FISHERY STATISTICS
IN THE PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN
- AN EXPANDED PLAN OF DEVELOPMENT

UNITED NATIONS DEVELOPMENT PROGRAMME
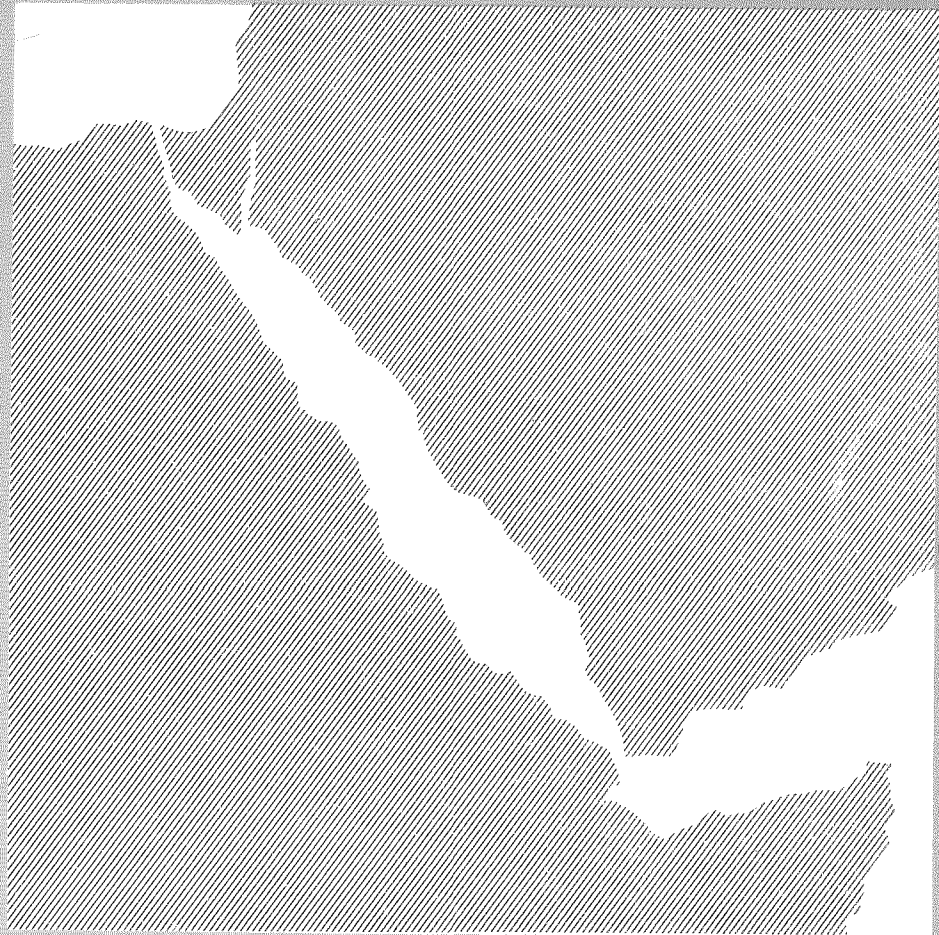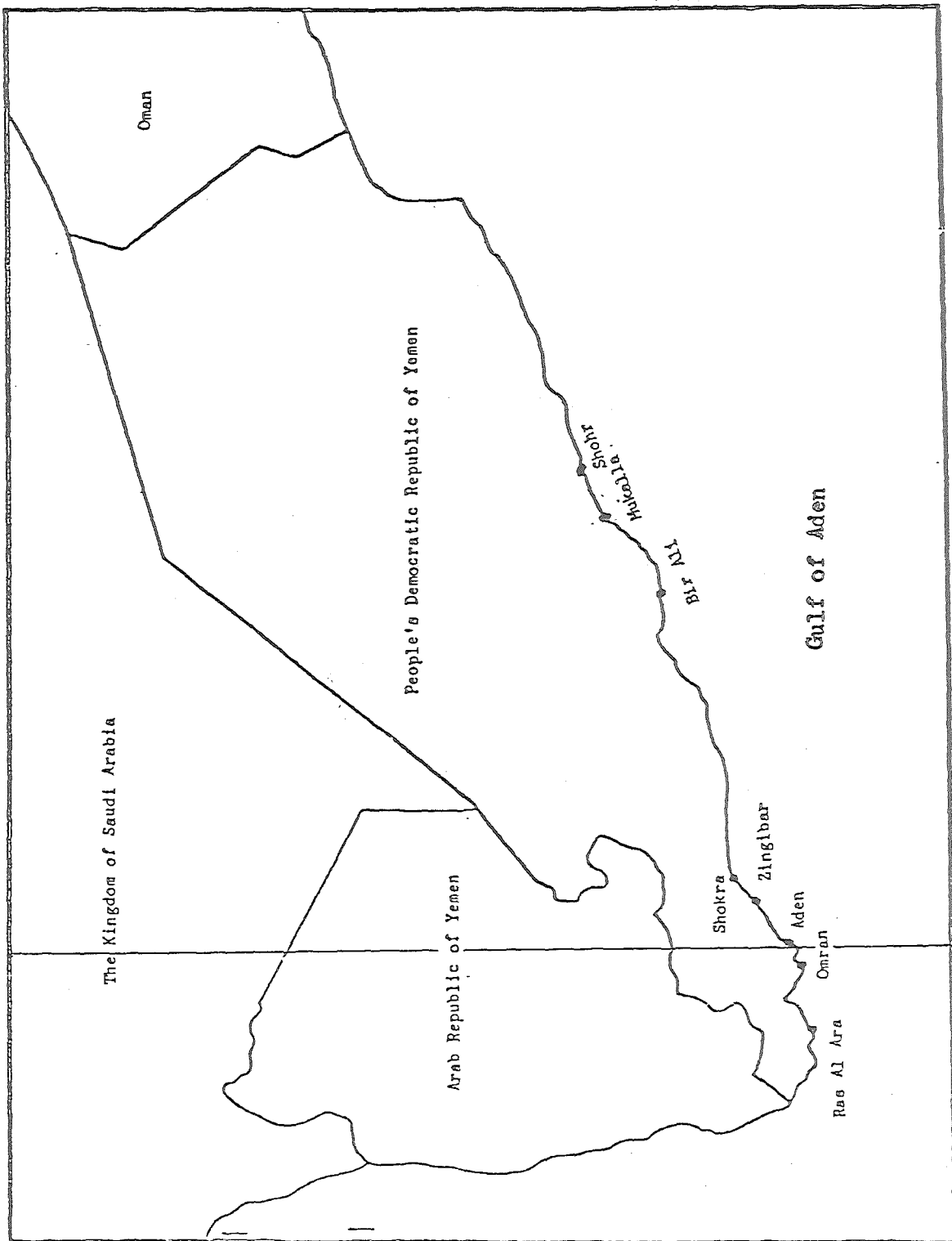FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

PROJECT FOR DEVELOPMENT OF FISHERIES IN AREAS
OF THE RED SEA AND GULF OF ADEN

FISHERY STATISTICS

IN THE PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

- AN EXPANDED PLAN OF DEVELOPMENT

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MAP OF THE PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

Oman

People's Democratic Republic of Yemen

The Kingdom of Saudi Arabia

Shohr

Hukalla

Bir Ali

Gulf of Aden

Zinglbar

Shokra

Aden

Omran

Arab Republic of Yemen

Ras Al Ara

45° E

ABSTRACT

The paper evaluates the existing status of fisheries statistics in PDRY and describes the type of fishery data that are needed for economic evaluation of fisheries and biological/stock assessment studies.

A phased plan of development of an adequate statistical system extending over a period of three years is proposed. The system is based on regional concepts and uniform definitions of statistical items to facilitate inter and intra country comparability of the collected fishery data. The methods of collection of data are furnished in details; the facility requirement by way of man-power and equipment is examined. The cost estimate for running the three year programme is worked out and the potential benefits are indicated.

C O N T E N T S

1. INTRODUCTION

The Project for Development of Fisheries in Areas of the Red Sea and Gulf of Aden has given a high priority to establishment of an adequate statistical system in the member countries. Statistical training courses have been organised at national level and pilot sample surveys have been undertaken in selected landing sites. Some information on fishing activities and their intensities is also available with the participating countries. Based on the results obtained through the ad-hoc surveys undertaken by the Project and other available information with member countries it is now possible to prepare a plan for establishment of a statistical system to generate diversified marine fishery data in the People's Democratic Republic of Yemen (PDRY). The present paper is a follow up action of the conclusions and recommendations brought out in the travel report to PDRY (Chakraborty, 1984).

2. BACKGROUND INFORMATION

The coastline of PDRY is about 1550 km along the Gulf of Aden with a continental shelf of about 20,000 km2. The country is divided administratively into six governorates. All the governorates excepting the fourth governorate have got coastline. A large portion of the population is associated with the sea. Fishing forms an important occupation. The fishery is characterised by the highly developed industrial fishing fleet and also by the traditional fishing boats of different sizes. A wide variety of nets are used depending on the target fish and the fishing season. The industrial fishery is carried out by the domestic and foreign companies or corporations under licenses from the Government; the traditional fishery is undertaken by fishermen from the coastal villages. A great number of the fishermen belongs to a fishermen's cooperative society. There are 13 cooperative societies distributed in different governorates.

The following agencies operate in the industrial sector:

    (i)   Yemen Fishing Corportation

   (ii)   Coastal Fishing Corporation

 (iii)   PDRY-USSR Expidition (a Joint venture).

  (iv)   USSR License Vessels.

The fishermen's cooperatives in the different governorates are as follows:

Governorate	Cooperative
1	Gulf of Aden, Socotra
2	Ras El Ara
3	Shokara, Alwar
5	Bir Ali, Mukalla, Ash Shihr, Diss-Hami, Qusayir
6	Sayhut, Qishn, Al Ghaydah.

Apart from the fishermen who are members to one of these cooperatives, there are private fishermen and in certain areas their number may exceed the number of the fishermen who are members of a cooperative.

