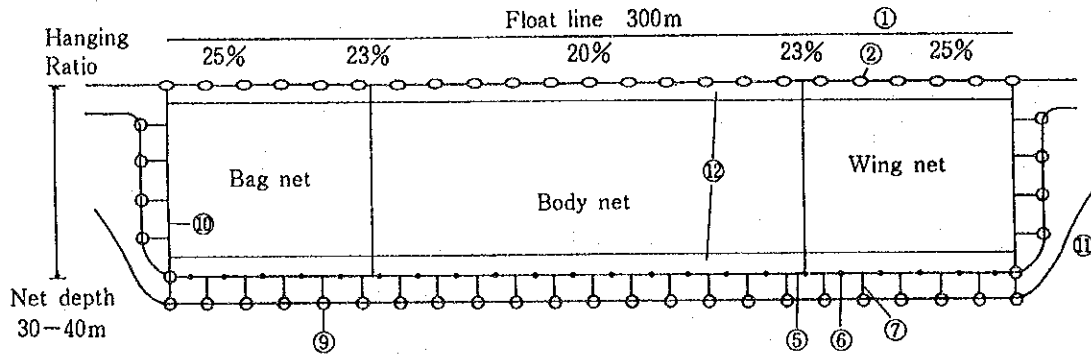
and long line operations as well. As to fishing gear, nothing of particular note is used, with all operations performed manually.

The rigging construction for both small and medium-size purse seine nets is as shown in Figure 2-1. Naturally, the standards for nets, ropes, floats, rings, and sinkers will vary in response to the respective net sizes but, in terms of overall construction, there are, in principle, no differences among them. In Figure 2-1, standards have been shown for nets directed at sardines and horse mackerel. In the case of small purse seine nets, as was observed in the Fokum area, which is one of the production bases for the Gulf of Aden Cooperative, the float line length was 250 m and net depth 35 m, with operations directed at horse mackerel and mackerel. Purse line uses dia. 9 mm PE rope. This vessel was a 9m Hourri boat, equipped with a 25 PS outboard motor and carrying a 9-man crew. Some of the sinker lines used side float lines, while others did not.

4) The beach seine fishery

The southern coast of the Gulf of Aden is composed of long sandy beaches, with shallow waters extending out a good way from shore and a sea bottom with gently rolling topography. During seasons of little wind or waves, beach seine is a useful fishing technique for these waters, which are endowed with such favorable conditions. In the case of the beach seine net observed under repair at Imran, a production base for the Gulf of Aden Cooperative, float line length was 65 m and net depth about 5-6m. In both the float and sinker sides, some 10 meshes of net web made of vinylon (PVA) twine with a thickness of approximately 20'S/30 with a mesh size of 4 cm were used as selvage; the rest were all nylon (PA) Raschel nets of 8 mm mesh from wing to bag net. The float lines were of PE dia.15 mm, the sinker lines of PE dia.13 mm, while, in the center of the net, a bag net was attached with a 7 m opening and a horizontal depth of 12 m. The towing rope was of PE dia.15 mm, with a side length of 250 m. The main species taken by this fishery are sardines, horse mackerel, and other small pelagic fish but, depending on the location, demersal species may also be caught.

Figure 2-1 An Example of Purse Seine Construction



- | | |
|--------------------|---|
| ① Float line | PE, dia. 9mm, 300m |
| ② Float | 135 x 80 x 15 mm, 1,400 ~ 1,800 pcs. |
| ③ Float side line | PE, dia. 6mm |
| ④ Hanging line | |
| ⑤ Sinker line | PE, dia. 9mm |
| ⑥ Sinker | Lead, 180gf. |
| ⑦ Ring string | PA, dia. 6mm |
| ⑧ Sinker side line | PE, dia. 6mm |
| ⑨ Ring | Outer dia. 80mm, thickness 10mm in dia. |
| ⑩ Frame line | PE, dia. 6mm |
| ⑪ Purse line | PE, dia. 9mm |
| ⑫ Selvage | |

5) The shrimp trawl fishery

At the present time, there is no commercial shrimp trawling in the project area but pilot shrimp trawl operations have been conducted in the past, based on technical assistance from the FAO in connection with the Fisheries Development Plans. An example of this pilot fishing and gear improvement would be the Saba No.2, belonging to the Gulf of Aden Cooperative. This vessel is 20 GT, with an L.O.A. of 15 m, and is used chiefly for pilot trawl and gill net operations. Since the trawl nets have been used only a few times, no clear data have yet been compiled. The trawl nets used for these pilot operations are made of PE and are of small size, even for shrimp trawling purposes.

(2) Production Data

Table 2-4 presents data on the volume of fish production by domestic Yemen vessels over the 1981-1989 period. In former South Yemen, which contains fishing grounds along the Gulf of Aden coast, the main catches have been of small pelagic fish and cuttlefish. In former North Yemen, with fishing grounds along the Red Sea coast, operations are targeted at mackerel and demersal species such as emperor and others.

Table 2-4 Fish Production in Yemen
(1981 - 1989; in 000 tons)

	Former North Yemen	Former South Yemen
1981	16	(Estimated
1982	14	at 42-52)
1983	17	-----
1984	18	47
1985	19	51
1986	22	50
1987	22	50
1988	21	51
1989	21	51

Source: FAO Catch Statistics (1991)

The above statistics are comprised of catches by commercial fishing vessels of the YFC and other organizations as well as those of artisanal fisheries, as reported by the fishermen's cooperatives. However, the

portion based on reports from cooperatives is believed (cf. FAO, 1989) to exclude a considerable volume of fish which is distributed through the private market, bypassing the cooperative system.

According to data in the Appendix to the General Economic Memorandum, submitted to the Round Table Conference with Aid Partners, held in Geneva in July, 1992, the annual catch volume in Yemen from 1980 to 1984, including catches by foreign-flag vessels, is estimated to have totaled 90,000 tons and, from 1985 - 1989, 104,00 tons. In the same Memorandum, it is also reported that the 1990 Yemen catch was 77,100 tons, of which 40,200 tons were taken by the private sector, 27,300 tons by the fishermen's cooperatives, 3,400 tons by public corporations, and 6,200 tons by foreign fishing vessels.

In Table 2-5, figures are presented on fish production volume for 1988 by individual cooperative. In this table, some 40% of the total fish catch of the former South Yemen shown in Table 2-4 was accounted for by fish moving through fishermen's cooperative channels.

Table 2-5 Fish Production in 1988 by Individual Cooperatives

Fishermen's Cooperative	Fish Production
	(in tons)
Gulf of Aden	756
Ras Ara	464
Shuqra	435
Bandar	624
Bir Ali	1,436
Mukalla	1,182
Shihar	7,086
Diss	2,355
Qusayir	2,556
Al Garida	1,513
Sayhut	1,248
Qishn	1,261
Secotra (islands)	685
Total	approx. 22,000

Source: Ministry of Fish Wealth (1992)

2.2.4 Size of the Fishing Fleet:

Small-size vessels used by the fishing fleet in Yemen may be divided into two classes:

Huoris : lengths of 6-9 m, using outboard engines, sail, and oars and carrying some 4 man crews

Sambuk: lengths of 13-20 m, using inboard engines of 25-50 PS and carrying 5-12 man crews

These fishing vessels are built from imported timber at domestic shipyards in Aden, Mukalla, and other locations. In recent years, 7 m - 15 m vessels have also been built of FRP at the shipyard in Aden operated by the CFC. The principal fishing methods include gill net, hand-line, purse seine, and long line. The total number of these small fishing vessels is reported at around 1,100 to 1,200 in the coast of the Gulf of Aden among some 2,000 vessels in the whole country. Detailed fishing boats statistics covering hull sizes and engine outputs are not available.

In addition to the small boats described above, the YFC operates a fleet of trawlers of several hundred tons, directed at cuttlefish and other export species.

(1) Huoris Vessels

Generally speaking, the small-size vessels known as Houris have stationary decks at bow and stern as well as thwarts in a number equal to the size of the crew. There is also another small boat, similar to the Huoris, which is called Khadeefa. The latter has a crew of 3, is 6 - 7 m long, and is equipped with an outboard motor at the stern. It participates mainly in the gill net and long line fisheries.

In recent years, a new type of Houri has been built, using FRP. It has a slim profile, with a LOA of 7-9 m and a breadth of 1 - 1.3 m. This vessel was designed for increased speeds so as to reduce the time spent traveling to and from fishing grounds. The output of the outboards is quite varied, ranging from 8 PS to 15 PS and 25 PS but, given the

importance placed on speed in recent years, many such boats have installed two 15 PS engines.

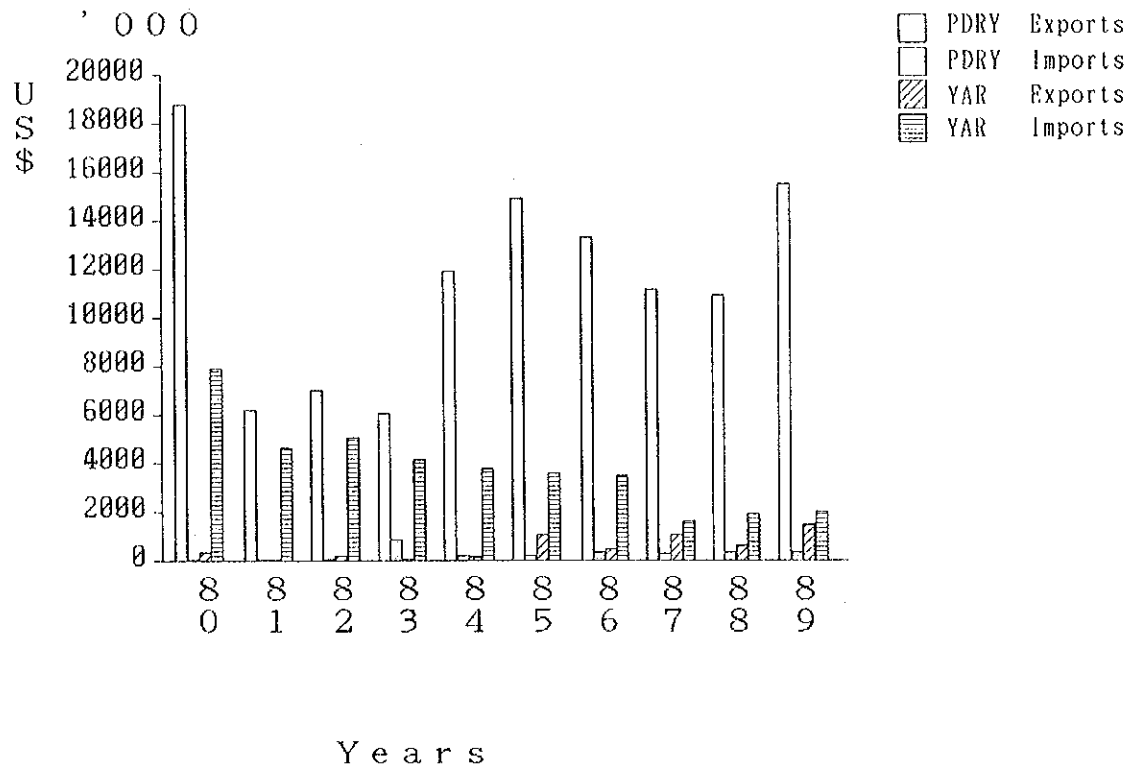
(2) Sambuk Vessels

Sambuk-type vessels characteristically have full decks, with an overall length of 13-20 m and inboard engines in the 25 - 50 PS class. It is difficult to measure their numbers statistically but it is believed that about 70 vessels in all are deployed and operating in the fishermen's cooperatives. The Noba is a vessel of the Sambuk type, operated by the Gulf of Aden Cooperative in the Fokum area which operates in the purse seine, gill net, long line and certain other fisheries. It is equipped with a 52 PS marine diesel engine, and its purse winch and net hauler are operated by a generator-driven hydraulic motor unit installed on deck. Another example of a coastal fishing vessel equipped with an inboard engine is the Saba No.2, an FRP vessel also belonging to the Gulf of Aden Cooperation. This vessel has been engaged in pilot trawl and other operations, fitted with a 150 PS marine diesel engine. Its fishing equipment consists of a trawl winch with a capacity of 1.5 tons/minute and a net drum.

2.2.5 Imports and Exports of Fish Products

In South Yemen prior to unification, fishery products were one of its most important export commodities. In North Yemen, on the other hand, fish products had to be imported each year to meet domestic demand. The following Figure 2-2, derived from FAO Fisheries Statistics (1991), shows exports and imports of fish products for both North and South Yemen over the 10-year period through 1989:

Figure 2-2 Yemen Fish Exports and Imports Amount



Cuttlefish and lobster accounted for the bulk of fishery exports from former South Yemen over the period, with a portion of fish being shipped in fresh and frozen form. Almost all of the fish imported into former North Yemen was in canned form. In South Yemen, fish exports were an important source of foreign exchange, thereby playing a key role in the national economy.

Table 2-6 shows the share of fishery products in total exports from South Yemen over the 1981 - 1985 period. By value, fishery products were the number-one export category in former South Yemen, making a major contribution to the nation's economy.

Table 2-6 Share of Fish Products in Total Export Value
(Former South Yemen; in US\$ millions)

	1981	1982	1983	1984	1985
A) Fish Exports	5.8	7.0	6.1	11.9	15.0
B) Total Exports	48.6	37.9	40.2	30.7	36.2
C) A/B(%)	12	18	15	39	41

Source: Current Economic and Social Conditions in South Yemen
(2nd Edition)

The characteristics of both North and South Yemen prior to unification, as seen in the above data on foreign trade in fishery products, are apparent in the following chart outlining the distribution of fishery products for the domestic market.

