

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

MARINE FISHERIES STATISTICS IN
SUDAN
AN EXPANDED PLAN OF DEVELOPMENT



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

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

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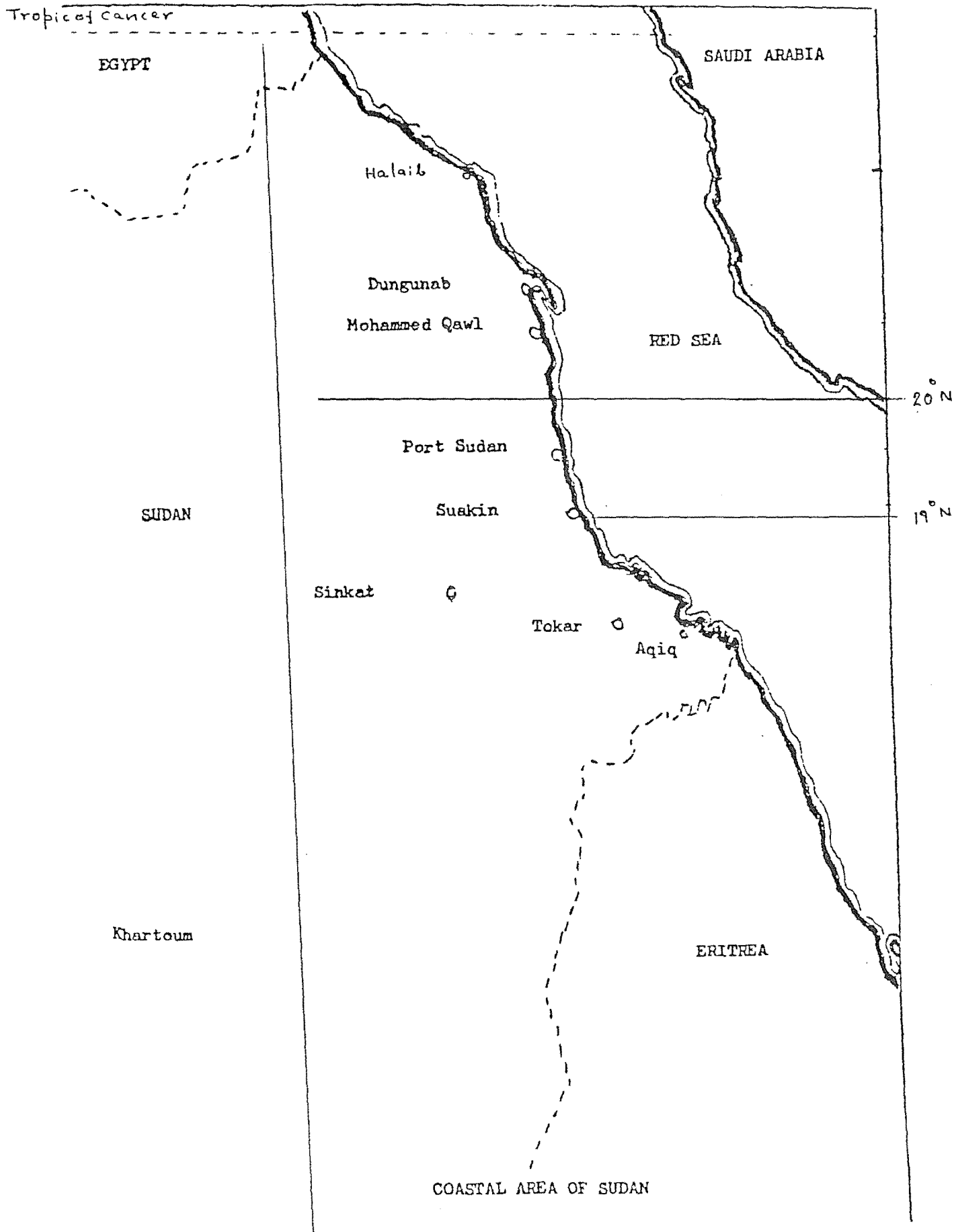
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MAP OF THE SUDAN COASTAL AREA

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ABSTRACT

The paper evaluates the existing status of marine Fisheries Statistics in Sudan and describes the type of data that are needed for economic evaluation of fisheries and biological/stock assessment studies.

A phased two-year plan of development of a statistical system covering marine fisheries in Sudan 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 described in details; the facility requirement by way of manpower and equipment is examined. The cost estimate for running the two-year programme is worked out and the potential benefits are indicated.

I. 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 organized at national level, pilot sample surveys have been undertaken in selected landing sites. Based on the results of the surveys and information available with the participating countries, a plan for establishment of a marine fishery statistical system in Sudan is envisaged to generate marine fishery data for the country as a whole with a view to catering to the needs of scientists, engineers, administrators, legislatures, ... etc.

2. BACKGROUND INFORMATION

The coastline of the Democratic Republic of Sudan is about 720 Km. The offshore reef along the coastline generally extends from 6-10 Km; while in certain areas off Muhammad Qol and Sha'ab el Shubuk it extends from 30-80 Km. The shelf area is around 4,000 Km². The region has been well charted in British Admiralty Charts. The fisheries in the Red Sea coast of Sudan are artisanal and mainly based on handlining. However, a semi-industrial fishery is being developed by the participation of increasing number of launches fitted with inboard engines of 20-50 HP. According to the report prepared by O'riordan, B.J (MS) some 350,000-400,000 people inhabit in the coastal areas; and about 700-800 people are involved in catching fish. Fishing is carried out all along the coastline in various marsas. There are many scattered landing sites (Appendix 1); only a few are important from landings point of view. Khor Kilab and Abu Hashis areas in Port Sudan are the two important landing sites. In the area north to Port Sudan, Muhamed Qol is important while in the South, Suakin is considered as the main landing site. A Fishermen's co-operative Society has been set up at Muhamed Qol by the Project RAB/81/002. A coldstore, engineering workshop and Jetty facilities are available.

