THE STATUS OF CORAL REEFS IN EGYPT - 2000

Nicolas Pilcher[1] & Mohammed M. Abou Zaid[2]

[1]Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia Email: nick@tualang.unimas.my
[2]Marine Biology and Fish Science Section, Zoology Dept., Faculty of Science, Al-Azhar university, Cairo, Egypt. Email: zizo90@hotmail.com

Executive Summary
The Arab Republic of Egypt is home to over 1800 km of diverse coral reef habitats along the western Red Sea coast and in the Gulfs of Suez and Aqaba. Until recently the reefs were considered healthy and free of major anthropogenic stresses but recently sedimentation from land reclamation works, oil spills and physical damage from the recreational SCUBA diving industry have taken their toll, and coral cover at many places has dropped by up to 30 %.

Corals accounted for 55 % of reef cover in non-sheltered areas and 85 % of cover in sheltered areas. The percentage of live coral cover was highly variable along the coast, with the highest cover occurring on reef walls and the leading edges of the reefs. Southern reefs housed a greater diversity of fish species than northern reefs, while exposed reefs contained higher diversity of fishes than sheltered reefs. The El Niño/La Niña event of 1997/1998 resulted in significant levels of bleaching. The reefs are under a number of anthropogenic impacts including recreational SCUBA diving practices, oil spills, land reclamation and sedimentation. Natural threats include flooding, disease and predator outbreaks.

Egypt currently has four Marine Protected Areas that include coral reefs, established around the Sinai peninsula at sites where recreational SCUBA diving is common and the threat from anchor and flipper damage is high. There are seven additional areas that have been proposed or suggested to the Government for protected status.

There are three national institutions tasked with the management of coral reef resources, the Tourism Development Agency, the Egyptian Environmental Affairs Agency and the three Red Sea Governorates. In addition, there are several secondary agencies which play a role in environmental management including the Egyptian General Petroleum Corporation and the National Committee for Integrated Coastal Zone Management A number of tertiary agencies are also responsible for the protection of the marine environment.

Egypt is a signatory to a number of international conventions under which the conservation of coral reef resources is stipulated or indirectly addressed. The country has also enacted a number of laws and presidential decrees through which coral reefs receive direct or indirect protection. Mechanisms are underway to streamline coastal zone management through projects funded by Danida, USAID and the GEF. To improve the current response to and mitigation of natural and anthropogenic threats, the development of an integrated coastal area management plan, the review and upgrade of existing regulations and more efficient monitoring and control of pollution sources and coastal development are required.

1. Introduction

The Egyptian Red Sea coast extends approximately 1800 km along the Gulfs of Suez and Aqaba and the Red Sea, and is bordered by fringing reefs for most of this length. There are also several submerged reefs and fringing reefs surrounding some 35 small islands (Fig. 1).

The Arab Republic of Egypt is a member of the Regional Organisation for the Protection of the Environment of the Red Sea and Gulf of Aden (PERSGA). Matters pertaining to the conservation and management of the coral reefs falls under the auspices of the Egyptian Environmental Affairs Agency (EEAA), and are closely linked with the regional Strategic Action Plan currently being developed and implemented by PERSGA.

Rapid, uncontrolled development over the last few decades has resulted in a number of anthropogenic threats to the reefs, including high sedimentation rates, dredging, destructive fishing, tourism and curio trading. Resort development is proceeding rapidly, threatening the valuable coral reef resources (Jameson et al. 1995). The reefs in the Hurghada area, for instance, have been placed under a significant amount of stress through anchor and flipper damage (Jameson & Smith 1997), and an initiative funded by ISAID has provided a number of permanent mooring buoys to mitigate these effects. Non-anthropogenic threats included flood run-off, infestations by the crown-of thorns *Acanthaster planci* and high sea temperatures, resulting in severe bleaching.

