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REPORT ON MANAGEMENT PLANS FOR SUDAN

DR. RANDA ELTAYEB & MR. HAMMAD SHANTO SALIH

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NATIONAL REPORT ON MANAGEMENT PLANS FOR THE SUDAN

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1. INTRODUCTION

Sudan is situated in the North-East of Africa and covers an area of 1,886,068 km^2. Sudan has 18 states and a current population of some 40 million as per available statistics. The jurisdiction of Sudan on the Red Sea is limited to a coastline of some 750 km and an Exclusive Economic Zone of 91 600 sq. km of which 22 300 km^2 constitute the shallow coastal area.

Sudan borders seven countries (Egypt, Eritrea, Ethiopia, South Sudan, Central African Republic, Chad and Libya). With a total land boundary of 7 687 km and has a population of 40 million and an annual growth rate of 1.6 (2020). In 1989, Sudan adopted a Federal Government System. Accordingly, an administrative structure of 18 autonomous States was established. The Sudanese coast lies within the Red Sea State. This state has an area of 214 458 km^2 of which 55 percent is pastoral grounds, 42 percent is saline and desert areas and 3 percent is cultivable lands. Coastal populations rely mainly on the sea for their food security and income generation in such an area with limited alternatives livelihood opportunities.

Agriculture (including fisheries) dominates Sudan economy contributing 80 percent of the total working force and 42 percent of the GDP. **The contribution of fisheries in GDP is currently marginal.**

The Fisheries G.D within the Ministry of Animal Resources is the central fisheries authority entrusted with planning, policy formulation, training and overall supervision of the fisheries sector. This administration is answerable to the Undersecretary of the Ministry. It is formed of (5) main Sub administration: namely:

- **Capture fisheries**
- **Aquaculture**
- **Conservation**
- **Statistic, and**
- **Marketing and training center**

At the state level, Fisheries Administration structures are under the umbrella of the Director General of the State Ministry of Agriculture who is answerable to the State Minister of Agriculture. There are currently 18 fisheries administration structures in the states endowed with fisheries resources including the Red Sea State.

This current Fisheries General Directorate discharges its mandatory obligations from its headquarters and associated structures based in Khartoum in close coordination with its Marine Fisheries Department in Port Sudan (Red Sea State) and with other relevant public and private sector institutions and agencies.

2. FISHERIES IN SUDAN

Sudan Marine Fisheries is small-scale and artisanal in nature, as defined as a labour-intensive fishery that is conducted by artisanal craftsmen whose level of income, mechanical sophistication, quantity of production, fishing range, political influence, market outlets, employment and social mobility and financial dependence keep them subservient to the economic decisions and operating constraints placed upon them by those who buy their production. As of yet, no industrial and or recreational fisheries have emerged. The limited number of 20 tonnage capacity foreign trawlers that frequent the territorial waters usually operate on seasonal basis mainly targeting shrimps and discarding the by-catch.

.Sudan territorial waters are generally characterized by weak currents, lack of upwelling phenomenon, weak tide (1-2 feet), high water temperature (20 degrees in February and 33 degrees in August), high salinity, (39-45 percent) lack of permanent rivers and freshwater runoff except the freshwater reaching the sea seasonally from Baraka River forming Delta Towker in the south and rain water that influx through valleys and ephemeral khors such as Arbaat in the north and Khor Kilab, Khor Moug, Hoshiery Valley and Khor Nawarat south of Port Sudan. These basic characteristics are believed to have their negative impact on productivity and organic production of the Sudanese sector of the Red Sea. These same territorial waters are rich in intensive coral formations in the inner and outer continental shelf. Although these corals represent attractive feeding localities and refuge areas for coralline fish as well as resorts for tourism activities, they also constitute obstacles to bottom trawl fishing due to their irregular beds.

Mariculture constitutes a potential avenue to augment fish production from capture fisheries for local consumption and export. Emphasis has been historically placed on oyster cultivation targeting production of oyster shells for export as raw material for button manufacturing, cosmetics, medicinal and inlay works. Technologies for oyster cultivation from spat collection to market size stages have been developed and implemented in small-scale oyster family farms adjacent to human settlements in the northern sector of the Sudanese coast. These technologies need to be further investigated and disseminated for expansion of this lucrative business. Over and above, there are other indigenous finfish and crustacean species which may be qualified and feasible for cultivation in land- based structures (ponds, pens, and lagoons) or floating cages in the open water. Diversification and intensification of mariculture is a research and development area that accord high priority in government policies for proper resource utilization for food security and socio-economic enhancement.

2.1 Marine Capture Fisheries

Some 450 bony fishes have been identified in the Red sea out of which some 250 species are found in the Sudanese coast. The following have been identified:

- 65 commercial bony fish's species, (5500t/y).
- 4 commercial Mackerel (tuna) species.
- 2 Molluscs commercial species.
- Sharks, rays, lobsters, crabs, sea cucumber & shrimps, ornamental fishes, pearl oysters, sea weeds.
- 3 species of marine mammals (Dolphin).
- 4 Turtles species.

The table below gives the potential, annual catch and number of fishermen at nine locations in Sudan. The number of boats is also given.

Table 1 : Some statistics

No.	Source Location	Potential (MT)	Area / Km^2	Fish Catch mt/year	No of fishermen	No of Boats
1	The Red Sea	**10000**	**91600**	**5000**	**2000**	**600**
2	Jebel Aulia Dam	**15000**	**600–1500**	**13000**	**4500**	**2000**
3	Roseires Reservoir	**4100**	**290**	**1700**	**885**	**800**
4	Sinnar Reservoir	**1100**	**140- 160**	**1000**	**610**	**305**
s5	Khashm el Girba Reservoir	**800**	**125**	**500**	**744**	**372**
6	Lake Nubia	**5000**	**830 -1144**	**2000**	**920**	**560**
7	River Nile	**4000**	**4400**	**2000**	**-**	**-**
8	Merowe Reservoir	**5500**	**800**	**925**	**900**	**460**
9	Setit &Upper Atbara Reservoir	**1700**	**297**	**-**	**-**	**-**

2.2 Fishing gears

The main fishing gears used are namely: trawling nets, purse seine, gill nets and long lines are also common.

2.3 Fresh water and capture fisheries

Some 125 species have been identified of which 44 to 48 have a high commercial & economic value. The taxonomy of the aquatic fauna and flora is neither accurate nor complete, not all inland waters have been surveyed. Fresh water fish species consists mainly of Tilapia sp. (40%), *Clarias* (50%) and others (10%). Common cultured species in Sudan depend on local markets demand. Note that shrimps are the only cultured species.