The Central Statistical Organization (CSO) is responsible for the overall statistical programmes of the country. The statistical section of the Ministry of Fish Wealth (MFW) who has got the responsibility of development of fisheries in PDRY, functions under the technical guidance of the CSO. Every agency operating in the industrial sector has got a statistical cell.

There is a research department of the MFW-Marine Science and Resources Research Centre (MSRRC). A section of it maintains fish statistics. The department has got a sub-station at Mukalla (fifth governorate).

The domestic fish marketing is undertaken by the National Corporation for Fish Marketing. It buys fish from the cooperatives who in turn buy fish from the fishermen at a fixed price. Other fishing agencies also supply fish to the Corporation. The Corporation has a refrigerated vans to collect fish from the cooperatives and also for delivering fish to the local markets. In every governorate there is a branch of the Corporation for the collection and the distribution of fish. For Socotra Island fish is delivered to Mukalla and marketed there. The Corporation has a processing plant for mackerel and shark fins. Processed mackerel is sold in the interior markets and shark fins are exported. The Corporation, however, does not deal in sardines and anchovies which are caught in large quantities. These are generally sun dried and sold directly to the agriculturists as fertilizer or cattle feeds. These are also sold to the Yemen Arab Republic through the local marketing channel.

FAO/UNDP Projects on improvement of fish marketing and fisheries extension service operate in PDRY.

3. EXISTING STATUS

The fishery data available with the different fishing agencies and the cooperatives in PDRY, their methods of collection of these data and other associated details are furnished below.

3.1 Industrial Fishery:

3.1.1 Yemen Fishing Corporation

During 1983, the fishing fleet operated by the Corporation was as follows:

T Y P E	Number
S.R.T.M. (Medium trawler with engine of 1000 HP; some are provided with fish meal factory) ...	8
Chinese	3
Japanese	1
Others	2
TOTAL	14

Daily radio reports are sent from each vessel to the Ministry of Fish Wealth (MFW). These reports contain information of location, depth, number of shots/time of fishing, catch of cuttle fish in kg by 9 size categories, catch of other fishes in kg, lobster and shrimps, 'Harika' and 'Yarika'. These daily reports are the source documents for tabulations of catch statistics. Based on these reports the Marine Science and Resources Research Centre (MSRRC) and MFW make monthly and yearly tabulations. For 1979, data on total catches by weight are available for each vessel separately while from 1980 total catches are shown by months. Thus it is difficult to check the coverage of different vessels. The catch statistics run as follows:

(in tonnes)

Year	Cuttlefish	Lobster	Shrimp	'Harika'	'Yarika'	Other fish	TOTAL
1979	2 495	29	4	8	7	1 340	3 883
1980	1 873	37	18	-	-	1 165	3 093
1981	653	39	10	23	34	2 077	2 836
1982	1 092	2 876	300	16	89	2 147	6 520

Thus, barring the high catches of lobster during 1982, the total annual landings by the Yemen Fishing Corporation fleet come to around 3 000 tonnes.

3.1.2 Coastal Fishing Corporation

During 1983, the number of vessels operated by the Coastal Fishing Corporation was as follows:

T Y P E	Number
Fibreglass vessel (length 25.5 ft, width 8.6 ft; crew size 4-6; inboard engine)	59
Big wooden vessel (length 32 ft, width 5.5 ft; crew size 5, inboard engine)	8
Small wooden boat (crew size 1-2)	4
TOTAL	71

Fifty five fibre glass vessels were engaged in lobster fishing with net and diving, two were trawling for fish while the other two were doing purse seining.

The vessels owned by the Coastal Fishing Corporation generally operate in the areas off the fifth and sixth governorate, Ras Al Arah and Aden. Catches are delivered to the cold storage operated by the Marketing Corporation. Rock lobsters are delivered to Mukalla and Sayhut cold storage where tails are processed and packed individually for export. Daily radio reports are sent from each vessel to the Corporation office in Aden. These reports form the source material for compilation of statistics which are kept by the Corporation, MSRRC and the Planning and Statistics Section of the MFW. The reports contain position of fishing, total catches in kilograms of lobsters and fishes by certain commercial varieties/grades. The catches of fish runs as:

(in tonnes)

F I S H	1979	1980	1981
Shark	110	17	2
Indian Mackerel	344	43	59
Grouper	4	7	--
Caranx	66	21	28
Jack	2	--	--
Queenfish	--	--	3
Kingfish	16	54	--
Kawa Kawa	21	--	--
Longtail tuna	--	4	--
Blue fin tuna	206	187	--
Frigate mackerel	.--	--	4
Sail fish	--	--	10
Spotted tuna	--	--	50
Black runner	10	1	--
Others	--	226	110
TOTAL	779	560	266

Thus, during 1979-1981 fish data are available in great details though the records are very inconsistent over years. The total catches also show a wide flunctuation. It is understood that the fish data are now shown only by commercial grades; and during 1983 data on lobsters only are available, fish data are either not recorded or incomplete. The catches of lobsters can be compiled from the daily radio reports and also from the records of the cold storage, thus a verification of the data is possible.

3.1.3   PDRY-USSR Expedition (a Joint Venture)

During 1983, eight trawlers of SRTM type operated in PDRY waters. The daily radio reports are sent to the MFW. The information relates to: the name of the vessel/registration number, place of fishing by latitude, longitude , fishing depth, number of shots/fishing hours, catch of cuttle-fish in kilogram by 7 size categories, catch of lobster in kg by 3 size categories, catches of shrimp, 'Harika', 'Yarika' in kg, catch of export variety fish (snapper, horse mackerel, ribbon fish, catfish, Indian mackerel), catches of fish for demestic consumption. From the daily reports the MSRRC prepares monthly tables showing the following: Fishing position, kind of vessel (SRTM, RTM - refrigerated trawler with 1340 and 2320 HP engine), number of vessels, .   catch per day in kg, number of fishing days,   number of shots per day, depth range(shallow: 10-150 m, deep: 200-400 m), catch in kg of cuttlefish by 8 size groups, lobster, shrimp, 'Harika' and 'Yarika'. In the same way yearly tabulations are also made. The total yearly catches run as follows:

<div align="center">(in tonnes)</div>

Year	Cuttle fish	Fish	Lobster	Shrimps (tails)	'Harika'	Yarika'	TOTAL
1980	1731	1937	3	--	--	--	3671
1981	525	1798	126	110	15	--	2574
1982	459	986	34	270	144	5	1898
1983 (up to Oct,)	342	1196	53	237	7	--	1835

During the last three years, the annual catches showed a downward trend, the same trend is seen in respect of catches of cuttle fish. A wide variation is noticed in lobster catches.

3.1.4   USSR License Vessels

These boats had been operating since February 1980. Four SRTM and four RTM vessels operated during 1983. Daily catch reports are also sent by these vessels, but unlike in other fishing agencies, the catch details of each vessel are not shown separately; a consolidated daily report for all the vessels in operation is prepared and transmitted to the MFW. Based on these reports, MSRRC tabulates monthly catch statistics giving date, fishing position, fishing depth, number of shots/fishing hours, species caught in kilograms by five export varieties and others, catches in kilograms of cuttle fish, lobsters

shrimps, and fish meal (in product weight). The conversion factor for converting the fish meal weight into the corresponding live weight equivalent is not known. The five export varieties of fish are exported to Russia, Japan and Singapore while the fishes shown under 'others' are marketed locally through the National Marketing Corporation. The yearly catches by these vessels run as follows:

(in tonnes)

	1981	1982	1983 (upto June)
Catfishes	3 771	239	114
Horse mackerel	1 046	312	627
Sardines	186	104	30
Japanese mackerel	2 435	10 044	8 071
Scavengers	383	1 343	111
Others	4 175	2 945	2 709
Cuttlefish	443	429	4
Lobster	-	-	-
Shrimps	-	-	-
Fishmeal (Product wt.)	1 195	867	603
TOTAL	13 634	16 283	12 269

It is seen that the Soviet vessels catch annually 12-15 thousand tonnes of marketable variety of fish, 400 tonnes of cuttle fish and 1 000 tonnes of fish meal in product weight (10 000 tonnes live weight equivalent ?). Japanese mackerel forms the most important component of their catches.

3.2   Traditional Fishery:

The statistics on the traditional fishery is collected through the 13 cooperatives which are functioning in the maritime governorates. Five of them are in the fifth governorate ; three are in the sixth governorate and two are in the third governorate. Socotra which is administratively under the first governorate, has also easy access to the fifth governorate. The Office for Fisheries Cooperative in MFW receives a monthly statement from each cooperative showing the information for every day of the month as follows (i) Date, (ii) Money received, (iii) Total fish (kg), (iv) Total processed fish in kilogram (frozen, dried, dry-salted, salted, cooked). Fish delivered to the National Fish Marketing Corporation (60% of the total) is recorded in one book while the fish sold locally (40% of the total)by the cooperatives is recorded separately. The office prepares a monthly statement covering all the 13 cooperatives. The primary interest in these statements are on the total catch and the money realised. The species break down and

other ancillary information of fishery are, therefore, not adequately
recorded. The total catches in tonnes as recorded by the 13 cooperatives
during 1981 and 1982 are given below:

Cooperative	Governorate	1981	1982
Gulf of Aden	1	1 417	1 771
Ras El Ara	2	839	768
Shokara	3	571	1 010
Ahwar	3	267	407
Bir Ali	5	748	997
Mukalla	5	1 430	1 182
Ash Shihr	5	7 597	7 176
Diss-Hami	5	1 233	1 363
Qusayir	5	1 929	2 000
Sayhut	6	1 239	883
Qishn	6	680	928
Al Ghaydah	6	2 105	3 363
Socotra	1	377	381
TOTAL		20 432	22 229

It is seen that the fifth governorate accounts for about 60% of
the total recorded catch in the country; this is followed by the sixth
governorate (about 20% of the total recorded catch). Ash-Shihr Coopera-
tive is the most important one. Catches from Socotra are also transported
to Mukalla area. Hence, any scheme on improvement of catch statistics
should be launched in the fifth and sixth governorates and subsequently
be extended to other governorates.

