

Ministry of Fish Wealth
Marine Science and Biological Researches Authority
Labour Island – Khormaksar - ADEN – YEMEN

Biology and status of sharks fishery in Yemen,
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Introduction

The Republic of Yemen has long coastline reaches **2,500 km**, the coastline of the Gulf of Aden measures **1,550 km** from Bab el Mandab, extends east ward up to boarder of Oman The Red Sea coastline stretches 650 km north from Bab el Mandab to the border with Saudi Arabia. The Scooter Archipelago, which lies off the tip of the East African Horn, has a coastline of **320 km**. (see the map)



The coastal areas of Yemen characterized by higher Bio-productivity (primary) making it basic feeding and nursery ground for marine species, were more than 600 species of fish and marine organisms were recorded in Yemen `s water this phenomena of biodiversity found to exist in tropical water.

The most important dominant and commercial species targeted are

Large pelagic fishes (tuna &tuna like species (yellowfin tuna, kawakawa, Skipjack tuna ,Stripped bonito ,Spanish mackerel, Marlin)

Sharks (Black tip shark ,Sphyrna leweni Milky shark Arabian smooth-hound

) **Small pelagic fishes** (Sardine ,Anchovies, Indian mackerel ,Chub mackerel).

Demersal fishes (Emperor. Scavenger , Snappers , Grouper , Breams, Barracuda Carangoides etc..) **Crustaceans** (Spiny rock lobster, Deep- sea shrimps)

Molluscus (Cuttle fish , Squids) The last two catogories are exported because of their high value.(see table (1) Contain species catch composition and their annual Average production)

Total pelagic fish stock were calculated from integrated Echo Sounder were (**376000 -495000**)Metrec Tons,AOKesteven et al,1981) .

Gulf of Aden waters are characterized by a large variety of species, commercially important. The abundance of pelagic species is strongly influenced by seasonal variations due to the prevailing Oceanographic condition which is dominated by the Indian Ocean monsoon system. resulting in high productivity of fish resources, particularly in the eastern part of the Gulf of Aden .

The winds blow from east to north-east during the north-east monsoon, October to April, and from south-west during the south-west monsoon, May to September. The strongest winds and associated water currents occur in July/August. During the south-west monsoon ,oceanic upwelling stimulates primary production of phytoplankton and ultimately creates an increase in the abundance of pelagic fish. The north-eastern part of the Gulf and the area south of Socotra are among the most productive marine areas in the world

The production size of sharks are increased in Yemen in the last recent years as result of effort increasing, sharks are targeted and exploited by traditional artisan fishery (fishery society + private fishermen). The potential of annual sharks production in Yemen was estimated as 21,300 Metric tons .

In the Socotra Archipelago, fishing is the main occupation for coastal inhabitants. Sharks are targeted using long-lines, gill nets, and hook and line techniques. The annual production of sharks is estimated at 7,283 metric tons, and average CPUE is estimated at 54 kg per boat and day. The most important predominant migratory species ,caught in the Gulf of Aden and Socotra Archipelago are :-

1- <i>carcharhinus limbatus</i> (Black tip shark)
2- <i>Carcharhinus albimarginatus</i> (silver tip shark)
3- <i>Sphyrna lewini</i> (hammerhead shark)
4- <i>Carcharhinus seali</i> (Black spot shark)
5- <i>carcharhinus sorrah</i> (spot tail shark)

While the others are resident and distributed along the coastal areas specially eastern part of Gulf of Aden mainly they are :

<i>Species landed</i>	<i>Percentage</i>
<i>Rhizoprionodon acutus</i>	65.6%
<i>Mustelus mosis</i> (Arabian smooth-hound)	22.4
<i>Loxodon macrorhinus</i>	3.5
<i>Carcharhinus limbatus</i> (Black tip shark)	1.0
<i>Chondrichthyans</i> (Rays and skates)	7.4

Acronyms Used

- CPUE Catch per unit effort
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- PCFSM --- Public Corporation for Fisheries Services and Marketing
 - EEZ--- Exclusive Economic Zone
 - FAO --- Food and Agriculture Organisation
 - UNDP United Nations Development Programme
 - GEF Global Environment Facility
 - IOTC Indian Ocean Tuna Commission
 - NCSFM National Corporation for Services and Fish Marketing (Yemen)
 - PERSGA Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden
 - MCS Monitoring, Control and Surveillance
 - n.a. Data not available
 - WWF World Wide Fund for Nature
 - UNCLOS United Nations Convention on the Law of the Sea
 - CITES Convention on International Trade in Endangered Species of Wild Fauna and Flora
 - IATTC The Inter-American Tropical Tuna Commission
 - ICCAT The International Commission for the Conservation of Atlantic Tunas
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- IPOA-Sharks International Plans of Action for the Conservation and Management of Sharks

The important of sharks fisheries

Fisheries resources (including Sharks) in Yemen are considered the most important national and natural sustainable resources contributing achieving an important goals mainly :

- Achieving national food security .
- Raising the national economic revenue.
- Serving socio-economic purposes.-
- Fishery production as food resources for the population particularly to the coastal zones habitants.

Moreover the sharks have an important for Biodiversity and ecological considerations that Sharks plays an important role as top predators. Directly or indirectly they regulate the natural balance of the populations of food pyramid. Because they usually prey on older, weaker or sick prey, they also help

maintain the health of the prey population. Healthy and strong individuals thus have a better Sharks resources service a socioeconomic purpose
Shark fins trade in Yemen showed a remarkable and rapid increase and fishing pressure on shark stocks has been recorded during the last two decades in Yemen due to the ex-vessel price for dray shark fins has reached **\$60 per kg.**, in the world market, provided sufficient incentive to harvest sharks , even dry meat of sharks found to be marketable in the local markets and in the regional Gulf of Aden are facing ever increasing levels of fishing pressure. Sharks have high commercial value for their meat, fins, skin and jaws (valuable to the tourist trade), and are a major component of the diet and income earning potential for many rural fishing communities throughout the Region and their decline or collapse would have catastrophic consequences for the livelihood of many coastal communities in Yemen

Fisheries activities in Yemen

A Brief history of will be necessary to obtain a clear idea before discussing Plan action of Yemen

A . Industrial activities in Yemen

Since 1966 two Japanese industrial fisheries companies(Tayo , Nishiro) starts fisheries activities using bottom trawl gears targeting cuttle fish .
In 1975 Russian (USSR) Industrial fishing boats starts to operate in Yemen's (EEZ) region replacing Japanese industrial fishing companies after they are stopped in (1980) , the (USSR) industrials fishing boats starts increasing in numbers targeting commercial species of demersal and pelagic fishes
Since 1990 (Chinese, Korean , Egyptian , and Tailandian) industrial fishing boats are started to introduced fisheries activities in Yemen's water they were heavily fishing the commercial species using bottom trawling gears. These industrial boats contributed in increasing fishing pressure on the fisheries resources in general And sharks stock specifically
Yemen indicate that landings have declined since 1990 and the average size of rock lobster has decreased; despite government attempts to initiate management controls, these have not been successful due to lack of compliance by fishermen
Illegal fishing by foreign vessels and violations of the laws and regulations by licensed vessels only will not stop unless the law provides for enforcement, prosecution procedures and deterring penalty fees. For instance, off Yemen's southern coast industrial trawlers continue the damaging exploitation of the spawning stock of cuttlefish in shallow waters

B . Artisanal Fisheries

In Yemen the artisanal sector has expanded very rapidly , there has been at least a doubling of the number of boats and fishermen in the Gulf of Aden during the period 1990-1999 (that is, since unification of Yemen in 1990). Returnees from the Gulf War have also added to the numbers entering artisanal fishing. Uncontrolled expansion eventually leads to over-exploitation. The most appropriate way of regulating fishing is to limit the fleet to a certain size. It is also appropriate for the government to charge fishermen for the right to exploit the common resources of the country and recover some of the costs of administering the fisheries.
The most appropriate management measure to limit the fishing Effort (number of boats is to implement a registration and licensing system for boats and fishermen. Vessel registers are a very valuable tool used in many parts of the world. In many cases, such registers are already provided for in the existing

Despite of commercial important of sharks the fishing effort and the pressure of exploitation shark resources has been increased in the last three decade it's noticeable that the stock of most commercial species has been declined In addition to other negative impacts resulted from industrial trawlers fisheries, habitat destruction ,including damage to coral reefs, sea grass beds ,spawning grounds for cuttlefish and depletion of resources. These vessels compete with artisanal fishermen whose gear they regularly damage, and conflicts are common , Problems reported include:

- Direct competition for shrimp and demersal fish, causing a reduction in catch rates for the artisanal fleet.
- High rate of discards of juvenile demersal fish, causing a decline in the stocks.
- Damage to or loss of local fishermen's nets.
- Destruction of habitat by indiscriminate use of heavy trawl gear.
- Fishing for shrimp during the closed season under the pretext of fishing for demersal fish.

all these problems associated with There is a lack of funds for monitoring, research and sound fishery management of sharks and other chondrichthyans. In addition to that the lack of and the lack of fishing effort regulation led to over-exploitation and as result to the above-mentioned reasons a noticeable shark stocks collapse has been observed during the last decade .

Around 62 species of sharks, rays and chimaeras are resident or more or less regular visitors in yemen territorial water probably for feeding , mating , nursing

The term 'chondrichthyans' (class chondrichthyes) with elasmobranch being used for the sub-class comprising the sharks and rays alone. Many of these are caught in Yemen's fisheries grounds as either target species or by catch. As a consequence of declining catches in traditional fisheries.

The Chondrichthyans face many of the same problems of overfishing as do teleosts, they have certain characteristics that make them particularly vulnerable to fishing pressure; their growth is often slow, they mature at a relatively late age and they usually produce very few offspring (sometimes as few as 1 or 2 young every two years). Because of these characteristics, chondrichthyans lack the resilience to withstand sustained exploitation by fisheries (Holden 1974, Pratt and Cassey 1990) and in this respect, they resemble mammals more than other fish species. Their stocks can therefore easily be over fished, and there is a real risk of severe depletion or extinction of rare species with a consequent loss of biodiversity

The UN Convention on Biodiversity (1992) places an obligation on all its signatories to develop national strategies, plans or programmes for the conservation and sustainable use of biodiversity. This obligation extends to territorial waters and to 200 nautical miles from coastlines. Managing shark populations is essential to preserving biodiversity within The Yemen's territorial waters

National Strategy for Development of the Fisheries Sector in yemen.

Fishery managers should take appropriate measures to achieve'' the optimum utilization of the fisheries resource and to ensure the conservation of the Biodiversity and management of sharks and their long-term sustainable use ,based on scientific advises .

The MFW adopted a strategies in order to fulfill this objectives.

.The most recent policy for fisheries development has been articulated in MFW's

'National Strategy for Development of the Fisheries Sector' (MFW, 2000).

The main elements of this strategy can be summarized as:

- Reducing the manpower of MFW by pensioning off redundant staff;
- Networking of MFW's offices to improve communication and information data exchange
- Replacement of industrial fishing with coastal activities;
- Increased artisanal fishing licence fees to compensate for lost industrial revenue;
- To enact and issue regulations to control the growing artisanal fishing sector;
- Increased revenue collection from traders to fund improvement to market infrastructure.
- Development of fish retail markets in Sana'a, Aden, Mukalla, Taiz and Ibb
- To redefine the rules and regulations governing the fisheries sector;
- To continue encouraging the formation of fisheries cooperative societies as a focus for fisheries development and regulation approaches.
- To review the future of public corporations such as the PCFSM, including the possible privatisation of some or all of its assets.
- Restructuring of MSRRC and its branches.