Ice is supplied for fishing trips by the co-operative. Facilities available at Suakin are comparatively good. Water, electricity, markets, easy road communication to Port Sudan and the fishing aids provided by the Overseas Development Authority (ODA) have greatly increased the fish landing prospects of this landing site. The coastal roads and their connections to the different landing sites are yet to develop to facilitate marketing of landed fish. In some areas specially in the north roads are extremely rough during the rainy season from October to February.

Port Sudan is the most important fish market for marine fish in the country, fish dealers buy fish directly from fishermen at the outlying landing sites and bring the fish into Port Sudan for sale. It is believed by the Fisheries Department, Sudan that one half of the fish sold in Port Sudan goes through the market. Fish dealers also carry fish directly to hotels, restaurants, ship chandlers at Port Sudan. Fishes collected through Fishermen's Co-operatives at Muhammad Qol and Arakayi are brought to Port Sudan market for sale.

Sport fishing during weekends, though not very popular is conducted in Khor Kilab and Suakin. Similarly collection of sea shells (Trochas, Mother of Pearl, conch ... etc) is also practised in discrete areas like Tawaritt and Entabil Marsha, .. etc.

3. EXISTING STATUS

The FAO/UNDP RAB/81/002 set up a pilot sample survey at Khor Kilab in Sudan. By sampling over days the estimate of monthly landings and their composition had been arrived at for the period Jan-Dec 1982. The scheme was extended to another important landing site Abu Hashis during 1983. Due to paucity of field staff continuing observations could not be carried out for all the months during 1983. Master Fisherman of FAO/UNDP RAB/77/007 had also collected data on the location and number of landing sites, fishermen, fishing units, fishing boats, fishing practices, fish species caught, .. etc. Barrania (1979) transcribed landing data at Port Sudan during 1975-1978. Based on his experiences acquired through field trips to markets and fishing

bases, annual marine fish landings at Sudan were estimated at 500-600 tons.

The Sudan/UK Red Sea Fishery Development Project collected statistical information on Red Sea fisheries. Since 1976, several ad-hoc surveys have been undertaken to count the number of fishing boats by type (canoes, felukas, motor launches) and number of fishermen in different fishing locations along the Red Sea coast. During 1982, an extensive survey (Appendix 1) has been undertaken, attempts were made to arrive at estimates of total marine fish landings in Sudan. During 1979 it was estimated at 770 tonnes. During 1982 the figure was put as 500-600 tonnes. These estimates are based on the average landings per day by a fishing boat of a particular type (e.g. feluka), the estimated number of fishing days during a month and the number of fishing boats of a particular type at a fishing location. The data were collected either from fishing boats and fishermen who had co-operated with the scheme or through field observations of ad-hoc nature. Objective methods of collection of field data based on probability sampling has not been used; and therefore the error of these estimates cannot be calculated. Over and above, data by species and fishing units (a combination of boat, gear and manpower) and fishing effort in terms number of trips, fishing hours and man hours, .. etc are not available in any of these surveys.

The Department of Fisheries in Sudan also builds up an estimate of annual marine fish production in Sudan. At Port Sudan fishmarket the daily (excepting Fridays and holidays) quantity of fish by varieties passing through the market is recorded by a field enumerator. It is believed by the Department that one half of fish consumed in Port Sudan area passes through the market; while in other areas in the Red Sea coast, it is assumed, based on some subjective judgements, that there are landings for 300 days in a year and the daily landings amount to some one tonne. To arrive at the estimate of the annual marine fish production in Sudan the quantity of fish in tonnes recorded at Port Sudan market is multiplied by a factor of 2; and the resultant product is added to 300 tonnes. The production statistics during split years (July to June) 1981-82 and 1982-83 were arrived at 1050 and 1167 tonnes respectively.

Thus while the data on landing sites and their fishing capabilities are available, the landing statistics and their requisite breakdown are either

non existent or suffer from errors due to subjective estimation methodologies.

4. DATA NEEDS

The statistical system should generate all types of fishery data needed by the ultimate users with a known level of accuracy and free from errors due to subjective judgements. 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/quarter
 - (b) Year
 - (ii) Space division
 - (a) Important landing sites
 - (b) Whole country
 - (iii) Fishing establishment/enterprise
 - (a) Industrial/semi 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/semi industrial
 - (b) Traditional
 - (c) Method of fishing
 - (d) Size class by GRT, length, HP, ..etc
 - (vi) Fishing effort
 - (a) Man-hours
 - (b) Trips
 - (c) Manpower

- (vii) Fish catch (a) Total and value at retail and whole sale level
- (ix) Trade statistics (a) Import of fish and fishery products (quantity and value)
 (b) Export of fish and fishery products (quantity and value)
- (x) Service facilities
 - (a) Cold storage
 - (b) Ice factory
 - (c) Workshops
 - (d) Licensing services

4.2 Statistics for biological studeis/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) Method 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
- (v) Fish Catch (a) Total
 (b) Species composition
- (vi) Biological data (a) Size composition of selected species
 (b) Sex, maturity, .. etc.

(Biological statistics are generally collected by the Biologists, based on their programme of work).

5. GENERAL OUTLINE OF STATISTICAL CONTENT

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

The very fundamental item in fisheries data is catch. It is termed as the nominal catch and is given by the live weight equivalent of landings i.e. landings on ex-water weight basis.

So landing data when undergo any treatment by way of dressing or processing should be converted into the corresponding nominal catch by applying a suitable conversion factor. In Sudan upto now marine fishes are landed either fresh and/or frozen. But in inland fisheries dried and salted fish are common.

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

5.1 Development of statistical standard

5.5.1 Species

A regional statistical standard (Appendix 2) for the Red Sea and Gulf of Aden has been established. This has been prepared according to groupings indicated in the International Standard Statistical Classification of Aquatic Animals and Plants (ISSCAAP). This will ensure comparability data collected in the neighbouring countries. The landing data in Sudan should, therefore, be collected as per this classification of species/species group.

5.5.2 Gear

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

5.1.3 Fishing Boat

The fishing boats in Sudan which are operated for marine fishing can be broadly classified under three categories:

(i) Non-mechanised boats:

Canoes of 2-3 meters in length to houries/felukas of 3-5 meters in length fall under this category. Hand line is the usual gear in use and daily trips by 1-3 persons are undertaken.