Clarias gariepinus

Tilapia *spp*

Table 2 : Annual Catch (over 10 years)

year	Freshwater (t)	Marine Fish(t)
2010	27,000	486.90
2011	28,100	592.89
2012	25,000	118.14
2013	30,000	232.40
2014	28,000	473.20
2015	33,000	925.50
2016	33,150	2850.00
2017	38,390	3654.00
2018	39,800	4850.00
2019	40,916	5190.00
2020	51,270	4196.00

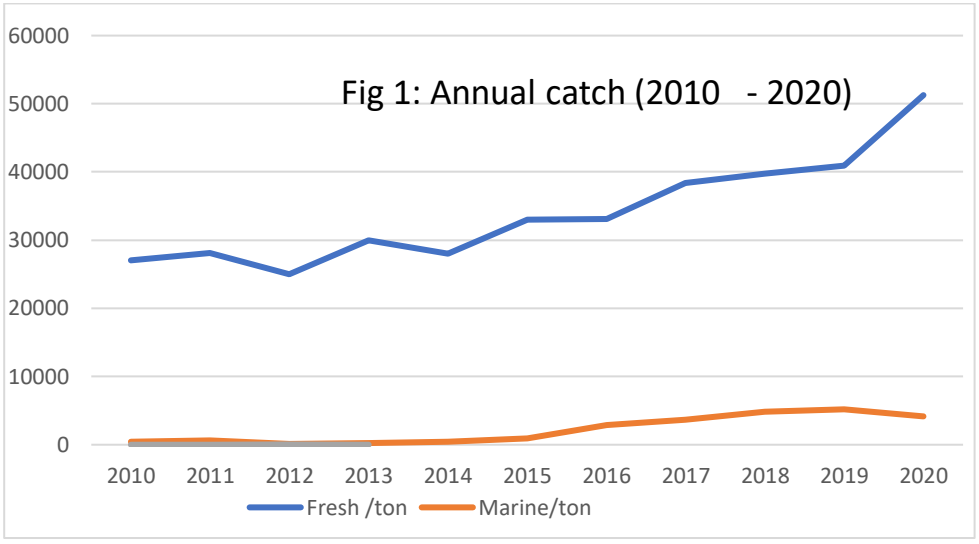
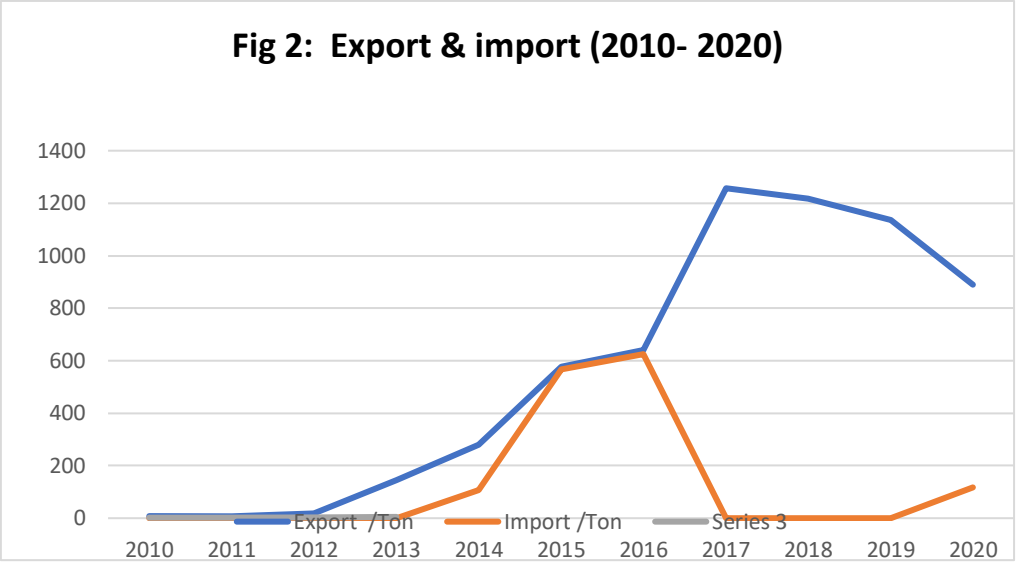


Fig 1: Annual catch (2010 - 2020)

Table 3 : Export & import

year	Export (t)	Import (t)	Value us $
2010	8.0	0	14375
2011	7.2	0	15200
2012	18.2	0	65320
2013	145.3	0	127440
2014	279.5	108	228250
2015	576.4	566	164336
2016	639.1	625	467239
2017	1,256.3	0	79580
2018	1,216.6	0	1386020
2019	1,137.2	0	1147839
2020	889.5	116.8	897015



As for finfish, fishing activities are carried out by the artisanal sector using traditional gear, craft and fishing techniques and frequenting near shore areas. Investments in commercial fisheries are limited in magnitude with a tendency to increase in recent years using small and medium-size trawlers and purse seiners. Some firms are engaged in collection and marketing fish through different forms of production relations with local fishermen. Cartilaginous fishes include 30 species of sharks and 21 species of skates and rays. The reported bony fish's amount to 280 species. However, 60-70 percent of the finfish catches are attributed to *Epinephallus aerolatus*, *Lutjanus bohar*, *L.gibbus*, *Lethrinus* spp., *Caranx* spp., *Plectiopomusmaculates*, *Aprion* spp., *S comberomorus commersoni* and *Mugil* spp. Estimates for finfish potential in the Sudanese waters are rather discordant ranging between 6 000 and 35 000 tonnes/year as proposed by stock assessment studies at different times. However, for precautionary approach measures, a fish potential figure of 10 000 tonnes/year is adopted. Of this, the current annual finfish landing did not exceed 5 000 tonnes.

Molluscs of commercial importance include *Pinctada margaritifera*, *Trochus dentatus*, *Strombus*, *Lambia*, *Chicorus*, *Fasciolaria* and *Sypraya* spp. The first two species contribute to over 90 percent of the wild mollusc collection which is exported to Europe as raw material for button manufacturing, cosmetics and inlay works. Other species such as *Strombus Lambia* and *Tridachnia* are also fished for local market as souvenirs or use of the shell and meat as ingredients in poultry feed and local perfume production. The available production statistics need updating.