A comprehensive legal framework (Definitions of the rules and regulation governing

Fisheries sector) is a prerequisite for fisheries management and its establishment should receive highest priority.

Implementing **'National Strategy for Development of the Fisheries Sector'**

The Government after reviewed the laws and regulations, weaknesses identified and the new National Fisheries Legislation is formulated On the bases of this strategy .

MFW has adopted very important legal actions after the state enacted and Issued the

" Law No.2/ 2006 for Regulation ,Conservation , Exploitation of the Marine Organisms "

The new legislation formulated aimed to solve problems and difficulties , unregulated fisheries activities and law violation, associated with fisheries activities and environment for sharks other resources in the past and to ensure the conservation of the Biodiversity and management of sharks and their long-term sustainable use.

This legal measures provides better fisheries management and conservation fisheries are governed by national laws that dictate the terms and conditions under which fishing activities may take place and which provide for protection and conservation of living marine resources. Regulations (or by-laws) set out the details concerning fishing activities and restrictions that apply existing national legal frameworks provide for effective management and protection of living marine resources and the environment, and supporting the strength for effective management and monitoring, control and surveillance.

the law provides for enforcement, prosecution procedures and deterring penalty fees

Surveillance of artisanal fisheries can be assisted by implementing boat registration and licensing systems for Fishermen, these are already established.

Vessel registers are a very valuable tool for fisheries, such registers are already provided for in the existing legislation. The authorities responsible for registration and licensing would be the national fisheries authorities and their branches, for which they need to be properly staffed and equipped.

The most appropriate way of regulating fishing is to limit the fleet to a certain size. It is also appropriate for the government to charge fishermen for the right to exploit the common resources of the country and recover some of the costs of administering the fisheries.

management measure to limit the number of boats is to implement a registration and licensing system for boats and fishermen. Vessel registers are a very valuable tool for fisheries. It supports improving controlling, surveillances and regulation the fishing effort, to control the annual catch landed to control the trade of fin sharks,

.In all states, fisheries are governed by national laws that dictate the terms and conditions under which fishing activities may take place (MCS) (Lintner and others, 1995; Nichols,

Important regulating measures

A fishery measure undertaken by the fishery decision makers of the MFW, to prohibit the operation of industrial vessel under 6 nautical and allocated this area for the artisanal sector beside the introduction of fishery area rights where two distances were allocated for the small scale and large scale sectors, all these conditions has contributed to prevent violations caused by the industrial sector and has contributed the stock to recover and rebuild of the whole fishery resources in the Al-mahara and Hadramout coastal area.

- 1- It should be pointed out here that the MFW has closed and prevented fishing the spiny rock lobster along the coastal of Al-mahara area during November and December 2003, but in the of January, 2004, the fishing operation on rock lobster was reopened and the fishermen were allowed to fish from January to the end of April 2004.

The fishery season of rock lobster, usually starts from the beginning of October every year till the end of April, as a result of this fishery measure most of the fishermen found to concentrate and intensivate their fishing pressure in order to harvest a large quantity of rock lobster, beside other high value species like cuttlefish shrimps, tuna, sardine and tuna like species during January to the end of April, therefore we found out that the fishermen avoid to fish sharks during this period, in turn the fishing power on sharks found to be reduced noticeably, because the incomes from the rock lobster catch is higher than the income gained from sharks however over fishing of sharks during this period were not recorded despite the drop of the annual catch in the area during 2003 and 2004.

- 2- Due to the noticeable reduction of fishing power during the above mentioned period a noticeable decline of shark catch were recorded, where a limited and few boats were involved in shark fishing where the majority of the artisanal boats were concentrate on fishing the high value species as a result, decline of shark catch in the area were recorded, because of this reason data collected during two periods were not enough, due the scarcity of information and samples.

- 3- The period from June through December are usually characterized by the high marine Bio-diversity, where a lot of commercial high value species found to appear in the area, such high marine life diversity, beside the availability of huge substantial reproductive stock in the area has offered a wide scope to increase the rate of exploitation of the fishery resources

and has offered a favorable capability to the fishermen to harvest a lot of quantity from different species in general the fishermen found to focus and intensivate their fishing activates during this time in order to harvest a lot of the high value species in order to increase their income gained from the high value species therefore they avoid to fish sharks , which it's income found to be lower comparing with the income gaining of high value species .

4- During the last three years 2003, 2004, and 2005 the status of shark stock observed to be in stable condition , indications of over-fishing on shark stock were not recorded in this period , the main reasons is the reduction of the fishing power from one side and the fishery measures taken by the MFW which has prevented the industrial vessel to operate under 6 nautical mile since the mid of 2003 , where a ministerial resolution has been undertaken to prohibit the operation of industrial vessel under 6 nautical and allocated this area for the artisanal sector and allows the industrial vessels to operate above 6 nautical mile , as a result of these positive measures the in an oppressor bottom - trawling caused by bottom - trawl vessel were stopped in turn this positive action has prevented the huge damages of the productive sea-bottom along the inshore coastal zone in the area and has contributed to reduce the violations of the industrial vessels which found to damage the reproductive fishery resources and destroy the marine life which causes a noticeable deterioration of the marine environment including the fishery resources in general and sharks stock in particular .

5- Biological analysis and catch effort data obtained from survey sampling process during 2003, 2004 and 2005 , beside the results obtained from evaluation process , shows that the present status of shark resources in Al-mahara coastal area in stable condition , indication and scientific observation on the size and the mean lengths of sharks indicate that the shark resources were not exposed to over-fishing process , where the drop of mean lengths of any particular species and stock gives an indication of a stock collapse , such noticeable drop in mean lengths of sharks during 2003 and 2004 and 2005 were not recorded . (See tables No. 4 , 5 and 6) which illustrate the status of shark sizes and it's length frequency distribution can be seen in the figures attached in this final report , where a similarity in the mean lengths of shark can be observed obviously from the comparative table No. (7). Despite the slight changes in size and lengths and the decline of catch landed , due to the reduction of the fishing power from year to year all these factors together shows that the stock of shark resources are in stable condition and no indications of over-fishing were reported during the above-mentioned period in Al-mahara area , taking in mind that the fishery measures undertaken by the fishery decision makers of the MFW , beside the introduction of fishery area rights where two distances were allocated for the small scale and large scale sectors , all these conditions has contributed to prevent violations caused by the industrial sector and has contributed to stock stabilization of the whole fishery resources in the Al-mahara coastal area .

6- It's observed obviously , that the marine bio-diversity phenomena in the marine life has contributed positively in enlarging the scope of the fishery resources in the area from one side and has offered a wide opportunities to the fishermen to benefit from the existed multi - fishery grounds .

The availability of these essential diversity in the whole area has offered too , a favorable fishing conditions and a proper alternatives .

However, it should be pointed out that all these potential capacities and conditions has reduced the fishing power on sharks resources , taking in

mind that the artisanal fishermen usually think and look to exploit the high value species that has a high economical revenue particularly , the species like , rock lobster , cuttlefish shrimps , tuna and tuna like species . The availability of the unique marine bio-diversity phenomena , multi-species and multi-fishing grounds existed in the territorial inshore waters beside the reduction of the industrial fishing power since the mid of 2003 till present time and the sound fishery management measures undertaken by the MFW , which aims to regulate fishing effort between the small scale and large scale fishery sectors through the introduction of a fishing area distances rights were allocated for both fishery sectors in order to prevent crossings and to reduce the conflicts between the small scale and large scale fishery sectors , all these actions has contributed to conserve and to keep the shark resources in stable condition , taking in mind that all these positive measures were warmly welcomed by the artisanal fishery sectors meanwhile it has contributed in increasing their income which in turn it has improved their social life . Finally it should be recognized that fishery activities is competitive work and business and not to forget Abrams statement " to find a fish is not enough".

Measures to minimize waste of sharks

MFW has been adopted a legal measure to minimize Fining The practice of fining sharks (removing the fins and discarding the remainder of the fish at sea) should cease in Yemen

Ministerial resolution is adopted -to cease fining gradually by increasing the percentage body weight should be retained, now as beginning its compulsory to retention 5 % of the body weight of the shark, beside the fins cuted this percentage gradually increasing up reach 100 % and after few years its means the full utilization of the shark which is the goal and The FAO IPOA-Sharks states that Shark Plans should aim to:

implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use; because discarding of shark bodies is wasteful of protein and other potential products derived from sharks .

It prevents socio-economic benefits, and is a threat to food security. every part of these animals has been used for some purpose.

Shark can be fully utilized ,each part of the sharks body used for different purposes.

Shark **meat** is used for human consumption and its an excellent source of Fat-free protein, **liver** of sharks provides high quantities of oil that depending on the species can have very high contents of **Vitamin -A** in other cases a high prized chemical compound known as **Squalene** , which is used in the production of **cosmetics ,pharmaceuticals** and **paints**, shark **skins** can be turned into some of the most resistant and high quality leather known, Chinese cuisine uses **shark fin** as base for soap that attain s very high prices in restaurant around the globe, The corneas of sharks have been used human transplant and even the cartilage is now marketed as presumed cur for all sorts of human ailments shark jaws and teeth also used to makes souvenir for tourist and collectors. even the offal that remains after utilizing most of the shark is burned down for use in fishmeal and added as a complement to animal feed.

. Given the growing demand for shark products while many stocks are in decline, there is an urgent need to rationalize current patterns of usage. The FAO IPOA-Sharks states that Shark Plans should aim

To Minimize waste and discards from shark catches in accordance with article.2.2.(g) of the Code of Conduct for Responsible Fisheries and to Encourage achieving the full use of dead shark Contribute to the protection of biodiversity and ecosystem structure and function.

Materials and Methods

Separate Survey was conducted each to Al-Mahra and Socotra(one month) Archipelago for aims of estimation

- Annual size production of shark.
- Species catch composition and percentage of each species.
- Catch and Effort(average catch/boat/day) (catch per unite/Area.Landing site).
- Lengths size composition .
- Length frequency distribution of the dominant sharks species .
- Mean lengths and weights of the dominant species.

Catch statistics data for Sharks were collected from statistic branch of the MFW

- Biological samples and data for Sharks were collected randomly from traditional artisanal fish Landing sites were visited 7 to 8 day per month,in 2003-2004

Al-Mhahra ,Landing sites
Mehefif, Neshtoon and Dhaboat
Fatk-Dhamqoot
Saihoot - Khatr
Hisai-Dhamnoon

Socotra, Landing sites
Hadiboh
Qalansiya
nogad
hawllaf

• an interview were made with the artisinal fisherman in each landing sites in different areas .

- The type of data and biological samples collected were
- An individual total lengths nearest to 1 cm of length and their corresponding weighs in gm
- Sexual maturity stage
- Stomach content

catch were sorted into separate species groups, the species of sharks were Taxonomically identified with help of

1 - FAO Indian ocean identification sheets.

2 - Field identification guide to the sharks and rays of the Red Sea and Gulf of Aden

Lengths of each species were grouped into 4 or 5 cm groups for length frequency analysis.

