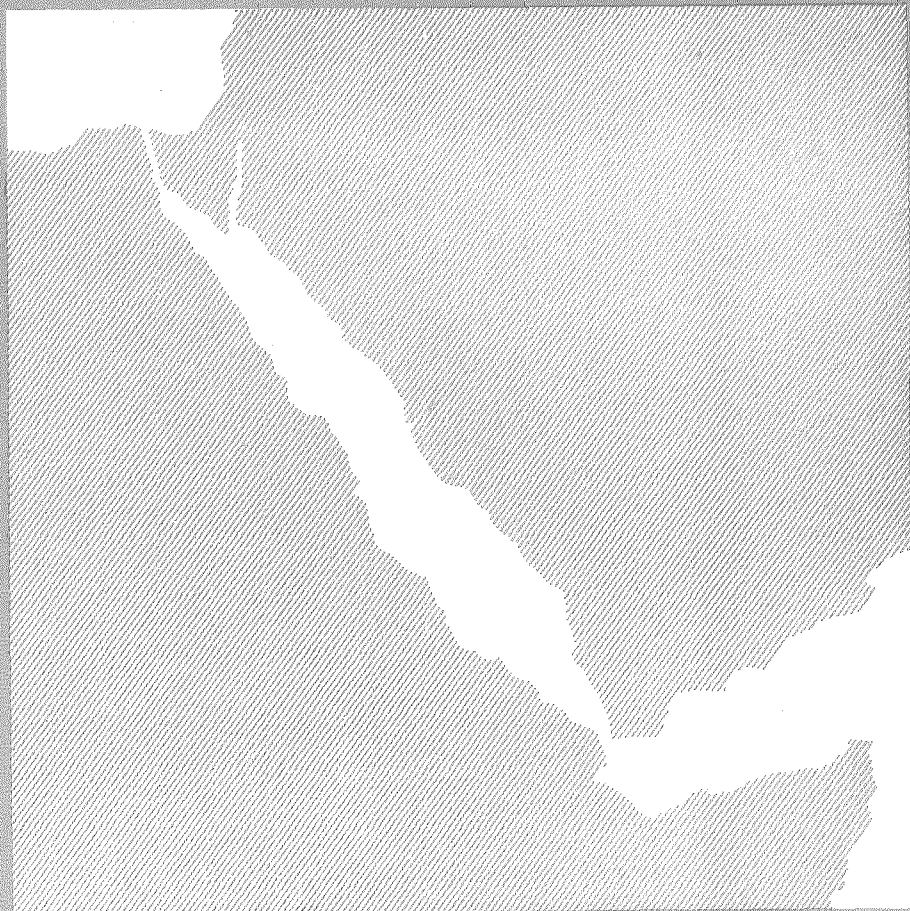


RAB/81/002

**DEVELOPMENT OF FISHERIES IN AREAS  
OF THE RED SEA AND GULF OF ADEN**

**FISHERY STATISTICS  
IN THE YEMEN ARAB REPUBLIC  
AN EXPANDED PLAN OF DEVELOPMENT**



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

FISHERY STATISTICS  
IN THE YEMEN ARAB REPUBLIC  
AN EXPANDED PLAN OF DEVELOPMENT

BY

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PROJECT FOR DEVELOPMENT OF FISHERIES IN AREAS OF  
THE RED SEA AND GULF OF ADEN  
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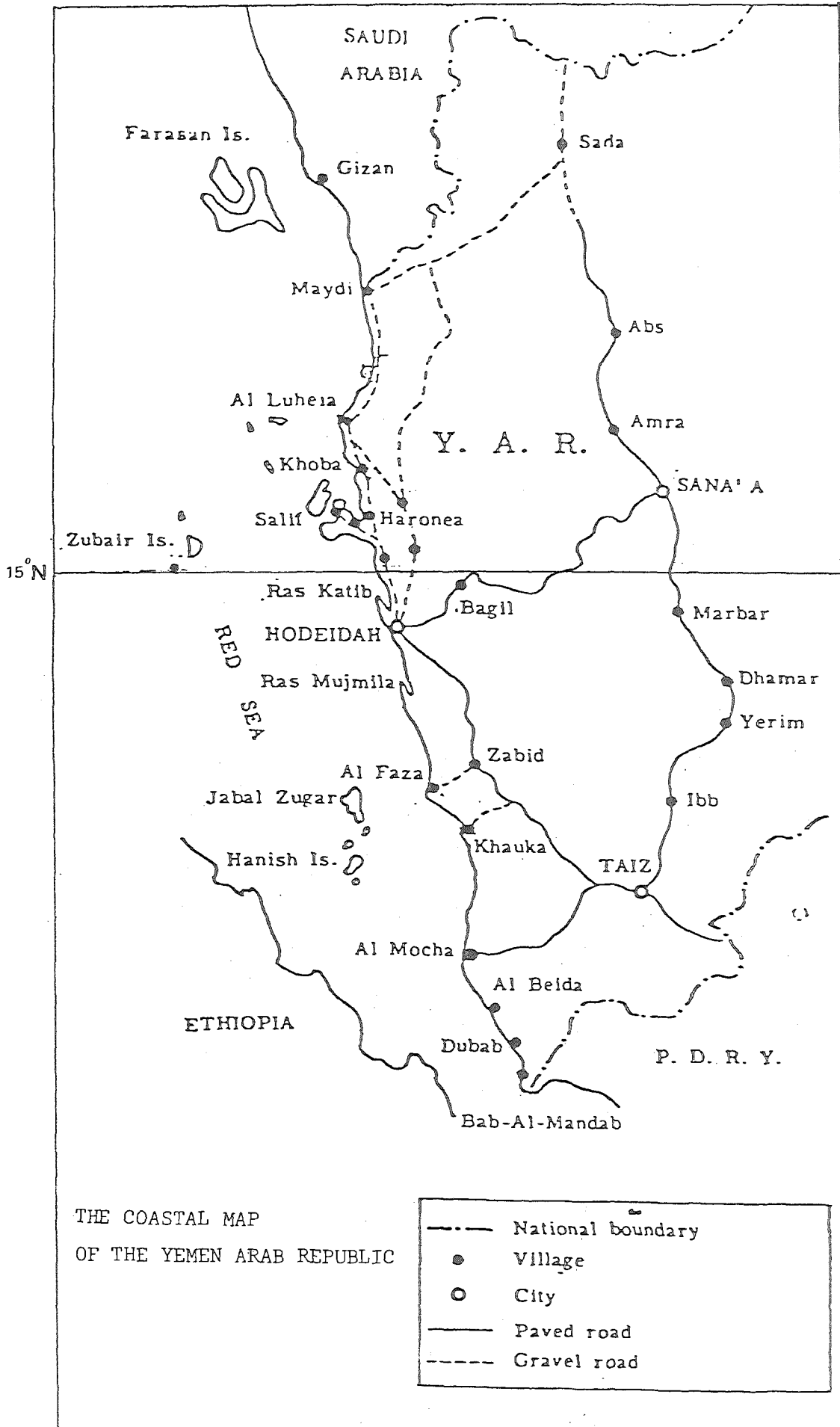
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THE COASTAL MAP  
OF THE YEMEN ARAB REPUBLIC

