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Natural resources, bottom facies, impacts, management plan and recommendations on some islands of the Red Sea, Egypt

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Abstract

The studied islands are areas for various and high sensitive habitats as mangrove stands, coral reefs, and seagrass beds. Moreover these islands are characterized by different types of mammals, birds and reptiles. The distribution and description of various bottom facies of the studied islands are documented in a bottom facies map depending on field observations (Tahoon, 2005). This includes the description for topography, geomorphology, geology, coastal environments essential for management and assesses the status of coastal zones in the context of current and future socioeconomic pressures and impacts. The islands area has suffered from a number of stresses caused by human activities that has caused observable reduction in environmental quality. They can be summarized as pollution by oil and letters, coral reef damage, illegal fishing, building or camping on the islands, and animal disturbing. Cooperation between the investors and EEAA is very important in order to centralize the decisions and responsibilities. Management recommendations can be applied on the Red Sea coastal areas. These findings will help the EEAA and the developers to assess the risk to the region's resources and to human health, besides addressing land management and policy issues in these local areas.

1. Introduction

Coastal areas of the Red Sea are under stress from a variety of human activities and many, especially in Hurghada, have experienced widespread degradation. Hotel/resort and other development along the Red Sea coast of Egypt are proceeding rapidly, and threatening valuable coral reef ecosystem (Jameson *et al*., 1995). Effective coral reef management program is critical to sustainable tourism strategies for the Red Sea (Reeve *et al*., 1998). Unfortunately, some islands in Hurghada became sites of human activity (ex. Giftun Island). Giftun islands and their adjacent areas are special places, given their close proximity to Hurghada and the degree to which they are the object of tourist demand.

The present study is confined to three islands, Wadi El Gimal as an island exposed to lesser environmental problems, Big Giftun and Abu Minqar as two heavily impacted islands in Hurghada area. Red Sea islands have been declared as a protected area by Prime Ministerial Decree 450 for 1986.

Wadi El Gimal island is located in front of wadi El Gimal fan (Ras Bagdadi), south of Giftun island by about 330 Km. The island lies between latitudes 35° 8′ 33″ and 35° 10′ 30″ N, and longitudes 24º 38′ 30″ and 24º 40′ 30″ E, far from the shore by a distance about 4.5 Km. It occupies an area 4 Km² (Figure 1a).

Big Giftun and Abu Minqar islands are located in the front of Hurghada (about 5 km from the shore), between latitudes 27° 16′ 8″ and 27º 10′ 8″ N and longitude 33º 52′ 9″ and 33º 57′ 38″ E. Their areas are of about 20 Km² (Figure 1b).

Geologically speckling, the Big Giftun rock units are related to Quaternary and Pliocene, but wadi El Gimal and Abu Minqar rock units are related to Quaternary. Pleistocene facies are represented in the shallow sediments. Sabkha occupies most of low land areas in the island. It surrounds most of the mangrove swamps in Abu Minqar and wadi El Gimal islands. It covers large areas in the northwestern and southern parts of the Big Giftun island.

1.1 Topography

They are rocky islands with fossilized coral and carbonate rocks. The entire region around the islands, with the exception of the eastern side of Big Giftun and wadi El Gimal islands, is a shallow water area with very rugged bottom morphology. The slope of the central part of the eastern side of Big Giftun is especially steep, only a few meters seaward, water depth of 40m is reached. A NW-SE oriented flat trench (fault plain) of shallow water area separated the big and little Giftun islands. The western side of Big Giftun and wadi El Gimal island has an extended reef flat, while the northern and northeastern sides have relatively

short reef flat due to the NW-SE trench and the high dynamics of waves, current and winds as well.

1.2. Geomorphology

The land area of the Big Giftun island is dominated by a central high mountain (120 m) running parallel to the shore. In contrast, Abu Minqar is a flat, low land and of elevated coral reef. These mountains of Big Giftun island create a series of coastal seaward draining watersheds and "wadis", resulting in alluvial plains as they reach the sea. There are several wadis, mostly of short extensions. Large wadis are rare and ending with relatively large bays. Wadis of Big Giftun island flow in different directions, mainly toward the west in the western side, toward the northwest in the northern part, toward the southwest in the southern part and toward the east in the eastern side. In wadi El Gimal island smaller and shorter wadis are running toward the western side. The drainage area of wadis in Big Giftun and wadi El Gimal islands range from a few hundreds of meters to few kilometers (ex. some wadis in the western side of wadi El Gimal and Big Giftun islands). They carry alluvial deposits ranging from rubble to silt into the coastal plain, and support important freshwater functions.

1.3. Geology

The depositional sequence of Big Giftun island, is about 120 m. height, consists of alternating coral reef and calcareous sandstones deposited in littoral to beach environment during arid episodes of Pliocene.

Wadi El Gimal and Abu Minqar islands are mainly built of limestone of Quaternary coral reefs (Figure 2a&b).

Marine carbonate sediments of the Big Giftun island, including echinoid-rich calcarenites, coral reefs and oolitic limestones, were deposited in the littoral areas that protected from detrital discharges. Some components of the marine fauna (echinoides, *Tridacena*, etc.) indicate direct connection for the first time with the indo-pacific domain. These faunas indicate a plio-pleistocene age for these sediments. The Pliocene sequence along the Egyptian coast of the NW Red Sea has demonstrated that rift tectonics is the main factor determining sedimentary evolution (Soliman *et al*., 1993).

Quaternary sequence of the islands constitutes a conspicuous belt flanking the Pliocene succession. They are composed mainly of coral reefs. Three reefs terraces of 20, 10, and 4 m. in elevation above the mean sea level can be recognized in the northwestern part of Big Giftun island. Raised beach and coral reef rim, of about 1.5 m high surrounding the islands. The marine terraces along the Red Sea coast and the Gulf of Aqaba, exhibit different elevations above the present sea level (Al Sayari *et al*., 1984a,b; El Asmar and Attia, 1996, Mansour, 2000). Elevation of the lower reef terrace is also different from place to another and generally exceeds toward the south along the Egyptian coast (Mansour, 2000). Dry wadies acting as aconduit for coarse detritus to the sea during flash floods only dissect the Quaternary terraces. Tectonism controls the aerial distribution of the depositional systems and influences the number, thickness, extension, and elevations of the reef sequences (Mansour, 2000). Pleistocene sequences comprise shallow-water carbonates of different facies mostly corresponding the modern fringing reefs. However this facies similarity probably reflects similar climatic conditions.