Demand for Fish Products in North and South Yemen

(in '000 tons)

Production	NY	22	Edible Use	NY	25
	SY	51		SY	37
Imports	NY	3	Exports	NY	0
	SY	0		SY	4
Note : Average for 1986-1988			Non-edible Use	NY	0
NY = Former North Yemen				SY	10
SY = Former South Yemen					

Note : Average for 1986-1988
NY = Former North Yemen
SY = Former South Yemen
Source: FAO Fishery Statistics(1991)

In North Yemen, fish products are used chiefly as food, with about 10% of total fish demand dependent on imports. By contrast, the fishing industry of South Yemen was further specialized, with some 20% of the total supply of small pelagic species going to inedible use as processed fish meal and other products for feed use. Certain fish and shellfish species, such as cuttlefish and lobster, are diverted to the export market, but about 70%

of total supply is consumed in edible form in the domestic market. From 1986 to 1988, per-capita consumption of edible fish, derived from total population data, was 3.0 kg in North Yemen and 16.5 kg in South Yemen. In terms of export and home consumption levels for fish products, we see clearly that, prior to unification, economic reliance on the fishing industry was far higher in South Yemen than in North Yemen.

2.3 The Fishery Development Plan

The National Reform Programme, passed by the Parliament in January, 1992, may be seen as a sign of the Republic of Yemen's economic development policies, pending implementation of the National Development Plan, which is to be prepared after completion of the post-unification transitional phase. The developmental targets set by the National Reform Programme in the fisheries sector may be summarized as follows:

- To complete the reorganization of public corporations in the fisheries sector.
- To upgrade production of canned fish products and encourage exports of marine products.
- To encourage operations of private fishing companies.
- To lend assistance to fishermen in marketing their catches and encourage the establishment of private marketing companies.
- To make improvements in public services to the fishing sector, including research, extension activities, resource studies , catch preparation, and the expansion of fish consumption.
- To ease financing conditions for fishermen and cooperatives at the Cooperative and Agricultural Credit Bank.
- To establish and protect fish farms.

- To arrange tax exemptions for fishing equipment.
- To implement a general review of the fishery sector as soon as possible.

The fishery development projects that were carried out in the former South Yemen from 1970 through the 1980s included the following:

Project Title	Project Detail		
1st Fishery Development Plan	Period :	1973 - 1978	
	Investment :	U.S. \$5 million	
	Funding :	IDA	
	Description:	Construction of an 800 ton cold storage in the Mukalla area.	
2nd Fishery Development Plan	Period :	1979 - 1984	
	Investment :	U.S. \$ 45 million	
	Funding :	IDA, ARABU Fund, ABUDABI Fund, EEC	
	Description:	Construction of an 800 ton cold storage, port facilities, ice making plant, generating facility, workshop, and roads in the Nishuton area.	
3rd Fishery Development Plan	Period :	1985 - 1989	
	Investment :	about U.S.\$28 million	
	Funding :	IDA, ARABU Fund, IFAD, EEC	
	Description:	Construction of a 20 ton cold storage, a 10 ton/day ice-making plant, workshop, net loft, and quay complex and supply of insulated vans and fishing gear at 5 key	

locations on the west coast
extending from Ras Ara to Bir Ali;
expansion and improvements at the
Fishery Training Centre in Aden.

The Ministry of Fish Wealth is currently planning to implement a 4th Fishery Development Plan, to run from the second half of 1993 to the end of 1995, based on financial aid from IDA, IFAD, and EEC (though, according to certain sources, the actual start-up year is still indefinite). Consideration is being given to the providing the same sort of facilities and fishing equipment as those provided in the 3rd Fishery Development Plan, with the target area to be Mukalla and other points along the eastern Gulf of Aden coast

As part of the policy of extending assistance to coastal fisheries from the public sector, within the context of this series of Fishery Development Plans, the Ministry of Fish Wealth has distributed basic fishery equipment, such as marine engines, replacements parts, fishing gear and materials to fishermen through the Ministry and various local fishermen's cooperatives. It was reported in this connection that the fishery equipment and gear incorporated in the 3rd Fisheries Development Plan was in the order of \$5,000,000. These items were imported during the 1980s on the basis of a government procurement program, with annual purchases estimated to have reached \$2,500,000. However, based on interviews with the Aden branch of the Ministry, during 1991 and 1992, owing to an acute shortage of foreign exchange, this procurement activity has been very difficult to carry out.

The equipment and gear that have been distributed to fishermen under past programs by the public sector have come to a considerable volume. Exports of outboard motors by a Japanese manufacturer to Yemen over the 13-year period from 1980 to 1992 totaled 9,000 units, spread over 8 PS, 15 PS, and 25 PS output classes, while Japan's exports of inboard engines over the 9-year period 1983 - 1991 totaled 150 units over an output range of 26 PS to 165 PS. Although these figures should be considered to include engines used by ordinary small-sized vessels, apart from those used on fishing vessels operating along the Gulf of Aden and Red Sea coasts, it can be

presumed that, particularly in the case of outboard motors, the bulk of the engines were distributed to fishermen through the Ministry of Fish Wealth and fishermen's cooperative channels.

SECTION 3: CONTENTS OF THE PLAN

3.1 Plan Objective:

The Coastal Fisheries Development Project in the Republic of Yemen is intended to develop fishery production by supplying required items of fishing equipment and gear to fishermen and fishermen's cooperatives along the Gulf of Aden coast.

3.2 Consideration of the Request:

3.2.1 Need and Appropriateness of the Plan:

As background for the subject Plan and the points to be considered in its formulation, followings are shown to outline the characteristics of the Yemen fishery sector along with the major problem areas and the need and importance of solving these problems.

- For some time now, catch effort has been stepped up for cuttlefish and lobster developed for the export market, raising concern over the need for resource conservation. On the other hand, portions of the resource for small pelagic species, such as sardines and mackerel, are still underdeveloped. Particularly in former South Yemen, the role of the coastal artisanal fisheries is quite important in increasing domestic fish consumption.
- The supply of fishing equipment and gear to the artisanal fisheries has thus far been carried by concerned departments of the Ministry of Fish Wealth and the fishermen's cooperatives as one of the key aid programs implemented by the public sector.
- The fishermen's cooperatives, which are the direct parent organizations for the artisanal fishermen, extend aid not only for fish production but also in the area of improving the quality of life for fishing families, particularly in remote areas. There are,

however, definite constraints on cooperative activities, owing to a deficiency in personnel, equipment, and facilities.

- The subject Plan also incorporates the goal of developing artisanal fisheries along the Gulf of Aden coast through a strengthening of the activity programs of the fishermen's cooperatives. In addition, the expatriate workers who have been forced to return to their home fishing villages since the Gulf crisis find themselves unemployed as a result of shortages in gear and materials. It is necessary, therefore, to consider countermeasures for this situation in the subject Plan.

As seen in the previous Section, government organizations have been concentrating their energies on developing fisheries along the Gulf of Aden coast through a series of development policies starting in the 1970s and have scored notable achievements in a variety of fields, such as improvements in the fishery infrastructure and the supply of fishing equipment and gear. However, in view of the burgeoning foreign debt within the context of a deteriorating national economy since the 1990 unification of North and South Yemen, economic aid is clearly required to implement future development programs.

Since the supply of fishing equipment has a direct bearing on fish production, continuation of this supply is a core aspect of coastal fishery development policy. The subject Plan is, therefore, deserving of a high priority.

3.2.2 Composition of the Request Items:

The composition of the requested equipment, as confirmed in the field survey, is as shown below. The equipment has been listed in order of the priorities indicated during the Team's discussions with the implementing organization in the Republic of Yemen.

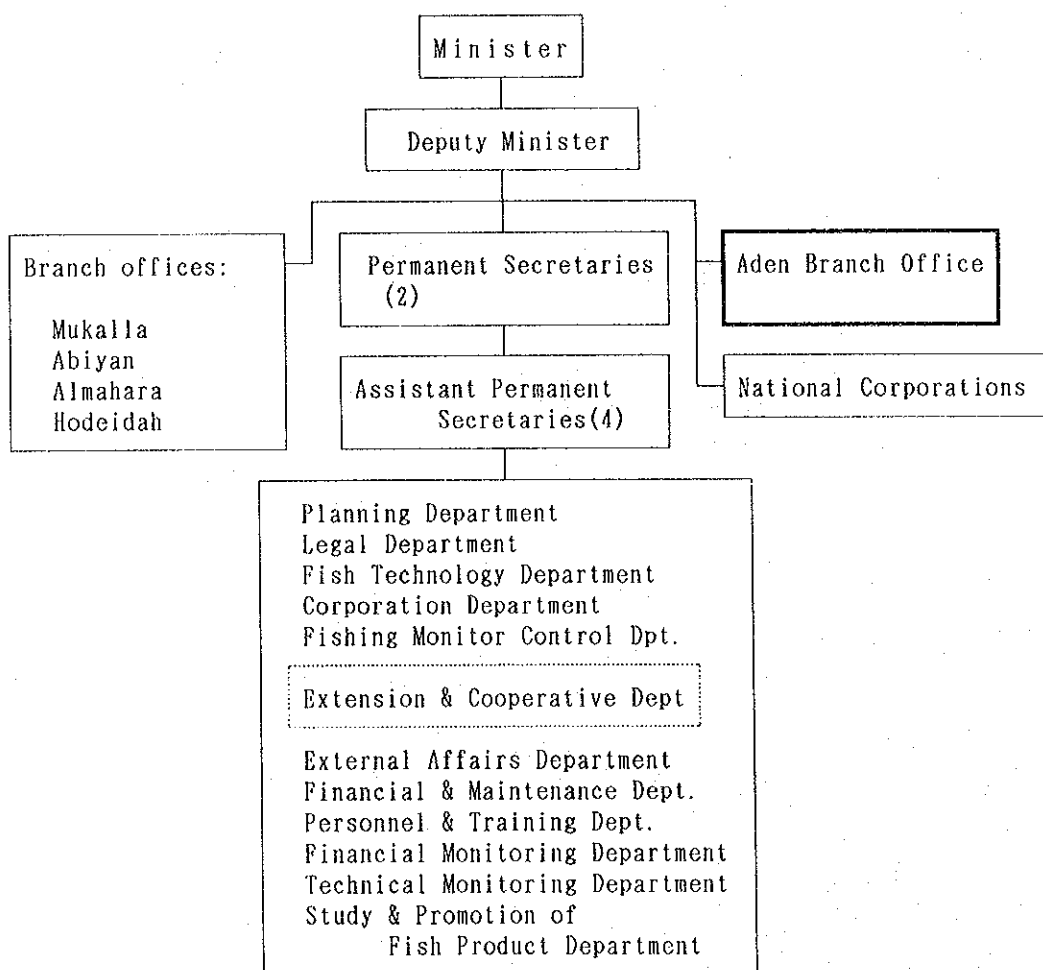
Priority Ranking	Requested Items	Quantity
1	Outboard motors and spare parts:	
	15 PS	300 units
	25 PS	150 units
2	Inboard engines and spare parts:	
	52 PS	10 - 12 units
	75 PS	6 - 8 units
3	Container-type workshops	6 units
4	Gill net materials	1 lot
5	Hand-line and trolling materials	1 lot
6	Purse seine	6 sets
7	Beach seine	6 sets
8	Fish processing equipment	1 lot
9	Vehicles:	
	2-ton insulated van	2 units
	5-ton insulated van	2 units
	Vehicles for extension services	4 units
10	Mobile workshop	1 unit
11	Shrimp trawl nets, net cage, and fish aggregation device	1 lot

3.3 Outline of the Plan:

3.3.1 Implementing Organization; Management Structure:

The responsible organization for Plan implementation will be the Ministry of Fish Wealth of the Yemen Government. Distribution of the planned equipment will be carried out by the Extension & Cooperative Department and the Aden Branch Office of this Ministry. Ministry headquarters are located in the capital, Sanaa. Figure 3-1 is an organization chart for the organizations concerned with Plan implementation:

Figure 3-1 Organization Chart for Concerned Organization



3.3.2 Recipients and Management of the Requested Equipment

Among the requested equipment, the outboard motors, gill net materials, hand lines, and trolling gear have been planned to be distributed to fishermen. The inboard engines are to be installed on new fishing vessels built at the FRP shipyard of the CFC and the wooden vessel shipyards at Aden and other locations and also as replacements for superannuated engines on existing vessels. The new vessels fitted with inboards will, as in the past, be delivered to the cooperatives, which are also to receive the container type workshops, purse seines, beach seines, and vehicles. The container workshops and vehicles will be administered and operated by the cooperatives, as was the case with related equipment previously provided under the 3rd Fisheries Development Plan. The purse seines and beach seines are to be used on vessels belonging to the various cooperatives but will also be leased directly to local fishermen, as required.

3.3.3 Distribution Plan of the Requested Equipment

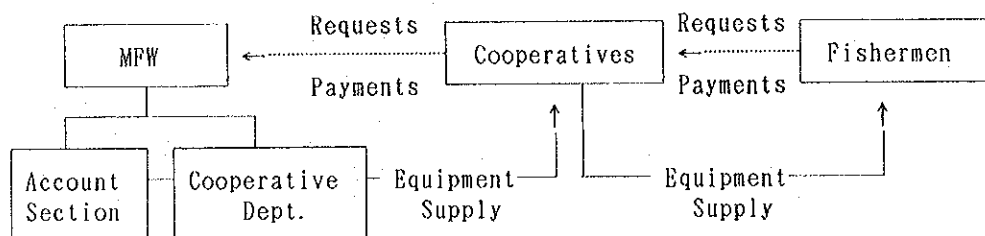
Until the requested equipment is distributed to the fishermen or fishermen's cooperatives, it will be temporarily stored in a warehouse operated by the Aden Branch Office of the Ministry of Fish Wealth located in the Malla district of Aden City. The repository warehouse has previously been used to store the fishing materials procured through antecedent plans. This building has a floor area of about 900 m² and is equipped with a security post and handling areas for equipment and materials. The space is considered ample for storage of the Plan equipment.

The Plan is to have the Cooperative Department of the Aden Branch Office of the Ministry of Fish Wealth manage warehouse operations for the requested equipment. This was the administrative system used for the fishery materials that the Ministry procured and sold under antecedent plans. It is explained that facilities and personnel at the Services and Transportation Department of the Aden Branch Office are to be used for distribution of the equipment, and it is planned to transport the material within current budgets.

With respect to the outboard motors and other equipment to be used by fishermen, the various fishermen's cooperatives along the Gulf of Aden coast will accept requests from the fishermen and submit requests, in turn, for the required quantities to the Ministry of Fish Wealth. Fishermen recipients will be selected by a committee composed of representatives from the cooperatives. Supply of and payments for the use and possession of the equipment will be processed through the cooperatives, under supervision of the Ministry, as shown in the following chart.