ABSTRACT

The paper evaluates the existing status of fisheries statistics in the Yemen Arab Republic 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; 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.

## 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 fishery statistical system in the member countries. Statistical training courses have been organised at national level and ad-hoc surveys have been undertaken in selected places. Available fishery data with the participating countries have been studied. Field travels have been undertaken to study the fisheries situation in the region. Based on these results it is now possible to draw a plan for establishment of a statistical system which is capable of generating the diversified marine fishery data in the Yemen Arab Republic (YAR). The present paper is a follow up action of the conclusions and recommendations brought out in the travel report to the YAR (Chakraborty, 1983).

## 2 - BACKGROUND INFORMATION

The YAR is situated on the South West corner of the Arabian Peninsula. The coast line along the Red Sea is about 450 km with a continental shelf of 11,200 km<sup>2</sup>. The country is mountainous and the coastal length is separated from the mountains by a coastal plain known as the Tihama. This coastal plain is 64 km wide at latitude 15°N (north of Hodeidah) and narrows to a few hundred metres at the cape of Bab-el-Mandab. The area is predominantly hot. The inhabitants in the Tihama rely on fishing and cattle breeding for their livelihood. Fishing is mostly traditional in nature and is concentrated close to the shore.

The country is administratively divided into 9 provinces of which 2- Hodeidah and Taez border the Red Sea. The main commercial harbours in the YAR are Hodeidah, Mocha and Salif. The coastal area is shallow excepting the Salif area.

The Ministry of Agriculture and Fisheries functions in Sanaa, the capital of the YAR. The staff involved in marine fisheries work under the direct control and supervision of the General Corporation for Development of Fishery Resources (GCDFR) with its headquarters in Hodeidah. The GCDFR issues licences for fishing and it has got departments for fishery research and fishery statistics. The Corporation is responsible for the management of the World Bank Fisheries Project. This Project has the following main objectives:

- i - Construction of fishery harbours at Hodeidah and Khauka, construction of piers at Khoba and Moha.
- ii - Construction of fish markets at Sanaa, Dhammar, Ibb and Taez.
- iii- Construction of 32 km road linking Khoba with the Hodeidah/Jizan road.
- iv - Providing fishermen with credit facilities to buy fishing boats etc..



3 - EXISTING STATUS

At present there is no system of collection of fishery data at the national level; the GCDFR, however collects landing data of its fleet, and also for Al Khauka and Mocha. In the past estimates of the total catch had been made by multiplying the estimated number of boats of the various types by the estimated annual catch of each type of boat. The estimated total catch runs as follows:

<u>TIME REFERENCE</u>	<u>TOTAL CATCH IN TONNES</u>	<u>SOURCE</u>
1973	7,500 ± 1,000	Agger (1973)
1975	11- 12,000	Walczak, Gudmundsson (1975)
1976	13,500	Walczak (1977)
1976	17,000	Campleman <u>et al</u> (1977)
1977/78	17,500	Barrania (1979)
1979	19,250	FAO estimate
1980	12,000	FAO/World Bank (1980)
	17,000	Second Five Year Development Plan (1982-86) in the YAR

The reliability of these statistics cannot be judged as the estimates are merely based on subjective judgements. In this connection Lintern (1983) comments " Obviously, without knowing to some degree of confidence the present landings, it is extremely difficult not only to plan for the future development of the fisheries but also to evaluate the results of the development programmes that are implemented".

Similarly the species composition of the landings are not available. Walczak (op cit) presented the species composition of the landings in Hodeidah for the period 1974-76. But unfortunately, no consistent or reliable picture of the species composition emerged from these data. An inefficient sampling scheme and personal biases had been attributed as the contributing factors to the anomaly.

The statistics on boats and fishermen are also lacking. Lintern (op cit) observes, "There are no official data for the numbers of boats and fishermen employed in the fishery sector, although a number of surveys have been carried out and various estimates given. The two principal types of vessel in use are the "sambuk" of between 10 and 15 m in length, fitted with inboard engines, and the "houris" a small conoe type of vessel which is often equipped with an outboard engine. Campleman et al estimated the number of vessels and fishermen as follow:

	<u>VESSELS</u>	<u>FISHERMEN</u>
Sambuks	284	1846
Mechanized houris	144	346
Sailing houris	643	1286
Total	1071	3478

Barrania indicated the following numbers :

	<u>VESSELS</u>	<u>FISHERMEN</u>
Sambuks	440	3520
Mechanized houris	565	2260
Sailing houris	587	1174
Total	1592	6954

The fishing operations take place through out the year along the whole coastline of the YAR by gillnets, handlines and trolling. In some areas beach seines and fish traps are popular. There are some 40 landing sites, the important ones are Hodeidah, Al Khauka, Al Khoba and Mocha.