Length- Weigh relationship a,b were estimated, using **Excel Soft-ware**

$$W=aL^b$$

Were applied.

Lengths and weighs area converted into logarithmic, from the slope of the straight line obtained from the plot of

Log (L) and Log (W) the values of a, b were estimated, using ExcelSoft-ware

The Stomach content and sexual maturity stage of 200 specimens were examined.

Fishing gears and methods

The fishing craft operating along the coast of Yemen in the traditional artisanal fisheries are mainly two type of deferent size

Sunbuk

It's constructed from wood or fiberglass (recently)the most Sunbuks are mechanized either with inboard or outboard benzene engine power ranging 15-45 HP Fishermen operate 15-25 miles away from the shore, with crew number of 6 persons. They use in the fishing operation . Trolling , Handline ,Small-pure seining,Longline ,Surface Gillnet. The catch is kept either with ice or salted and dried,

The technical specification of Sunbuks as follows

Length = 12-14 m , width = 2-3 m , Engine power= 15-45 HP , Manpower = 4-6 Person

Hubris

It's constricted from either wood fiberglass most of them are mechanized with outboard benzene engine of 8 - 15 HP, the Number of crew about 2-5 persons, they use the same gears and methods that used by Sam books,

the technical specifications of huris are :-

Length = 3-11 m , Width = 1.5-2 m , Engine power = 8-15 HP , Manpower = 4-5 person

The common gears and methods used by Small-scale fishery for Traditional artisanal sector

Longline -- for Shark Tuna, , Bilefish capturing

Trolling -- pelagic fish sp. capturing

Gillnet and draftnet--- for both pelagic and demersal sp. capturing

Small pure-seining-- for Sardine, Indian mackerel Tuna and Seer fish

Most fishing boats used for shark fishing are Fiberglass mechanized boats , it's size ranged from 7m to 9 m and HP ranged from (15 to 45HP) and fishing gears used mainly are gillnet 2 to 4 gillnet per boat , it's length about 70m and width about 15m , mesh size ranged between (100 mm to 300 mm) , large of C.limbatus were caught by longlines (length about 1200m) provided by 40 to 70 looks , most of above mentioned species

recorded in Dhamqoot landing site during May 2003 . Most depths used for gillnets ranged between (7 to 34m) .

Depths used for longline found to be in 200m (offshore) see table (2).

Most dominant species of sharks in the landing sites visited consist of Rh. acutus during May, 2003 and it's lengths in the sample ranged between (51 to 86 cm), but dominant lengths ranged between (70 to 75m) in the sample it's mean lengths recorded were 74.2 cm and mean weight recorded were 1940gm for females. Females recorded in sample 20% and 35% for males

Discussion.

Highly Migratory and Shared Stocks

Shark migration is not completely understood.

Since yellowfin is a highly migratory species, the fish present in the waters of the Gulf of Aden are almost certainly part of the larger Indian Ocean stock rather than a separate, resident stock. The potential yield is therefore influenced by the catch taken in other Indian Ocean countries that share the stock.

Information on migration patterns and population dynamics of shared and highly migratory stocks in the Region is not available. Obtaining such information is possible through tagging experiments, which are costly and require a high degree of technical ability and regional cooperation.

Highly migratory species, in particular yellowfin, (*Thunnus albacares*), Spanish mackerel (*Scomberomorus commersoni*), Indian mackerel, (chub) mackerel (*Scomber japonicus*) and various shark species are most likely part of larger Indian Ocean stocks rather than separate, resident stocks.

The future of the Region's fisheries are therefore influenced by the catch taken in other Indian Ocean countries which share the stock. A regional organization, the IOTC, serves to assist member states to better manage their shared tuna and tuna like fish resources. Yemen and Somalia would benefit from closer involvement in the activities of this body.

Most species of shark are captured in multi-species fisheries directed at more productive and more highly valued teleost species. Harvest strategies designed to maximize economic and social benefits from these multi-species fisheries will inevitably deplete the less productive shark and other chondrichthyan species unless methods for reducing the catch of the less productive species can be developed and implemented. As fishing effort increases characteristic and predictable changes occur in the fish assemblages which have major implications for sustainability and management. In general as effort increases larger individuals and species disappear from the assemblage to be replaced by smaller counterparts.

This results in a gradual drift towards shorter-lived, faster-growing species. This is accompanied by an initial increase and later a decrease in the number of species in the exploitable population although the number of fish actually appearing in the catch can increase until a maximum level is passed.

Results.

Hadramout Governorates

The total annual catch of the artisanal fishery sectors in Hadramout Governorates only exceeds **78,228** MT of multi species (see the table below)

The average annual catch of sharks in Hadramout were estimated as **4563** Metric tons /year

consisting of three categories of fishes:

- Large and small pelagic fishes
- Semi pelagic fishes
- Demersal fishes (See the table below contains average annual production of the deferent species with their percentage in the catch composition

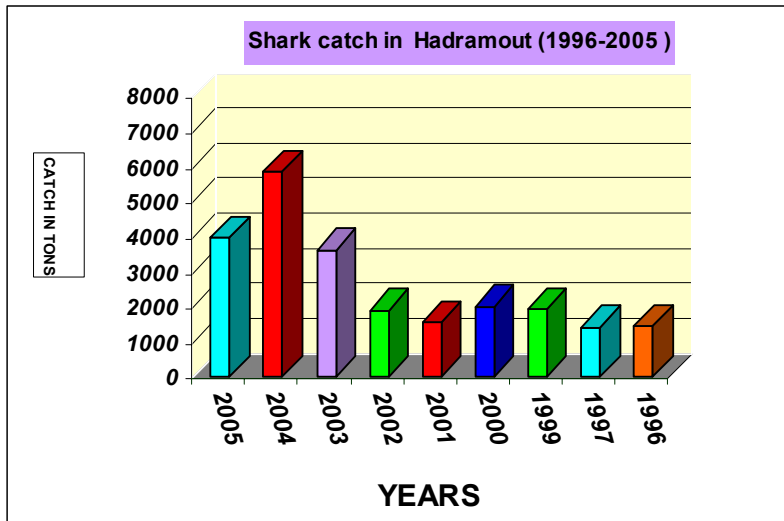
Table(1) average annual production fishes and their percentage catch composition

<i>species</i>	2003	2004	2005	mean annual	%
	(kg)	(kg)	(kg)	catch (kg)	
<i>Yellow fin tuna</i>	45163731	48828950	29898484	41297055	52.8
<i>Longtail tuna</i>	1440230	1252079	1468671	1386993	1.8
<i>Kawa kawa</i>	868949	814544	2103711	1262401	1.6
<i>Striped bonito</i>	1349933	1928822	1208772	1495842	1.9
<i>Skip jack tuna</i>	1063951	585330	499336	716206	0.9
<i>Frigatetuna</i>	199113	454733	13382	222409	0.3
<i>Spanish mackerel</i>	2312227	1632397	734598	1559741	2.0
<i>Sharks</i>	3634000	5860675	3974940	3634000	4.6
<i>marlin</i>	17581	21160	39974	26238	0.0
<i>sardine</i>	122754	41071	21733	61853	0.1
<i>Indian mackerel</i>	177935	1079839	638041	631938	0.8
<i>cuttlefish</i>	1800316	7388466	6790584	5326455	6.8
<i>lubster</i>	46559	15726	50198	37494	0.0
<i>Emperore</i>	474814	1045453	1616908	1045725	1.3
<i>Grouts</i>	762164	784460	786519	777714	1.0
<i>others</i>	10617888	13227171	32391714	18745591	24.0
<i>Totals</i>	66418145	78514871	78262625	78227657	100

The annual catch of shark has been increased steadily in Hadramout Governorate In the last recent years . see the fig (1) bellow.

The catch increased from low of 1569 Metric Tons in (2001) reaching maximum numbers of its production 5861 Metric Tons in 2004 , Followed by the decline in the catch in the next year (2005) .

Fig (1)



year	catch/tons
1996	1465
1997	1423
1999	1935
2000	2021
2001	1569
2002	1898
2003	3634
2004	5861
2005	3975

Shark fins trade in Yemen showed a remarkable and rapid increase and fishing pressure on shark stocks has been recorded during the last two decades in Yemen due to the ex-vessel price for dry shark fins has reached \$60 per kg., in the world market, provided sufficient incentive to harvest sharks , even dry meat of sharks found to be marketable in the local markets and in the regional markets

markets the rapid increase of trade on sharks species and as a result of intensive fishing on shark stocks beside the lack of a sound fishery management and the lack of fishing effort regulation , a stock collapse of sharks will be recorded in the few coming years in Yemen is expectable.

There is concern over the increase of shark catches and the consequences this has for the populations of some shark species in several areas of the world's oceans. This is because sharks often have a close stock-recruitment relationship, long recovery times in response to over-fishing (low biological productivity because of late sexual maturity; few offspring, albeit with low natural mortality) and complex spatial structures (size/sex segregation and seasonal migration).

Sharks in general are more vulnerable to exploitation than most other fishes, because of their

longevity, delayed maturation and relatively low fecundity (Camhi et al. 1998). Available evidence

suggests that whale shark populations are, like those of other large sharks, very vulnerable to targeted fisheries (perhaps even more so, because they have so very few natural predators).

Populations rapidly decline due to unregulated over-exploitation and, as described for other depleted shark populations, may remain low for many decades into the future.

. In addition to that the lack of sound fishery management and the lack of fishing effort led to over-exploitation and as result to the above-

mentioned reasons a noticeable shark stocks collapse has been observed during the last decade .

Socotra Archipelago

The Socotra Archipelago, located in the Arabian Sea at the entrance to the Gulf of Aden, constitutes a separate marine ecosystem. The islands' inaccessible location has spared them from modern intrusions and today the archipelago represents an undisturbed, pristine environment with a unique biodiversity. It has been described by the World- Wide Fund for Nature (WWF) as an 'Indian Ocean version of the Galapagos' (UNDP/GEF, 1997). the Gulf of Aden and the area south of Socotra are among the most productive marine areas in the world, with productivity levels comparable to those off the coasts of Peru and West Africa.



The catch composition varies by area, season and water depth and species

It should be stressed that a more cautious approach to managing shark fisheries is required due to their relatively low reproductive rate and slow growth. Reports from fishermen on Socotra Island off Yemen's south coast indicate that catches are noticeably declining, indeed an ongoing GEF UNDP project focuses on shark fishery management for this reason. Collapse of the Socotra shark fishery would have catastrophic consequences for local communities there, as they rely very heavily on sharks for food and a source of economic prosperity (Saeed, 1999).

In the Socotra Archipelago, fishing is the main occupation for coastal inhabitants. Sharks are targeted using long-lines, gill nets, and hook and line techniques.

The annual production of sharks is estimated at 7,283 metric tons, and average CPUE is estimated at (54-66) kilograms per boat and day. It is estimated that the boats fish for shark 160 days of the year (Saeed, 1999). The predominant species are *Carcharhinus albimarginatus*, *Carcharhinus sorrah* and *Sphyrna lewini*. In the catches at landing sites along the southern coast of Socotra Island (the Nogid area), species such as *Carcharhinus smelanopterus*, *Carcharhinus sealei* and *Galeocerdo cuvier* have been identified.