(ii) Mechanised Boats:

Houries/feluks fitted with outboard engines of 3-8 HP fall within this category. Sometimes depending on favourable wind sail is also used by these boats. These boats fitted with higher HP engine carry ice boxes and make trips of 2-3 day's duration.

(iii) Launches:

The launches built by the Marine Fisheries Department under the Boat Mechanization Programme are classified under this heading. Recently private parties are also building launches of longer length fitted with powerful engines. These launches carry ice boxes and may spend a week at a stretch in the sea.

5.1.4 Statistical Sub-Areas (Fishing Areas):

The Red Sea waters of Sudan can be divided into the following statistical sub-areas: (see map over leaf, Appendix 5)

(i) Waters off the coastal points at Egypt/Sudan border and at north of Halaib (22° 15'N) on the northern coast of Sudan including Foul Bay waters:

- Sub area number 5;

(ii) Waters off the coastal points at Halaib (22° 15'N) and 20°N Latitude (Marsha Arus):

- sub area number 6;

(iii) Waters off the coastal points at 20°N Latitude (Marsha Arus) and 19°N Latitude (south of Entabil) including waters around Eitwid reefs:

- Sub area number 7;

- (iv) Waters off the rest of the Southern coast of Sudan:
- sub area number 8;

5.2 Development of Survey System

5.2.1 Frame Survey

Frame survey (change survey) provides information on the size, type and localization pattern of the fishing units at a point of time. Based on this information sampling frames for sample surveys generating current statistics may be constructed. At present the data on fishing locations and their fishing capabilities can be gleaned from the reports prepared by ODA. In future these data may be up dated based on sampling and/or complete enumeration.

5.2.2 Current Statistics

Current Statistics will be collected through Catch Assessment Surveys and Marketing Statistical Surveys. Continuing Catch Assessment Surveys will be undertaken at selected landing sites while the Marketing Statistical Surveys will be conducted at Port Sudan fish market.

5.2.2.1 Catch Assessment Survey

(a) Objective

The objective of the Catch Assessment Survey will be to build up estimates of:

- (i) Monthly landings (catch) data by species and fishing units according to established statistical standard;
- (ii) Fishing effort in terms of fishing trips, fishing hours, man hours, .. etc expended to obtain the monthly landings (catch).

(b) Survey Method

The survey method depends on the level of development of the fishery, its organizational aspects, the localization pattern of the fishing units, their fishing and landing habits, the way the catches are handled and disposed of. These factors are more capital intensive and organised in respect of launches

fitted with inboard engines. The fisheries operated through these launches are semi-industrial in nature while the other fisheries operated by houries and felukas, etc constitute the traditional sector. The methodology of collection of data differs and they are, therefore, treated separately.

(i) Semi-industrial Sector

According to O'riordan (Op.cit) the distribution of the operating launches as of May-Oct. 1982 (Appendix 4) is as follows: Suakin - 36; Khorkilab - 20; Mahammed Qol - 9; Arakayi - 4; Dara - 2; and Arus - 2. Total - 73. The very ideal way of collecting catch data of these launches is through introduction of log book system. A properly designed log book which is kept by the master of the launch and returned at the end of each trip or perhaps once in a fortnight if the trips are of short duration may be the basic source of fishery data. This arrangement necessitates good will and co-operation on the part of the master of the launch. Unfortunately at the present moment the situation is not very congenial for introduction of the log-book system. At the base ports of the launches, however, there are field offices of the Department of Fisheries; and Fishermen's co-operatives also function at some of these ports. It is, therefore, planned that the catch data relating to launches landing at Suakin, Khorkilab, Muhammed Qol and Arakayi will be collected through actual observations and interviewing the fishermen at the time of landing. The catch by these launches are generally disposed of through specific merchants who also may be contacted to gather any missing information. The list of the operating launches (Appendix 4) which may be termed as Master-list will be updated every month through the existing licensing system and/or field observations. The data will be entered in specially designed survey form (Appendix 5). Catch data of launches operated from Dara and Arus will be collected through ad-hoc visits and/or enquiry depending on the availability of transport and field staff.

It may be emphasised in this connection that a great deal of care has to be undertaken to check the 'coverage' of the recorded landings by the launches. To facilitate this work a 'coverage-check' for the launches (Appendix 6) will be introduced.

(ii) Traditional Sector

In the traditional sector of fisheries, fishing is conducted by non-mechanized and mechanised canoes, houries and felukas. Continuing sample surveys covering this sector will be carried out at Khorkilab, Abu Hashis and Suakin. At Muhammad Qol and Arakayi all the landings pass through the Fishermen's co-operative society. The required data will be collected at the time of landing by complete enumeration. The sample survey design for the Catch Assessment Survey and the corresponding method of estimation are given below with reference to a particular landing site.

Survey Design:

Separate estimates will be constructed for each landing site Korkilab, Abu Hashis, and Suakin and as such sampling over landing sites is not done. However, 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 two randomly selected complete weeks will be allotted to Khorkilab while one randomly selected complete week will be allotted to Abu Hashis. At Suakin, however, three randomly selected weeks will be allotted. In the allotted week at each landing site data will be collected for six consecutive days selected at random. Landings at each of these landing sites take place through out the day; a time sampling will, therefore, be introduced on the day of observation. The sampling day will be divided into two parts: 0600-1200 hrs, 1200-1800 hrs. On the first

day of observation data will be collected from 1200-1800 hrs, while on the second day from 0600-1200 hrs; and on the third day again 1200-1800 hrs and so on. Data for two parts in the two consecutive days will form one day's landings. Six days observations during a week will constitute three days' landings. Landings between 1800 hrs of the first day to 0600 hrs of the second day which is termed as 'night landings' will be collected before the morning observations on the second day by enquiry. Similar night landing data will be collected on each of the other two morning-observation days. The same system will be followed in other allotted weeks.