In addition, maintenance and repairs on the outboard units will be handled at the existing workshops that were established at some of the cooperatives under the 3rd Fisheries Development Plan and other antecedent plans and also by the container type workshops to be provided under the present Plan.

Distribution Organization and Equipment Supply Channels



The container type workshops, purse seines, beach seines, and vehicles will be provided to fishermen's cooperatives selected by the Ministry of Fish Wealth. Based on the confirmation by the Team at the Ministry headquarters, it was explained that the number of target cooperatives will be determined on the basis of the available quantities for related equipment and that priority will be accorded to southern areas in selecting the recipient cooperatives.

3.3.4 Quantity and Size of the Required Equipment:

(1) Outboard Motors and Spare Parts:

The Request calls for 450 gasoline-powered outboard motors, 300 with an output of 15 PS and 150 of 25 PS. Throughout the 1980s, as already noted, a considerable quantity of fishery equipment and gear was procured by government agencies while, over the past 13 years, a total of some 9,000 outboards were imported from a manufacturer of Japan alone through a series of official procurement programs and open market purchases, with average annual imports running about 700 units. The breakdown by output class has been: 17% of 8 PS, 65% of 15 PS, and 12% of 25 PS, with these 3 classes accounting for 94% of total. The planned outputs for the subject project are, therefore, typical of historical patterns. Judging by the annual imports of 700 units to date, it has been concluded that demand for these engines is substantial and that the 450 outboard motors to be sourced under this Plan can be absorbed without difficulty under the existing official procurement and distribution structure.

(2) Inboard Engines and Spare Parts:

A total of 16 diesel main inboard engines have been requested, with 10 units in the 52 PS class and 6 units in the 75 PS. It is estimated that about 70 vessels equipped with inboard engines currently operate along the gulf of Aden coast, predominantly member vessels of fishermen's cooperatives. The majority of these engines are said to be in the 25 PS - 50 PS range, and certain boats observed during the field survey were fitted with a 150 PS unit. Over the past 9 years, the output composition of the 150 small marine main diesels exported to Yemen by a manufacturer of Japan were as shown below:

Output Class	No. of Engines (units)
20 - 40 PS	38
40 - 60	55
60 - 80	43
80 - 100	0
Over 100	14
Total	150

The above data show that an average of close to 17 inboard engines have been imported each year from Japan alone, with roughly 65% falling within the output range designated in the present Plan. The outputs of the engines requested for the Plan may, accordingly, be considered to be an average mix, based on import data for recent years. The total requested quantity is 16 engines. While the imports shown in the above table presumably included engines used on vessels operating outside the Gulf of Aden, such as those fishing along the Red Sea coast, as well as small-size vessels not engaged in fishing operations, considering only the fleet size in the project area, it may be concluded that the numbers shown in the Request document are by no means excessive, falling in a reasonable range.

(3) Container Type Workshops:

Based on the 3rd Fisheries Development Plan targeted at the Gulf of Aden coast, which was carried out between 1985 and 1989, workshops designed for the maintenance and repair of small fishing vessels were built at 5 key locations extending from Ras Ara on the west to Bir Ali in the central portion of the coast. The facilities of 3 of these workshops, in Imran, Fokum, and Shuqra, were observed by the field survey. The workshop facilities contain drilling machines, hydraulic presses, and other small machine tools as well as other hand tools and implements. The workshop was also equipped with a simple slipway and a set of winch of enough capacity to land Sambuk vessels. The container type workshops included in this Plan will be provided with mobile containers for moving such equipment and tools as used at existing workshops to cooperatives and production bases that are not yet equipped with workshop facilities. The repair equipment

is to be geared to the maintenance and repair of small marine engines and will comprise small drilling machines, hydraulic presses, grinders, compressors, generators, and other types of machinery, along with a supply of common hand tools and specialized tools for marine engine repairs. Six container type workshop units are planned, in accordance with the Request document.

(4) Gill Net Materials:

1) Netting:

Gill nets are the most common used fishing method in the project area, with the majority made of PA multifilament. During the Study Team's discussions at the Ministry of Fish Wealth headquarters, the following changes were received in the Request specifications for net web (A):

Original specifications for Net Web (A):

PA multifilament, 210 D/ 6 x 60 mm x 50 MD x 100 m, 1,000 rolls

Alternative specifications for Net Web (A):

PA multifilament, 210 D/36 x 4.5" x 70 MD x 162 m,	200 rolls
210 D/36 x 5.0" x 70 MD x 162 m,	200 rolls
210 D/36 x 6.0" x 70 MD x 162 m,	200 rolls
210 D/36 x 7.0" x 70 MD x 162 m,	200 rolls

Net web (A) is a PA double-knot net with a 210 D/36 thickness. While this net is directed at large fish, such as skipjack, tuna, and kingfish, when considering twine diameter (D) and mesh size (L) in anticipation of the targeted fish sizes, since twine thickness is fixed in relation to the various mesh sizes, in the case of netting with a 4.5" - 6.0" mesh, the D/L ratio is excessive, threatening to lower catch efficiency. In Japan, the D/L for gill nets is ordinarily in the 0.004 - 0.007 range, but the net web (A) in the Request document has a D/L of 0.0078 - 0.0123. Since this netting is double knot, the knot is enlarged, making the effective mesh size even smaller. Even considering the differences in hanging ratios

and durability, it should be noted that the specifications will entail a sacrifice in catch efficiency.

If twine diameters are examined giving priority to the mesh sizes by the Request, even considering the size of the hanging ratio, the appropriate twine thicknesses would be in the order of 210 D/21 with 4.5" mesh, 210 D/24 with 5" mesh, and 210 D/30 with 6" mesh. It is planned to attach one mesh of double selvage to both sides of all nettings under net web (A).

With respect to net web (B) as well, for nets of 210 D/15, 2.0" (50.8 mm), the D/L becomes 0.0173, which may be too large for gill net use. If the standard is set at 210 D/15, then, even in light of local conditions, it would be appropriate to set the mesh sizes at about 3.0" (76.2 mm), 3.5" (88.9 mm), and 3.7" (95.3 mm). Comparing nets of 210 D/6 and 210 D/15 thicknesses, although the twine thickness of the latter netting would be more than double the former, it would be unnatural to use the same mesh size irrespective of the target species. For the above reasons, in the case of net web (B), it would be proper to increase mesh size slightly.

2) Twine:

Twine of 210D/6, 210D/15, 210D/36, and 210D/75 would satisfy the requirements of the mending twine for net webs (A) and (B). It is planned to add 2 types of spun nylon as hanging and rigging lines.

3) Sinker and Float Lines:

Since most nets are handled manually, both sinker and float lines will, in principle, use one main line for both the float and sinker sides; side line will be applied only to 210D/6 nets. This is because, in most 210D/6 nets, the netting is attached to the float line via side float line penetrating to the selvage, rather than using hanging line. In the other nets, netting will, as a general rule, be attached to the float line via hanging line penetrating to the selvage.

Sinker lines are generally slightly thicker than float lines, because a much stronger force is applied to the sinker line during net hauling operations. In the present case, since the nets are hauled in by hand,

while nylon has a breaking strength about 20% greater than PE, there is no problem with using the same diameter of rope. The number of ropes has been planned with due regard to the quantity of the netting so as to assemble working sets of gill net. Some sinker lines in Yemen are made of PP or PE, but it is considered that, in terms of function, nylon or PVA would be preferable. Also, in view of the fact that the price difference between nylon and PVA has virtually disappeared, nylon, as per the Request, would be acceptable. Thickness too would respond to actual operating conditions.

Reinforced lead lines were requested as a sinker line, which has a thinner lead sinker as a core placed in the center of the sinker line. While this is highly functional in mechanized hauling operations, since manual hauling is the rule in the project area, the necessity for this type is considered to be limited.

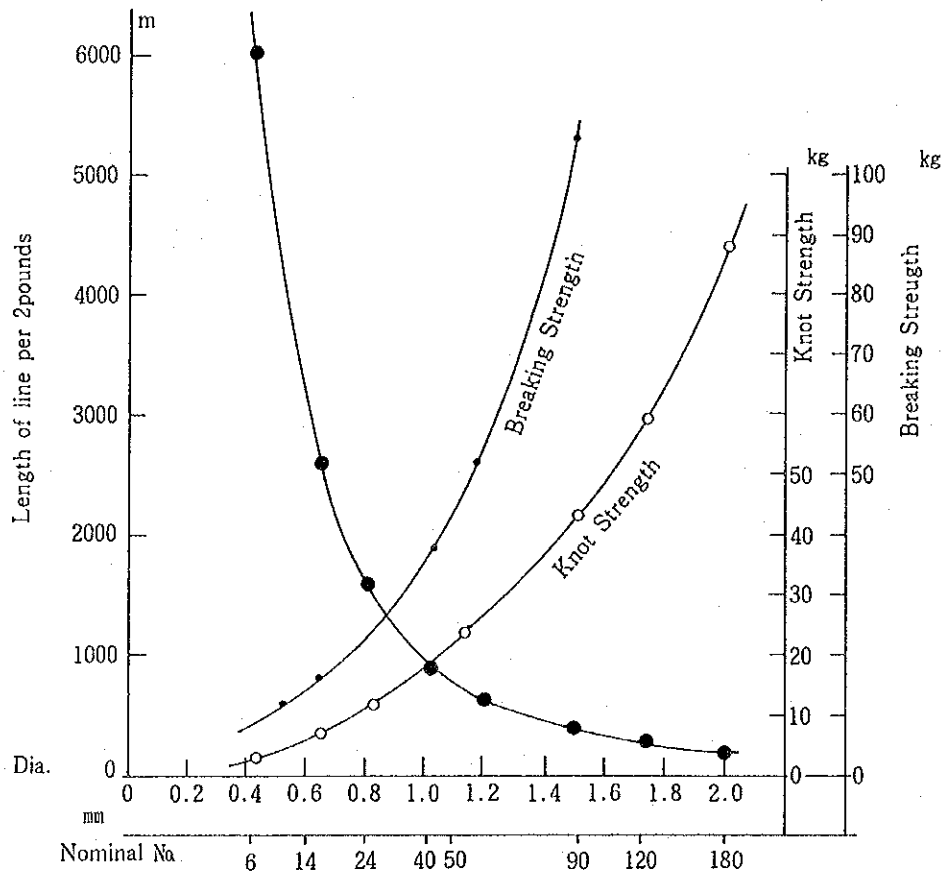
4) Sinkers and Floats:

The number of sinkers and floats as well has been estimated with an eye to the planned number of the nets. Floats will be provided under two standards, for use in large-scale and small-scale gill nets respectively. In principle, the number is determined on the basis of buoyancy per unit length and the ratio to that buoyancy, but will be planned in this project to permit use in either drift nets or bottom gill nets for which the sinking force and buoyancy dictate commensurate quantities.

(5) Trolling and Hand-line Materials:

As noted earlier, hand-lines and trolling lines are very popular fishing methods in the subject area, catching a large volume of useful species. For this reason, the provision of hook and line fishing materials has been accorded a high priority. For fishing lines, which are the primary gear item, the Request asks for nylon monofilament construction, with a thickness range of 0.4 mm - 2.0 mm. The tensile strength and knot strength of these fishing lines are in the range of 8 kg - 180 kg and 25 kg ~ 91 kg respectively (Cf. Figure 4-1), and fish that can be taken with such lines would range in size from 0.5 kg - 40 kg. Accordingly, it may be concluded that these lines would include almost all of the hook and line operations currently undertaken in Yemen.

Figure 4-1 Particulars of Nylon Mono. Lead Line



In the Request eight kinds of fishing line are equally of a same weight, with a quantity of 2-lb. 125 reels. As shown in Figure 4-1, with respect to the length/diameter relationships among the various fishing lines, whereas thin lines of 0.4 mm have a 6,000 m reel length within the 2 lb. reels, 1 mm lines have a reel length of 900 m and 2 mm lines only 200 m. That is to say, in the case of the 0.4 mm lines, produced with 200 m lead lines, 30 castings can be made per reel but, in the case of 2.0 mm, only one casting per reel is possible. In addition, although catch conditions vary by season, most of the fish landed by the hand-line vessels observed by the Study Team in fishing villages had 40 - 60 cm lengths, weighing 3-4 kg or more, with several hand-line boats bringing in catches of larger tunas. In light of the above, it should be considered to adjust quantities of fishing lines, rather than to apportion them uniformly for each of the 125 reels.

During the field discussions, the Study Team was asked to consider the modification of the "O'Shaughnessy" type hooks to whale-bone jig hooks for the hook and line gear incorporated in the Request document. Consideration has been given to the Request specifications for lures, swivels, and hooks in the light of the desired change. In this area of Yemen, there are extremely large catches of shark by both hand-line and long line vessels. In the case of these shark catches, since it is normal to use wire leaders with all types of hook and line gear, it would be desirable to add wire leaders for use on branch lines of tuna long line gear (zinc-plated, with a breaking load of 180 - 220 kg) in shark fishing operations. We have, accordingly, included in the Plan zinc-plated 3x3 to 4x3 wire leaders with a yarn wire diameter of 0.46, which can, we believe, serve as wire leaders for both trolling and hand-line use.

(6) Purse Seines:

Finished purse seines have been requested for use on 12-15 m vessels directed at sardines, mackerel, and Spanish mackerel. However, as size differences tend to be pronounced in these species, unless net specifications are set separately, operations will be impossible. Accordingly, the designs for the purse seines to be supplied have been divided into a large size (for mackerel and Spanish mackerel operations) and a small size (for sardine use). The bulk of the seines are hauled in manually but, when hauling is mechanized, as on the Noba, the thicknesses and rings of the float lines and purse lines, as well as the quantities of floats and sinkers in the bag net, must be slightly modified from those applicable to manual hauling. This design has been predicated on manual hauling operations. In the design of purse seine gear, some consideration must be given to fish schools and the fishing ground environment. It should also be recognized that the local fishermen are already catching a wide variety of species, ranging from such large fish as tuna and kingfish down to small species, such as mackerel and sardines, making nets well suited to the local grounds with superior skills. It may be preferable to consider furnishing fishermen with the necessary materials and let them fabricate their own nets.