The observations made and experiences gained by the author through
field visits to a few cooperatives, fish landing sites and fish markets
are given below:

(i) Al Shokra

A Cooperative is located at Al Shokra village, 110 kilometres
east of Aden in the third governorate. Fishermen of the neighbouring
villages belong to this Cooperative. Member fishermen are obliged to
bring their catches to the fish delivery centre of the Cooperative.
Fishes landed in four landing sites (Al Shokra, Om Sahela, Makalin and
Sheik Abdalla) are transported to the fish delivery centre by road.
Some of these landing sites are at a distance of 10-15 kilometres.

During 1983, the composition of the fishing fleet owned by the Cooperative was as follows:

T Y P E   Number

Sambouk (25 ft length with inboard engine of 45 HP) 10

Fibreglass houri (15 ft length with outboard engine of 15 HP).. 5

Wooden houri (12 ft length with outboard engine of 8-15 HP) .. 70

While the Sambouk generally use nylon surrounding gillnets, the houris use diversified gear such as handlines, longlines, gillnets, etc. depending upon the fishing season and the target fish.

The Cooperative maintains the records of fish delivered to it under the headings as : (i) Month, (ii) Number of receipt/name of fisherman, (iii) Date, (iv) Kind of fish by grade, (v) Method of processing (fresh, sundried, soaked with brine solution), (vi) Quantity in kilograms, (vii) Price per kilogram, (viii) Value. The recorded landings during August-October 1983 were as follows:

1983 (in kilograms)

I T E M	October		September		August	
	P.W.	F.W.	P.W.	F.W.	P.W.	F.W.
Fresh	29579	29579	33201	33 201	38344	38344
Sundried	10	33	34	133	240	800
Soaked in brine solution	954	2385	273	683	399	998
Dry Shark fin	47	168	17	43	170	567
Soaked shark fin	-	-	-	-	24	60
TOTAL ------------------		32165		34060		40769
TOTAL as recorded in the office for Fisheries Cooperative in MFW ---------------		32000		34000		30000
Effort expended (in number)						
Fishermen		-		96		98
Big Sambouk		-		6		6
Medium Sambouk		-		20		23
Fibreglass houri		-		5		5
Wooden houri		-		1		4

(Note: P.W. = Product Weight, F.W. = Fresh Weight, (-) = not available.)

Excepting in August, the total catches maintained by the Al Shokra Cooperative and the office in MFW tally very well, though the conversion factors used by the Cooperative for converting the weight of the processed fish into the corresponding fresh weight are sometimes not consistent in different months.

While looking into the effort statistics the contribution of the wooden houri seems to be under represented.

The records of fishes delivered to the Cooperative are kept in two separate books: (i) fourty percent of the delivered fish which are sold locally, (ii) the rest which is handed over to the National Corporation for Fish Marketing. But the main interst of the recordings lies on the total catch delivered to the Cooperative and the corresponding value. The species composition of catch obtained from the different types of fishing units, the details of gear, fishing time, etc. are not recorded.

(ii) Mukalla

Al.Mukalla is the capital of the fifth governorate. It is about 620 kilometres from Aden and accessible by air and road. There is a Fishermen Cooperative. A branch of the MSRRC is also located.

Fishermen Cooperative

The Cooperative has got five branches with the Headquarters at Mukalla. The number of fishermen at Mukalla area are as follows:

Year	Coopt.members	Private
1977	233	-
1978	211	-
1979	200	500
1980	200	417
1981	156	510
1982	192	-
1983	195	-

Note: (-) = Not available.

The fishing fleet belonging to the Cooperative consists of:

TYPE	Number	REMARKS
Big Sambouk (33 ft. length, inboard engine of 45 HP)	18	15 units longliners for sharks, 3 purse seiners (Ring net)
Medium Sambouk (20 ft length, inboard engine of 15 HP)	18	2 boat purse seiners or operate gill nets.
Houri (outboard engine of 8-15 HP)	13	Operate gill nets or handlines.

The total recorded catches by the Cooperative members are as follows:

Year	1977	1978	1979	1980	1981	1982	1983 (upto October)
Catches(tonnes)	372	734	749	662	1211	1439	729

The Cooperative has got 11 data collectors at the five branches: Mukalla (5); Brom (2); Soher (2); Fua (1); Rokim (1). Fish record is done in each branch office -in 4 copies giving the quantity of fish in kilogram by four grades and the corresponding value according to the predetermined price. A copy of the fish record is handed over to the fisherman based on which the money is collected from the Cooperative, sometimes with some time lag. When a private fisherman sells the catch to the Cooperative, the same procedure is followed. During October 1983, when the rock lobster season started the Cooperative bought 5169 kilogram of rock lobster from 26 fishermen of which 23 are private and only 3 are member fishermen. (Rock lobster has got export market and, therefore, can only be sold to the government cold storage through Cooperatives).

Fish Markets

There are two fish markets situated on the sea shore at Mukalla. Fishermen from the sea come directly to the markets. There is an office of the Mukalla Cooperative at the market site where the catches are weighed and recorded before putting them for sale. The marketing pattern of the catches landed at the jetty/beach near the market was closely observed. It is found that a portion of the catch is sold at the landing jetty/beach; another portion is carried to the Cooperative office and weighed and recorded; while the third portion goes straight to the market. It is understood that the catches recorded in the Cooperative office are subject to Cooperative taxes and market taxes, over and above money for the fishes sold through the Cooperative may not be immediately available - while fishes sold at the jetty/beach and the market direct without passing through the Cooperative office produce ready cash and subject to no or less taxes. The prices at the beach are sometimes lower than those in the market. This attracts a great number of fish buyers. Thus, the recorded catch in the Cooperative office is only a small fraction (less than 1/3) of the total catch landed in the market fish landing sites). In one market frozen fish in paper carton is sold through nine retailers. The daily sale of these retailers is recorded by a government staff so as to monitor the supply of the frozen fish.

Fishes from the other nearby landing sites are brought to the Mukalla fish markets by road. According to law, fish can be sold in the market provided the seller does possess a paper from any Cooperative indicating that the fishes which have been brought to the market had already been reocrded in a cooperative. This induces many fishermen/fish mongers to sell their fishes outside the fish market, specially the fishes of particular variety and size which are liked by the Yemenis.

(iii) <u>Rokim</u>

It is a small fishing village and also a landing site. A branch of the Mukalla Cooperative functions here. On the day of visit there were ten sambouks, three wooden houris and one fibre glass boat on the shore. Two fibre glass boats with purse seine were waiting for sardine schools. Till 12:30 p.m., there were no landing . On the shore, however, sardines and scads were being sundried. It is reported that a person from the Cooperative records these catches; but unfortunately, he could not be traced for interview.

In many places on either side of the road extending from Ash Shihr to Mukalla, sardines were found to be sundried. It is also reported that sardines are caught throughout the year in this region.

(iv) <u>Ash Shihr</u>

AshShihr is a village 58 kilometres from Al Mukalla. It has got a cooperative society, a fish delivery centre, a landing site and a small fish market.

<u>Cooperative Society</u>

The number of fishermen in Ash Shihr area during 1983 is 642, of which 340 are cooperative members and 302 are private fishermen. The fishing fleet in the area during 1983 is as follows:

T Y P E	N U M B E R		TOTAL
	<u>Co-op.</u>	<u>Private</u>	
Medium Sambouk (20 ft.length, outboard engine with 15 HP)	76	62	138
Houri (outboard engine with 8 HP)	--	76	76

The Sambouks operate two-boat purse-seine (ring net) and longlines for shark while the houris operate mostly hand lines.

The recorded catch in tonnes is given below:

Y E A R	COOPERATIVE MEMBERS			PRIVATE		
	<u>Sardines</u>	<u>Others</u>	<u>Sub-Total</u>	<u>Sardines</u>	<u>Others</u>	<u>Sub-Total</u>
1981	--	--	7 085	0	646	646
1982	6 000	1 572	7 572	0	1 272	1 272
1983*	4 000	1 086	5 086	0	592	592

Note * = upto October 1983.

It is seen that the sardines caught by the private fishermen do not pass through the Cooperative records. It is said that every year a good proportion of sardine catch (may be about 4000 tonnes) cannot be sold and gets spoiled. When any fish passes through the Cooperative, it collects service charges 15% and 20% of the money realised for sardines and other fishes respectively. There is also some delay in getting payments from the Cooperative. This works as a dis-incentive to the fishermen for handling over their catches to the Cooperative.

Fish Delivery Centre

Fishermen bring fish to this centre where it is weighed and recorded. Fish can also be handed over to the centre for sale. Fishermen are given a paper by the delivery centre based on which they can sell the fish in a market. At the time of visit, some fishermen were found to be collecting this paper.

Fish Landing Site

It is a big landing site extending over 2-3 kilometres. Fishermen bring their catches at two landing points. On the day of visit only houris landed their catches. The most common fishes were kingfish and skipjack. These fishes are gutted before taking them to the Fish Delivery Centre and market. The recorded weight of these fishes in the Fish Delivery Centre is, therefore, the wieght of the gutted fish. A conversion factor is necessary to convert the gutted weight to the corresponding live weight equivalent.

A fisherman with 10-12 kilogram of rock lobster was waiting for the van of the Fish Marketing Corporation. A lot of sardines was being sundried.

(v)   Fukum

It is situated 20 kilometres west of Aden in the first governorate. It has a Cooperative Society and a fish landing site.