Sequence boundaries of reef units as in most areas along the Red Sea coast are depicted by an abrupt basinward shift of coastal onlap (Mansour, 2000). The paleotopography of the prequaternary basin, is mainly related to the late Pliocene halokinesis and rift tectonics, controlled the different facies distribution of the Quaternary sediments (Ahmed *et al*., 1993).

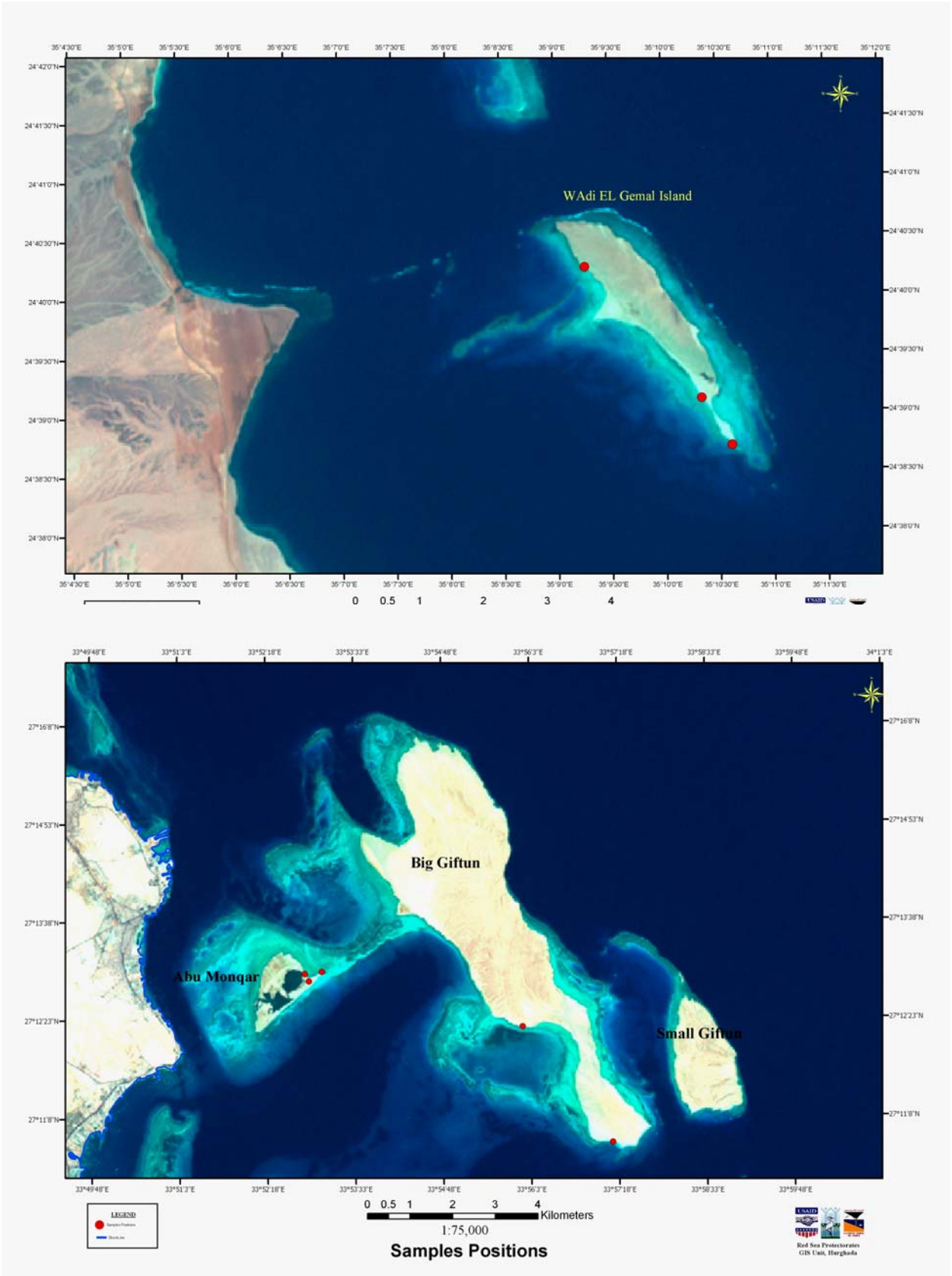

Figure 1: Location map of wadi El Gimal island (A), Big Giftun and Abu Minqar islands (B), Red Sea, Egypt.

