This document contains chapters extracted from the Egyptian State of Environment Reports for 2007 and 2008 that deal specifically with biodiversity. The complete reports are available at: http://www.eeaa.gov.eg/English/info/report_search.asp

Biodiversity

Introduction:

Biodiversity is the sphere of life on earth that encompasses ecosystems, natural habitats, fauna and flora, microbial species, and genetic resource. Biodiversity provides food, fuel, construction materials, waste purification and decomposition, climate regulation, alleviation of disasters, renewal of soil fertility, disease combating, keeping genetic resources (crops, breeds, animal wealth, medicine and other products). For that reason, biodiversity is the basis of life prosperity, the means of human lives and cultures, and by its conservation, we keep humanity, providing its treasures for the existing and future generations.

The Arab Republic of Egypt has paid special attention in the last 2 decades for natural resources conservation issues, and has enacted legislation to conserve natural heritage with support of political leadership to assure integration of development sectors with environment protection, and conserving natural resources for the existing and future generations. The promulgation of law no 102 of 1983 on protected areas was in tandem with the declaration of Ras Mohamed, the first national park in Egypt, in south Sinai, followed by establishment of 27 protectorates all over Egypt covering 15% of Egypt's total area. Since 1980 until now, many skills and experiences have been gained to improve protected areas management and biodiversity conservation. The first phase, during eighties, was distinguished by comprehensive protection, while the second phase during nineties, was distinguished by conservation and sustainable development, and currently the main target is comprehensive ecosystem management which depends on applying integrated ecosystem for human being welfare, as well as achieving 2010 target (reducing the rate of biodiversity loss).

Egypt is considered one of the leading developing countries in the field of biodiversity conservation. It joined all the international agreements that promote that aim, with the conservation on biological diversity on the top in 1992. Egypt was also one of the first countries that prepared biodiversity strategy and action plan (1997-2017) with governmental, local and national participation, which concentrated on 3 basic overlapping and interactive pillars.

The first pillar encompasses research programs, studies, monitoring, and evaluation, perform biodiversity surveys, studying economics of biodiversity, completion of some reference groups, establishing monitoring networks, recognizing traditional knowledge of local communities.

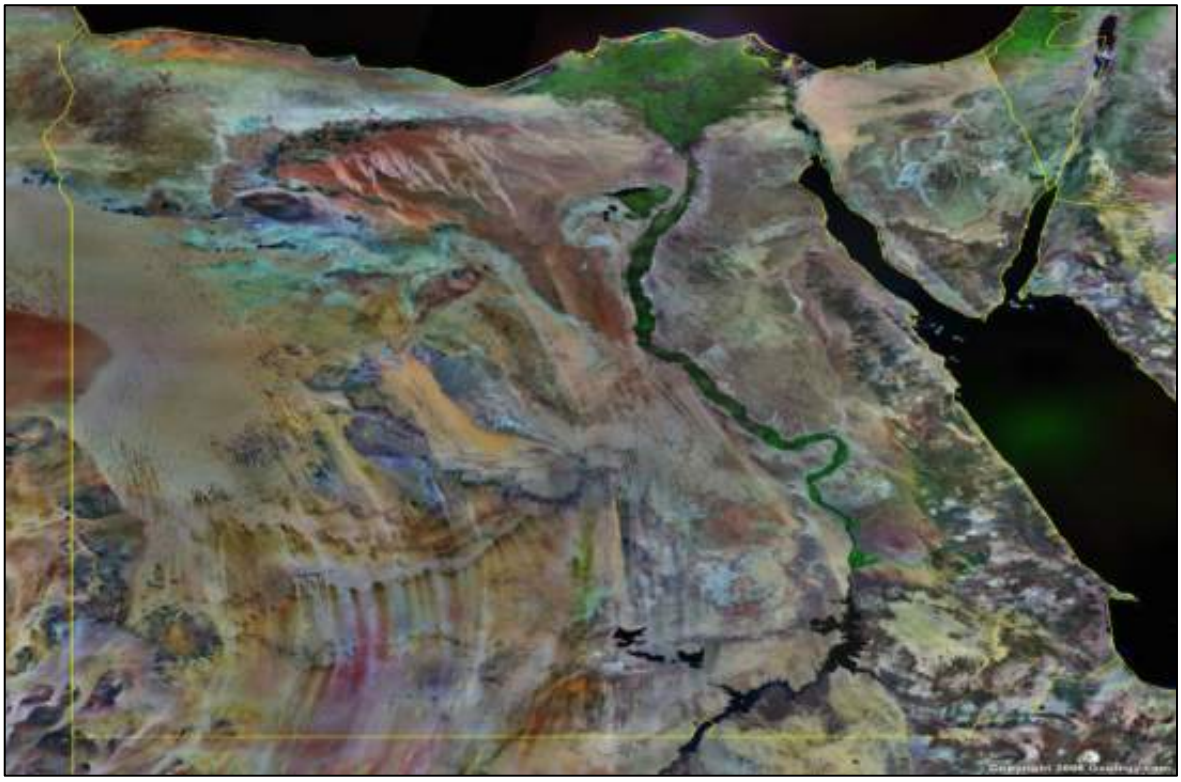
The second pillar encompasses applied projects program like protected areas networks , Egyptian museum for natural history , gene banks , establishing captive breeding programs, ex-situ conservation, and applying information technology in biodiversity conservation.
The third pillar encompasses program for human development, for monitoring & management, education, awareness, cultural heritage, support institutional capacity, and modernization of national legislations. It includes also mobilizing financial and technical resources to conserve biodiversity, in participation with NGOs and civil society.

On the occasion of celebrating the silver anniversary of issuing the national law for protected areas and declaring Ras Mohamed as the first natural park in Egypt in 1983, this chapter has been prepared on biodiversity status in Egypt within the framework of guidelines provided by biodiversity convention.

This chapter includes:

- Biodiversity status, trends, and threats.
- The current status of national strategies and action plans.
- Mainstreaming of biodiversity in all developmental sectors.
- Conclusions and future priorities.

First: Biodiversity status, trends and threats



Map (7-1) Satellite image for Egypt

Egypt covers an area of about one million square kilometers and can be divided into four physiographic regions: the Nile Valley, Western Desert, Eastern Desert and Sinai. The arid desert covers 92% of the land, the remaining 8% of arable land being restricted to the Nile Valley, the Nile Delta and a few oases scattered in the Western Desert. The population is very unevenly distributed: 99% of Egyptians live on less than 4% of the land. The country can be also divided into 4 bioclimatic zones: the Eastern Desert which is hyper-arid with mild winters, hot summers and extremely rare rainfall; the Southern Sinai region which is also hyper-arid but has cool winters, hot summers, and less than 30mm/yr of rainfall; the coastal belt along the Mediterranean Sea; and the sub-coastal belt and the wetlands (Nile Valley, Nile Delta).

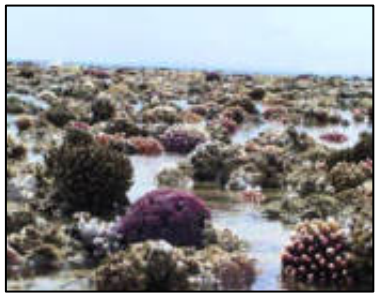
Egypt, lies at the northeast corner of Africa at the junction of four bio geographical regions, Irano-Turanian, Mediterranean, Saharo-Sindian and Afro tropical. At the same time it is at the center of the great Saharo-Sindian desert belt that runs from Morocco on the northwest corner of Africa to the high, cold deserts of central Asia. Egypt is bounded on the north and east by two largely enclosed seas, the Mediterranean Sea and the Red Sea. This unique position is enhanced by the circumstance that it is divided by the Nile, the longest river in the world. Most of Egypt is either arid or hyper arid, however, due to its very varied eco-zones, the country is a home to a wide diversity of terrestrial habitats and a fauna and flora, which

although relatively low in species numbers and with few endemics, is extremely varied in composition.

Despite being dominated by desert and draught, Egypt's biodiversity is of global significance for 143 species, due to the fact that it is situated at the juncture of three continents: Europe, Africa and Asia. It is the home of at least 800 species of non-flowering plants, 2302 flowering species and subspecies (62 endemic species and 2 threatened), 116 mammal species (13 threatened), 447 bird species (14 threatened), 109 reptile species (6 threatened), 9 amphibians and more than 1000 fish species. Invertebrates are very diverse, for instance insects varies between 5 and 10 thousand species, more than 200 coral species, 800 molluscs, and more than one thousand crustaceans.

Picture (7-1) Deseret in Egypt

The biodiversity of Egypt reflects its habitats, position and climate. The uniqueness of the Nile as a conduit from tropical Africa contributes greatly to the fauna and flora, and there are few places where the contrast between water and aridity is as stark.



Picture (7-2) Extreme low tide phenomena in South Sinai

From the terrestrial point of view, outside the Nile Valley Egypt is one of the most hyper-arid countries in the world, with large areas of completely barren desert where no rain has fallen for decades. There is slightly more rainfall in the north close to the Mediterranean coast, in the mountains of Sinai, and in the extreme southeast where fog deposition in Gebel Elba produces the only Egyptian example of an officially (WWF) endangered habitat – a Red Sea Fog Woodland. In terms of terrestrial habitats, all of Egypt is classified into only two of the major habitats of Africa (desert and riverine vegetation (albeit greatly modified by man), and thus habitat diversity is low overall.

Picture (7-3) Mangrove trees in the Red Sea

Because of the hyperaridity, the overall number of species in most taxa is low in a world scale. The Nile corridor has ameliorated this to an extent, providing a source of freshwater habitats and wetlands that is extremely important, especially to migrating and overwintering animals. Levels of endemicity are reasonably high because the drying of North Africa over the last 5000 years has fragmented and isolated the fauna and flora, allowing the evolution of many unique forms. Isolated pockets of biodiversity exist in the oases of the Western Desert

Picture (7-4) Nile River

and on the mountain tops of Sinai. Probably the relatively rich biodiversity of Gebel Elba harbors many endemic forms, but more study is needed to assess their uniqueness relative to other Red Sea fog woodlands further south in the Sudan.

Egypt is at the junction of three major bio geographical zones (Western Palaearctic, Eastern Palaearctic and Afro tropical,), and its biodiversity reflects the mixture of elements that this implies. The fauna and flora change significantly on either side of the Suez Canal because of the bottleneck effect of the connection between Africa and Asia, augmenting Egypt's total biodiversity.

In the marine environment, biodiversity in Egypt benefits from having two completely independent elements – the Mediterranean and the Red Sea. Its Mediterranean fauna and flora are modest and shared with most of the countries of that region. Its very rich Red Sea equivalents are also probably shared with most of the countries bordering the Red Sea. Endemics are largely or wholly limited to Red Sea habitats, where Egypt has the most northerly coral and mangrove habitats of the world – possibly these will become even more important as climate changes occur. The shallow waters of the Suez Gulf are important areas for marine biodiversity, and the contrast with the abyssal depths of the Gulf of Aqaba create a very important set of habitats.

Although country species diversity is relatively low owing to its general aridity, many species are very narrowly distributed or highly localized making habitat conservation crucial. Threats to Egypt's biodiversity include demographic pressure, excessive hunting and cutting, globalization and its negative impacts on resource extraction, limited human and financial resources, habitat degradation due to pollution from unsustainable agricultural and industrial use. Many species have been introduced in the last 2 centuries and became the backbone of Egypt's agriculture: cotton, fruit cultivars, animal races including fish and chicken. This has resulted in the neglect of local breeds, and therefore some have been badly degraded with others disappearing. It is noteworthy that many plant and animal species in Egypt are on the very edge of their geographical or ecological range, and have therefore very limited tolerance for ecological pressures. (e.g. coral reefs and mangroves).

The major activities of biodiversity assessments included (monitoring, upgrading databases, conducting surveys, evaluation of eco-geographical areas ecosystems, productive ecosystems, threatened species, application of GIS techniques, evaluation of rehabilitation and restoration programs, participation in combating bird flu, integrating biodiversity monitoring in and outside protected areas, into databases, protecting sensitive habitats, determining gaps in some habitats, and rare species, determining national indicators that can be applied all over protected areas and completion of some reference groups of biodiversity.

It is now available one million records about animal and plant species in Egypt, collected from references, books and international museums. It is now available an Egyptian record of about 20.000 species and their distribution in Egypt, in addition to prediction maps for their distribution where it was possible to take the appropriate procedures to protect biodiversity.

Biodiversity database has been upgraded and used in more than Arabic and English websites, in addition to Biodiversity forum that benefited 60.000 citizens.
Some indicators have been applied to reflect the status of biodiversity in Egypt, threats and its impacts on social and economic life. These indicators are: ecosystem health, trends of habitats, status of species, red list species (extinct and threatened species) black list species (alien and invasive species), resilience ability, economic and social indictors for biodiversity, efficiency of protected areas management, measures taken to protected biodiversity outside protected areas.

Ecosystems and habitats maps for Egyptian fauna and flora:

Recent map has been prepared for Egyptian habitats with reference to the following data :

1- Satellite pictures

2- Radar topographical maps

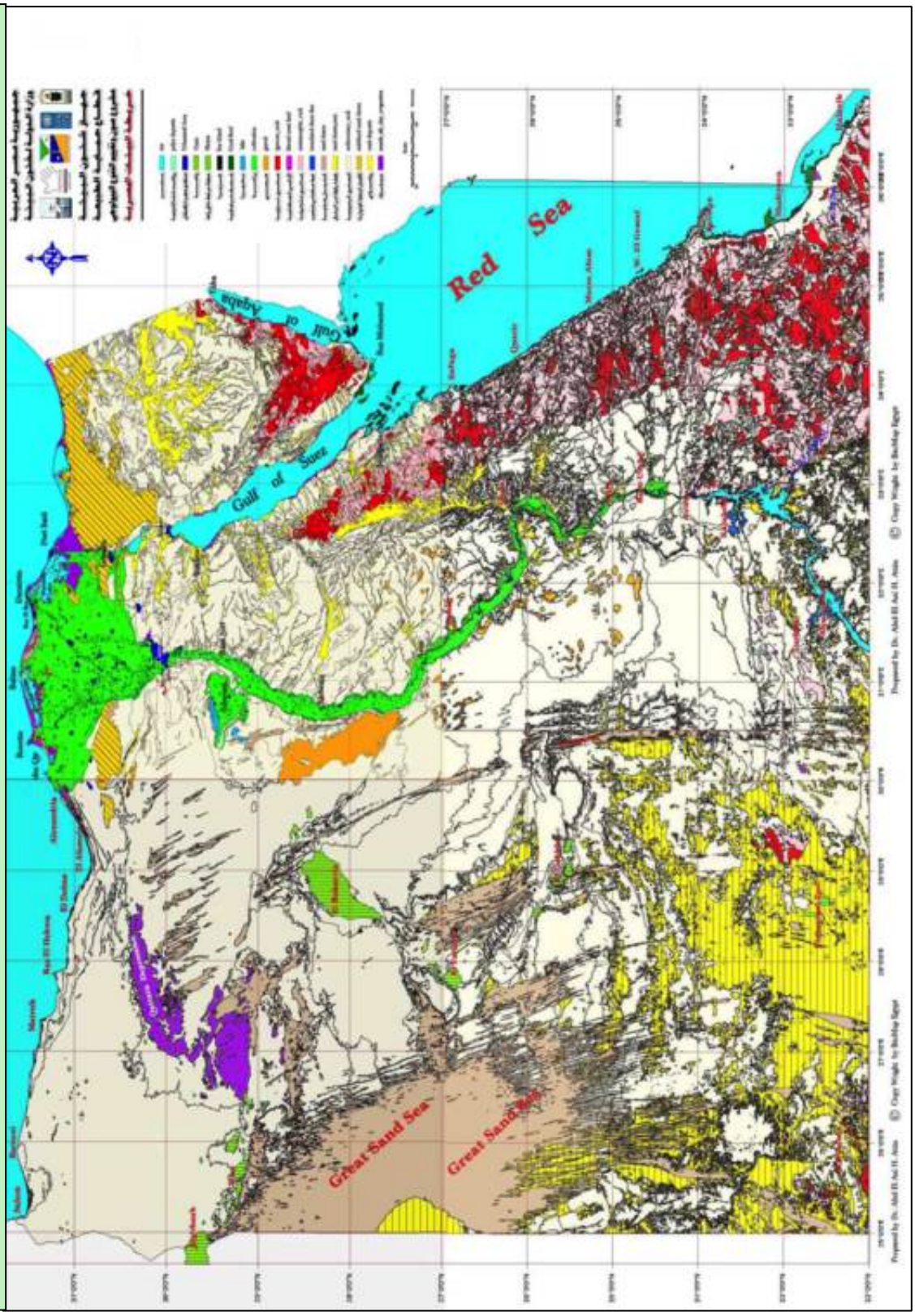
3- Egypt geological map scale 1:250000

4- Egypt 3D plan scale 1:250000

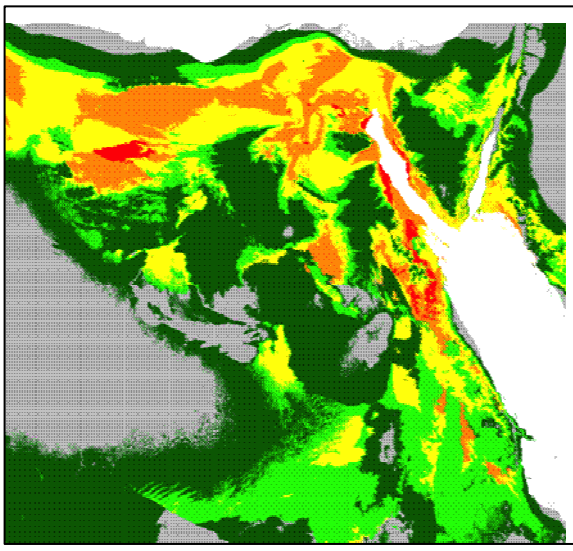
All habitats have been interpreted according to the available data of satellite pictures like land uses, areas for water, agriculture, canals, and lakes, Egypt's geological map have shown types of rocks, dunes, valleys, mountains etc.

The Egyptian habitats map includes 22 main groups such as urban areas, islands, oasis's, dunes, metamorphic and sedimentary rocks, open water, fresh water channels, warm springs(El Ain El sokhna – Oyon Mousa), coral reefs, and mangrove trees. Every habitat has been subdivided into divisions, depending on morphological characteristics and important groups of fauna and flora that inhabit it.

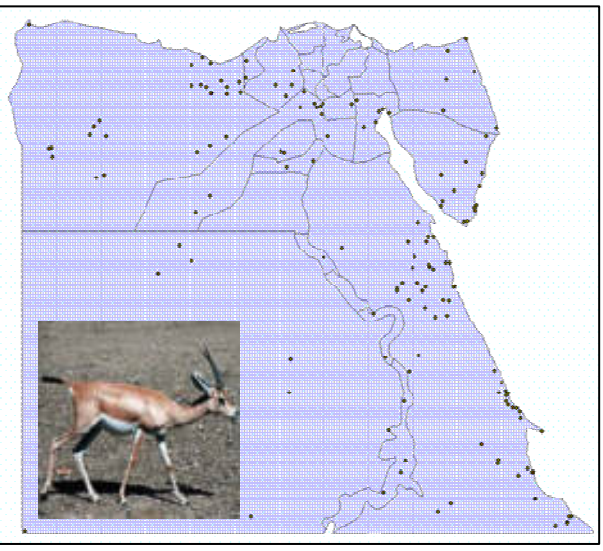
Map (7-2) Habitats distribution in Egypt



After preparing Egyptian habitat's map, records for each species have been prepared in relation to its distribution, time and frequency of record. Advanced prediction programs were prepared to determine future species distribution according to soil quality, place topography, temperatures, type of habitat and real distribution recorded. An example of that was the prediction of Egyptian gazelle which was used to live in many places, and now it is restricted to 3 areas(eastern and western desert , south Sinai) .The importance of species distribution prediction refers to the ability in recognizing threats that face fauna and flora, so special measures and arrangement can be taken to reduce the rate of biodiversity loss, such as providing more protection in protected areas or implementing captive breeding programs for endangered species.



Map (7-4) Predicted distribution of Gazelle



Map (7-3) Actual distribution of Gazelle

Coastal and marine biodiversity:

The Egyptian and marine environment is distinguished by specific habitats and threatened species especially all marine mammals (17 species) , marine turtles (4 species), sharks (more than 20 species) sea cucumber, special bivalves (clams), coral reefs, mangrove trees and many birds (white eyed gulls , sooty falcons, ospreys) This is in addition to great biodiversity (more than 5000 species) , including 800 species of seaweeds and sea grasses , 209 species of coral reefs , more than 800 species of molluscs, 600 species of crustacea, 350 species of echinodermata, in addition to hundreds of species that have never been discovered until now especially in the Exclusive Economic Zone in the Red Sea and the Mediterranean.

Picture (7-5) Dugong, one of the most famous marine mammals in the Red Sea

More than 20% of Egypt total population lives on the coasts where available food and raw material are required for economic development. More than 40% of industrial and developmental activities are concentrated on the coastal zone (ports, cities, infrastructure, petroleum and mining activities and tourism)

The marine fish production amounted to 120.000 tones / year (12.5% from total fish catch). The revenues of marine activities related to biodiversity especially tourism are more than 20 billion LE annually. The revenue from protecting threatened species is amounted to tens of billions LE annually.

Picture (7-7) Hermit Crab

Picture (7-6) Marine turtle

Fish Resources:

Egypt's total territorial water amounted 14 million acres in the Red Sea, Mediterranean, Suez Canal, Northern islands, River Nile, Eltemsah and Bitter lakes.

There are more than 1000 species of fish that live in different habitats such as coral reefs, fish (more than 500 species were recorded) in the open water, (tuna fish), coastal fish (like mullet), bottom fish (like bream and grouper), fresh water fish (Tilapia)> About 100 species of fish and invertebrates are fished including sharks, emperor, bream, grouper, shrimps, sea cucumber, septia, lobsters, sardinis, crabs, lizard fish, flat fish, bass and others.

Picture (7-8) fish bream

According to the annual report issued by the General Authority for Development of Fish Resources, fish production amounted 971,000 tones , with value of L.E. 10 million; 207 .000 tones of fish have been imported (21%), so every person's share amounts to 16.6 kg/year. Fish price ranged from L.E. 4 (tilapia) to L.E. 36 for (eels), and L.E. 100 for shrimps according to Elabour market. More than 1 million fisherman are working on 35.000 manual or automatic boats, in addition to availability fish hatcheries that produce about 270 million fish fries (bream). This resulted in fish farming now provide 595,000 tones (61% of total fish production). The natural resources (Nile River – Red Sea – Mediterranean) provided 375.9.000 tones (38% of total production).

Picture (7-9) Mullets

There are many centers for gathering fish fries all over Mediterranean (Port Said – Damieta – El Borullus) which amounted to about 70 million fries during 2005 ; 41 million (mullet and bream) that are used in developing fish production, (Qaroun, and Wadi El-Rayan lakes), in addition to fish culture in Port Said and Damieta.

The annual report issued by the General Authority for Development of Fish Resources explained that fish catch has been developed from 191,000 tones during 1980 (7 kg /year/person) to 971,000 tones during 2006 and it is expected to be increased to 1.5 million tones by 2012.

By studying Fish production data it is clear that:

1. Continuous increase from fish farms from 86.000 tones during 1997 to 595,000 during 2006 (ten folds). This increase has an important role in reducing water quality (water pollution).
2. In spite of efforts exerted to increase fish production in all waters, and applying measures for sustainability such as closed seasons (Quaron lake, El-Rayan, Bardawil lakes, Suez gulf, Red Sea) and forbidding illegal fish gear and providing fish fries, there is still remarkable decline in wild fish production. In the Red Sea, fish production was reduced from 82,000 tones in 1999 to 47,000 tones in 2006. In the Mediterranean Sea, fish production was reduced from 89,000 tones in 1999 to 46,000 – 47,000 tones during 2002-2004, then it increased to 72,000 tones in 2006.
   In El-Manzala lake, fish production was reduced from 87,000 tones in 1998 to 41,000 tones in 2006, In Lake Nasser lake, it amounted to 26,000 tones in 2006 after it was 53,000 tones in 1997. On the other hand, fish production from Lake Brullus it oscillated from 50.000 to 60.000 tones, and in Timsah and Biller lakes increased from 2700 tones in 1998 to 6162 in 2006. In Bardawil lake it increased from 2000 tones in 1998 to 4000 tones in 2006.

Depletion of natural fish production is due to the violation of fishing law by increasing the number of motor boats to more than 1000, also by using illegal nets. This resulted also in overfishing of fish fries from 13 million in 1998 to 41 million in 2006.

Coral reefs:

Coral reefs status in Egypt has been monitored since 2001 until 2007 in more than 120 sites in the Red Sea and Gulf of Aqba, using environmental indicators(living/non living coral reefs – numbers of species , other indicators such as fish and vertebrates),

Picture (7-10) Coral reefs ecosystem

The studies indicated that coral reefs status inside protected areas is better than elsewhere. In addition, sites, which are far away from human activities, have witnessed increase in coral reefs (14%) compared with areas with human activities (5-7%), where soft corals have been increased at the cost of hard ones.

Carrying capacity of coral reefs was evaluated, especially in diving areas through studying their annual and monthly patterns of entertainment activities in more than 60 diving sites.

Visitor numbers in diving areas have been ranged from 10,000 to 60,000 dive annually which is more than the international rate (15.000 dive/year). An analytical study has been conducted for violations in coral reefs during the last 10 years amounted to 600 violations for hotels, other tourism establishments, ships and individuals. These have led to destruction of coral reefs in many sites with financial value of tens of billions of LE.