Cooperative Society

It has been established as Gulf of Aden Cooperative by merging two Cooperatives: El-Sha'ab Cooperative and Aden Cooperative. It covers villages of Omran, Aden, Haswa, Hesa, Fukum and Qa'wa. The members of the Cooperative during 1983 and 1982 were 247 and 242 respectively. The number of private fishermen is reported to be about 50 only. Private full time fishermen possess license for fishing and selling the catches in the market while the private part time fishermen are allowed to fish for their own consumption only. The composition of the Cooperative fleet during 1983 was as follows:

T Y P E	NUMBER	REMARKS
Sambouk (35 ft.length with inboard engine of 45 Horse Power)	35	25 owned by IDA
Fibre glass Houri (15 ft. length with outboard engine of 8-15 HP)	21	
Wooden Houri (15 ft. length with outboard engine of 8-15 HP)	50	
Small Houri (without engine)	9	

A wide variety of nets is used by these boats depending upon the target fish and season. Sometimes one sambouk and a motoriesed houri work together. Purse-seine with $4\frac{1}{2}$ inches mesh size fishes for tuna; while the same with $3\frac{1}{4}$ inches mesh size is used for Indian mackerel. Gillnets of different mesh sizes are used. Surrounding gillnets are used for anchovies. Handlines are used in rocky areas for snapper during July to September. Sharks are caught with baited longlines of 100 metre length with 30 hooks.

The quarterwise total catches in tonnes by the Cooperative boats during the last three years are given below:

		Q U A R T E R S			
Y E A R	1	11	111.	IV	TOTAL
1983	192	178	663	--	
1982	237	320	601	259	1 417
1981	214	460	954	143	1 771

(--) not available

Species composition of catches is not available. The total catch is divided under 4 grades; similarly the data by fishing units could not be constructed. Sixty percent of the catches are handed over to the National Marketing Corporation while the rest is sold to the local markets of Little Aden, Sheik Osman, Monsuera, Crater, Steamer Point and Mallaa.

It is reported that sardine schools are found in the deeper waters. Tunas follow the sardine schools. But fishermen are interested in tunas not in sardines due to lack of markets.

For each member of the Cooperative based on his fishing equipments and performances in the earlier years, a target quantity of fish to be caught during the coming year is fixed. When the actual catches exceed the target quantity, the member is rewarded.

Fish Landing Site

In the fish landing site there is a fish delivery centre with cold storage facilities. On the day of visit, two boats with handlines landed 30 kilograms of skipjack. A few fish was sold to the landing site to the waiting buyers (some with private cars) and the rest was handed over to the fish delivery centre.

The quality fish has easy market in each landing site while anchovies/sardines are sundried and transported to the Yemen Arab Republic through private marketing channels. The recordings of these data are far from complete.

As stated earlier the research department of the Ministry of Fish Wealth - Marine Science and Resources Research Centre (MSRRC) has got a section for maintaining fish statistics from the reports of the various fishing agencies, a consolidated compilation of fish statistics is attempted here; and the section provides the available data to the researchers. Data needs of the ultimate users of fishery data are not identified, and the MSRRC has got limited or no responsibility to develop statsitical methodologies which are capable of generating the needed data. All compilations are done manually by four assistants. The quality of data cannot be gauged. As the Centre is one of the ultimate users of the fish statistics in connection with its research programmes, the available data are merely assembled together in bound books. Statistical analysis of the collected data is not attempted and also no built-in procedure to check the quality of data has been established. But it is noted that this is the only place where the available data covering all sectors of fisheries in PDRY are readily available. Recently, the MSRRC has acquired a computer HP9845B. It is planned that this computer will be used for storage and analysis of the Oceanographic data (which are to be collected in the near future) and also the existing statistical data.

The CSO is preparing for an agricultural census in PDRY. As a prelude to this operation it has recently conducted a household survey wherein among other things, the number of families engaged in fishing and their composition (males, female, children), number of persons engaged in fishing is also recorded. The data are at present being processed at the computer centre.

From the above narrative it is thus seen that every agency in PDRY dealing with any aspect of fishery has got a statistical cell, but unfortunately none of these cells is manned by a person with background of statistical science. As a result the fishery statistics in PDRY has developed as a by-product of the 'book-keeping' process, the main interest being the total quantity of fish handled by any particular agency and the corresponding revenue earned. The data needs at the country level by the different end users have not been identified, the system of scrutinising

the available data with respect to their coverage and consistency has not been developed. Mere addition of the available data on fish production has given rise to a series of historical data whose accuracy and comparability cannot be judged by objective methods. This is more so in the case of the statistics relating to the traditional fishery which are mainly based on the records maintained by the 13 Cooperatives. According to the law, the catches are expected to be delivered to the Cooperative for sale. But it is apprehended that the majority of the landed catch does not pass through this channel. Over and above the private fishermen whose number in some areas exceeds the number of the Cooperative member-fishermen, may sell their catches freely. The catches of anchovies and sardines are very much under-recorded.

It is, therefore, essential that the data needs at the national and the international level should be identified and their collection methodologies be developed. The statistical system should generate all types of the fishery data needed by the ultimate users with a known level of accuracy and free from errors due to subjective judgements.

4. DATA NEEDS

The type of data to be collected depends on the need of the ultimate users and it can be broadly divided into two categories (i) Statistics for economic evaluation, (ii) Statistics for biological studies/stock assessment.

4.1   Statistics for economic evaluation:

(i) Time division: (a) Month

(b) Annual

(ii) Space division: (a) Important landing sites

(b) Coastal length containing few contiguous landing sites.

(c) Whole country:

(iii) Fishing establishment/enterprise:

(a) Industrial

(b) Traditional

(iv) Fishermen population:

(a) Active fishermen by age group

(b) Population engaged in processing, marketing of fish/fishery products by sex and age group

(c) Total fishing population by sex and age group.

    (v) Fishing unit: (a) Industrial

                        (b) Traditional

                        (c) Methods of fishing

                        (d) Size class by GRT, length, HP etc.

   (vi) Fishing effort:(a) Man-hours

                        (b) Number of trips

                        (c) Man-power

  (vii) Fish catch: (a) Total and value at retail and whole-sale level

                        (b) Important commercial varieties and values at retail and wholesale level

                        (c) Size composition of important commercial varieties.

(viii) Trade statistics:

                        (a) Import of fish and fishery products by quantity and value

                        (b) Export of fish and fishery ptoducts by quantity and value.

   (ix) Service facilities:

                        (a) Cold storage

                        (b) Ice factory

                        (c) Workshop

                        (d) Licensing services.

4.2   Statistics for biological studies/stock assessment:

    (i) Time division: (a) Trip duration

                        (b) Month

                        (c) Annual

   (ii) Space division:(a) Fishing area

                        (b) Whole country

                        (c) Depth range

                        (d) Bottom quality

  (iii) Fishing unit: (a) Methods of fishing

                        (b) Size class by GRT, Length, HP etc.

(iv) Fishing effort: (a) Number of fishing units

                          (b) Number of trips

                          (c) Hours of fishing

                          (d) Number of fishing days

                          (e) Number of hauls.

(v) Fish catch: (a) Total

                          (b) Species composition .

(vi) Biological data:(a) Size composition of selected species

                          (b) Sex of selected species

                          (c) Maturity etc of selected species.

(Biological data are generally collected by the biologists based on their programme of work).

5. GENERAL OUTLINE OF STATISTICAL CONTENT

Before developing survey methodologies it is essential to enumerate the survey items on which the data will be collected. The included survey items should cater to the needs of the ultimate users of the data and be uniquely defined and classified according to International Classifications. This will ensure the comparability of the collected data at the national and international level and also diminish the non sampling errors while executing the surveys.

5.1 Basic concepts:

The very fundamental item in fishery statistics is catch. It is termed as 'nominal catch' and is given by the live weight equivalent of landings , i.e. landings on ex-water weight basis. The diagram (Appendix 1) illustrates various concepts commonly used in fishery statistics. Attention is drawn to the rectangles shown at the bottom of the diagram, i.e. 'landing' and 'nominal catch'.

Conversion factors

In PDRY landings often take place in processed or dressed form. Sometimes landings take place in fresh form but the product is delivered to the cooperative in processed form. As for example, in Al Shokra Cooperative fish is received as fresh, sundried, soaked in brine solution. Similarly dry shark fins and soaked shark fins are also received. Though some rough conversion factors are at present used by the cooperative for converting the weight of the processed fish into the corresponding fresh weight, it is essential to establish a firm set of conversion factors covering all the fishery products produced under different conditions in PDRY.

For arriving at the conversion factors some experimental studies are to be undertaken in the field. The conversion factos arrived at should also be under continuous review of the statistics office in colla - boration with the producers of the fishery products. Examples of fish dressing, processing and preserving as given in FAO Fisheries Circular No. 725, Rome, March 1980, are shown in Appendix 2. Taking into account the current practices in PDRY, the list of fishery products for which the conversion factors are to be constructed will be finalised.

The next step is to develop statistical standard for species, gear, fishing boat and fishing area.

5.2   Statistical Standard:

5.2.1 Species

A regional statistical standard for the commercial species in the Red Sea and Gulf of Aden has been established (Appendix 3). This has been prepared according to groupings indicated in the International Standard Statistical Classification of Aquatic Animals and Plants(ISSCAAP). The catch statistics in PDRY should be collected and tabulated as per this classfication of species and species groups to ensure the comparability of data collected in the neighbouring countries.

5.2.2. Gean

A regional statistical standard for gear in the Red Sea and Gulf of Aden (Appendix 4) has also been established. The landing data in PDRY should be broken up according to this classification of gear to facilitate comparison of the parallel data collected in other countries and also in PDRY collected in future times.

5.2.3 Fishing craft

The fishing craft in PDRY may be classfied under the three broad categories :

(i)   Inboard powered boat: The boats operated by the PDRY-USSR Expedition and Yemen Fishing Corporation, the USSR License Vessels, fibre glass vessels (25.5 ft) and big wooden vessels (32 ft) of the Coastal Fishing Corporation, big sambouks (30-35 ft) operated by some cooperatives will come under this category.

(ii)   Outboard powered boat: The medium sambouks (20-25 ft), fibre glass houris (15 ft) and wooden houris (10-15 ft) will generally fall within this category.

(iii) Non-powered boat: The small wooden boats with crew size of 1-2 may be classfied under this heading.

To describe the structure of the fishing fleet it is necessary to classify the powered-boats by the following characteristics:

(a) Tonnage

(b) Length

(c) Horse power

For the classification by tonnage class the International Standard Statistical Classification of Fishing Vessels (ISSCFV) may be used (Appendix 5). For the classifications by length and horse power, suitable class intervals are to be decided upon. The non-powered boats may, however, be classified by length only.