Data will be collected for each type of fishing unit (boat, gear combination, generally known by the type of gear) separately. Attempts will be made to collect data as per the Fishery Survey Form number 1A and 1 (Appendix 7 & 8) from all the fishing units of a particular type landing on the day of observations. If, however, many fishing units land, then a sampling over landing fishing units will be introduced according to the following schedule:

<u>No. of 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 expected to land on the day of observation).

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

Methods of Estimation:

Let observations be made on \bar{d} days out of D days in a month ($\bar{d}=6$ at Khorkelab; 3 at Abu Hashis; 9 at Suakin. $D = 31/30/28/29$ depending on the number of days in a calendar month and year.

Let M_j = the number of fishing units of a particular type (e.g. handline) on the j th. day of observation; ($j=1,2,\dots,\bar{d}$).
 m_j = the number of such fishing units selected for sample.
 Y_{jk} = the catch (effort) of the K th. sample fishing unit of the particular type (e.g. handline) on the J th. day of observation, ($K = 1,2,\dots, m_j$)

The estimated catch (effort) on the J th. 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)

$$\hat{Y} = \frac{D}{\bar{d}} \sum_j \hat{Y}_j$$

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

$$V(Y) = \frac{D(D-\bar{d})}{\bar{d}(\bar{d}-1)} \left[\sum_j \hat{Y}_j^2 - (\sum_j \hat{Y}_j)^2 / \bar{d} \right] + \frac{D}{\bar{d}} \left[\frac{M_j}{m_j} \frac{(M_j - m_j)}{(m_j - 1)} \left(\sum Y_{jk}^2 - [\sum Y_{jk}]^2 / m_j \right) \right]$$

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

As indicated earlier at Muhammad Qol and Arakayi the data will be collected by complete enumeration. Fishery Survey Form No. 1A and 1 (Appendix 7 & 8) will be used for this purpose. Hopefully, the existence of Fishermen's

co-operative society and its organised marketing system will facilitate the collection of data. It is emphasised that the data are to be collected by physical observation/ weighing of fish and interviewing the fishermen from the landing fishing units at the time of their landing at the landing site not at Port Sudan market where the landed fish are ultimately transported for sale. This will greatly improve the quality of data collected.

5.2.2.2 Marketing Statistical Surveys

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

- (i) Marketed volume of fish by varieties and method of disposition;
- (ii) Prices of fish by varieties at the whole sale and retail level and the value of the marketed volume;
- (iii) Origin and destination of 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 the disposition pattern of the fish landings. In Sudan the Port Sudan Fish market is most important.

Present Situation:

The Port Sudan fish market has 14 fish stalls operated by fish merchants. Fish mongers and fishermen sell fish to these fish stalls. Generally the total quantity of fish brought by an individual is weighed in a platform balance before sale. As the price of fish does not vary according to the type of species (only Shark Sells at a lower price) not much attention is paid to weight by species.

The total quantity of fish passing through the market is recorded by the Department of Fisheries every day excepting Fridays and holidays. The record also includes information on eye estimated quantity of fish by variety and their origin. The names of fishing grounds, the types and number of fishing units and the crew size involved in catching the fish load transported to the market are also collected by interviewing the fishmongers and fishermen. The authenticity of this information is highly doubtful due to subjective judgements of the respondents who may not be directly involved in catching the transported fish. According to the records maintained by the Fisheries Department, the monthly quantity of fish in tonnes passing through the Port Sudan fish market during the split year 1982/1983 is as follows:

<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Total</u>
35.3	36.1	60.7	12.2	34.3	34.7	17.1	23.3	31.3	38.9	91.9	18.1	433.9

Future Plan:

The system of collection of data at the Port Sudan fish market will continue; however, the data element collected through interviews and eye estimation will be kept to the minimum and its authenticity will be examined through consistency checks. Data will be collected every day including Fridays and holidays. The scheme will include the following survey items:

- (i) Total quantity of fish brought by each fishmonger and fishermen;
- (ii) The origin of fish;
- (iii) The name of the merchant to whom fish is sold, and price per kilogram;
- (iv) Mode of transport;
- (v) Mode of disposition - (fresh/frozen, dried, salted, ... etc.)
- (vi) Fishing area as per the established sub-areas in Sudan;

(vii) Type of boat and gear involved in the catch;

(viii) Number of fishermen and boat involved in the catch;

(only when the fishermen bring the catch to the market).

The total quantity of fish brought to the market by each fish monger or fishermen is at present weighed in a platform balance kept in the market before the sale. A fish monger/fishermen bringing fish to the market will be termed as an 'arrival'. The number of arrivals in a day does not generally exceed 5-6, hence, the total fish brought by each arrival will be recorded separately. To collect data on fish composition every day a sub-sample of the arrivals will be selected systematically as follows:

The first,

The second,

The third,

The fifth,

The seventh, ... etc.

The catch composition of the sample arrivals will be determined by actually weighing the fish by species/species group with the help of a spring balance. The number of samples in a day should not be less than two. The data will be recorded in Fishery Survey Form No. 2 (Appendix 9). Fishes brought from Muhammad Qol and Arakayi should not be included in the sample as their catch composition have already been established through daily survey at the respective landing sites.

5.2.2.3 Yield Surveys for Shell Fish:

Objective:

The objective of the survey is to collect data relating to total yield by the following shell fish:

- (a) Spiny lobster
- (b) Mother of Pearl Shell
- (c) Conch

Survey Method:

The distribution of these fisheries is very discrete or patchy. Fishing is carried out along the fringing reef or small marsus. Spiny lobsters are boiled in the sea water and sold to specific merchants. Mother of Pearl shell and conch are also sold to a few merchants in Sudan. It is planned to collect the yield data relating to these fisheries through establishment of contact with the merchants.

A list of the merchants dealing in each of the products will be drawn and the data on the quantity purchased by each merchant will be collected through periodic visits. The weight of the processed products will be converted into the corresponding live-weight equivalent by using a suitable conversion factor. These data should, however, be compared and reconciled with the data maintained by Govt. offices. The method of collection of ancillary data on fishing .. etc will be planned in future.