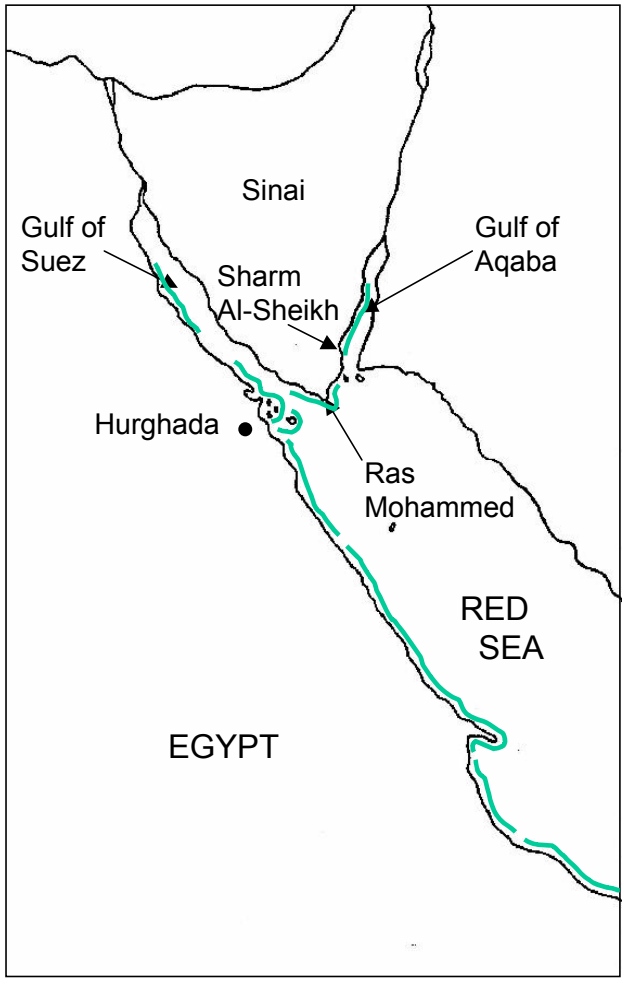

Fig. 1: Coral reef coverage along the Egyptian coastline.

Egypt has subdivided the future requirements for coral reef conservation into three major categories: Information requirements, development challenges, and public awareness. Under information requirements, it is recommended that advance mapping techniques be employed to update current reef extent data, and that reef monitoring be prioritised in areas of recreational and industrial use be continued and incorporated into coastal management plans. Development challenges include improving sewage treatment and outfalls, including collection and recycling of solid wastes, testing and implementing the national Oil Spill Pollution Response Protocol, developing flood control mechanisms, minimising siltation and careful planning of tourism operations within the coastal zone. Finally, it is recognised that there is a need for heightened and improved information dissemination though various media, including workshops and seminars and the development of academic programmes, and a need for co-operation among the tourism and government sectors.

2. Methods

i. Geographical Scope

The most northerly reefs at near Suez. Along the eastern coast of the Gulf of Suez, patch reefs are small and penetrate to a depth of 1 - 5 m resting on calcareous sandy substrates. On the western coast of the Gulf of Suez reefs are more developed, forming a fringing reef that extends form 50 km south of Suez to Ain-Sukhna that extends 30 - 40 m offshore and sloping from 1 - 5 m depth. There are extensive reefs in the southern Gulf of Suez, on the Sinai peninsula at Ras Mohammed and surrounding the Ashrafi islands close to the western shores of the Gulf. In the Gulf of Aqaba there are narrow fringing reefs along the steep cliffs of both shores. At the mouths of *wadis* (river valleys) and across bays the fringing reefs extend outward up to 1 km from shore. In the Red Sea proper, fringing reefs extend from Gubal at the north nearly continuously to Halaib, at the border with Sudan. These reefs are 25 - 150 m wide at the northern end, increasing to 500 m wide from Marsa Alam to Shalatein. At Shalatein the reef then extends up to 12 km from shore to Mirear island, decreasing in width (to 50 m) southward to Abu Ramad.