5.2.4 Fishing unit

Fishing unit will be defined as the smallest unit for a fishing operation and is generally comprised of the fishing boat, fishing gear and fishermen. It is named by the type of the gear used. In PDRY two-boat boat purse seine is used. In this fishing unit two boats will form a part of the unit. Similarly a boat may operate a trawl in certain months of the year while a gill net is used by it in other months. In this situation the same boat will be regarded as a part of the two fishing units.

The fishing units will be classfied by the type and size of the fishing boat taking into account its method of propulsion. The size of the fishing boat will be measured by its gross tonnage, hp and length.

5.2.5 Statistical sub areas (Fishing areas)

At present the industrial fleet of PDRY report their fishing areas with reference to 11 land positions distributed along the coastline. The positions are as follows:

Land position:	Aden	Shukrah	Maquatin	Al-Aim	RasKalp	Mukalla	Ras-Sharmah
Governorate:	1	3	3	5	5	5	5

Land position:	Sayhut	Ras-Fartek	Jabal-Qamar
Governorate:	6	6	6

This system seems to be working well. The present method may continue until a better demarcation of the PDRY waters can be made possibly based on the spatial distribution the important marine resources in the area.

The catch and effort statistics relating to the traditional fisheries are also to be collected with reference to the same land positions as followed by the industrial fleet.

5.3   Development of Survey System:

5.3.1 Industrial Fishery

There is a good system of radio reporting of the daily catch
details by the operating vessels. It is, however, noticed that often
the catch details are given by commercial grades instead of by species
and also some fishing agencies transmit the consolidated information
based on all the vessels operated by them on that day. It is emphasised
that these methods give rise to great limitations to the available data.
It is imperative that the catch data are adequately broken down to
species/species groups according to the statistical standard of species
(Appendix 3); and similarly data are to be obtained separately for each
vessel taking into account the different fishing positions the vessel
might have fished on the day under report. Merger of data over different
vessels owned by an agency or over fishing grounds should, therefore, be
avoided.

Another drawback in the existing system of building up fishery
data relating to the industrial fishery is the lack of proper checks
in respect of the coverage of the recorded data. To facilitate this work
the following steps are to be introduced,

5.3.1.1 Master list

A list of the operating vessels under each fishing
agency will be prepared. The list may be termed as Master-list
(Appendix 6) which will be updated every quarter of a year
through the existing licensing system and/or ad-hoc enquiries
and surveys. For each vessel in the Master list a 'file' will
be opened and based on the daily radio reports trip reports
will be prepared in a proper format (Appendix 7). For the
vessels which, after fishing, sail direct to the country where
the fish is exported, a monthly report will be constructed,
For these vessels care should be taken to record the data for
all the days of fishing. These vessels do not call at the local
port, as such the reporting and recording of the data may be
sometimes incomplete.

5.3.1.2 Coverage check

A system will be introduced to check the coverage of the
recorded catches (Appendix 8). Judged on the 'Coverage-check'
if any trip report seems to be missing, necessary actions will
be initiated to incorporate the missing data either by contac-
ting the concerned fishing agency,(if it fails)or by a suitable
estimation process. The problem of 'missing data' is very
serious. This should be carefully handled.

5.3.1.3 Consistency studies

The aim of consistency studies is to see how the catch-
effort data furnished by the fishing vessels of similar fishing
power, fishing in the same area compare among themselves and
also with some generally accepted knowledge about the characteri-

stics involved or their relationships. If any internal incon-
sistency is detected, it should be reconciled before the final
tabulation of data is made.

5.3.1.4 Data processing

      After thorough checking and scrutiny of the data as
entered in the trip reports (Appendix 7), the data will be
processed to bring out the results in the form of statistical
tables which should be suitably designed to cater to the needs
of the ultimate users.

5.3.1.4.1 Computarization:

      The MSRRC has already acquired a computer. This
computer may perhaps be used to bring out the required statisti-
cal tables in the form of computer 'print outs'. The minimum
requirement of the data to be brought out in the form of output
tables is as follows:

1.   The structure of the fishing fleet in terms
of numbers, type, length, gross tonnage and HP.
Classes as established in statistical Standard;

2.   Annual and monthly catches by species and the
corresponding fishing effort with respect to
11 fishing areas in PDRY waters;

3.   Annual and monthly catches by species and the
corresponding fishing effort with respect to
places of landing.

5.3.2 Traditional Fishery

     In the traditional sector of fisheries fishing is conducted by
fishermen operating sambouks and houris from many landing sites scattered
all along the coastal length of PDRY. Landings generally take place
throughout the day, though there is a peak period of landing. It is
not feasible to collect these data by complete enumeration. Only alter-
native is to collect these data through large scale sample surveys wherein
the sampling error will be reduced by choosing an appropriate sampling
design and the non sampling error will be controlled by proper supervision
and institutional arrangements.

5.3.2.1 Frame Survey

      In PDRY, the names of the fish landing sites in each
maritime governorate are known. A list showing the names in
a geographical order (west to east) will be prepared. For each
landing site the information as contained in Frame Survey Form
1.0 and 1.1 (Appendix 9A and 9B) will be collected. Some infor-
mation is available with the Cooperative offices (specially
relating to their members) and branch offices of the MFW. How-
ever this may have to be updated and supplimented through field
visits to landing sites and fishing villages.

5.3.2.2 Geographical Stratification

Estimates on current statistics will be built up for each maritime governorate separately. The coastal length of a governorate will be divided into a number of strata depend - ing upon their approximate daily catches, fishing practices and fisheries.

(i) Major stratum: Each important landing site will form a major stratum.

(ii) Minor stratum: A few contiguous small landing sites (say 10-15) will form one minor stratum.

The number of strata will therefore depend on the number of landing sites, their importance with respect to the total landings and fisheries.

The survey design and the corresponding method of esti- mation are given below with reference to a stratum. The estimate for a governorate will be attained by adding the estimates of the concerned strata.

5.3.2.3 Survey Design

5.3.2.3.1 Major stratum:

Estimate will be built up for each important landing site separately. In many important landing sites a fishermen's cooperative functions. In these sites data will be collected by complete enumeration of the days of a month. In other important landing sites without having the facilities offered by a coo- perative society, sampling over days of the month which is the period of estimation will be introduced. A month contains 3 to 4 complete weeks (Sunday to Saturday). During a month a randomly selected week will be allotted to each landing site. Data will be collected on all the days of the allotted week for each type of fishing unit (boat, gear combination, generally known by the type of gear) separately. Data will be collected as per the Fishery Survey Form no. 1A and 1 (Appendix 10A and 10B) from all the fishing units of a particular type landing on the day of observation. If, however, many fishing units land, which cannot be covered by the complete enumeration, then a sampling over the landing fishing units will be introduced according to the following schedule.

No. of units landed	Fraction to be examined
Less than 10	all
Between 11 and 20	1 in 2
Between 21 and 50	1 in 5
More than 50	1 in 10

(To choose the fraction the field enumerator will be guided
by his own experiences in a particular landing site and/or
he will make necessary enquiries as to the likely number of
fishing units that are expected to land on the day of obser-
vation).

Based on the above schedule when sampling of the fish-
ing units is necessary, the sample fishing units will be
selected systematically with a random start.

Data on catches will be collected, as far as possible
by physical verification and actual weighing of the landed
catches; the information on fishing etc. will be collected by
intervewing the fishermen of the sample fishing units.

Method of estimation

Let observation be made on d days out of D days in
a month.

Let M_j = the number of fishing units of a particular
type (e.g. gill net fishing unit) landed on
the jth day of observation; ($j = 1, 2, \ldots.d$)

m_j = the number of such fishing units selected in
in the sample;

y_{jk} = the catch (effort) of the kth sample fishing
unit of the particular type (e.g. gill net
fishing unit) on the jth day of observation;
($k = 1, 2, \ldots.m_j$)

The estimated catch (effort) on the jth day of observation by
the particular type of fishing unit:

$$\hat{y}_j = \frac{M_j}{m_j} \sum_k y_{jk}$$

The estimated monthly catch (effort)

$$\hat{y} = \frac{D}{d} \sum_j \hat{y}_j$$

The estimated variance of $\hat{y}$ is given by:

$$V(\hat{y}) = \frac{D(D - d)}{d(d - 1)} \left[\sum_j \hat{y}_j^2 - (\sum_j \hat{y}_j)^2/d \right]$$

$$+ \frac{D}{d} \left[\frac{M_j(M_j - m_j)}{m_j(m_j - 1)} \left(\sum y_{jk}^2 - (\sum y_{jk})^2/m_j \right) \right]$$

If all the landing fishing units are observed i.e. $m_j = M_j$, the contribution of the second component arising out of the variation of catches (effort) among the fishing units within the sample day is zero.

5.3.2.3.2   Minor stratum:

As indicated earlier, a few contiguous small land ing sites (say 10-15) will form one minor stratum. To start with (depending on the number of field staff available and also on the total number of fish landing sites in a stratum) three landing sites will be selected at random from a stratum for a month. A month contains 4 to 3 complete weeks (Sunday to Saturday). One randomly selected week will be allotted to each of the three landing sites selected above; and data will be collected by actual observation and weighing of the catches landed in all the days of the allotted week. Information on fishing etc. will be collected by interviewing the fishermen. Fishery Survey Form no. 1A and 1 (Appendix 10A and 10B) will be used to enter the data relating to each type of fishing unit separately.

Method of estimation

Let there be N fish landing sites in a minor stratum out of which n fish landing sites (n = 3 here) have been selected at random for observation. Let observations be made on d days out of D days in the month in a selected landing site.

Let y_{ij} = the catch by a particular type of fishing unit on the jth day at the ith landing site.

The estimated monthly catch by the particular type of fishing unit at the ith landing site:

$$\hat{y}_i = \frac{D}{d} \sum_j y_{ij}$$

Now let x_i be the number of fishing units of the particular type under study existing in the ith fish landing site (obtained through the Frame Survey).