The GCDFR collects some data on prices relating to the landings brought by its boats and also at Al Khauka and Mocha. But these are not based on any objective-oriented survey plan. The distribution pattern of fish and fishery products over space and time, price fluctuations at the producer's, wholesale and retail level cannot be gauged. It is understood that a significant part of the total landings is either salted or sundried before sale. Campleman et al (op cit) estimated that annually 5,000 tonnes of fish are salted and another 5,500 tonnes are sundried. The FAO/World Bank Cooperative Programme Report in 1980 indicated that more than half of the total catch in the YAR was being salted and dried.

Though there is no system of collection of fishery data at the national level as described above, the GCDFR has established a nucleus for the collection of fishery statistics. At present it is confined to the data relating to the corporation fleet and the landings at two points, Al Khauka and Mocha. Based on the stock assessment programme of the Project RAB/81/002 some data on shrimps are also collected by the Corporation.

The statistics relating to the Corporation fleet during 1980-82 are given as follow:

YEAR	PERIOD OF PRODUCTION	NO. OF VESSELS	PRODUCTION IN KG		
			SHRIMP	FISH	TOTAL (KG)
1980	Apr - Dec	4-6	150	350	500
1981	Jan - Dec	7	14 415	4 645	19 060
1982	Jan - Dec	7	16 764	6 047	22 811

The distribution of production over months during 1982 is as follows:

MONTHLY PRODUCTION IN KG BY THE CORPORATION FISHING FLEET  
OF SEVEN VESSELS, 1982

PRODUCTION	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
Shrimp	1442	3562	5911	622	685	725	225	1816	838	72	116	750	16764
Fish	539	1045	592	705	885	453	948	583	71	24	162	40	6047
Total	1981	4607	6503	1327	1570	1178	1173	2399	909	96	278	790	22811

The observations made and experiences gained by the author through field visits to a few important fish landing sites and fish markets are furnished below.

Hodeidah

Landing site:

It is the biggest and the most important landing site in the Yemen Arab Republic. A World Bank Project is in operation for providing harbour and marketing facilities in this location. At present, fishing units land their catches in both sides of the proposed "jetty area". Landings take place between 0700 and 1100 hrs, the peak being 0800-0900 hrs. The type of fishing units landed were sambouk with gillnets and houris with either gillnets or handlines.

The units were mostly mechanised. The number of fishermen working in a sambouk ranges from 7 to 9; in a houris with gillnet 3 to 5; while in a houris with handlines it varies from 5 to 7. The mesh size of the gillnet also varied 5-10 cm stretched mesh depending on the target species, i.e. big fish like kingfish or smaller pelagics: mackerel or jacks. Fishermen go to the sea in the evening, set gillnets overnight or usehandline during the night and land the catches in the morning. Sambouks may, however, stay out at sea for a few days.

There is fishermen's cooperative society here. According to the fishermen in this society there are 200 sambouks and 300 houris operate from this landing site.

The corresponding figures from other sources are:

TIME REF.	MECH. SAMBOUKS	SAIL SAMBOUKS	MECH. HOURIS	SAIL HOURIS	TOTAL	SOURCE
1975	81	1	29	82	193	Walczak (1977)
1978	150		60	150	360	Barrania (1979)
4.7.79 (landing units)	19		63	3	85	(Eid 1981)

It was also reported that during the shrimp season which extends from August to April several sambouks are engaged in trawling for shrimp, landing their catches at Hodeidah.

On three mornings observations were made at this landing site. The number of fishing units landed was as follows:

DATE/DAY	PERIOD OF OBSERVATION	SAMBOUKS	HOURIS	TOTAL
2.6.83/Thur.	0830 - 1030	20	60	80
3.6.83/Fri.	0600 - 1030	33	66	99
6.6.83/Mon.	0700 - 0900	12	40	52

The species composition of landings was kingfish (S.commersoni) queenfish (S.lysan), snappers (Lutjanidae), emperors (Lethrinidae), sharks (some big ones - 2 m long), eastern little tuna (E.affinis), longtail tuna (T.tonggol), mackerel and jacks. It was informed that few units land during the afternoon as well. Landings take place either in bundles or in plastic containers in a great rush for marketing. It, therefore, necessitates some tact on the part of the field staff to persuade fishermen to allow examination and weighing the landed catch on sample basis. An eye estimation of landings by sambouk ranges from 400 kgs to 700 kgs while the same for houris varies from 60 kgs to 100 kgs. Taking average landings for sambouks and houris as 500 kgs and 75 kgs, the total landings at Hodeidah on the three days of observations (2/6, 3/6, 6/6) worked out as 14.5, 21.5 and 9.0 metric tons respectively thus showing a wide day to day variation.

The daily landings at Hodeidah landing site depend on the fishing success of the fishing units specially sambouks on the days at sea. Fishing units stay out at sea longer time until a desired quantity of fish accumulates. In this connection, the observation made by Walczak (op cit) which runs as follows may be relevant(through the relative figures appear to be small):

"In Hodeidah daily landings fluctuate in the spring from 1.5 - 8 metric tons/day, and in winter from 1 - 6 metric tons/day. These fluctuations are caused in large part by the weather conditions and the lunar cycle."

Fish market:

Apart from the local landings the wholesale market at Hodeidah is fed by the landings from the near about places like Salif, Haronea, Taif, etc.. and distant places like Mocha by road. Fishes are sold as fresh and iced and are distributed to local areas as well as to distant interior markets by car. some buyers buy fish for salting and later sale to the interior areas.

The retail market is situated by the side of the wholesale market.

Al Khoba

It is an important landing site with a big fishing village situated by its side having 700 families and 6000 fishing population. The number of fishermen having either a fishing boat and/or net comes to 70 while 10 times more than that may be working in the sea as fishing labourers on catch sharing basis. The long coast line scattered with fishing boats gives a first hand impression of its having a huge quantity of landings; but it is reported that many fishing units operate in Saudi waters and land their catches in Jizan before coming down to Al Khoba for rest. A few fishing units, however, from the neighbouring islands like Kamerans land their catches here. Landings take place during the morning hours. On the day of visit the number of fishing boats on the shore was as follows:

MECH. SAMBOUKS	MECH. HOURIS	SAIL HOURIS	TOTAL
23	86	4	113

On interviewing the fishermen it appears that there are 75 sambouks and 200 houris in the fishing village and many of them operate and land in the Saudi Arabian coast.