(7) Beach Seines:

The beach seines in the Request document have a float line length of 130 m. In its field trip to Imran, the Study Team found the length of the float lines in these nets to be 126 m. In Japan, beach seines are generally of a size requiring about 20 men to operate them.

In the case of Imran, from wings to bag ends, with the exception of the selvage, the same narrow-opening specifications were being used (210 D/8 PA 6 mm, Raschel nets). However, using the same narrow openings from wings to bag ends cannot be considered functionally sound. It would, therefore, be appropriate to use nets with narrow openings from the body net to bag net, and medium range meshes made of PE or PP multifilament, with a low specific gravity, in the wing. Since sardines are the directed species, in the case of water depths where, with excess buoyancy left at about 1.2, the net foot does not reach the sea bed, the number of floats and sinkers should be determined in such manner that the float side assembly can float on the sea surface.

(8) Fish Aggregation Device:

Some years back, experiments were conducted with a fish aggregation device in hand-line fishing grounds for large pelagic species in the Gulf of Aden. Although catch records are not available, based on reports from the fishermen's cooperative, aggregation was quite effective, and the device was well used by the hand-line fishery. However, this fish aggregation device disappeared before long, with the equipment presumably washed away, though theft cannot be ruled out. Considering the aggregation effectiveness of this one example, in our judgment, it would certainly be meaningful, in terms of developing the coastal fisheries, to build another fish aggregation device, designed to prevent theft and loss through drifting. Several possibilities exist, and a construction method will be based on various examples in Southeast Asia, where this type of facility is widely utilized with good results. This fish aggregation device will be located in an area of reef seabed with a depth of 150-200 m.

(9) Fish Processing Equipment:

A request has been made for first-stage fish processing equipment, including insulated ice boxes, fish baskets, plastic trays, knives, and

rubber globes. They would be used at the fish handling facilities set up in the Gulf of Aden Cooperative and some other cooperatives. However, since reservations remain with respect to the cost effectiveness of sourcing such bulky items from Japan, they have been excluded from the subject Plan.

(10) Vehicles:

Under the previously discussed 3rd Fisheries Development Plan, the fishery infrastructure was improved at 5 key locations, extending from Ras Ara on the west to Bir Ali in the central district, through the provision of cold storages, ice-making plants, and other distribution facilities. In order to transport the fish collected at each cooperative to Aden and other consuming centers, large insulated vans were deployed to certain cooperatives. However, given the need to move other materials as well as fish, transport vehicles, including the insulated vans, remain in short supply. Accordingly, the requested vehicles have been planned.

This Plan incorporates 4 units of insulated van trucks as high priority items. Considering the road conditions in remote areas, the insulated vans will all have 4-wheel drive, and within market availability that meet with this specification, the pay loads will be planned.

The mobile workshops that were requested are trucks fitted with fishing vessel repair equipment which would circulate among various areas to provide this service. Considering, however, that 6 container type workshops are also included in the Plan, and in view of limitations in terms of performance and maintenance of the equipment that can be installed on transport vehicles, these mobile workshops have been excluded from the subject Plan.

(11) Other Items:

1) Shrimp Trawl Nets:

As mentioned in the previous section, the shrimp trawl fishery is still in a developmental stage in the Yemen coastal fishery. Small-size trawl nets have already been introduced for the purpose of conducting pilot

operations, and the operating results of these tests are still being analyzed. In addition, in designing trawl nets, detailed information is needed on the general layout and other major particulars of the fishing vessels on which the nets are to be used. Considering the stage of development and also the fact that the user vessels have not been specified, it has been decided not to include the shrimp trawl nets in the Plan.

2) Net Cages:

For purposes of temporarily collecting high-value fish species, net cages were included in the Request. It was informed that the location for this facility is still to be determined. But, since most of the fishing bases on the Gulf of Aden coast face open sea, there seem few suitable sites with adequate depth. In addition, market research must be conducted in this connection on sales channels for live fish. Until preparations are completed for these location and market surveys, it would be premature to introduce these net cages.

3) FRP Materials:

During the field discussions, a supplementary request was made to include in the Plan FRP materials used for hull construction, with a view to distributing this material to the FRP shipyard belonging to the CFC. Built in 1980, this yard has constructed 500 - 600 vessels to date, mainly small fishing vessels of the Khadeefa class. Prior to unification in 1990, the fishing vessels built by the CFC had been sold chiefly to fishermen's cooperatives but, since unification, only 30% have gone to cooperatives, with 70% having been sold to the private sector. Although these fishing vessels are certainly contributing to the development of coastal fishing in Yemen, considering the fact that construction activity at this shipyard is reported to be running smoothly, while the intended recipients of the Plan equipment are to be fishermen's cooperatives and fishermen selected by these cooperatives, these FRP materials are not necessarily being given a high priority in the subject Plan.

SECTION 4: BASIC DESIGN

4.1 Basic Design Conditions:

4.1.1 Maintenance Technology:

The fishing equipment examined in this study include several items, such as inboard and outboard engines, whose useful lives vary greatly on the basis of maintenance technology and the effort devoted to routine inspections. Along the Gulf of Aden coast, workshops established at certain cooperatives have been engaged in the maintenance of outboard motors and other equipment imported during the 1980s. In order to further develop the maintenance structure for marine engines, it would be set ease of maintenance as the primary condition in evaluating target equipment. Thus, the selection criteria will focus on specifications conforming as much as possible to the maintenance technology level that has been reached in the project area as well as a construction that will permit easy maintenance and repairs, so that this work can be carried out smoothly in remote areas lacking repair facilities. From a similar standpoint, at the implementation stage, when selecting manufacturers, consideration should be given to whether or not they have an agent in the Republic of Yemen with a proper setup for after-sale service, particularly the capability to promptly supply replacement parts.

4.1.2 Extra Supplies of Spare Parts:

In the case of both the inboard and outboard engines, it has been asked that the Plan make special provision for replacement parts. This request did not refer to the standard supply of spare parts included in the engine price but rather to an extra allowance of parts beyond that included in the equipment cost. In this Plan, therefore, with regard to both the inboard and outboard engines, an extra parts allowance will be considered within about 15% or 20% of the basic engine price.

4.1.3 Finished and Unfinished Products:

The marine engines, workshop equipment, and insulated vans will be delivered as finished equipment. In the case of marine engines, for instance, there will be no need for engine assembly, the user must be able to put the engines immediately into operation after rigging; i.e., after installing the engine, propeller assembly, and fuel tanks on the vessel.

On the other hand, the fishing gear will not be brought in in finished form but will be shipped as netting, lines, floats, buoys, and other materials. The rationale for this policy is that it will permit a proper determination of the gear composition at the time of distribution, in relation to the scale of operations that can be delegated to local fishery management bodies.

During the implementation stage, as required, labels indicating equipment standards should be considered. In addition, in response to requests from the implementing organization, assembling plans should be supplied for items related to the purse seines, beach seines, and fish aggregation device.

4.1.4 Packing and Operating Manuals:

While the trunk highways along the Gulf of Aden, such as that between Aden and Shuqra, are paved, as of the time of the field survey, the road between Fokum and Imran, for example, was as yet unpaved. To prevent transport problems over difficult roads, careful attention must be paid to the packing of the marine engines and machine tools.

Manufacturer's operating manuals should be attached at the time of delivery for the marine engines, insulated van trucks, and the hydraulic presses, table drills, grinders, compressors, and emergency generators destined for the workshops.

4.2 Specifications for the Equipment

4.2.1 Outboard engines and spare parts

No	Descriptions	Outline of specifications	Q'ty
	Outboard engine	Gasoline powered 2-stroke outboard motor Fuel tank : approx. 20 ltrs. Transom height : for approx. 20 inches	unit
	(1) Outboard engine(A)	Displacement : approx. 240 ~ 280cc Max. output : approx. 15PS	300
	(2) Outboard engine(B)	Displacement : approx. 490 cc Max. output : approx. 25PS	150
	(3) Spare parts	Spare parts for the outboard engine	lot 1

4.2.2 Inboard engines and spare parts

No	Descriptions	Outline of specifications	Q'ty
	Inboard engine	4-cycle marine diesel engine of natural aspiration system, with mechanical cooling and lubricating system, maintenance lids for crank case, complete with stern arrangement	unit
	(1) Inboard engine (A)	No. of cylinders : Four Displacement : approx. 3600 cc Output, continuous : approx. 50PS/2100 rpm Reduction ratio : 2.59	10
	(2) Inboard engine (B)	No. of cylinders : Four Displacement : approx. 4300 cc Output, continuous : approx. 70PS/2300 rpm Reduction ratio : 2.96	6
	(3) Spare parts	Extra spare parts for inboard engines	lot 1

4.2.3 Container type workshop

6 sets

No	Descriptions	Outline of specifications	Q'ty
	Hydraulic press machine	15 tons	No 1
	Drilling machine	13 mm, 200W, 1ph, with stand	1
	Grinding machine	150 mm, 350W, 1ph	1
	Air compressor	0.75 kW, 1ph	1
	Parts cleaner	1280 x 950 x 550 mm	1
	Work bench	1500 x 900 x 740 mm	2
	Outboard engine stand		2
	Parts wagon	850 x 580 x 370 mm	2

Parts shelf	900 x 450 x 1800 mm	2
Hand car	300 kg	1
Lever block	250 kg	1
Crank aligner		1
Crank jig set		1
Adjustable pipe wrench	40 mm dia.	1
Gear oil filler pump		1
Grease pump		1
Air duster	with short nozzle and lever	1
Rubber hose		10
Air transformer	with air cleaner	1
Hose band		20
Torque wrench, plate type		
	920 kgf.cm	1
	1300 kgf.cm	1
	1900 kgf.cm	1
Copper hammer	2 lb.	2
Electric drill	13 mm	1
Drill set	0.5mm interval 25 pcs/set	1
Quick chuck		5
Hand drill	6 mm	1
Hand grinder	125 mm	1
Vice	130 mm	1
Terminal kit		1
Heil coil kit		1
Tap and die set		1
Oil measure	2 ltr.	1
Oiler	180 cc	1
Oil pan	400 x 250 x 95 mm	1
Electric solder		1
Solder wire		1
Hacksaw frame	250 mm	2
Hacksaw blade set	12 pcs/set	2
Torch lamp	kerosene type	1
Wire brush		5
Files	flat, half round, round, 250 mm 2 pcs/set	1
Test propeller	15/25PS outboard engine	1
	40 PS outboard engine	1
	75 PS outboard engine	1
Magnet base		1
Ampere meter		1
Ignition timing tester		1
Ignition coil tester		1
Tachometer		2
Timing meter		1
Dial gauge set		1
Vernier caliper,	150 mm, within 0.05 mm	1
Cylinder gauge		1
Diesel nozzle tester	5 nozzle attachment	1
Diesel generator	2.7 KVA	1
Extension cable,	20m, with reel	1
Battery charger,	12V	1

Battery tester		1
Powder extinguisher		1
Special tool kit for outboard engine		1
General tool kit for outboard engine		3
Special tool kit for diesel engine		1
General tool kit for diesel engine		1
Bond	200g	12
Grease	250 g x 12 pc	2
Gear oil	350cc x 24 pc	20
2-cycle oil	20 ltr	2
Spray paint	250cc x 12 pc	2
Container	20ft. type prefabricated container: Electric wiring works including distribution board and room light, painting and interior works	1

4.2.4 Gill net materials

No	Descriptions	Outline of specifications	Q'ty
1.	Net web (A)	Nylon multifilament, double knot, gray color, one mesh double selvage	roll
		210D/21, 4.5" STR, 70 MD, 162 m/roll	200
		210D/24, 5.0" STR, 70 MD, 162 m/roll	200
		210D/30, 6.0" STR, 70 MD, 162 m/roll	200
		210D/36, 7.0" STR, 70 MD, 162 m/roll	200
2.	Net web (B)	Nylon multifilament, single knot, gray color	
		210D/ 6, 2.0" STR, 120 MD, 108 m/roll	300
		210D/ 6, 2.25" STR, 120 MD, 108 m/roll	300
		210D/ 6, 2.5" STR, 120 MD, 108 m/roll	300
		210D/15, 3.0" STR, 94 MD, 180 m/roll	300
		210D/15, 3.5" STR, 81 MD, 180 m/roll	300
		210D/15, 3.7" STR, 76 MD, 180 m/roll	300
		210D/75, 12.0" STR, 47 MD, 180 m/roll	300
3.	Twine	Nylon multifilament twine, gray color	reel
		210D/ 6, 1 lb /reel	500
		210D/15, 1 lb /reel	2000
		210D/36, 1 lb /reel	500
		210D/75, 1 lb /reel	500
		Spun nylon, 10'S/12, 1 lb/reel	500
		Spun nylon, 10'S/36 1 lb/reel	500
4.	Sinker line	Nylon, 3-strand, natural white	coil
		04mm dia., 200m /coil	540
		06mm dia., 200m /coil	450
		08mm dia., 200m /coil	360

5.	Float line	10mm dia., 200m /coil	150
		Polyplopylene, 3-strand, "Danline" type	
		04mm dia., 200m /coil	540
		06mm dia., 200m /coil	450
		08mm dia., 200m /coil	360
6.	Sinkers	10mm dia., 200m /coil	150
		Polyethylene, 3-strand	
		03mm dia., 200m /coil	500
		Lead, penetration type	pce 25000
		Hole diameter : 12 mm Weight : 200 g (air)	
7.	Float	Cylindrical type plastic float for shallow water	
		Buoyancy : 340 g 128 L x 74 W x 13 hole dia.mm	8500
		Buoyancy : 250 g 165 L x 52 W x 15 hole dia.mm	16500