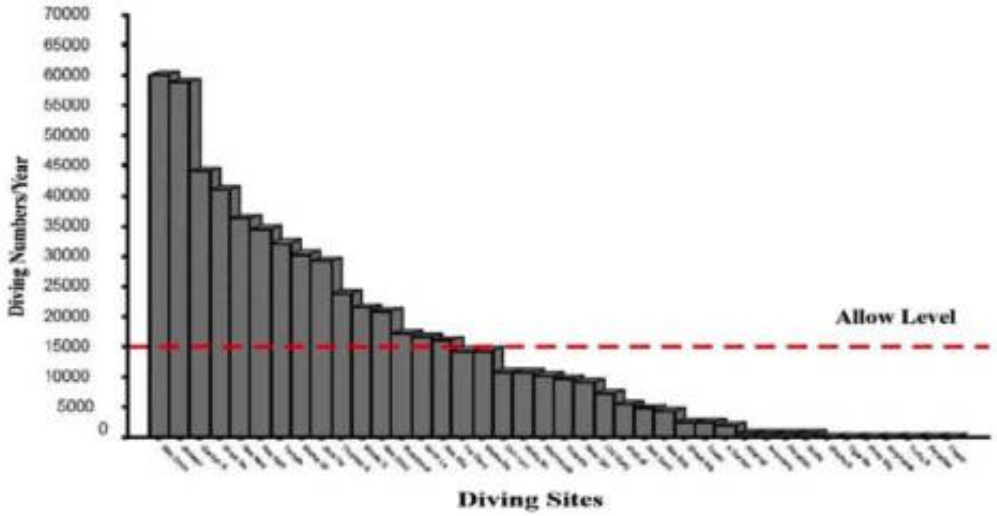


Figure (7-1) Diving activities on coral reefs in different diving areas during 2007

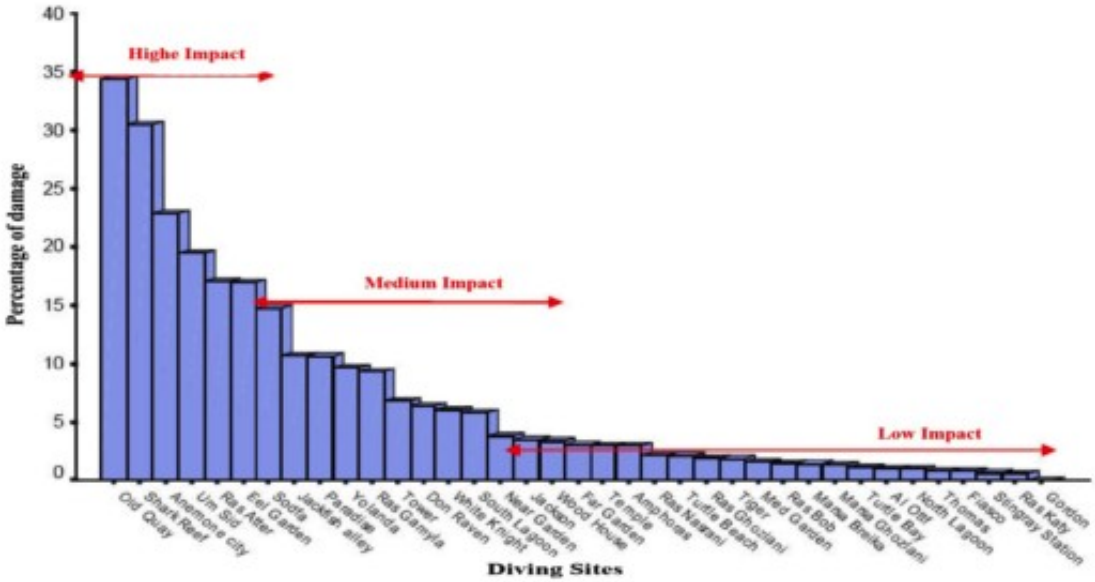


Figure (7-2) Diving impacts on coral reefs

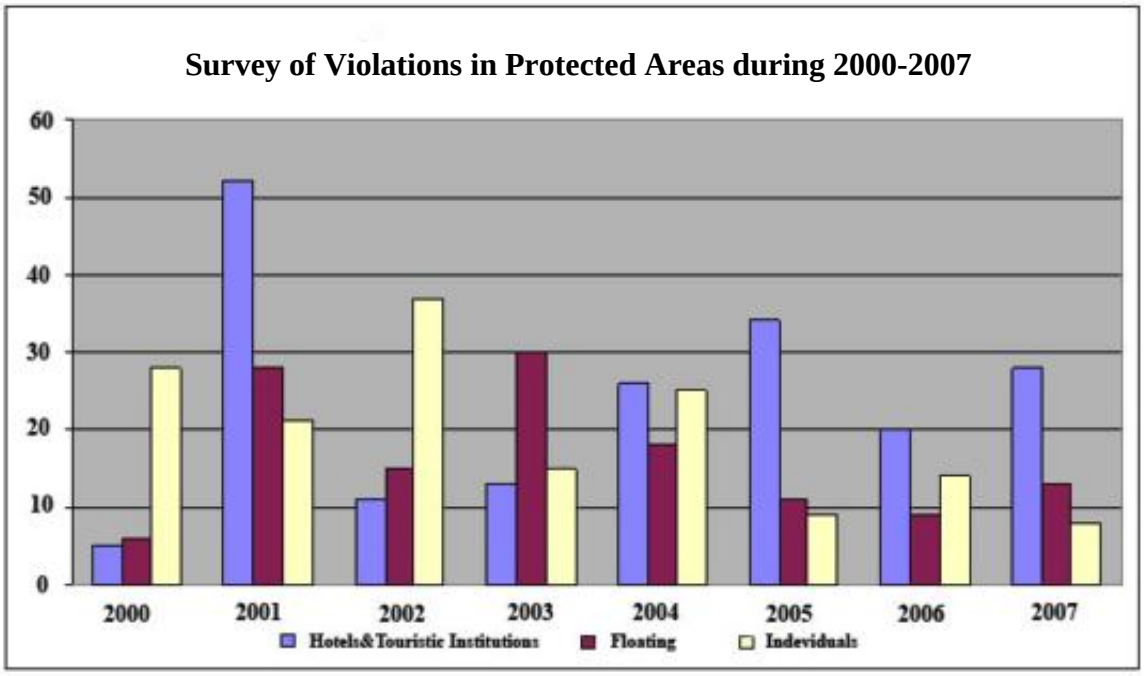


Figure (7-3) Violations in Protected Areas

Picture (7-11) Mass tourism

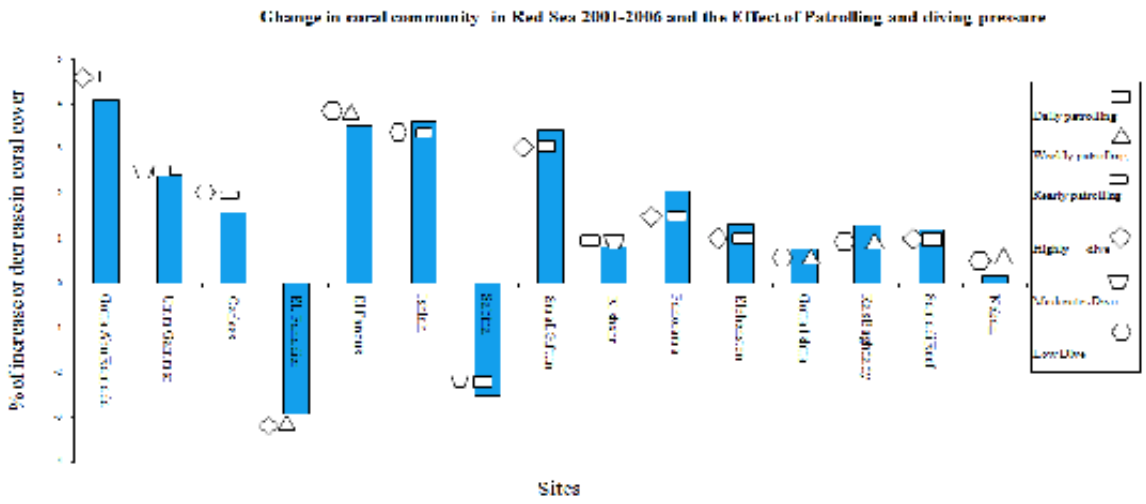


Figure (7-4) Change in coral reef community in Hurghada 2001-2006

Successful models

Few years ago, divers discovered Samadi area, south of Marsa Alam city , in the Red Sea where a large and young dolphins (80 dolphins) occur at the site. Divers, snorkelers, and vessels have increased dramatically in this area. This has led to unacceptable behavior by individuals such as chasing dolphins, making noise in the water, and in some cases, vessels were set on fire, resulted in dolphins deserted Samadi for about two weeks.

Picture (7-12) Spinner dolphin

Red Sea protectorates in coordination with the Red Sea governorate interfered to solve this problem. They developed a management plan for the area and a team work was established to study dolphins. It was also agreed to apply this plan in 2004.

After one year of implementing the management plan, dolphins have been increased from 32 to 78 dolphins daily. The monitoring program has shown remarkable increase in coral reefs growth. Number of visitors does not exceed over 200 daily.

In 2005, fees collected amounted L.E. 3 million in addition to improving tourism in Marsa Alam area during 2006, 2007, and establishing Abu Salama association for dolphins with participation of beneficiaries in this area .This has led to protecting dolphins in this area that reached 120 dolphins daily during summer. Studies succeeded in determining the breeding season of dolphins, along with identifying dolphins food which included fish, molluscs and crustacean.

Mangrove trees

Studies conducted by remote sensing proved that total area of mangrove trees has been increased to 700 hectare by the end of 2007, compared with 525 hectare in 2002. This is because of limiting animal grazing, protecting the sites, as well as implementing transplantation program for mangrove trees. In addition, biological study was conducted on mangrove trees (height, volume, density fruit production, flowering period). Studies proved that mangrove habitats are characterized by high biodiversity, including algae (36 species), insects (40 species), crustacean (65 species), echinoderms (17 species), fish (22 species) that is considered to be of economic importance (Mangrove trees habitat work as an incubator that provide food and protection for small fish) .

Picture (7-13) Aerial roots of mangrove trees

Picture (7-14) Mangrove

Monitoring program of Turtles

Marine turtles monitoring program in the Red Sea and Mediterranean is considered to be one of the most successful monitoring programs, because of the existence of specialists in this field for more than 5 years. Four species of marine turtles have been recorded (green, loggerhead, hawsbill and leathar back) in 15 sites on the beach and islands. They have been monitored, with high percentage of nesting in El-Zabargad island (5336 nests were found in 2007 in comparison with 438 in 2001). This is because El-Zabargad island is far from any human activities.

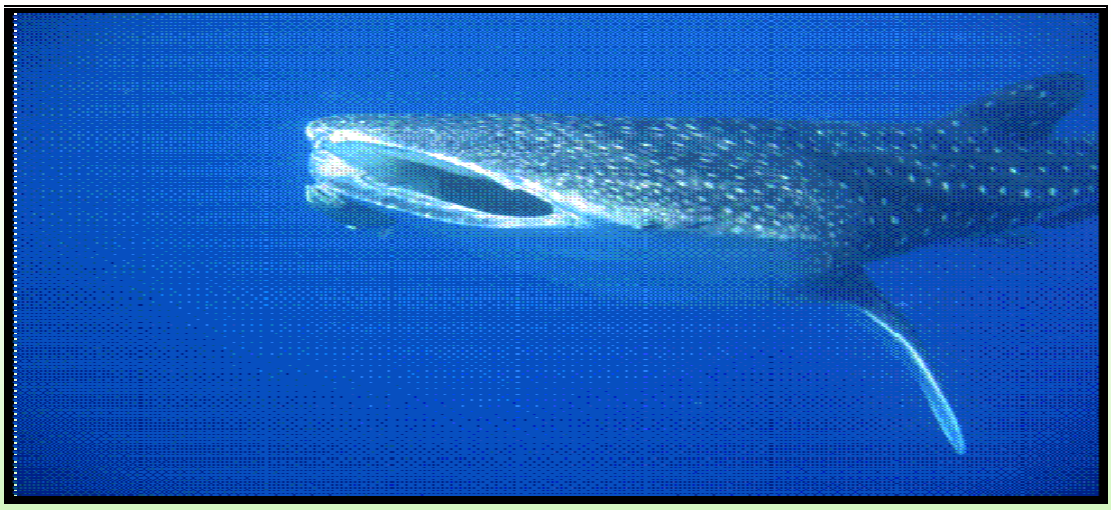
Picture (7-15) Marine turtle monitoring program

El-Giftoun Island is rich with hawksbill turtles where 21 nests were found in 2001 and increased to 255 nests in 2007.

In contrary, the coast where tourism activities have increased greatly at Ras Hankorab – Om Elabs – elkalan during the past ten years, led to decreases in egg hatch from 60% in El-Giftoun to 70% in El-Zabargad island.

Picture (7-16) Marine turtle

Whale Shark



Picture (7-17) Whale shark

Whale shark is considered one of the biggest marine creatures. Its size is similar to whale, 15 meters in length and 20 tones in weight. It lives in tropical areas and feeds on plankton that is filtered through a special lappratus. It is characterized by its calm behavior. Divers usually get friendly with it, and sometimes touch it especially its dorsal fins. Whale shark is considered a threatened species and is recorded in the Red list of IUCN. This requires unifying efforts to protect it from extinction. Researchers in the Red Sea and Gulf of Aqba conducted studies to monitor whale shark and conducted questionnaire on its distribution which was recorded by divers and swimmers. A total of 35 whale shark were watched from 2003 until February 2008 in Dahab, Sharm Elshikh, Ras Mohamed, Hurghada, Quseiur, Marsa Alam, Port Ghaleb, Elswany Islands, Elsayal, Elsokor, and Elafiston. The highest record was during spring time (12 whales) and at the end of summer (9 whales). This indicates that whale shark migrates from one place to another.

Sea Cucumbers

Sea cucumbers are classified under phylum Echinodermata. They are invertebrates living at the bottom of the sea and play an important role in marine ecological balance especially in food chain of coral reefs and sandy areas. They feed on benthos and organic materials, so they help in improving water quality. Sea cucumbers were subjected to global depletion during 1980th, however, there were increases in demands for them for medical and other purposes during 2000 especially in south east Asian countries. So they started searching for them in other places like the Red Sea.

Picture (7-19) Dried sea cucumber

Picture (7-18) Sea cucumber

There are many species of sea cucumber in Egypt, some species live in shallow water close to coral reefs and sea grass (86-95 sea cucumber/100m^2). Fishing of sea cucumber started in 1998 by fishermen outside Red Sea area, using illegal fishnets. This led to the decrease of thier numbers to 30 sea cucumber/100 m^2. The total catch of sea cucumber was estimated by 12000 animals annually. These activities resulted in the increase of mortality of non professional divers which reached more than 30 cases, due to the high price of sea cucumber. Accordingly, fishing of sea cucumber was prohibited since 2001. Studies were then conducted to know the impact of sea cucumber depletion on the marine environment.

Field surveys included 34 sites in the Gulf of Aqba and 82 in the Red Sea (from Taba in the north to Shalateen in the south). A total of 22 species were identified out of 49 recorded species during 1980th (biodiversity loss is more than 60%). Coast guards forces in cooperation of officers of national parks have arrested transgressors of 95 cases of law violation who caught 47500 animals.

During 2001-2003, field surveys confirmed the huge decrease in their numbers and densities that reached 10 animal / 100m$^{2)}$. Most of the areas that practiced illegal fishing became empty from sea cucumber (compared with 35 animal /m^2) in protected areas.

In addition to the decisions taken to prevent catching of cucumber and the continuous monitoring of its depletion, measures were taken to culture sea cucumber at laboratories of both Suez Canal University and Ras Mohamed National Park. Results have shown considerable success of breeding sea cucumber which can be released into the sea.

Dugong

A total of 50 Dugong (mermaid) were recorded. This is one of the most threatened species in the world, and reaches more than 2 meters in length. It is usually found in sea grass beds. The largest number of dugong (17) was recorded during summer 2007. A small Dugong was seen (1 meter in length) with its mother during February 2007. In addition, other marine sea mammals especially spinner dolphins and humback whales were also observed during 2007.

Picture (7-20) Dugong

Successful story

Crown of thorn starfish

Crown of thorn starfish classified under phylum Echinodermata. They are distinguished by many arms and toxic spines. They feed on coral reefs. In normal circumstances, they don't exceed small numbers of 10m², but in some cases they increase greatly in number and accumulate over each other until 50 starfish /m² that caused great problems because they feed on coral reefs, causing their death.

Picture (7-21) Crown of throns causing coral bleaching

During 1994, great numbers of Crown of thorns were recorded, reaching a number of 370 in two sites at Ras Mohamed National Park, and then they spread in 13 other sites. During 2000 some other 37 sites were observed in Ras Mohamed and soon they spread to the north along the Gulf of Aqaba reaching Dahab, and to the south reaching Hurghada on the Red Sea(more than 30 sites) More than 100 000 individual were recorded, leading to the death of many coral reef colonies (more than 40%).

Picture (7-22) Collecting Crown of throns by hand

In 2001, great efforts were exerted from protected areas staff. NGOs and volunteers from Sharm El-Sheikh, Dahab and Hurghada. They collected 150,000 starfish. In 2002 and onwards, their numbers have decreased dramatically, and the coral reefs also recovered, exhibited by an increase in growth rate (10cm/year).

Sooty Falcon (*Falcon concolor*)

The large colony of *Sooty Falcon (Falcon concolor)* in Wadi El-Gemal island is considered one of the highest colony in number. This is an endangered species that had been monitored since 2004. Studies included information on migratory season, breeding season, incubating egg period, and parental care. Number of Sooty falcons amounted 300 to 340 bird. Breeding time starts at spring and egg hatchlings in late summer. They, then start its migration towards East of Africa in September and October. Numbers of Sooty Falcon are nearly the same during the past five years, in spite of the increasing number of nests from 73 in 2004 to 94 nests in 2007.

Picture (7-23) Sooty falcon

Biodiversity in inland waters and wetlands

The Nile valley and wetlands are considered one of the most varied and productive ecosystems, (87species of aquatic plants have been recorded , 80 of phytoplancton , 100 of zooplancton, 82 species of fish, 31 species of amphibia and reptilia, 144 species of birds, 37 species of mammals). It is worthy to mention that some fish species were reduced in number especially after the construction of the high dam. Lake Naser is inhabited by 58 species of fish, and some threatened species like Nile Soft-Sheld Turtule (*Trionyx triunguis*), Nile Monitor (*Varanus miloticus*) crocodiles and Hippopotamus have existed in Nile River until 1800. Birds that have increased in Lake Naser are *Aopochen aegyptiacus* and many other migrating birds that amount more than 200,000 birds. In the Nile river, some invasive species inhabited there, like Water hyacinth (*Eihhornia crassipes*), *Procambarus clarki*i, snails, fish, one reptile species and 3 bird species.

Map (7-5) Nile River

A chemical and biological index has been applied for water quality in the Nile River. Results confirmed that water quality of Nile water from Aswan to Cairo is good but it not so in Delta and other water canals, due to water pollution.

Water Hyacinth (*Eihhornia crassipes*)

The aquatic floating plants in Egypt like Water hyacinth (*Eihhornia crassipes*) cause fatal problems in water streams. The infected areas in Egypt amounted 487 km^2 covering most of canals, and about 151 km^2 in lakes. Water loss resulting from evaporation in the infected areas, amount 3.5 billion m^3 annually. This quantity is considered adequate to irrigate extra 432 km^2 annually. This plant has caused water streams logging and changing of environmental components .It prevents sun light and oxygen to reach submerged plants that lead to great decrease of biodiversity in aquatic ecosystems.

Picture (7-24) Water Hyacinth as invasive species

Freshwater lobster *Procambarus clarkii*

Procambarus clarkii is considered to be one of the biggest invasive species in the Egyptian aquatic environment. They entered fresh water at the beginning of 1980'th and are considered to be one of the biggest crustacea in the fresh water ecosystems.

Two species of *Procambarus* species have been recorded in Egypt (*Procambarus clarkii and Procambarus zonangulus*). *Procambarus clarkii* has invaded most of the upper and lower Egyptian governorates from Northen delta to Asuit. The existence of these species have caused many problems to fishermen, irrigation systems and agricultural crops. They burrow in fields, causing water flooding into other fields. They feed on buds of crops, attack fish nets and cause harm to fish.

Picture (7-25) Freshwater lobster as invasive species

Wetlands

Wetlands assume ecological importance due to their hydrologic attributes and their being ecotones between terrestrial and aquatic ecosystems. Wetlands are sometimes described as the kidneys of the landscape because they function as downstream receivers of water and waste from both natural and human sources.

Wetlands are ecosystems with attributes that include high bio productivity (biomass of reed swamps among the highest), sources, sinks and transformers of numerous chemical, biological and genetic materials. Wetlands are valuable habitats for fisheries, wildlife and birds. Conservation associations and bodies worldwide noted and decried the alarming changes in these important habitats.

Wetlands have been subject to transformation to dry lands for agriculture schemes, human settlements etc.

A wetland is an ecosystem that depends on constant or recurrent shallow inundation or saturation at or near the surface of the substrate. The minimum essential characteristics of a wetland are recurrent, sustained inundation or saturation at or near the surface and the presence of physical, chemical and biological feature reflective of recurrent, sustained inundation or saturation. Common diagnostic features of wetlands are hydric soils and hydrophytic vegetation.

Picture (7-26) Wetlands

Wetlands perform many services and goods as follows:

Water purification: wetland ecosystems play a role in removing nitrogen and phosphorus compounds brought by drainage, thus reducing Eutrophication. Reeds and other water plants remove, at least partly, chemical pollutants including heavy metals compounds.

Protection against sea surges: wetlands of northern Delta act as buffer pads between the sea and the low-lying farmlands of the Delta.

Reservoirs of biodiversity: wetlands hold more than 40% of the world species. Coastal wetlands are vital to the survival of migratory birds. Wetlands act as refuges for animal species during spells of drought and other environmental adversities.

Wetlands products: wetlands are highly productive ecosystems. The northern lakes, Lake Nasser and near-shore zones of coastal waters are the principal fisheries of Egypt. Mangrove swamps, and tidal wetlands and marine grasslands are breeding and nursery habitats for many fish species. Inhabitants of wetlands areas, mostly fishermen, obtain additional income from catching waterfowl.

Recreation and eco-tourism: wetlands provide venues for many recreational activities: angling, hunting, boating, bird watching, etc…

Hydrological functions: wetlands could be used for water storage (schemes for using Lake Burullus as a reservoir in years of high flood was considered); they may be sources of replenishment of underground aquifers. In Egypt, the northern lakes act as barriers to the subsurface seawater intrusion to the farmland further south.

Climate change mitigation: some wetland types release methane (one of the principal greenhouse gases); but highly bioproductive wetlands act as carbon sinks, their conservation and restoration increase the potential for sequestration for fending against anticipated rises in sea level.

Education and research: wetlands provide sites for education and public awareness programs. They also provide sites for research studies: water-dependent ecosystems processes, restoration needs, maintenance and conservation methods, etc.

It may seem possible to classify wetlands in Egypt in a systematic pattern (saltwater and freshwater wetlands, etc…) or in a geographical pattern (Mediterranean, Red Sea coastlands, inland wetlands, etc…), but environmental management and conservation make this taxonomy difficult. We note here 12 generic types (each group of a type with some resemblance):

1. The Bardawil -Manzala-Brullus, -Idku-, Mareotis lakes of north Egypt.
2. The Matrouh lagoons, a set of closed lagoons that are close to the sea (Mediterranean) and receive their water through the narrow limestone barrier.
3. a. The Moghra – Wadi Natrun lakes.
   b. Groups of ponds and lakes formed in the oases of the Western Desert and in its outskirts.
4. The Qarun – Wadi Rayan Lakes. These are, two of the depressions of the West Desert. Lake Qarun is the lowest part (bottom at 45m. below sea level) of the larger depression that is now the farmlands of the Governorate of Fayoum.
5. A number of small lakes scatter in the Delta and its ourskirts, mostly formed as drainage water collected in depressions.
6. Within the red Red Sea littoral an coastal belts, there are sites of warm water springs including:
   - Ein Sokhna on the western coast of the Gulf of Suez,
   - Hammam Pharos on the eastern coast of the Gulf of Suez,
   - Mousa Springs in the Southwestern part of Sinai,

7. The main channel of the Nile between Aswan and Cairo embraces numerous islands. Shores of these islands and the riverbanks provide strips of wetland habitat and vegetation including floating reed growth.
8. Lake Nasser is the Egyptian part of the Aswan High Dam reservoir-lake. This is an extensive freshwater body, one of the larger man-made in the world: 496 km long (292 km in Egypt and 204 km in the Sudan, total area c. 50000 km²).
9. The depressions of Toshka spillway: a number of freshwater formed in depressions of the western Nubian desert as excess of Lake Nasser water flowed into them.
10. The Mediterranean coast outside the Delta provides little room for developed littoral sale marshes.
11. The Red Sea:
    a. The main body and the Gulf of Suez (and not the Gulf of Aqaba)
    b. The Red Sea (including the Gulf of Aqaba – and not the Gulf of Suez) coastal lands have extensive patches of mangroves.
    c. The Red Sea coral reefs form long stretches parallel to the shoreline.
    d. The Red Sea islands within the Egyptian exclusive economic zone comprise two types: coral formation and volcanic islands.
12. The Suez Canal system includes a small lake near the city of Ismailia (Lake Temash) and a larger lake further south (Bitter Lake).

El-Burullus protectorate:

El-Burullus lake is considered to be one of the 5 northen lakes of Egypt. It has the Mediterranean in the north, and agricultural land to the south. This lake is considered to be a site of International importance for birds (Ramsar Convention).

Picture (7-27) Hawis (to control water flow)

Studies conducted in El-Burullus lake included common characteristics of the lake like location, geology, geomorphology, different kinds of land and aquatic habitats, biological communities, climate, plants and green cover in the lake and islands inside it, benthic animals, fish, spiders, amphibian, reptiles, residential and migratory birds. Studies focused on the important sites for birds, mammals, economical and social development, the protectorate management plan, to implement the conservation program.

The main basin of the lake includes 3 sectors: Eastern, Central and Western), each sector has its own identity in the morphological, aquatic and biological characteristics. The scattered islands in the lake act as natural separators between these three sectors. The aquatic balance indicates that agriculture drainage water amounts 97% of the total resources of the lake (3.9 billion m^3) .The rain water amounts less than 2% (77.4 million m^3) , while the underground water amounts 1%. On the other side, the evaporation amounts 16% water loss of the

Picture (7-28) Ringed

total recourses (646.7 million m^3) .The drained water to sea amounts 84% of total aquatic resources (3.2 billion m^3) .

Picture (7-29) Salt march

El-Burullus has 6 main habitats: salt marshes, sandy formation (hills – landscapes – sandy dunes), lake outcomes soil and plants (lands resulted from drying the lake which are located in the eastern and western side of the lake), .drainages (the end of drainages) the lake (the open beaches of the lake, and islands .Every habitat has its own chemical and natural characteristics, distinguishing it from other habitats.

The biological community in El-Burullus area (according to the functional dimension) is divided into: producing organisms, consuming ones, and saprophytic organisms. The productive organisms include floating plants and vascular root plants. 197 species of vascular root plants have been recorded (100 species of annual plants - 97 species of Perennial plants). 11 species of aquatic fauna reeds (*Phragmites australis* is the most famous species of the lake: 276 species of phytoplankton (145 of diatoms 50 species of blue algae, 10 species related to other groups), other recorded 90 species of zooplankton, 33 species of benthic animals, 27 species of (screwworms, mollusca, arthropods) land invertebrates, 33 species of fish, 23 species of reptiles, 112 species of birds, and 18 species of mammals.

Picture (7-30) Visitors to Burullus lake

During 1970's, 33 species of fish were recorded, at the begging of this centaury 52 species were recorded, most of them fresh water fish and migratory fish, 8 more species disappeared of marine fish. This is a biological evidence of dominance of agricultural sewage to the lake, and lower saline. In spite of increasing primary productivity of the lake, but the quality of fish (mostly freshwater fish) value has decreased dramatically.

Picture (7-31) Wild plants

El-Bradweel Lake:

A total of 136 species have been recorded belonging to 109 genera and 42 subfamilies; 241phytoplancton and 59 zooplankton species, 72 species of invertebrates including crustacea (shrimps) 329, of field worms, molluscs, echinoderms , spiders (55 species) pests (202 species) 45 species of bream and_mullets 23 species of reptiles, 241 species of birds (more than 50% of recorded species in Egypt), 21 % of mammals, so biodiversity amounts 2111 species of birds and animals have been recorded.

Picture (7-32) Fishing activities

Fish production in Bardaweel lake ranges from one to 3.5 tones (about 2% of Egypt's lake production), a remarkable change was observed over the past 30 years. This leads to dominance of bream fish during 1980's, then mugilidae family increased in 1990th and now crustacea (shrimps) that amounts 50% of lake production. This is due to variation in saltiness in addition deeping the lagoon entrance. In addition to fishing with purse seiner was banned, allowing the lake bed to be abundant with sea grasses.

Biodiversity status according to the red lists as described by the International Union for Conservation of Nature (IUCN), includes 6 plant species threatened with extinction, 2 of them are endangered and one is unidentified, one other is rare. In addition to that, 5 species amount 3.7% of total number are considered to be limited in distribution.

77 of plant species have ecological importance, more than half is sand fasteners (windbreak), followed by (shadow plants), then grass. El-Bdardawil Lake has 99 species having economic importance (graze for wild animals and domestic animals, a food for native people who eat green plants, fruits and land fruits of 21 species). One of the most famous threatened species in El-Bardawil lake is the Egyptian tortoise (3species), the wild Egyptian turtle in addition to corn crake which has increased greatly in the last few years.Mammals also have numbers of threatened species like Greater Gerbeoa, Fennec Fox (*Vulpes zerda*), wild cat, and sand cat.

El-Zaranik protectorate is the gate for bird migration to Egypt.

El-Zaranik protectorate is considered to be one of the most important bird area in the East Mediterranean region especially in autumn. Tens of thousands of birds pass by from East Europe and North West of Asia in their way to south and middle Africa.