The number of boats in the village according to other sources are :

TIME REF.	MECH. SAMBOUKS	HOURIS	TOTAL	SOURCE
1975	12	80	92	Walczak ( <u>op cit</u> )
1978	150	100	250	Barrania (1979)
1979	65	135	200	Eid (1981)

Small pelagics like mackerel, jacks form the important component of the landings. There is a small local consumption of fresh fish, the rest of the landings is either smoked in kilns or salted to be transported to the interior markets or to Saudi Arabia.

#### Al Khauka

The next important fishing and landing area is the Al Khauka region. It has five important landing points: Al Goheyba, Abu Zahr, Al Kataba, Al Gasha, Al Walra, all separated from one another by 3-5 kms distance. Each of these points is therefore, a distinct landing site. The number of boats as observed at the landing site during the day of visit is as follows:

NAME OF LANDING POINT	MECH. SAMBOUKS	MECH. HOURIS	SAIL HOURIS	TOTAL
Al Goheyba	-	20	3	23
Abu Zahr	-	11	6	17
Al Kataba	7	69	4	80
Al Gasha	5	42	41	88
Al Walra	-	127	30	157
Total	<u>12</u>	<u>269</u>	<u>84</u>	<u>365</u>



The number of fishing boats operating in this area as per other sources are:

TIME REF.	MECH. SAMBOUKS	MECH. HOURIS	SAIL HOURIS	TOTAL	SOURCE
1975	15	21	131	167	Walczak ( <u>op cit</u> )
1978	40	50	200	290	Barrania (1979)
1979	75	113	-	188	Eid (1981)

It was reported that during the winter, sambouks and large houris go northward including Saudi waters while during the summer intense fishing takes place off the Yemeni coast in deeper waters. Sometimes fishermen go for fishing, specially for tuna, during evenings and return by the midnight. Fish is preserved in ice. The species composition of landings in this area is different from the Hodeidah region; the proportion of tuna like fishes and elas-mobrachs is considerably higher.

The World Bank Project is engaged in the construction of harbour facilities in one of the landing points (Al Goheyaba). A field staff collects landing data by species of a few observed fishing units on alternate days at any of the landing points. On the other days, he collects market data at Al Khauka market giving market arrivals, wholesale and retail prices by varieties of fish and size category (big, medium and small). Recently the data on the number of fishing units landed on the days of observation are also collected but unfortunately the actual name of the landing point wherefrom the data are collected is not stipulated in the recording sheet; all the observed landing points are designated as "Al Khauka". The total observed landings collected during the last three years are given as follows:

YEAR (COVERAGE)	TOTAL LANDINGS IN TONNES
1982 (8 months)	78.2
1981 (11 months)	83.6
1980 (7 months)	101.3

#### Small Landing Sites

Visits were made to Al Salif, Al Taif and Al Nakhlia. These places have limited marketing facilities. Landings, therefore, are transported by road to Hodeidah. Sometimes fishing units come to the native landing site after fish being disposed of in some other landing site like Al Khoba or Hodeidah.

In the shallow water areas around Salif there are many stake nets. It was reported that during the winter months these nets are extensively used for mackerel and mullets. While a major portion of this catch is sundried and subsequently transported to the interior markets; some fresh fish is taken to Hodeidah market as well. It may be mentioned that in the area north of Hodeidah mullets form an important component of the catches which may be salted and transported to the interior places and also to Saudi Arabia by road.

From the above narrative it is thus seen that a statistical system should be established in the YAR which should be capable of generating the fishery data for the whole country. The system should be consistent with the local fishery conditions, the availability of manpower and financial resources. The generated data should meet the needs of the ultimate users-biologists, economists and administrators etc... These should have a known level of accuracy and be

comparable with the parallel sets of data collected in the neighbouring countries. It is, therefore, essential that the data needs of the ultimate users at the national and international level be identified, their collection methodologies be developed under the regional concepts and definitions of the survey items and the necessary steps for their implementation be initiated.

#### 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 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) Trips;
  - (c) Man-power.
  
- Vii- Fish catch:
  - (a) Total and value at retail and wholesale level;
  - (b) Important commercial varieties and value at retail and wholesale level;
  - (c) Size composition of commercially important varieties.
  
- ix - Trade statistics:
  - (a) Import of fish and fishery products by quantity and value;
  - (b) Export of fish and fishery products by quantity & value.
  
- x - Service facilities:
  - (a) Cold storage;
  - (b) Ice factory;
  - (c) Workshops;
  - (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 quantity.
  
- iii- Fishing unit:
  - (a) Methods of fishing;
  - (b) Size class by GRT, length h.p, 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, 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 the survey methodologies it is essential to enumerate the survey items (statistical items) on which the data will be collected. The included statistical 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 will also diminish the non-sampling errors while executing the field surveys.

### 5.1- Basic concepts.

#### Catch

The very fundamental concept in fisheries 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. Special attention is drawn to the rectangles shown at the bottom of the diagram i.e. "landings" and "nominal catch".

#### Conversion factor

In the YAR landings at present take place in fresh and/or frozen condition and as such the conversion factor to convert landings to nominal catches is not necessary. But a significant part of the total landings is salted or sundried before sale. To relate the landings to the products processed ashore, a conversion factor is to be established. This is essential for commodity studies and market studies.

## Discards

Fishermen in the YAR bring ashore fishes of marketable varieties and sizes. The unsaleable varieties and undersized catches are thrown away.

As for example, catfishes are not retained. But these data on discards are essential for stock assessment purposes and should, therefore, be included in the survey programme.

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 statistical standard for the commercial species in the Red Sea and Gulf of Aden region has been established (Appendix 2). This has been prepared according to groupings indicated in the International Standard Statistical Classification of Aquatic Animals and Plants (ISSCAAP). The catch statistics in the YAR should be collected and tabulated as per this classification to ensure the comparability of the data collected in the neighbouring countries.

#### 5.2.2- Gear

A statistical standard for the gear in the Red Sea and Gulf of Aden region (Appendix 3) has also been developed. The landing data in the YAR should be broken up according to this classification of gear to facilitate the comparison of the parallel data collected in other countries and also in the YAR collected in future.