Surveys were carried out by staff from the Suez Canal University and the Al-Azhar University between 1997 and 1999 from Hurghada to Shakateen, covering 130 reef sites to evaluate the status of coral reefs and associated communities. In addition, more detailed studies were carried out at 11 sites close to Hurghada to assess the impact of recreational diving on reef habitats. Abou Zaid (2000) summarised data collected by the Egyptian Red Sea Coastal and Marine Resources Management Project, the Ecological Sustainaable Tourism Project and the Coral Reef Biodiversity Project to provide an recent overview of reef status. Rapid Environmental Asssessments (REAs) were made at 48 frequently visited dive sites as part of the Environmentally Sustainable Tourism Project (Jameson et al., 1997).

ii. Survey Techniques

Survey methodology generally followed that outlined in Wilkinson et al. At the detailed study sites, ten replicates of a 4 m^2 quadrat were used at 5 m and 10 m to assess coral and fish community structures, comparing heavy and moderately dived sites with control sites at which no diving occurred. In the REA project, quadrat sampling over a one hour period at 43 sites yielded data on percent life form coverage, and the IUCN quantitative line transect method (Pernetta 1993) was used to obtain detailed data at five heavily used sites.

4. Status of Coral Reefs – Benthos and Fish

i. Summary

Corals accounted for 55 % of reef cover in non-sheltered areas and 85 % of cover in sheltered areas. The percentage of live coral cover was highly variable along the coast, with the highest cover occurring on reef walls and the leading edges of the reefs. Coral cover levels were correlated with levels of siltation, with higher siltation resulting in lower coverage, such as in the Gulf of Suez. Southern reefs housed a greater diversity of fish species than northern reefs, while exposed reefs contained higher diversity of fishes than sheltered reefs, attributed to the lower incidence of divers and fishermen.

ii. Coral Diversity

Reefs in the north were more diverse than those in the south, with nearly double the number of coral species and genera (Table I). The distribution and development of reef-building corals was restricted by several physio-chemical parameters, including temperature, sediment load, salinity and light.

Table I: Number of genera and species of reef building corals in the Egyptian Red Sea (Source: Abou Zaid, 2000).

Region	*Genera*	*Species*
Gulf of Aqaba	47	120
Gulf of Suez	25	47
North Red Sea	45	128
Central Red Sea	49	143
South Red Sea	31	74

iii. Coral Cover

The percentage of live coral cover generally ranged from 11 to 35 % in the reef flat areas (Table II), while the highest cover was found along the reef walls (ranging from 12 to 85 %) and reef slopes (5 - 62 %). Variation in coral cover was attributed to siltation caused by flooding and mining activities, and recreational scuba diving.

Table II: Average coral cover along the Egyptian coastline (Source: GEF 1977).

Sector	*Reef Zone*			
	Reef Flat	Reef Edge	Reef Wall	Reef Slope
North of Hurghada	30	65	68	35
Hurghada - Safaga	18	25	50	20
Safaga - Qusseyr	16	45	33	20
Qusseyr - Marsa Alam	14	25	50	5
Marsa Alam - Hamatah	11	20	45	12
Hamatah - Barnes	12	20	22	10
Barnes - Shalatein	20	11	12	45
Shalatein - Halaib	35	48	85	62

Overall there has been a decline in coral cover at most sites in the Egyptian Red Sea (Table III). Coral cover has decreased by 20 to 30 % and the percentage of recently dead coral (normally through anchor and flipper damage) has increased by several factors. Surveys by

the Marine Conservation Society also indicate deteriorating trends between 1981 and 1996 at Shaab Fanadir and Giftun Saghir (Wood et al. 1996).

Over 40 % of dive sites had less than 30 % hard coral cover, of which more than one third had significant levels of broken coral (Jameson et al. 1997).

Table III: Historical comparison of reef composition at three dives sites in the northern Red Sea (adapted from Jameson et. al. 1997).

	Al Aruk		*Small Giftun*		*El Erg 3*	
	1987	*1996*	*1987*	*1996*	*1987*	*1996*
Hard Coral	36.8	24.1	49.9	22.0	60.9	49.2
Soft Coral	23.6	15.6	12.5	3.1	16.6	19.8
Rubble	1.7	5.0	3.6	3.6	0	1.5
Recently broken coral	10.9	0	9.2	0	0.2	0.2
Recently dead coral	0	5.5	1.3	3.5	0.5	6.0