Picture (7-33) Avocet migratory bird

The end of August and beginning of September is the highest season for bird migration. These birds have their food from El-Zaranik protectorate like herons and waders, in addition to small birds that pass from North to South like quails, craks, storks. This area is considered to be one of the most important winter areas where many species spend winter like Sea Gulls, Greater flamingo (*Phoencopterus rubber*).

Many predatory and Soaring Birds pass during spring time, making use of warm air streams that help them in their return trip. This area is very important for breeding species in Mediterranean region like *(Kentish blovar)*.

Picture (7-34) Migratory birds

241 species have been recorded most of them are aquatic birds like Grey herons, waders, Gulls, pelicans. These species can be divided into:

Picture (7-35) Slender-billed

1- Resident species:

These species breed and spend their life in the protectorate. They include the lowest recorded numbers for 12 species like *(Kentish blovar)*, Desert Lark (*Ammomanes desert*).

2- Autumn birds (main migratory birds):

Autumn season which starts from middle August until the end of October is considered the main season for receiving hundred thousands of birds. The most popular species that visit the protectorate, are quails, herons, gulls, wading birds, ducks, black-winged stilt, chiffchaff, Dove, terns, corncrake, Dunlin, Garganey Kentish plover. The total number of species that have been recorded during the last Autumn is 133 species amount 38223 bird.

Picture (7-36) White stork

3- Visiting birds /Winter birds:

Birds visit this region during December until the end of February are coming from Europe in their way to Africa. Aquatic birds are the most recorded species, among them are terns, ducks, cormorant and crested lark.

4- Spring birds (return trip)

Since middle of March until the end of May , El-Zaranik protectorate receives more birds returning to their home, making use of warm air streams, that distinguish this time .The most famous birds is white stork where tenth of thousands were recorded during their return trip through North Sinai, in addition to soaring and predatory birds.

Summer time:

It includes June and July months which witness the lowest numbers of birds. They act as a transitional period between birds returning to their original home and starting of new season during August.

Rare species:

8 species were recorded as threatened with danger in this protectorate like Corn Crake (*Crex crex*), Imperial Egale (*Aquila heliaca*), Lesser Kestrel (*Falco moumanni*), Ferruginous Pochard (*Aythya nyroca*). Corn krake was recorded in large number during the last few years. The increasing in numbers of this species is due to prohibiting fishermen from hunting during the last two seasons, and the lowest number of bird hunters using nets because of bird flu.

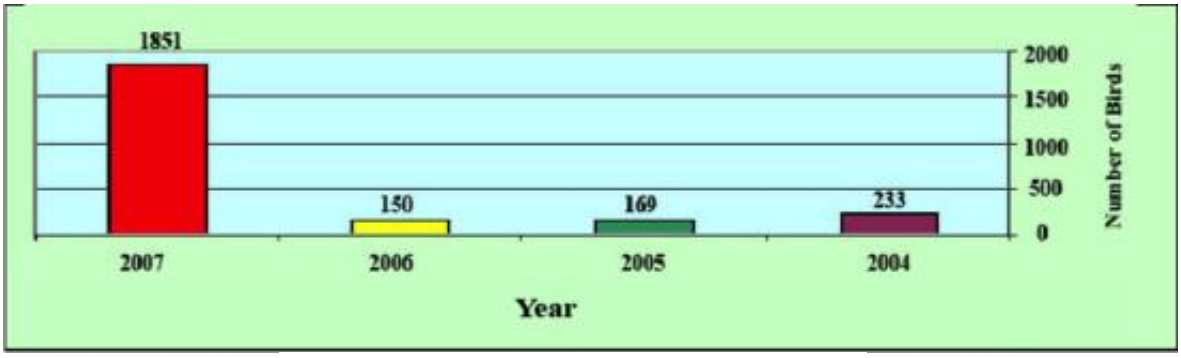


Figure (7-5) Increase in number of corn crake

The most important problems that face migratory birds:

- Increasing rates of hunting, whether using nets across the migration route (quails hunting nets) or using weapons for hunting aquatic birds.
- Destruction of natural habitats and bird nests in their original home, because of using modern technology during post-harvesting.
- Excessive use of pesticides in agriculture.
- High rates of pollution, whether in lakes or rivers where those birds pass away.
- Open sewage areas that attract birds during their migration.

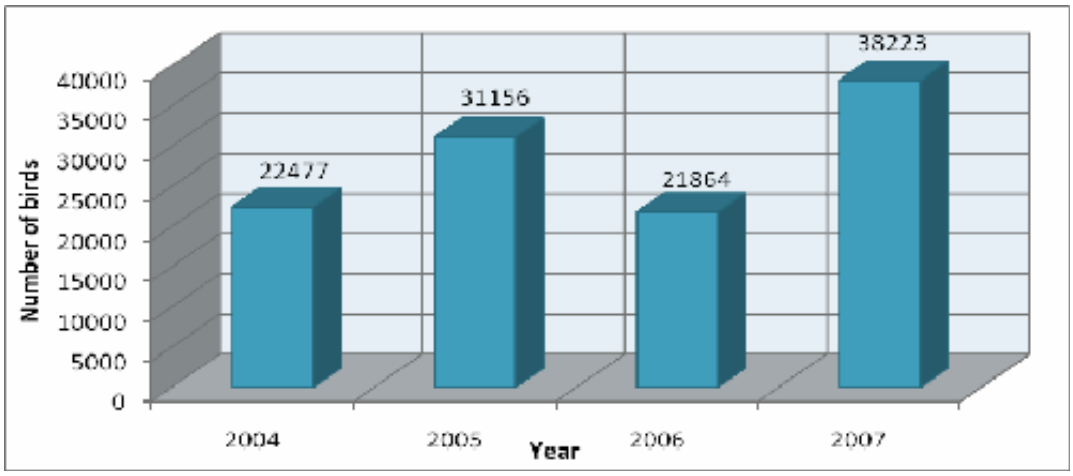


Figure (7-6) Number of birds

Table (7-1) Statement of Number and Species of Birds in El- Zaranik registered during the period from Aug., 2007 till March 2008

Month	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	March
No. of Species	46	115	122	52	56	47	53	82
No. of Birds	2445	24198	10887	6793	10838	12829	11679	17658

Threats to wetlands:

Wet lands face great threats, mainly in land, scooping up for land reclamation and construction expansion project. For example, El-Burullus lake has been shrunk from 136,000 feddans in 1953 to 101,000 feddans in 2000, losing more than 1/3 of its total area. The environmental status that was dominant during the past years was the salty or marine water to the North and in the South (from agriculture sewage water). The agriculture expansion increased the agriculture sewage water that pours into sea water giving no space to saline water. Agricultural water is mixed with sewage water from cities and Industrial drained water, which are carrying pollutants to El-Burullus lake that affect biota and lower services and resources that lake can give.

Picture (7-37) Land filling in wetlands

Wetlands are exposed to threats emerged from natural phenomenon among which sedimentation, alluvium and sand creep to deserts and oases; in addition to seacoast erosion's effect upon North lakes leading to shrink of narrow barriers separating each lake from the sea which may transfer them to marine gulfs; in addition to threats of climate changes mainly raise of sea level drowning lakes and leading to sea transgression.

Picture (7-38) Reduced water masses in wetlands

Biodiversity of dry and sub-humid lands

Studies demonstrated that although Egypt's climate is dry in our modern age (little amounts of winter rains in the Northern coast ranging from 100 to 250 mm/year, rare in the middle region from 20 to100mm/year) yet in ancient geological eras it was rainy (more than 450mm/year) and till nowadays some floods still come from the Red Sea mountains chain and fall upon the Eastern Desert while for the Western Desert, it is very drought and extremely exposed to winds erosion factors.

Dry and sub-humid lands cover most of Egypt (currently 92%) combining different environmental systems; Western Desert (681 thousand km^2) composed of equatorial plateau in its greater portions (significant plateau of El-Galf El-kibear and El-Ouwaynat Mountain); and many depressions (El-Qattara, Siwa, El-Fayoum) ;in addition to parallel belts of sand dunes lines (Bahr El-Remal El-Aazm). Eastern Desert (223 thousand km^2), consisting of rock plateau and the Red Sea mountains chain with inconsiderable number of valleys. As for Sinai Peninsula (61 thousand km^2) it is considered to be a huge mass of basic formation with high rough peaks (Saint Catharine mountain), valleys and some oases (EL-Fyran).
Valleys are considered to be one of the main characteristics of deserts, in addition to the following habitats: Surface rocky, Erosion pavement, Gravel desert, slopes and cliffs; all these

habitats are characterized by vegetation cover that differ from one place to another. Surface rocky habitat is very dry without any existence of necessary requirements for plants growth except for some kinds of plants called rocky plants, which embed their roots through rocks. In addition, little amount of rainfall in the desert may create small holes in rocks where some soil and water are collected, giving rise to growth of seasonal plants.

The upper layer of the second habitat (erosion pavement) is covered with fine gravel mixed with some round rocks, and this layer might be even or wavy. Surface water concentrate in water courses lined with layer of fine sand, therefore plants find a suitable environment for their growth. In gravel desert habitat, surface sedimentations are composed principally from movable substances and not from substances emerged from broken infrastructure soil. Winds blow sands away from surface of gravel deserts, particularly in heights leaving little stones on surface bare of soil. However they protect underneath soil from being moved by winds; accordingly, they are considered to be a protective armor for soil. Little stones interfere and connect to compose a solid layer, where roots of plants can not penetrate. For that reason gravel deserts are considered to be a barren environment, where plants can not grow excluding some rocky trees and soil moss. In some areas constitution of solid gravel cover dose not fulfill on surface of earth, however it become little, distant and mixed with large amount of fine soil. In that kind of environment some seasonal and annual plants can grow.

Habitats of slopes are found at edges of plateaus and sides of valleys, mountains and hills. Surface of such habitat is covered with rocks' crumbles, composing appropriate consistency for plants' growth, as there are small pockets within surfaces of rocks where sands and water concentrate composing suitable environment for plants' growth particularly those tolerating dryness.

In slopes of high mountains, vegetation cover is influenced by elevation factor; where bottom parts of these slopes receive large amount of rain water than upper parts. This leads to a change in kinds of plants from bottom to upper part of the mountain. This phenomenon is obviously clear in the Red Sea Mountains and Sinai Peninsula.

Cliffs habitat is considered to be a very drought environment, which hinder plants' growth except from some little kinds, which use rocks clefts. These cliffs are deprived from the formation of surface soil. Only sands, carried by winds are gathered inside clefts. In the presence of little amount of water, seeds of some plants, adapted with that kind of habitat, can germinate.

Valleys are considered to be the most important environmental system in the Egyptian deserts, as they constitute drainage systems for waters of rains and floods. For that reason, they receive huge amounts of water than other environments. Consequently, their vegetation cover is dense, but at the same time exposed to oppressive cut and over grazing. Their structures are formed of rocks' crumbles, which vary from being tiny sand particles to large stones. Quantities of water and soil are the main factors determining quality of vegetation cover in valleys. If the soil is delicate and superficial, it is wetted with water during rainy season but they dry out fast. In that kind of soil that is not capable to preserve water, only short lived vegetation cover (seasonal) can grow. As for deep soil, which allow to preserve greater

amount of water underneath its layers and accordingly they are considered to be a constant source of perennial plants with deep roots including herbal plants, trees and bushes.

Habitat of different sand dune formations, which are widely spread in the Egyptian deserts, such as sand dunes, are very important. Plants grow and prevail that habitat (Sand dune stabilizer), having the ability to sediment sand borne by winds around them, and accumulating them in different formations of heights and sizes of sand dune. These plants produce large number of horizontal roots from their stems and branches enabling them to overcome the problem of total burial with sand, as they have the ability to produce new branches uppermost; and in that case, branches and stems play the role of roots after being buried under sands. By this way, plants can grow upright penetrating sand bar covering them.

There are two kinds of coastal and inland salt marshes. As for coastal salt marshes, they are found along coasts of Mediterranean Sea, Red Sea, Gulf of Suez and Gulf of Aqaba in addition to Northern Lakes. Inland salt marshes are located in salty marshes and lands in oases and depressions.

Climate factors affected soils' characteristics of salt marshes. Dryness of weather lead to raise evaporation's rate from soil and increase its amounts of soluble or insoluble salts.

Picture (7-39) General view of arid lands

About 1775 species of plants were recorded as follows: (279) in North Sinai, (472) in South Sinai, (328) in North Coast, (66) in Halayeb, (205) in Western Desert and (280) in Eastern Desert. Results of surveys clarified that most of recorded plants are included in the traditional knowledge in Sinai, North Coast, Eastern and Western deserts. Biological diversity is represented by 324 species in El-Omayed protectorate, which is considered an example of

deserts' protectorates, including many endangered species particularly large mammals, such as Gazelles. In addition to the presence of some genetic resources such as wild cotton in Siwa.

There are indicators referring to loss of biological diversity. For example loss rate of plants has reached to 40% in Wadi El Alaky protectorate during the last 20 years as a result of increased dryness rate which decreased the ability of plants to reproduce, as well as other grazing animals. Cheata, has not been seen during the last two decades in the Western Desert.

Dorcas Gazelle (*Gazelle dorcas dorcas*):

Egyptian Desert was dwelled by 6 species of the following large mammals known by Antelopes, Mountain Gazelle (*Gazella gazelle*), Scimitar Horned Oryx (*Oryx dammah*), Rhim Gazelle (*Gazelle leptoceyos*), African Wild Ass (*Equus asinus*). These animals were common in the deserts till mid 1940th of the last century.

Picture (7-40) Egyptian Gazelle

As a result of hunting activities and drought, Mountain Gazelle (*Gazella gazelle*), Scimitar Horned Oryx (Oryx dammah), Rhim Gazelle (*Gazelle leptoceyos*), African Wild Ass (*Equus asinus)* disappeared completely and only the Dorcas Gazelle (*Gazelle dorcas dorcas*) and Rhim Gazelle (*Gazelle leptoceyos*) remained and threatened with extinction. The Dorcas Gazelle is relatively widely spread than Rhim Gazelle which had been monitored in limited areas of Western Desert close to Siwa oasis; while Dorcas Gazelle exist in numerous areas as it was monitored in 11 protectorates (Wadi El-Gemal, Siwa, White Desert, Elba, Wadi El-Rayan, Wadi El-Alaky, El-Asuti, Catharine, Degla, Nabeq and Taba).

Studies indicated that numbers of Gazelles are constantly decreasing with different rates according to their area of existence and range of threats they are exposed to, such as oppressive hunting and unsustainable collection of plants and habitat fragmentation.

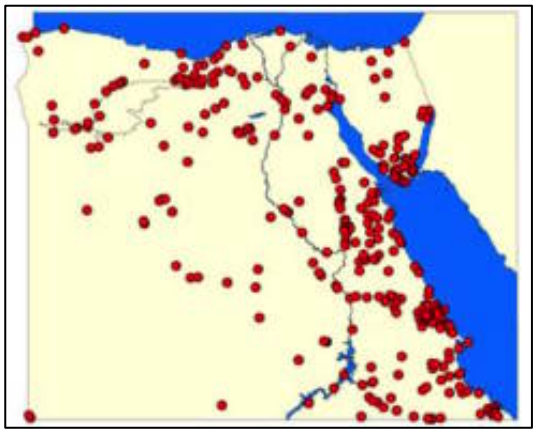
Dorcas Gazelle is considered to be one of the indicators of biological diversity condition in the Egyptian environment, which is characterized by its nimble and quick movements to remote distances looking for graze. It feeds on leaves and fruits of El-Sayal trees, grasses and bushes being one of the browsers and not grazers. For that reason, it assists in the estimation of plants and consequently helping in their growth. Both male and female of Dorcas Gazelle have ring horns but female's horns are smaller and more cylindrical than those of male. Its weight range from 15 to 20 kg. Sexual maturity of male is after 18 month and that of female

after 9 months while pregnancy period is about 6 months. Breeding season starts in Autumn, giving birth in Spring and sometimes early in January. Female mostly deliver only one borne each time and nursery period does not exceed 3 months. Egyptian Gazelle can live for more than 12 years.

Studies conducted on Gazelle proved that it existed in all Egyptian deserts and valleys and due to threats, Gazelle had been exposed to many threats during last decades, such as hunting and construction development, its numbers has decreased in Egyptian environment. For that reason a program to monitor Gazelle was carried out in all protected areas known of its existence to determine its current status. Studies concentrated in protectorates of Wadi El-Rayan, Saint Catherine, Nabq, Wadi El-Gemal, and Elba Mountain.

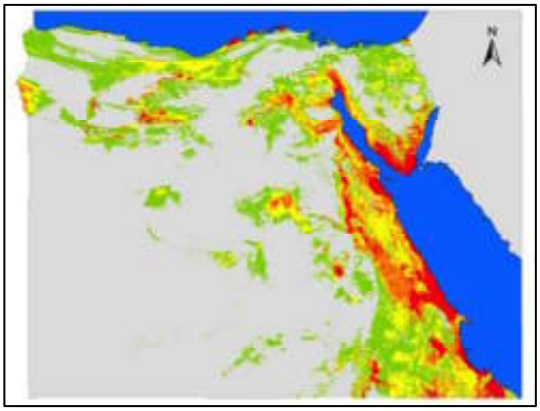
Elba Mountain Protected Area

Indicators for status of the Egyptian gazelles has been made, including areas of distribution, extent and their numbers, as well as information related to the protection, threats, and time of new generation recruits.



Map (7-6) Actual distribution of Gazelle

There is remarkable increase in the number of Gazelles in their distribution areas which may be due to rainfalls in the last year and the efficiency of patrolling activities inside the protectorate. 16 areas were identified of its spread, among which 11 areas in the Southern part of the protectorate (Hadarba, Sermatay, Bahgat, Aydeab, El-sadrek, El-shalal, Bdakowan, Fenaa, and Bear El-Negma) and five areas in the Northern part (Wadi El-Gemal, El-Fakaa, Maadi, El-Mashbah, and Meatkwan). Concerning numbers' indicator, ranged from 145 to 200 animals which are monitored monthly inside the protectorate. Hadraba area is considered to be one of the most areas containing the Egyptian Gazelle as its monitoring numbers has been ranged from 50 to 70 Gazelle monthly.



Map (7-7) Predicted distribution of Gazelle

Monitoring of new births and generations has been observed in four areas of its spread, especially during rainy seasons, which give a good indicator of the ecological balance inside the protectorate. Despite that, three kinds of threats face the protectorate have been identified, embodied in hunting, drought, rare grassing and the increased numbers of roads inside the

protectorate, Hunting embodied 70% of threats, but there is patrolling to reduce these illegal practices. Actually, hunting has been banned and control has been imposed upon entrance and exit areas to control tracks and movements inside the protectorate. As for drought and rare grassing, they have great effect on ecological balance, in addition to the increases in roads' inside the protectorate, reaching an impact of 60% upon the area and level of the protectorate.

Wadi El-Gemal National Park

In Wadi El-Gemal protectorate there is one of the greatest concentration areas of Egyptian Gazelle upon which a case study has been conducted to identify areas of their distribution and favored environment for them. It is worthy to mention that the greatest numbers of Gazelle are located in Wadi El Gemal area and the adjacent Raas Banas. Their majority are concentrated in the coastal area more than the mountain area due to the existence of green plants along the whole year, such as in El Tarfa and El Sayal having the ability to endure drought periods and scarcity of rainfall, in addition to the presence of great amount of dew early in the morning and opened areas. The area is distinguished with little disturbance and noise emerged from (human beings, donkeys, dogs, cars, and public roads) especially in Raas Banas which is considered to be a closed area by Borders Guards'. It includes small and narrow flood water ways necessary for the quick hide in case of the presence of any disturbance.

It is remarkable that the total number is constant and stabilized as it is ranging from 30 to 50 individuals with exception in February, which is the time of giving birth. For that reason, numbers of Gazelles decrees inside the valleys, as they tend to hide inside mountain area. After that period in subsequent months numbers of Gazelles increases with youngs accompanying their mothers. The greatest number of Gazelles was recorded in September as it is the season of courtship where numbers of female are increasing around males.

Southern Sinai Protectorates

In Southern Sinai, Gazelles live in two main areas, Sahl El-Kaa adjacent to Saint Kathrine, Nabq and Taba protectorates. Studies conducted since 1998 till now confirmed the following two findings: The first one is activity index, which enables to identify the extent of El-Gazelles activity in the area by depending upon the amount of foot traces in a defined area. The second indicator is to define Gazelle's rang of spreading in the area by monitoring numbers of fecal balls then applying statistics equations to determine the extent of using an area by it .

Studies proved that activity's rate has been decreased from 6.9 trace /km in 1998 to 1.8 trace /km in 2007.The current concentrated activity of Gazelles is near mountain boarder, due to the presence of plants. This area is remarked with little threats emerging from human activities, such as hunting, woodcutting and mining. The Southern area of Sahl El-kaa was considered to be one of the most active areas with Gazelle's activities but due to the change in the green coverage and increase of human activities, Gazelle left the area and went to remote areas.

Wadi El-Rayan Protectorate:

In Wadi El-Rayan, the recorded number of Gazelle in 2001 fluctuated from 6 to 14 Gazelle. In 2008 a survey has been conducted in 31 areas where a monitor of Gazelle's activity has been traced in 4 areas, only near the fourth spring (El Rowayfay). The estimation of its density was 25 balls of fecal /km (it is an indicator of Gazelle's activity and not its number), which means that white Gazelle has disappeared during the last years and little numbers of

Egyptian Gazelle has been remained, the study clarified that Gazelle faces the following threats:

Closeness of springs area to the public road has caused disturbance for Gazelles, spread of cars tracks inside springs area (one of the most important areas for the spread of Gazelles), agricultural reclamation areas, presence of straying dogs and tourism activities. In addition, surveys proved that Gazelles are still facing hunting and that their presence depends upon being away from these kinds of threat.

El- Argoun Palm

Trees of El- Argoun palm are considered to be a good example of protection's activities. Their numbers were abundant in ancient Egypt and they were re-discovered during sixties, thereupon had been cultivated in Waddi El-Alakey protectorate. Nowadays, there are plentiful numbers of El-Argoun in Karkar and Donkel in Western desert, to which necessary procedures are going to be taken to declare them as a natural protectorate.

Picture (7-41) Argoun palm

Mountains Biodiversity:

In mountain areas of Egypt, climate fluctuate from being very dry (moderate winter and hot or very hot summer) as it is the case in El-Owaynate mountain, and dry climate as in Elba mountain where rainy winter exist or very cold winter as in Saint Katherine mountain, where temperatures reaches to under zero. Rains amounts are ranging from less than 5mm/year in El-Owaynate mountain to less than 10mm/year in Saint Katherine. In Elba Mountain it fluctuates from 100 to 150 mm/year which, in the past, had been reached to 400mm/year. It is worthy to mention that there is a great fluctuation in the amounts of rains during last decades.

Mountainous areas are concentrated in three places in Egypt: South Sinai Mountains, El Owaynate Mountain, Read Sea and Elba Mountains. These areas are distinguished by unique biological diversity, particularly plants because of the variety of habitats distinguished with dryness and graduation of temperatures according to the altitude and different habitats such as mountains peaks, rifts, mountain slopes, desert valleys, mountain valleys, and caves.

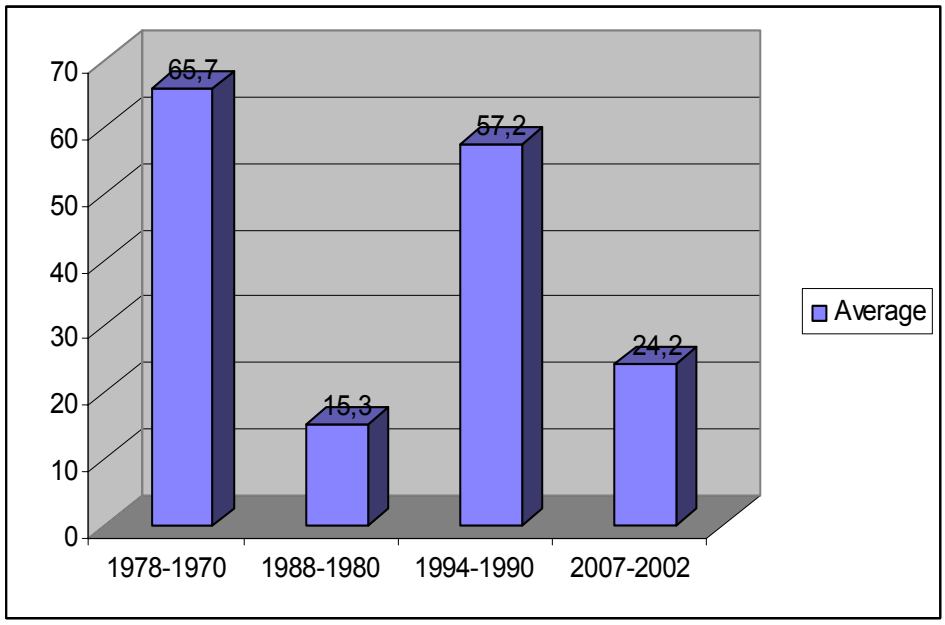


Figure (7-7) Rainfall in St. Catharine

More than 600 plant species in mountainous areas were documented, but there are confirmations of the loss of its biological diversity especially indigenous and endangered species in Elba mountain and Saint Katherine (the loss reached to about 70 plant species approximately).

Sinai leopard was one of the most famous animals in the mountains of Sinai. It has not been seen during the last 20 years. From the other side, the Arabian wolf has been registered for the first time during the last three years after it has been thought that it has been disappeared since more than 50 years. Dorcas Gazelle (*Gazella dorcas dorcas*, Barbary Sheep (*Ammotragus lervia*) and Antelope Kob (*Kobus kob*) are considered to be the famous mammals nowadays, but their numbers are constantly decreasing. The same can be said about wild cat, caracel, and hedge hoog but as for hare, it is still present with reasonable numbers .

There is a relative stability in the numbers of Barbary Sheep (*Ammotragus lervia*), Griffon Vulture (*Cyps fulhus*) in Elba protectorate as they were monitored constantly, in addition to monitor their new recruit (new generations).

Barbary Sheep (*Ammotragus lervia*) in Elba Mountain

Monitoring of Barbary Sheep (*Ammotragus lervia*) in Gabel Elba protectorate has been undertaken during the last few years. Due to the difficulty of their visual monitoring, as they are available only on peaks of mountains and getting down during limited periods for grazing and drinking, methods of their monitoring depended upon their traces and residues.

Distribution and spreading areas of Barbary Sheep (*Ammotragus lervia*), indicates that from 2001 to 2003 , only their residues were monitored ,but since 2004 they had been monitored and photographed in six areas: serdab, um kalta, seeh, Al-fakah, Mashabbeh, Komweab all of them are located in Western North of the protectorate . It was obvious that there were relative stability in their numbers (30 – 33), due to stoppage of hunting and increasing numbers of patrols to control areas of their spread.

Picture (7-42) Barbary sheep

During the last year, monitoring of new births and generation of Barbary Sheep (*Ammotragus lervia*), were conducted in an area of its spread which gave a good indication about its status, inside the protectorate and its ability to give birth. The general indicator clarifies that there are many kinds of violations such as hunting, development projects which have direct impacts, as in Sohean /Shalatean new road, drought and cars movements. Due to continuous patrolling, an actual stoppage of many attempts of hunting during the last three years, in addition, a system of issuing cars' licenses from the protectorate has been undertaken to control their movement inside areasof the Barbary sheep spread since 2004.

El Ombet and El Arar Trees

El Ombet trees in Elba mountain face danger of extinction, embodied in the continuous decrease in their numbers till reaching to 60%. Nowadays, they can be found on elevated areas only. This is due to climatic changes (rise in temperature by 3°C since the sixties and severe decrease in levels of humidity and rains). Trees of El Arar were recorded in Sinai and now are found only in Mountains of El-Halal, El-Maghara, and Balka which are considered to be the only refuge in Egypt, as they represent isolated islands amid desert. They can be found in Jordan and Libya.