The fish resources associated with the coral formations and their vicinity can contribute, apart from food security, in supporting a vigorous ornamental fish industry. There are three types of coral reef in the Sudanese waters including the fringing reef, barrier reefs and atolls. Sanganab atoll. (35 km northeast of Port Sudan) has been declared since 1990 as an internationally recognized Marine National Park. Management of this park is the main responsibility of Environmental and Wildlife Protection Force of the Ministry of Interior. Two other potential marine reserve areas have been surveyed and identified in Makoar Island and Dongonab Bay (approximately176 km north of Port Sudan). Administrative and legal steps pertaining to their official declaration are underway. In these areas the threatened Dugong, Sea Turtles, Sharks, Manta Ray and resident and migratory birds such as Osprey, Goliath, Heron, white-eyed gull, Sandpipers and Crab Plover have been reported.

Apart from fragmentary studies on finfish, no stock assessment data and basic information are available for these resources. Much of the research emphasis was placed on oyster biology and culture technologies. Several alternative hanging and bottom culture systems have been evaluated and tested in pilot farms. Based on that, a programmer of establishing small oyster family farms was launched with financial support from the Ministry of Agriculture, Animal Resources and Irrigation of the Red Sea State, OXFAM and ACCORD.

Seven fishing zones have been recognized and exploited within Sudan Territorial Waters. These are:

- **Bays, Inlets and "Merssas**". These are single channel, bilobate and trilobate water bodies perpendicular to the coastline and extending inland for 1-5 km with water depth ranging between 15 - 100 fathoms. This zone is famous for Sardine and Siganus sp.
- **Coastal Boat Channels** extending for some half a mile from shore with a depth of approximately three fathoms and harbours mullet milk fishes and *Lethrinus* spp.
- **The fringing reefs** paralleling the coast at 1-2 miles inwards. Important fishes such as Cranx, *Litharinus Plectropomas* are fished from this zone
- **Deep Boat Channel** with a depth ranging between 40-200 fathoms and famous for fishing of Aprion and sharks.
- **Outer Barrier Reefs** within the continental edge in which fishes such as *Lutjanus bohar*, *L. gibbus*, *Variola louti* are predominant.
- **Pelagic zone** of over 300 fathoms in depth occupied by Agus, Cranx, Mackerel, Tuna, and others.

A limited number of trawlers are used in coastal and offshore fishing. Fishing gear in use include surrounding nets, seine nets, gillnets, cast nets, handline, hook and line and limited number of trawl nets used in seasonal bottom and mid water fishing.

There are 1 800 registered local fishermen operating 410 fishing crafts including 3–5-metres dugout canoes (Houri), 5-7 metres wooden and steel boats (Felucca) and 7-10 metres lunches (Sambouk). The majority of the Houris is maneuvered by wooden oars and bamboo staff while the other fishing vessel are fitted with outboard or inboard engines ranging between 10 and 100 horsepower. Over and above, there are some 50 medium size wooden boats and steel trawlers of capacities in the tune of 20 - 25 tonnes each most of them operate on seasonal basis. Trawling is performed by a limited number of small size trawlers in confined areas in southern and northern parts of the Sudanese Red Sea and mainly of seasonal nature targeting shrimps, lizard fish, goat fish and threadfin bream.

Cultivation of the black-lip mother-of-pearl shell, *Pinctada margaritifera,* is the form of mariculture practiced in Sudan. The systems adapted for oyster cultivation are based on off- bottom and bottom culture techniques. Culture operations were geared towards production of oyster shells for export as raw material for button manufacturing, cosmetics and inlay works. The industry is predominantly based on oyster family farms along the Sudanese coast on the Red Sea, as well as large investment in artificial pearl production.

The marine environment and fisheries have been observed to be apparently subject to various hazards and risks that demand high priority attention. Some of these negative impacts are cited below:

- Overfishing of and stress on some component of fisheries resources because of improvement of fishing gears and techniques (e.g., overexploitation of historical locations for wild oyster collection in Dongunab Bay and Mohamed Goal area in the north coast and Suakin Archipelago in the south).
- Illegal fishing performed by unlicensed foreign vessel and smuggling of catch.
- By-catch and discards of untargeted fish which is thrown back to the water particularly by shrimp trawlers and its negative economic and environmental impacts.
- Use of illegal fishing methods (e.g., dynamite) by foreign fishermen or fishing during the breeding season.
- Destruction of coral community stands and dredging of fishing grounds in the process of construction of new ports (e.g., Bashayr Petroleum Port, rehabilitation of Suakin Port and Ooseif Port).
- Deterioration of coastal environment through cutting of mangroves and blocking of natural water courses from reaching the sea by the fast pace of industrial and economic development.
- Oil pollution

3. MANAGEMENT PLANS

Management frameworks have recently been developed for inshore reef fisheries and sea cucumber fisheries of the Red Sea that need to be implemented. There may be some scope for expanding the more offshore pelagic fisheries on the Red Sea. The absence of light-attraction fisheries for small and highly productive freshwater pelagic species offers promising potential for reservoir fisheries development and increased fish production contributing to improved food security and fish feed for aquaculture.

The wider development approach of Government involves a shift towards a more commercially orientated agricultural sector, which presents challenges in fisheries as a business approach to the sector is hardly recognized by Government and fisheries stakeholders themselves. However, it is to be noted that the adoption of a more business-like approach to small-scale producers/processors and traders of all scales, with close linkage to fisheries resource management, offers opportunities for enhanced future growth and sustainability of the sector.

Management is currently focused on finfish, crustaceans (shrimps, prawns and lobsters) and molluscs. However, most of the management efforts were directed towards finfish. Management capabilities and discharge reflect relative progressive development particularly during the last five years. The reasons behind this progress are increased recognition of the sector and respective political will, human resources capacity building and exchange of expertise with regional and international fisheries agencies and bodies.

3.1 Current Fisheries Management Tools and Trends

Management Goal and Objectives as expressed in the Comprehensive National Strategy (1992-2002) called for

- Rational utilization and conservation of marine living resources.
- Protection of the marine environment from pollution and ecological degradation.
- Promotion of investment.
- Development of rural communities.
- Improve fish distribution and marketing.
- Coordinate efforts for integrated coastal management at the national, regional and international levels.

3.2 Technical measures

3.2.1 Regulation of Access: licensing local fishermen and fishing crafts and issuing special permits for foreign vessels subcontracted with Sudanese counterparts. It must be mentioned, however, that the issued licenses to artisanal fishers and craft give them the right to fish throughout the year within the territorial waters (e.g., open access regime). As for the foreign fishing boats, permits are given with clear specification of the fishing zone, season and fisheries resource targeted. No catch quota is implemented at the moment for both categories.

3.2.2 Mesh Regulation: Standard mesh size of fishing gear is recommended. Check on these is performed during routine inspection and illegal nets are confiscated.