iv. Fish Communities

Abou Zaid (2000) reported a total of 261 fish species representing 89 genera in 46 families, and that southern reefs housed a greater diversity of fish species than northern reefs. Exposed reefs contained higher diversity of fishes than sheltered reefs, which was attributed to the lower incidence of divers and fishermen in these areas. The most abundant family was the Pomacentridae (damselfishes), represented by 16 to 26 species across all sites, followed by the Labridae (wrasses), represented by 20 species. The most common damselfish was *Chromis dimidiata*, and the most common wrasse was *Labricus quadrilineatus*. The least abundant family was the Scaridae (parrotfishes), represented by only nine species, of which *Hipposcarus harid* and *Scarus ferrugineus* were the most common. Among the Acanthuridae (surgeonfishes), N*aso literatus, Acanthurus negrifuscus* and *A. sohal* were the most common species. Chaetodintidae (butterflyfishes) diversity increased in the north, with *Chaetodon larvatus, C. auriga* and *C. fasciatus* among the most common.

5. Status of Coral Reef Fisheries

i. Summary

The Red Sea fisheries contribute approximately 11 to 14 % of the total annual Egyptian fish production, including aquaculture, and nearly 16 % or marine fisheries. Of these, 44 % of fish landings are coral reef-based, with the highest landings in Suez. Large fishing boats generally fish in southern Red Sea waters, but land their catch in Suez. Total catch increased in 1993, but declined from 1994 to 1998. Fishery activities are regulated by the General Authority for Fish Resources Development (GAFRD) of the Ministry of Agriculture. GAFRD aims to increase fish catches to 70 thousand tonnes by 2017, but there is currently no active management of the Egyptian Red Sea fisheries.

ii. Fishery Distribution

Over seven percent of the national workforce are involved in fisheries of one kind or another (GAFRD 1989). Highest landings are reported for the port of Suez (78 % of the total), but most of the fishing boats landing their catch in Suez actually fish further south, in central and southern the Red Sea.

iii. Fishery Composition and Trends

The total number of commercial coral reef fishes species is 27, of which five make up over 48 % of the total landings, amounting to slightly over 22 thousand tonnes per annum. The balance of the catch is made up of crustaceans, offshore pelagic fishes and demersal fishes (in equal proportions). Fishery landings have decreased steadily since 1994, after a peak in 1993 which consisted of record landings of Indian and other mackerel, and sardines.

6. Threats to Coral Reef Biodiversity

i. Summary

Coral reefs are associated with a wide range of anthropogenic impacts, of which oil spills, land reclamation and sedimentation are responsible for a large extent of damage. Damage from recreational SCUBA diving practices, which also include anchor damage, is also considered significant. A number of natural phenomena, including flooding, disease and predator outbreaks also affect coral reef habitats, although it is not understood how much these are the indirect effect of anthropogenic input.

ii. Floods and Earthquakes

In Egypt, heavy rainfall causes floods from *wadis* increasing sediment loads and reducing salinity levels. These effects may extend several km offshore depending on the substrate type and severity of the flood.

iii. Disease

A number of coral diseases prevalent in the Red Sea have been found in Egyptian waters, including black band and white band disease, believed to be the result of cumulative stresses from anthropogenic impacts such as high nutrient (chemical) and sediment (physical) loads.

iv. Predator Outbreaks

Major outbreaks include infestations of the crown of thorns starfish (*Acanthaster planci*), sea urchins (*Diadema* sp.) and gastropod snails (*Coralliphyllia* sp. and *Durpa* sp.). Coralliphyllia violacea was found to feed intensely on Porites sp. at several sites along the Red Sea (Abou Zaid et al. 1999). *Acanthaster planci* was rarely observed prior to the 1990s. In 1994 there was a moderate outbreak (200 individuals) at Ras Mohammed in south Sinai. It was estimated that the 20 - 30 cm sized starfish caused a loss of 20-30 % of total live coral cover. From 1995 to 1998 the populations of starfish appeared to increase in density, with records of up to five starfish per 10 m^2 (Salem 1999). In 1998 a further outbreak of approximately 250 to 300 small (7 -15 cm) individuals occurred at Ras Mohammed, but the greatest outbreak (10,000 individuals) occurred around Gordon reef, near Tiran island. EEAA efforts have diminished the impact of the starfish by organising the collection of over 60,000 *A. planci* between 1998 and 1999.