Let $x = \sum_{i=1}^{N} x_i$ give the total number of fishing units of the particular type under study in the stratum. The estimated monthly catch in the stratum by the particular type of fishing unit under study is given by:

$$\hat{Y} = \frac{\sum_{i=1}^{n} \hat{y}_i}{\sum_{i=1}^{n} x_i} \; x = \hat{R} \, x \qquad \text{where} \quad \hat{R} = \frac{\sum_{i=1}^{n} \hat{y}_i}{\sum_{i=1}^{n} x_i}$$

The approximate variance of $\hat{Y}$ is given by:

$$V(\hat{Y}) = \frac{N(N - n)}{n} \quad (S_{\hat{y}}^2 + \hat{R}^2 S_x^2 - 2\hat{R} \, S_x \, S_{\hat{y}}.r)$$

where r is the estimated correlation coefficient between x and $\hat{y}$; the other symbols have got the usual significance.

Summing over the estimated catches by all types of fishing units operated in the stratum, the monthly catch in the stratum will be obtained. The total variance will also be obtained by adding the corresponding variances.

5.3.3   Trade Statistics

In PDRY the exports of fish and fishery products are very important. A small quantity of imports of fish also takes place. At present, stastistics on these are not readily available. FAO estimated the annual export figure as 6276 tonnes during 1977 to 1980, the annual import statistics during the same period being 9 tonnes. It is, therefore, necessary to develop statistical data on exports and imports.

Generally the exports and imports take place through the established official channel. The export-import statistics can be collected from the official records of the concerned ministries in PDRY. The statistical enumerator will visit the concerned officials on periodic basis and transcribe the necessary data. The unofficial transactions, if any, could be covered while undertaking the continuing field surveys.

5.3.4   Statistics on Infrastructure Facilities

The information will cover the number, the capacity and the existing level of utilization of the service facilities like cold storage, ice factory, workshops etc. available in PDRY. These data are available with the MFW and the cooperative offices. It should be gathered in a suitable format.

6.   IMPLEMENTATION

The implementation of the programme of work for the improvement of the fishery statistical system in PDRY should be undertaken in the following sequential stages:

(i)   Develop the statistical standards.

(ii)   Organise the data collection systems covering the industrial and the traditional fisheries.

(iii)   Collect information on trade statistics and infrastructure facilities.

6.1 First Year

The regional statistical standards have already been developed. These standards are to be made use of while collecting and tabulating the fishery data.

Steps should be initiated to improve upon the existing data on industrial fisheries. A system of reporting and tabulations of data is already available. A desk study along with some minor changes in the reporting system as indicated in the paper will greatly improve the quality of the existing data. Computers will be made use of in the tabulation.

More work is needed in the field of the traditional fishery. The field surveys presented in the paper should be undertaken on a pilot scale in one governorate. As indicated earlier (item 3.2) the fifth governorate accounts for about 60% of the total recorded catch in PDRY. Hence, the pilot project should be started in the fifth governorate as early as possible during the first year of implementation.

The data based on the pilot survey will be analysed and the necessary changes, if any, will be incorporated in the system. A manual incorporating the methods of scruitinising and processing the data will be prepared. The statistical enumerators will be given training in the collection of the data according to the newly designed survey plans; and the data processors will also be trained in the analysis and compilation of the data . IF found necessary, the national staff may be sent abroad on fellowships for 6-12 months.

6.2 Second Year

The main emphasis during the second year will be the extension of the field surveys covering the traditional fisheries to the other governorates.

The statistics available during the first year of implementation will be sent to the ultimate users of the data in a proper format and their comments on the adequency of the data and the format will be procured. Based on these comments and experiences gained during the first year, a computer oriented layout of the tables showing the available fishery data in PDRY will be finalised.

6.3 Third Year

Computarization

Some use of the existing computer of the MSRRC will be made during the first year for the analysis of the data relating to the industrial fishery. Steps will be initiated to computarise the data relating to the traditional fishery in course of the third year of implementation. The completed Fishery Survey Forms will be the source documents and the format of these forms will be suitably modified so that these forms are amenable to automatic data processing. An Annual Fisheries Bulletin for PDRY will be published. The computer ' print-outs' will constitute the

the various tables of this bulletin. The Fisheries Bulletin will thus
be the by-product of the automatic data processing system. It will
reduce the time lag between the collecting of data and the publication
of results.

Consolidation of survey programmes

During the third year the survey programmes will be institutiona-
lized to facilitate smooth running at the planning and implementation
stage. The technical contents of the newly established statistical
system will be documented in the form of handbooks to be used by stati-
stical enumerators, data processors and supervisors etc. Some documents
should be available in Arabic so as to ensure proper comprehension by
the users.

Other statistics

During the second half of the third year, statistics on trade
and infrastructure facilities will be collected. Some derived statistics
will be worked out showing the likely relations between the productions
of fish in PDRY and the data generated through export-import process.

7. ORGANISATIONAL SET UP

7.1   Headquarters

The Headquarters of the proposed statistical system should be
so located as to facilitate the administration and management of the
system; and it should function in close collaboration with the ultimate
users of the collected data. It must also be cost efficient. The MFW
should house the Headquarters of the newly organised statistical system
and it should work in close collaboration with the Planning Section and
the MSRRC. This statistical cell will work, as at present, under the
technical guidance of the CSO but be directly responsible to the Hon'ble
Minister of the MFW. It will develop and accumulate the need-oriented
fishery data with a known level of accuracy in a 'fishery data bank'
and transmit those to the ultimate users on a routine basis and in time.
The system will promise cost efficient by integration at the processing
level with the programmes that might be undertaken by the MSRRC.

The newly established section should be adequately manned and
equipped both at office and field level for proper delivery of goods.
The facilities which are likely to be required and the job description
of the personnel are indicated below.

7.2   Manpower

7.2.1 Headquarters : Officer-in-Charge(Fishery Statistics)

The officer will be responsible for fishery statistics in PDRY.
He must have adequate background in statistics or mathematics with
experiences in statistical science. The officer will execute the plan
of collection of the diversified fishery data as incorporated in the paper;

have the data processed and published in the Annual Statistical Bulletin.
Based on the data collected, quarterly and annual reports for the statis-
tics section should be prepared. The officer should, however, be helped
and guided by an International Expert in Fishery Statistics at least in
the initial years of the implementation of the expanded programmes.

The Officer-in-Charge (Fishery Statistics) will be helped by the
supervisory staff, data processing staff and field staff as indicated
below:

Supervisory staff

The supervisor will be responsible for the supervision of data
processing work at the Headquarters. He will also coordinate the pro-
cessing of the fishery data in the different fishing agencies and the
MSRRC so that the duplication of work may be minimised.

Data processing staff

All the field data will be scrutinised in the field offices and
despatched to the Headquarters for processing and analysis. Initially,
the data relating to the industrial fishery will be porcessed by the
computer of the MSRRC, while the data relating to the traditional
fishery will be processed by using desk calculators. It is contemplated
that 4 persons should be able to do the job.

7.2.2. Field Staff

Supervisory staff

Each governorate has a statistical unit under the supervision of
the CSO. In addition, there are branch offices of the MFW and Fisheries
Cooperatives. Field supervision can be conviently arranged in collabora-
tion with these offices and as such no extra staff is necessary.

Statistical enumerators

The number of statistical enumerators will depend on the number
of strata into which the coastline of a governorate is subdivided.
Generally, the Fishermen Cooperatives have got some data collectors. As
for example, the cooperative at Mukalla (fifth governorate) has got 11
data collectors distributed at five branches. The duties of these data
collectors can be suitably re-allocated taking into account the field
work under the newly designed survey plans; some additional hands in
some areas may, however, be necessary. As a rule of thumb, 2 extra
field staff may be necessary in each governorate.

7.3 Equipment

The equipment necessary will be as follows:

During the initial years the data relating to the industrial
fishery will be processed by the computer of the MSRRC, and the data
relating to the traditional fishery by desk calculators. After a year
or so when the data relating to the traditional fishery are also computer-

ised, some arrangements either with the MSRRC or the CSO will have to
be made for more computer time. Requisition of a computer in the
statistics section of the MFW should be considered if the computers at
the MSRRC and the CSO cannot provide sufficient time for processing the
fishery data.

For the statistical enumerators spring balances of suitable
range and/or platform balances at certain fish landing sites will be
necessary. Field staff will be provided with field note books to
record the observed data and also small plastic boards fitted with
a clip.

7.4 Other facilities

(i) Transport: For conducting field work the statistical
enumerators and supervisors should be provided with suitable
transport.

(ii) Incentives: Generally fish landings commence early in the
morning and sometimes continue throughout the whole day. To
collect data by actual observations the statistical enumerators
have to be present at the landing site very early in the morning.
This is a regular job and difficult to perform for a long time.
Hence the enumerators should be provided with incentive by way
of paying some extra money. This should improve their perfor-
mances.

8. ESTIMATED COST (US DOLLARS)

A. Personnel

International Staff	Total	1st year	2nd year	3rd year
1. Fishery Statistician (P-5)	330 000	110 000	110 000	110 000
2. System Programmer (P-4 6m/m)	30 000	10 000	20 000	-
Sub Total	360 000	120 000	130 000	110 000

National Staff	Total	1st year	2nd year	3rd year
1. Officer-in-Charge (Fishery Statistics @ $ 500 pm)	18 000	6 000	6 000	6 000
2. Supervisor (HQ @ $ 400 pm)	14 000	4 800	4 800	4 800
3. Data Processor (4) @ $ 200 pm)	28 800	9 600	9 600	9 600
4. Statistical enumerators (10) @ $ 200 pm)	72 000	24 000	24 000	24 000
Sub Total	133 200	44 400	44 400	44 400
Component Total	493 200	164 400	174 400	154 400

B. Other Costs

	Total	1st year	2nd year	3rd year
1. Duty travel	50 000	20 000	20 000	10 000
2. Incentives for enumerators (20%)	14 400	4 800	4 800	4 800
3. Equipment and supplies				
(a) Computer	10 000	-	10 000	-
(b) Others	20 000	10 000	5 000	5 000
4. Vehicles (3)	30 000	30 000	-	-
5. Reporting	25 000	5 000	10 000	10 000
6. Drivers (3) @ $ 100 pm	10 800	3 600	3 600	3 600
7. Fellowships (2) (one: 6m, other 12 m)	13 950	4 650	9 300	-
8. Miscellaneous	20 000	5 000	10 000	5 000
Component Total	194 150	83 050	72 700	38 400
PROJECT TOTAL COST	687 350	247 450	247 100	192 800

9. PROJECT OPERATION

During the extended phase of the Project RAB/81/002, the implementation of the planned proposals can be executed through the Regional Project. This will reduce the financial commitment to the international staff and some travel costs. The national Government will bear the cost of the national staff and also the other costs which cannot be met through the Regional Project.