5.2.2.4 Survey on Infrastructure Facilities:

The survey will collect information on the number, the capacity and the present level of utilization of the service facilities like ice factory, cold storage, workshops, ... etc available along the Red Sea coast of Sudan. The survey will be carried out at a particular point of time (say, once in 3 years). O'riordan (Op.cit) records some information on ice factory, ice supply to Suakin. This information will be supplemented through ad-hoc investigations by mail questionnaire and/or personal interviews.

6. IMPLEMENTATION

In Sudan, through the work carried out by RAB/81/002 and ODA Statistical Standard for species, gear, fishing boat, fishing areas have been established; data on locations of landing sites and their fishing capabilities have been collected. The next steps in the implementation of the work programme for establishment of statistical system should, therefore, be the following:

- (i) Organise Catch Assessment Surveys;
- (ii) Organise Marketing Statistical Surveys;
- (iii) Organise Yield Surveys for Shell Fish;
- (iv) Organise ad-hoc Survey on infrastructure facilities;

6.1 First Year

The continuing Catch Assessment Surveys at Khorkilab, Abu Hashis and Suakin and Marketing Statistical Survey at Port Sudan fish market will be undertaken on routine basis. A computer oriented layout of the statistical tables showing the available marine fishery data for Sudan will be designed.

Some derived statistics will be worked out showing the likely relations between the data generated by Catch Assessment Survey and the corresponding data relating to market inflow at Port Sudan fish market. It may be emphasised that the Catch Assessment Surveys and Marketing Statistical Survey are repetitive type; these will be conducted every month.

6.2 Second Year

6.2.1 Computarization:

For the first year data will be processed manually. By this time the methods of collection of data will be finalized and the layout of the statistical tables in which the various marine fisheries data will be available to the ultimate users will be given a final format. At this stage the processing of data will be done through computers. The completed survey forms trip reports ... etc will be the source documents and the format of these documents should be amenable to automatic data processing. An Annual Fisheries Bulletin for Sudan may also be contemplated. The computer print outs will form the various tables relating to

marine fisheries in this Bulletin. This will reduce the time lag between collection of field data and publication of results; the processed data will be available to the ultimate users well in time.

6.2.2 Extension of Survey Programmes:

During the second half of the second year the yield surveys for shell fish and ad-hoc survey on infrastructure facilities will be introduced. The required conversion factors for converting the product weight into the corresponding live-weight equivalent will be worked out based on field experiments.

6.3.3 Consolidation of Survey Programmes:

Survey programmes will be institutionalized to facilitate smooth running at the planning and implementation stage. The technical contents of the newly established statistical system should be well documented in the form of handbooks to be used by field staff, data processors and field supervisors, .. etc. Some of the documents should be available in Arabic so as to ensure proper comprehension by the users.

7. ORGANIZATIONAL 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. Marine Fisheries Research Department is located at Port Sudan and the staff members of this Department are the main users of these data. Hence, the marine fishery statistical section should be developed as a part

of Marine Fisheries Research Department at Port Sudan. This should however function in close collaboration with the Fishery Statistics Division located at Khartoum. 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 Headquarter at Port Sudan:

One officer will be responsible for marine fishery statistics. He will plan the Statistical Surveys, organize, supervise, have the data processed and transmitted in proper format to the Fishery Statistics Division at Khartoum. While executing the job he should be helped and guided by an International Expert on Fishery Statistics during the initial two years when the newly designed plans will be executed. The officer-in-charge (Fishery Statistics) will be helped by data processing staff and field staff as indicated below.

7.2.1.1. Data Processing Staff:

All the field data will be scrutinised by the officer-in-charge (Statistics) under guidance of the International Expert. The data will be processed by the field staff themselves according to the survey design and estimation procedures. The officer-in-charge will render the necessary help as and when required.

7.2.2 Field Staff:

Catch Assessment Survey:

The manpower requirement at different locations is given below.

<u>Sector & Location</u>	<u>No.</u>
A. Semi-Industrial Sector:	
Khorkilab	1

<u>Sector & Location</u>	<u>No.</u>
Suakin	1
Muhammad Qol	1
Arakayi	1
	<hr/>
Sub-Total	4
B. Traditional Sector:	
Khorkilab	1
Suakin	1
	<hr/>
Sub-Total	2
C. Marketing Survey:	
Port Sudan	1
	<hr/>
Sub-Total	1
Grand Total -----	7
	=====

7.3 Equipment

The equipment necessary will be as follows:

During the first year when the processing of data will be done manually, seven scientific desk calculators will do the job, while during the second year depending upon the volume of data and its storage needs a mini computer will be chosen.

For the field staff spring balance of suitable range 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

(i) Transport:

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

(ii) Incentives:

Collection of fishery data by actual observations is a

difficult job. This routine type of job is difficult to perform for a long time. Hence, field enumerators should be provided with an incentive by way of paying some extra money. This should improve their performances.

8. ESTIMATED COST (US\$)

A. Personnel

	Total	1984 <u>1st yr.</u>	1985 <u>2nd yr.</u>
<u>International Staff</u>			
1. Fishery Statistician(P.5)	226,800	109,080	117,720
2. System Programmer (P4) 4m/m	20,000	-	20,000
Sub-total	246,800	109,080	137,720
<u>National Staff</u>			
1. Officer-in-charge (Fishery Statistician) @ \$ 150 per month	3,600	1,800	1,800
2. Field Staff (7) @ \$ 75 per month	12,600	6,300	6,300
Sub-total	16,200	8,100	8,100
Component Total	263,000	117,180	145,820

B. Other Costs

1. Duty travel	10,000	5,000	5,000
2. Incentives for 8 persons @ \$ 30 per head per month	5,760	2,880	2,880
3. Equipment & Supplies	30,000	5,000	25,000
4. Vehicles (2)	12,000	12,000	
5. Reporting	10,000	5,000	5,000
6. Drivers (2) @\$75/mo.	3,600	1,800	1,800
7. Miscellaneous	5,000	2,000	3,000
Component Total	76,360	33,680	42,680
Total Cost	339,360	150,860	188,500

9. PROJECT OPERATION

During the extended phase of the project RAB/81/002 the planned proposals can be executed through the Regional Project. This will reduce the financial commitment due to international staff and some travel costs. The national government is to bear the cost of national staff and other costs which cannot be met by 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. The data will be available to the ultimate users on timely basis. Hopefully this will lead to better planning and evaluation of marine fishery projects and also play an important role in the day to day decision process for development and management of marine fisheries in Sudan.