Picture (7-44) Arar tree

Picture (7-43) Ombet trees

Agro biodiversity

Wild life plays an important role in agricultural habitats in keeping ecological balance. One third of the agricultural crops depend upon pollination by insects and other wild animals. Insects play also an important role in ecological balance (biological control of agricultural pests), while wild birds are nourished on insects and agricultural pests and helps in the dissemination of seeds. In addition, there is the role of minute living organism (bacteria) which decompose and digest organic materials.

Agricultural resources are restricted in old lands of Nile Delta and its Valley where amount to 80% of the total agricultural lands and new reclaimed lands.

Accordingly, agricultural lands amount to about 8.3 million Acres. Approximately winter harvest production, overwhelm 49% of the total crop area, while summer harvest occupies 46% of it. Areas used in Nile crops production do not exceed 5%. Productivity of most of agricultural crops has increased due to improved agricultural brands, and usage of improved varieties resistant to agricultural diseases and pests. For that reason rate of agricultural growth has been increased from 2.6% in eighties to 3.97% at beginning of the third millennium. About 90% from supplies of livestock are derived from 14 species of mammals and birds. In addition, 4 kinds of agricultural crops (wheat, maize, rice, potatoes) provide Egypt with half of its needs from plants.

Modern agriculture methods encouraged farmers to adopt the usage of species or brands of high ranking yields in the production of crops, livestock and fish, which lead producers to abstain the usage of local brands and strains.

Picture (7-45) Agricultural

Most of Egyptian botanical crops depend completely or partially upon insectile pollination in its production. Egyptian economy's losses were estimated by about 13.5 billion pounds/year due to usage of pesticides which contributes to the absence of pollination. Agricultural, poultry, livestock, and fish resources were estimated by about 92.2 billion Egyptian pound in 2006. Agricultural exports contribute with about 20% from the total agricultural exports. In the field of tourism about 2 million individuals provide services for about 12 million tourists in 2007 with an income exceeding more than 60 billion Egyptian pounds. Ecosystems and biological diversity provide direct services for tourism, in addition to indirect services such as protection of coasts by coral reefs and mangrove trees in the Red Sea, which their value estimated by about 80 million Egyptian pound /km^2 .

Others different benefits of biological diversity and their value were not estimated yet such as natural materials produced by coral reefs, and plants used in treatment of many diseases. In addition, the usage of micro organisms by biotechnology to produce genetically modified organisms has not yet fully investigated.

Red Palm Weevil Pest (*Rhynchophorus ferrugineus*)

In 1992, Red Palm Weevil Pest invaded Egyptian agriculture lands due to importation of palm seedlings from United Arab of Emirates; its spread in Egypt was restricted to two sites at Sharkaya Governorate.

Picture (7-46) Red palm weevil

Despite of the limited number of damaged trees, the condition is very concerning in Egypt; as Red Palm Weevil Pest has been found in Delta's governorates and also in some of the horticultures along the roads between Cairo and Alexandria and even in the capital itself.

This spread is due to the difficulty of implementing forbiddance upon the exchange or plantation of imported seedlings or mature ornamental palms, in the frame of strict preventive procedures. Red Palm Weevil Pest does not fly too much in horticultures where it is present in. May be, after getting rid of all of palm trees living in it and can find nothing to eat, it moves to new horticultures.

Red list of endangered species:

The Egyptian Red list currently includes three main groups of animals and plants.

1- **Mammals:** A total of 111 species, categorized into 36 species which are less endangered, 24 species exposed to extinction, 11 endangered species with extinction, one endangered species and in a critical condition, and another one has been already extinct. The rest has not been evaluated due to lack of enough data about their status (figure 7- 8).

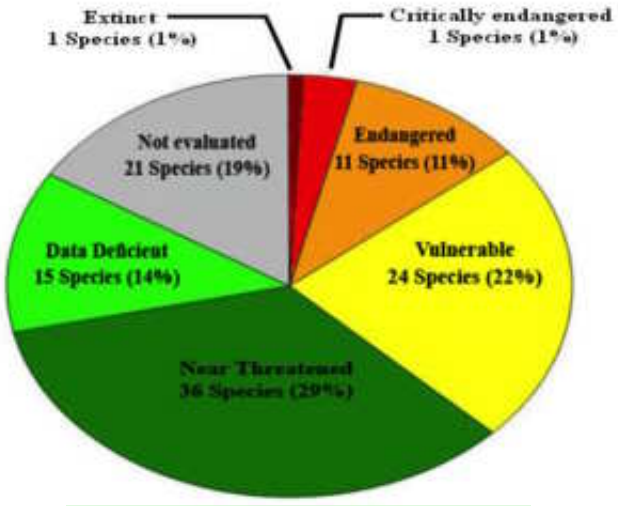


Figure (7-8) Red list of mammals

2- **Insects:** A total of 63 species categorized into the following: 17 species less endangered, 14 species exposed to extinction , one specie endangered , another endangered and in critical condition , 14 species has not been evaluated, 16 species without enough information , 40 species of Odonata of which 11 less endangered , 10 exposed to extinction , 7 endangered,,3 endangered and in critical status and 9 without enough information .

a- Butterflies: The total number of evaluated species in Egypt is 63, categorized as clarified in figure (7-9)

b- Odonata: The total number of evaluated species in Egypt is 40, categorized as clarified in figure (7-10)

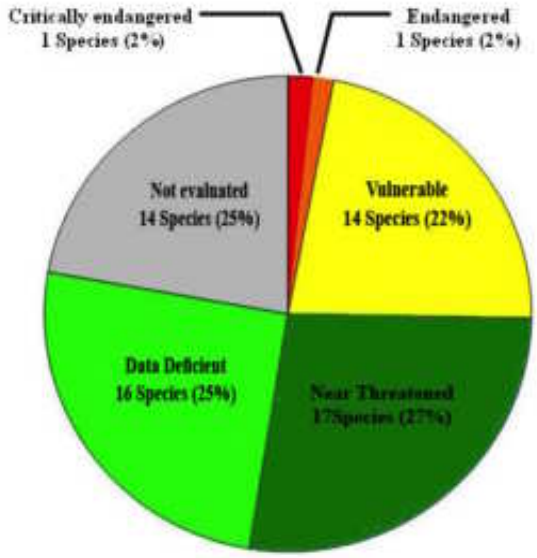


Figure (7-9) Red list of Butterflies

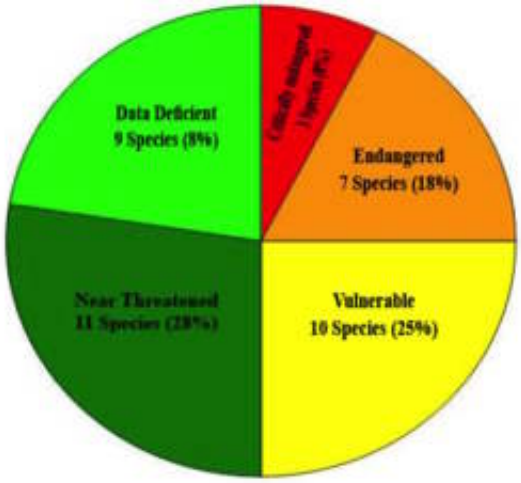


Figure (7-10) Red list of Odnata

3- **Plants:** Studies on two families were completed, the Apocynaceae, (11 species less endangered, 7 exposed to extinction, 2 endangered, and 2 without enough information) and Euphorbiaceae, with 51 species of them (15 less endangered, 22 exposed to extinction, 7 endangered and 7 in critical status).

a- Apocynaceae: Total number of its registered species in Egypt is 22 one categorized as clarified in figure (7- 11).

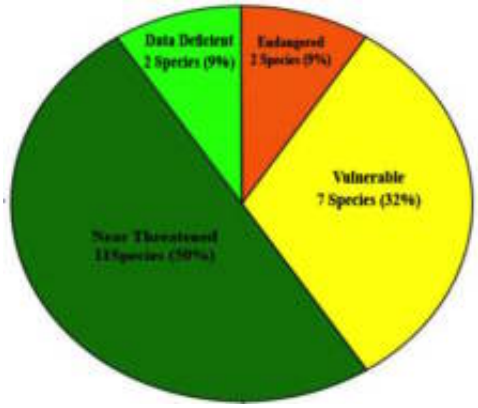


Figure (7-11) Red list of Apocynaceae

b- Euphorbiaceae: Total number of its registered species in Egypt is 51 one categorized as it is clarified in figure (7- 12).

Currently efforts are carried on to identify the rest of the groups such as birds, reptiles, rest of plant species, rest of insect species, and other groups.

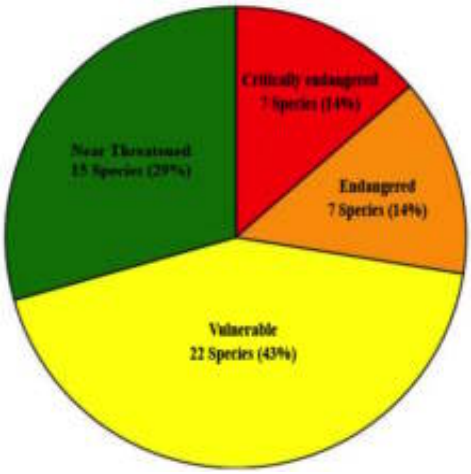


Figure (7-12) Red list Euphorbiacea

Black List (Invasive species):

Invasive species are those invading other habitats rather than their original ones, with negative impact on local environment, economy and human being, contributing to the spread of diseases to birds as bird flue , to agricultural crops , fishing resources and pastures, in addition to the loss of water resources and hindrance of navigation in water ways. Article 8 of Biological Diversity Convention requests parties to present national reports not only about status and trends of biological diversity but also about status and extent of invasive species in national environments. Ten years ago, an international conference was held in Norway about invasive species as they were considered to be the second greatest threat facing ecosystems especially fragile systems. It was obvious that most of the countries were not recognizing the extent of the problem and haven't enough information at national level, while many other countries haven't enough capabilities to face this problem.

Picture (7-47) Invasive rat

For that reason, preparation and execution of international program for invasive species is depending upon coordination among relevant organizations such as UNESCO and IUCN to collect, and provide available information on invasive species, in addition to implementation of sound practices and managed information concerning educational and public awareness programs that explain methods of their invasion, danger, assessment, economical and social aspects of this problem, assessment of the current status with regard to legislations, legal opinions, research programs, and support of activities at national, regional and international levels .

National action plan depends upon identifying national needs and priorities, surveying relative policies, legislations and institutions, enhancing cooperation among different sectors, improve public awareness on threats to biological diversity, sharing information with stakeholders and holding cooperation among neighboring countries.

The black list of invasive species which have been recorded in Egyptian habitats includes 152 species of plants, animals, viruses (bird flu), marine plants, water hycancea, rrustaceans (fresh water lobster), molluscs, insects (Red palm Weevil Pest), Mesquite (Prosopis juliflora), and even fishes, birds and some species of mammals. A case study about some invasive species has been conducted, setting up data base and forming a task group to take some of the necessary action such as monitoring, combating and preparation of national action plan.

Combating invasive species requires huge technical, financial potentials and human capabilities, in addition to participation of all of relevant entities. Bird flue is an example of invasive species problem's extent which has negative impacts on environment, economy and human health.

(Table 7-2) Invasive species monitored in the Egyptian Environment

Category	Invasive species in marine water	Invasive species in fresh water	Invasive species on land	Total
Plants	6	27	31	64
Crustacean	13	2	-	15
Insects	-	-	14	14
Arachnids	-	-	1	1
Fishes	20	12	-	32
Mammals	-	-	3	3
Birds	-	-	3	3
Reptiles	-	1	-	1
Amphibia	-	1	-	1
Micro Organism	-	-	7	7
Nematodes	-	-	3	3
Molluscs	-	4	-	4
Echinoderms	1	-	-	1
Coelenterates	2	-	-	2
Total Number	43	47	62	152

Impacts of climate changes on biological diversity:

Climate changes impacts on biological diversity have been recorded by monitoring for the first time coral bleaching in 2007, decrease in the spread and distribution of Ombet trees, *Medemia argum* on elevated areas of Elba mountain, and many of medicinal plants in St. Katherine mountain, in addition to the small Sinai baton blue (Pseudophilotes) the smallest butterfly in the world which is endemic to Sinai and its home range doesn't exceed 5 km^2, feeding on Sinai Thyme (*Thymus decussates*) a plant species endemic to St. Katherine.

Biodiversity

Many species of Egyptian fauna and flora occur in habitats with very limited areas, and due to dry climate, biological diversity faces many dangers resulting from pressure of population growth, inequitable outrage hunting of animals, removal of many plants especially medicinal plants, cutting trees, globalization and its negative impacts on extraction of biological materials, limited financial and human resources, environmental deterioration due to different types of pollution, habitat fragmentation because of huge projects. Additionally, the intrusion of many plants and animals to Egypt, along the last two centuries which gain great economical importance especially cotton and fruits in agricultural field, livestock species including fish and poultry, all lead to the neglection of Egyptian strains. Accordingly, some of them begin to deteriorate or about to extinct (agricultural genetic resources). From the other side many invasive species invade Egypt with their negative impacts on agriculture (agricultural pests), aquatic environment (Nile flower), and human being health (bird flu).

Egyptian ecosystems habitats and species suffer from ecological imbalance due to human being activities, leading to great deterioration. The exemption of that is about 15% from Egypt's area, which is the total area of the declared protected areas where many activities are dedicated to limit environmental deterioration and loss of biological diversity, this area is expected to reach up to 20% by 2017.

Climate change impact on Sinai butterfly, the smallest butterfly in the world

Climate change phenomenon has been recorded by monitoring disappearance of living organisms on peaks of St. Katherine mountains due to raise of temperatures, which may expose some organisms to the danger of extinction, among which Sinai baton blue (pseudophilotes) the smallest butterfly in the world. The length of its wings doesn't exceed 6 mm**.** It is endemic to St. Katherine mountains and can not be found in any place in the world except in this area. Its larva feed on buds of Sinai Thyme (*Thymus decussates*), while adult butterflies feeds on nectar of its flowers. Peaks of Sinai Mountains are the only place in the world where Sinai Thyme (*Thymus decussates)* can be found, as it is an endemic plant species.

Picture (7-48) Sinai butterfly

Studies proved that annual change in temperatures, expedite its exposure to danger of extinction, as it was notified that the rate of Sinai Thyme flower (*Thymus decussates)* decreased with about 40% or more in more droughty years, and if temperature degrees continue its raise Sinai Thyme (*Thymus decussates*) will continue its decrease leading to decrease in the numbers of Sinai baton blue (pseudophilotes) exposing it to danger of extinction in a very limited period, specially if exposed to human threats, such as over grazing and collection of Sinai Thyme (*Thymus decussates*) for medical purposes.

Climate change impacts on coral reefs

Climate change are exhibited in the steady slow raise of temperatures and increase see level. In 1998 monitoring of many coral reefs in different parts of the world resulted in coral bleaching where symbiotic living inside corals were expelled due to change in water temperatures, leading to white color of corals, and in many instances death of corals.

Picture (7-49) Coral bleaching due to increase in water temperature

In 2006, two phenomena of coral reefs' bleaching had been monitored in Egypt. The first represented in the extreme low tide exposing coral reefs to direct air and losing its vitality. This phenomenon continued for few days during spring season, where some areas are still affected and did not recover till now.

The second phenomenon is considered the most important, as in October 2007 for the first time, the prediction program being implemented by the USA National Oceanic and Atmospheric Administration NOAA predicted coral bleaching in about 20 m depth in an area near to remote islands in the Red Sea (Rooky island). Temperatures on that depth reached about 29°c. This program depends upon accumulation of water temperatures, known by Degree Heating weak, when the period of their accumulation reached 12 weeks. Indicators referred to bleaching coral reefs in the middle of Red Sea. Photos were taken from different areas and near islands, according to the questionnaire conducted with diving centers clarifying this phenomenon. This phenomenon is considered to be a very danger indicator because it is expected to spread to reach Sayall Island and other islands.

Bird Flu:

Bird flu virus (H5N1) invaded 61 countries, and after declaring 24 countries uninfected anymore, it returned back by the end of 2007 to invade another 9 countries, renewing its invasion to 15 countries in 2008. The total number of recorded infected areas in Egypt were 998 in 2006, among which 642 in farms and 356 in household breeding. In 2008 another 81 infected areas have been recorded.

Picture (7-50) Examined dead bird

Despite that, Egypt is relatively delayed in infection by bird flu virus as it was infected since February 2006 but it ranked the third level internationally in mortality rate. Since March 2006 and till now 45 infection with virus, among which 20 death cases with 44% from the total infection cases. These infections create a huge gap in poultry production leading to great negative social and economical effects on the Egyptian society. The government and civil societies are trying to confront, to mitigate or reduce its effects as possible.

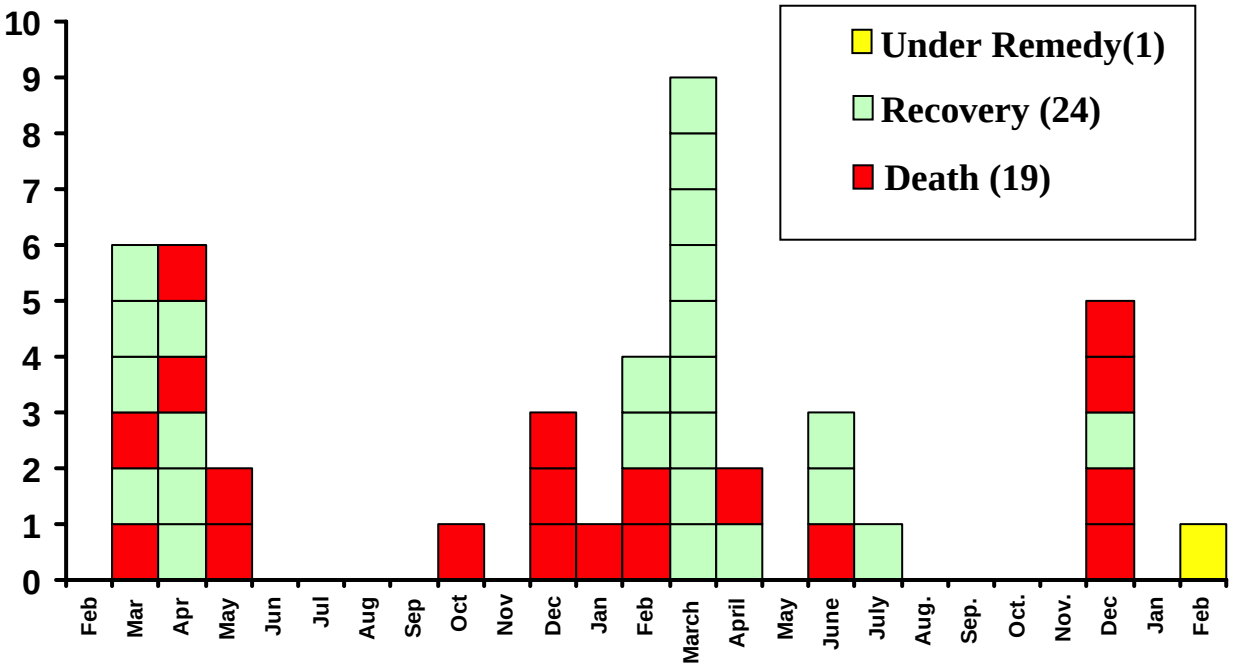


Figure (7-13) Confirmed infected human cases

International organizations such as FAO and United Nations Food Program warned from the outbreak of the crisis and its effects on the hygiene of foods in Egypt. That led Egypt to implement anticipated actions to apply necessary procedures by analyzing infection's effects, setting up an emergency room at the Ministry of State for Environmental Affairs, preparation of combating teams by training 100 person on methods of how to manage combating activities. Additionally, different scenarios on operations of combating and sterilizing infected areas were prepared, providing equipments and tools of sterilization. In addition to that, monitoring programs were activated at all levels by examining more than 30.000 samples of wild birds and an equivalent number from poultry breeding, as well as examining 4905 persons being suspicion with infection.

Picture (7-51) Disinfection procedure

Briefly, Egypt has got a good harmonized and appropriate system of laboratories, qualified staff, combating and executive committees to adopt determined decisions. Health institutions become more aware with procedures of how to deal with reports and cases of suspicion infections upon all levels, and operation rooms become well qualified to deal with crisis.

Economical, cultural and social importance of biological diversity:

Goods and services provided by biological diversity were estimated by about 34 trillion $ per year globally .Biological diversity have many benefits for human beings as it provides him with perquisites of life, its different kinds and species contributes in providing agricultural, fishing and livestock services, scientific research services and services of scientific and cultural heritage. Some flora and fauna species with its genetic components help in developing medical, agricultural, industrial sectors. Additionally, it provides daily essential needs for the life of many local communities, Biological diversity support, develop and evolve many fields of new industries such as ecotourism with its great economical revenue.

Prehistoric man interest in biological diversity

Investigation of drawings found on the walls of caves in eastern and western deserts related to prehistoric period (Stone Age) indicate the presence of animals such as elephants and giraffes during rainy Ages where they extinct after that due to dryness. There are some kinds of animals extinct from Egypt such as Hippopotamus which were in river Nile in 1800, beside many other endangered species that were recorded before.

Picture (7-52) Pre-historic drawing

Picture (7-53) Pre-historic drawing showing biodiversity

Second: Current status of the biodiversity national strategies action plans and Implementation Programs.

Assessing effectiveness of the strategy and experiences

Egypt paid attention to nature conservation and its natural heritage since many years ago, by signing many international and regional conventions, issuing many legislations for the nature conservation. Among such legislation is the important law 102/1983 on the establishment and management of natural protectorates, and law 4/1994 on the protection of environment. Two other legislations are being prepared concerning bio-safety and regulation of biological resources. With participation of all the concerned ministries, entities and nongovernmental organizations, Egypt issued its action plan (2002-2017) which integrated initiatives of environmental protection in different social and economical sectors to support sustainable development. It also includes what was confirmed in the strategy of biological diversity .This strategy is connected with national plans of combating desertification and climate change. Currently, national plans related to the three conventions of Rio are under activation by applying a mechanism to follow up its rate of progress.

President Hosni Mubark's declaration in his election program for social, economical and political reform in 2005 is considered to be the most important support to environmental

national work. It includes the future of development, modernization, and chances of employment in programs of the government along 6 years, in addition to the modification of the Egyptian Constitution in 2007 including article 59 that stipulates environmental protection as a national duty and the law regulates necessary procedures to protect the environment. In that manner, the constitution obligates all sectors of the state to respect laws and procedures concerned with the protection of Egyptian environment and its natural resources.

In the light of Egypt's commitment to achieve targets of Millennium Development Goals by 2015, several national committees were established (sustainable development, integrated management of coastal zones, climate changes, wetlands and conservation of biological diversity) to achieve harmonization between policies, strategies and national action plans of development, by executing specific indicators to determine implementation efficiency in different fields such as, environmental sustainability, reduction of poverty pressure, enabling women, quality of health and education, etc… Egypt issued many strategies and specialized programs related to conservation of wetlands in 2005, ecotourism in 2006 and medicinal plants conservation in 2007.

The utmost target from national strategy of biological diversity conservation is to set up sound bases of natural resources sustainable development in Egypt to preserve their capability of sustain and ensure the availability of necessary needs and welfare for current generations and preserve the right of future generations in these wealth, achieve harmonization between conservation and development plans in different sectors (agriculture, industry, mining, housing and tourism). The strategy has been interpreted into work programs dealt with establishing, developing and managing network of protected areas, setting up genetic bank, planning for establishment of national museum of natural history, center captive breeding of endangered species, implement national program for researches and monitoring in the field of biological diversity, setting up national network of biological diversity data, developing human resources in the field of biological diversity, implementation of national program for education and awareness.

Work Priorities is based upon 3 main pivots:

- Development and management of existing protectorates and taking necessary procedures to declare new ones.
- Assessment of biological diversity through monitoring and updating data bases.
- Taking necessary actions for the conservation of biological diversity through institutional development and capacity building, partnership with relevant entities and civil society, information and marketing, sustainability of projects being funded by donor states and organizations.

Main activities of biodiversity conservation:

1) Legislative, institutional support and capacity building:

Human resources in nature conservation sector reached more than 600 person including 7 holding PhD, 33 with Master Degree, 31 with B.S.C, 127 with higher intermediate education, and the rest with basic essential education.

Assessment of management effectiveness of protected areas was carried according to international standards in cooperation with projects being implemented and participation of employees in Nature Conservation Sector. The assessment showed a set of important findings manifested in some strength points in the network of natural protectorates (providing important environmental, social and economical services. Good presentation of Egyptian habitats and important species, proper conservation of biological diversity, in addition to the existence of high-qualified staff). Also some weakness points appeared such as; great advantages of protected areas are not realized in addition to lack of revenue resources and expenditures. The more significant effective pressures on protected areas are lands usage, recreational activities (tourism and hunting), failure in law enforcement due to stresses and violations on protectorates.

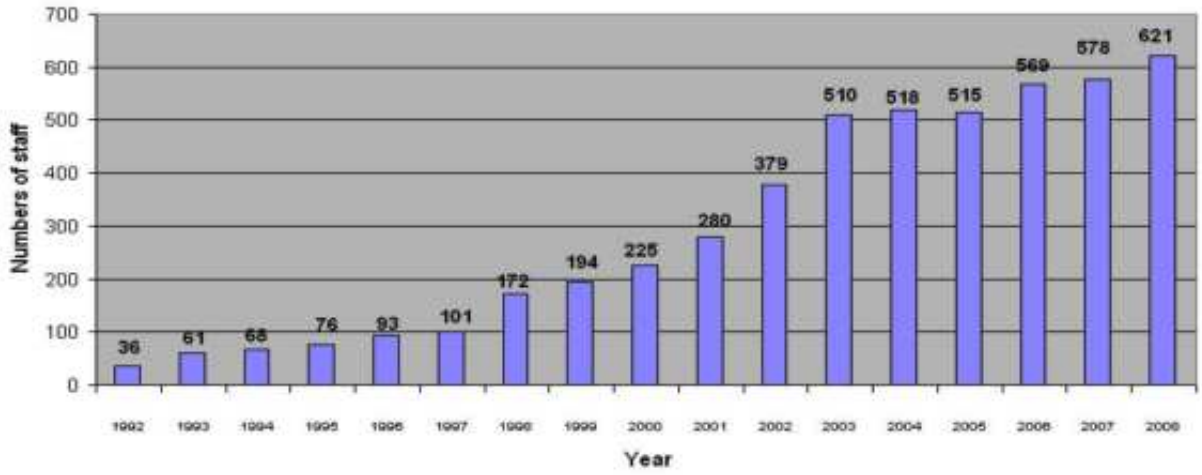


Figure (7-14) Development in number of NCS staff

Upon the evaluation carried out at the beginning of 2006 (figure 7-15), a set of decisions have been undertaken concerning restructure of nature conservation sector, setting up clear policies, increasing numbers of employees and financial resources, implementation of training programs, developing data base, improving means of communications among sector's employers and different departments in EEAA, increase numbers of effective management plans supported with means of transportation, accommodation, infrastructure and equipments.

Strength points in protected areas network:

a. Egypt imposed protection upon a large part of its land by the establishment of protected area network, which provides important environmental, social and economical services.
b. Protected areas network represents, in general, the main habitats of Egypt with its biological importance, but it lacks quantitative evaluation.
c. Protected areas network succeeds in conserving many aspects of biological diversity, such as good representation of main habitats, important species, integrated range of biological diversity and large groups of living organisms.
d. Protected areas generally realize their main objectives especially activities of protection and preservation; in addition to the availability of high technical qualified persons.