4.2.5 Trolling and hand line materials

No	Descriptions	Outline of specifications	Q'ty
1.	Fishing line	Nylon monofilament	
		0.4 mm dia., 2 lb /reel	100
		0.6 mm dia., 2 lb /reel	100
		0.8 mm dia., 2 lb /reel	120
		1.0 mm dia., 2 lb /reel	125
		1.2 mm dia., 2 lb /reel	150
		1.6 mm dia., 2 lb /reel	145
		1.8 mm dia., 2 lb /reel	130
		2.0 mm dia., 2 lb /reel	125
2.	Trolling lure	Lure head : "Kona" cut type, 18mm	500
		Skirt : Rubber, octopus type	
		Hook : Double type, MUSTAD 7/0 or equivalent	
3.	Swivel	Brass, box type	
		Size : 1/0, 100 pcs./box	20
		2/0, 100 pcs./box	20
		3/0, 100 pcs./box	20
		4/0, 100 pcs./box	20
		5/0, 100 pcs./box	20
4.	Fishing hook	"Whale bone" type jig, double hooks	
		Size : 3/0, 10 pcs./pack	10

		3/0.5, 10 pcs./pack	10
		4/0, 10 pcs./pack	10
		5/0, 10 pcs./pack	10
		6/0, 10 pcs./pack	10
5.	Wire loader	Zinc coated 3 x 3, dia. 2.2 mm, 400m/reel 4 x 3, dia. 2.4 mm, 400m/reel	20 20

4.2.6 Beach seine net

No	Descriptions	Outline of specifications	Q'ty
	Beach seine net construction materials		set 4
1.	Float and sinker line materials		
	Float line	PE dia. 9mm 138m	
	Sinker line	PE dia. 8mm 138m	
	Warp	PP Danline type dia. 12mm 2000m x 2	
	Hanging line	Spun nylon, 10'S/30 500m	
	Lacing line	Spun nylon, 10'S/15 3,000m	
	Float	PVC sponge farm 146 x 90 x 16mm, 250 pcs	
	Sinker	Lead, penetration type, 200g weight, 1,000 pcs	
	Buoy	ABS Hollow type, orange colored, dia. 300mm, 5 pcs	
	Reinforcement line	Spun nylon, 20'S/18 300m x 2 pcs	
2.	Nets materials		
	Wing (A)	PP 170D/15, hard twisted, trawler knot Mesh size : 50mm Mesh depth : 120MD Net length : 40m	
	Body (B)	PP 170D/12, hard twisted, trawler knot Mesh size : 32mm Mesh depth : 220MD Net length : 30m	
	Body (C)	PA 210D/10, Raschel web Mesh size : 20mm Mesh depth : 450MD Net length : 24m	
	Bag (D1)	PA 210D/8, Raschel web Mesh size : 12mm Mesh depth : 900MD Net length : 15m	
	Bag (D2)	PA 210D/8, Raschel web Mesh size : 12mm Mesh depth : 1-135MD Net length : 4.5m	
	Bag (D3)	PA 210D/8, Raschel web Mesh size : 12mm	

		Mesh depth : 900MD Net length : 12m	
	Selvage	PA 210D/12, Trawler knot Mesh size : 50mm Mesh depth : 10MD Net length : 109m	

4.2.7 Purse seine (A)

No	Descriptions	Outline of specifications	Q' ty
	Purse seine (A) construction materials		set 1
1.	Float and sinker line materials		
	Float line(1)	PE dia.12mm Z twist 350m, with eyes	
	Float line(2)	PE dia.10mm S twist 350m, with eyes	
	Sinker line	Nylon dia.10mm Z twist 350m, with eyes	
	Hanging line(1)	Nylon spun 10'S dia.3mm, 500m	
	Hanging line(2)	Nylon spun 10'S dia.4mm, 500m	
	Lacing line	Nylon spun 10'S dia.2mm, 3,000m	
	Flame line	PE dia.9mm 45m x 2 with eye at both end	
	Ring string	Nylon multi dia.6mm 0.8m x 90	
	Ring	Al out side dia.12cm, inside dia.10cm, 90pcs	
	Purse line	PE dia.12mm, 600m	
	Side purse line	PP dia.16mm, 80m x 2	
	Tow line	PP dia.18mm 30m x 2	
	Float	PVC sponge from, 148 x 90 x 16 Buoyancy 500 gf, 600	
	Sinker	Lead penetration type 200gf, 700	
2.	Net materials		
	Selvage (A)	Nylon trawler knot web, 210D/27, 50mm, 10MD, with double selvage, 450m	
	Landing (B1)	Nylon trawler knot web, 210D/15, 30mm, 100MD, 37.5m, 20pc	
	Landing (C1)	Nylon trawler knot web, 210D/12 43mm, 100MD, 37.5m, 14pc	
	Body(B2)	Nylon trawler knot web, 210D/12 50mm, 100MD, 37.5m, 28.75pc	
	Body(C2)	Nylon trawler knot web, 210D/12 60mm, 100MD, 37.5m, 22.60pc	
	Wing(B3)	Nylon trawler knot web, 210D/12 60mm, 100MD, 37.5m 11.2pc	
	Wing(C3)	Nylon trawler knot web, 210D/12 65mm, 100MD, 37.5m 10.26pc	

Purse seine (B)

No	Descriptions	Outline of specifications	Q'ty
	Purse seine (B) construction materials		set 1
1.	Float and sinker line materials		
	Float line(1)	PE dia. 9mm Z 231m, with eye at both end	
	Float line(2)	PE dia. 7mm S 231m, with eye at both end	
	Sinker line	Nylon dia. 9mm 231m, with eye at both end	
	Hanging line(1)	Nylon spun 10'S dia. 2mm, 500m	
	Hanging line(2)	Nylon spun 10'S dia. 3mm, 500m	
	Lacing line	Nylon spun 10'S/18, 3,000m	
	Flame line	PE dia. 6mm 40m x 2 with eye at both end	
	Ring string	Nylon multi dia. 6mm 0.8 x 70m	
	Ring	Al out side dia. 10cm, inside dia. 8.5cm, 70pc	
	Purse line	PE dia. 10mm, 600m	
	Side purse line	PP dia. 12mm, 80m x 2	
	Tow line	PP dia. 16mm, 30 x 2	
	Float	PVA sponge from 135 x 83 x 15 Buoyancy 350 350gf, 800	
	Sinker	Lead penetration from 200gf/pc to 500	
2.	Net materials		
	Selvage(A)	Nylon trawler knot web, 210D/27, 50mm, 5MD, 300m, 2pcs	
	Landing(B1)	Nylon trawler knot web, 210D/9, 15mm, 500MD, 37.5m, 8pcs	
	Landing(C1)	Nylon trawler knot web, 210D/9, 20mm, 500MD, 37.5m, 7.6pcs	
	Body(B2)	Nylon trawler knot web, 210D/6, 25mm, 500MD, 37.5m, 19.75pcs	
	Body(C2)	Nylon trawler knot web, 210D/6, 30mm, 500MD, 37.5m, 17.2pcs	
	Wing(B3)	Nylon trawler knot web, 210D/6, 43mm, 500MD, 37.5m, 6.4pcs	
	Wing(C3)	Nylon trawler knot web, 210D/6, 35mm, 500MD, 37.5m, 9.6pcs	

4.2.8 Fish aggregation device

No	Descriptions	Outline of specifications	Q'ty
	FAD construction materials		set 1
	Floating unit A1	Body float, FRP cylinder, dia. 160mm x 4m, 5mm thickness	
	A2	Iron band(rust-proofed), band thickness 5mm	
	A3	Suspension wire rope, dia. 16mm Z plated, 3m with eye at both end	
	A4	(Palm tree leaf)	
	Flag pole B1	FRP cylindrical tapered rod dia. 60-20mm, 4m length, 4mm thickness, with flag	

Anchor rope	B2	Iron band with eyed wire rope, 16mm, 2m, ABS mark buoy, dia. 330mm, 1 pce
	C1	Anchor rope, 100 m, with connection wire rope dia. 16mm, 2m, ABS mark buoy dia. 330mm, 3 pcs
	C2	Anchor wire rope with swivel, dia. 16mm and dia. 22mm, 30m
	C3	Anchor rope dia. 18mm, PP Danline type, 250m with eye at ends
Others	D	(Drum anchor with connecting wire dia 16mm 200kgf x 3 pcs, not included in the Plan)
	E	Short link chain for anchor, 19mm x 20m

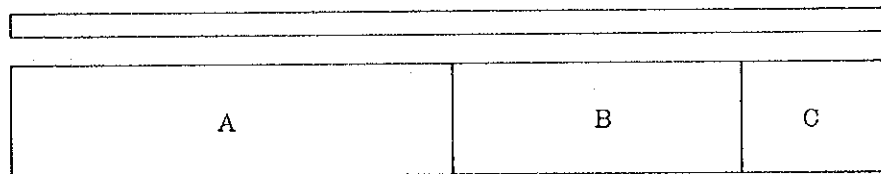
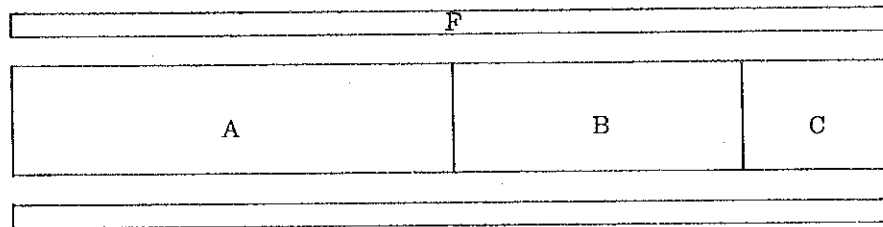
4.2.9 Insulated van trucks

No	Descriptions	Outline of specifications	Q'ty
1.	Insulated Van Truck A		unit
	Chassis, engine	Four wheel drive, diesel engine truck Left hand drive Seating capacity : Three Engine output : Approx. 165PS/3200 Pay load : Approx. 3.5 tons	2
	Insulated Van	Van body Dimensions : Approx. 4,400 L (inside) 2,100 W 2,000 H Insulation : Polyurethane foam, 75 mm	
2.	Insulated Van Truck B		
	Chassis	Four wheel drive, diesel engine truck Left hand drive Seating capacity : Three Engine output : Approx. 165PS/3200 Pay load : Approx. 4.5 tons	2
	Insulated Van	Van body Dimensions : Approx. 5,000 L 2,200 W 2,000 H Insulation : Polyurethane foam, 75 mm	

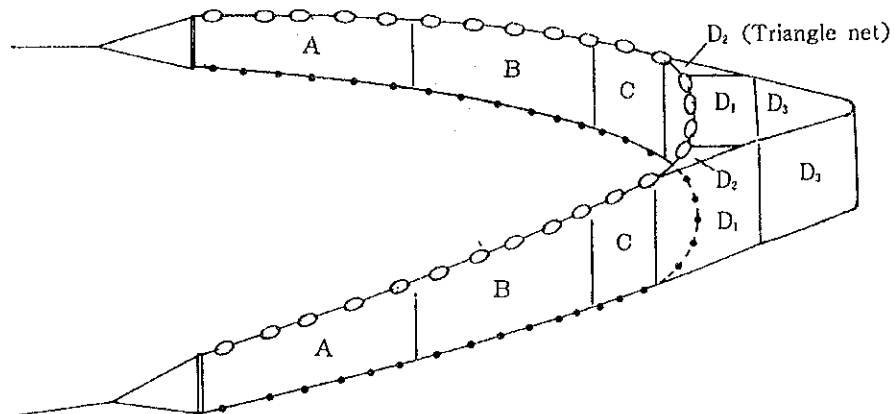
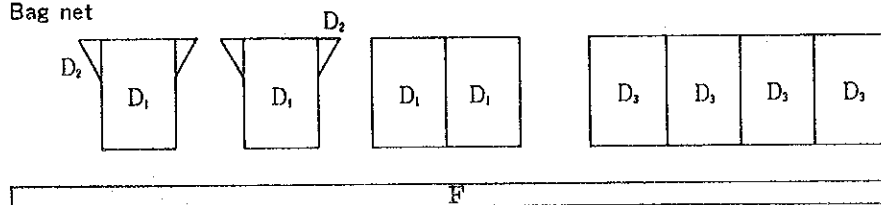
4.3 Basic Design Plan

(1) Beach seine

Wing and body nets



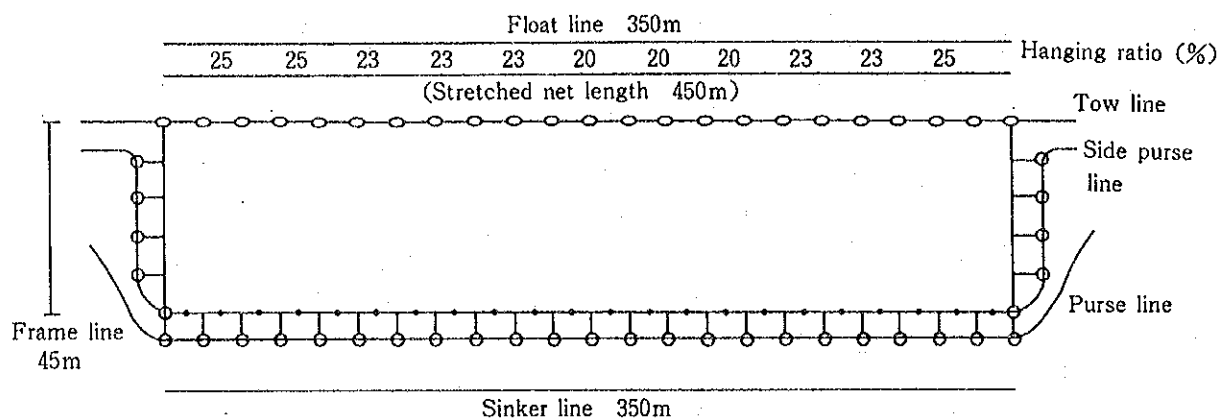
Bag net



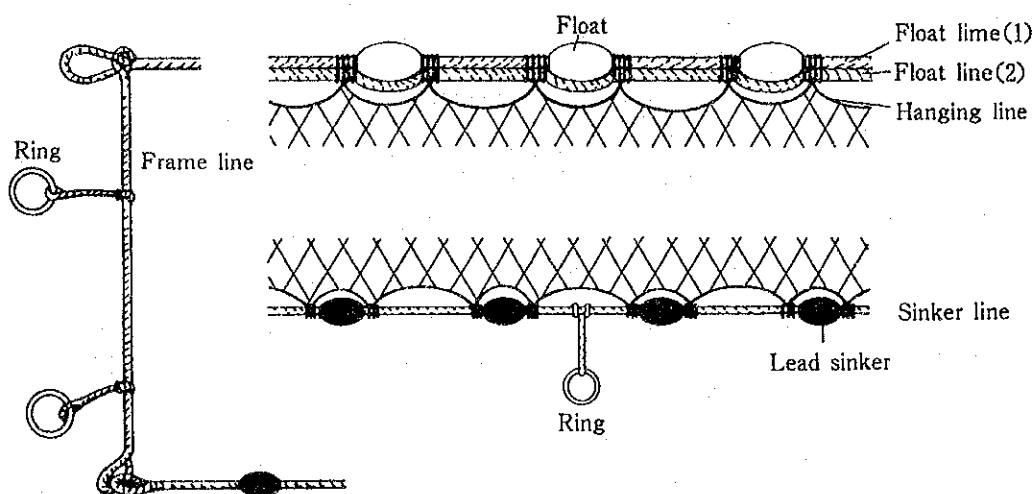
(2) Purse Seine (A)