3.2.3 Fish Size Regulation: Minimal allowable size limits for the most important fishes are specified and declared to fishers. Undersized fish are usually confiscated.

3.2.4 Banning of certain fishing methods: The law prohibits the use of dynamite, poisons, and spear guns in fishing.

3.2.5 Increase of Fishermen Capacity: Training, extension, improvement of fishing boats, establishment of boat and engine maintenance workshops, and supply of other services are examples.

3.2.6 Closed Areas: Fishing is completely forbidden in Saganab atoll as a conserved Marine National Park. Dongonab Bay is a closed area for oyster farming and small-scale fishing and wild oyster collection by the local inhabitants.

3.2.7 Closed Season: This is applicable to shrimp grounds where fishing is not allowed during the period mid-March to mid-August coinciding with the breeding season.

3.2.8 ICZM: Recently (2004), an Integrated Coastal Zone Management (ICZM) Plan has been prepared by national experts under the umbrella of the Strategic Action Programme (SAP) of PERSGA. The assignment incorporates two complementary parts: a detailed background coastal profile document and the proposed ICZM plan of action. This plan is geared towards vertical and horizontal coordination of efforts among various stakeholders in the private and public sectors at the state and federal levels for rational use, conservation, and sustainable development of the coastal area. The draft of this ICZM had been discussed in two workshops in Port Sudan (January 2003) and Khartoum (July 2003). A final workshop is planned to convene in Port Sudan on 6-7 October 2004 before submission of the ICZM plan to the Cabinet of Ministers and legislative bodies for approval. The ICZM Implementation Programme is planned to start with the following activities:

- Capacity building for the ICZM Council and the ICZM Secretariat (provision of basic equipment's and training).
- Preparation of the "Land Use Map" and Planning of the Sudanese Coastline.
- The establishment of the "Public Participation Center for the ICZM" as a mechanism for communication and information dissemination to be hosted by an NGO based in Port Sudan.
- Establishment of GIS/Remote Sensing/data base center in Port Sudan that should be connected with the main center in Khartoum.
- Training and Capacity Building (including the preparation of training kits that consist of trainer manual as well as trainee materials on Environmental Impact Assessment, Tools of ICZM, Public Participation and ICZM, Communication and negotiation skills and other related topics and implementation of training courses).
- Conduct socio-economic study to measure the impacts of ICZM on poverty reduction.
- Prepare fund raising plans for all other projects suggested.
- A coordination unit for ICZM Implementation Programmed should be established and provided locally with in kind contribution such as working place and communication tools. PERSGA will cover all the expenses of a part time consultant in addition to part time administrative staff to coordinate all technical and financial issues of the programmer.

3.2.9 Support and dissemination of fish farming technologies: -

Hatcheries equipment, cage culture in Meroe Lake &Nubba Lake& whit Nile and Atbara and setite.

3.2.10 Qualification of workers in the sector: -

Training courses of how to manufacture feed & fish farming technology in floating cages & aquarium engineering& fish diseases and post-harvest.

3.2.11 Recent studies of fish stocks and reconstruct: -

Study and update estimates of fish stocks in upper Atbara, setite & GabaL awlia Reservoir & Meroe Dam Lake &Nubba Lake and Rusires

3.2.12 Extension to producer fishermen's association and youth project:

Project for fishermen and producer s & associations on both Read Sea & Niel and

Providing production input and a model market for fish on international standard

3.2.13 Protection and sustainability of water bodies: -

Provide transportation between the fisheries departments in the 18 states (network)

Provide 18 fishing boat with external engine Yamaha 30 horsepower

Provide 3 four-wheel drive cars.

4. COSTS AND REVENUES OF FISHERIES MANAGEMENT

As mentioned earlier, several institutions are involved in fisheries management in one way or another. The Fisheries Administration and Fisheries Research Centre are directly involved in fisheries management and perform their responsibilities within the available budget and financial support from the Federal and State Governments and other donors. There is no contribution of magnitude from the private sector apart from fishing permit fees. Public and private universities contribute indirectly through capacity building and basic research.

Due to lack of proper records, it was practically impossible for the author to reach actual figures for the overall budget and exact management costs. The available records of the Fisheries Administration and Fisheries Research Centre indicate a general increase in their budgets during the last ten years for finfish and crustacean management while that for management of wild molluscs fishing remained unchanged. Sources of revenue are limited to license fees, penalties and income tax which is applicable now to fish exporters and importers while traditional craftsmen are exempted from income tax. Estimation of the budget, costs and revenues during the last ten years took into consideration the inflation factor and devaluation of the Sudanese currency.

Table 4: Fisheries management Budgets 2016-2020

Year	Total amount in dollars	Remarks
2016	68,666	• hatcheries equipment • training course in fisheries • stock assessment • surveys for some dams & the huffier western states of Sudan • Rehabilitation of fish landing sites
2017	400,000	
2018	389,000	
2019	183,500	
2020	1,000,000	
Total	**2,041,166**	

5. LEGAL FRAMEWORKS AND POLICY DOCUMENTS

5.1 Legal framework/ Fisheries legislations

5.1.1 Marine Fisheries Ordinance 1937

This ordinance was launched on 15 June 1937 to regulate the marine fisheries. The ordinance was a very modest administrative and technical guideline reflecting the available knowledge and expertise available at the time. The main rules specified in this ordinance are:

- No craft shall be employed for the purpose of fishing in territorial waters unless a valid license, hereinafter referred to as a fishing craft license, shall have been issued under this ordinance in respect of such craft.
- No person shall engage in or be employed in fishing in territorial waters unless he is to be a holder of a valid permit hereinafter referred to as a fishing permit, issued under this ordinance for such purpose.
- Fishing craft licenses and fishing permit under this ordinance shall be issued by the local authority on payment of the fees set out in Schedule II here to, and unless previously forfeited or otherwise determined shall expire on the 31st day of December next following.
- The Governor General may, for the better consideration and development of fisheries, by order published in the Sudan Government Gazette, declare any part of territorial water to be a closed area.
- No person shall fish in a closed area otherwise than for the sole purpose of sport unless he has previously obtained the permission in writing of the local authority.
- The local authority may grant such permission subject to such terms and conditions as he shall think fit and may refuse such permission at his discretion and without assigning any reason.
- Every Police officer, customs officer, or other person duly authorized in that behalf by the local authority may, for purpose of enforcing this ordinance or any regulation made hereunder:

  - Board and search any craft found in territorial waters or any craft which he has purpose continuously from territorial water into the high seas and which he, on reasonable grounds, suspects to have been employed for the purpose of fishing in territorial waters; Required any person on board any such engaged in or employed in fishing in territorial waters or whom he, on reasonable

grounds, suspects to have been so engaged or employed to exhibit his fishing permit, apparatus and catch.