Catches of the blackspot shark (*Carcharhinus sealei*) reached 3,000 fishes, or 7.5 metric tons per day in May 1999. During the monsoon season, fishing decreases due to the high wind speeds and wave swells. Fishing effort is also limited by the lack of marketing paths for all products except for dried shark fins and limited amounts of shark meat. A lack of fisheries services.

Tab(2) shark species identified in Socotra Archipelago

Species	FAO- Name	Local -name
<i>Carcharhinus Limbatus (Vlenciennes,1839)</i>	<i>Black tip shark</i>	بردعید
<i>Carcharhinus lewini (Griffith and Smith,1834)</i>	<i>Salloped hammer head shark</i>	قرین/کوفي
<i>Carcharhinus longimanus (Poey,1861)</i>	<i>Oceanic white tip shark</i>	مسح
<i>Carcharhinus Albimarginatus(Ruppell,1837)</i>	<i>Silvertip shark</i>	عورور
<i>Carcharhinus Sorrah (Vlenciennes,1839)</i>	<i>Spot tail shark</i>	هلکة
<i>Carcharhinus seali (Pietschmann,1916)</i>	<i>Black spot shark</i>	ابوحازم
<i>Carcharhinus Amblyrhncchos (Bleeker, 1856)</i>	<i>Grey reef shark</i>	نکة
<i>Galeocedro Cuvier (Peron & Lesue)</i>	<i>Tiger shark</i>	نمرانی
<i>Carcharhinus Brevipinna(Muller&Henle,1839)</i>	<i>Spinner shark</i>	شوصه
<i>Isurus Oxyrinchus (Rafinesque , 1810)</i>	<i>Short fin mako</i>	ذیبه
<i>Carcharhinus Plumeus (Nardo , 1827)</i>	<i>sand bar shark</i>	دوغة
<i>Carcharhinus melanopterus(Quoy&Gaimard1824)</i>	<i>Blacktip reef shark</i>	شبیصة

Catch per unit AREA (CPUA)

Annual catch of sharks per landing site

Landing site	pers of boats	atch per day	Annual catch	Percentage
Qalansiya	210	11,34	1546.5	1814.4
Hadiboh	179	9,666	182301	1546.5
nogad	211	11,394	1581.1	1823.1
Abdull kuri	183	9,882	518.4	1581.1
Samha	60	3,240		518.4
totals	842			7,283

Species	Catch (Numbers)	Weight (kg)	%
<i>Carcharhinus Sorrah</i> (Spot tail shark)	22	160	12.1
<i>Carcharhinus lewini</i> (hammer head shark)	4	36	2.7
<i>Carcharhinus Albimarginatus</i> (Silvertip shark)	7	31	2.3
<i>Carcharhinus Plumeus</i> (Spinner shark)	4	24	1.8
<i>Carcharhinus Limbatus</i> (Black tip shark)	20	128	9.7
<i>Carcharhinus longimanus</i> (Oceanic white tip shark)	1	4	0.3
<i>Scombro.commerson</i> (Spanish mackerel)	205	868	65.6
<i>Thunnus albacores</i> (Yellow fin tuna)	2	8	0.6
<i>Katswons pelamis</i> (Skip jack tuna)	16	6	0.5
<i>Euthynnua affinis</i> (Kawa kawa)	24	28	2.1
<i>Lethrinus Spp.</i> (Scavenger/ emperor)	27	21	1.6
<i>Xiphias gladius</i> (Sword fish)	1	9	0.7
Totals	333	1323	100

Species	catch	Mean engths	%
<i>Carcharhinus Albimarginatus</i> (Silvertip shark)	500	224 cm	60
- <i>Sphyrn lewini</i> (Scalloped hammerhead shark)	160	175 cm	19
3 - <i>Isurus oxyrinchus</i> (Sortfin mako)	65	-	7.8
4 - <i>Carcharhinus limbatus</i> (Black tip shark)	55	120	6.6

Species	Mean length	Mean weight	%
1- <i>Carcharhinu sealei</i> (Black spot shar	82 cm	2.2	86.4
2- <i>Carcharhinu Meloanpterus</i> (Blacktip reef shark)	80 cm	2.5	23.4
3- <i>Galeocedro Cuvier</i> (Tiger shark)	90 cm	3.3	2.4
4 - <i>Carcharhinus Albimarginatus</i> (Silver tip shark)	80 cm	3.0	9.0

RED SEA

A round 22 families of sharks comprising more than 45 shark species inhabiting In the Red Sea , fishing is the main occupation for coastal inhabitants. Sharks are targeted by artisanal fishery sectors using long-lines, gill nets, and hook and line techniques.

The annual production of sharks in 2006 is estimated at 2,000 metric tons comprising the

following predominant species from the following main landing site Al-Hodieda , Al-Luhaya ,Al-kokah, A l-Salife, Al-koba , Al-kataba,and other landing sites

The catch statistics of sharks for red sea landing sites didn't speciefed sharks into species of sharks ,they are grouped and totaled under the name of sharkes.

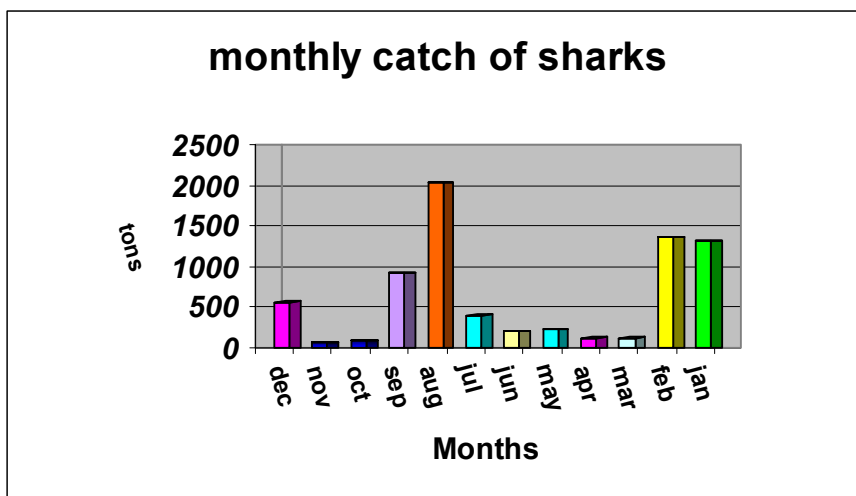
The dominant species of sharks in the above mentioned landing sites are as follows

<i>Species landed</i>
1. <i>Rhizoprionodon acutus</i>
2. <i>Mustelus mosis</i> (Arabian smooth-hound)
3. <i>Loxodon macrorhinus</i>
4. <i>Carcharhinus limbatus</i> (Black tip shark)
5. <i>Chondrichthyans</i> (<i>Rays and skates</i>)
6. <i>carcharhinus limbatus</i> (Black tip shark)
6. - <i>Carcharhinus albimarginatus</i> (silver tip shark)
7. - <i>Sphyrna lewini</i> (hammerhead shark)
8. - <i>Carcharhinus seali</i> (Black spot shark)
9. - <i>carcharhinus sorrah</i> (spot tail shark)

Al Mahra Governorate

In the Al Mahara fishing is the main occupation for coastal inhabitants. Sharks are targeted using long-lines, gill nets, and hook and line techniques.

The annual production of sharks is estimated at **7,451** metric tons, and average CPUE for sharks is estimated at (118) kilograms per boat and day.



species	nthly catcl
Jan	1320.7
fob	1365.5
mar	122.9
apr	123.5
may	224.8
jun	213.0
jul	401.2
aug	2040.2
sep	925.4
oct	87.0
nov	60.8
dec	565.9
total	7450.7

the previous graph and catch statistics of the Regular monthly landing of sharks in (2004) shows that the highest catch of sharks appears in July it's the time where the monsoon upwelling is at its maximum strength in this period it is frequently observed that Association of fish abundances with strength of the monsoon upwelling Also migration of large species from off shore moves toward the near shore Water this occurs just before the spawning migration or reproduction period. On the base of our results the fishing season for sharks In Yemen extending from (June - December) this period is usually characterized by the high marine Bio-diversity , where a lot of commercial high value species found to appear in the area , such high marine life diversity , beside the availability of huge substantial reproductive stock in the area has offered a wide scope to increase the rate of exploitation of the fishery resources and has offered a favorable capability to the fishermen to harvest a lot of quantity from different species in general the fishermen found to focus and intensify their fishing activities during this time in order to harvest a lot of the high value species in order to increase their income gained from the high value species

The catch statistics of sharks for both al-Mahra and Hadramout Governorates didn't specify sharks into species of sharks , they are totaled under the name of shark

species catch composition and average catch per boat of sharks in the different given below

targeted landing sites, catch and effort is illustrated in the next table

Dominant species	Average catch per per boat	Total catch	No of boats	Landing site
	kg	kg		
Carcharhinus limbatus	75.4	829.6	11	Nishtoon
Loxodon macrorhinus	89.2	445.8	5	Dhaboat
Carcharhinus sorrah	43.4	347.1	8	Mehefif
Sphyrna lewini	295.9	1183.7	4	Dhamqoot
Rhizoprionodon acutus	16	16	1	!Fatk
Rays and skates	80.1	160.2	2	Makeip
Carcharhinus falciformes	11	44	4	Khatr

1. Results obtained during surveys (April through June, 2003) :

During April 2003 a random samples were taken, catch composition and dominant species were determined from each single boat , where 202 shark of *Rhizoprionodon acutus* were analysed and their biological parameters were taken , percentage of females reached 38.1% and males reached 61.9% in sample . Mean length of females reached about 68.4cm, and their average weight reached 1621.3gm , where the mean length of males in sample reached about 61.2 and their average weight reached 1043.2 gm respectively.

In April 2003, about 8 species of sharks of *Carcharhinus sorrah* were appeared in the catch landed in Mehefif area , seven were females and one was a male , the mean length of females reached about 83.3 cm and it's mean weight reached 3914.3 gm , the total length of the male reached 88 cm and it's weight reached 3600 gm.

Beside this about 13 sharks of hammerhead shark (*Sphyrna lewini*) appears in the sample 7 of them were males and 6 of them were females , the mean length of males reached 76.3cm and it's mean length of females reached 78.2cm and it's mean weight reached 2433.3gm. respectively .

Fig.(1) illustrate the length frequency distribution of *Rh. acutus* and fig.(2) illustrate the length frequency distribution of *Carcharhinus sorrah* and fig.(3) illustrate the length frequency distribution of *Sphyrna lewini* , see pages No (1,2).

During May, 2003 a field work survey and sampling process were carried out along the coastalline of Al-mahara area , where the targeted landing sites were visited and biological parameters and analysis were taken .

Table No.(2) and No.(3) illustrate the main landing sites which were visited and a biological and bio-statistic catch data were collected , these tables illustrate the No. of boats , total catch, main dominant species , average catch per boat type and size of boat , fishing gears used , see pages No.(8-9) .

During June, 2003 about 812 species of *Rh. acutus* were taken and a biological parameters were taken and analyzed percentage of females in the total samples reached about 27.6% and for males reached 72.4% , number of species of *M.mosis* in the total sample reached about 171 sharks , percentage of it's females reached about 76.6% and males reached 32.4% in the total sample , beside this a *Loxodon macrorhinus* were males , it seems that *Rh. acutus* found to be a dominant species in June , where *L. macrorhinus* and *M.mosis* found to appear in few numbers and it seems that *Rh. acutus* replaced instead of the above mentions two species where *Rh. acutus* represent about 99% in the total catch landed in June 2003.