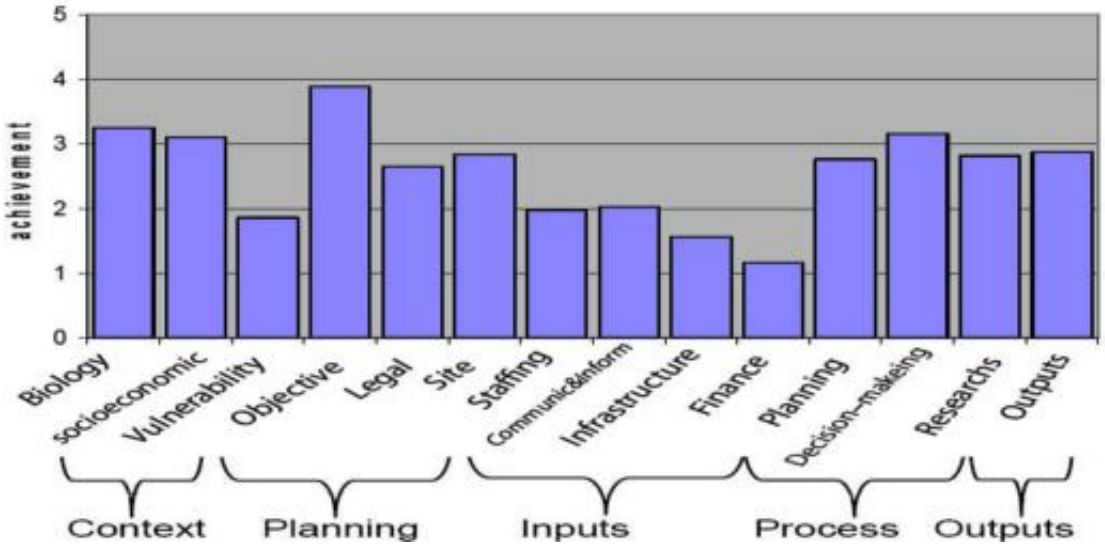


Figure (7-15) Effectiveness evaluation of protected areas management

Weak points in protected areas network:

a. Protected areas network has social and economical importance for Egypt, but there are many benefits unrealized.
b. Protected areas suffer from scarcity of revenue resources and expenditures resources (19 dollar/ k.m^2/ year) in comparison with African and Arab states, apart from developed states.
c. Methods of lands utilization, recreational activities, especially tourism and hunting, form effective pressure and stress on protectorates and constitutes necessitation to implement laws and national strategies to face them in the future.
d. Relative weakness in planning of protectorates on the level of their location, as there are management and work plans in half of Protected areas which reflects upon the efficiency of good management.
e. Inputs of Protected areas are limited and form the main obstacles facing management efficiency, such as low levels of employment, governmental finance, lack of training, in addition to insufficient means of transportation, weakness of infrastructure potentials in natural protectorates.

Drafting two legislations concerning bio-safety and regulation of biological resources uses, and procedures are going on to adopt them by People Assembly and Shoura Council.

Environmental Impact Assessment:

Coordination is being applied for and participatory approach with relevant entities and civil society concerning environmental impact assessment of development projects, management of coastal zones and protected areas, agricultural and tourism projects and other kinds of activities; in addition to coordination in various fields related to conservation of biological diversity through national committees and National Center for Planning State Land Uses. There are many successes in local communities, governmental departments and agencies, investors and magnifying women's role.

Survey of Environmental Impact Assessment (EIA) studies in Natural Protectorates

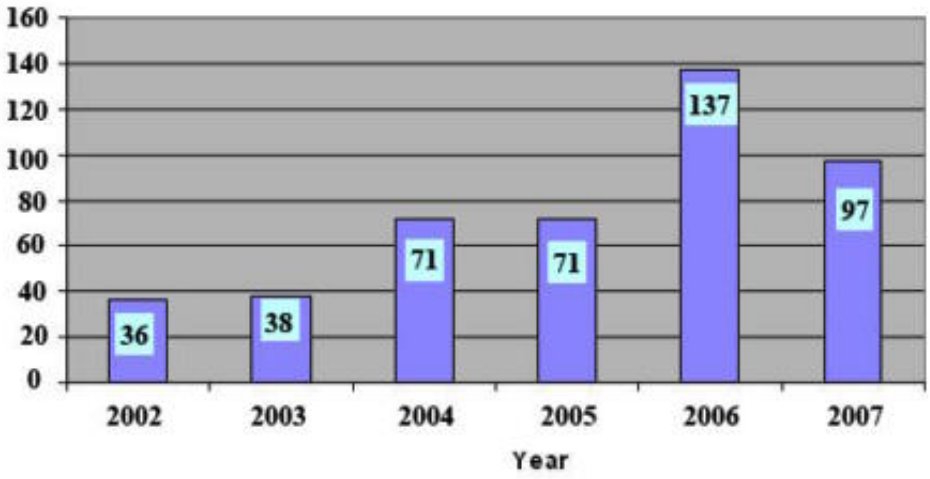


Figure (7-16) Environmental impact assessment (EIA) reviewed by NCS

2) Partnership with concerned entities with biological diversity:

Nature Conservation Sector deals with all sectors and departments of EEAA (Environmental Management, Branches Affairs, Environmental Impact Assessment, International Cooperation and Coastal Marine Management); Ministry of Agriculture (General Authority for Development of Fish Resources, General Authority for Agricultural Development, and Agricultural Research Center), Ministry of Tourism (Tourism Development Authority); Environmental Police; Ministry of Defense (Borders' Guards); Ministry of Petroleum; Ministry of Higher Education and Scientific Research and local and civil society .Continuous coordination is carried on in addition to applying partnership principle regarding environmental impact assessment of development projects, management of coastal zones, management of natural protectorates, agricultural and tourism activities and other kinds of activities.

3) Traditional Knowledge:

Egypt protected and documented traditional knowledge and their usage particularly in protected areas; through registration of 38 species of medicinal plants in South Sinai, 45 species in North Sinai, 19 species in Elba's area, 13 species in western desert, 16 species in eastern desert; in addition to registration of handicrafts and linkage of cultural heritage with natural heritage in protected areas.

Picture (7-55) Documenting traditional knowledge

Picture (7-56) Handicrafts

Linkage between cultural and natural heritage in protected areas

Concrete cultural heritage such as monuments and unconcrete such as popular traditions and habits are the bases of human beings development along different ages. Man used available natural resources surrounding him and has changed their nature according to his needs. Cultural and natural heritage are linked closely as biological diversity was mentioned in all religions, beliefs, common laws, languages, folklores and music. Accordingly, loss of biological diversity is a loss of cultural heritage of different nations.

Egypt is considered to be one of the most richest countries with its cultural heritage that reflected in civilizations and different human traditions where their heritages and knowledge transferred across different generations .These natural and cultural wealth were exposed to huge pressures emerged from human beings, in addition to new technologies that contributed in loosing great amount of them . For that reason, taking decisions about suitable technologies to be used must arise from needs of nations especially in local communities.

Protected areas contributed in the protection of cultural heritage, natural landscape and traditional knowledge. It also encouraged participation of local communities in conservation of their different cultures, as there are prehistoric drawings in protectorates of El-Gulf El-kabeer, Wadi El-Gemal and Elba mountain; roman and pharaonic monuments in protectorates of Qaroun, Sewa, Wadi El-Gemal and El-Zaranik; Christian monuments in protectorate of Saint Catherine and Islamic monuments in protectorate of El-Zaranik. They were also encouraged in protection of cultural diversity of languages, local dialects, handicrafts, folklore, dancing and traditional tools in local communities as in Bedouins and tribes of El- Ababda and El- Basharia, in addition to green buildings that reflect local raw materials and different natural scenes.

Women and children in protected areas

Saint Katherine Protectorate: Training of about 600 women and girls on handicrafts and methods of marketing their products, enabling each one of them to earn about 350 pounds, vaccinating children in remote areas, and implementing educational health program for about 300 families on family and child care.

Picture (7-56) Training of local community

El-Zaranik Protectorate: Setting up non governmental society, providing health and veterinary services, providing houses with natural gas stoves, and training of about 56 women and girls on handicrafts and methods of marketing their products through environmental exhibitions.

El-Omayed Protectorate: Issuing birth certificates and national number identity cards for about 600 women and girls, providing some families with sewing machines and natural gas stoves.

Elba Protectorate: Setting up Red Sea Development Society for Supporting local Community, providing health support for inhabitants and vaccination of children, building of a class to eliminate illiteracy and educate 30 child in the area of the protectorate, training of about 40 women and girls on handicrafts and marketing their products through environmental exhibitions, presenting a proposal for Environmental Protection Fund of EEAA to train about 300 women and girls with about 30.000 L.E.

LIFE project in the Red Sea: Forming a folkloric show troupe in Shalatean, develop Hamatta School, setting up Vocational Training Center, develop handicrafts in Hamatta , Shallatean and Elba Mountain for about 30 families , employing 3 women in separation station of solid wastes to earn about 1500 pounds for each .

El-Alaky Protectorate: Setting up Society of Developing Women and Local Community to raise incomes for about 40 women and girls, establishing some small projects such as distributing sewing machines and eliminate illiteracy, implementing agricultural projects, raise inhabitants health awareness, in addition to initiate implementing some of handicrafts projects.

4) Communication, education and Public Awareness:

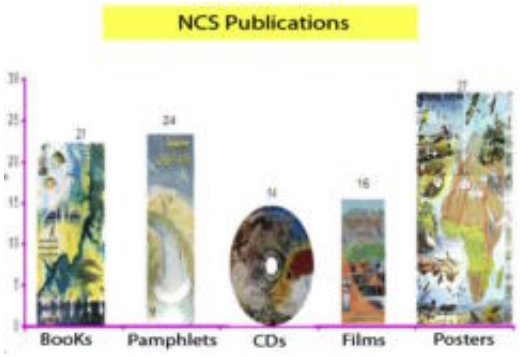


Figure (7-17) NCS

Prepared and implement the Strategy of Communication, Education and Public Awareness dealing with common issues among important sectors and focusing upon the importance of taking necessary procedures to conserve biological diversity; enhancing education concerning biological diversity; allocating suitable materials in the field of education, communication and defining targeted groups; mainstreaming biological diversity in education strategies; establishing an effective method for communication and exchange of information; developing data bases and establishing websites ; publishing books, reports ,CD's, films, videos; holding workshops, TV and radio interviews, delivering lectures for targeted groups. This strategy has achieved success in raising public awareness among public that can be manifested through the increasing numbers of protected areas visitors, and the increasing numbers of electronic mails reporting about violations in protected areas by local inhabitants, public and foreign tourists.

5) Egyptian museum of natural history:

The Study of establishing national museum for natural history has been finalized on an area of about 4200 m^2 , composed of 4 floors with an estimated budget of 36 million dollars; Ministry of State for Environmental Affairs is exerting efforts to market idea of the project among different available entities to participate in providing the needed budget; to initiate in its construction even with a reduced budget in order to set the idea and emphasis Ministry's role in adopting the project and to encourage supporting entities to provide assistance .

Establishment of the National Gene Bank affiliated to the Ministry of Agriculture and Land Reclamation .This Bank is currently conserving more than 35 thousand samples of botanical genetic resources among which about 500 samples of vegetables; in addition to the other samples collected from protected areas especially medicinal plants.

6) Sustainability of projects funded by donor states and entities:

Projects funded by donor states and organizations contributed in developing protected areas network; implementing programs of building capacities, monitoring and conserving biological diversity and raising public awareness. These projects enhanced infrastructure of many protected areas by providing them with equipment and tools; prepare and implement management plans for about 50% of protected areas and business plans for some protected areas, declaration of new protected areas, in addition to prepare studies of institutional reform. But, in spite of these achievements protected areas still need more financial and human resources and technical support to be able to fulfill their duty towards the protection and conservation of biological diversity in Egypt.

Nature Conservation Sector's information Bulletin

In the framework of providing a method to inform about biological diversity and its issues, 24 issues of the information monthly bulletin published by Nature Conservation Sector; including interesting subjects about biological diversity and means of its protection, important events and activities related to natural protectorates, in addition to holding a competition among employees on Nature Conservation Sector of the best one during the month.

Clearing House Mechanism's website to exchange biological diversity's information

www.egyptchm.org

This electronic website has been initiated according to specifications adopted by Convention of Biological Diversity (CBD) and furnished with all reports of biological diversity in Egypt; to be a reference for all those interested in status and trends of biological diversity in Egypt. It was activated on 5th June 2007 in celebration of World Environment Day.

The site is divided into four main parts including all information related to Convention of Biological Diversity (CBD), all authorized reports about trends and status of biological diversity in Egypt, in addition to a part dealing with Egyptian interests of biological diversity. The number of its visitors reached to 8139 since its inauguration.

Bio Map Forum

To cope up with the vast development in the field of electronic publishing of environmental awareness subjects on the internet, Nature Conservation Sector designed a Bio Map forum which is considered to be the first of its kind in the Middle East, its main target is to disseminate , exchange information and opinions about biological diversity ; method of direct communication between Nature Conservation Sector and all those interested and working in the field of biological diversity in Egypt and the Arab World . This Forum was activated on 6th November 2006, composed of 8 main sections classified into 42 sub forums containing the following main subjects: (public section, environmental subjects, scientific subjects, biological diversity, protected areas, environmental literature subjects, environmental recreational subjects, Nature Conservation Sector activities' news and administrative subjects). It contains important news of Nature Conservation Sector and its affiliated projects through news bar, in addition to an encyclopedia of herbal medicine which contains more than 160 medicinal and aromatic plants supported with pictures of plants and their scientific classification and how to benefit from them, beside books and references dealt with each plant of this encyclopedia. The forum sends a periodical bulletin through electronic mail to all its members with all new subjects discussed throughout the month. Number of forum visitors reached to 500 visitors daily, that is 15000 visitors monthly.

Index	topics	participation	members	active members	visitors
Last week	475	1586	457	360	62288
Largest no. of online visitors			110 visitors in1/4/2008 at 03:04:19PM		
No. of countries permanently log in			32 counties international Google analysis		
note	The survey was made on Thursday dated 30/4/2008 at 10 am				

Conservation outside natural environment:

There is no comprehensive system to mange wildlife outside protected areas copping with national, regional and international recent requirements. Activities of conservation are concentrated in the protection of wild endangered species, genetic resources related principally to agriculture in the National Bank of Conserving Genetic Resources affiliated to the Ministry of Agriculture. Also, captive breeding programs of wild species outside its natural habitats in cooperation with Private Sector on the implementation of Awareness campaigns, regulation means of obtaining living organism, cooperation with coast Guards and Environment Police in their campaigns on markets selling endangered species such as Egyptian Turtle, Foxes, Gazelles and Falcons, in addition to fining and confiscation of species hunted or collected by tourists.

Picture (7-57) Captive breeding

Captive Breeding Program which will end by 2010; targets in its current second phase to reach the third and fourth generations of Egyptian endangered species , which will help with the coming generations to return back to their natural habitats. From the most important endangered species that are currently under breeding are Dorcas Gazelle(*Gazella dorcas dorcas*), Nubian Ibex (*Capra ibex nubiana*), Barbary Sheep (*Ammotragus lervia*), Hyrax (*Procavia species*), Fennec Fox (*Vulpes zerda*), Striped Hyena(*Hyaena dubbah*), Caracal (*Caracal caracal schmitizi*) ,Swamp Cat (*Felis chaus*); in addition to 3 species extincted from Egypt: Addax Antelop (*Addax nasomaculatus*), Oryx (*Oryx dammah*) and Lepto cerus gazelle which is believed to be on the verge of extinction. These animals have bred successfully and their numbers reached to more than one thousand animals. This program includes also cultivating medicinal plants, such as Accacia, Ombet and mangrove trees.

Picture (7-58) Fennec fox

Picture (7-59) Caracal)

Table (7-3) Results of mammals included in the captive breeding program by Conservation Program outside natural habitats

Serial	Name of animal	Original number from the natural habitat 2002-2003	Current number after raising	Original Habitat
1	Dorcas Gazelle(*Gazelle dorcas dorcas*)	6	64	Egypt from Sinai Peninsula and Eastern Desert
2	Nubian Ibex (*Capra Ibex nubiana*)	4	27	Egypt from Sinai Peninsula
3	Barbary Sheep (*Ammotragus lervia*)	4	31	Western Desert
4	Addax Antelop (Addax nasomaculatus)	inserting 4 in raising program (2007)	4	Lodging Centers
5	Oryx (*Oryx dammah*)	inserting 2 in raising program (2008)	2	Lodging Centers
6	Striped Hyena (*Hyaena hyaena dubbah*)	4	7	Egypt from Sinai Peninsula
7	Caracal (*Caracal caracal schmitzi*)	2	5	Egypt from Sinai Peninsula
8	Jungle Cat (*Felis chaus nilotica*)	2	6	Egypt from Delta
9	Wild Cat	6	6	Western Desert
10	Fennec Fox (*Vulpes zerda*)	13	13	Egypt from Sinai Peninsula
11	Hyrax (*Procavia Species*)	4	15	Egypt from Sinai Peninsula
12	Crested Porcupine	8	12	Egypt from Sinai Peninsula
13	Egyptian Mongoose (*Herpestes ichneumon ichneumon*)	11	11	Egypt from Delta
14	Baboon Monkeys (*Papio species*)	4	12	Saudi Arabia from El-Sarawat Mountains
15	Egyptian Goose (*Alopochen aegyptiacus*)	10	100	Egypt from Nile Valley
16	Egyptian Turtle	24	56	Egypt from western north coast
17	African Turtle	5	639	From the area lies between borders of Egypt ,Libya, Chad and Sudan
Total number		**113**	**1010**	

Work program of Natural Protectorates:

A work program for protected areas in Egypt has been prepared in the light of the program adopted by Convention of Biological Diversity, including the following pivots:

- First pivot: Direct measures to plan, select, establish and manage Network of protected areas.
- Second pivot: Good governance, partnership, equality and sharing benefits in the management of protected areas.
- Third pivot: Enabling activities in the management of protected areas.
- Fourth pivot: Measurement, assessment and monitoring.

Picture (7-60) Law enforcement of endangered Barbary sheep

First pivot aims at achieve the following:

a. Establish and enhance a network of protected areas on both national and regional levels and its integration in the International Network of protected areas.
b. Mainstream protected areas on a large scale within the natural harmonization of lands, coasts and different sectors to conserve structures and functions of ecosystems.
c. Establish and enhance regional and transboundry networks of protected areas.
d. Sustainability and improvement of planning and management programs of protected areas.
e. Prevent and reduce main threats facing protected areas.

Picture (7-61) Water regulation by small dams

Second Pivot aims at achieve the following:

a. Encourage access and benefit sharing of biological resources among local communities.
b. Partnership with indigenous, local communities and stakeholders.

Picture (7-62) Ecolodge at St. Catharine

Proposed activities include assessment of economical and social revenues emerging from the establishment of protected areas; develop institutional structure of natural protectorates to enable local inhabitants to participate effectively in management of protected areas; encourage positive incentives which decrease loss rate of biological diversity; prevent negative practices which threat biological diversity ; set up and implement polices and plans to ensure partnership with local communities.

Third pivot aims at achieving the following:

a. Apply enabling policies and provide institutional, social and economical benefits of protected areas.
b. Building capacities for planning, establishing and managing protected areas.
c. Develop, adopt and transfer appropriate technologies for protected areas.
d. Ensure financial sustainability for management of protected areas.
e. Enhance communication, education and public awareness.

Picture (7-63) Visitor center at Abu-Gallum

Proposed activities include assessment of current policies and legislations to recognize obstacles facing development and management of natural protectorates; evaluate social and economical aspects of protected areas; harmonize policies of protected areas within social and economical policies of the country ; marketing protected areas as a source of tourism, education and knowledge ; support human and institutional capacities of protected areas; prepare case studies and learned lessons from protected areas experiments and publish them; evaluate appropriate technologies and their adoption in protected areas.

Picture (7-64) Use of modern technology

Fourth pivot aims at achieving the following:

a. Set up and apply measures for best practices in the network of protected areas.
b. Evaluate and improve efficiency of protected areas management.
c. Evaluate and monitor status of protected areas and their development.
d. Increase the extent of sufficient contribution of interested scientific institutions in the establishment, efficiency and management of protected areas network.
e. Publish results of monitoring and evaluation via web sites.

Picture (7-65) Environmental awards

Protection inside natural habitat:

Egypt is witnessing a remarkable progress in the implementation of protected area's work program; which includes development and management of many protectorates; declaration of new protectorates (El-Gilf El-Kebir, El Dababiah and North Islands of the Red Sea) that have

reached to 27 protectorates covering about 15% of Egypt's area; integration of many activities of protected areas with relevant sectors especially tourism, agriculture and activities of using state's lands; prepared studies about transboundry protectorates; completion of infrastructure, human resources, and providing necessary equipment and tools; implementation of conservation and protection programs; sustainable usage of biological resources; establishment and maintenance of administrative and scientific centers in protected areas; implementation of restoration and rehabilitation programs (plantation of mangrove trees and coral reefs, elimination of reeds and weeds from wetlands, plantation of Accacia trees in protectorates of Saint Katherine, El-Zaranik, El-Borolos, Wadi El-Alaky); prepared and implemented management plans for 12 protected areas : El-Borolos, El-Zaranik, El-Omayed, Wadi El-Gemal, Wadi-El-Rayan, Nabq, Elba Mountain, Saint Katherine, Qaroun , White Desert, Degla, and Petrified Forest; Prepare business plans for Ras Mohammed and Wadi El-Rayan protectorates; evaluate efficiency of protected areas and suitability of human resources, problems and obstacles facing them through focusing upon four protectorates (Ras Mohammed, Saint Katherine, Wadi El-Rayan and Qaroun); Prepare cooperation protocols with local inhabitants and NGO's; enabling women; enhancing partnership with private sector in some investment projects inside protected areas (fisheries in Wadi El-Rayan , shrimp culture in Nabq and the ecolodge in Saint Katherine); Identifying values, products and services provided by some protected areas and their effects on economical and social development; implementing awareness programs among children, youth and members of syndicates to promote visiting protected areas ; environmental impact assessment of development projects inside and outside protected areas ; development of local communities and their participation in much activities of protected areas (ecotourism, medical plants, programs of restoration and rehabilitation); and document borders of 10 protectorates (Wadi Degla, Petrified Forests, Qubea El Hasana, Wadi El-Rayan, Qaroun, Wadi El-Asuoty, Nabq, El-Burullus, Ashtoom El-Gamil, Wadi El-Alaqy).

Picture (7-66) Public awareness in the Red Sea

Picture (7-67) Public awareness in Wadi Degla

Picture (7-68) Documenting traditional knowledge

Third: Mainstreaming and assessment of biodiversity considerations in relevant sectors

Activities of mainstreaming biological diversity in strategies and national action plans included consultations with relevant entities, studying national plans of concerned ministries, Millennium Development Goals, and national reports issued by specialized entities.

It is obvious that environmental aspect is maintained and considered in most of national action plans of different sectors; a responsible about environment is found in each ministry in addition to an environmental department in every governorate. About 27 ministries participate in executing 81 laws in addition to numerous decisions concerned with environmental protection; generally most of infrastructure projects and activities of different ministries take into consideration environmental aspects. In spite of the fact that more than 40 governmental organization handling activities related to environment ,there is no obvious remark of mainstreaming biological diversity in these strategies and national action plans ,however, their interest of environmental protection are implied as there are many actual successes in coordination to mainstream biological diversity in many of governmental activities particularly national committees, prepare legislations , establish environmental court , environmental impact assessment of development projects which many of them contains biological diversity, limit violations on natural protectorates , and contribution in developing great projects . These successes were reflected on essential features of human development, third millennium's development targets, incentives applied to decrease loss of biological diversity and enhancing joint activities among Rio's three conventions.

Conservation of Medicinal plants

Main achievements of conservation and sustainable usage of medicinal plants project

- Cultivation 51 species of medicinal plants, collection 812 seeds samples of 84 species and conserving them at the National Gene Bank and Bank of Desert Research Center; among them 14 species with high international importance.
- Implementing Management Program of Natural Resources in cooperation with local communities; implementing of training programs for Bedouins on methods of plantation and cultivating medicinal plants, post harvesting techniques and how to extract aromatic oils. Enhancing activities in Saint Katherine protectorate by raising capacities of its employees and providing it with high qualified human resources to implement conservation programs of natural resources, in addition to necessary equipment and tools to activate management plan of the protectorate to ensure sustainability of these activities after finalization of the project.
- Establish and updating database of medical plants, through national surveys in (North Sinai, Saint Katherine, Western North Coast, Halayeb, Western Desert Oasis, Eastern Desert and Red Sea Coast) with a total of 1775 plant species in Egypt, among which 579 species of medicinal plants, beside adding detailed data on 14 medicinal plants with international importance in Saint Katherine .

- Prepare national legislations concerned with regulation of biological resources uses and protecting relevant heritage knowledge; sharing benefits arising from their usage; in addition to preparation of a national strategy for conservation and sustainable usage of medicinal plants in Egypt.
- Study and evaluate risks threatening rare medicinal plants in Saint Katherine protectorate.
- Registration of Bedouins' traditional knowledge in Saint Katherine, in addition to medical usage of Saint Catherine's plants as follows :
    - 11 species used in treating skin diseases
    - 13 species used in treating respiratory system diseases
    - 21 species used in treating digestive system diseases
    - 4 species used in treating heart and blood vessel diseases
    - 7 species used in treating reproductive system diseases
    - 5 species used in treating nervous system diseases
    - 11 species used in treating kidney's diseases
    - 22 species used as human nutrition
    - 13 species used in treating miscellaneous diseases.

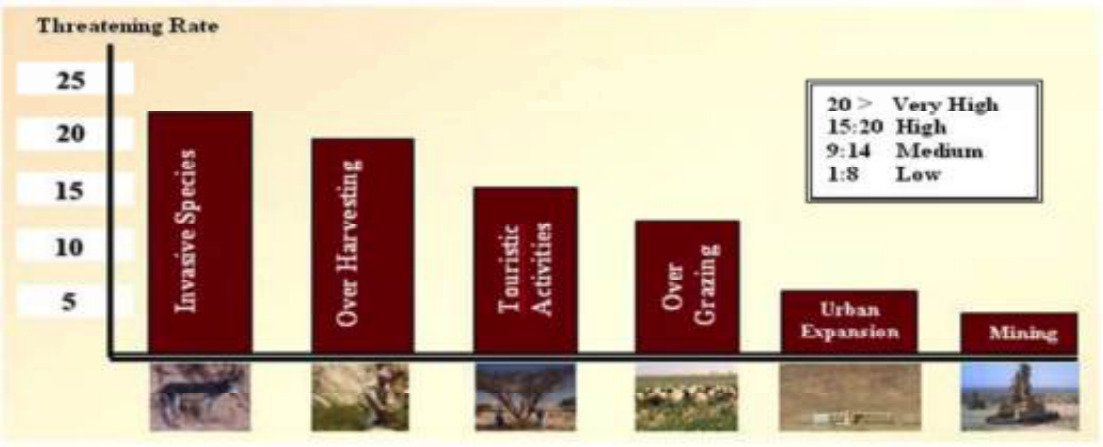


Figure (7-18) Risk assessment for threatened medicinal plants at St. Catherine

Incentive measures to decrease loss of biodiversity

Nature Conservation Sector in coordination with projects financed by donor states and organizations, relevant governmental entities, civil society and non governmental organizations adopted various measures and mechanisms to decrease loss of biological diversity particularly in protected areas.

Picture (7-69) manual collection of reeds

Wetlands Project financed by Global Environment Facility (GEF) from 1999 -2006 contributed in supplying fishermen with boats, machines and legal fishing gear to limit fishing

particularly small fishes in Burullus Lake; assist fishermen by setting up non-governmental organizations and provide them with training on methods of eliminating reed and wood hindering fishing activities. Control grazing activities in El-Omayed protectorate, provided inhabitants with fodder to limit over grazing in addition to assist and train women on the production and marketing of handicrafts; providing them with gas stoves to decrease cutting of trees which used as fuel; the project contributes with General Authority for Development of Fish Resources in clearing Inlets of Bardawil Lake to protect and increase new fish fries.

Picture (7-70) Distribution of boat engine

Regional Development project of South Sinai (2005-2010) funded by European Union contributed in enhancing development of South Sinai Protectorates (5 Protectorates) and providing them with facilities and tools to assist in biodiversity conservation; provide assistance to develop local communities through various small projects among which establishing "Company of Sinai Art " for handicrafts produced by Bedouins women; developing ecotourism in South Sinai; in addition to projects supporting infrastructure environment, social and economical development to improve environment and natural resources conservation.