The National Staff will work shoulder to shoulder with the International Experts for a period of two years. This will develop local expertise in the field of marine fishery statistics. They will be capable of looking after the statistical needs of the country when the international help fades away.

REFERENCE

- | | |
|---------------------|--|
| Barrania, A. (1979) | The exploratory Socio-economic survey of the Sudanese Red Sea Fisheries. |
| Oriordan, B.J. (MS) | A report on the collection of catch and effort data on the Sudanese Red Sea Coast.
May 1982 - December 1982 |

APPENDIX 1

Landing Sites, Fishermen, Boats in Sudan 1982

1. FULLTIME

Landing	Number of fishermen	Unpowered canoes & fleukas	Felukas with out boards	Small motor launches	Larger motor launches
Mohamed Qul & Dunganab	55	16	-	10	-
Salak, Arakii & Paraa	20	-	-	4	-
Aruus	16	4	-	-	2
Parur	17	4	-	-	-
Halote	5	5	-	-	-
Regeba	10	4	-	-	-
Abu Hashis	60	11	9	-	-
Khor Kelab	104	6	15	4	9
El Malaha	2	2	-	-	-
Towarfit	30	16	2	-	-
Darmat	10	4	-	-	-
Suakin	146	26	7	25	7
Entibib	30	10	2	3	-
Sheik Ibrahim & Sheik Gaad	11	7	-	-	-
TOTAL	506	115	32	46	18

Source : ODA Report

APPENDIX 1 (Contd.)

Landing Sites, Fishermen, Boats in Sudan 1982

2. Part - time

Landing Sites	Number of fishermen	Unpowered canoes & felukas	Felukas with out-boards	Small motor launches	Larger motor launches
Halib	10	3	-	1	-
Aruus	41	3	5	-	5
Halote	6	1	2	-	-
Ragaba	3	-	1	-	-
Abu Hashis	55	29	10	-	-
Khor Kelab		4	1	-	4
Towarfit	6	2	1	-	-
Enharis Entabib	2	2	-	-	-
Heidub	18	-	-	-	5
Sheik Saad	20	5	-	-	5
Agatai	5	-	-	1	-
Agig	6	2	-	1	-
TOTAL	198	51	20	3	19

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: otolithes sp.
Snappers	Lutjanidae	Example: <u>Lutjanus lineolatus</u>
		<u>L. gibbus</u>
		<u>L. bohar</u>
		<u>L. argentimaculatus</u>
		<u>Pristipomoides types</u>
Grunts	Pomadasyidae	Example: <u>Pomadasye hasta</u> <u>Pomadasye, Opisthulopsis</u>
Sweetlips	Pomadasyidae	Example:

Appendix 2 (continued)

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

Statistical Item	Family/Genus Name	Scientific Name
GROUP 33(contd.)	PERCHES, BREAMS, SNAPPERS , ETC. (Redfishes, Basses, Congers etc.)	
Red Mulletts	Mullidae	Example: <u>Mulloidichthys flavolineatus</u> , <u>upeneus</u>
Parrot fishes	Scaridae	Example: <u>Scarus harid</u>
		<u>S. ghobban</u>
Emperors	Lethrinidae	Examples: <u>Lethrinus harak</u>
		<u>L. mahsena</u>
		<u>L. nebulosus</u>
Sea Breams	Sparidae	Examples: <u>Argyrops spinifer</u>
		<u>Mylio bifasciatus</u>
Threadfin Breams	Nemipterus spp.	Examples: <u>Nemipterus japonicus</u>
Lizard fishes	Synodontidae	Examples: <u>Saurida undosquamis</u>
		<u>S. tumbil</u>
Pony fishes	Leiognathidae	Example: <u>Leiognathus sp.</u>
Moharras	Gerreidae	Example: <u>Cerres oyena</u>
Seacatfishes	Ariidae	Example: <u>Arius thallassinus</u>
Therapons	Theraponidae	Example: <u>Therapon jarbua</u>
Rabit fishes	Siganidae	Example: <u>Siganus rivulatus</u>
Squirrel fishes	Holocentridae	Example: <u>Holocentrus spinifer</u>
Surgeon fishes	Acanthuridae	example: <u>Acanthurus sp.</u>

Appendix 2 (continued)

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

Statistical Item	Family/Genus Name	Scientific Name
GROUP 34(contd.)	JACKS, SCADS, MULLET, GARFISHES, ETC.	
Barracudas	Sphyraenidae	Example: <u>Sphyraena jello</u> <u>S. barracuda</u>
GROUP 35 :	HERRINGS, SARDINES, ANSHOVEES, ETC.	
Herrings/Sardines	Clupeidae	Examples: Herklotsi <u>chthys punetatus</u>
		Examples: <u>Sardinella gibbosa</u>
		<u>S. longiceps</u>
Anchovies	Engraulidae	Example :
		<u>Stolephorus</u> sp.
GROUP 36:	TUNAS, BONITOS, BILLFISHES, ETC.	
King fish	Scombridae	<u>Scomberomorus</u> <u>commerson</u>
Spanish mackerel		<u>Scomberomorus</u> <u>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 albacores</u>
		<u>Thunnus alalunga</u>
		<u>Thunnus tongol</u>
Dogtooth tuna		<u>Gymnosarda unicolor</u>
Oriental bonito		<u>Sarda orientalis</u>

Appendix 2 (continued)