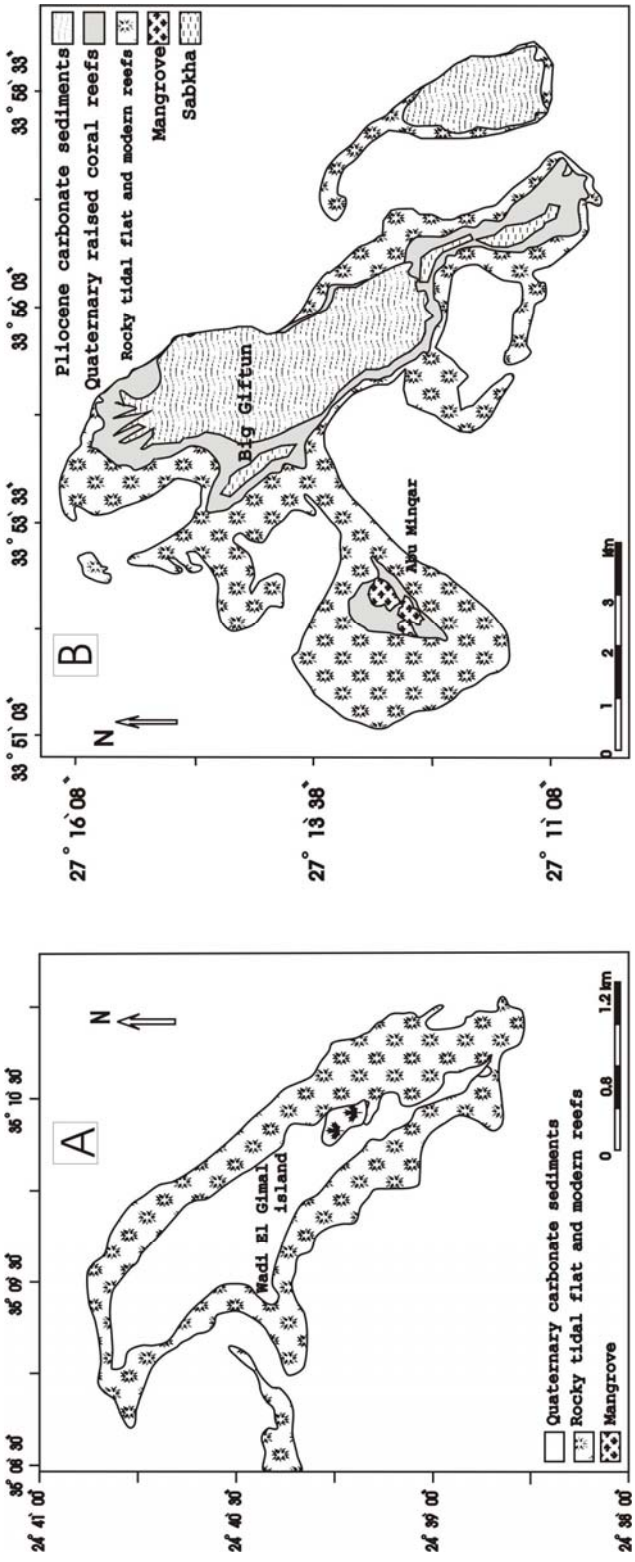

Figure 2: Geological map of wadi El Gimal island (A), Big Giftun and Abu Minqar islands (B), Red Sea, Egypt.

2. Surveys

In 2002 Wadi El Gimal is, Big Giftun and Abu Minqar islands and their surroundings were surveyed using a boat and zodiac, landed at a number of sand beach sites. Wading, snorkeling and diving in several areas around the islands collected information from the variable environments.

3. Natural resources and bottom facies

Natural resources

The islands areas are very rich with natural resources in the land or in the sea and its preservation is of national interest. The description of various natural resources of the studied islands was the primary intension of this study. These natural resources, documented by many pictures are based exclusively on field observation.

Six main natural resources have been noticed from the studied islands. This includes mangroves, coral reefs, seagrass, mammals, birds and reptiles (plates, 1, 2, 3 and 4).

- Mangroves

Mangroves are a group of unusual trees that can live in salt water from oceans and seas. Most land plants are killed by salt, but mangroves are able to get ride of salt. Also mangrove trees have developed special kinds of roots that stick up out of the mud into the air to get oxygen. As a result mangrove forests are common along the coasts of many tropical islands where the shore is soft and muddy enough for the roots. Mangroves are also considered as a shelter area for fish juveniles to grow up before going living in the lagoon or on the reef. Besides, mangroves build land or keep it from being washed away, which can be very important on islands where land is so limited.

Mangrove trees are recorded in some of the Red Sea islands. These islands include wadi El Gimal, and Abu Minqar. As in the mangrove in the northern part of the Red Sea (Friedman and Krumbein, 1985; Piller and Pervesler, 1989; Mansour, 1992) it consists exclusively of *Avicennia marina*. Its growth form is bushy, its density is generally sparse, and its occurrence is restricted to small patches.

- Seagrass beds

The total area of grass pastures in the northern Red Sea is quite small providing suitable feeding ground for sea turtles (Frazer and Salas 1984). These areas are also of importance as feeding sites of marine mammals, particularly Dugongs. There are seagrass pastures off Abu Minqar, Big Giftun and Wadi El Gimal island with pasture of Abu Minqar one of the largest.

- Coral Reefs

Coral reefs are built near the surface in tropical seas by the accumulated skeletons of tiny animals (most corals) and plants (coralline algae), wherever sunlight reaches a suitable bottom.

Coral reef is very productive type of ecosystem with many kinds of plants and animals. It also grows and adds to the size of islands, making sands, rubbles and rocks that build the island.

Most of dive sites around Big Giftun and Wadi El Gimal islands are characterized by high diversity of coral reef types, weak to moderate water current velocity, shallow to moderate depth usually not more than 50 m, and good visibility.

The reef ecosystem requires environment without much change in water quality or temperature; if that environment is disturbed the reef may die or may take many years to recover. Many kinds of pollution can also damage or destroy the coral reef, as oil pollution or solid waste from diving boats.

Plate 1

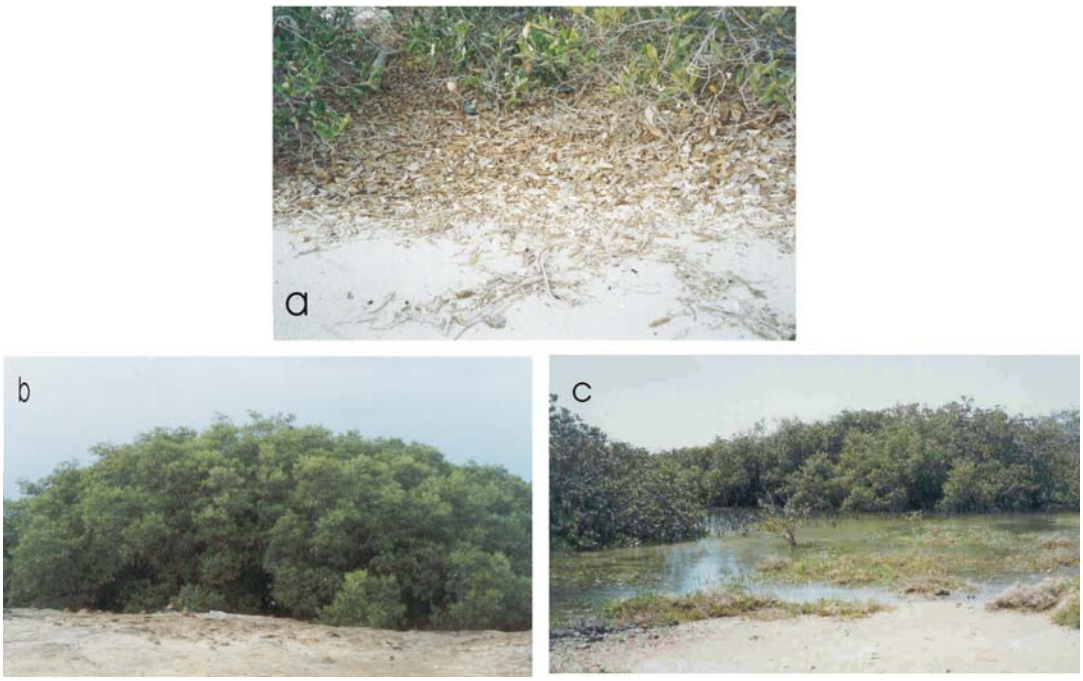

Plate. 1

a. Mangrove leaves mixed with sand sediments in the middle western part of Wadi EL Gimal island.
b. Mangrove standcrop in the southern part of Wadi EL Gimal island.
c. Mangrove channel in the southern part of Abu Minqar island.