① For Indianmackerd & Spanish mackerd

Ropes and accessories



Rigging of accesories



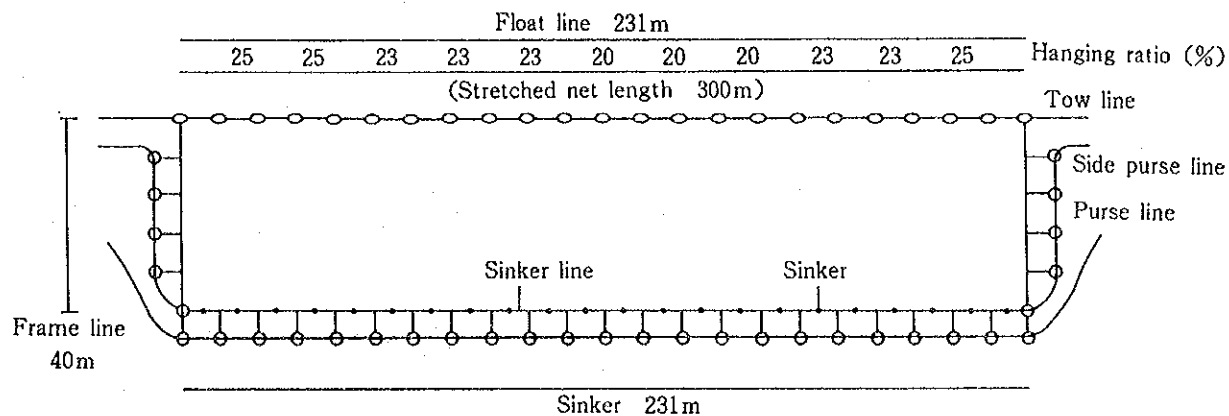
Net webbing

A	A			
B	B ₁ 20pcs	B ₂ 12.5pcs	B ₃ 11.2pcs	B ₄ 16.25pcs
C	C ₁ 14pcs	C ₂ 10.4pcs	C ₃ 10.26pcs	C ₄ 12.2pcs
A	A			

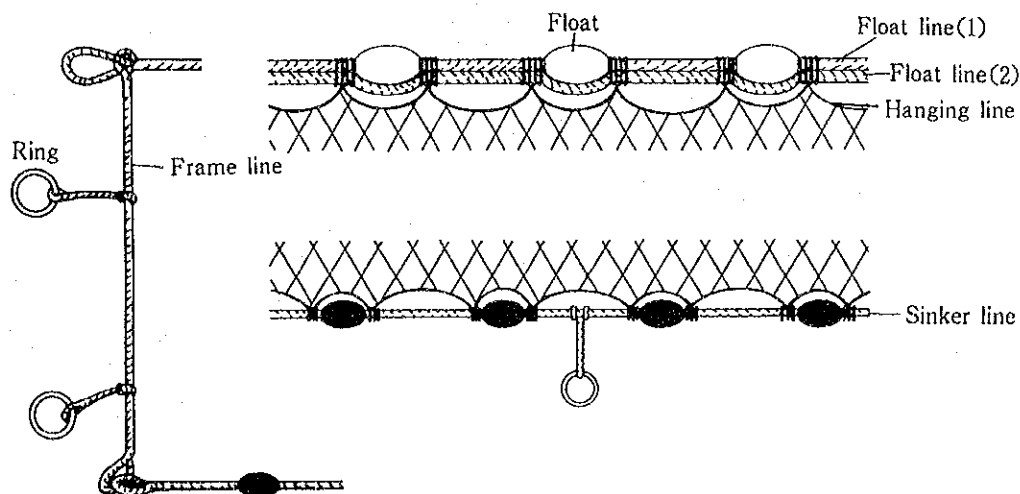
(3) Purse Seine (B)

② For sardine

Ropes and accessories



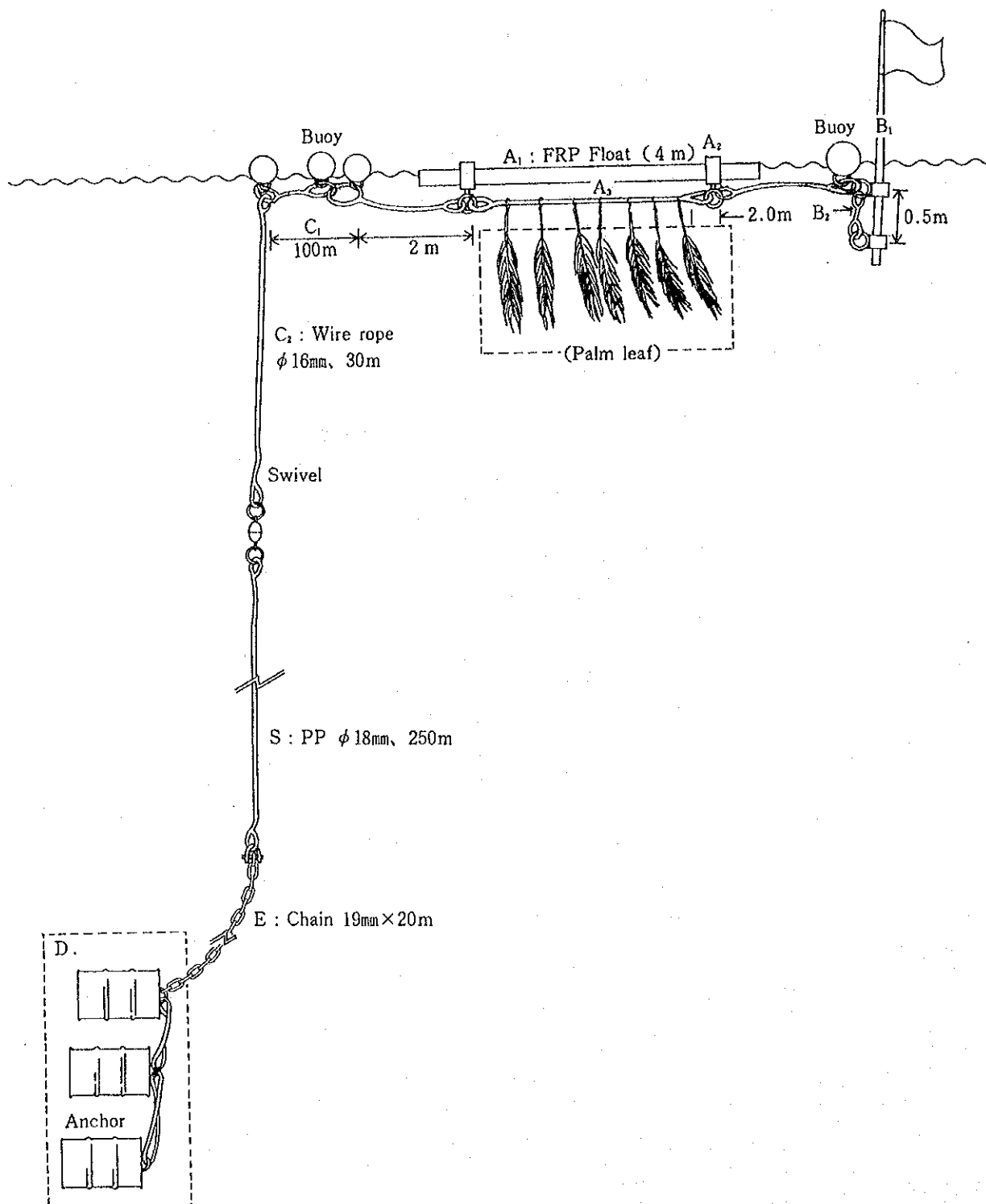
Rigging of accessories



Net webbing

A	A			
B	B ₁ 8.0pcs	B ₂ 8.50pcs	B ₃ 6.4pcs	B ₂ 11.25pcs
C	C ₁ 7.6pcs	C ₂ 7.40pcs	C ₃ 9.6pcs	C ₂ 9.80pcs
A	A			

(4) Fish aggregation device



4.4 Procurement and Supervision

4.4.1 Procurement Plan:

In principle, all Plan items will be sourced in Japan. It is planned that equipment deliveries will be made to the designated warehouse in the city of Aden belonging to the Ministry of Fish Wealth of the Government of Yemen.

The Plan equipment, comprising marine engines, insulated van trucks, workshop equipment, and fishing gear and materials, will be sourced from a number of different manufacturers. As in similar past projects, general trading companies are considered to be qualified as prospective bidders. As one of the conditions for insuring final delivery to the implementing organization and proper after-sale service arrangements by the procurement contractor, it is desirable that the latter have a representative office in Yemen, and it should be considered to stipulate such a condition in the qualification credentials for bidders. From the same standpoint, in selecting manufacturers, consideration should also be given to their service setup within Yemen, particularly the existence of an agent capable of supplying replacement parts promptly.

The primary supervisory responsibility of the procurement contractor in Yemen will include customs clearance of the Plan equipment and materials, inland transport, delivery to the designated warehouse, equipment audits, and orientation on maintenance procedures for the main equipment items. With the exception of the equipment orientations, these functions would be performed by the Yemen representative office of the contracting firm. However, for equipment briefings, it will be necessary to dispatch a technician for brief periods.

4.4.2 Supervisory Plan:

Following the Exchange of Notes between the Government of Yemen and the Government of Japan, implementation of the subject Plan will start with the conclusion of a consultancy agreement between the Ministry of Fish Wealth, the Plan implementing organ, and a consultant of Japanese nationality which will be recommended by JICA. The consultant will prepare

technical specification sheets and bill of quantities, as required for Plan implementation, and other tender documents as required for the tender and the equipment procurement contract. Subsequent to approval by the Government of Yemen and completion of the necessary formalities, followed by an examination of bidders qualifications, tenders, and tender documents, a selection will be made of the procurement contractor.

After contracts is signed with the Government of Yemen and certified by the Government of Japan, the procurement contractor will initiate procurement activities for the Plan equipment. The consultant will be responsible for overall supervision of the procurement phase through delivery of the equipment. These responsibilities will include approval of equipment specifications and presence at factory tests. One member of the consultant will also be dispatched to the project area to be present at the equipment audit at the time of delivery from Japan.

4.4.3 Division of Project Responsibility:

- (1) Areas of responsibility to be assumed by the Government of Japan:

If this Plan is implemented on the basis of a grant-aid from Japan, the Government of Japan will be responsible for defraying the cost of the following items within the context of its grant-aid system:

- 1) Procurement of Plan equipment and materials.
- 2) Consultancy services in connection with implementing design, assistance in tender operations, and procurement supervision.

- (2) Areas of responsibility to be assumed by the Republic of Yemen:

Assuming that the Plan is implemented on the basis of a grant-aid from Japan, the Government of Yemen will assume responsibility for the following aspects of the project:

- 1) To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement (B/A).

- 2) To ensure prompt unloading, tax exemption, and custom clearance on the goods brought for the Plan at the port of disembarkation in the Republic of Yemen.
- 3) To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contracts such facilities as may be necessary for their entry into the Republic of Yemen and stay therein for the performance of their works.
- 4) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the Republic of Yemen with respect to the supply of the goods and services under the verified contracts.
- 5) To maintain and use properly and effectively the equipment and materials provided under the verified contracts.
- 6) To bear all the expenses other than those to be born by the Grant, necessary for the transportation and the installation of the equipment and materials.
- 7) When the equipment and materials provided under the Plan are sold or leased to the fishermen involved in the Plan, the Government of the Republic of Yemen shall take necessary measures to ensure the followings;
 - i Money raised by a sale or lease of the equipment and materials would be deposited in a special revolving fund in an account of the Government of the Republic of Yemen.
 - ii The above-mentioned fund would be utilized for the purpose of developing fisheries and maintaining the equipment provided under the verified contracts.
 - iii The Government of the Republic of Yemen would consult with the Government of Japan on the utilization of the fund prior to the disbursement.

iv The Government of the Republic of Yemen would report the balance of the fund account and the state of fund's utilization by request from the Government of Japan.

4.4.4 Implementation Schedule:

The implementation schedule for the subject Plan will be divided into the following phases: detailed design, tenders, production of equipment, and shipment. The function requiring the most time will be that of equipment production. The estimated production times for the various equipment types are as shown below:

Marine engines	about 4 months
Insulated van trucks	5 - 6 months
Workshop equipment	4 months
Fishing gear materials	3 - 4 months

Based on the longest time estimate (viz., for the insulated van trucks), 5 months have been allowed for equipment production in Japan, 3 months for the Implementation Design, 2 months for ocean transport plus inland transport within Yemen, and 1 month for delivery to warehouse and audits prior to the delivery. The above estimates are summarized in the following Implementation Flow Chart.

Implementation Flow Chart

Month	01	02	03	04	05	06	07	08	09	10	11
Detail Design	Site works										
	Home works										
	Documents Validation										
	(Total 3.0 months)										
Equipment Procurement					Production						
	(Total 8.0 months)					Transportation △ Delivery					

SECTION FIVE: PROJECT EVALUATION AND CONCLUSIONS

5.1 Project Evaluation:

The former South Yemen is dominated by a desert climate and has only a limited supply of arable land. On the Gulf of Aden coast, therefore, fishing is one of the key industries supporting the regional economy. As seen in the 1st to 3rd Fisheries Development Plans targeted at the Gulf of Aden area during the 1970s and 1980s, the Yemen Government has been devoting considerable effort toward development of the country's coastal fisheries through a series of fishery development programs. These projects have registered solid achievements in a wide variety of fields, such as improvement of fishery-related infrastructure and the supply of fishing equipment.