10. CONCLUSIONS

The statistical system will generate diversified marine fishery data with a known level of accuracy based on objective survey methods and uniform definitions of survey items. The data will be available to the ultimate users on a timely basis. Hopefully, this will lead to a better understanding of the marine fishery in PDRY. It will also help in better planning and evaluation of marine fishery projects and play an important role in the day to day decision process for the development and management of fisheries resources in PDRY.

The national staff will work shoulder to shoulder with the international experts for a period of three years. This will develop local expertise in the field of marine fishery statistics. The national staff will be capable of looking after the statistical needs of the country when the international help fades away.

11. REFERENCES

Chakraborty, D. (1984)   Travel Report to People's Democratic Republic
                            of Yemen. Nov. 11 - Dec. 19, 1983.

DIAGRAM SHOWING BASIC CONCEPTS
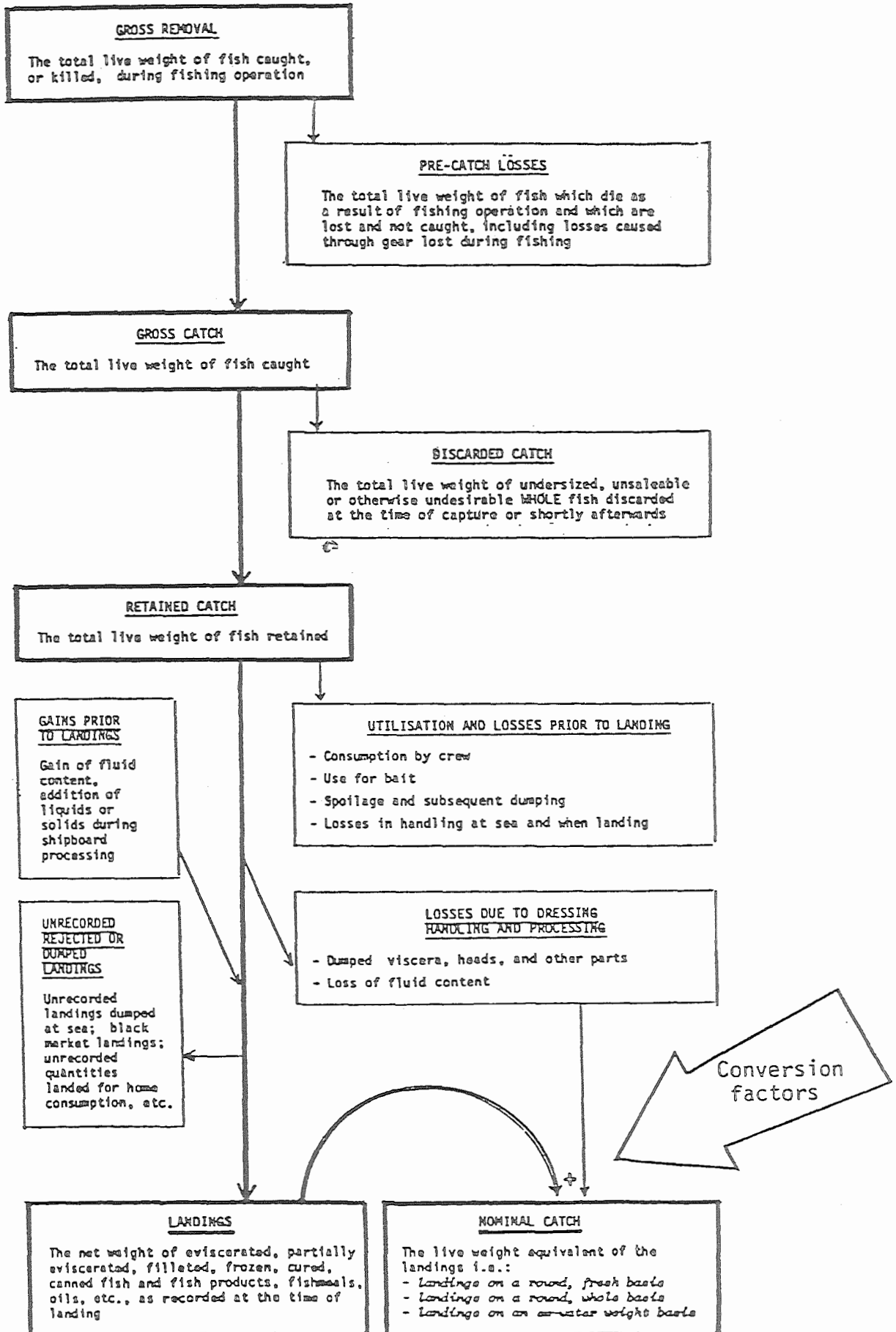
Appendix 2

EXAMPLES OF FISH DRESSING, PROCESSING AND PRESERVING

Fish, fresh, chilled, iced
Whole, not dressed
Whole, head on
Dressed, head on
Gutted, head on, tail on
Gutted, head on, tail off
Gutted, head off, tail on
Gutted, head off, tail off
Fillets
Fillets, skin on
Fillets, skinless (=skin off)
Fillets, skinless, boneless

Fish frozen
Whole
Gutted, head on
Gutted, head on, tail on
Gutted, head on, tail off
Nobbed
Gutted, head off
Gutted, head off, tail on
Gutted, head off, tail off
Nobbed, tail off
Fillets
Fillets, skin on
Fillets, skinless (=skin off)
Fillets, skinless, boneless
Fillets and blocks
Steaks

Fish, dried, salted, smoked
Gutted, head off - Dried
Gutted, head off - Dried-salted
Whole - Salted
Head on, full shotten - Salted
Ungutted - Light-salted
Gutted, head on - Salted

Gutted, head on, boneless - Salted
Gutted, head off - Salted
Gutted, head off, split - Salted
Gutted, head off, boneless - Salted
Nobbed - Salted
Gutted, head off - Green-salted
Gutted, head off - Light-salted, dried
Gutted, gills off - Salted
Nobbed - Spice-salted
Gutted, head off - Wet-cured
Round - Pickled
Dressed, head on (split) - Pickled
Dressed or split - Pickled
Dressed, head off - Pickled
Whole, round - Smoked
Dressed - Smoked
Gutted or split - Smoked
Boneless - Salted and smoked

Fish canned
Marinated
Fillets
Kippers

<u>Appendix 3</u> STATISTICAL STANDARD FOR SPECIES IN THE RED SEA AND GULF OF ADEN REGION

Statistical Item	Family / Genus Name	Scientific Name
GROUP 24 : SHADS, MILKFISHES, ETC.		
Milkfish	Chanidae	<u>Chanos</u> <u>chanos</u>
GROUP 33 : PERCHES, BREAMS, SNAPPERS, ETC. (Redfishes, Basses, Congers, etc.)		
Groupers	Serranidae	Examples: <u>Ephinephelus</u> <u>summana</u>
		<u>E</u>. <u>areolatus</u>
		<u>E</u>. <u>Tauvina</u>
		<u>E</u>. <u>microdon</u>
		<u>E</u>. <u>chlorostigma</u>
		<u>Variola</u> <u>louti</u>
		<u>Cephalopholis</u> sp.
		<u>Plectropomus</u> <u>maculatus</u>
Croakers	Sciaenidae	Example: <u>Otolithes</u> sp.
Snappers	Lutjanidae	Examples: <u>Lutjanus</u> <u>lineolatus</u>
		<u>L</u>. <u>gibbus</u>
		<u>L</u>. <u>bohar</u>
		<u>L</u>. <u>argentimaculatus</u>
		<u>Pristipomoides</u> <u>typus</u>
Grunts	Pomadasyidae	Examples: <u>Pomadasys</u> <u>hasta</u> <u>Pomadasys</u> <u>opercularis</u>
Sweetlips	Pomadasyidae	Example: <u>Plectorhynchus</u> <u>pictus</u>
Red Mullets	Mullidae	Examples: <u>Mulloidichthys</u> <u>flavolineatus</u>, <u>Upeneus</u> sp.
Parrot fishes	Scaridae	Examples: <u>Scarus</u> <u>harid</u>
		<u>S</u>. <u>ghobban</u>

Statistical Item	Family / Genus Name	Scientific Name
GROUP 33 (contd.) :	PERCHES, BREAMS, SNAPPERS, ETC. (Redfishes, Basses, Congers, etc.)	
Emperors	Lethrinidae	Examples: Lethrinus harak
		L. Mahsena
		L. nebulosus
Sea Breams	Sparidae	Examples: Argyrops spinifer
		Mylio bifasciatus
Threadfin Breams	Nemipterus spp.	Example.: Nemipterus japonicus
Lizard fishes	Synodontidae	Examples: Saurida undosquamis
		S. tumbil
Pony fishes	Leiognathidae	Example: Leiognathus sp.
Moharras	Gerreidae	Example: Cerres oyena
Seacatfishes	Ariidae	Example: Arius thalassinus
Therapons	Theraponidae	Example: Therapon jarbua
Rabbit fishes	Siganidae	Example: Siganus rivulatus
Squirrel fishes	Holocentridae	Example: Holocentrus spinifer
Surgeon fishes	Acanthuridae	Example: Acanthurus sp.
Unicorn fishes		Naso unicornis
GROUP 34 :	JACKS, SCADS, MULLETS, GARFISHES, ETC.	
Jacks	Carangidae	Examples: Caranx sexfaciatus
		C. ignobilis
		Alepes djeddaba
		Carangoides bajad