Plate 2

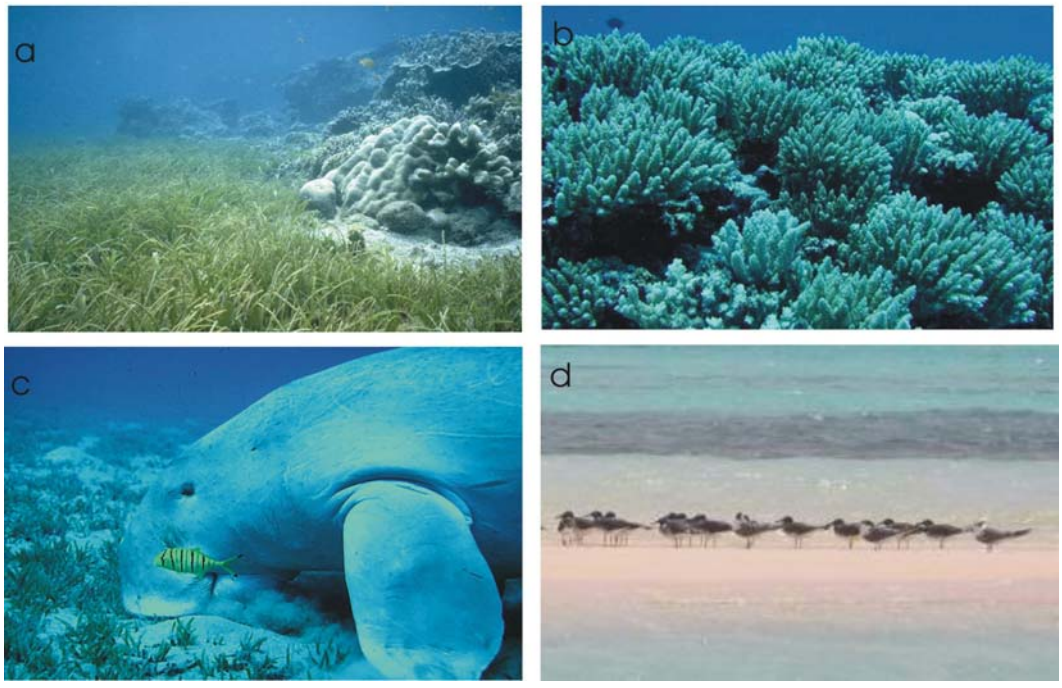

Plate. 2

a. Seagrass beds around Wadi EL Gimal island.
b. Coral reef patches around Wadi EL Gimal island.
c. Dugong dugong eats seagrass in the western side of Wadi El Gimal island.
d. Group of gulls along the southern tip of Wadi EL Gimal island.

Plate 3

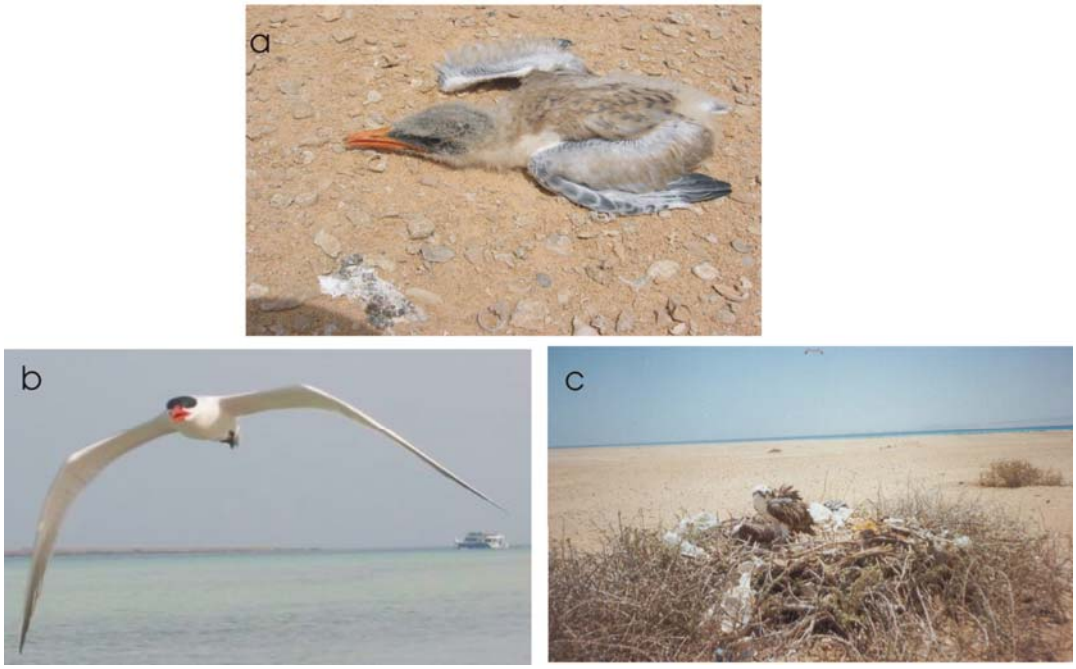

Plate. 3

a. Chick of Caspian Tern in Wadi EL Gimal island.
b. Big bird of Caspian Tern in Wadi EL Gimal island.
c. Chick of Osprey in the north eastern part of Wadi EL Gimal island.

Plate 4

Plate. 4

a. Dead green turtle in the south western part of Big Giftun island.
b. Turtle track in the western beach of Big Giftun island.
c. Dead hawksbill turtle floated on the surface of the water near the south western part of Big Giftun island.
d. Turtle nest in the western beach of Wadi EL Gimal island.

- Mammals.

According to the references, only one terrestrial mammal has been recorded on the Red Sea Islands, House Mouse *Mus musculus*. There is yet to be any conclusive evidence of small mammals on the Hurghada islands, but burrows, tracks and reports of observations indicate this or other species are present.

A number of marine mammals occurred in the marine Red Sea, a few species are resident; the majority is vagrant occurring on an irregular basis.

Several dolphin species are reported from the northern Red Sea. Bottlenose Dolphin *Tursiops truncates* is resident and the most common dolphin are observed in the Hurghada area. It is usually seen in small pods to the north, east and south of Big Giftun and is reported to bread in the area. One of the most important sites is said to be " El fanus". A large number of Spinner Dolphin S*tenella longirostris* have been observed to the western side of Wadi El Gimal island.

Dugong is a rare resident of the Egyptian Red Sea. It was thought to have been expired from the Hurghada area, but interviews with local fishermen indicated that Dugong had been observed in seagrass beds of Abu Minqar as little as six years ago. Skeletal remains of an adult belonging to this species were found on the west side of Big Giftun substantiating its occurrence. Dugong have been seen in 26/5/2004 (Tahoon, 2005) through snorkeling in the western side of wadi El Giml island at 24º 39` 35.5″ N and 35º 8` 38.3″ E. This area recorded as an area with seagrass facies at a depth of about 13m.