Picture (7-71) Handicrafts exhibit

Medicinal plants project funded by Global Environment Facility (GEF) contributed in establishing revolving funds to assist local inhabitants in limiting collection of medicinal plants and planting much of them in Bedouins gardens, setting up a pharmacy in Saint Katharine, to continue programs of health and veterinary care, supplying local inhabitants with beehives and training upon their usage as a method to reduce loss of biological diversity. Nature Conservation Sector contributes with investors in setting up hatcheries to provide fries of marine fishes instead of collecting them from their natural environment.

Italian project and American Aid programs contributed in developing ecotourism (setting sites for bird watching, management of diving sites; implement measures of land-use planning for tourism and management of environmental protection activities in Red Sea, especially those related to ecolodges, rural development and organic agriculture in Wadi El-Rayan and developing neighborhood villages, in addition to increase jobs in protected areas.

In spite of achieved success in the field of nature conservation; however it is not accepted that programs of biodiversity conservation can be implemented apart from human being; it is necessary that human health and welfare become the essential base in exerted efforts for

conservation, for that activities implemented to achieve conservation by officials of environmental affairs and conservation of biological diversity (such as ecotourism, development of local communities, combating pollution and supplying clean water). To apply ecosystem approach to achieve human safety and better life, it is necessary to mainstream biological diversity strategies with relevant sectors .This necessitate more efforts especially that this concept is still restricted to academic field and is not accepted enough by decision makers, excluding natural protectorates which exert great efforts to apply ecosystem approach for the sake of human health and welfare.

In this rapid changing world and in the light of intensive pressures on natural resources due to constant increase in population and expansion of industrial, agricultural and tourism activities, we need new approach to conserve biological diversity and clarify its role in conservation agenda and achieve sustainable development. This approach requires maintenance and development of conservation targets, in addition to fair integration of all human. By this way, it is imperative to unify efforts of conservation, systems of supporting life on earth and sustainable development. We believe that protected areas are essential tools to realize these efforts effectively and with reasonable costs, as they provide much benefits and advantages beyond their geographical boarder.

Some learned lessons from protected areas

- Natural protectorates proved to be the best tool to conserve biological diversity.
- Social and economical returns constitute essential reference to develop protected areas.
- Protected areas are effective methods for local and regional planning.
- Protect now and study later.
- Flexible and dynamic management, according to conditions of each protectorate.
- Development of protection concept to include sustainable development and environmental management inside protected areas.
- Provide practical prototypes of good management to be followed in other areas.
- Importance of good selection of human resources working in protected areas.
- Leadership and political support of protected areas are essential for their progress.
- Necessity of partnership with local communities, governmental and private sectors, in addition to NGO's to mange protectorates.
- Scientific approach is with great value to achieve successful management of protectorates.
- Importance of applying concepts of participatory, precautionary and ecosystem approaches, to realize adaptive management.
- Environmental awareness programs, good marketing, and encouragement of eco-tourism preserve natural wealth.

Fourth: Conclusions and future priorities:

Strategies and national action plans succeeded to a large extent in achieving the expected targets, however many challenges are still facing nature conservation such as insufficient

finance, development of the institutional structure, supporting infrastructure for the rest of the established protectorates, apply decentralization principle in management, risks facing protectorates' employees, implementation of laws, issuing new legislations, implementing international agreements, reduce violations on protectorates and depletion of natural resources; in addition to dealing with new emerging issues that have not been included in the national strategies such as invasive species, traditional knowledge, information technology and its modern tools; bio safety, climate change's impacts on biological diversity, and achieving 2010 target. In order to improve and update national strategy a set of proposals have been prepared to overcome current and future challenges, in addition to indicators of achieving effective biodiversity conservation are currently being applied.

Targets of the following phase:

1- Achieve and support sustainable development of natural protectorates to realize economical and social development.
2- Integrate national activities to conserve biological diversity and decrease biodiversity loss rate (2010 target).
3- Enhance institutional, executive and legislative capacities to nature conservation.

Nature conservation priorities, within the framework of the President's directives, Government program and national obligations toward regional and international conventions include:

1. Increase exports and attract investments in the field of nature conservation and natural protectorates.
2. Provide innovative and untraditional solutions for governmental disbursements, budget and economical techniques for self finance.
3. Raising efficiency of administrative board and services through development of institutional structure, development of human resources, and efficiency of natural protectorates, in addition to indicators of awareness, planning and follow up.
4. Reduce unemployment; maintain social dimension and society values through presenting protectorates as a model of sustainable development, combating poverty, protection of intellectual property and heritage of local inhabitants.
5. Open door policy to realize Egyptian benefits through cooperation with donor states and organizations, implementation of international conventions and benefiting from their organizations.
6. Using modern technology and potentials to improve communication network, develop information systems of natural protectorates and biological diversity, in addition to modern techniques of monitoring.
7. Deepening public participation in national work through partnership with local communities, civil society, enhance women's role, benefits for unabled groups, in addition to raising environmental awareness and information.

Many achievements have been realized to improve the current status of biological diversity and development of protected areas within the framework of the national strategies and consolidation efforts with different sectors to execute international and national commitments

and realize effective progress towards decrease of biological diversity loss. In spite of that, the matter requires great efforts during next phase to fill the gap between needed duties and available resources by enhancing institutional development, decentralized management and applying economical tools, ensuring sufficient finance, enhancing partnership, and cooperation among all relevant sectors with biological diversity and protected areas.

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Chapter 7
Biodiversity

7-1 Introduction

Biodiversity status cannot be isolated from human being especially local communities with their traditional knowledge and usage of biodiversity. Biodiversity is the sphere of life; diversity of species provides agricultural, livestock and medicinal services in addition to scientific research and cultural heritage. Some of fauna and flora species with their genetic components support development of medicinal, agricultural, industrial and basic daily needs of local communities. In addition to the fact that biodiversity supports and develops many new industries like ecotourism, which provides high economic return.

Egyptian biodiversity reflects several important facts among which its desert habitat, strategic geographic location among three continents "Europe, Africa and Asia" and its variant climate. River Nile with its unique habitat contributes greatly in improving biodiversity from freshwater habitat to wetlands with their international importance for migratory and resident birds. Egypt is bounded from north and east by two largely enclosed seas, Red and Mediterranean, connected through Suez Canal, which leads to wide diversity of coastal and marine faunal and floral species, particularly those migrated from the Red Sea through the Suez Canal and settled in the eastern Mediterranean.

Despite being dominated by desert and drought, Egypt's biodiversity has 143 unique species with global significance, in addition to species with limited geographical distribution to certain areas "Oasis, Elba Mountain and Sinai Mountains", as well as endemic species. Egypt is inhabited with about 20 000 faunal and floral species. Egyptians benefited greatly from this unique biodiversity in establishing civilizations from Stone Age till current Age.

2008 report highlights significant changes occurred in the status and trends of biodiversity and degree of improvement in comparison with last year ;as well as measures taken , affecting factors and exerted efforts to enhance Egyptian policies to conserve biodiversity within the framework of national biodiversity strategy and achieving 2010 global target which is to reduce biodiversity loss rate significantly .

7-2 Biodiversity efficiency Indicators

7-2-1 Ecosystems Health

This indicator follows up free services and products granted by ecosystems to support socio-economic development, improve Egyptian citizens' standard of living and health; particularly quantity and quality of water, food, energy, and different uses of biodiversity including traditional knowledge and intact ireplacibility areas.

This indicator is considered one of the most difficult indicators, as it requires huge mass of information available at concerned ministries such as "Agriculture, Health, Central Agency for Public Mobilization & Statistics, National Centre for Planning state Land uses, Egypt Human Development Report of 2008 and others".

Egypt covers an area of about one million km^2; population is approximately 78 million, living on about 8% of Egypt's total area after it had been 4% for long time. During the first decade of 21 century, cultivated agricultural land amounts 8.3 million Feddan (about 3.5% of Egypt's area). Results obtained from the National Centre for Planning State Land Uses indicated that land used has reached approximately 14-15% of Egypt's total areas, and if we add the 148,000 km^2 which is the total area of protected areas it will be discovered that currently used lands amounts to 30% which means about 70% of Egypt's area are still intact ireplacibile areas.

Agriculture sector consumes the greatest amount of water, about 59.3 billion cubic meters representing 85.6% of all available water. The government is planning to reclaim 3.4 million Feddan by 2017 to satisfy Egyptians' increasing need for food. Hence, there is a need for additional water resources for agriculture estimated by 20.4 billion cubic meters.

Results of water quality monitoring in Nile River and Lake Nasser conducted by Environmental Monitoring Centre affiliated to Ministry of Health and Central Laboratory affiliated to Egyptian Environmental Affairs Agency ,proved that fresh water quality is within the international permissible level (State of the Environment Report 2007).

Therefore, fresh water quality improvement programs were implemented, including preventing industrial water discharge into Nile River, reuse of treated sewage water in planting timber forests and rationalizing pesticides' uses.

Agricultural, poultry, livestock and fish resources estimated with 92.2 billion LE, among which agricultural products share with 20% from the total exported goods; with about 30% employees from the total Egyptian man power "6 million" working in the agriculture sector; and about 2 million in tourism sector achieving more than 60 billion L.E. annually.

Incomes generated from mineral resources estimated with billion LE annually, in addition to Red sea "coral reefs and mangroves" estimated with 80 million LE / km^2; as well as the many invaluable benefits of biodiversity, such as the micro-organisms "biotechnology" and natural substances produced by coral reefs used in treating many diseases such as cancer.

Human development indicator of Egypt during 2008 refers to a remarkable improvement in basic features of human development such as an average increase in human age to more than 70 years,

individual quota from calories "4258 cal/ day", education "91%", GDP "6142 LE/per capita/year" , a decline in population growth with about "2.05%", increase in electricity consumption per capita "1090 kw/h" ; in addition to the steady increase of tourists number with the exception of last quarter of 2008 due to the international financial crisis that has lead to a slight decrease in tourism income which is expected to extend along next year .Exporting rate of services and goods reach to about 276 billion LE during 2007/2008 and the unfavorable balance of trade amounted to 29 billion LE according to 2008 Progress Report issued by State Information Service . Central Agency for Public Mobilization & Statistics' report referred to an increase in exports to 79 million LE during 2006 compared to 62 million LE during 2005, imports from 115 to 119 million LE, and the unfavorable balance of trade ranged from 53 to 50 billion LE.

Poverty alleviation's field data indicates a decrease in percentage of people with income less than one dollar daily from 40% to 25%, which is expected to reach 16.5% by 2015. Percentage of population who suffer malnutrition had declined from 25.6% to 14%.

The above mentioned data, clarifies that Egypt is facing many challenges due to the steady increase of population and expansion of industrial, agricultural and touristic activities to achieve economic development. This leads to intensify pressures on renewable natural resources. Internal debt has increased to 666.9 billion LE (74% of GDP) during 2006 – 2007 according to Central Agency for Accounting report.

7-2-2 Status of Habitats

7-2-2-1 Marine Habitats:

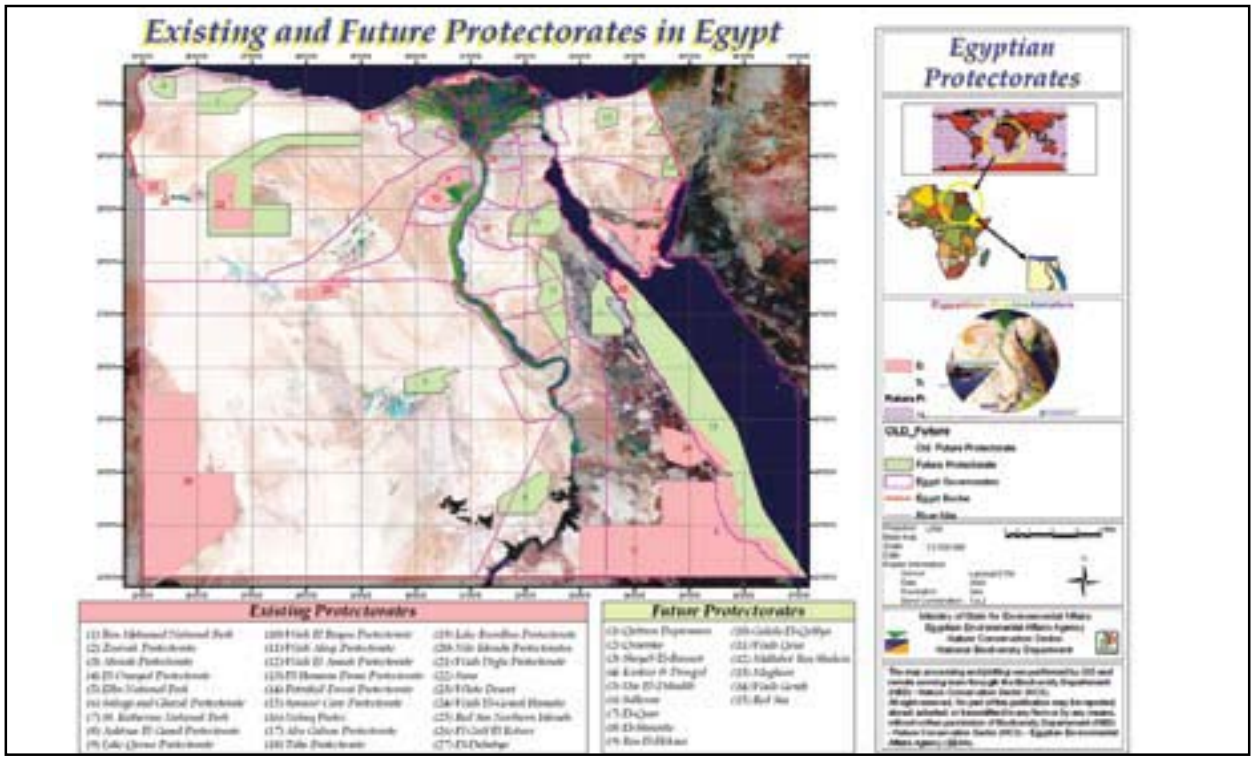
Biodiversity Assessment Report issued last year has shown that available information about Red Sea is more than Mediterranean Sea information. Therefore, a study about the Mediterranean was conducted this year, with concentration on the area located between Mattrouh and Salloum in order to be declared as a marine protected area according to the National Biodiversity Strategy and Action Plan. Meanwhile, monitoring of Red Sea biodiversity is going on with a focus upon its most important habitats and species.

a) Biodiversity in the Mediterranean:

About 10000 marine species have been recorded in the Mediterranean, "including 8500 fauna species and more than 1300 flora species" this represents approximately 8%– 9% of the total known global marine species, although Mediterranean represents only 1% of the total marine areas .Its endemic species reaches to about 8-9% from the total number of species, including 600 fish species, 3 marine turtles, 33 marine bird species, 22 marine mammals, and thousands of invertebrate species. There are also some endangered species with extinction , due to the increasing human exploit of marine environment, for example monk seal which was living in all areas of

the Mediterranean ,currently available in Greece and Turkey only.
The Mediterranean Sea is facing many threats, like coastal soil deterioration, coastal erosion, climate change, over-exploitation of marine resources particularly fish resources and biodiversity loss.

Recent studies conducted upon the area located between Mattrouh and Salloum (Environex, Egypt 2008) have shown the great importance of its coastal and marine environment and the sensitivity of its habitats including sea grass, fisheries, and sponges; in addition to the presence of 5 marine and 11 terrestrial endangered species. Despite the fact that Salloum Gulf is one of the richest areas with marine biodiversity in terms of habitats and species, however this study shows the presence of 55 commercial species compared with 89 species in the previous surveys. Therefore, it is essential to declare this site as a marine protected area to be managed on scientific basis.



Map (7.1) Existing and Futuer Protectorates

b) Biodiversity in the Red Sea:

Monitoring Program of coral reefs continued during 2008, as 72 sites (permanent quadrates) were assessed in north and south Hurghada. Results of northern area around Hurghada were classified into 3 main groups: the first shows an increase in percentage of coral reefs up to 15% from 2001 till 2008, the second shows an average increase 4 – 7%, whereas the third group which is one of the areas that attract considerable number of divers shows a decrease in coral coverage (4– 5%), (Fig. 7.1).

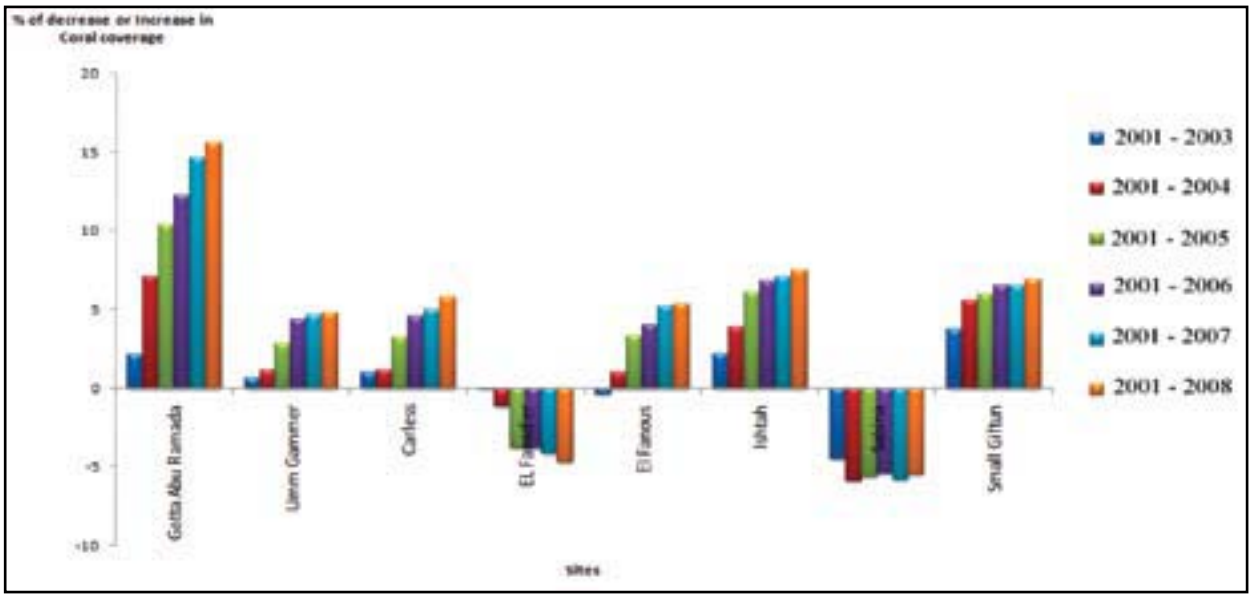


Fig (7.1) Change in coral community during 2001-2008 in Hurghada

Results of southern sites "2003 till 2008" are less than those of the northern ones. They were also classified into three groups: the first group shows an increase in coral cover "4 - 5%", the second group shows an increase from "1 - 3%" ,whereas an increase in coral reefs of the third group that did not exceed "1%", (Fig. 7.2).

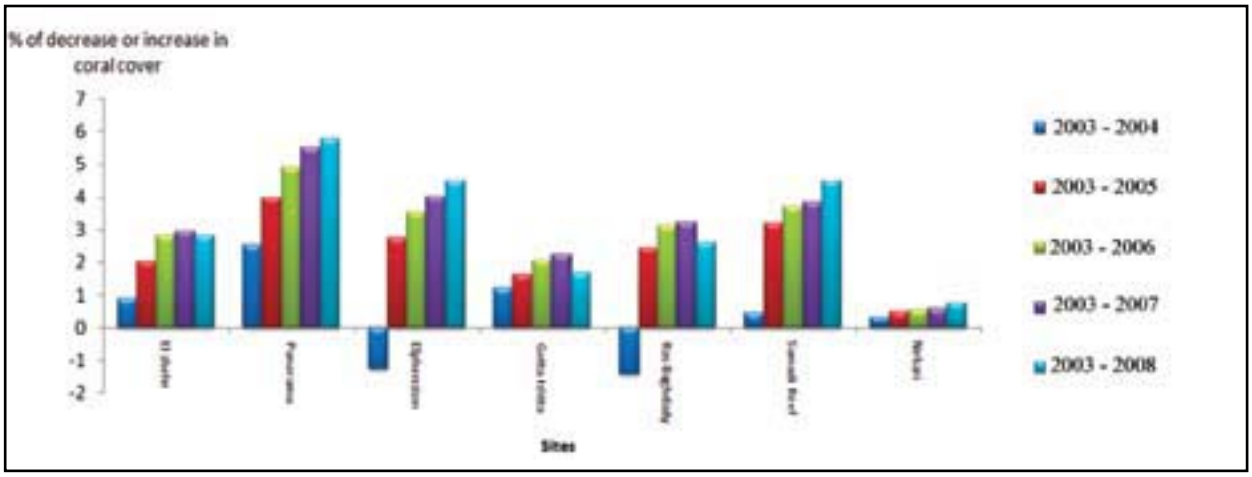


Fig (7.2) Change in coral community at southern area during 2003 - 2008

Applied protection procedures such as moorings and patrolling had succeeded in increasing coral cover in Protected Areas. Monitoring results had shown a significant difference in species indices (number of species / area unit) ranging between 10 - 20 species in the northern sites, and 4 – 15 species in the southern sites. (Fig. 7.3)

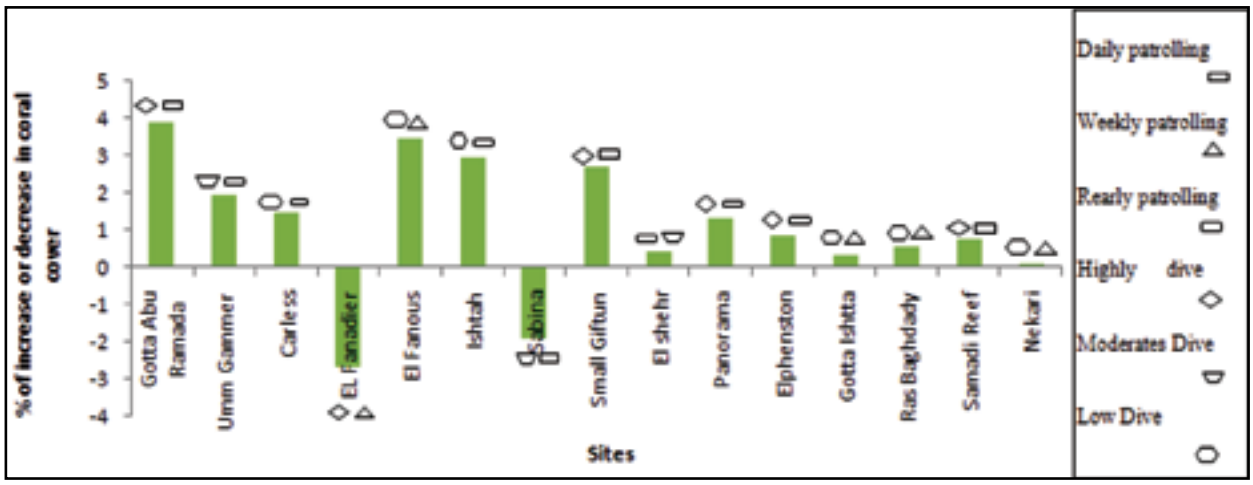


Fig (7.3) Change of coral community in the Red Sea (Hurghada) 2001-2008
and the effect of patrolling and diving pressure

Mangroves monitoring program continued in 28 sites with an area exceeds 700 hectare along Red Sea coasts, islands and Gulf of Aqaba . Results showed that mangrove status has improved considerably compared with previous years; as the average tree height has reached to 2.7 m, stem 1.8 m and trees' density reach to 313 trees / hectare. Mangrove transplantation continued, reaching 80 Feddan with 15% increase during 2008.

7-2-2-2 Wetlands

Monitoring biodiversity of Wetlands continued in "Zaranik, Brullus, Qaroun, Wadi Rayan, Siwa, Salough and Gazalla, Ashtoum El-Gamil, and Wadi Allaqi". Past years witnessed monitoring of bird species in 4 sites of Zaranik Protectorate.

Data refers to a remarkable increase in birds' numbers and species. For example birds recorded during 2005 were 111 species with total number of 51152; whereas during 2008 the number had increased significantly to 174 species with total number of 156860. This increase is due to the accuracy of monitoring programs, prevention of bird hunting since 2006 till now and the considerable increase in some migratory birds.

There were also considerable differences in numbers of birds observed monthly during the past 4 years. For example, summer and autumn recorded the largest number of birds "159 species with total number of
70 000 birds", (Fig. 7.4).

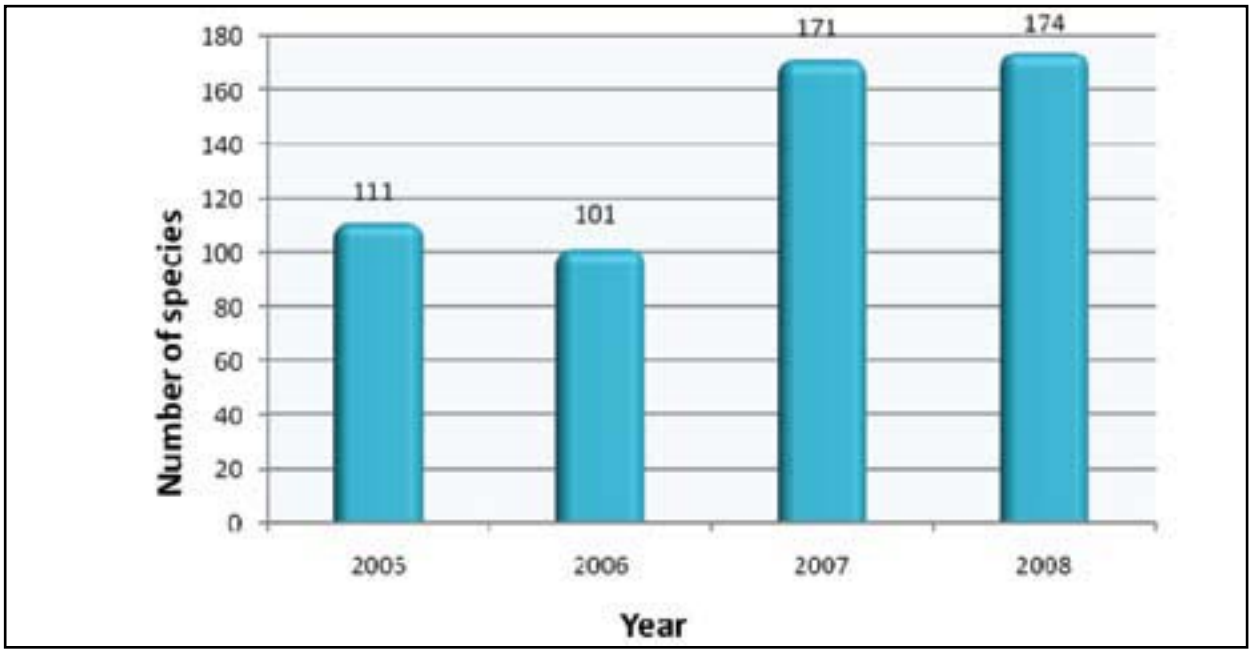


Fig (7.4) Number of birds species observed in Zaranik PA during 2005 - 2008

Studies clarified that monitored number of the most frequent bird species were 68 species with total number of 103067, whereas birds that were observed once only were 69 species. The most common birds recorded in large numbers were herons, cormorant, quails, corn crake, kingfisher, and little stint.

7-2-2-3 Agro biodiversity

Agro biodiversity in Egypt faces many challenges, mostly fauna and flora genetic resources and over use of chemical fertilizers and pesticides, leading to the disappearance of most of its wildlife like "owl, fox, mongoose and wild cat". Other factors contributed to wildlife loss like lack of agriculture rotation that is useful to land and cultivation of some high yield crops due to their high economic revenue. In addition to the fact that total average of effective compounds in fertilizers used in Egypt annually were about 5800 tons containing large amount of sulphur and copper compounds over last four years (2005 – 2008), with an average of 414 g/ Feddan/year (Ministry of Agriculture and Land Reclamation 2008).