During may, 2003 a field survey work and biological sampling process were carried out along the targeted landing sites . table No.(2) illustrate , the landing sites visited , bio-statistic data , No. and size of boats ,total catch , average catch per-boat , fishing gears used and other essentic information ... etc .(see tables attached).

During biological analysis and data processing total catch landed were estimated in the western part of Al-mahara area , Saihut area , Khatr , Hesai , Thamnoon landing sites and Rakhoot area , beside this the landing sites in the eastern area of Al-mahara (Neshtoon , Dhaboot , Mehefif , Feidimi , Al-fatk and Damqoot sites were visited most dominant species of sharks landed in the western landing sites observed to consist of *Rh. acutus* represents about 56% and Hammer head sharks (*Sphyrna lewini*) about 14% in the eastern part most dominant species of sharks landed consist of *Rh. acutus* % , and *C. limbatus* forms about 29% and *Sphyrna lewini* forms about 15% .

Most fishing boats used for shark fishing are Fiberglass mechanized boats , it's size ranged from 7m to 9 m and HP ranged from (15 to 45HP) and fishing gears used mainly are gillnet 2 to 4 gillnet per boat , it's length about 70m

and width about 15m , mesh size ranged between (100 mm to 300 mm) , large of *C.limbatus* were caught by longlines (length about 1200m) provided by 40 to 70 hooks , most of above mentioned species recorded in Dhamqoot landing site during May 2003 . Most depths used for gillnets ranged between (7 to 34m) . Depths used for long line found to be in 200m (offshore).

Most dominant species of sharks in the landing sites visited consist of *Rh. acutus* during May, 2003 and it's lengths in the sample ranged between (51 to 86 cm), but dominant lengths ranged between (70 to 75m) in the sample it's mean lengths recorded were 74.2 cm and mean weight recorded were 1940gm for females. Females recorded in sample 20% and 35% for males see Fig. No. (3) . Large length of *Rh. acutus* recorded in Khatr landing site was 89cm for females and small length for male recorded in Dhamqoot site was 51 cm. Total lengths of *Loxodon macrorhinus* recorded in the sample ranged from 50 to 90cm and dominant lengths in sample ranged between 70-75cm , females represented about 41.6% and males represented about 23.3% , mean lengths of females recorded was 71.9cm and their mean weight was 1350gm and mean lengths for males recorded was 69.2cm and mean weight was 1256 gm . It was observed that *Loxodon macrorhinus* during survey time in May has found to appear in few quantities in catch landed comparing with previous months which recorded about 50 to 85 % in total catch landed, a larger shark of *L.macrorhinus* recorded in the eastern part in Neshtoon site Saihoot site was 59cm. See Fig. (4) .

Total length of *C.sorrah* encountered in the sample ranged between (60-110cm) , and dominant length recorded were between (80-90cm) for females and represented about 44.4% and males ranged between (70-80cm) represented about 42.8% .

Mean length of females recorded was 88.8cm. and their mean weight was 2690gm. And mean length of males was 75-80 cm and their mean weight was 2044 gm . See fig. (5).

A larger shark of *C.sorrah* recorded in the eastern part in Damqoot site was about 209 cm and it's total weight was 157447 gm and smaller shark of this species recorded in the western part in Saihut site was about 65 cm and total weight was 1000gm . Biological analysis should that this species was in the second stage of maturity for both males and females and mostly found to feed on Sardine species and were in stage 2 and 3 of stomach contents .

C.limatus encountered in catch landed during survey time, where the total lengths recorded ranged between 60-190cm and dominant lengths recorded ranged between 80-90cm represented about 55.6 for both females and males . Mean length of females recorded in the sample was 96.2cm and their mean weight was about 7032gm and mean length of males recorded was 99.5cm and mean weight was 7525gm . See fig. No.(6).

A largest total length of *C.limbatus* recorded in sample was 197cm for females Damqoot landing site and for males was about 189cm .

Most of them were caught by longline (40 to 70 hook per 1200cm length) and smaller size of females of *C.limbatus* recorded in sample in Khatr landing site in the western part of Al-mahara area was about 75cm and it's weight was 2300 gm, but this small size was fished by gillnet maturity stage recorded for both males and females were in stage 2 and stomach content were in stage 2 and consist of Sardine sps. And swimming crabs (*Portunidae*) hammer head species (*Sphyrna lewini*) recoded in catch landed , their total lengths recorded in the sample ranged between (70-210)cm lengths between 70-90cm fished by gillnet and dominant length ranged between 70-80cm in the sample 55.6% were females and their mean length was 78.4 cm and mean weight was 2271gm mean length of males recorded was 147 cm and mean weight was 5500 gm.

Lengths between 110-210cm were fished by longlines, their dominant length ranged between 180-210 cm where both females and males represented about 33.3% See Fig. No. (7).

A few of other species like *Mustelus mosis* which belong to the (Triakidae) were recorded in catch landed , their total length ranged between (76-82cm) and mean length recorded was 80.5cm and mean weight was 1510cm , all were males and females were not recorded in Dhamqoot landing site.

In Al-mahara area a two females of skates species were recorded (*Rhinobatus granulatus*) which are belong to the family (Rhinobatidae) , their total lengths were 155 cm , 190cm and their weight were 13000 gm and 25000 gm respectively. Mean length was 156.6 cm and mean weight of both species was 16650 gm. Both females were trying to release thier fully developed youngs ,or were ready to release this young's .

Other species were recorded (*Rhinoptera Jaranica*) which belong to the family (Myliobatididae) in Khatr landing sites both species were females and their total lengths ranged between (56-47) cm and total weight of each female ranged between 1500 -2500)gm mean length was 51.6 cm and mean weight was about 2020 gm , both were fully matured and were ready to release their fully developed youngs .

In June 2003 , about 812 sharks of *Rh. acutus* were sampled and biological parameters were taken percentage of females reached 27.6% and males reached 72.4% in catch landed about 171 sharks of *Mostelus mosis* was recorded in total catch land , and a biological parameters were taken . Percentage of females reached 76.6% and males reached 23.4% .

Other species were recorded in the sample taken , where 37 sharks of *Loxodon macrorhinus* wee taken for biological analysis , females represented in the sample were 35.1% and males represented about 64.9% .

These were observed that *Rh. acutus* were dominant species in catch landed in the main target landing sites visited during June 2003, this period is the beginning of upwelling phenomena , which occur during summer time due to the SW monsoon winds in the area .

These species are prefare to live and exist in shallow waters during this period and found to aggregate in this time forming school sharks , because results obtained during survey in this period shows that , this species represents about 95% in the total catch , landed and are most dominant species , thier total lengths found to be similar and this similarity in total lengths indicate that , these species belong to the same age class or are equal in age , where school phenomena found to exit mostly in pelagic bony-fishes like mackerels , sardine and tuna species .

Results obtained during survey time in June 2003, can be summarized as follow :

1. Catch landed of shark species from the sampled boats during June 2003 were higher than the previous months (the first quarter of this year) .

The average catch per boat as well shows the same results .

2. Dominant species of sharks landed in the sampling landing sites during June,2003 and their distribution in percentage for each species are illustrated below as follow :

Species landed	Percentage
<i>Rhizioprionadon acutus</i>	65.6%
<i>Mustelus mosis</i> (Arabian smooth-hound)	22.4
<i>Loxodon macrorhinus</i>	3.5
<i>Carcharinus limbatus</i>	1.0
Rays and skates	7.4

Biological analysis of *Rh. acutus* and *M. mosis* recorded in catch landed in the sampling landing sites shows that these two species were dominant species in catch composition and they were in a condition of reproductively stage and seems to be in a breeding period .

During survey time, the scientific team observed that the above -mentioned species were ready to release their new born youngs and some of them were in hatching stage where new born youngs were observed coming out or trying to liberate their new born youngs , the new born youngs were measured during sampling process their total lengths were ranged between 29 to 37 cm and their total weight ranged between (190-200gm) .

It should be mentioned that sharks have an unusual combination of biological characteristics, but most of shark species share in one main biological features, that most of them are characterized by their similarity in born feature, they are viviparous which means that they hatch or birth where they born is a fully developed youngs which are similar completely to their parents .

Their fertilization and reproduction is completely differ from the bony-fishes which are oviparous, which means that, their fertilization and reproduction activities occur externally, where their eggs and sperms found to be liberated out side during spawning season and their development stage from eggs to larvae, to Juvenile and to small size fish to large size fish , such phenomena are not existed in shark species .

The value of mean length and mean weight for the main dominant species recorded from collected analyzed parameter for both males and females of each species are illustrated below :

Species	Mean length		Mean weight		No. Of samples	
	Female	Male	Female	Male	Female	Male
R. acutus	72	71.8	1737	1604	167	437
M.mosis	72.4	96.4	1675	2987	131	40
L. macrorhinus	76.7	76.2	1509	1382	13	24

As follow up and making a comparative measures between mean lengths recorded in June 2003 , with mean length recorded in the previous months the following findings were observed :

- The mean length value of *Rh. acutus* in the sample of June founded to be larger than the other previous month .
- As follow up the mean length values of this species during the first quarter of this year through the second quarter of this year 2003 , are in Ascending stage .
- Mathematical relationships between the length and weight to bony-fishes .
 - Constant values for mathematical expression were estimated by using (EXCEL)computer program and through understanding these constant values , we can know the total length of any fish in case we knew it's weight or vice versa , this relationship is illustrated below :

$$W=aL^b$$

Where , W =Total weight of the fish

L = Total or standard weight of the fish

b = Are constant

These constants values were estimated for the dominant species in the sample and are illustrated as follow :

Constant values for dominant species of sharks .

Species	a		b	
	Female	Male	Female	Male
Rh. acutus	0.0014	0.0122	3.258	2.755
Mostelus mosis	0.0041	0.0041	2.950	2.951
Loxodon macrorhinus	0.1242	4.2883	2.166	1.333

Length frequency distribution obtained from biological parameters and proceeding biological data in June shows that 604 sharks of Rh. acutus were analyzed 65% of them were males and their lengths ranged between 70-75cm and they were dominant lengths in samples, where 56.9% of females found to range between 60-75 cm .

For Mostelus mosis 35% of males found to range between 75-80cm and 45% of their females ranged between 85-90cm . See figures attached in this report .

It's worth to mention that the size structure and length frequency distribution of shark species are changes according to the changes of some factors , such as depths of fishing ground , fishing gears used , mesh-size of gillnet , smaller versa - longline in distant water will produce large size of sharks and smaller size will not be appeared.

It's unacceptable that the small size sharks will be occurred between the large size , if it happened or existed in longlines they will be inevitably vulnerable for feeding by the large predators of sharks .

Studies on tuna population shows that there is a similarity pattern and behaviour between tuna populations and shark populations , particularly in their size distribution and structure where the larger size of sharks exit in distant water , while the smaller size found to exist and aggregate in inshore waters .

Therefore behaviour and pattern of distribution of shark species found to be similar to the behaviour and pattern of tuna distribution , as well as the size of fish become large , it found to move to distant waters .