- Where there is reasonable suspicion in the case of any such craft that on offence has been committed, take the alleged offender, the craft, apparatus, and catch without summons warrant or other process to the nearest or most convenient police station or post. The craft and apparatus may be detained pending trial and the catch may be sold and the proceeds of the sale impounded.

- Any person who acts in contravention of or / to fails to / comply with any of the provisions of this ordinance shall be guilty of an offence against this ordinance and shall be liable to a fine not exceeding 50 pond or to imprisonment for a term not exceeding three month or to both such fine and imprisonment.
- The Court may also order the confiscation of any craft apparatus or catch employed in the commission of, derived from any offence under this ordinance and the cancellation of or suspension for such time as the Court thinks fit or endorsement of the date and nature of the offence on a fishing craft license issued in respect of any such craft or any fishing permit issued to any person guilty of any such offence as aforesaid.

5.1.2 1975 by-law

On 15 April 1975 a by-law was issued by the Minister of Agriculture Food and Natural Resources (where Fisheries at that time was under the ministries mandate) and published as supplement No 1175 (in Arabic) in the Sudan Government Gazette. In this by-law, a slight amendment of the Marine Fisheries Ordinances was made whereby a new item was added dealing with banning use of water guns, fishing of certain fish resources and aquatic pollution. According to this amendment no body is allowed to:

- use water guns in fishing without an issued permit.
- fishing or collecting corals or molluscs or ornamental fishes without an issued permit.
- dumping pollutants in water or coastal area.

It goes without saying that the Marine Fisheries Ordinance (1937) and its By-law are old-dating and demand radical amendment to accommodate recent development in management concepts and procedures and benefit from the international boom of legal and administrative development and initiatives.

5.1.3 Fresh water fishing law (1954) amended (1960) & (1995)

This is the current in force inland fisheries legislation.

The FAO commissioned an expert in 1998 to update & complete the missing links.

The new version proposal by the expert under the Title federal inland fisheries Act but not yet put into force

5.1.4 Marine fisheries state law (2008)

This law regarding red sea fisheries activates include:

- Fishing permissions for domestic &foreign fishing boats in territorial waters.
- Fishing licenses for public private &cooperate boats.
- Prohibited IUU fishing activities in red sea organizes, market& manacle of marine organism.

5.1.5 Marine fishery regulation (2010)

- Controls on sea cucumber harvesting using SCUBA
- Protection of sea grasses algae &mangroves, turtles sea birds etc.
- Protection against pollution.

5.1.6 Proposed fresh water & marine capture fishers & aquaculture law (2017)

This law aimed at regulating:

- Fisheries conservation activities in marine & freshwater capture fisheries activities.
- Banning of IUU & overfishing activities.
- Importing &exporting fish &fishing gear &equipment's.
- Aquaculture & mariculture activities.
- National reginal & observers' program
- Fish health &quarantine.
- Specification of fishing gears.

However, none of the above is being implemented so far.

There are two legal mechanisms in place to implement measures, agreements and technical guidelines adopted by regional fishery bodies.

Mechanism I: Recommendations stemming from regular meetings, technical consultations or involuntary guidelines are brought to the attention of the central government through technical reports with recommendations from the representative(s) who attended the scientific forum. Within the Fisheries Administration (Ministry of Animal Resources and Fisheries) and Fisheries Research Centre (Ministry of Science and Technology), the expertise gained, and recommendation reached in these meetings are as far as possible adopted to improve performance. Seminars are usually organized to disseminate information and recommendation of these regional and/or international meetings.

Mechanism II: Agreements and Protocols are usually submitted to the Cabinet of Ministers by the concerned Minister for approval as a prerequisite for subsequent signature, ratification, accession, and implementation. The procedures involve several steps:

- Evaluation of the proposed document by the concerned Sector Ministerial Committee of the Council of Ministers.

- Review of the comments and recommendations of the Sector Ministerial Committee by the Council of Ministers to decide general approval or otherwise.
- If approved, submission of the document to the Attorney General Office of the Ministry of Justice for legal opinion.
- Submission of the agreement or Protocol to the National Assembly as the highest-ranking legislative organ for final approval or enacted by presidential decree in the absence of the National Assembly as the case may be.

The organs and mechanisms directly involved in fisheries management are the Fisheries Administration, the Fisheries Training Institute (Ministry of Animal Resources and Fisheries) and the Fisheries Research Centre (Ministry of Science and Technology) according to the mandate of these ministries specified in relative Presidential Decree of their establishment.

According to Sudan federal government system, there are structural arrangement for fisheries administration at the federal and states levels.

5.2 Policy documents

Sudan policy, at large, is directed towards achieving international standards in the following areas:

- Legal reform to be compatible with international trade and safety agreements and establishment of public sector regulatory bodies.
- Economic reform to achieve progressive liberalization and promotion of parastatal commercial enterprises.
- Reform in the services sector (e.g., transport, health, education, public awareness, etc.) which build capacity for development.

In 2002, Sudan launched its long-term national strategy entitled the Quarter-Century Strategy (2002-2027) that incorporates fisheries development and rational utilization. With regard to fisheries and aquaculture, the strategy states the following seven guiding objectives:

- The role of fish resources in poverty alleviation, food security and welfare of the people.
- Rational utilization, conservation and development of fisheries and aquatic resources through sustainable management of production, restocking of depleted resources and pollution control.
- Increase of productivity and efficiency of fishers and producers through research, technology development and transfer, training and capacity building.
- Development and strengthening of competitiveness of fisheries products through improvement of marketing facilities and quality control.
- Investment incentives and privatization.
- Participation of stakeholders in management and development processes.
- Strengthen databases and documentation.

The policies and implementation and enforcement mechanisms adopted within the strategy to attain these seven objectives include:

- Institutional and legislative reforms.
- Strengthening of coordination mechanisms between the public and private sectors at the central and state levels within the country.
- Establishment and development of fishers and producers' organization.
- Promotion of fish producers and fisheries investors through stimulating easy-term credit systems.
- Harmonization of market access and trade facilitation activities.
- Staff recruitment and training.
- Allocation of financial resources for fisheries research and development to public institutions.
- Establish and maintain professional links and relations with relevant regional and international institutions.