### 5.2.3- Fishing craft

The fishing craft in the YAR may be classified under the three broad categories. (At present there is no industrial fishing in the YAR waters. However, there are plans to introduce shrimp trawlers and purse seiners in near future. Hence a provision is made to include these vessels in this classification):

i - In-board powered boat.

a- Shrimp trawlers.

b- Purse seiners.

c- Sambouks.

These measure 10-15 m in length and 2.3.5 m in beam width and are equipped with 15-25 h.p diesel engine.

ii - Out-board powered boat.

a- Houris (Large).

b- Houris (Small).

These are planked conoes 4-10 m long.

iii- Non-powered loat.

a- Sambouks.

b- Houris.

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

a- Tonnage.

b- Length.

c- Horse power.



#### 5.2.4- Statistical sub-areas (Fishing areas).

The marine waters of the YAR can be divided into the following statistical sub-areas:

- i - Waters off the maritime province of Hodeidah;
- ii - Waters off the maritime province of Taz.

These sub-areas can be suitably modified when sufficient data on the spatial distribution of the important marine resources in the YAR waters are accumulated.

#### 5.3- Development of Survey System.

##### 5.3.1- Industrial fishery.

The YAR has planned to develop an industrial fishing fleet particularly for shrimps trawling. From the very beginning of its operation it is essential to urge the fishing fleet to enter the necessary fishery data in a specially designed logsheet (Appendix 4). The logsheet have to be completed in the sea and be forwarded to the GCDFR as soon as the vessel arrives at the port. While entering the data in the logsheet special attention should be paid to "Discards" in the sea.

If some other type of fishing unit is introduced the logsheet has to be suitably modified to accommodate additional data. As for example, in purse seine fishery search-time for the fish schools is important; this item should be included in the logsheet.

### 5.3.2- Traditional fishery

#### 5.3.2.1- GCDFR fleet

The Corporation has at present a fleet of 7 small boats. The catches of these boats should be properly logged by the master while at sea. For this purpose a specially designed logsheet (Appendix 5) should be used. It should include all the catches whether retained or discarded. While recording these catches an 'eye-estimation' of the weight in kg. may be used. Appropriate 'correction factor' will be developed by comparing the 'eye-estimates' of the marketable varieties of fish with the corresponding actual weight which is taken at the Corporation office by the Processing Section. The 'nil catch' in any haul will also be recorded in the logsheet. A boat may be using different types of gear in different hauls of the same fishing trip, care should, therefore, be taken to enter the information on gear correctly.

#### 5.3.2.2- Other fishing fleet

##### Design

The coastal length of the YAR is divided into two zones:

Zone 1 : coastal length of Hodeidah province;

Zone 2 : coastal length of Taez province.

The landing sites in each zone are stratified into major and minor strata as follows:

	Major strata	Minor strata
Zone 1	Hodeidah, Khoba, Khauka	Other landing sites in Hodeidah province.
Zone 2	Mocha	Other landing sites in Taez province.

a- Major Stratum:

Each important landing site will constitute one major stratum and a separate estimate will be built up for each of these landing sites by sampling over days in a month. The methodology given below relates to one landing site under a major stratum. While deciding on sampling over days the phases of moon are to be taken into consideration. A month is, therefore, divided into three time-strata,

Time-stratum 1 : New moon day with 4/5 days on  
eitherside;

Time-stratum 2 : Full moon day with 4/5 days on  
eitherside;

Time-stratum 3 : Rest of the days in the month.

Three days will be selected at random within each time-stratum assuming no fishing holiday in the time-stratum.

Data on landings, catch and effort will be collected as per Fishery Survey Forms No. 1A and 1 (Appendix 6A and 6B) from each type of landing fishing unit (boat, gear combination generally known by the type of gear used) separately. Attempts will be made to cover all the fishing units of a particular type landing on the day of observations. If however, many fishing units of a particular type land, then a sampling over fishing units according to the following schedule will be introduced.

<u>NO OF FISHING UNITS LANDED</u>	<u>FRACTION TO BE EXAMINED</u>
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 observations).

Data on catches etc.. will be collected as far as possible by physical examination and actual weighing while those relating to fishing etc.. will be collected by interviewing the fishermen of the selected fishing units.

Method of estimation.

Let observations be made on d days out of D days in a time-stratum.

Let  $M_j$  = the number of fishing units of a particular type landing on the jth day of observations ( $j = 1, 2, \dots, d$ ),

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

$y_{jk}$  = the catch (effort) of the kth sample fishing unit of the particular type under study on the jth day of observations ( $k = 1, 2, \dots, m_j$ );

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

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

The estimated catch (effort) for the time stratum:

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

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

$$v(\hat{y}) = \frac{D}{d} \frac{(D-d)}{(d-1)} \left[ \sum_j \hat{y}_j^2 - \frac{(\sum_j \hat{y}_j)^2}{d} \right] + \frac{D}{d} \left[ \frac{M_j}{m_j} \frac{(M_j - m_j)}{(m_j - 1)} \left\{ \sum_k y_{jk}^2 - \frac{(\sum_k y_{jk})^2}{m_j} \right\} \right]$$

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

By adding the estimates of the three time-strata the monthly estimate for a landing site under the major stratum is arrived at.

b- Minor Stratum

The landing sites under minor strata of zones 1 and 2 will be grouped into a number of sub-strata. Each sub-stratum will contain a few contiguous landing sites (say around 10 - 15) having similar fisheries and fishing practices. As for example, the landing sites around Salif fishing village (north of Hodeidah) having a good mullet fishery will be grouped under one sub-stratum. The methodology developed below refers to one sub-stratum.

To start with, three landing sites will be selected at random from a sub-stratum. A month contains 3 to 4 complete weeks (Sunday to Saturday). One randomly selected week will be allotted to each of the three landing sites selected. On all the days of the allotted week data will be collected at the selected landing site by actual observations and weighing of the catches of the landing fishing units according to the Fishery Survey Forms 1A and 1 (Appendix 6A and 6B). Data will be collected for each type of fishing unit separately covering all the units of a particular type that land during the day of observations.