Conclusion

This research studies and the regular field surveys on sharks aims to evaluate the status of shark stocks along the coastal line of Al-mahara area , but there some problems and difficulties encountered our work and studies , in particular to determine and understand the impact of fishing pressure and trade fishery upon species of sharks . First , there is a general lack of biological knowledge about sharks. Second we encountered a general lack of species - specify catch and effort statistics in the shark fishes and in the shark by catch . Third the specific data needed for demographic and stock assessment models is simply lacking and most of the models used in stock assessment were development for bony-fishes and their application to sharks may be questionable and still were not approved for cartilaginous species . Therefore problems in understanding and assessing the status of shark populations can be explained in general as following :

1. Lack of biological data on sharks and elasmobranches .
2. Lack of fishery data on shark fisheries is critical to their proper management .

3. Lack of suitable Models for shark populations models to assess the impact of fishery and trade on sharks .

4. Lack of validated age estimates , the growth rate of species and it's estimated age at sexual maturity are essential for stock assessment and demographic models .

Scientific studies on sharks indicate that sharks have an unusual combination of biological characteristics; (a) low growth (b) delayed maturation (c) long reproductive cycles (d) low fecundity (e) long life span, this factors determine the low reproductive potential of many shark species.

Some species, includes some commercial important species, are extremely slow growing and sharks produce young that hatch or born fully developed and that are relatively large at hatching or birth.

It was observed that the lack of fishery data on shark fisheries is critical to their proper assessment and obtaining adequate data found to be difficult.

It should be pointed out that these above mentioned factors determined the low reproductive potential of many shark species, therefore most of shark species found to be endangered species due to the over-fishing and to the rapid increase of trade on sharks species and as a result of intensive fishing on shark stocks beside the lack of a sound fishery management and the lack of fishing effort regulation , a stock collapse of sharks will be recorded in the few coming years in Yemen .

We think that some precautionary and sound fishery management should be under taken in order to preserve and conserve depleted shark stocks and fishery manager should activate their role in controlling and monitoring shark fisheries and to educate the fishermen about the threats face the shark fishery and shark trade .

The preliminary results obtained thought the second quarter of this years compared with the results obtained in first quarter of this year shows that some species like smooth round shark (*Mostelus mosis*) and *Loxodon macrorhinus* are disappeared or started to disappear in the second quarter and sometime found to appear in few quantities in the catch .

We think that the appearance of these species from time to time relatively in few numbers considered to be a temporary disappearance due to the migration from inshore waters to offshore waters, for breeding or reproduction activities or may be springtime resting or may qualify them selves for hatching or produce a young or for laying a new born developed young during the SW monsoon season , which start in June through July , August and September period but the remarkable appearance of *Rh. acutus* in large quantities during May and June at the second quarter of the years , shows that a kind of replacement of species has been occurred in catch landed in most landing sites in the eastern and western area of Al-mahara coastline . Biological analysis during this period shows that most of these dominant species are matured and some of them found carrying a developed new born some have released their new born or found to be ready to release their young's in July or early August . Length parameters of some released new born were taken and total length of new born young reached between 34 to 36cm. beside this some other species like *Carcharhinus sorrah* and *Sphyrna lewini* appears from time to time in few numbers in catch landed where the numbers appears found to represent about 5% from the total catch .

This progress report which was achieved during April-June, 2003 shows some preliminary positive results which were obtained from sampling process during this period , where these positive results is giving us a primary picture on the present status on shark stocks and results on dominant species that appear in lot quantities in the catch landed , beside it gives us some primary indications of the dominant species like *Rh. acutus* .

It seems that a decline in the mean lengths of *Rh. acutus* was not observed and not appeared in catch landed , if length drop of *Rh. acutus* appears in catch , such drop will give indications on the status of shark stocks , such indications were not observed during the second quarter of this year. The length frequency distribution illustrated in this report found to give us a preliminary picture on this report on the present status of shark stocks . A regular sampling data on length parameters during the fore coming months and collecting a biological data on shark species till the end of this year, will give us a proper and clear picture in Al-mahara coastal line .

- The period from June through December are usually characterized by the high marine Bio-diversity , where a lot of commercial high value species found to appear in the area , such high marine life diversity , beside the availability of huge substantial reproductive stock in the area has offered a wide scope to increase the rate of exploitation of the fishery resources and has offered a favorable capability to the fishermen to harvest a lot of quantity from different species in general the fishermen found to focus and intensivate their fishing activates during this time in order to harvest a lot of the high value species in order to increase their income gained from the high value species therefore they avoid to fish sharks, which it's income found to be lower comparing with the income gaining of high value species .

- - Studies on tuna population shows that there is a similarity pattern and behavior between tuna populations and shark populations , particularly in their size distribution and structure where the size structure and length frequency distribution of shark species are changes according to the changes of some factors , such as depths of fishing ground , fishing gears used , mesh-size of gillnet , smaller versa - long line in distant water will produce large size of sharks and smaller size will not be appeared.

It's unacceptable that the small size sharks will be occurred between the large size , if it happened or existed in longlines they will be inevitably vulnerable for feeding by the large predators of sharks . Studies on tuna population shows that there is a similarity pattern and behavior between tuna populations and shark populations , particularly in their size distribution and structure where the larger size of sharks exist in distant water , while the smaller size found to exist and aggregate in inshore waters . Therefore behavior and pattern of distribution of shark species found to be similar to the behavior and pattern of tuna distribution , as well as the size of fish become large , it found to move to distant waters .

- **RECOMMENDATIONS AND SUGGESTION :**

A cording to the findings obtained and results mentioned in this report on the status of the sharks species along the coastal area of Al-mahara governorate , we would like here to recommend the following :

- 1- Artisanal fishermen should use longline fishing gear provided with large hooks for fishing sharks along off shore waters in depths ranged from 70m to 200m .
- 2- To prevent using the present gillnets used in the area which it is mesh-size found to be small (7mm) , we advise to use a large mesh-size about (14mm) in fishing sharks along the shallow coastal in inshore waters depths 5m to 30 m during October through the end of April in

order to conserve and protect the small size of sharks species resources .

- 3- We advice to use the present gillnet used of 7mm mesh size . During upwelling seasons June-September in the shallow waters in depths ranged from 15-50m , but it should be not used during October to the end of April, where this time is the nursing period and growth stage for the smallest new born of sharks in order to conserve them and to secure a strong recruitment process and to prevent stock collapse of sharks .
- 4- According to the results and findings obtained through evaluation and estimation process by using stock assessments methods , where catch per unit offer (CPUE) methods were used during 2003, 2004 and first half of 2005 , all estimations shows that the average and annual catch of sharks landed by the artisanal boats along the coastal line of Al-mahara area estimated to range between 2000 m/tons to 3000m/tons annually this average rate of catch landed found to be coincident to the present fishing efforts, therefore we advise to keep on the present level of catch and effort not to cross the present annual catch quota (see tables No.8 and 9 , which illustrate the total catch and the average catch per boat during 2003 and 2004 respectively).
- 5- We highly recommended the fishery decision maker of the MFW, to pay a significant attention and importance to the sharks resources , where this fragile

resources deserves a scientific and economic attentions due to its vital role in marine eco-systems therefore , its necessary to improve and activate monitoring , surveillances control and to promote and activate sound fishery management in order to regulate the fishing effort , to control the annual catch landed to control the trade of fin sharks , and should be given the same attention and importance which is given to the high value species , beside that shark fishing a activities and its fishing gears and its trade should be under the fishing managers control monitoring and, surveillances and should be managed , regulated as well as the other fishery resources .

Finally , we high recommend to be given a scientific attention , for further studies and investigation not only in Al-mahara area , but the whole coastline of Yemen should be involved in future .

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Finally , we high recommend to be given a scientific attention , for further studies and investigation not only in Al-mahara area , but the whole coastline of Yemen should be involved in future .

Table (2) Illustrate the dominant species in each month in the year and their percentage composition in the catch sampled (2003)

Period 2003	Dominant species the sample	Percentage of dominant species in the catch sampled
Jan	Rhizoprionodon acutus Loxodon macrorhinus	37% 63%
Feb	Loxodon macrorhinus Rhizoprionodon acutus Mustelus mosis Carcharinus limbatus Carcharinus sorrah Sphyrna makorran	46% 21% 6.4% 11.3% 6.4% 6.2%
Mar	Rhizoprionodon acutus Loxodon macrorhinus Carcharinus limbatus Carcharinus sorrah Sphyrna makorran	67.0% 9.8% 3.5% 8.7% 11.0%
Apr	Rhizoprionodon acutus Carcharinus sorrah Sphyrna lewini	77.8% 8.3% 13.9%
May	Rhizoprionodon acutus Loxodon macrorhinus Carcharinus limbatus Carcharinus sorrah Sphyrna lewini Rhinoptera javanica	35.0% 10.0% 10.0% 15% 20% 10%
Jun	Rhizoprionodon acutus Carcharinus limbatus Loxodon macrorhinus M. mosis Himatura bleekeri	66.2% 2.8% 8.3% 3.3% 19.4%
Jull	Rhizoprionodon acutus Sphyrna lewini	69.7% 30.3%
Aug	Rhizoprionodon acut Carcharinus limbatus Carcharinus sorrah Sphyrna lewini	79.2% 12.5% 6.3% 2.0%
Sep	Rhizoprionodon acut Carcharinus limbatus Sphyrna lewini Carcharinus sorrah	45.4% 12.8% 33.7% 81%
Oct	Rhizoprionodon acut Carcharinus limbatus Carcharinus sorrah Sphyrna lewini	35.8% 23.9% 13.4% 26.9%
Nov	Rhizoprionodon acut Carcharinus limbatus Carcharinus. altimus Sphyrna lewini	20% 20% 20% 20%

Period 2003	Dominant species the sample	Percentage of dominant species in the catch sampled
	M. mosis	20%
Dec	Rhizoprionodon acut	20%
	Carcharinus limbatus	20%
	Carcharinus. altimus	20%
	Carcharinus. Sorrah	20%
	Sphyrna lewini	20%

Table (3) Illustrate the dominant species in each month ,the numbers of sharks sampled and their percentage composition in the catch sampled (2004)

Period 2003	Dominant species the sample	No. of random	Percentage of dominant species in the catch sampled
Jan			
Feb	Rhizoprionodon acutus	107	40.2%
	Mostelus mosis	72	27.1%
	Loxodon macrorhinus	32	12.0%
	Dusky shark	17	6.4%
	Sphyrna lewini	15	5.6%
	Carcharinus limbatus	4	1.5%
	Carcharinus sorrah	2	0.8%
	Rays	5	1.9%
Mar	Rhizoprionodon acutus		
	Sphyrna lewini		
Apr	Rhizoprionodon acutus	70	97.3%
	Carcharinus limbatus	2	2.7%
May	Carcharinus albimarginatus	30	15.5%
	Rhizoprionodon acutus	54	25.7%
	Mostelus mosis	13	6.7%
	Carcharinus sorrah	22	11.3%
	Carcharinus limbatus	2	1.0%
	Sphyrna lewini	1	0.5%
Jun	Carcharinus folciformis	60	45.8%
	Rhizoprionodon acutus	28	21.3%
	Mostelus mosis	19.0	15.5%
	Sphyrna lewini	6	4.5%
	Carcharinus limbatus	7	5.3%
	Carcharinus sorrah	5	3.8%
Jull	Rhizoprionodon acutus	413	90%