5.2.1 Policy documents

- The fisheries policy aims at delivering the way forward and charting the course for a revitalized fisheries sector.
- The policy has been designed to ensure that the sector plays an integral part in the governments shift away from over – reliance on oil towards an agriculture-based economy. See Attached (Sudan national fisheries policy 2012).
- Under the new policy the sector will modernize to increase contributions to national food security economic growth & employment whilst conserving biodiversity &the environment.
- This is the essence blue growth in a green economy.

5.2.2 Blue Economy Resources in Sudan

Sudan blue economy section includes the following:

- Fisheries aquaculture
- Inland river transport
- Energy sections
- Tourism &environment
- marine tourism section
- Power renewable energy
- Desalination
- Extractive industries & under water mining

The importance of blue economy is presented through the national action plans for conservation of marine resources (turtles, sea birds & mangroves (law 2010) which contain extensive management actions that have identified in response to the issues affecting these habitats & species.

Constraints/challenges of Blue Economy:

- Pollution originating from industries, e.g., oil industry, oil spills, mining, overfishing, IUU fishing etc.
- Rising level in the red sea & gulf of Adenas as a result of global warming could have serious consequences for many areas near the coast & for man- made structures including the harbours.
- The policy is divided into six pillars that addresses the principal challenges facing the sector and set out the strategic directions contributing to attaining the overall policy objective. (Sudan national fisheries policy, 2012).

5.2.3 Pillars of the policy.

- Improved governance framework
- Secured fisheries financing
- Aquaculture potential unleashed
- Effective fisheries co- management
- Business & trade development.
- Food security enhanced by fisheries

5.2.4 Regional and international Agreements & obligations

- UN Convention on the Law of the Sea (1994).
- Regional Convention for the Conservation of the Red Sea and Gulf of Aden (PERSGA), known as the Jeddah Convention, signed in 1982, which is an intergovernmental organization dedicated to the conservation of the coastal and marine environments in the region.
- Protocol Concerning the Conservation of Biological Diversity and the Establishment of Protected Areas 2005.
- Protocol concerning Regional Cooperation in Combating Pollution by Oil and other Harmful Substances in the Red Sea.
- Protocol concerning the Protection of the Marine Environment from Land-Based Activities in the Red Sea and Gulf of Aden.
- The Convention on Biological Diversity (CBD).
- FAO Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and unregulated Fishing (PSMA) in 2009. Which finalized with drafting a strategy in 2017.
- UN Framework Convention on Climate Change and Kyoto Protocol to the Convention.
- The FAO Code of Conduct for Responsible Fisheries (CCRF).

- The Nile Basin Initiative (NBI) to achieve sustainable socio-economic development through equitable utilization of, and benefit from, the common Nile Basin water resources.
- The Convention on International Trade in Endangered Species of wild Fauna and Flora (CITES).

5.2.5 Regional organisations

Sudan works closely with the following organisations:

- New Partnership for Africa's Development (NEPAD) in 2005.
- The Comprehensive Africa Agriculture Development Program (CAADP).
- FAO Committee on Fisheries (COFI).
- FAO REGIONAL FISHERY BODIES:
- Committee on Inland Fisheries and Aquaculture of Africa (CIFAA)
- Indian Ocean Tuna Commission (IOTC) in 1996

6. CHALLENGES

- Market demand for undersized fish and under-investment in the fisheries sector.
- The capture fisheries sector find it roots from the increasing population in Sudan, weak governance and inadequate management capacity in fisheries (state level).
- The combination of these factors results in environmental degradation, overfishing, use of illegal gears, trade in undersized, immature fish and poor post-harvest facilities and practices. This leads to reduced catches and exports, reduced incomes, reduced revenue to government and reduced food security.
- The main challenges facing the aquaculture sector are multi-dimensional, complex and seemingly resistant to change. They revolve around: business risk; technology transfer; availability of satisfactory technical advisory capabilities; costs and quality of fish feed and seed; provision of an enabling and supportive environment by the Government for large-scale commercial ventures; and banking or other financial systems willing to support sound business ventures.
- The sector is facing problems in areas of communication, availability of information, coordination and cohesion between and within the various administrative levels of government.
- Environmental degradation, overfishing, use of illegal gears, trades in undersized, immature remains a problem.
- Poor post- harvest facilities and IUU fishing practices has led to reduced catches and exports.
- IUU activities and oil linkages in red sea.
- Enhanced monitoring, control, and surveillance (MCS) system for sustainable management of fishery resources [in targeted areas] in favour of the small-scale inland fisheries communities.
- Capacity building for fishing communities and other stakeholders on the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries to enhance their knowledge for sustainable management of the resource.
- Weak government controls on traceability system making it easy to distribute illegal catches.
- Inadequate funding to conduct trainings.

- Weak and ineffective MCS capacity effective to identify and patrol EEZ esp. Reliance on donor funding.
- Weak legal frame works.
- Lack of accreditation bod that participate in the regional & international forum.

7. OPPORTUNITIES

- Development opportunities exist in capture fisheries and aquaculture in the marine waters of the Red Sea, but freshwater aquaculture is the most likely source of increased production through the adoption of proven technologies.
- Prevailing high fish prices add to the commercial attraction of large-scale ventures. These appear feasible in reservoir waters and irrigated agricultural areas fed by these waters.
- Wild fish stocks are generally over-exploited. However, improvements in sustainable harvests should be possible through the establishment of responsible co-management
- Management frameworks have recently been developed for inshore reef fisheries and sea cucumber fisheries of the Red Sea that need to be implemented. There may be some scope for expanding the more offshore pelagic fisheries on the Red Sea. The absence of light-attraction fisheries for small and highly productive freshwater pelagic species offers promising potential for reservoir fisheries development and increased fish production contributing to improved food security and fish feed for aquaculture.
- The wider development approach of Government involves a shift towards a more commercially orientated agricultural sector, which presents challenges in fisheries as a business approach to the sector is hardly recognized by Government and fisheries stakeholders themselves. Adoption of a more business-like approach to small-scale producers and processors and traders of all scales, with close linkage to fisheries resource management, offers opportunities for enhanced future growth and sustainability of the sector.
- A wider awareness campaign could be beneficial at all levels.
- There are two legal mechanisms in place to implement measures, agreements and technical guidelines adopted by regional fishery bodies.

8. CONCLUSION

The fisheries sector needs a complete overall including updating legislations and bringing in new policies to cater for an effective and sustainable development of the sector, updating all fisheries management plans and developing plans for other species in an effort towards tackling the vicious issue of open access in Fisheries.