Method of estimation:

Let there be N fish landing sites in a sub-stratum out of which a random sample of size n is selected ( n = 3 here) for observations.

Let observations be made on d days out of D days in a month in a selected landing site. For a particular type of fishing unit (as for example, beach seine) let the catch (effort) on the jth day at the ith landing site be  $y_{ij}$ . The estimated monthly catch (effort) by the particular type of fishing unit at the ith landing site:

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

Let  $x_i$  be the number of fishing units of a particular type under study existing in the  $i$ th fish landing site. (These data are available for most of the landing sites, however, these may be up dated by a quick survey).

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

$$\hat{y}_{\text{rat}} = \frac{\sum_{i=1}^n \hat{y}_i}{\sum_{i=1}^n x_i} X = \hat{R}X$$

$$\text{where } \hat{R} = \frac{\sum_{i=1}^n y_i}{\sum_{i=1}^n x_i}$$

The approximate variance is given by:

$$V(\hat{y}_{\text{rat}}) = \frac{N(N-n)}{n} \left[ S_{\hat{y}}^2 + \hat{R}^2 S_x^2 - 2\hat{R} S_x S_{\hat{y}} \cdot r \right]$$

Where,  $r$  is the coefficient of correlation between  $x$  and  $\hat{y}$ ; the other symbols have the usual significance.

Summing over the estimated catch (effort) by all types of the fishing units operated in the sub-stratum, the monthly catch (effort) in the sub-stratum will be obtained. The variance will also be obtained by adding the corresponding variances.

Similarly the catch (effort) data relating to the different sub-strata under a minor stratum will be added to constitute the catch (effort) statistics at the minor stratum level.

### 5.3.3- Marketing Statistical Surveys:

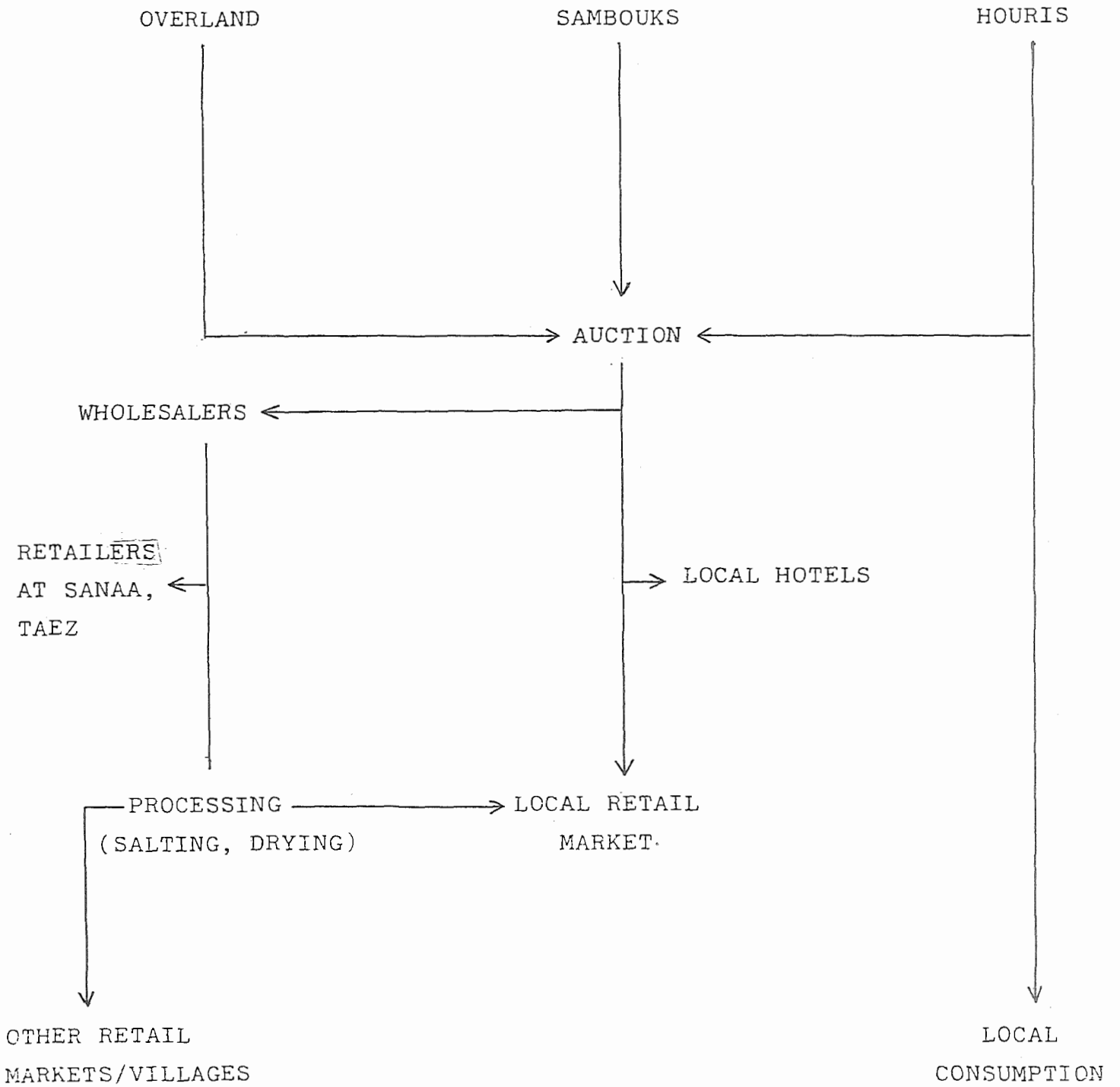
The main objective of the Marketing Statistical Surveys is to collect information on the following:

- i - Marketed volume of fish by methods of disposition;
- ii - Prices of fish at wholesale and retail level and the value of the marketed volume;
- iii- Origin and destination of the marketed items with respect to mode of transport.

The method of collection of data greatly depends on the structure and organisational aspect of the market, facilities available and disposition pattern of fish landings. In the YAR the first hand sales of fish are usually carried out through an auction system; the auctioneer gets 5 to 10 % of the realised amount as the commission. The marketing and distribution chain of fresh fish in Hodeidah is presented in Fig.1 .