- Birds

Red Sea islands are extremely important for breeding land and sea birds. Most of the Red Sea seabirds breed exclusively on islands, which are few, highly accessible and vulnerable to disturbance.

Birds are the most prominent and important non-aquatic vertebrate fauna in the Hurghada Archipelago. Hundreds of different species are found in the area, a small number are resident; the majority is migratory occurring on a seasonal basis. (Mindy 2001).

Three Ospreys nests with 4 babies have been observed on wadi El Gimal island. Two of these nests in the northern side of the island were observed in 8/5/2003. The third One was seen in 27/5/2004 was in the southern part of the island. Twenty Reef Heron (*Egretta gularis*) nests were observed through mangrove trees in 27/5/2004 (Tahoon, 2005). 7 nests have just hatchery eggs.

Wadi El Gimal Island is one of the largest islands in the southern Egyptian Red Sea and is considered as an internationally important bird area by Bird Life International. It supports significant populations of globally threatened species, namely; the White-eyed Gull *Larus leucophthalmus* of which more than 200 pairs breed on the island representing over 1% of the global population. The island similarly supports more than 1% of the global population of the Sooty Falcon *Falco concolor* (about 50 pairs).

Table 1: Estimates of breeding water and sea birds (and birds of prey) on islands and mangroves in WGHPA, according to observations during 2002-2003.

Species / Island	Wadi El Gimal
Phaethon aethereus	old nest
Egretta gularis	15
Butorides striatus	X
Platalea leucorodia	5-10
Pandion haliaetus	5
Falco concolor	50
Larus hemprichii	30
Larus leucophthalmus	200
Sterna repressa	*
Sterna caspia	20
Sterna bengalensis	*
Charadrius alexandrinus	X

Figure = pairs of breeding birds. X = breeding occurs but no estimates made. * = probable breeding.

- Reptiles

Only a few terrestrial reptiles are resident on the islands. Small spotted lizard *Mesalina gattulata* is the most common species and occurs on Big Giftun and Abu Minqar. Egyptian sand snake *Psammophis aegyptiusv* (non- venomous) inhabits Big Giftun. (Mindy 2001).

Out of the five species of sea turtle reported as occurring in Egyptian Red Sea, three species have been observed off the coast of Hurghada; those are Hawksbill Turtle, green Turtle, leatherback Turtle

Hawksbill Turtle *Eretmochelys imbricate* is the most common species and the only sea turtle known to bread in the area. A nest with eggs was found on Big Giftun during the 1982 surveys (Frazer and Salas, 1984). The dried carapace of a baby sea turtle of the species (hawksbill) was collected on the northwest part of Big Giftun island probably brought to the location by a bird. (Mindy 2001).

Both Hawksbill *Eretmochelys imbricata*, and Green Turtle *Chelonia mydas*, have been reported nesting in significant numbers on Wadi El Gimal island (Frazer & Salas 1984).

Two false nests have been observed in the southwestern part of the Big Giftun. One is at 27º 10′ 9″ N and 33º 56′ 10″ in April 2000. The other was observed in May 2002 at 27º 10′ 9.18″ N and 33º 56′ 10″ E.

One nest with eggs was found on Wadi El Gimal island in 8/5/2003 at 24º 39′ 48″ N and 35º 09′ 31″ E.

Bottom facies

The distribution and description of various bottom facies of the studied islands was the primary intension of this study. This bottom facies, documented by

bottom facies map (Figures 3a&b) are based exclusively on field observation.

Five main bottom facies have been defined from the studied islands. These comprise seagrass, fringing reef, mangrove, sand and beach facies.

- Seagrass facies

The variations in density of plant growth depend on the composition of bottom sediments, where areas abundant with sand and fine sediments such as valley mouths are rich with seagrass meadows.

The area around Big Giftun and Abu Minqar islands is characterized by more or less dense stands of seagrass, mainly *Halophilla stipulacea* and *Halodule uninervis.* These two species behave separatly as well as in a mixture. Seagrass bottom facies are mainly developed as narrow strips parallel to the coast or as isolated patches.

In the eastern and northern parts of Abu Minqar island, the seagrass occurred as isolated patches cover the sandy areas. In South west of Abu Minqar island, the seagrass patches scattered at about 500m away from the shore.

In the northwest and southeast of the Big Giftun island the seagrass represents long fringe, however, in the southwest it represents a patchy fringe. El Nasranya Bay, at Giftun island, it represents a protected seagrass by a lagoon, where many patches were growing on fine sand in shallow water of southern side of this bay (2m. depth).

In Wadi El Gimal island, the seagrass represent isolated patches in the southern and western parts of the island.

- Fringing reef facies

* Reef flat (coral zone)

The coasts of the studied islands consist of sedimentary rock with fringing coral reef. This fringing coral reef has in most sites wide reef flat. The northern east shores of the studied islands are exposed to waves and swells. These coasts include high cliffs that drop precipitously to deep water with very narrow fringing reefs.

The areas between the coral heads consist of a wavey, rocky bottom with a smooth surface covered by varies calcareous (mainly coralline) and soft algae. At the reef slop, several species of the genera *Acropora* and *Porites* are dominant, but in the more shallow parts *Millipora* also exist.

In all cases these plains represent rocky tidal flats built by coral limestone with rugged surface. The contact with the subtidal zone is either abrupt (e.g., eastern sides of the studied islands) or graditional (e.g., western side of the studied islands).

The tidal flat extends from few meters (in the eastern side of the studied islands) to about 200 m at the western side of Wadi El Gimal and Big Giftun islands and reaches to about 1000 m at the northwestern side of Abu Minqar island.

The tidal flat is composed mainly of carbonate material, dominated by skeletal remains, with a relatively high content of terrigenous material at the valley mouth.

- Mangrove facies

Abu Minqar Mangrove forest extends for about 1.2 km from NW to SE and its width in some places reach to 200 m. The mangrove vegetation cover is about 40% of the total land area. It is a monospecific dense thickness of *Avicennia marina* trees, some of them are 6.0 m long and cover an area of more than 9 m^2.

The transpiercing water channel divides the island nearly into a northern part and a southern one. The width of the channel increases in some places to form lagoons along its length. Along both sides of the channel *Avicennia marina* trees are solely forming the mangrove forest.