Over grazing of natural grasslands and their conversion to agricultural lands, lead to biodiversity loss. Furthermore, threats of illegal urbanization and building on agriculture lands are greatly increased, although legislations prohibit these actions ; this leads to a considerable loss of fertile lands with an average of 47.7 thousand Feddans annually, (Osama Bedeir 2008).

Invasive species are from the other threats facing agro biodiversity, especially Red Palm Weevil pest that lead to the loss of more than 10 million trees, in addition to different weeds and agricultural pests that had caused considerable economic loss.

Fragmentation of agricultural tenure, poverty in rural areas, marketing problems due to low quality of agriculture products have led to migration from rural to urban areas, leading to an increased pressure on Egypt's natural resources.

7-2-3 Fauna status and trends

Depending upon monitoring programs over a certain period of time, different uses and threats species exposed to. This indicator requires maps of distribution, extent, and changes' species exposed to over time. In addition, there is a need for species' indicator in each habitat as well as indicators for national species such as "Egyptian Gazelle and Accacia tree".

A brief about status of certain species monitored during 2008*:*

Egyptian wild tortoise: Egyptian wild tortoise monitoring program is considered one of the most important monitoring programs since 2003. Egyptian wild tortoise existence is limited to Zaranik Protected Area in four sites: Makhaied Island, Sheikh Salama, Khoianat and El-Mehasab. Continuous monitoring, clarifies that wild tortoise uses up to 54 flora species for feeding and hiding. Makhaied Island is considered one of its most important sites, where 70 tortoises recorded during 2003 which was increased to 151 tortoises during 2008. The same was observed in Sheikh Salama area where 15 tortoises were found during 2003 then increased to 57 by 2008. Its numbers in Khoianat, were almost constant 43 individual over the last 5 years, whereas in El-Mehasab its number ranges from 4 - 8. Although 259 tortoises were recorded over the past 5 years, number of dead animals' especially young one had reached 120 tortoises. By marking female tortoises it was observed that each female lay down between 3 to 5 eggs / year, and mostly one egg succeeds in continuing its life cycle. 67% of tortoise preferred plants with heights ranges from 62.41cm to 74.09cm with an average of 68.25 cm either for feeding or protection. It was also found that tortoise uses plants with densities that ranged from (71 – 86 cm). Despite the fact that tortoise can live up to 50 years, but El-Zaranik's study showed that most tortoises did not exceed 15 years old and its average age is 8 years old. It was also found that grazing and cutting trees are main threats facing tortoise. (Fig 7.5)

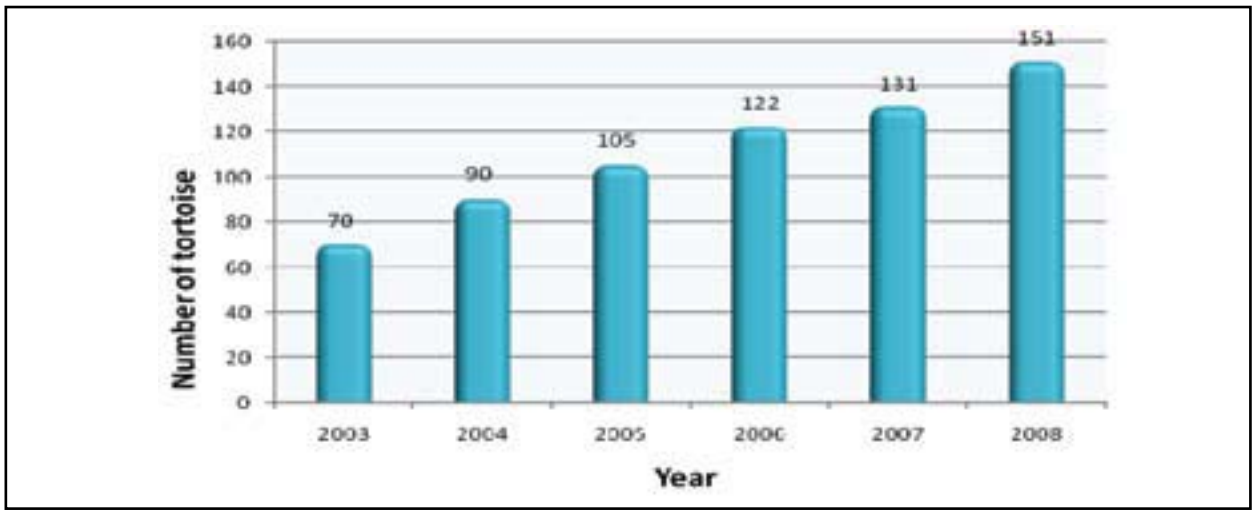


Fig (7.5) Number of Egyptian tortoises in Makhaied Island in Zaranik PA during 2003-2008

- Monitoring of **Egyptian gazelle** continued in Wadi Gemal, Elba, St. Catherine, Nabq, and Wadi Assouti Protected Areas. A remarkable increase of Gazelles' number in Elba protectorate had been observed during January which were 70 then increased to 125 during May and July, due to the successful breeding as it is known that delivering time in March and April.
- The total number of Gazelles observed in Protected Areas varied between 200 - 250 individuals every month. (Fig 7.6)

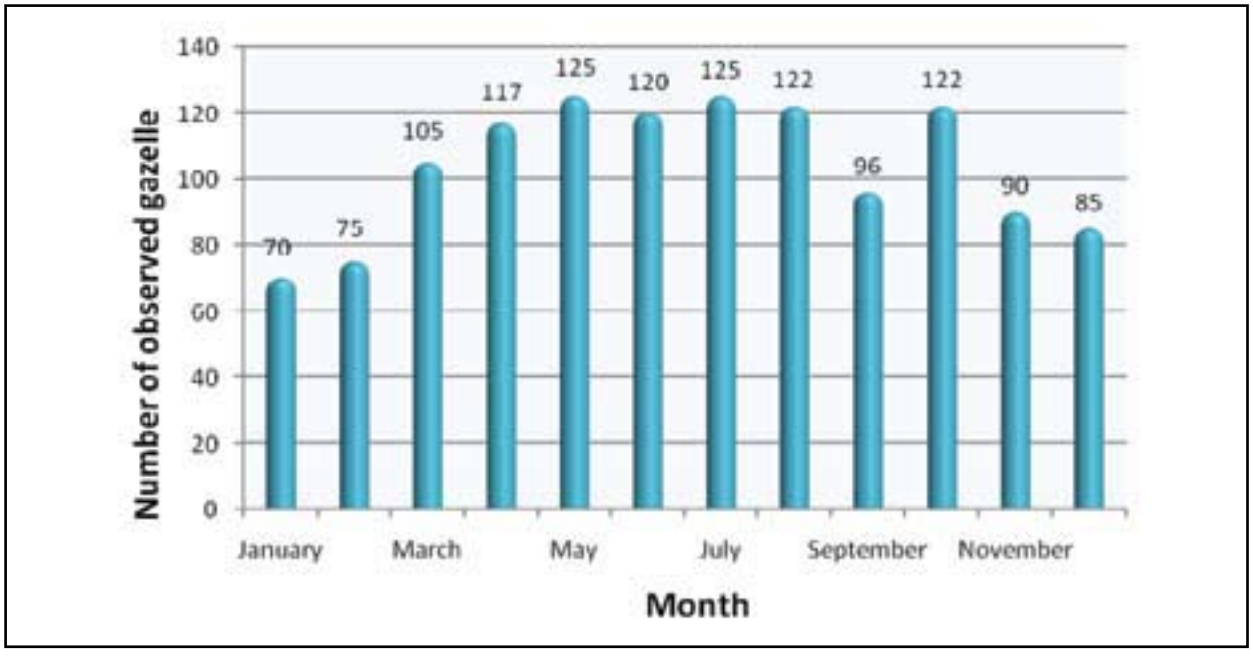


Fig (7.6) Number of Gazelles observed in Elba PA during 2008

- **Ibex and Barbary sheep** continued their increase in Elba, reaching more than 200 individual during 2008.

- **Lappet-faced vulture** was monitored in Elba protectorate during 2008; its observed number ranged from 4 - 16 birds monthly. **Egyptian vulture** was observed with range fluctuate between 12 -42 birds monthly.

- **Bird monitoring:** more than 200 bird species were monitored during 2008, with observance of at least one million birds in Zaranik, Brullus, Omayed, Ahrash, Ashtoum El-Gamil, Siwa, Ras Mohamed, Sallouga and Ghazalla, Allaqi, Wadi Gemal, Elba, and Northern Islands of Red sea. **Corn crake** which is considered endangered specie had shown an increase in Zaranik, reaching to more than 6000 bird during autumn and spring migration. **Sooty falcon *(Falcon concolor*)** in Wadi Gemal is also globally endangered specie, its numbers ranged between 300 - 340 birds, with a remarkable increase in their nests with about 94 nests during 2008 compared to 73 nests during 2004.

- **Aquatic birds** were observed both in coastal and inland lakes reaching more than 50 000 during 2008. Little egret was observed in more than 50 sites in Damietta and Fayoum with numbers exceeding more than 30 000 birds. In Zaranik more than 70 000 birds were recorded, representing 104 species during autumn migration, among which more than 30 000 birds belong to quail species. In addition to monitoring of different species in different areas as follows: 33000 birds belong to 40 species observed in Ashtoum El-Gamil, 28000 birds belong to 117 species observed in Brullus, 8000 birds belong to 50 species observed in Wadi Rayan; whereas 150 000 birds belong to 36 species observed in Ras Mohamed including149 422 from white stroke bird in addition to the observance of one bird belong to the rare **Namaka Dove** for the first time in South Sinai and Wadi Al-Arish.

- **Crocodiles** in Lake Nasser were also monitored with the assistance provided from IUCN and an expert from Florida University, where 280 crocodiles were recorded.

- **Marine turtles** Monitoring programs in the Red Sea and Mediterranean are considered one of the most successful programs. Four species of turtles (Green, loggerhead, hawksbill and leather back) were observed in more than 20 sites along coasts and islands. El-Zabargad Island in the Red Sea had recorded a high percentage of green turtle nesting with about 7000 nests during 2008 compared with only 438 nests during 2001; whereas El-Giftun Island is rich with hawksbill nesting where255 nests were observed during 2008 compared with only 21 nests during 2001. Zaranik Protectorate is on the richest areas with Marine turtles in the Mediterranean.

- A total of 35 **whale sharks** were observed during 2008 in Dahab, Sharm El-Sheikh, Hurghada, Kosseer, Marsa Alam, Port Ghalib, Sayal Islands. About 50 dugongs were observed in 15 sites

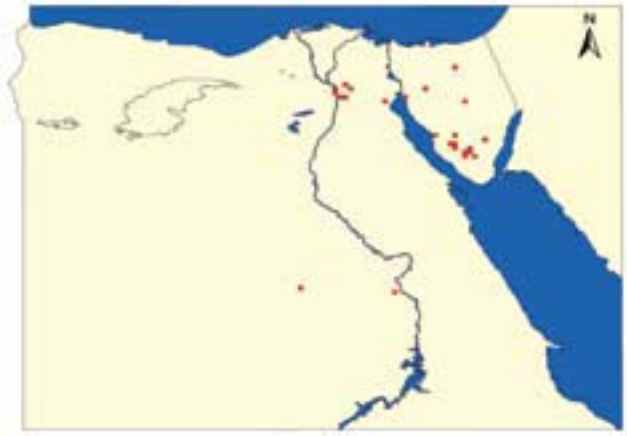
in the Red Sea. There is also remarkable increase in numbers of spinner dolphins especially in Samadi area. Fin whale (about 17 meter long) was observed for the first time near Gamsuah along the Mediterranean coast in addition to the observance of dugong in the Red Sea, Marsa Alam and Shalateen.

- (Sei whale *Balaenoptera borealis*) belongs to (Balaenoptiidae) family, endangered with extinction, observed for the first time at Elba Protectorate. (Picture 7.1)

Pic (7.1) Sei whale

7-2-4 Red List of Endangered Species

This indicator relays on the applicable lists from IUCN and other related conventions (e.g. CITES), it is concerned with extinct species, endangered species and least vulnerable species. Database that was established by BIOMAP Project, including approximately one million records collected at different times and locations from Egypt were used in the evaluation. . Egypt was divided into squares according to longitudes and latitudes, each square with an area of 4.2 km², with total area of 227446. The extent of distribution of each species was determined according to individuals' occupancy of each species at different times. An advanced prediction program was applied based on information collected from satellite pictures, radar topographic maps, geological map, and actual distribution of each species. (Map 7.2 & 7.3)



Map (7.2) Occupied area by individuals of a species

Map (7.3) Actual distribution of the species

During 2007 the red list was published including mammals (111 species), insects mainly butterflies (63 species) and *odonata* (40 species), in addition to two plant families *Apocynaceae* (22 species) and *Euphorbiacea* (51 species).

Based on the above, the following actions were taken:

- Continuation of monitoring and assessment programs of endangered species
- Law enforcement , prevent hunting and trading of endangered species
- Studying genetic structure of some important species
- Participation of local communities in conservation activities
- Joint coordination between national and international agencies to reduce impacts of climate change.

During 2008 setting Red List for species of both, Primulaceaa (9 species) and *Amaranthaceae* (25 species) were completed. Most species of the first family concentrated in St. Catherine Mountain in South Sinai and the northern coast of Mediterranean, where its endangered species represent 34%, critically endangered represent 11%, and the rest species with data deficient for assessment. (Fig 7.7)

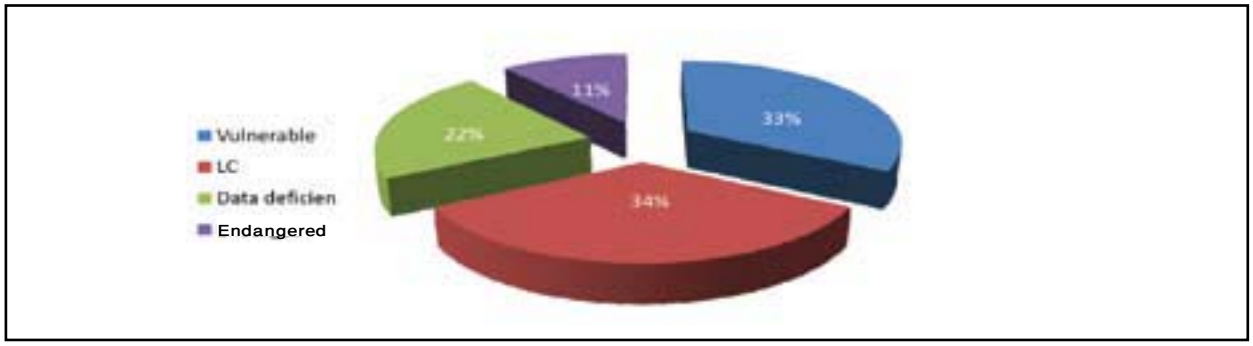


Fig (7.7) IUCN red listing of Primulaceaa Family

With regard to *Amaranthacea*, 4 species (17%) are endangered, 2 in critical status, 11 less threatened and the remaining with data deficient. Currently, efforts are undergoing to assess other groups including medicinal plants, birds, reptiles, and some insects' families. (Fig 7.8)

Fig (7.8) IUCN red listing of Amaranthaceae Family

Our previous information about endangered species (134 faunal species and 82 floral species) were not accurate, as recent studies proved that endangered fauna and flora species are much more , and require much efforts during the coming few years. It is noteworthy that all efforts made by IUCN over the past 30 years, represent only 10% of known species.

7-2-5 Black list (Invasive species)

This indicator reflects the extent and spread of invasive species and measures taken to limit their spread.

During 2008 number of invasive species reached to 110 species. The recorded species including (14) aquatic plants, terrestrial plants (7), crustaceans (16), insects (14), spider (1), fish (31), mammals (3), birds (3), reptile (1), amphibian (1), viruses (8), nematodes (3), mollusks (4), echinodermates (1), coelenterate (1) and polychaetes (2).

The decrease of invasive species during 2008 compared to previous year is due to the fact that the preliminary list was sent to experts for revision to ascertain the accuracy of registered invasive species ,so some species were deleted upon their recommendations ; and efforts are groining on to insure accuracy of the current list.

A National Action Plan was prepared depending upon national requirements and priorities, reviewing existing policies, legislations and concerned agencies; in addition to encourage cooperation with different sectors, enhance public awareness, participation of different stakeholders, and collaboration with neighboring countries. However, exerted efforts during 2008 were still limited in spite of the fact that invasive species represent real threats to the Egyptian ecosystem, economy and human health. Avian flu is a good example of invasive species, together with water hyacinth (*Eichhornia crassipes*), freshwater crayfish (*Procambarus clarkii*) and red palm weevil; as their estimated damage may cost billion LE.

Exerted efforts were focused on the current status of invasive species in terms of their identification, determine economic cost of some species, combat bird flu, gather available legislations and participate in training courses and conferences. Combating Invasive species is beyond our current potentials in terms of human, financial and technical resources, and requires participation of all

concerned agencies.

Table (7-1) Provisional list of Invasive species in Egypt

S	Common name	Species	Arabic name
Aquatic plant			
1	Water hyacinth	Eichhornia crassipes	نبات ورد النيل
2	Hypnea (alga/seaweed)	Hypnea musciformis	طحلب هايبنيا
3	Azolla Fern azolla Pacific azolla Pacific mosquitofern	Azolla spp (Azolla filiculoides)	نبات الأزولا – سرخس الباعوض
4	Caulerpa, Killer alga	Caulerpa taxifolia (algae)	طحلب كوليربا تكسيفليا
5	Grass Caulerpa	Caulerpa prolifera (Green algae)	طحلب كلربا برولفيرا
6	Red tide	Gymnodinium mikimotoi Karenia mikimotoi	طحلب كارينيا ميكيموتوى – المد الأحمر
7	Feathered Water Fern	Azolla pinnata (aquatic plant)	سرخس الماء
8	Fairy moss Mosquito Plant Carolina Mosquito Fern	Azolla caroliniana	سرخس باعوض كارولينيا
9	Sea lettuces	Ulva ohnoi	طحلب خس البحر
10	Tape-grass American Wildcelery, Eel Grass	Vallisneria spiralis (weeds) Vallisneria Americana	العشب الشريطى
11	Brown Algae	Stypopodium schimperi	الطحلب الأسمر
12	Red Algae	Antithamnionella elegans	
13	Foxtail Flatsedge, Mat Sedge	Cyperus alpecuroids	
14	Star- fruit	Damosonium alisma	
Land plant			
15	Giant reed	Arundo donax	الغاب البلدى - غاب هندي
16	Mesquite, ironwood	Prosopis juliflora	نبات المسكيت - شجرة الغاف – نبات السول
17	African foxtail grass	Pennisetum ciliare	حشيشة الفيل
18	Indian bassia – Quail plant	Bassia indica	

19	broad-leaved pepperweed broadleaf pepperweed	Lepidium latifolium (herb)	نبات الثفاء/ حب الرشاد
20	Shrubby morning glory Bush morning glory	Ipomoea carnea (plant)	زهرة مجد الصباح/ نجمة الصباح/عوير
21	Narrow Leaved Aster Annual Saltmarsh Aster Swamp Aster	Aster squamatus (plant)	نبات زهرة النجمة
DECAPODA, DECAPOD CRUSTACEANS			
22	The freshwater crayfish	Procambarus clarkii	أستاكوزا المياه العذبة
23	White River Crawfish	Procambarus zonangulus Procambarus acutus	أستاكوزا النهر البيضاء
24	Green crab	Carcinus maenas	الكابوريا الخضراء الأوروبية
25	Blue crab	Callinectes sapidus (crab)	الكابوريا / السرطان الأزرق
26	Portunid crab Indo-Pacific Swimming Crab	Charybdis hellerii (crab)	الكابوريا السابحة
27	Tiger Prawns & Endeavour Prawns	Marsupenaeus japonicus	جمبرى النمر/ القريدس/ الروبيان العملاق
28	Ginger prawn Speckled prawn	Metapenaeus monoceros	الجمبرى الخشن
29	Peregrine shrimp	Metapenaeus stebbingi	الجمبرى الأبيض
30	Green tiger prawn	Penaeus semisulcatus	ربيان النمر الأخضر/ الجمبري السويسي
31	Penaeid prawn	Trachysalambria palaestinensis	
32	Coastal mud shrimp Red Prawn	Solenocera crassicornis Solenocera subnuda	الجمبرى الأحمر/ جمبرى الطين الساحلى
33	Snapping shrimps	Alpheus audouini	
34	Snapping shrimps	Alpheus migrans	
35	Pebble crabs	Leucosia signata	
36	Pebble crabs	Myra subgranulata	
37	Giant river prawn	Macrobrachium rosenbergii	الروبيان النهرية الكبيرة
Land invertebrate - Arthropoda (Insect)			

38	Mediterranean fruit fly	Ceratitis capitata	ذبابة الفاكهة
39	Khapra beetle	Trogoderma granarium	خنفساء الحبوب الشعرية
40	Sweet potato whitefly	Bemisia tabaci	ذبابة البطاطس/ الطماطم البيضاء
41	Castor bean whitefly	Trialeurodes ricini (Misra 1924)	ذبابة الخروع البيضاء
42	Red palm weevil	Rhynchophorus ferrugineus	سوسة النخيل الحمراء
43	pink hibiscus mealy bug	Maconellicoccus hirsutus	البق الدقيقي/ البق الدقيقي القرنفلي
44	Encyrtid Wasp	Anagyrus kamali	
45	Southern house mosquito	Culex quinquefasciatus (insect)	الباعوضة خماسية الخطوط بعوضة كيوليكس
46	potato tuber moth	Phthorimaea operculella	فراشة درنات البطاطا
47	Egyptian cottonworm	Spodoptera littoralis	دودة ورق القطن
48	peach fruit fly, Guava fruit fly	Bactrocera zonata (insact)	ذبابة الجوافة/ ذبابة ثمار الخوخ
49	leopard moth, wood leopard	Zeuzera pyrina (insect)	حشرة حفار ساق التفاح
50	Ash whitefly Pomegranate whitefly	Siphoninus phillyreae (insect)	ذبابة الرمان البيضاء
51	Leaf-mining fly Chickpea leaf miner	Liriomyza cicerina (Insect)	حشرة حفار أنفاق ورق الحمص
Land invertebrate - Arthropoda - Arachnida (Acari)			
52	Glasshouse spider mite Two spotted spider mite Carmine spider mite Red spider mite	Tetranychus urticae Koch	سوسة العنكبوت الاحمر العادى
Vertebrates (Bony fishes)			
53	Common carp	Cyprinus carpio	سمكة المبروك الشائعة
54	Nile perch	Lates niloticus	سمكة قشر بياض
55	Western mosquito fish	Gambusia affinis	سمكة الجمبوزيا
56	Mozambique tilapia	Oreochromis mossambicus Oreochromis korogwe Tilapia mossambica	سمكة بلطى موزمبيقى

57	Large mouth bass	Micropterus salmoides	سمكة القاروص كبيرة الفم
58	Silver Carp	Hypophthalmichthys molitrix	سمكة المبروك الفضى
59	Grass Carp	Ctenopharyngodon idella	سمكة مبروك الحشائش
60	Bighead Carp	Hypophthalmichthys nobilis Aristichthys nobilis	سمكة المبروك كبير الرأس
61	Black or Snail Carp	Mylopharyngodon piceus	المبروك الأسود
62	Sabaki tilapia	Oreochromis spilurus	بلطي سبيلورس
63	Red Tilapia	Oreochromis mossambica	البلطي الأحمر
64	Blue tilapia	Oreochromis aureus	البلطى الأزرق
65	Slender yellowtail kingfish Shrimp scad	Alepes djedaba	الدراك أصفر الذيل
66	Bignose Shark, Knopp's Shark	Carcharhinus altimus	القرش ذو الأنف الكبيرة
67	Gobies	Coryogalops ochetica	
68	Karenteen Seabream, porgies	Crenidens crenidens	دنيس
69	Fringelip Tonguesoles	Cynoglossus sinusarabici	
70	Spotback herring & Herrings & Sardines	Herklotsichthys punctatus	السردين منقط الظهر
71	ponyfishes	Leiognathus klunzingeri	
72	Keeled mullet	Liza carinata	أسماك البورى
73	African sailfin flyingfish	Parexocoetus mento	السمك الطائر
74	Fourlined terapon	Pelates quadrilineatus Holocentrus quadrilineatus	
75	Bartail flathead	Platycephalus indicus	
76	Narrow-barred Spanish Mackerel	Scomberomorus commerson	أسماك الماكريل الأسبانى/ الكنعد
77	Silver sillago	Sillago sihama	سمكة حاسون
78	Small-scaled terapon	Terapon puta	
79	Broad-Banded Hardyhead Hardyhead silverside, Whitebait	Atherinomorus lacunosus	سمكة بزري كبيرة
80	Karateen Seabream	Crenidens crenidens	سمكة الدنيس

81	Spotback Herring, Spotted Berring, Spotted Herring	Herklotsichthys punctatus	سمكة الرنجة المنقطة
82	Bar-tail flathead	Platycephalus indicus	سمكة الوحره
83	Channel Catfish, Graceful Catfish	Ictalurus punctatus	سمك القط، قرموط القنوات، سلور القنوات
Mammal			
84	House mouse	Mus musculus	الفأر المنزلى
85	Black rat Ship rat	Rattus rattus	الفأر الأسود
86	House shrew Asian musk shrew	Suncus murinus	زباب المنزل
Birds			
87	Cattle Egret	Bubulcus ibis	أبو قردان، بلشون القطعان
88	Rock Dove Rock Pigeon	Columba livia	الحمامة البرية، حمام دحل
89	Indian House Crow	Corvus splendens	غراب المنزل الهندى
Reptile			
90	Red- eared slider	Trachemys scripta	السلحفاة ذات الأذن الحمراء
Amphibian			
91	Cane toad	Bufo marinus	الضفدعة الأسترالية
Micro- organism			
92	bunchy top virus	Banana bunchy top virus	فيروس تورد القمة
93	Rinderpest virus	Rinderpest virus	فيروس طاعون البقر
94	Plum pox virus, PPV, Sharka disease	Potyviruses: Potyviridae	فيروس جدرى الخوخ، مرض الشاركا
95	Banana streak virus	Banana streak virus, Badnavirus	فيروس تخطيط الموز
96	Cucurbit yellow stunting disorder virus	Crinivirus CYSDV	فيروس التقزم الشاحب
97	Squash leaf curl virus, SLCV	Begomovirus	فيروس تجعد أوراق الكوسة
98	Faba bean necrotic yellows virus		فيروس التقرح الأصفر

99	Avian flu virus – H5N1		فيروس انفلونزا الطيور
Nematodes			
99	Rat-lung Nematode	Angiostrongylus malaysiensis	دودة رئة الجرذ الخيطية
100	Rice white tip nematode	Aphelenchoides besseyi	نيماتودا الأوراق والبراعم
101	Soybean Cyst Nematode	Heterodera glycines	نيماتودا فول الصويا
Molluscs (Gastropoda)			
102		Helisoma duryi	
103	Blood fluke planorb	Biomphalaria glabrata	قوقع بيومفلاريا جلبريتا
104	Blood fluke planorb	Biomphalaria alexandrina	قوقع بيومفلاريا الكسندرينا
105		Bulinus truncates	قوقع بولينس ترنكاتس
Invertebrate (Echinodermata)			
106	Crown of thorn starfish	Acanthaster planci	نجم البحر الشوكى
Coelenterata, Cnidaria (Jellyfish)			
107	Indo-Pacific nomadic jellyfish Mediterranean medusa Nomad jellyfish	Rhopilema nomadica	قنديل البحر روبيليما نوماديكا
Annelids (polychaetes)			
108		Pseudonereis anomala	
109	Fouling serpulid worm calcareous tube worm	Hydroides elegans Protohydroides elegans Uchinda	

7-2-6 Resilience ability

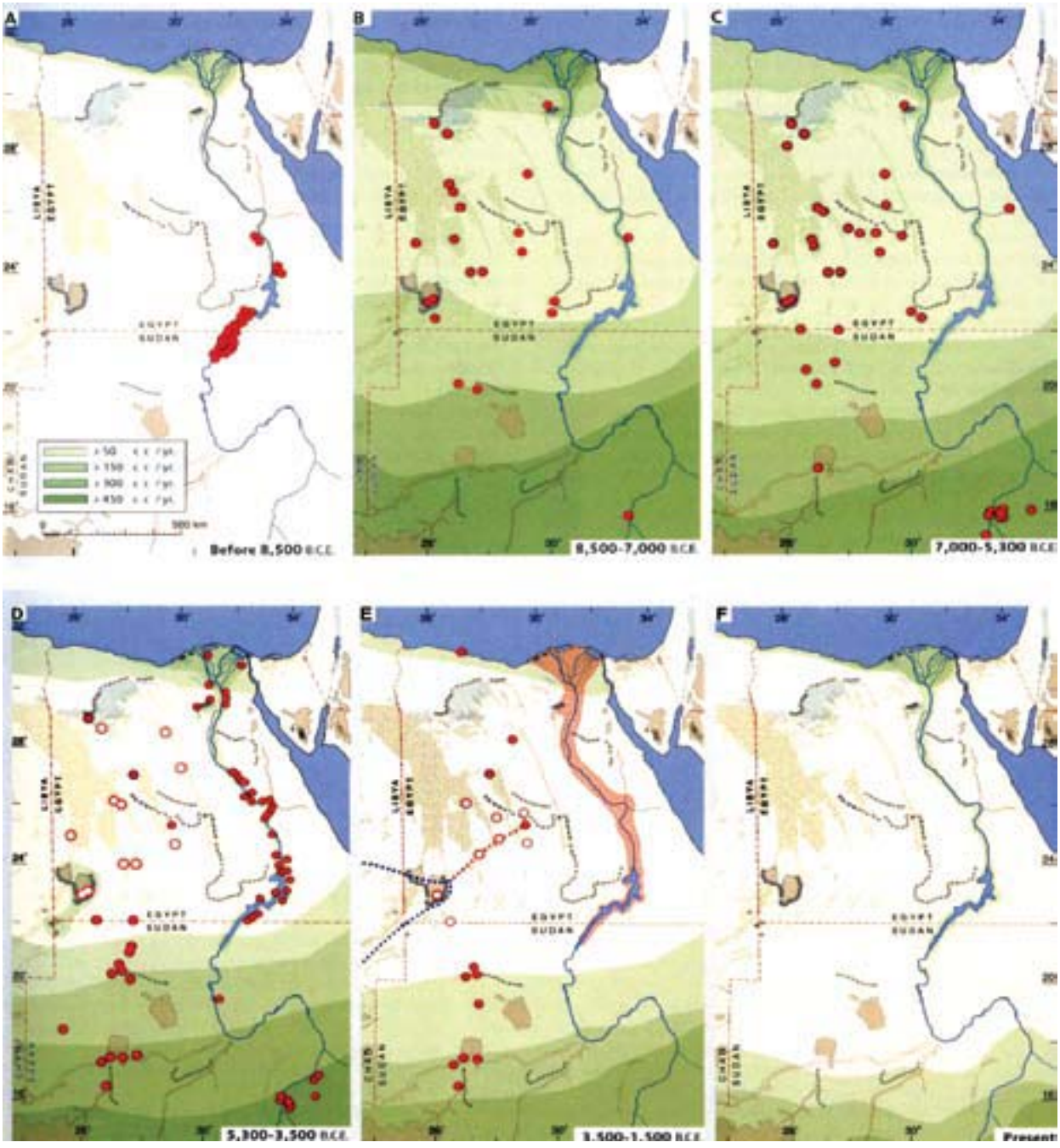
This indicator requires monitoring of all climate phenomena such as rainfall and its relation with green coverage; in addition to climate change and different human activities that can affect Resilience ability, habitat loss, movement of animals and plants to other appropriate places (such as movement of certain plants with different densities to higher areas in Elba Mountain and South Sinai Mountain; while shriveling in lower areas due to the very arid climatic conditions).