v. Sedimentation and Siltation

In Egypt, siltation is invariably the result of poorly planned and implemented construction. Dredging and land reclamation (landfilling) activities have resulted in the loss of numerous reef habitats. In Hurghada, a 2,900,000 m^2 reef flat was landfilled, and the sediments plume

from this activity extended several km from shore between 1994 and 1997. Mandatory Environmental Impact Assessment studies have curtailed landfilling operations.

vi. Sewage, Phosphate Ore Washing, and Nutrient Enrichment
Sewage and phosphate ore washing (such as that at Qusseyr and El-Hamrawain) are the principal nutrient enrichment forces along the Egyptian coastline. Sewage, high in coliform bacteria and suspended solids, is normally untreated and discharged into the intertidal zones. The effect of these nutrient loads and coral habitats is not fully understood, although it is believed that they result in higher turbidity and sedimentation and reduce coral reproductive capacity. Additional wastes in the form of plastics are discharged to the sea from urban areas and shipping.

vii. Salinity Changes
Salinity fluctuations from human activities are primarily discharges from desalination plants. The higher salinity discharges increases coral mucous production and results in the expulsion of zooxanthellae and eventual bleaching and algal overgrowth in coral colonies. Efforts are underway by the EEAA to enforce the dilution of the brine prior to reintroduction to the sea to mitigate these effects.

viii. Destructive Fisheries
Unsustainable fishery practices include spear fishing, the use of closed mesh nets, and dynamite (blast) fishing have been reported to occur along the Egyptian coastline (Reigl & Luke 1998). These practices remove many reef herbivores, resulting in changes to natural reef ecological processes such as algal blooms.

ix. Curio Collecting
Vast amounts of corals, molluscs and fish are collected for the curio and aquarium trades.

x. Recreational SCUBA Diving Practices
Major effects of the recreational SCUBA industry include anchor, trampling and flipper damage (see Jameson et al. 1999).

xi. Oil and other Hydrocarbons
The danger from oil pollution comes not only from exploration activities but also from transport, in which up to 100 million tonnes per annum may pass through the area (PERSGA 1995). Oil and gas exploration is concentrated in the gulf of Suez, with the main sources of pollution being from Ras Ghariba, Ras Shoukier, Abu Rudees, and Abu Zenimah through the inefficient operation of equipment, illegal discharges and lack of monitoring. More than 20 oil spills have occurred along the Red Sea since 1982 (Table IV). The spills involve a number of pollutants, which smother corals and poison them through hydrocarbon absorption. Oil exploration through seismic blasts is also a threat to coral reefs (Fouda 1983).

Table IV: Shipping accidents along the Egyptian coastline (1982-1994) resulting in hydrocarbon contamination (Source: Abou Zaid 2000).

Location	*Date*	*Vessel*	*Spill*	*Cause*
Gulf of Suez	1982	Unknown	Crude oil	Collision
Gulf of Suez	1989	Mbuy Samba	Crude oil	Collision
Suez Canal	1989	Lauber Horn	Crude oil	Grounding
Safaga Island	1991	Salem Express	Fuel	Sinking
Ras Ghareb	1992	Samah	Fuel	Sinking
Barnis	1993	Hamad	PVC and fuel	Sinking
Gulf of Suez	1993	Gele 15	Crude oil	Collision
Gulf of Suez	1993	Mega Biolot	Crude oil	Unknown
Suez Harbour	1994	Salam 91	Detergent	Collision
Ras Nasrami	1994	Baltabs Kiazori	Fuel	Grounding
Suez Harbour	1994	Itab	Fuel	Bunkering
Sharm El-Sheikh	1994	Balmeera	Bilges	Malfunction
Ras Shokheir	1994	Meraw	Crude oil	Collision
Ras Shokheir	1994	Hazzam	Chemicals	Discharging
Suez Harbour	1994	Rafah	Bilges	Discharging
Ras Shokheir	1994	Ocean Spirit	Ballast water	Discharging
Sharm El-Sheikh	1994	Unknown	Crude oil	Unknown
Suez Harbour	1994	GPC	Crude oil	Pipe leak