Note that this goes hand in hand with the establishment of a taskforce to drive forward the implementation of the National Fisheries Policy/ies. A participatory approach ensuring the involvement of all within the fisheries sector is strongly recommended.

There is also a serious need to plan for capacity building for new recruits and existing staff to take up the various challenges in the wake of Climate change and its impacts on the fisheries sector, which still needs to be worked out.

Aquaculture is another area which needs to be seriously investigated. Sudan has great potential which needs to be further developed to create wealth and well-being for the population.

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The information contained in this review were gathered from various sources including records of the Fisheries Administration and Fisheries Research Centre, FAO Publications, Previous Assignments prepared by the author of these reports to FAO (FAO Fisheries Country Profile; http://www.fao.org/countryprofiles/) and PERSGA (ICZM Plan), National Strategy Documents, local conference papers, internet and personal communication.This report has been prepared by Dr. Randa Eltayeb Babiker and Mr. Hammad Shanto Salih .

Annex 1: Ornamental and Commercial and Recreational species of Sudan

Pomacentridae (Damseil fishes)

Dascyllus aruanus

Pomacentrus sulfurous

Amphiprion bicinctus

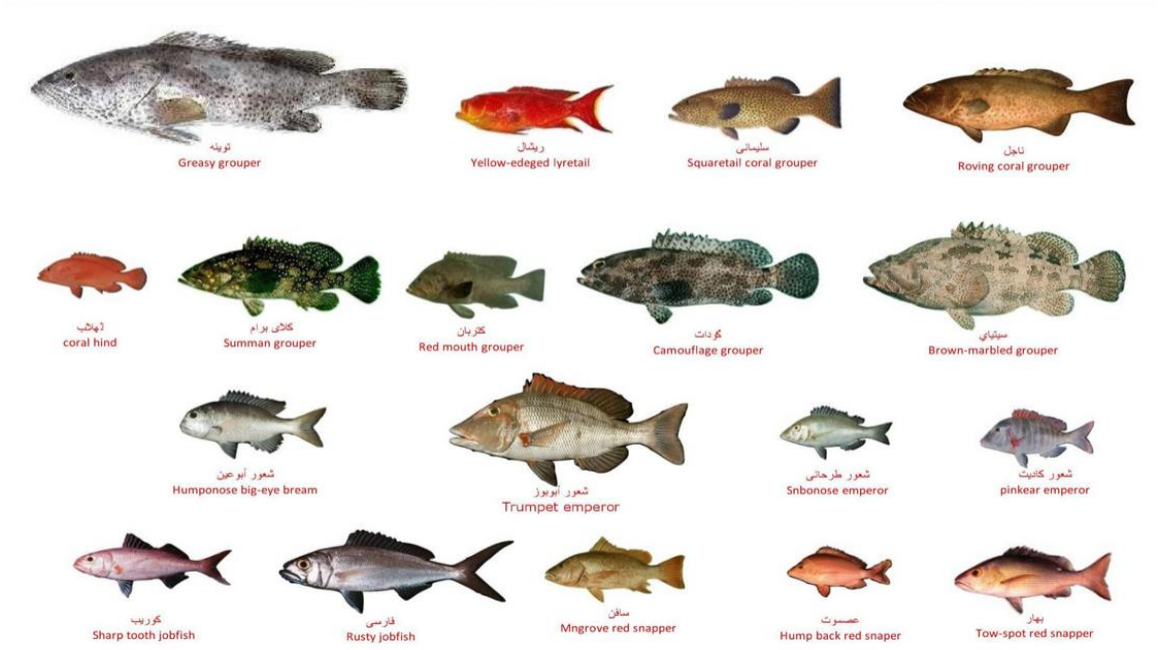
Chromis caerulea

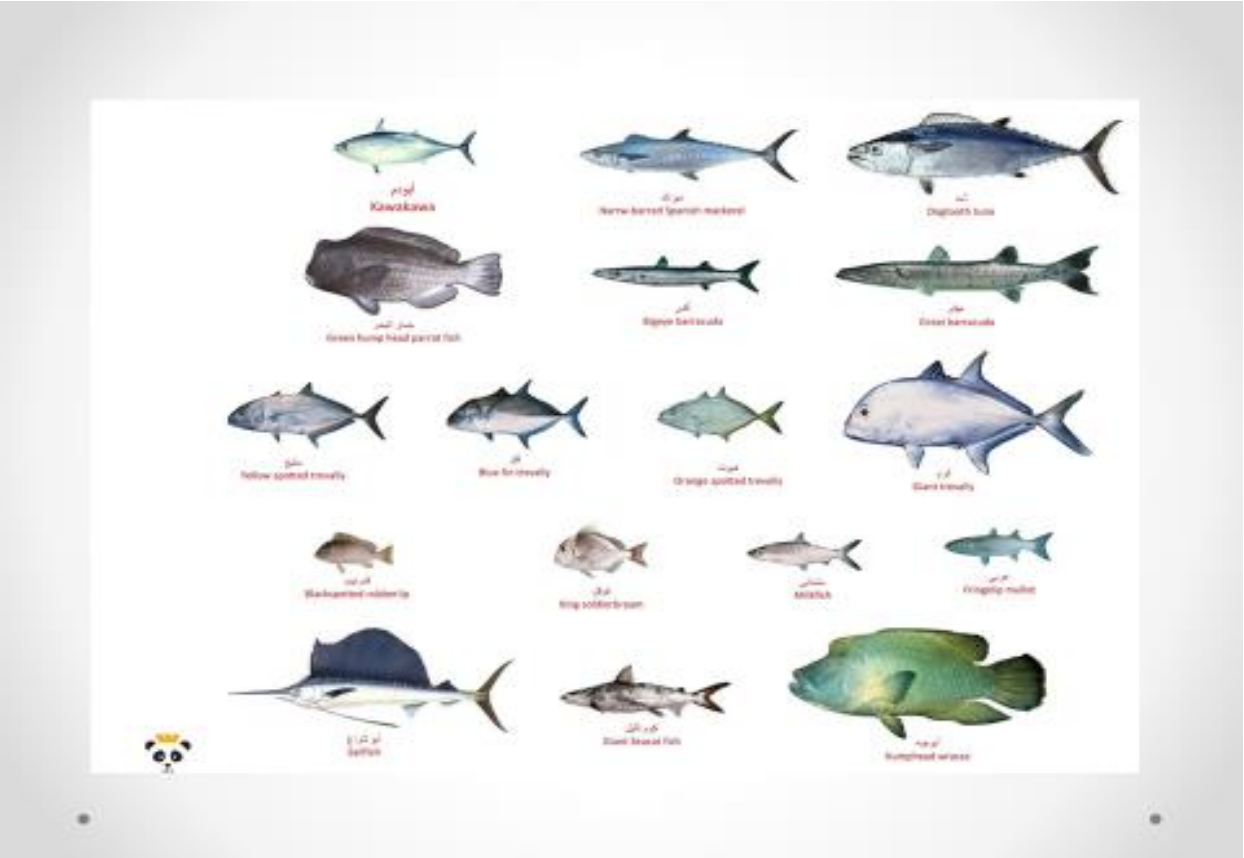
Labridae (Wrasses fishes)