FIG. 1 - MARKETING AND DISTRIBUTION CHAIN OF FRESHFISH  
IN HODEIDAH



### Survey method

Before undertaking the Marketing Statistical Surveys it is necessary to group the existing markets taking into consideration their importance, size and organisational practices. In certain cases the same volume of fish may circulate among a number of markets; these markets should be treated together to avoid double counting of the same volume of fish.

In the YAR initially the Marketing Statistical Surveys will be launched at Hodeidah, Sanaa and Taez. In each market the existing recording systems of the daily inflow of fishery products and fish transactions maintained by the marketing authorities will be critically examined. The information thus available will be supplemented by the data collected through direct observations and interviews with the auctioners/ fish mongers by statistical recorders assigned to the markets. In view of the importance of these markets data will be collected daily and published as weekly/monthly time series for market inflows and prices etc...

### 5.3.4- Trade Statistics

Imports and exports of fish and fishery products take place through the established official channel. These statistics can be collected from the official records of the concerned ministries of the YAR. The field 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 like surveys for estimating catch and effort, Market Statistical Surveys etc...

#### 5.3.5- 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 available in the YAR. These data will be collected at a point of time (say, once in three years). Some of these data are available with the local fisheries offices. These will be supplemented through ad-hoc investigations.

### 6 - IMPLEMENTATION

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

- i - Develop the statistical standards;
- ii - Organise the data collection systems covering the industrial and traditional fisheries;
- iii- Organise the Marketing Statistical Surveys;
- iv - Collect information on trade statistics and infrastructure facilities.

#### 6.1- First Year

All the relevant statistical standards have been developed. The next step is to organise the data collection systems. The first year will be completely devoted to introducing the logsheet system in the GCDFR fleet and the large scale sample surveys in each of the landing sites under the major strata. These landing sites are: Hodeidah, Al Khauka, Al Khoba and Mocha. The field staff will be given training in the collection of data and the data processors will also be trained in the consequent analysis and compilation. A manual incorporating the methods of scrutinising and processing of data will be prepared.

## 6.2- Second year

The data collected during the first year will be documented in a departmental publication. During the second year the large scale sample surveys in the major strata will be undertaken on a continuing fashion and these will be extended to the minor strata.

During the second half of the second year the Marketing Statistical Surveys will be introduced covering three markets: Hodeidah, Sanaa and Taez. The data will be scrutinised and analysed to form weekly and monthly time series.

## 6.3- Third Year

### Consolidation of Survey Programme

The statistics collected during the first two years will be documented in a proper format and sent to the ultimate users of the data for their comments on the adequacy of the available data. Based on their comments and the experiences gained during the first two years of field work the necessary modifications, if any, will be introduced in the surveys plans.

The survey programmes will be institutionalised to facilitate smooth running at the planning and implementation stage. In situ training programmes will be established to impart training to the new recruits at the various positions in the field as well as in the office. The technical contents of the newly established statistical system should be will documented in the form of hand books to be used by the field staff, data processors, supervisors etc... Some of the documents should be available in Arabic to facilitate proper comprehension by the users.

### Computarization

For the two years data will be processed manually. By this time the method of collection of data will be finalised and the layout of the statistical tables will be given a final format. At this stage the processing of field data will be done through computers. The completed fishery survey forms will be the source documents and the format of these forms should be amenable to automatic data of processing. The computer-print outs should also conform to the layout of the statistical tables in which the various fisheries data will be available to the ultimate users. The computer print- outs will be published in the form of an annual fishery statistical bulletin. The fishery statistical bulletin will thus be a by-product of the computarization of the processing of field data. It will reduce the time lag between the collection of field data and the publication of results; the processed data will be available to the ultimate users in a timely fashion.

### Derived Statistics

During the year attempt will be made to compile trade statistics showing the import and export of fish in the YAR for the last two years. These data when matched with the catch estimates generated through the newly established sample surveys will provide the statistics on the supply of fish and fishery products in the YAR. The perspectives of future local requirements and the possibilities for the expansion of the internal and external trade in fish may also be examined. In addition data on infrastructure facilities will be compiled.

## 7 - ORGANISATIONAL SET UP

### 7.1- Headquarters

The Headquarters of the proposed statistical system should be located to facilitate the administration and management of the system; it should also function in close collaboration with the ultimate users of the collected data. To effect ease in the administration of the field surveys on the Red Sea coast, the Headquarters should be based in Hodeidah. The GCDFR with its Headquarters in Hodeidah has already established a statistics section and a fishery research section which is the main user of the data; and the existing staff involved in marine fisheries in the YAR work under its direct control and supervision. The GCDFR should therefore be charged with the responsibility of the newly established statistical system. The newly established section should be adequately manned and equipped both at the 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 furnished below.

### 7.2- Manpower

#### 7.2.1- Headquarters

##### Officer-in-charge (Fishery statistics)

One officer will be responsible for fishery statistics in the YAR. He will plan the statistical surveys, organise and have the data processed and published in the Annual Fishery Statistical Bulletin. Based on the data collected the quarterly and annual reports for the statistics section should also be prepared. While executing the job he should 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 data processing staff and field staff as indicated below.

Data processing staff.

The field data collected during a month will be scrutinised by the field staff and despatched to the Headquarters in Hodeidah for processing and analysis. During the initial years the field data will be processed using desk calculators by 2 persons. They will also be responsible for further scrutiny of data by consistency check under the supervision of the officer-in-charge (Fishery statistics).

7.2.2- Field

The number of field staff will depend on the number of strata/sub-strata into which the coastline of the YAR is sub-divided. In some landing sites field staff is already stationed while in some others new hands will be required. The following shows an estimate of the field staff requirement in different areas. (The programme of the field staff will be suitably modified to collect data in the minor strata)

<u>LOCATION</u>	<u>EXISTING STAFF</u>	<u>ADDITIONAL STAFF</u>	<u>TOTAL STAFF</u>
a) Landings sites			
Hodeidah	-	1	1
Al Khauka	1	-	1
Al Khoba	-	1	1
Mocha	<u>1</u>	<u>-</u>	<u>1</u>
Sub-total	2	2	4

<u>LOCATION</u>	<u>EXISTING STAFF</u>	<u>ADDITIONAL STAFF</u>	<u>TOTAL STAFF</u>
b) Fish Markets			
Hodeidah	-	1	1
Sanaa	-	1	1
Taez	-	1	1
Sub-total	0	3	3
<u>Total</u>	<u>2</u>	<u>5</u>	<u>7</u>

### 7.3- Equipment

The equipment necessary will be as follow:

During the initial two years when the processing of data will be done manually three scientific desk calculators will do the job, while during the third year depending upon the volume of data and its storage needs a minicomputer will be chosen.