7. Marine Protected Areas (MPAs) and Level of Management

i. Summary

The Government is committed to a management programme to arrest environmental degradations and improve environmental quality. Egypt currently has four Marine Protected Areas that include coral reefs, and another two in which coral reefs are not present. These protectorates have mostly been established around the Sinai peninsula at sites where recreational SCUBA diving is common, and the threat from anchor and flipper damage is considered high. There are seven additional areas that have been proposed or suggested to the Government for protected status. The major implementing and funding bodies in each case involve the current GEF-Egypt and USAID projects.

ii. MPAs Declared

Ras Mohammed National Park: Established by Prime Minister's Decree No. 1068 in 1983, the Park occupies part of the southern portion of the Sinai peninsula (27°44'N 34°15'E) extending to and including Senafir and Tiran islands, and covers an area of roughly 750 km^2. The Park houses a particularly high diversity of flora and fauna, including coral reefs, seaweed and seagrass beds, mudflats, mangroves and other halophytic vegetation. The management plan, developed with financial and technical assistance from the European Commission, includes the development of infrastructure and training for rangers and scientific staff. The Park is an important sea turtle developmental habitat, and serves as Egypt's major marine environment education center.

Nabq: Occupying another 600 km^2 of the southern Sinai peninsula, the Naqb Multiple Use Management Area (28°15'N 34°24'E) was established by Prime Minister's Decree No. 1511 in 1992. It encompasses a number of marine and terrestrial ecosystems and is an important habitat for resident and migratory birds. The mangroves within Naqb represent the northern

limit of their extent in the Red Sea. Threats include recreational diving-related damage and uncontrolled output from a shrimp farm.

Abu Galum: Also established by Prime Minister's Decree No. 1511 in 1992, the Abu Galum Multiple use Management Area occupies part of the Sinai peninsula extending into the Gulf of Aqaba (28°41'N 34°34'E), and covers an area of roughly 500 km^2. Biologically rich in both flora and fauna, Abu Galum traverses several mountain ranges and wadi systems, freshwater springs and sand dunes. The coral reefs form one of the main SCUBA diving attractions in the region. In addition to coral reefs, the Area contains seagrass beds which support a significant level of marine life.

Elba: The Elba protectorate is by far the largest in Egypt, encompassing 35,000 km^2 of the Doaib, Gebel Elba and Abraq regions (22°10'N 36°19'E). The protectorate is home to large mangrove communities which serve as important bird breeding sites, and extensive fringing reefs along the mainland and offshore islands. The main threats within the MPA are extensive fishing activities.

iii. *de facto* and Planned MPAs

Giftun Islands and Straits of Gubal: This MPA has been proposed to the Egyptian government based on the well-developed and diverse coral reefs and rich reef-associated fauna. The islands are also important sea turtle seabird nesting areas. The total area that the MPA will cover is currently undefined. Current threats are recreation pressure, anchor damage and fishing.

Safaga Island: Small patches of coral reef surround the mangrove-lined island, which is also a seabird nesting site. It has been suggested by PERSGA that the habitat be protected through GEF-Egypt and USAID projects. The total area that the MPA will cover is currently undefined. Current threats are shipping and a small-scale fishery.

Sharm al-Lulu: This is a small bay lined with coral on both sides. It has been proposed as a MPA with support from the GEF-Egypt and USAID projects. The total area that the MPA will cover is currently undefined. Threats to the area are unknown, but believed to include tourism.

Dedalus Island: The island lies some 40 km from shore, and is mostly impacted through recreational SCUBA diving and anchor damage. It has been suggested by PERSGA that the habitat be protected through GEF-Egypt and USAID projects. The total area that the MPA will cover is currently undefined.

Zabareged Island: This is a small sea turtle nesting island surrounded by coral reefs. It has been suggested by PERSGA that the habitat be protected through GEF-Egypt and USAID projects to counter potential recreational SCUBA diving and anchor damage. The total area that the MPA will cover is currently undefined.

Brother Islands: The coralline islands support extensive and well-developed coral reefs, on which extensive diving takes place. It has been proposed that the habitat be protected through GEF-Egypt and USAID projects. The total area that the MPA will cover is currently undefined.