Wadi El Gimal Mangrove forest is also related to *Avicennia marina*. It is represented mainly in the southern part of the island in addition to a small accumulation located toward the south western part. Mangrove vegetation cover is about 8% of the total land area. In the southeastern part of the island mangrove trees reach to about 7 m height at 24˚ 39` 9.4″ N and 35˚10` 26.4″ E,. Mangrove swamp in the south part of the island extends toward the eastern side at 24˚ 39` 9.7″ N and 35˚ 10` 18.9″ E with about 1m depth under sea level with healthy and condense mangrove trees. Small standcrop of mangrove trees alternative with the splash zone plants in the western side of the island at 24˚ 39′ 38.7″ N and 35˚ 09′ 52.3″ E.

The sediment of mangrove swamps are composed mainly of poorly sorted, fine sands. Gastropods occur in clusters on the sediment surface and on the vertical roots of *Avecenia.* Mollusca influence the composition of the sediment by production of large quantities of fecal pellet. Peneroplidae, especially P*eneroplis* and *Sorites*, is dominant type of Foraminifera. Agglutinated Foraminifera are a very minor component of assemblages recovered in the Red Sea mangrove environment (Mansour, 1992).

- Sand facies

The sand facies occur mainly at the southern and south western part of studied islands, and vary in width from few tens of meters to a few hundreds of meters.

Primary sedimentary structures of the sand facies include wave ripple cross lamination. Varies burrows, are attributed to crustaceans, mostly destroy these structures and texture.

- Beach facies

Flat sandy beaches are developed only in some parts of the study islands. In the southern tip and southwestern part of Wadi El Gimal and Abu Minqar islands, and in the southwestern part and Nasranya Bay in Big Giftun island..

Typical surface sedimentary structures of the beach sediments are flat beds with occasional heavy mineral concentrations, and current shadows associated with bivalve shells. Various burrows attributed to crustacean occur in the beach sand.

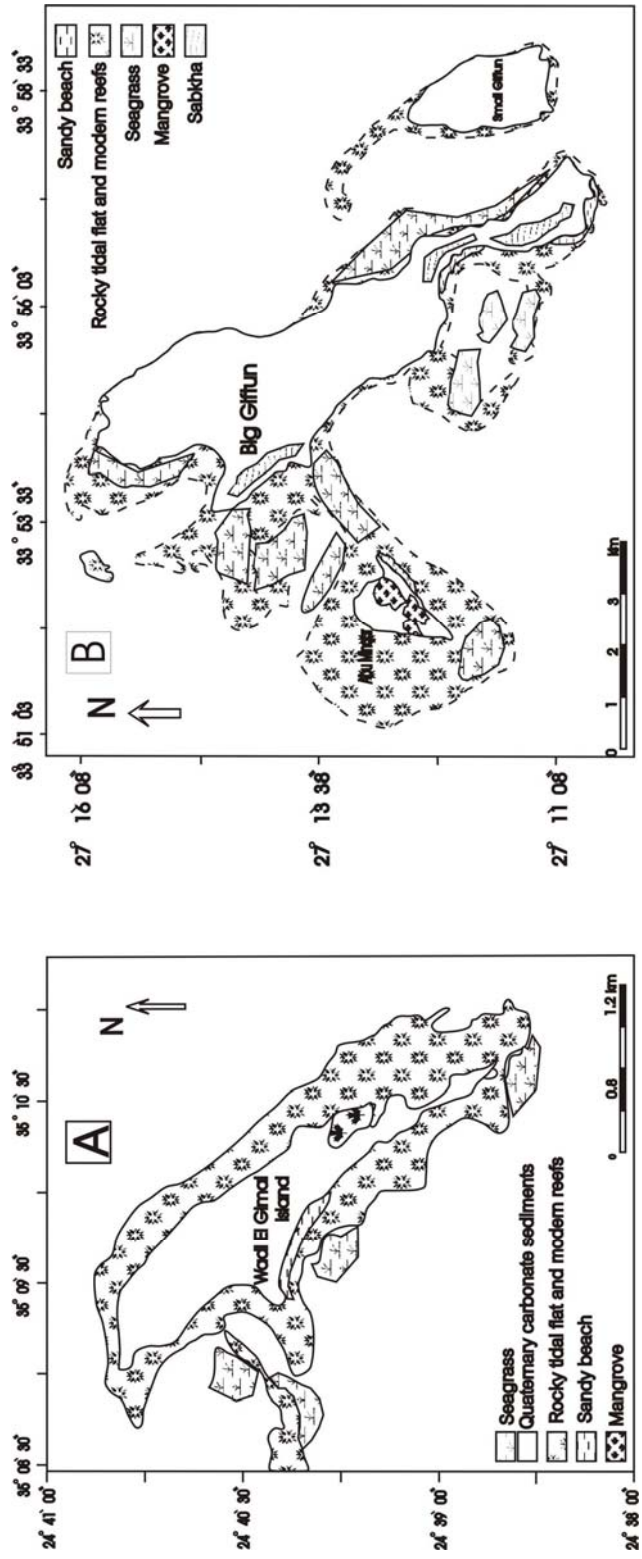

Figure 3: Bottom facies map of wadi El Gimal island (A), Big Giftun and Abu Minqar islands (B), Red Sea, Egypt.

Plate. 5

a. The northern side of Wadi El Gimal island is polluted with oil which constitutes thin layer over the beach sediments.
b. Solid waste in some buckets in the northern side of Wadi EL Gimal island.
c. Fishing boat around Wadi EL Gimal island.
d. Illegal fishing around Wadi EL Gimal island

Plate. 6

a. Sandy beaches and tourism activities in the southwestern
part of Big Giftun island.
b&c. Different light structures on Big Giftun island (cafeterias Queen Magi and Mahmya), as a source of negative human impact on the natural resources**.**

Plate. 7

a. Oil pollution cover the eastern side of Abu Minqar island.
b. Cracks in the oil bed in the northern side of Abu Minqar island.
c. Oil pollution and garbage in the northeastern side of Abu Minqar island.

4. Impacts and pressures

The concept of anthropogenic impact is extremely important for analyzing the ecology of coastal and shelf zone. For centuries this zone has been the center of various human activities. These include urbanization, construction of seaports and harbors, development of natural resources (including oil production and fishing), marine aquaculture, shipping, recreation, and many others.

*** Wadi El Gimal island**

The island area is one of the fishing sites in south of Marsa Alam. Small fishing boats come to the island in case of bad weather to be protected from wind and strong current. Some oil spots cover small areas in the north and north western part of the island as a tar balls mixed with beach sediments. Litter plastic bottle, wood fragments, and iron boxes fill some buckets in the northern area.