For the field staff spring balance of suitable range and/or platform balance at certain fish landing sites and markets will be necessary. They will be provided with field note books to record the observed data and also a small plastic board fitted with a clip.

### 7.4- Other facilities

#### a) Transport.

For conducting the field work the field staff should be provided with suitable transport.

#### b) Incentives.

Generally fish landings commence early in the morning and sometimes continue through out the day. To collect data by actual observations the enumerators have to be present at the landing site and fish market very early



in the morning. This is a regular job and difficult to perform for a long time. Hence the field staff should be provided with an incentive by way of paying some extra money. This should improve their performances.

8 - ESTIMATED COST (US \$)

A. PERSONNEL

<u>INTERNATIONAL STAFF</u>	<u>TOTAL</u>	<u>1ST YR</u>	<u>2ND YR</u>	<u>3RD YR</u>
1. Fishery Statistician (P-5)	330,000	110,000	110,000	110,000
2. Systems Programmer (P-4) (3m/m)	15,000	-	-	15,000
Subtotal	345,000	110,000	110,000	125,000
<u>NATIONAL STAFF</u>				
1. Officer-in-charge (Fishery Statistics) @ \$ 800 p.m.	28,800	9,600	9,600	9,600
2. Data processors (2) @ \$ 600 p.m.	43,200	14,400	14,400	14,400
3. Field staff Landing sites (4) @ \$ 400 p.m.	57,600	19,200	19,200	19,200
Fish markets (3) @ \$ 400 p.m.	28,800	-	14,400	14,400
Subtotal	158,400	43,200	57,600	57,600
<u>Component Total</u>	<u>503,400</u>	<u>153,200</u>	<u>167,600</u>	<u>182,600</u>

B. OTHERS COSTS.

1. Duty travel	30,000	10,000	15,000	5,000
2. Incentives for field staff (20%)	17,280	3,840	6,720	6,720
3. Equipment and supplies				
a) Computer	10,000	-	-	10,000
b) Others	15,000	5,000	5,000	5,000
4. Vehicles (2)	20,000	20,000	-	-
5. Reporting	15,000	5,000	5,000	5,000
6. Drivers (2) @ \$ 300 p.m	21,600	7,200	7,200	7,200
7. Fellowships (2) (one 6m; other 12m)	13,950	4,650	9,300	-
8. Miscellaneous	15,000	5,000	5,000	5,000
<u>Component Total</u>	<u>157,830</u>	<u>60,690</u>	<u>53,220</u>	<u>43,920</u>
PROJECT TOTAL COST	661,230	213,890	220,820	226,520

## 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 commitments to the international staff and some travel costs. The national Government will bear the cost of the national staff and also other costs which cannot be met through the Regional Project.

## 10 - CONCLUSIONS

The proposed 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 fashion. Hopefully, this will lead to a better understanding of the marine fishery in the YAR. It will also help better planning and evaluation of marine fishery projects and play an important role in the day to day decision making process for the development and management of fisheries resources in the YAR.

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.

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APPENDIX 2 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 chanos</u>
GROUP 33 : PERCHES, BREAMS, SNAPPERS, ETC. (Redfishes, Basses, Congers, etc.)		
Groupers	Serranidae	Examples: <u>Ephinephelus summana</u>
		<u>E. areolatus</u>
		<u>E. Tauvina</u>
		<u>E. microdon</u>
		<u>E. chlorostigma</u>
		<u>Variola louti</u>
		<u>Cephalopholis sp.</u>
		<u>Plectropomus maculatus</u>
Croakers	Sciaenidae	Example: <u>Otolithes sp.</u>
Snappers	Lutjanidae	Examples: <u>Lutjanus lineolatus</u>
		<u>L. gibbus</u>
		<u>L. bohar</u>
		<u>L. argentimaculatus</u>
		<u>Pristipomoides typus</u>
Grunts	Pomadasyidae	Examples: <u>Pomadasyus hasta</u> <u>Pomadasyus opercularis</u>
Sweetlips	Pomadasyidae	Example: <u>Plectorhynchus pictus</u>
Red Mulletts	Mullidae	Examples: <u>Mulloidichthys flavolineatus</u> , <u>Upeneus sp.</u>
Parrot fishes	Scaridae	Examples: <u>Scarus harid</u>
		<u>S. ghobban</u>

APPENDIX 2 (contd)

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

APPENDIX 2 (contd)

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

APPENDIX 2 (contd)

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





APPENDIX 3

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 5

GENERAL CORPORATION FOR THE DEVELOPMENT OF  
FISHERY RESOURCES  
YEMEN ARAB REPUBLIC

Fishing logsheet for boats operated by GCDFR

Name of boat \_\_\_\_\_

Date \_\_\_\_\_  
Day Month Year

Depart From \_\_\_\_\_ date \_\_\_\_\_ Arrive at \_\_\_\_\_ date \_\_\_\_\_

Haul No.	1	2	3	4	5	6	7	8	Daily total
Gear used									
Fishing area									
Fishing time (hrs)									
Depth range (m)									
Catch by species (kg) "Eye-estimates"									
Others									
Total									
Discards (specify)									

Name of Recorder \_\_\_\_\_

Signature \_\_\_\_\_

APPENDIX 6.A

GENERAL CORPORATION FOR THE DEVELOPMENT OF FISHERY RESOURCES  
YEMEN ARAB REPUBLIC

Fishery Survey Form No. 1 A

RECORDS OF LANDINGS

Landing Site \_\_\_\_\_ Fihsing 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		46		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		