The distribution of fishing equipment has been carried out as part of an overall policy of coastal fishery support from the public sector. Accordingly, such basic fishing equipment as marine engines, replacement parts, and fishing gear have been distributed to fishermen through related departments of the Ministry of Fish Wealth and fishermen's cooperatives located at various points along the Gulf of Aden coast. On the basis of this public assistance, a considerable volume of equipment has been distributed to date to local fishermen, and these programs are acknowledged to have played a most important role in coastal fishery development.

During the 1980s, since both North and South Yemen relied on imports for virtually all its consumer and capital goods requirements, Yemen suffered chronic and massive trade deficits, which had to be offset mainly by the transfer payments and capital account, chiefly in the form of private remittances from Yemeni expatriate workers and receipts from foreign borrowings. After unification in 1990, the economy still continued to be characterized by a persistent import surplus. As a consequence, in 1990, the country's foreign debt was almost equivalent to its GNP, having expanded to a level more than 10 times the value of its total annual exports. In addition, the outbreak of the Gulf crisis in August, 1990 dealt the Yemen economy a major blow, contributing to a further deterioration of the country's balance of payments.

As a result of the worsening economic situation, imports of industrial equipment have become quite difficult, and this has placed serious constraints on the official procurement of equipment for the fishery sector as well. The Coastal Fisheries Development Project, which was formulated under the above conditions, is intended to develop fishery production through the supply of needed fishing equipment to the fishermen and cooperatives along the Gulf of Aden coast. Thus, continuation of this supply program, which so directly impacts on fish production, constitutes a core element in coastal fishery development policies. The subject Plan, therefore, carries a very high priority.

The quantity of the fishery equipment included in the subject Plan, measured against the record of government procurement to date, is considered to be equivalent to at least 12 to 14 months' import volume. If these items are supplied under this Plan, it will be possible to limit, to some extent, the possibility, under existing economic conditions, of a feared stagnation in the supply of fishing equipment through government assistance programs.

Since the Aden Branch Office of the Ministry of Fish Wealth did not source any marine engines between May, 1991 and the time of the field survey, the Study Team was unable to establish recent prices for this equipment under government procurement programs. However, recent price data were collected from the Fishermen's Cooperative at Shuqra on outboard motors obtained through open distribution channels. Taking 15 PS units as an example, the current prices reported by this cooperative are more than four times those of 1989. This is only one example, but it may graphically underscore the sudden escalation in fishing equipment prices resulting from the difficulties besetting the government's procurement program. Since it is difficult to establish end-user prices for fishing equipment, quantitative comparisons are not possible, but it has been concluded that, through implementation of the subject Plan, it will be more easily possible to obtain the target fishing equipment.

A counterpart fund is considered to be established from the distribution of the above equipment. The fund should be deposited in an account of the Government of Yemen, and be used exclusively for fishing development.

programs carried out by official agencies as well as for the maintenance of fishing equipment.

5.2 Conclusions and Recommendations:

(1) Significance of the Plan

The purpose of the Coastal Fishery Development Project in the Republic of Yemen is to expand fishery production through the distribution of required fishing equipment to fishermen and fishermen's cooperatives along the Gulf of Aden coast. The government has been putting a major effort into coastal fishery development through a series of fishery development programs extending over many years, and satisfactory results have been attained in a number of areas, including the building of fishery infrastructure and the supply of fishing equipment. However, as a result of the deterioration in economic conditions in recent years, serious limitations have been imposed on the procurement of fishing equipment. The present Plan, which has been drafted in response to this adverse economic climate, seeks to continue a stable supply of fishery equipment on the basis of assistance from the public sector.

The Plan items comprise basic fishing equipment which exerts a direct influence on fish production. Thus, maintaining these supplies can be considered to be the vital core of policies on the coastal fisheries development.

(2) Future Fishery Development Plans

Under previous developmental plans, government assistance to artisanal fisheries in the Gulf of Aden coast has been predicated on both the building of fishery related infrastructure and the supply of fishing equipment and materials. One of the most significant objectives of the subject Plan is to prevent a disruption in the supply of fishing equipment through government procurement programs. However, considering the fact that, in most market economies, procurement of fishing equipment is sustained through commercial channels, it is presumed that, in the Republic of Yemen as well, the present system will at some point be turned

over to the private sector. In former South Yemen, in fact, since unification, a strong trend has already developed in the import and sale of fishery equipment through the commercial market. It is by no means easy to weigh the relative merits of government procurement, with its stable prices, and the activation of the market economy that private procurement would encourage. But, when shifting from the former to the latter system, history has shown that, in the absence of strong government guidance, the market may initially be thrown into confusion, with a sharp rise in commodity prices. In this sense, the tax exemption provisions for fishery equipment included in the objectives of the National Reform Programme of the Government of Yemen (1992) take on considerable importance. In formulating and implementing fishery development plans, in addition to these tax exemptions for fishery equipment, maintaining continuing surveillance over the price structure from the CIF to end-user level would also make a major contribution to coastal fishery development.

(3) Recommendations

Looking ahead to Plan realization, the following suggestions would be offered to the Ministry of Fish Wealth of the Government of Yemen:

1) One of the objectives of Plan implementation is the provision of assistance to fishermen's cooperatives. Of the 13 cooperatives that have been established along the Gulf of Aden coast, only 5 have benefited from previous Fishery Development Plans for the improvement of fishing-related facilities at 7 production bases. Thus, there are still a number of areas in which vital facilities remain undeveloped. In selecting the fishermen's cooperatives that will receive the Plan equipment, and considering the fact that, pending implementation of the expected 4th Fisheries Development Plan, the present Coastal Fisheries Development Project is one of the key elements in the aid programs for the coastal fisheries, it would be desirable to give priority to those areas which have received little assistance to date from official quarters and whose fishermen's cooperatives are in need of vitalization.

2) In addition to the engines installed on currently operating fishing vessels in the Gulf of Aden, a considerable number of new engines will be put into service through implementation of this Plan. In the interest of

proper maintenance and repairs for these engines, support from workshops belonging to cooperatives will become even more vital than in the past. It is hoped, therefore, that steps will be taken to offer technical training opportunities to responsible staff members of the workshops as well as in related positions, with a view to cultivating a pool of trained technicians in this field.

3) In case that the counterpart fund is established by the implementation of this Plan and then drawn upon as appropriate, it would be helpful if the following information were included in the utilization reports to the Government of Japan:

- Total costs (by expenditure category) of the technical assistance programs devoted to the rigging, maintenance, and repair of marine engines, together with the period and location of the effort.
- Total costs (by category) of technical assistance programs devoted to the installation, maintenance, and repair of fishing equipment, together with the period and location of the effort.
- Should there be a need for technical assistance in improving fishing gear and methods, the total cost (by category), period, and location of such programs.

APPENDICES

- I Minutes of Discussions
- II Members of the Study Team
- III Survey Itinerary
- IV List of Discussants
- V Survey Photographs

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY
ON
THE COASTAL FISHERIES DEVELOPMENT PROJECT
IN
THE REPUBLIC OF YEMEN

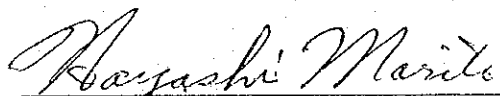
In response to a request from the Government of the Republic of Yemen, the Government of Japan decided to conduct a Basic Design Study on the Coastal Fisheries Development Project in the Republic of Yemen (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Yemen a study team, which is headed by Mr. Hayashi Morita, Fisheries Enforcement Officer, Setonaikai Fisheries Coordination Office, Fisheries Agency, the Government of Japan, and is scheduled to stay in the country from 17 December to 29 December 1992.

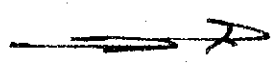
The team held discussions with the officials concerned of the Government of Yemen and conducted a field survey at the study area.

In the course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed to further works and prepare the Basic Design Study report.

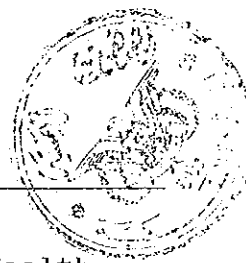
Sanaa, 23 December 1992

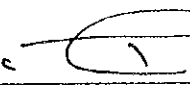


Hayashi Morita
Leader of Basic Design Study
Team, Japan International
Cooperation Agency



Yehia Ali Zabara
Deputy Minister,
Ministry of Fish Wealth,
Government of the Republic
of Yemen



١٩٩٢/١٢/٢٣

Kamal Abdulrahim
Assistant Deputy Minister,
Ministry of Planning and Development,
Government of the Republic of Yemen



ATTACHMENT

1. Objective

The objective of the Project is to increase the fishery production of the coast of the Gulf of Aden in the Republic of Yemen by providing fishing equipment and materials.

2. Project Area

The project area is located in the coast of the Gulf of Aden, as shown in Annex I.

3. Executing Agency

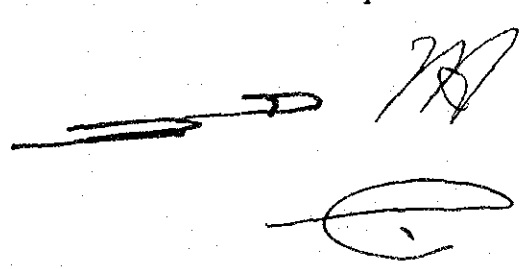
Ministry of Fish Wealth, Government of the Republic of Yemen, will be responsible for the administration and execution of the Project, and for the implementation and operation of the Project after the requested equipment and materials are delivered to Yemen.

4. Items Requested by the Government of Yemen

After discussion with the Basic Design Study Team, the following items have been definitively confirmed as the request by the Government of the Republic of Yemen.

- 1) Outboard engine and spare parts
- 2) Inboard engine and spare parts
- 3) Container workshop
- 4) Gill net materials
- 5) Fishing line and trolling materials
- 6) Beach seine net
- 7) Purse seine net
- 8) Shrimp trawl net
- 9) Floatnet cage
- 10) Fish Aggregation Device (FAD)
- 11) Vehicles
- 12) Mobile workshop
- 13) Fish processing equipment

However, the final components of the Project and the quantities of the components will be decided after further studies by the team as the home office work in Japan.

The block contains three handwritten marks. At the top right is a signature that appears to be 'JH'. Below it, on the left, is a horizontal line with a small vertical tick at its right end. At the bottom right is a large, stylized circular mark, possibly a signature or a stamp.

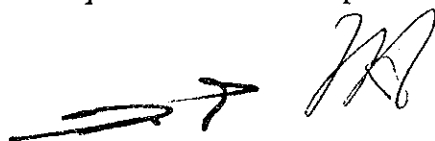
5. Japan's Grant Aid System

(1) The Government of the Republic of Yemen has understood the system of Japan's Grant Aid explained by the team.

(2) The Government of the Republic of Yemen will take the necessary measures, described in Annex II, for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

6. Schedule of the Study

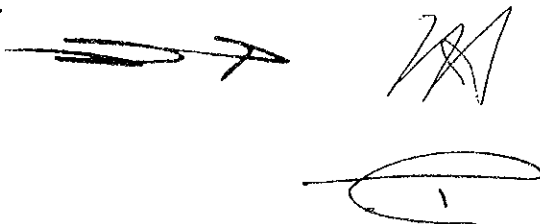
Based on the Minutes of Discussions and technical examination of the study results, JICA will complete the final report and send it to the Government of the Republic of Yemen by the end of April 1993.

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Annex II. Necessary Measures to be taken by the Government of Yemen in case Japan's Grant Aid is executed.

1. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement (B/A).
2. To ensure prompt unloading, tax exemption, and custom clearance on the goods brought for the Project at the port of disembarkation in the Republic of Yemen.
3. To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contracts such facilities as may be necessary for their entry into the Republic of Yemen and stay therein for the performance of their works.
4. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the Republic of Yemen with respect to the supply of the goods and services under the verified contracts.
5. To maintain and use properly and effectively the equipment and materials provided under the verified contracts.
6. To bear all the expences other than those to be born by the Grant, necessary for the transportation and the installation of the equipment and materials.
7. When the equipment and materials provided under the Project are sold or leased to the fishermen involved in the Project, the Government of the Republic of Yemen shall take necessary measures to ensure as follows;
 - (1) Money raised by a sale or lease of the equipment and materials would be deposited in a special revolving fund in an account of the Government of the Republic of Yemen.
 - (2) The above-mentioned fund would be utilized for the purpose of developing fisheries and maintaining the equipment provided under the verified contracts.
 - (3) The Government of the Republic of Yemen would consult with the Government of Japan on the utilization of the fund prior to the disbursement.
 - (4) The Government of the Republic of Yemen would report the balance of the fund account and the state of fund's utilization by request from the Government of Japan.

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Appendix-- II Members of the Study Team

Members of the Field Survey Team

Name	Title and Organization
Hayashi Morita	Leader Fishery Enforcement Officer, Setonaikai Fisheries Cordination Office, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries
Futoshi Takahashi	Grant Aid Programmer Official, Grand Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs
Toyomitsu Terao	Fisheries Development Planner Fisheries Engineering Co., Ltd.
Yoshiyasu Shimozaki	Fishing Boat and Gear Planner Fisheries Engineering Co., Ltd.