A large number of died blue spotted ray and colored fish were observed in the far southern part of the island with unknown reason. The end part of the blue spotted ray was cutted. Small fishing boat was tied near to this area and three mooring buoys for diving boats occured (Plate 5).

Some of fishermen in the northern part of the island with two boats land on the island near to turtle nest with eggs. This may be of almost danger for this nest if they don't care about the importance of that natural resource.

In relation to Abu Minqar and Big Giftun islands this island exposed to lesser human impact, as it located far from oil wells. The tourism activities in the area of Wadi El Gimal are lesser than that in Hurghada, and also most of tourists there prefer diving and snorkeling more than landing on the island.

*** Big Giftun island**

The severity of coral damage was the greatest at small Giftun at 4m depth whereas El Fanous at Big Giftun experienced the most sever degrees of broken coral damage at 8 m depth (Jameson *et al*., 1999). Nearshore areas and islands are the main physical resources and have many functions (ex. Diving, safari, biodiversity, fisheries). Estimates of the number of dives per year show diving carrying capacities for El Fanous and Gifun islands being exceeded by large amounts (Jameson *et al*., 1999). Over exploitation of natural resources and pollution are the main environmental issues of the Red Sea coastal area (El-Sayed, 1999).

The island is one of the fishing sites in Hurghada. There are about four fishing camps spread evenly through the island. Fishing activities must be organized and sometimes prohibited under the law of 102 for 1983.

There is a serious environmental degradation at some parts of northern and northwestern coast of the

island, and lesser environmental problems at some other sites along the NE coast. One of the main reasons for these problems is the oil pollution, which covers most northwestern side of the island. Oil mixed with the beach sediments to form small tar balls. Litter of plastic bottles, wood fragments and iron boxes full most buckets and bays in the north and northwestern side are source for solid waste pollution.

It is allowed to land on the big Giftun island. There are two cafeterias (Queen Magi and Mahmya) related to tourism companies in the most south eastern part of the island. Hundreds of persons visit the area every day from sunshine to sunset. This causes a heavy stress on the natural resources presented in the islands. Tourists collect every thing on the beach as coral derbies, or shells that considered as a home for many crabs. Birds escaped from the beach; also turtle avoid laying eggs in this sandy beach although this area is a suitable place for turtle nesting as old fishermen mentioned that this place formerly rich with turtle nests (Plates 6).

There are some activities that could affect the shore line, the most famous one is boat grounding on the southern beach of Big Giftun island, also boat propellers cause bottom turbidity and degradation of coral reef patches around the area.

*** Abu Minqar island**

Mangroves are sensitive to pollution, particularly oil pollution. If an oil spill goes into a mangrove area, the oil covers the aerial roots, and the tree roots can no longer get the air they need to live. The roots, will die, with them the whole forest.

The island position gives a chance that affected by pollution from the north. Oil pollution covers a large area, nearly all the coast except the western part. Oil mixed with fine beach sediments forms mud cracks in the north eastern side of the island. Also there is litter of plastic bottles, wood fragments and iron boxes full most buckets and bays in the north and northwestern side.

The south eastern part of the island is characterized by presence of oil pollution. This appears as a dry oil spots on the beach. This dry oil spots started to erode by water current to form very small oil parts which mixed with sand sediments and take part with the new sedimentation period.

Tourist boats have been anchors in the southwestern part of the island on a sandy bottom but near to the sandy beach of the island. This gives chance for tourists to land on the island, as many of them enjoyed by collecting shells and crustaceous, also some of them reach to Mangrove swamp and disturb birds and their nests.

Boat anchors, boating over, propellers and bait digging, all damage seagrass beds especially in areas of recreational potential of south Abu Minqar and Big Giftun islands (Plates 6 and 7).

5. Management plan and recommendations

With any tourism development where the attraction of the environment is the main resource being utilized, special attention must be paid to the protection of the offshore reefs and the islands. Of particular importance is that the reef shouldn't be exploited so that its value is diminished, both as natural resources and as a valuable tourist attraction (Mansour, 2001 and 2003).

It should be noted that investment in tourist projects is economically rewarding only if it is planned, organized, and managed according to proper sustainable concepts. So, all have to endeavor all efforts to protect the environment, and to keep adverse implications to the minimum. To materialize this objective, they have to follow consciously all the regulations set by EEAA, and have to supervise the practices of their employee, and the projects

Fishing within reef areas should be strictly controlled; the collection should be controlled. An education program on reef protection and preservation should be developed and undertaken together with a monitoring program.

The coastal zone of the island should be monitored on a regular basis during the development phase and afterward, to check if any environmental damage has occurred. Proper corrective measures have to be taken promptly, to prevent any major deterioration, once signs of negative implications are noticed.

Prior for allowing visitation to Abu Minqar and Wadi El Gimal islands, a study is needed to examine the potential impacts of tourism on birds and the feasibility of ecotourism development and potential options. Similar studies can be undertaken for sea turtles and marine mammals.

Tourism facilities on Big Giftun should not be placed on or near important nesting sites for breeding birds or sea turtles. Access for nesting sites of birds and sea turtle should be restricted during the main breeding season from the beginning of March until the end of October. Other breeding sites might have to be restricted at other times of year.

Given the high density of tourism and related settlement, considerable management of the island area is needed to ensure islands and reefs of Hurghada are protected through sound recreational and diving practices.

Specific objectives are to determine the effect on resource (ex. Oil, wastes), and to control/ reduce/ repair point source pollution commensurate with sustainable use of resources, based on assimilative capacity. However, cleaning beaches from oil and litter is highly recommended. Plastic bottles are the main part of litter, most of them are from the tourist villages and from the boats, therefore, control of the tourist villages and the boats is recommended (Mansour, 2001 and 2003).

Reefs and associated marine resources of the island are vulnerable to the effect of unregulated tourism and recreational practices. It is important to provide for the

effective management of the islands and surrounding to prevent unacceptable impact of recreational tourism and ensure along term sustainable future.

Carrying capacity study for dive sites must be done and according to the results of this study it will be possible to determine the suitable number of moorings to install in these areas and the suitable number of divers.

Conservation of reef and islands ecosystem and mangrove on Abu Minqar and wadi El Gimal islands is necessary for purpose of reef conservation, managed diving recreation, ecotourism and as a part of a broad reef monitoring network.

Boat grounding in the sandy areas around the islands moves sediments and increase water turbidity that affects negatively on the coral reefs and other marine environments in the area. Therefore, a pier for only loading and unloading is recommended, especially at the southern tip of the Big Giftun Island where a lot of tourist visits El-Mahmya. Extension of Pleistocene reefs in this area helps in construction of such pier.