Appendix 3   (contd)

Statistical Item	Family / Genus Name	Scientific Name
GROUP 34 (contd.) : JACKS, SCADS, MULLETS, GARFISHES, ETC.		
Rainbow runner	Carangidae	Elagatis bipinnulatus
Bigeye scad	"	Selar crumenophthalmus
Hardtail scad	"	Megalaspis cordyla
Golden toothless trevally	"	Gnathanodon speciosus
Queen fish	"	Scomberoides lysan
Talang Queen fish	"	S. commersonianus
Pompanos	"	Example: Trachinotus blochii
Scads	"	Example: Decapterus maruadsi
Horse mackerel	"	Trachurus indicus
Grey Mullets	Mugilidae	Example: Valamugil seheli
Dolphin fishes	Coryphaenidae	Example: Coryphaena hippurus
Needle fishes	Belonidae	Example: Tylosurus crocodilus
Barracudas	Sphyraenidae	Examples: Sphyraena jello S. barracuda
GROUP 35 : HERRINGS, SARDINES, ANSHOVIES, ETC.		
Herrings/Sardines	Clupeidae	Examples: Herklotsichthys punctatus
		Sardinella gibbosa
		S. Longiceps
Anchovies	Engraulidae	Example: Stolephorus sp.
GROUP 36 : TUNAS, BONITOS, BILLFISHES, ETC.		
King fish	Scombridae	Scomberomorus commerson

Appendix 3 (contd)

Statistical Item	Family / Genus Name	Scientific Name
GROUP 36 (contd.): TUNAS, BONITOS, BILLFISHES, ETC.		
Spanish mackerel	Scombridae	Scomberomorus guttatus
Auxis spp.	"	Example: Auxis thazard
Eastern little tuna	"	Euthynnus affinis
Skipjack tuna	"	Katsuwonus pelamis
Thunnus spp.	"	Examples: Thunnus albacares
	"	Thunnus alalunga
	"	Thunnus tonggol
Dogtooth tuna	"	Gymnosarda unicolor
Oriental bonito	"	Sarda orientalies
Sailfish/billfish	Istiophoridae	Example: Istiophorus sp.
Sword fishes	Xiphiidae	Example: Xiphias sp.
GROUP 37 : MACKERELS, SNOEKS, CUTLASSFISHES, ETC.		
Indian mackerel	Scombridae	Rastrelliger kanagurta
Cutlassfishes/ Hairtails	Trichiuridae	Trichiurus haumela
GROUP 38 : SHARKS, RAYS, CHIMAERAS, ETC.		
Sharks	Carcharhinidae etc.	Example: Carcharhinus sp.
Rays	Dasyatidae	Example: Dasyatis sp.
GROUP 42 : SEA SPIDERS, CRABS, ETC.		
Crabs	Portunidae	Example: Lupa pelagica
GROUP 43 : LOBSTERS, SPINY LOBSTERS, ETC.		
Spiny lobsters	Palinuridae	Example: Palinurus sp.

Appendix 3 (contd)

Statistical Item	Family / Genus Name	Scientific Name
GROUP 45 : SHRIMPS, PRAWNS, ETC.		
Shrimps/prawns	Penaeidae	Example: Penaeus sp.
GROUP 57 : SQUIDS, CUTTLEFISHES, OCTOPUSES, ETC.		
Squids	Loliginidae	
Cuttlefishes	Sepiidae	

Appendix 4

STATISTICAL STANDARD FOR GEAR
IN THE RED SEA AND GULF OF ADEN REGION

Gear Categories

SURROUNDING NETS

    Purse seine (one boat operated)
    Ring net (one boat operated)
    Ring net (two boat operated)

SEINE NETS

    Beach seine
    Seine net (not specified)

TRAWLS

    Otter trawls
    V-D Otter trawls

FALLING GEAR

    Cast net

GILL NETS AND ENTANGLINOR NETS

    Set gill net (anchored)
    Drift net
    Encircling gill net
    Fixed gill net (on stake)
    Tramel net
    Combined gill net-tramel net
    Veranda net
    Crab gill net
    Sardine gill net

TRAPS

    Pot
    Others

HOOKS AND LINES

    Hand lines (hand operated)
    Set longlines
    Drifting longlines
    Trolling lines

GRAPPLING AND WOUNDING

    Spears
    Harpoons
    Others

Appendix 6

P.D.R.Y.
MINISTRY OF FISH WEALTH
MASTERLIST OF INDUSTRIAL FISHING VESSELS   Quarterending _____ 198___

Fishing Agency Name	Sr. No.	Vessel Name	Type	Crew Size	Gross Tonnage	Dimention (m)			H.P.	Fish Finder	R E M A R K S
						L	B	W			

Appendix 7

MINISTRY OF FISH WEALTH, PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

TRIP REPORT OF INDUSTRIAL FISHING VESSELS

Page ---- of ----

Name of Company ------------------

Name of Vessel ------------------ Trip no. ---------- in 1984

Departure date ------ ------- Port ----------------

Arrival date ---------------- Port ----------------

Gear Used:

☐ Trawl	Headline (m) ----- Sweepline(m) ----
☐ Purse seine	Floatline(m) ----- Depth (m) ----
☐ Longline	Length (m) ----- No. of hooks ----
☐ Gill/Driftnet	Length (m) ----- Breadth (m) ----
☐ Other (specify)	

									Trip Total
Date									
Fishing area									
Target fish									
Vessel speed (knot)/hour									
No. of hauls									
Fishing hr.									
Depth (m)									
Catch by Species (kg)									
Others									
TOTAL									

Appendix 8

MINISTRY OF FISH WEALTH
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

COVERAGE CHECK

Name of vessel	1984												1985					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
A																		
B																		
C																		
D																		

Indicates duration of a trip

$\longleftrightarrow$

Appendix 9A

MINISTRY OF FISH WEALTH
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

FRAME SURVEY   FORM 1.0

Zone ___._____   Date of survey _____

Landing site(L.S.)_____ Permanent [ ] Temporary [ ]

Period of operation _____   Time of landing _____

Landing sites·on either side of this landing site   1. _____

Fishing area _____   2. _____

Direction and distance from the landing .site _____

Landings made by using: Desposition of landings: Percentage

                Boxes   [ ]   Fresh/iced [ ]

                Baskets [ ]   Salted/dried [ ]

                Others   Others
                (specify) [ ]   (specify) [ ]

Count of operating fishing units (boat and gear combination)

Type of boat	Mechanised	non Mechanised	Engine HP/ length (m)	Gear	Official information	Remarks

Names of fishing villages where fishermen using this landing site live:

Name				
Distance from (L.S.)				
Approach				
Remarks				

Name of recorder _____.
                                            Date _____
Signature _____

Appendix 9B

MINISTRY OF FISH WEALTH
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

FRAME SURVEY

FORM 1.1

(Details from the fishing villages as recorded in Form 1.0)

Date of survey _____

Name of fishing village _____

Fisherman and his fishing capabilities:

A. General

Name of fisherman _____

Full time ☐   Part time ☐

Name of landing site used by him: Mostly _____
                                      Occasionally _____

Number of family members :   More than 18 yrs   Less than 18 yrs
  (including himself)   Men

                         Women

Number of family members   Active fishing _____
(incl. himself) engaged in: Fishery related work _____

Number of fishing labourers engaged by him: Full time   Part time

                           Active fishing   _____ ·   _____
                           fishery related work _____   _____

B. Fishing boat

Serial Number	1	2	3	4	5	6	7
Name							
Registered No.							
Dimensions							
Mechanized							
Non-mechanized							
Type & HP of engine							
Year of construction of boat							
Year of purchase							
Purchase value							

C. Gear

Serial Number	1	2	3	4	5	6	7
Type							
Number							
Period of operation							
Characteristics (specify)							
Year of purchase							
Purchase value							

Remarks

Name of recorder ————————

Signature _____

Date _____

Definitions used in the Frame Survey

Fisherman:	A person who owns either a boat or gear for commercial fishing and spends a part/whole of his working time in supervision of fishing operations and/or in active fishing by going into the fishing area by himself.
Full time:	A fisherman who spends 90% of his working time in fishing/supervising fishing.
Part time:	A fisherman who spends at least 5% of his working time in fishing/supervising fishing but less than 90% of working time.
Fish landing site:	A place on the shore line/estuarine/riverine area where fishermen touch the shore for the first time after fishing operation is over and land their catches for disposition.
Fishing village:	A residential area where fishermen live with their family on a permanent basis.
Zone:	Administrative zone such as district.
Active fishing:	Participation in actual fishing by going into the fishing area.
Fishing unit:	It is a fishing economic unit comprising boat, gear and man power employed.

Appendix 10A

MINISTRY OF FISH WEALTH

PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

RECORDS OF LANDINGS   Fishery Survey Form No. 1 A

Landing Site _____   Fishing Unit _____ Date _____

Observer _____

Serial No	Time of landing	Serial No	Time of landing	Serial No	Time of landing	Serial No	Time of landing	Remarks
1		21		41		61		
2		22		42		62		
3		23		43		63		
4		24		44		64		
5		25		45		65		
6		26		46		66		
7		27		47		67		
8		28		48		68		
9		29		49		69		
10		30		50		70		
11		31		51		71		
12		32		52		72		
13		33		53		73		
14		34		54		74		
15		35		55		75		
16		36		56		76		
17		37		57		77		
18		38		58		78		
19		39		59		79		
20		40		60		80		

Appendix 10B

MINISTRY OF FISH WEALTH
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

DETAILS OF CATCH & FISHING EFFORT

Fishery Survey Form No. 1

Landing Site _____ Fishing Unit _____ Date _____

Observer _____ Total No. of Units Landed _____

Serial no. of units examined as per form. 1 A	Manpower employed	Absence from fishing port		Name & distance of the fishing ground (km)	Depth in metres	Duration of searching.	Duration of actual fishing	No. of hulls made	Weight of fish landed by species (kg)									Total (kg)	Remarks
		Departure	Arrival																	