Appendix-III Survey Itinerary

Date		Itinerary	Survey Works	
December 15th	Tu	Narita→Frankfurt 14:05 18:15	LH171	Travel
16	We	Frankfurt → 14:00	LH652	Travel
17	Th	Ar. Sanaa 00:45		Travel
		Courtesy call to Ministry of Planning and Development, Report to Embassy of Japan, Preliminary discussion with Ministry of Fish Wealth		
18	Fr	Ar. Hodeidah		
19	Sa	Visit to fishery facilities, Discussion with National Corporation for Fish Marketing, Lv. Hodeidah, Ar. Aden		
20	Su	Report to Consulate of Japan, Discussion with Aden Branch of MPW, Courtesy call to and discussion with Head Office of NCFM, Courtesy call to Aden Branch of MPD. Joined by consultant members. Visit to Sira.		
21	Mo	Visit to Mansuara Market and Fokum. Courtesy call to and discussion with Coastal Fisheries Corporation, Discussion with Aden Branch of MPW		
22	Tu	Aden → Sanaa 10:30 11:15	IY 407	Travel
		Discussion with MPW		
23	We	Discussion with MPW, report to MPD, Signing of Minutes of Discussions		

MORITA, TAKAHASHI:

Date		Itinerary	Survey Works	
Dec. 24	Th	Sanaa →Frankfurt 03:30 10:40	LH 653	Travel
25	Fr	Frankfurt → 17:00	LH 710	Travel
26	Sa	Narita 12:15	LH 710	Travel

TERAO, SHIMOZAKI:

Date		Itinerary	Survey Works	
Dec. 24	Th	Interview with MPW		
25	Fr	Lv. Sanaa, Ar. Aden		
26	Sa	Supplementary study at Aden Branch of MPW, Supplementary study at CFC, Visit to Imran		
27	Su	Visit to Shqura, Supplementary study at Aden Branch of MPW		
28	Mo	Lv. Aden, Ar. Sanaa		
29	Tu	Sanaa →Frankfurt 02:00 08:20 Frankfurt → 17:00	IY 740 LH 710	Travel
30	We	→Narita 12:15	LH 710	

Appendix-IV List of Discussants

Name	Title	Organization
A. Bary Fakhri	Assistant Deputy Minister	Ministry of Fish Wealth
Ahmed Masabi	Director General	Cooperative Dept.
Saad Al Buhsani	Director General	Planning Dept.
Shihab Al Shatri	Director	Cooperative Dept.
Mazhar Anwar	Director	Public Relation Dept.
Awad M. Musali	Director	Investment Dept.
Wahab Sharaf	Permanent Secretary	Aden Branch of MFW
Anwer Ahmed Khan	Senior project officer	
Ahmed Mohmood	Officer	Cooperative Dept.
Jafar Hamed	Deputy Minister	Ministry of Planning and Development
Kamal A-Radim	Assistant Deputy Minister	International Cooperation Dept.
Ali A. Hamid Ghaleb	General Director	Coastal Fisheries Corp.
Ali Damaj		National Corporation for Fish Marketing and Marine Service
Kazuo Wanibuchi	Ambassador	Embassy of Japan
Touru Kumada	Cosul	Cosulate of Japan
Yasuo Nakano	1st. Secretary	Embassy of Japan

Appendix— V Survey Photographs



①

Idling place for
small fishing boats
at Sira District,
Aden



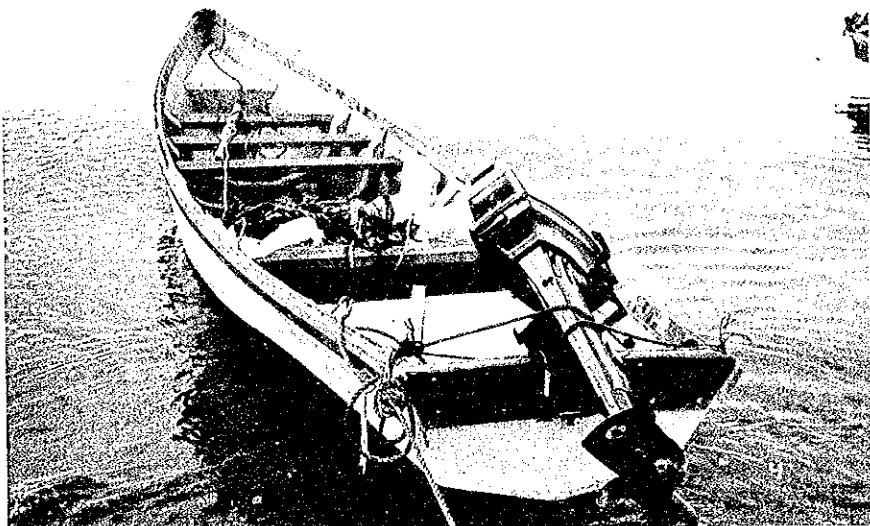
②

Front beach of Fokum.
Land facilities of
Gulf of Aden Coopera-
tives (Center)



③

Fish Wholesale Market,
Mansuara District, Aden



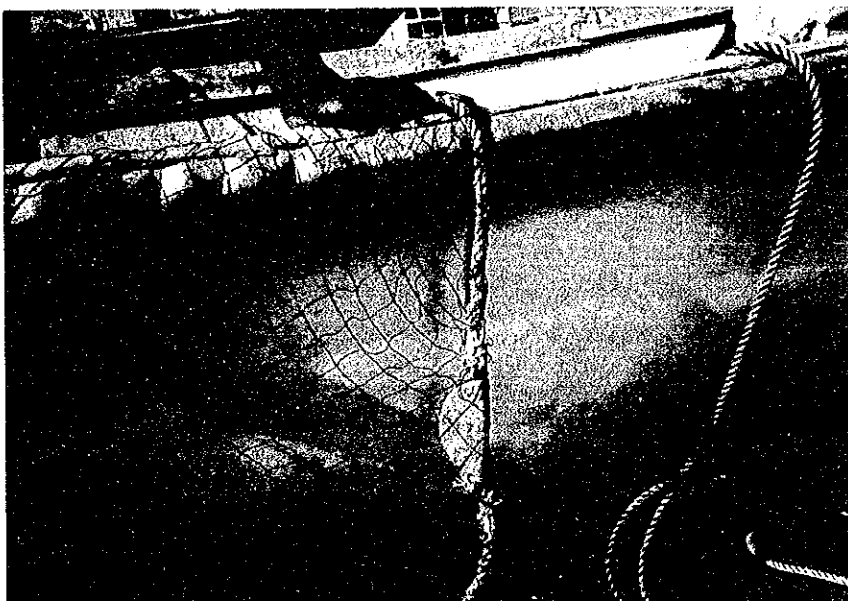
④

An example of FRP
fishing boat equipped
with outboard engine



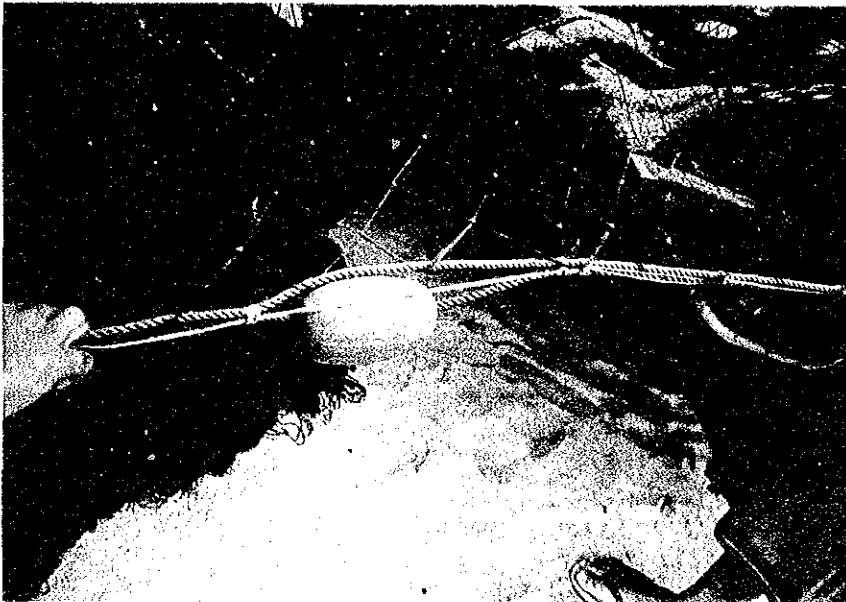
⑤

An example of float
side construction of
small size gill net



⑥

An example of sinker
side construction of
small size gill net



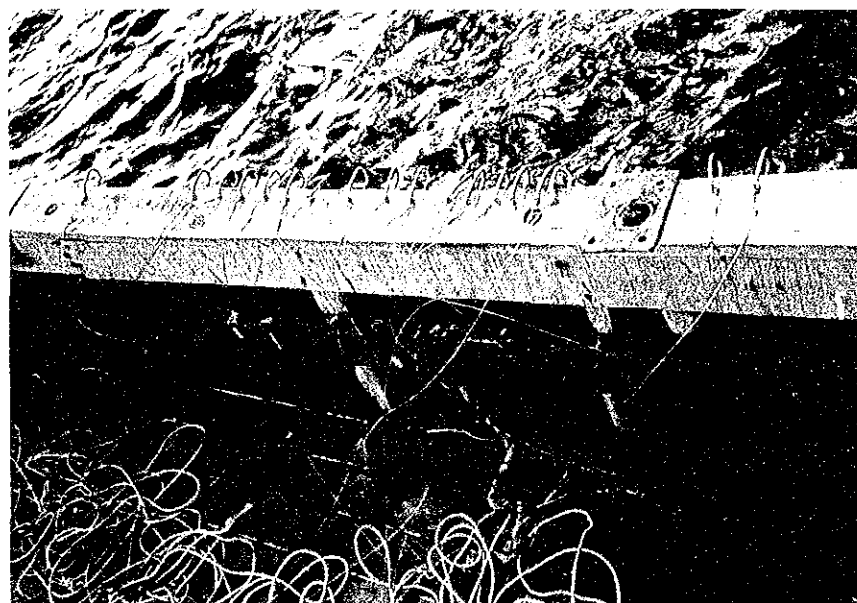
⑦

An example of float
side construction of
medium size gill net
with selvage



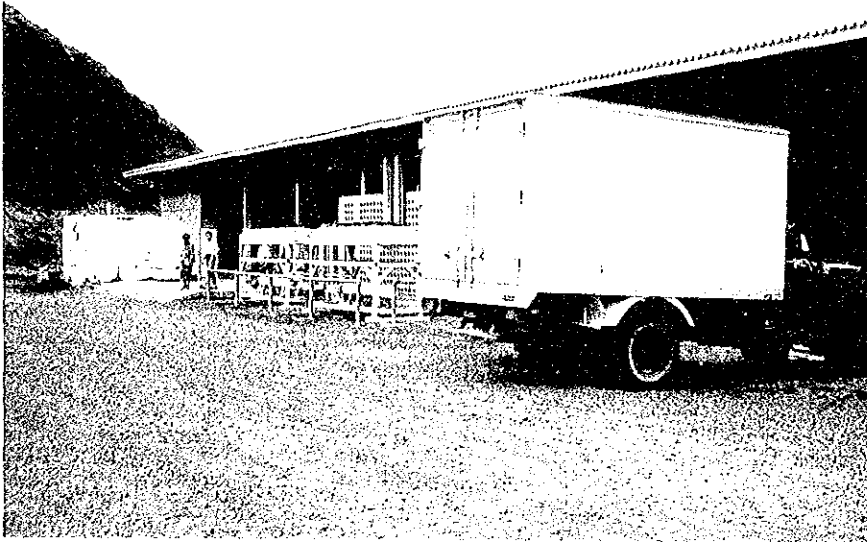
⑧

An example of sinker
side construction of
medium size gill net
with selvage



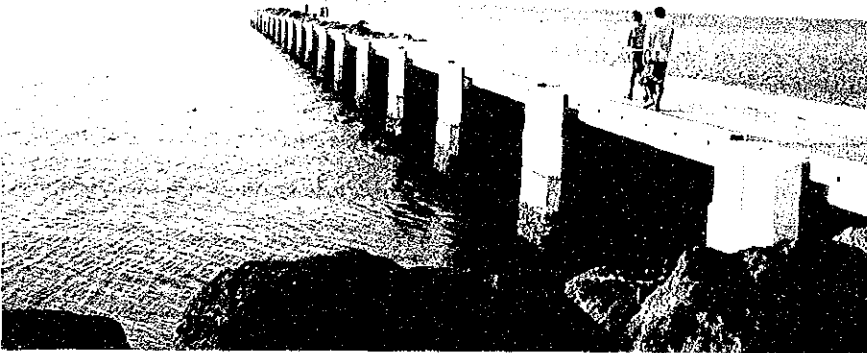
⑨

An example of long
line, operated by a
fishing boat of
Gulf of Aden Coop.



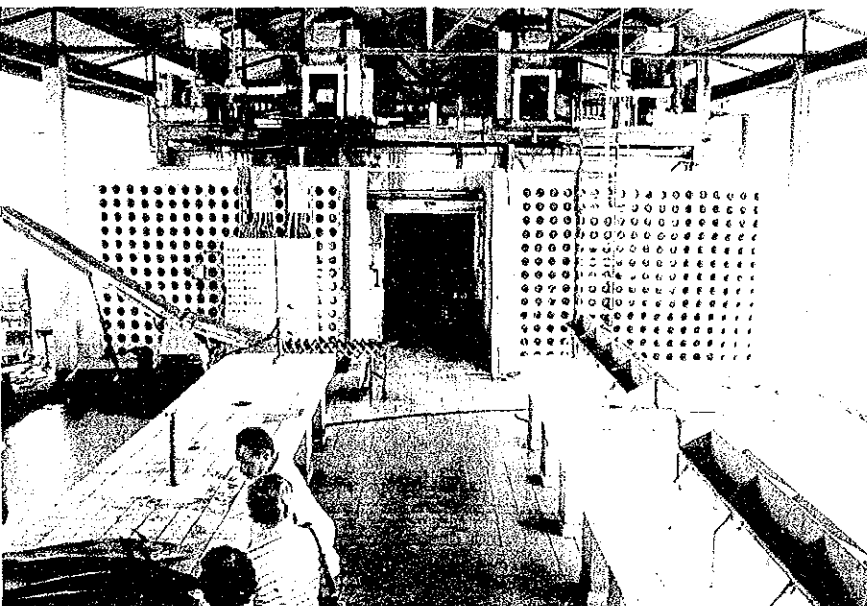
⑩

Land facilities of
"Gulf of Aden" at Fokum.
Constructed under the
3rd Fishery Development
Project



⑪

A fishery jetty of
"Gulf of Aden" at Imran.
Constructed under the
3rd Fishery Development
Project



⑫

Cold storage and fish
handling space of Shuqra
Cooperative.
Constructed under the
3rd Fishery Development
Project

JICA