Larabicus quadrilineatus

Paracheilinus octotaenia

Commercial fish



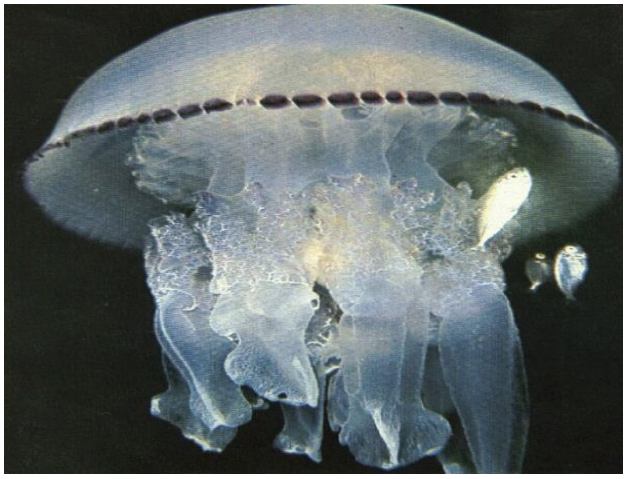


Other species

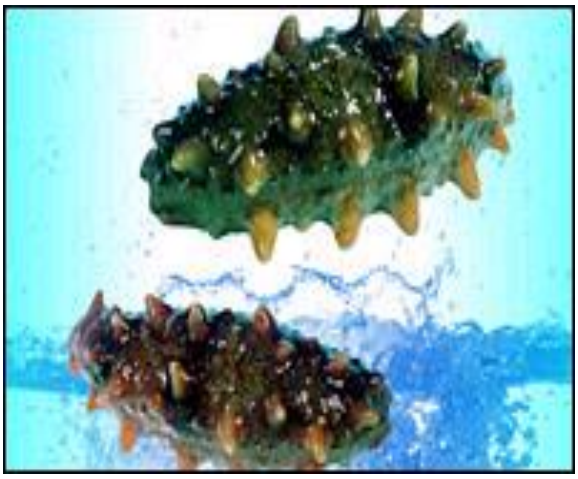
Shrimp

Pearl Culture

Jelly fish

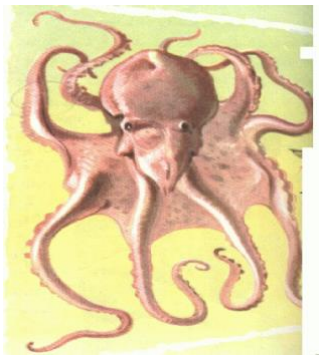


Sea Cucumber



Tortoise

Octopus



Rock Lobster

Annex 2: Fisheries /Aquaculture Past Projects

- The FAO and other international development agencies have contributed to fisheries and aquaculture development since 1980s.
- But much of this assistance focused on capture fisheries.
- In 2004, the European Commission had grant-fund a Sudan Productive Capacity Recovery Program on capacity building of public / private institutions and support to sustainable rural livelihoods through the Federal Ministry of Finance
- Whilst the bulk of the initiative was on capture fisheries, it did have a small component on developing a small tilapia hatchery in the Blue Nile State.
- Unfortunately, this facility was poor designed and was never completed and is currently dilapidated.
- The Canadian International Development Research Centre provided training in aquaculture at the Federal Ministry of Science and Technology and provided funding for a tilapia hatchery. (2017)
- The project is not fit for purpose as an education/training facility for seed production. (2014) TCP
- In 2008 a Unilateral Trust Fund proposed was drafted by FAO, principally on fisheries development for fisher folk but all indications are that it was never implemented.
- Technical support to the Fisheries & Aquaculture Sector Review and Investment Plan Preparation (TCP/SUD/3607/C5 - 2018).

Annex 3: Collaborative and support institutions

The Fisheries Training Institute in Khartoum is one of the specialized training facilities within the Ministry of Animal Resources and Fisheries. It provides short-term training courses targeting fisheries officers and fishermen from the public and private sectors. Fisheries extension services are coordinated with the Extension Administration within the Ministry of Animal Resources and Fisheries.

The Fisheries Research Centre, on the other hand, is the main applied research body which is under the umbrella of the Animal Resources Research Corporation, Ministry of Science and Technology. The Fisheries Research Centre HQ is in Khartoum and performs its mandatory functions through a number of specialized Capture Fisheries and Aquaculture Research Stations geographically distributed in strategic fisheries resources localities. The Red Sea Fisheries Research Station of this centre in Port Sudan caters for the marine environment.

Other collaborative institutions and support mechanisms include the following:

- **Local Universities and Higher Learning Institutions**. There are over 26 government universities and 40 private sector universities and colleges in Sudan. Several of these higher learning institutions deliver and offer undergraduate and graduate courses and degrees in fisheries and aquatic environment sciences.
- **The Fisheries Consultative Council**. This council was formed by the Minister of Animal Resources and Fisheries several years ago as a coordinating and advisory structure within the Ministry with representation from the concerned public and private institutions and agencies. The forum benefits from expertise of a wide spectrum representation of eminent university and research institutions staff, planners, extension personnel fisheries societies and trade unions. The council meets at least twice a year and submit to the minister a report of their deliberations and recommendations. The suggestions of the council are usually adopted but are not mandatory binding to the Minister.
- **The Higher Council for Environment and Natural Resources**, Ministry of Environment and Physical Development acting as a national focal point for issues, programmes and conventions of environmental concern.
- **Local and Foreign NGO's** e.g., Marine Conservation Society, Sudanese Environmental Conservation Society, OXFAM, ACORD.

- **Regional and International Organizations** e.g., FAO and its subsidiary bodies. UNDP. ODA, IDRC, PERSGA.
- **Major Stakeholders** including fisheries companies and firms, Fisheries Trade Chamber, fishermen unions and cooperatives, and fish and shellfish farmers. Special meetings, workshops and extension programmes are periodically organised and consult.

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