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

Statistical Item	Family/Genus Name	Scientific Name
GROUP 36: TUNAS, BONITOS, BILL FISHES, ETC.		
Sailfish/Bill fish	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</u> <u>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		Example: <u>Luba pelagica</u>
GROUP 43. LOBSTERS, SPINY LOBSTERS, ETC.		
Spiny lobster	Palinuridae	Example: <u>Palinurus</u> sp.
GROUP 45: SHRIMPS, PRAWNS , ETC.		
Shrimps/prawns	Penaeidae	Example: <u>Penaeus</u> sp.
GROUP 57. SQUIDS, CUTTLE FISHES, OCTOPUSES, ETC.		
Squid	Loliginidae	
Cuttlefishes	Sepiidae	

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)
Trammel net
Combined gill net-trammel 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 4

LAUNCHES BASED IN SUAKIN AND TO THE SOUTH MAY - OCTOBER 1982

<u>No.</u>	<u>Owner/Captain</u>	<u>Crew</u>	<u>Engine</u>	<u>H.P.</u>	<u>Comments</u>
1.					
2.	Ahmed Museri	3	"	"	
3.	Abdul Gatel Baiid	3	"	"	Enharse Sept '82
4.	Ahmed Abdulraim	3	"	"	
6.	Muha,,ed Sale Birak	4	Lister	23	
7.	Ali Birki Mubruk	4	"	"	
8.	Abu Medina Abdulla	4	"	"	
9.	Mashia Garmoush	4	"	"	
10.	Abdulla Eid Balet	5	"	"	
11.	Hassen Ismail Hassan	5	"	"	
12.	Muhammad Dakil Alla	4	"	"	
13.	Ali Awli/Mashim Abass (Cooperative Owned)	3	"	"	New Launch '81/'82 Old Engine
23.	Sheva Ahmed Ahmed	4	"	"	
24.	Sagi Muhammad Baiid	3	"	"	
25.	Fareg Fareg Fareg	1	"	"	
27.	Aran Coop/Ibrahim Sheva	4	"	"	
31.	Suleman Muhammad Suleman	3	"	"	
32.	Mamed Salin Masaod	4	"	"	
33.	Tahir Gilany/Ali Elmusny	3	"	"	
34.	Said Muhammad Baiid	3	"	"	
36.	Mahmoud Bashir Hamid	4	"	"	
37.	Hashim Muhammad Ali	?	"	"	
42.	Muhammad Ahmed Dubaly	4	Volvo	50	No Records May-Oct Owner Died Aug '82 For Sale (Oct '82)
45.	Agatai Cooperative	3	C.V.	7.5	New Launch Sept '82
46.	Aqiq Cooperative	3	"	"	" " " "
50.	Aran Coop/Ali Abu Anna	3	"	"	
	Ali Lasmi	4	Yanma	25	
Y50	Ali Muhammad Mubruk/ Bajit	4	"	40	
	Salim Salem	4	"	"	
	Seedi Mashim	4-6	"	"	
	Magboul	4	"	25	Damart/Suakin
	Salim Hamid	4	"	40	
	Ahmed Ali	4	"	"	
C.1	Abdulla El Kasifa	3	"	10	
140	Fawai Hassan	5	"	60	
137	Halif	4	Lister	23	Fisherie Dept. Engine
	Muhammad Ali Higi	4	Yanma	25	
TOTAL 36					

<u>Area</u>	<u>Boat Type</u>	<u>Engine</u>	<u>Owner/Captain</u>	<u>Crew</u>
Arakayi	Launch No.29	Cov Vic	Arakayi Coop	4
	Launch No.47	"	Fisheries Dept.	4
	Launch No.49	"	Arakayi Coop	4
	Launch No.51	"	Arakayi Coop	4
Dara	Launch	Ford 6	Hamsa	4
	Launch No.30	Cov Vic	Issa Hashim Hussein	4
Arus	Launch	Dukh 3	Ismail Hamed Mohmed Fagar Esau Mohamad	4

<u>Area</u>	<u>Boat Type</u>	<u>Engine</u>	<u>Skipper</u>	<u>Crew</u>
Dunganeh	Launch No.16	Lister	Adrob Ahmed Hamen	Mohmed Adrob Sadan Abdeiraim Ahmed Risa Hamden Mohmed Abdelraim
Muhammad Qol	Launch No.17	Lister	Ahmed Mohmed Okir	Hesein Risa Hassan Hessin Elhassan Hashim Mohmed Risa Mohmed Ahmed Hessin Ahmed Eisab
	Launch No.19	Lister	FAO/Abu Hamed	
	Launch No.20	Lister	Ahmed Ali Dukan	Baly Mutwakil Mohmed Kalas Osman Abdelraim
	Launch No.28	Cov Vic	Mohmed Herein	Hessin Mohmed Hessin Ahmed Ali Mosa Mohmed Mohmed Handan
	Launch No.38	Bukh	Hessin Berab	Mohmed Nakshab Ahmed Ansir Oshik Ali Wagj Elhessin Berab
	Launch No.39	Bukh	Taha Eisa	Elhessin Hamed Mohmed Ali Rbanait AbdElgader Taha Mohmed Ahmed Ebeid
	Launch No.40	Bukh	Mosa Mohmed Omar	Mohmed Hassan Hamed Mohmed Mosa Mohmed El Hag Hessin Mohmed Mosa Osman Serror

<u>Area</u>	<u>Boat Type</u>	<u>Engine</u>	<u>Skipper</u>	<u>Crew</u>
Mohammed Qol	Launch No.41	Bukh	Ali Dukan	Osheik Ali Babekir Mohmed Ahmed Ali Ahmed Alla Gabu Ghaba Ali
	Launch No.44	Bukh	Mosa Mohmed Omar	Messin Merker Eisa Osman Ali Osman
TOTAL 9				