Boats should be monitored to insure there is no discharge of wastewater in the vicinity of the islands. Tourist facilities on the islands also should be regularly monitored to insure that the wastewater is collected and transported to the mainland and there are no leakages.

6. Summary and conclusion

The present study covers three islands, Wadi El Gimal as an island exposed to lesser environmental problems, Big Giftun and Abu Minqar as two heavily impacted islands in Hurghada area. Red Sea islands declared as a protected area by Prime Ministerial Decree 450 for 1986, adjusted by Prime Ministerial Decree 1186 for 1986 and Prime Ministerial Decree 642 for 1995. Wadi El Gimal island included again through the Prime Ministerial Decree 143 for 2003.

The studied islands are areas for various and high sensitive habitats as mangrove stands, coral reefs, and seagrass beds. These islands are also characterized by different types of mammals, birds and reptiles. The distribution and description of various bottom facies of the studied islands was the primary intension of this study. This bottom facies documented in a bottom facies map depending on field observations.

The islands area has suffered from a number of stresses caused by human activities that has caused observable reduction in environmental quality. They can be summarized as pollution by oil and letters, coral reef damage, illegal fishing, building or camping on the islands, and animal disturbing. A cooperation between the investors and EEAA is very important in order to centralize the decisions and responsibilities.

The need to develop sound management practices and a clear understanding of the reefs ecosystem dynamics are becoming more urgent as man's uses of reef resources continue to escalate. Red Sea coastal zone requires integrated planning and management to achieve ecologically sustainable use of coastal resources and conservation of the coral reefs. Management recommendations of the islands can be applied on the Red Sea coastal areas. These findings will help the EEAA and the developers to assess the risk to the region's resources and to human health, besides addressing land management and policy issues in these local areas.

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المصادر الطبيعية، السحنات القاعية، التأثيرات السلبية، التوصيات و خطة الإدارة لبعض جزر البحر الأحمر – مصر

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تهدف هذه الدراسة إلى توضيح مدي الضغوط البيئية و التدهور التي تتعرض له منطقة جزر البحر الأحمر بالغردقة و ذلك نتيجة التنمية السريعة و الغير مخطط لها. و تعتمد الدراسة علي فحص و تفسير المنظومة البيئية و الجيولوجية عن طريق دراسة المصادر الطبيعية التي تتمتع بها جزر البحر الأحمر و تكامل منظومة الحياة الفطرية في المعيشة و علاقة هذه المصادر ببعضها البعض. و توصي الدراسة بضرورة الإعتماد علي الأدلة و الدراسات العلمية في إعداد إدارة متكاملة و مستدامة لسواحل و جزر البحر الأحمر تكفل حماية الثروات الطبيعية بهذه المنطقة للأجيال الحاضرة و القادمة.

تم اختيار ثلاثة جزر لعمل هذه الدراسة و هي جزر الجيفتون الكبير و أبو منقار ووادي الجمال. وهي جزر معلنة كمحميات طبيعية و قد تم اختيار جزيرتي الجيفتون الكبير و أبو منقار كجزيرتين تمثلان الجزر الموجودة بنطاق منطقة الغردقة و تتعرضان لقدر كبير من السلبيات نتيجة الأنشطة الآدمية الغير مقننة, و اختيار جزيرة وادي الجمال كإحدى اكبر و أهم جزر المنطقة الجنوبية و التي تتعرض لقدر اقل من الضغوط البيئية نتيجة بعدها عن التكدس العمراني و السياحي و مشاريع استخراج البترول. و لقد أوضحت الدراسة مدي أهمية جزر البحر الأحمر كخطوط هجرة و أماكن معيشة و تبويض للعديد من الطيور ، و أيضا مناطق تواجد للثدييات النادرة مثل عروس البحر و الدرافيل و خاصة بعد تغطية معظم سواحل البحر الأحمر بالقرى و المشاريع السياحية. شملت الدراسة توزيع السحنات القاعية كجانب من المصادر الطبيعية بالمنطقة و التي تعتبر مصدر تنوع بيولوجي و مأوي للعديد من الكائنات و تشمل هذه السحنات الحشائش البحرية و مستنقعات المانجروف و منطقة ظهر الشعاب و الشعاب المرجانية الحافية و أماكن الشواطئ الرملية و الصخرية . و قد تم توضيح ذلك عن طريق مجموعة من الصور الفوتوغرافية لمجموعة من الحيوانات و النباتات و السحنات المختلفة كما تم إعداد خرائط توضح توزيع هذه السحنات بالجزر التي تم دراستها.

و قد تناولت الدراسة المظاهر الطبوغرافية و الجيومورفولوجية و الجيولوجية اللازمة للإدارة ولتقييم الحالة التي عليها النطاق الساحلي , حيث ترتبط و تؤثر هذه المظاهر في طبيعة تواجد الغطاء النباتي

والتوزيع الحيواني و أشكال الشواطئ و المخاطر التي يمكن أن تتعرض لها بعض الأماكن نتيجة شدة الإنحدار أو تأثير السيول . كما توضح الدراسة و بصورة مبسطة الوضع الجيولوجي و الوحدات الصخرية التي تتميز بها الجزر موضع الدراسة.

بالرغم من تواجد العديد من القوانين المحلية و الدولية التي صدرت للحفاظ علي المحميات الطبيعية و البيئة بشكل عام و علي رأسها قانون المحميات الطبيعية رقم 102 لسنة 1983 و قانون البيئة رقم 4 لسنة 1994 إلا انه ما زالت هناك العديد من الممارسات الخاطئة و الآثار السلبية للأنشطة الآدمية خاصة بمنطقة الغردقة . و علي سبيل المثال البناء بالأماكن الحساسة بيئيا و التلوث بالزيت و المخلفات الصلبة و تدمير بيئة الشعاب المرجانية بالأعداد الزائدة للغواصين بأماكن الغوص أو باستخدام المخطاف علي الشعاب المرجانية علاوة علي الصيد بالقرب من الشعاب المرجانية أو صيد الأنواع الممنوع صيدها. و للحفاظ علي المصادر الطبيعية لا بد من اتباع منهج علمي يعتمد علي إعداد خطة إدارة متكاملة للمنطقة ككل . و يتم من خلال هذه الخطة إعداد برنامج للرصد البيئي للمصادر الطبيعية المختلفة و تقييم الأثر البيئي للأنشطة الصناعية والسياحية و التجارية مع الوضع في الإعتبار أن نجاح جميع هذه الأنشطة يعتمد في المقام الأول علي حماية البيئة للوصول إلى مرحلة التنمية المستدامة بيئيا.