Different studies of climate change impacts on various Egyptian ecosystems (arid, coastal and

marine, mountains) were collected. In addition to mainstream activities related to climate change within work programs of CBD and coordinate between Climate Change and Desertification Conventions through (GEF Project on capacity building to monitor and report multi environmental conventions known as Rio Conventions),with focus on the following :

- Determining most vulnerable sites,
- Mainstreaming mitigation and adaptation measures into biodiversity activities
- Assessing threats and potential impacts on biodiversity
- Determining and approving monitoring programs on the most likely vulnerable sites by climate change.
- Enhancing scientific tools and practical information about responding to climate change impacts on biodiversity including its impacts on social, economic and cultural approaches.
- Involving stakeholders in decision making related to impacts of climate change on biodiversity.
- Take appropriate measures to deal with and monitor impacts of climate change on biodiversity

Studies carried out by experts and scientists interested with different fields of paloecology, archeology, biology and geography (Bubenzer,et al 2008) had shown that Egypt's climate had changed greatly over the last
10 000 years, as it turned gradually from wet climate (rainfall was more than 300 mm/year) to arid climate (less than 50 mm/year) which is prevailing till now. During these rainy ages, vegetation cover was enough for human being and his cattle that he brought from the north (Syria now). Human relationship with his surrounding environment was intimate where many animals like giraffes and elephants were living at that time, then disappeared later on due to the arid climate; human relationship with his environment deteriorated leading people to migrate where water exists, thus history of settled civilization began. (Map 7.4)



Map (7.4) Climate Change in Egypt During the last ten thousand years

The following procedures were recommended for mitigation and adaptation with climate change to achieve sustainable development:-

1- The International Road:
It is recommended that the international road along the Mediterranean will be the main front in dealing with the expected rising of sea level, and directing all development activities during the next 50 years south this road.

2-National Plan for Land-Use:
National Plan for Land Use should consider the expected impacts of climate change; infrastructure should be away from the coast by 1 km, and focusing on the Western desert in future developmental activities. All future developmental projects must be committed to include the expected impacts of climate change within their strategic environmental impact assessment studies.

3-Conservation of Mountain Areas:
Mountains in Egypt represent less than 1% which considered the strategic reserve for biodiversity (Elba and South Sinai Mountains).

4-Reconsider existing and future network of Protected Areas:
To deal with expected impacts of climate change on human settlements and biodiversity.

5-More Rehabilitation and Restoration Programs for long-lived trees such as acacia and mangroves

6- Conducting more Scientific Researches on genetic resources of inhabiting plants in arid habitats particularly medicinal plants that can resist drought, diseases and require less amount of water. Identifying appropriate measures follow up procedures, traditional knowledge, appropriate technology transfer, capacity building, development and application of ecosystem and precautionary approaches.

7-More marine Protected Areas along the Mediterranean and conducting scientific researches in deep waters.

8-Implement Marine Culture Program, due to the fact that most of current fish produced from freshwater fish farms.

9-Mainstream biodiversity activities within climate change activities.

10-Using modern awareness tools to disseminate information and raise public awareness such as, websites, clearing-house mechanisms, and environmental forums.

7-2-7 Socio-economic status of Biodiversity

MESA has prepared several socio-economic and cultural studies about biodiversity by using models of Protected Areas that represent different ecosystems; such as Omayed Protected Area (representing desert ecosystem) that provides agricultural activities estimated with 33 million LE annually and rangelands with revenue valued 8 million LE annually. El- Brullus Protected Area (representing wetlands) providing services for more than 350 000 person like fishing which estimated with billion and 168 million LE; while agriculture, rangelands, salt extraction, and reeds providing services estimated with 200 million LE annually. Services provided by marine ecosystems (Red Sea) are so variable and estimated with hundreds billion pounds annually, they include coral reefs,

mangroves, islands, beaches, sea grass, fish, reptiles, birds and marine mammals.

Local communities include tribes of Bedouins in Sinai, (Ababda, Bishariah and Rashida) in the Eastern Desert; and (Sons of Ali and Barber) in the Western Desert. Their traditional knowledge includes all sciences and experiences in memories of local communities, represented in their daily life activities such as agriculture, fishing, grazing, folklore dances, customs and traditions, languages and natural tools derived from plants and animals. The importance of this traditional knowledge is the experiences provided for new generation about life styles of old generation and their adaptation with environment. They also provide practical solutions for problems facing man in dealing with environment to ensure human survival depending upon his understanding of various integration methods with environment.

Therefore, Egyptian government has paid special attention for protecting and documenting all traditional knowledge to include them while preparing legislations through series of workshops. Traditional knowledge of large numbers of plants' species had been recorded. They included those in South Sinai (38), North Sinai (45), Halayeb (19), Western Desert (13), and Eastern Desert (16).

A draft law has been prepared for protecting traditional life, together with a national strategy for medicinal plants that depend on local communities for their implementation.

7-2-8 Threats

This indicator requires identification of all threats affecting biodiversity, whether natural or human, underlying factors of these threats and their negative impacts on life style, social and economic development.

Biodiversity is facing many threats including population growth, hunting, removal of wild plants particularly medicinal plants, cutting of trees in many important habitats, globalization and its negative impacts on exploitation of biological resources, limited human and financial resources, habitats' deterioration due to pollution resulting from agricultural and industrial activities and habitats' fragmentation because of large projects. In addition to the intentional introduction of many fauna and flora species to Egypt over the last two centuries to increase agriculture, animal and fish production; due to their economic significance such as cotton, fruits, fish, chickens, and cattle. This resulted in neglecting many Egyptian species, became so rare and are about to disappear (agriculture genetic resources); while some other flora and fauna species were introduced unintentionally through (Suez Canal and bird migration), leading to the spread of many invasive species which negatively affects agriculture production (pests such as Red Palm Weevil), and aquatic habitats (water hyacinth, freshwater crayfish). Consequently, biodiversity suffers greatly from the introduction of these invasive species to Egypt.

Based on the above, it can be said that all ecosystems, habitats and plant species are no longer enjoying ecological balance; due to the fact that all habitats of Egypt whether wetlands, inland, agricultural, deserts or even mountains as well as deep habitats in the Mediterranean Sea had been greatly impacted by human interventions; with exception of the protected areas which represents about 15% of Egypt's total area, where many activities are executed to limit habitats' deterioration and biodiversity loss.

7-2-9 Protected Areas Management Effectiveness

This indicator includes number and size of Protected Areas including human resources, training and budget compared to international standards; in addition to assessment of Protected Areas management efficiency at the level of all Protected Areas, status of conservation and monitoring, education and public awareness programs, environmental impact assessment reviews, patrolling efficiency, environmental laws enforcement, Egypt's adherence to international conventions, performance of international cooperation projects and achieving sustainability of projects.

Egypt has 27 Protected Areas, covering 15% of Egypt's area; their employed staff reached about 650 employees compared to 4000 employees at the international level. 50% of staff received intensive training programs inside and outside Egypt, including biodiversity monitoring methods, Protected Areas management, use of modern techniques such as remote sensing, GIS in Protected Areas management, invasive species, preparation of management plans and public awareness programs etc. However, more training programs are required on how to attract investors and treat visitors to protected areas, preparation and implementation of investment projects inside protected areas in order to achieve partnership with civil society and business men, (Fig 7.9).

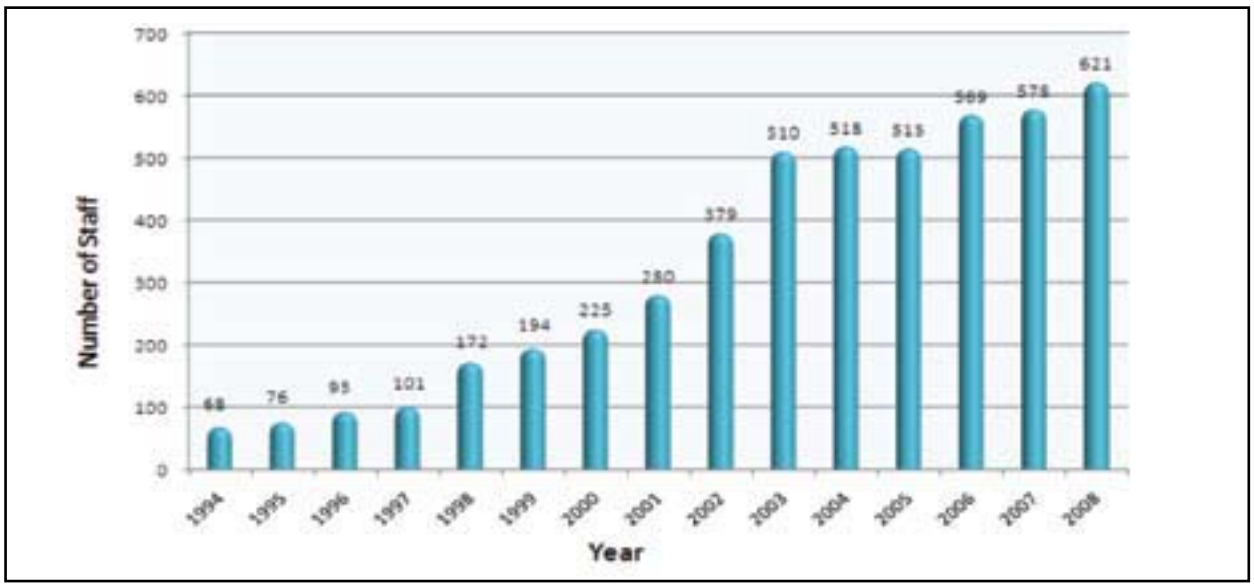


Fig (7.9) Increasing number of NCS staff from 1994 to 2008

With regard to financial expenditures, the governmental budget amounted 23.2 million LE during 2008 compared to 8 million LE during 2007 used in purchasing equipments, upgrading infrastructure in the Red Sea, South Sinai, Wadi Rayan and White Desert protected areas; in addition to establishing Biodiversity Information Centre and Natural History Museum in Sharm El-Sheikh; as well as finalizing the preparation of Salloum Gulf's file to declare it protected area. However, some protected areas are still suffering from shortage of human and technical resources as well as infrastructure such as Abu Galloum and Gilf El-Kabeer protected areas.

During 2008 a study was conducted on management efficiency of 4 protected areas, (Wadi Rayan, Qarun Lake, St. Catherine and Ras Mohamed). Assessment process included staff performance in implementing conservation, monitoring programs, communication and public awareness in addition to investment projects inside these four Protected Areas. Management plans were already finalized for 60% of Protected Areas in addition to economic plans for 3 protected areas as a start to lay down the base to achieve sustainable finance and development of Protected Areas. In addition to the above, 280 Environmental Impact Assessment studies were completed, review enforcement of environmental laws and environmental damage assessment, following up coordination with governmental and non-governmental agencies as well as Egypt's adherence to international conventions such as Biodiversity, Ramsar (wetlands), and Animal Migration (Fig 7.10).

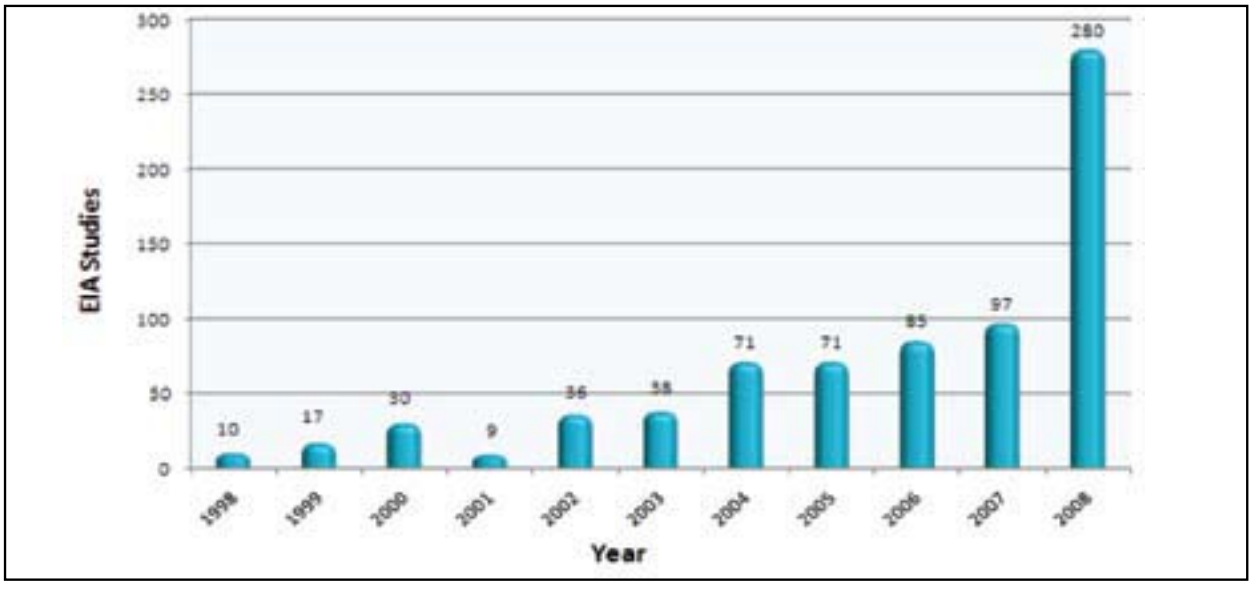


Fig (7.10) Increasing of EIA studies from 1998 to 2008

7-2-10 Special measures and procedures for Biodiversity conservation outside Protected Areas

- This requires continuing monitoring and assessment of biodiversity status, law enforcement, hunting and overgrazing prevention ; prepare policies and legislations to organize introduction of Modified Genetic Organisms , bio safety ,biological resources and their related traditional knowledge; coordinate with concerned agencies with international trade concerning illegal trade of endangered fauna and flora species (Ministries of Agriculture and Interior etc.) and conservation of biodiversity outside its natural habitats (ex-situ conservation).The following are some of the applied measures :

- Patrolling and law enforcement programs (day, night, marine and pedestrian patrolling) have shown continuous occurrence of violations in spite of applied legal procedures and assessment of environmental damages. Most of violations concentrated in boat accidents in coral reef areas (16 violations), oil pollution, illegal fishing, mining and quarries' violations, use of pesticides in agriculture, over collection of wild flora particularly medicinal plants, cutting trees for fuel, overgrazing, illegal use of lands in Protected Areas and constructions along exclusion zone of shoreline .

- Studying status of Genetically Modified Organisms (GMOs) in Egypt within a national framework concerned with safety handling, consumption and usage of (GMOs) through the Bio-safety project funded by GEF/UNEP. This project aims at preparing terms of reference(TOR) for implementing studies to identify status of living modified organisms (current status ,role of National Bio-safety Committee, related legislations , human capacities, experiences and financial potentials ,translation of bio-safety draft law into English , organizing a workshop in preparation for the first draft of Executive Regulation and participate in workshop of bio-safety projects in African countries).Dealing with licenses' requests "reviewing protocols of risk assessment", control and inspection "facilities that should be available at reference laboratories" in addition to communication and public awareness. The draft law has been prepared and approved by the Ministry of Justice prior its submission to People's Assembly and Shoura Council.

- Preparing a new draft law on "Access and Fair Benefit Sharing" of biodiversity and its resources, finalizing a Strategy on Medicinal Plants and improving partnerships with private sector and civil society. Establishment of National Biodiversity Museum at Sharm El-Sheikh is undergoing in addition to activation of Ecotourism Strategy in both Wadi Rayan (Wadi Hitan) and white Desert Protected Areas.

- During 2008, ex-situ biodiversity conservation efforts resulted in the success of captive breeding for several endangered species for the first time in Egypt. These efforts included

Oryxdammah and Arabian Oryx (four new births), Caracal, and porcupine. Cheetah was introduced for the first time since 40 years, in addition to breeding the fourth generation of Egyptian Gazelle. African turtles are also available in large numbers. The total number of individuals had reached 1469 animals compared to 113 previously, representing 17 species. As well as, medicinal plants, acacia trees, El Ombet and mangroves were cultivated successfully in several Protected Areas.

- Concerning Avian flu, the Ministry prepared a report including measures that were taken during 2008 to combat it through monitoring programs by examining 4150 samples of wild birds like (aquatic birds, herons, quails, sparrows, wades, and gulls).In addition to Ministry's efforts to transfer pig farms from Cairo, Kalyobiah and Giza Governorates, implement public awareness program, exchange experiences with other Arab countries, participate in preparing national plan for regional and international cooperation. In spite of the above mentioned efforts with all concerned institutions, avian flu represents a great danger in Egypt.

- Nature Conservation Sector has participated in many activities with the National Centre for Planning State Land-Uses to settle many disputes aroused as result of interventions among governmental agencies, investment projects related to agriculture, fisheries, tourism, mineral resources and new industrial cities.

- All available data about Egypt over 30 years at CITES have been examined, including Egyptian species registered at CITES, exported and imported species in terms of their quantities and the current status of international trade in endangered fauna and flora species.

This effort resulted in discovering that, Egyptian list combine 355 species including (352) fauna species among which 296 in annex"2" and 3 flora species only. After examining this list, it was found that registered species contain 43 mammals species only out of 120 species, 75 bird species only out of 480 migratory and endemic species, 28 reptile species only out of 112, 10 fish species only, 3 bivalves and the remaining majority belongs to sanitarians species (367) which includes most of coral reef species registered in Egypt, (Fig 7.11)

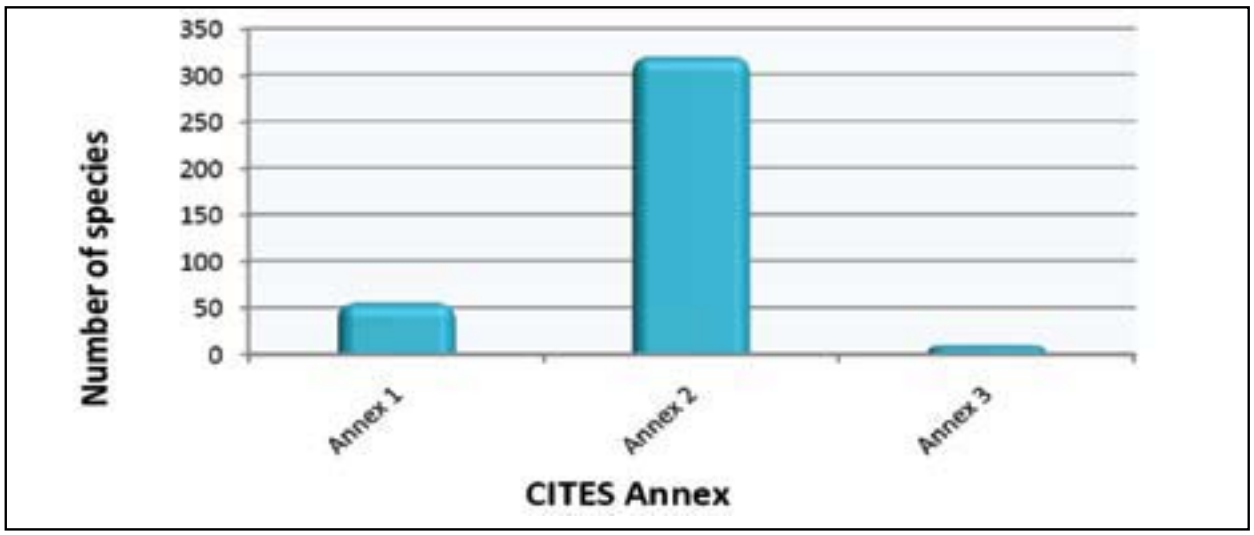


Fig (7.11) Number of Egyptian animals listed in CITES convention (352 sp.)

Previous information clarifies that there is an urgent need to reconsider Egyptian list as some species had disappeared completely like Hippopotamus and Oryxdammah. In addition that most of Egyptian mammals and reptiles are considered endangered species. Furthermore, there is no scientific basis for the Egyptian list as it almost includes all coral reefs species while many fish, mollusks and echinoderm species must be included.

By examining registered species over the past 30 years, it was clarified that registered species reached to 236 out of 355; wheras imported species reached to 61 only .List of exported species include 32 species registered in annex I, 181 species in annex II and 18 species in annex III.

Previous information clarifies that Egypt is one of the most important countries in the international trade of migratory species whether through direct export of its natural resources which are mostly endangered or through being a transit country for many species that come from Africa or being smuggled through illegal trade. The illegal smuggle of Gorilla and Chimpanzee which are listed in annex I have caused many problems with CITES Secretariat. In spite of all exerted efforts since early 2000 to form administrative and scientific committees to regulate and strict control over all Egyptian "seaports and airports", prohibit trading of these endangered species, inspection campaigns on hotels and bazaars selling these endangered species or their derivatives (leather and ivory handicrafts); however due to the limited qualifications and capacities of committees' members and customs' employees (mostly veterinarians) they require enhancement of their technical and institutional capacities ; as well as conducting scientific surveys on current status and trends of these endangered species, in order to issue exporting permits on a scientific basis. There is also a need to implement education and public awareness campaigns at all levels. Currently Nature Conservation Sector "NCS" affiliated to Ministry of State for Environmental Affairs "MSEA"

with its available scientific experiences is preparing lists of all endangered species and finalized lists of Mammals, butterflies and some plant families. However, this task needs further efforts beyond capabilities of NCS.

7- 3 Exerted Efforts

During 2008, Nature Conservation Sector's priorities were executed through plans based upon the following three pivots:

- Development and management of the existing protected areas and declaring new ones.
- Continuing assessment of biodiversity trends through environmental monitoring and updating information system.
- Supporting measures for biodiversity conservation through institutional reform, improving capacity building, partnership with civil society, media, marketing and sustainability of projects funded by countries and donors.

With regard to development and management of protected areas, patrolling and securing programs are already implemented, in addition to documenting protected areas boarders and finalizing all researches and field studies of natural protectorates which will be declared as natural protectorates in the near future (Salloum and Qattara Depression); as well as improve management efficiency of protected areas in Red sea and south Sinai protectorates, establishing Scientific and Administrative Center for Northern Island and Wadi Rayan protectorates , getting new equipments , devices and transportation means in addition to enhance communications, education and public awareness programs.

As for program of information, monitoring and assessment biodiversity; websites, clearing house mechanism and biodiversity forum are updated regularly. Preparation of a unified monitoring system for all protected areas, following procedures of combating bird flu, invasive species and bio-safety measures; as well as regular monitoring of captive breeding programs for endangered species.

With regard to biodiversity conservation supporting measures, on going projects were executed successfully, activate implementation of newly established projects , prepare more projects concerned with enhancing economic activities in protected areas to reach self-financing, launch implementation of bio-safety project in addition to Egypt's international and regional commitments ,drafting new legislation concerned with "Access and Fair Benefit Sharing" of biodiversity and its resources ,finalizing Medicinal Plants Strategy; improving partnership with civil society and private sector , Biodiversity Museum in Sharm El-Sheikh is almost finalized , activation and implementation of Ecotourism Strategy in Wadi Rayan (Wadi Hitan) and White Desert protected areas.

7-4 Future Vision

Next phase will focus on the following:

1. Achieve and support sustainable development of protected areas to realize economic and social development.
2. Integrate national activities to conserve biodiversity and decrease its loss rate (2010 target).
3. Enhance institutional, technical, legislative and executive capacities to conserve nature.

This will be achieved through the following main components:

- **Protection of biodiversity components** through enhancing biodiversity conservation.
- **Diversity of ecosystems and habitats with international importance,** through enhancing the existing situation of endangered species, habitat rehabilitation and restoration, and sustainable use of biological resources.
- **Address biodiversity threats,** through decreasing pressures arising from loss and deterioration of habitats, unsustainable use of biodiversity, control invasive species, and address potential negative impacts of climate change and pollution on biodiversity.
- **Preserve services and products derived from biodiversity** for human well-fair, through preserving capacities of ecosystems to sustain provision of their services and products.
- **Preserve cultural and social diversity** of local communities, through protecting their traditional knowledge, practices and rights to sustain their traditional knowledge.
- **Access and fair benefit sharing** on the use of genetic resources, through ensuring that all genetic resources transferred in accordance with Biodiversity Convention and other related international conventions.
- **Provision of appropriate financial resources,** through enhancing financial, human, technical and technological resources to conserve biodiversity.

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