LAUNCHES BASED IN KHOR KILAB

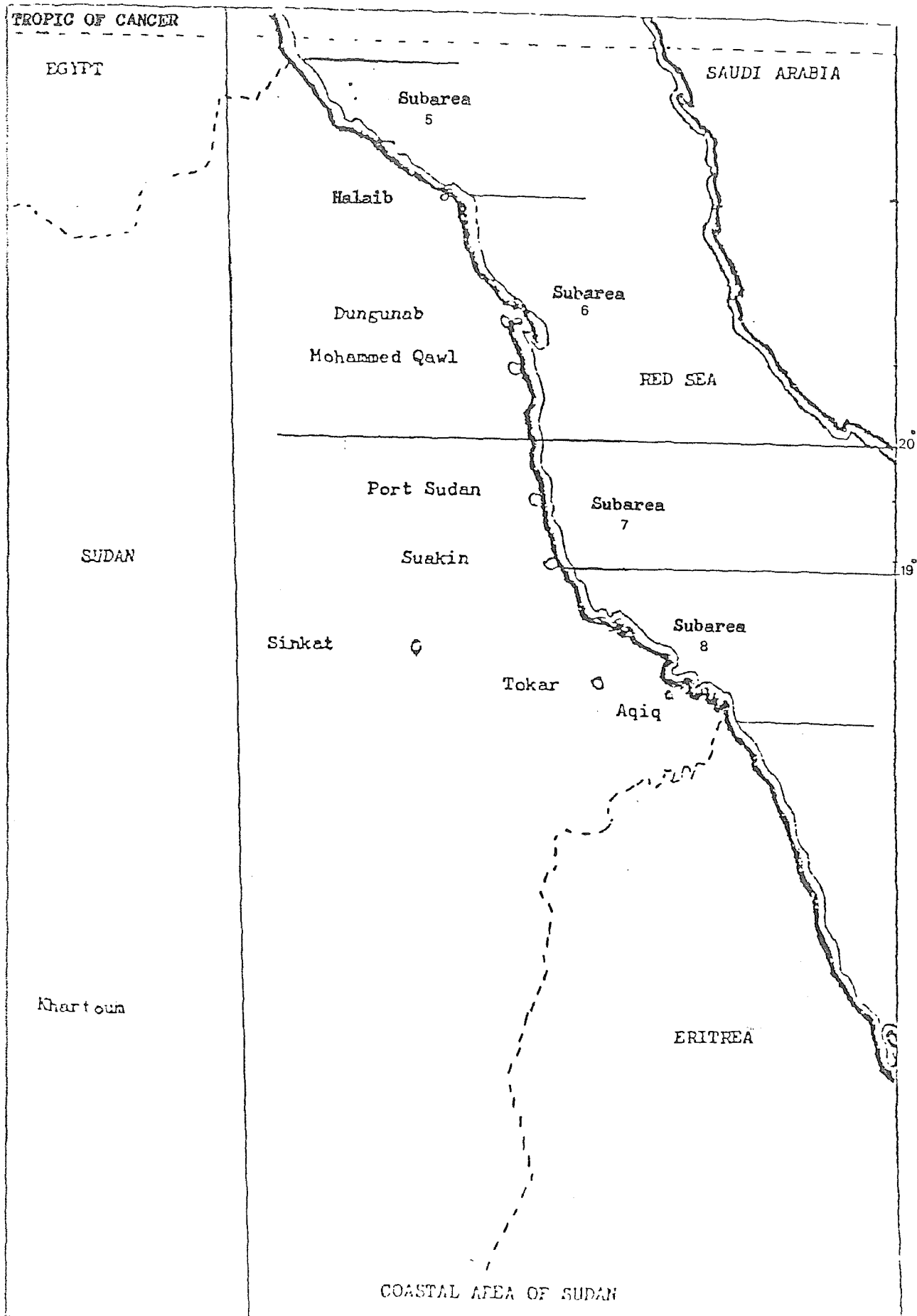
<u>OWNER/CAPTAIN</u>	<u>No.</u>	<u>Engine</u>	<u>H.P.</u>	<u>Crew No.</u>
Hassan Abu Medina	5	Ferkins	20	3
Abdel Abdul El Khalig	15	Lister	23	3
Abdlanart Coop	18	Lister	23	4
Abu Medina Muhammed	21	Lister	23	3
Ali Muhammad Idris	116	Bedford 6	50	3
Mitem Ali Tahir	138	Thames 6	50	3
Wajag Ali Dukan		Yanma 3TE	35	3
Sherif Ahmed		Yanma 3TE	35	3
Ali Bedri	130	Yanma 3TE	35	3
Hussein Adam	133	Yanma 3TE	35	3
Muhammad Tahir (Tumera)	128	Yanma 2TE	25	3
Muhammad Okir		Yanma 3TE	35	3
Ahmed Okir		Bedford 6	50	3
Hussein Musa		Bukh B21/71	30	3
id Abdulla		Thames 6	50	3
Tabikra Hamed		Bedford 6	50	3
Suror Abdulla		Bedford 6	50	3
Hamido/Halim Id*		Yanma 3TE	35	3
Hashim Osman		Yanma 3TE	35	3
Ibrahim Fallah		Yanma 3TE	35	3

TOTAL 20

* Hamido's launch was sold and then lost Sept. '82
Muhammed Derry's launch used for Trochus Fishing

MAP OF THE SUDAN COASTAL AREA

35°E



APPENDIX 7

DEPARTMENT OF FISHERIES

SUDAN

Fishery Survey Form No. 1 A

RECORDS OF LANDINGS

Landing Site _____ Fishing Unit _____ Date _____

Observer _____ Period _____

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		

Appendix 9

DEPARTMENT OF FISHERIES, SUDAN
Marketing Statistical Surveys at Port Sudan Fish Market
Fishery Survey Form No. 2

Name Of Enumerator _____ Date _____

Total Arrivals: _____

Sr. No. *	Origin	Quantity (Kg)	Name of Buyer/ price per kg	Mode of Transport	Mode of Disposition	Fishing Area	Type of Fishing Unit	No. of fishing units (Optional)	No. of Fishermen (Optional)	Remarks
1										
2										
3										
4										
5										
6										
Total										

*Encircle the sample units

SAMPLE ARRIVALS

Sample No.	(1)	(2)	(3)	(4)	(5)	(6)
Serial No. as per table given above						
Origin						
TOTAL						
Species as per Statistical Items						

Space for estimation purposes