Aug	Rhizoprionodon acutus	141	90%
	Sphyrna lewini	105	53%
	Carcharinus sorrah	19	39.9%
Sep	Rhizoprionodon acutus	203	41.7%
	Carcharinus limbatus	169	37.2%
	Carcharinus sorrah	25	5.5%
	Sphyrna lewini	30	6.6%
Oct	Rhizoprionodon acutus	258	90%
	Carcharinus limbatus	26	10%
Nov	Rhizoprionodon acutus	86	95%
	Sphyrna lewini	7	2%
Dec		n.a	n.a

Table (4) Illustrate dominant species of sharkes ,average lengths(males and females)and thier percentage composition in the catch sampled in the period (jan – jun -2005)

Period	Name of species in the sample	No. of species in the sample		Mean lengths		Percentage of Dominant species in the sample
		♀	♂	♀	♂	
Jan - 2005	Rh.acutus	72	47	66.2	65.5	80%
Feb.2005	Rh.acutus	124	123	66.7	64.9	90%
Mar. -2005	Sph. lewini	11	17	220	190	82%
	C. limbatus	3	1	180	120	3%
	C. sorrah	1	1	95	99	2%
Apr .2005	Rh.acutus	74	70	67.5	66.2	99%
May .2005	Rh.acutus	20	15	67.9	65.9	100%
June -2005	Rh.acutus	130	156	68.5	67.2	98%

Table (4) Illustrate dominant species of sharkes ,average lengths(males and females)and thier percentage composition in the catch sampled in the period (jan – dec -2003)

Period	Name of species in the sample	No. of species		Mean lengths		Dominant length in the sample	%
		♀	♂	♀	♂		
Jan.2003	Rh.acutus	61	51	58.6	58.3	55-60cm	54.4%
Feb.2003	Rh.acutus	42	69	60.2	60.0	55-70 cm	64%
Feb.2003	L.macrorhinus	91	152	64.5	63.2	55-70 cm	64%
Feb.2003	C.limbatus	34	26	88.0	85.6	75-90cm	73%
Feb.2003	C.sorrah	17	17	80.4	77.6	55-90 cm	71%
Feb.2003	Sph.lewini	15	18	83.3	64.9	60-90cm	57%
Feb.2003	M.mosis	39	-	84.3	-	75-90cm	64%
Mar.2003	Rh.acutus	101	131	60.6	56.0	55-65cm	67%
Mar.2003	L.macrorhinus	19	15	60.3	59.1	55-65cm	66%
Mar.2003	C.sorrah	13	17	84.2	78.3	70-85cm	53%
Mar.2003	C.limbatus	9	3	142.4	122.5	90-150cm	55%
Mar.2003	Sph.lewini	19	19	75.2	75.0	50-70 cm	81%
Apr.2003	Rh.acutus	76	126	68.4	61.2	60-70cm	70%
Apr.2003	Rh.acutus	60	40	65.4	60.1	60-70	60%
May2003	Rh.acutus	45	82	69.4	66.0	70-75	62%
May2003	L.macrorhinus	12	15	60.5	64.6	55-70	20%
May2003	C.sorrah	17	7	86.5	82.8	60-95	11%
May2003	C.limbatus	18	9	96.2	99.5	85-105	73%
May2003	Sph.lewini	-	-	78.4	147.0	70-150	50%
May2003	M.mosis	-	10	-	80.5	70-90	50%
June2003	Rh.acutus	42	38	77.0	75.5	70-80	55%
June2003	L.macrorhinus	13	24	76.7	76.2	70-85	55%
June2003	Rh.acutus	167	437	72.0	71.8	70-85	85%
June2003	Rh.acutus	90	70	80.5	73.6	60-85	69%
June2003	Sph.lewini	20	15	85.5	79.4	70-90	45%
June2003	M. mosis	40	131	81.2	79.4	70-90	45%
July 2003	Rh.acutus	279	508	80.5	73.6	70-85	95%
July 2003	Rh.acutus	184	180	77.0	75.0	70-80	99%
July 2003	Sph. lewini	45	108	80.4	73.6	70-90	70%
Aug.2003	Rh.acutus	220	140	84.2	70.6	70-90	81%
Aug.2003	Rh.acutus	160	120	85.3	75.6	70-90	73%
Aug.2003	C.limbatus	23	15	77.0	76.5	70-80	30%
Aug.2003	C.sorrah	9	8	64.3	60.0	50-60	99%
Aug.2003	Sph. lewini	4	6	51.6	53.9	40-60	69%

Period	Name of species in the sample	No. of species		Mean lengths		Dominant length in the sample	%
		♀	♂	♀	♂		
Sep.2003	C.sorrah	26	26	63.7	63.6	60-70	77%
Sep.2003	Rh.acutus			84.2	79.1	60-80	88.5%
Sep.2003	Sph. lewini	13	12	90.5	92.1	85-100	54%
Sep.2003	Rh.acutus			69.5	73.1	75-80	44%
Sep.2003	C.limbatus	15	14	76.9	75.5	70-80	82%
Oct.2003	Sph. lewini	35	15	50.2	49.9	45-50	94%
Oct.2003	Rh.acutus	97	77	67.3	66.9	65-75	71%
Oct.2003	C.limbatus	6	13	78.5	71.9	65-70	75%
Oct.2003	C. altimus	33	44	90.5	88.2	80-90	60%
Oct.2003	C. sorrah	5	6	64.2	63.6	60-70	10%
Oct.2003	C. sorrah	22	13	64.0	63.5	60-70	25%
Nov.2003	Rh.acutus	30	101	76.3	66.9	50-80	90%
Nov.2003	C.limbatus	19	24	79.5	78.2	70-80	35%
Nov.2003	Sph. lewini	80	69	56.5	49.5	45-60	85%
Dec.2003	Sph. lewini	0	12	179	154	120-150	55%
Dec.2003	C.limbatus	6	8	150	121	120-160	65%
Dec.2003	Rh.acutus	30	20	77.0	71.0	60-80	70%
Dec.2003	C. altimus	-	-	-	-	-	-
Dec.2003	C.sorrah	15	10	66.2	65.9	60-70	30%

Table (6) Illustrate dominant species of sharks ,average lengths(males and females)and thier percentage composition in the catch sampled in the period (Jan –dec-2004)

Period	Name of species in the sample	No. of species		Mean lengths		Dominant length in the sample	%
		♀	♂	♀	♂		
Jan.2004	NA.						
Feb.2004	Rh.acutus	63	44	68.1	65.3	60-80cm	67%
Feb.2004	M.mosis	68	4	66.0	61.3	60-70cm	55%
Feb.2004	L.macrorhinus	12	20	60.9	60.9	60-70cm	55%
Feb.2004	Sph.lewini	3	12	95.0	95.9	70-120cm	60%
Feb.2004	Dusky shark	7	10	77.7	76.0	70-80cm	45%

Period	Name of species in the sample	No. of species		Mean lengths		Dominant length in the sample	%
		♀	♂	♀	♂		
Feb.2004	C.limbatus	-	4	-	99.8	90-110cm	50%
Feb.2004	C.sorrah	2	-	97.5	-	65-80cm	65%
Mar.2004	Sph.lewini	8	12	79.5	78.2	60-70	95%
Mar.2004	Rh.acutus	83	32	68.4	67.2	50-75	95%
Apr.2004	Rh.acutus	38	32	85.0	89.0	70-85	
May2004	C.sorrah	13	9	104.3	104.3	70-130	80%
May2004	C.albimarg.	15	15	110	107	90-120	82%
May2004	Rh.acutus	27	27	72.2	70.0	60-80	70%
May2004	M.mosis	8	5	65.0	67.5	55-70	90%
June2004	C.falciforms	31	29	70.0	70.0	60-75	
June2004	Rh.acutus	9	19	67.8	72.5	60-75	
June2004	M.mosis	1	18	65.0	67.5	75-90	
June2004	Sph.lewini	4	2	80.0	72.5	70-85	
June2004	C.limbatus	2	2	80.0	81.3	75-90	
June2004	C.sorrah	3	2	77.5	87.5	70-90	
July2004	Rh.acutus	111	299	83.0	73.4	70-90	96%
July2004	Rh.acutus	-	-	-	-	-	-
Aug.2004	Rh.acutus	63	78	78.0	78.0	70-85	90%
Aug.2004	Sph.lewini	65	40	87.5	85	80-95	65%
Aug.2004	C.sorrah	8	11	80.0	75.0	70-90	96%
Sep.2004	Rh.acutus	87	116	77.0	76.0	70-80	61%
Sep.2004	C.limbatus	89	80	76.0	76.0	60-85	75%
Sep.2004	C.sorrah	10	15	68.0	66.0	60-75	99%
Sep.2004	Sph.lewini	11	19	70.0	71.0	65-75	80%
Oct.2004	Rh.acutus	97	161	73.0	77.0	70-85	90%
Oct.2004	C.limbatus	14	12	84	96.0	70-75-150	60%
Nov.2004	Rh.acutus	16	52	74.0	68.0	70-80	90%
Nov.2004	Sph.lewini	2	5	66.0	53.0	55-65	50%
Dec.2004							

Table (7) Comparison of average , lengths (males and females)of Rh. Acutus as dominant species in Al-mahara coastal area during Jan. Dec .2003-2004

Period 2003	Name of Species.	Mean lengths		Period 2004	Name of Species.	Mean lengths	
		♀	♂			♀	♂
Jan. 2003	Rh.acutus	58.6	58.2	Jan. 2004	Rh.acutus		
Feb. 2003	Rh.acutus	60.2	60.0	Feb. 2004	Rh.acutus	68.9	65.3
Mar. 2003	Rh.acutus	60.6	56.0	Mar. 2004	Rh.acutus	69.5	67.8
Apr. 2003	Rh.acutus	68.4	61.2	Apr. 2004	Rh.acutus	76.3	75.0
May. 2003	Rh.acutus			May. 2004	Rh.acutus	72.2	70.0

Period 2003	Name of Species.	Mean lengths		Period 2004	Name of Species.	Mean lengths	
		♀	♂			♀	♂
June. 2003	Rh. acutus	77.0	75.5	June. 2004	Rh. acutus	67.5	72.5
June. 2003	Rh. acutus	72.0	71.8	-	-	-	-
July. 2003	Rh. acutus	77.0	75.4	July. 2004	Rh. acutus	53.0	73.4
July. 2003	Rh. acutus	80.5	73.6	-	-	-	-
Aug. 2003	Rh. acutus	84.2	70.6	Aug. 2004	Rh. acutus	78.0	78.0
Sep. 2003	Rh. acutus	84.2	79.1	Sep. 2004	Rh. acutus	77.0	72.0
Sep. 2003	Rh. acutus	69.5	73.1	-	-	-	-
Oct. 2003	Rh. acutus	67.3	66.9	Oct. 2004	Rh. acutus	73.0	77.0
Nov. 2003	Rh. acutus			Nov. 2004	Rh. acutus	74.0	68.0
Dec. 2003	Rh. acutus	77.0	71.0	Dec. 2004	Rh. acutus	-	-

Tab. No. (8) Illustrate the target landing / sampling sites , catch composition by species total catch /average catch per boat /No size of boats , HP, fishing gears used / mush size / depths in Al-mahara coastal area during Jan. Dec.2003 .

Target landing sampling sites	Month /year	No. of boats	Total catch in kg.	Average catch per boat in kg.	Fishing gear		Type & size of boat	Depths in (M)	Duration of net set in water(hour)	HP	Catch compositor species
					Type of net	Mesh size					
Mehefif	Jan.2003	12	1425	118.0	Gillnet 4-6 nets	7 mm	9m fiber/ glass	15-20 (m)	14-16 (hours)	40- 45	1.Rh. acutus 2.L.macrorh
1. Mehefif 2.Saihut 3.Nishtoon	Feb.2003	14	2160	154.3	Gillnet 4-6 nets	7 mm	9m fiber/ glass	15-20 (m)	14-16 (hours)	40- 45	1.Rh.acutus 2.L.macrorh 3.C.limbatus 4.C.sorrah 5.Sph.lewini 6.M.mosis
1. Mehefif 2.Dabout 3.Saihut.	Mar.2003	9	2484	276.0	Gillnet 4-6 nets	7 mm	9m fiber/ glass	15-20 (m)	14-16 (hours)	40- 45	1.Rh.acutus 2.L.macrorh 3.C.sorrah 4.C.limbatus 5.Sph.lewini
1. Mehefif	April 2003	8	2001	250.1	Gillnet	7 mm	9m fiber/	15-20	14-16	40-	1.Rh.acutus 2. C.sorrah

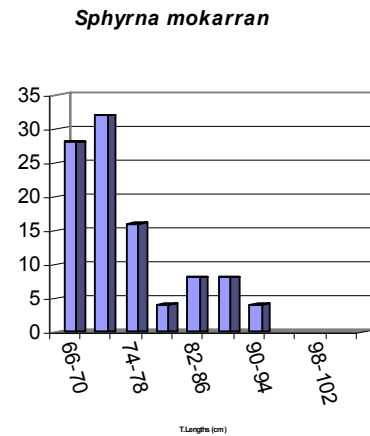
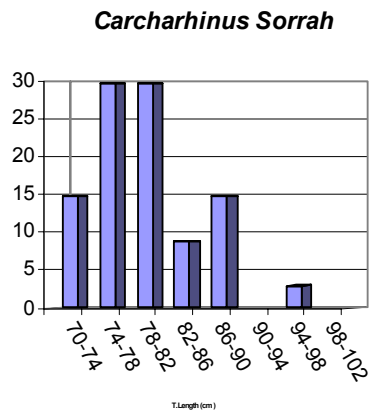
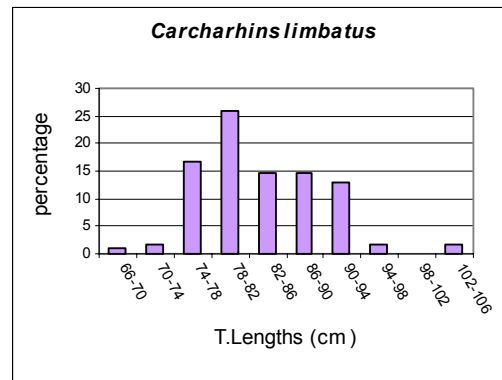
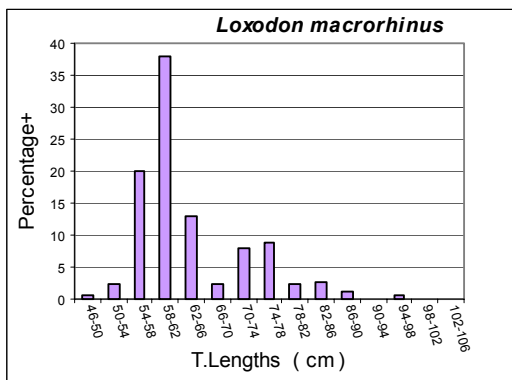
Target landing sampling sites	Month /year	No. of boats	Total catch in kg.	Average catch per boat in kg.	Fishing gear		Type & size of boat	Depths in (M)	Duration of net set in water(hour)	HP	Catch compositor species
					Type of net	Mesh size					
2.Saihut					4-6 nets		glass	(m)	(hours)	45	3. Sph.lewin
1. Mehefif 2.Nishtoon 3. Saihut	May,2003	7	2610	372.9	Gillnet 4-6 nets	7 mm	9m fiber/glass	15-20 (m)	14-16 (hours)	40-45	1.Rh.acutus 2.L.macrorh 3.C.sorrah 4.C.limbatus 5.Sph.lewini 6.Rhinptera Rays 7.M.mosis
1. Mehefif 2.Dabout 3.Saihut	June,2003	7	1800	257.1	Gillnet 4-6 nets	7 mm	9m fiber/glass	15-20 (m)	14-16 (hours)	40-45	1.Rh.acutus 2.C.limbatus 3.L.macrorh 4.M. mosis 5.Altimues blekeli
1.Mehefif 2.Dabout 3.Saihut.	July,2003	11	2808	255.3	Gillnet 4-6 nets	7 mm	9m fiber/glass	15-20 (m)	14-16 (hours)	40-45	1.Rh.acutus 2.Sph. lewin
1.Mehefif 2.Saihut	Aug.2003	6	3072	512.0	Gillnet 4-6 nets	7 mm	9m fiber/glass	15-20 (m)	14-16 (hours)	40-45	1.Rh.acutus 2.C.sorrah 3.C.limbatus 4.Sph.lewini
1.Mehefif 2.Saihut	Sep.2003	8	5088	636.0	Gillnet 4-6 nets	7 mm	9m fiber/glass	15-20 (m)	14-16 (hours)	40-45	1.Rh.acutus 2.C.sorrah 3.C.limbatus 4.Sph.lewini
1. Mehefif 2.Dabout 3.Saihut	Oct.2003	4	1675	418.8	Gillnet 4-6 nets	7 mm	9m fiber/glass	15-20 (m)	14-16 (hours)	40-45	1.Rh.acutus 2.C.sorrah 3.C.limbatus 4.Sph.lewini
1. Mehefif 2.Nishtoon 3. Saihut	Nov.2003	4	900.0	225.0	Gillnet 4-6 nets	7 mm	9m fiber/glass	15-20 (m)	14-16 (hours)	40-45	1.Rh.acutus 2.C.limbatus 3.C.altimus 4.Sph.lewini 5.M. mosis
1. Mehefif 2. Saihut	Dec.2003	3	576.0	192.0	Gillnet 4-6 nets	7 mm	9m fiber/glass	15-20 (m)	14-16 (hours)	40-45	1.Rh.acutus 2.C.limbatus 3.C.altimus 4.Sph. lewin 5.Sph. lewin

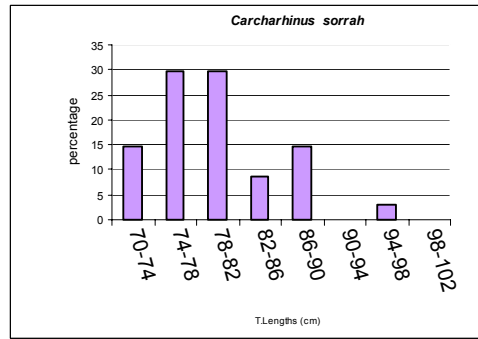
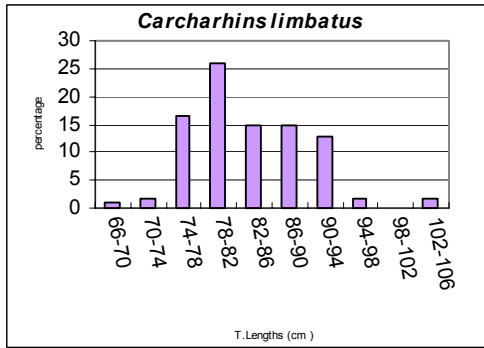
Tab. No. (9) Illustrate the target landing / sampling sites , catch composition by species total catch /average catch per boat /No size of boats , HP, fishing gears used / mush size / depths in Al-mahara coastal area during Jan. Dec.2004 .

Target landing sampling sites	Month /year	No. of boats	Total catch in kg.	Average catch per boat in kg.	Fishing gear		Type & size of boat	Depths in (M)	Duration of net set in water(hour)	HP	Catch compositio species
					Type of net	Mesh size					
1.Nishtoon 2. Saihut	Jan.2004										
1. Mehefif 2.Nishtoon 3. Saihut	Feb. 2004	12	1589.5	132.4	Gillnet 4-6 nets	7 mm	9m fiber/ glass	15-20 (m)	14-16 (hours)	40- 45	1.Rh.acut 2.M.mos 3.L.macrorf 4.Sph.lev 5.C.albim 6.C.limba 7.C.sorra
1.Nishtoon	Mar. 2004	13	324.1	47.2	Gillnet 4-6 nets	7 mm	9m fiber/ glass	15-20 (m)	14-16 (hours)	40- 45	1.Rh.acut 2. Sph. lev
Saihut	April, 2004	7	995.8	142.3	Gillnet 4-6 nets	7 mm	9m fiber/ glass	15-20 (m)	14-16 (hours)	40- 45	1. Rh.acu
Saihut	May.2004	15	2858.8	195.5	Gillnet 4-6 nets	7 mm	9m fiber/ glass	15-20 (m)	14-16 (hours)	40- 45	1.C.sorra 2.C.albima 3.Rh.acut 4.M.mos 5.C.limba 6. Sph. lev
Saihut	June.2004	4	301.6	75.4	Gillnet 4-6 nets	7 mm	9m fiber/ glass	15-20 (m)	14-16 (hours)	40- 45	1.Rh.acut 2.M.mos 3.Sph.lev 4.C.limba 5.C.sorra
Mehefif Saihut	July.2004	5	784.7	156.9	Gillnet 4-6 nets	7 mm	9m fiber/ glass	15-20 (m)	14-16 (hours)	40- 45	1.Rh.acut
Mehefif Nistoon	Aug.2004	6	848.0	141.3	Gillnet 4-6 nets	7 mm	9m fiber/ glass	15-20 (m)	14-16 (hours)	40- 45	1.Rh.acut 2. Sph.lev 3. C. sorr
Mehefif Saihut	Sep.2004	6	1665.3	277.5	Gillnet 4-6 nets	7 mm	9m fiber/ glass	15-20 (m)	14-16 (hours)	40- 45	1.Rh.acut 2. C.limba 3. C. sorr 4. Sph.lev
Mehefif Saihut	Oct.2004	3	547.5	182.5	Gillnet 4-6 nets	7 mm	9m fiber/ glass	15-20 (m)	14-16 (hours)	40- 45	1.Rh.acut 2. C.limba
Mehefif Saihut	Nov.2004	3	187.5	62.5	Gillnet 4-6	7 mm	9m fiber/	15-20 (m)	14-16 (hours)	40- 45	1.Rh.acut 2. Sph.lev

Target landing sampling sites	Month /year	No. of boats	Total catch in kg.	Average catch per boat in kg.	Fishing gear		Type & size of boat	Depths in (M)	Duration of net set in water(hour)	HP	Catch composio species
					Type of net	Mesh size					
-	Dec.2004	-	-	-	-	-	-	-	-	-	-

Length frequency distribution of common shark species





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- 13.