Al-Qusair Reef Complex: Extensive and complex submerged offshore reefs with diverse reef-associate fauna constitute the basis of this suggested MPA. The total area that the MPA will cover is currently undefined. Threats have been identified as anchor damage, coral collection and SCUBA diving-related damage.

iv. MPAs - Conclusions

Egypt has legally protected over 35,000 km^2 of the major tourist destination areas which encompass extensive and diverse coral reefs and associated fauna, and which are also important sea turtle and seabird nesting or foraging habitats. Most of this surrounds the Sinai peninsula and the Gabal Elba conservation area between Egypt and Sudan. Several smaller protected areas have been proposed to the government which include coral reefs through PERSGA, with the Egypt-GEF and USAID projects suggested as the key implementing and financing institutions.

8. Current and Potential Climate Change Impacts

Rising sea surface temperatures, especially the above-normal warm period between 1997 and 1998, resulted in a large scale bleaching and mortality of many scleractinian corals, compounding anthropogenic effects on coral reef environments. It is suggested that the slowly rising sea levels may affect the coral reef's ability to act as a natural erosion barrier, which will affect low-lying islands. Current models show that the upward growth of low lying coral cays is insufficient to keep pace with predicted rates of sea level rise. Furthermore, destruction of corals through bleaching and blasting will further reduce the amount of sand and rubble available to build up these islands. Being surrounded by fringing reefs, these sand cays will face greater wave and current erosion at higher sea levels. During summer months water temperatures increased to 30 - 35 ºC, particularly in shallow reef flat areas (30 to 50 cm deep), resulting in bleached corals in several areas.

9. Current Monitoring and Management Capacity to Conserve Coral Reef Resources

i. Monitoring Capacity

There are several institutions which carry out monitoring activities along the Egyptian coastline. The Egyptian Environmental Affairs Agency (EEAA) is responsible for monitoring pollution and damage of coastal environments. The National Institute of Oceanography and Fisheries (NIOF) has carried out investigations of fisheries and corals and associated fauna in the Hurghada region for 70 years. In addition staff from the Al-Azhar University, Suez Canal University carry out research and monitoring of coral reef habitats.

ii. Management Capacity

There are three organisations tasked with the management of coral reef resources, the Tourism Development Agency (TDA), the Egyptian Environmental Affairs Agency (EEAA) and the three Red Sea Governorates (RSG). The primary role of the TDA is to support the private sector tourism industry and to develop an institutional framework for environmentally sound tourism development, which includes developing guidelines for hotel management and follow-up application of environmental regulations and procedures. The EEAA is tasked with developing environmental preservation policy and legislation, and reviewing environmental Impact assessment studies. The EEAA also is responsible for the

control of pollution, National Park management and coastal zone management, including law enforcement for coastal recreational activities. In addition, the EEAA recommends the accession to regional and international conventions related to the environment. The RSG is responsible for promoting tourism and regulating land allocation and hotel construction within city limits through zoning and the issue of permits.

In addition to the three primary organisations, there are several secondary agencies which play a role in environmental management. The Egyptian General Petroleum Corporation (EGPC), which is responsible for oil and gas exploration, controls the activities of international oil companies and has developed an oil spill response capability in Ras Ghareb on the Gulf of Suez. At present, the equipment available for tackling oil spills is only suitable for small spills in good weather. The National Committee for Integrated Coastal Zone Management (NCICZM) co-ordinates coastal activities among competent authorities by developing guidelines for all activities, including EIAs. The NCICZM is responsible for harmonizing development with carrying capacity of coastal ecosystems, and for co-ordinating and specifying mandates for authorities in the coastal area.

Finally, a number of tertiary agencies are also responsible for the protection of the marine environment. These include the Port and Lighthouse Authority, the Suez Canal Authority, Suez Port Authority, General Authority for Fish Resource Development (GAFRD) and the General Organization for Coastal Protection.

10. Government Legislation, Strategies and Policy Pertinent to Reef Conservation

i. Summary

Egypt is a signatory to a number of international conventions under which the conservation of coral reef resources is stipulated or indirectly addressed. At the same time, since the early 1980s the country has enacted a number of laws and presidential decrees through which coral reefs receive direct or indirect protection.

ii. International Agreements

Egypt is a member of the Regional Organisation for the Protection of the Marine Environment of the Red Sea and Gulf of Aden (PERSGA) and subscribes to the Protocol for Regional Cooperation for Combating Pollution by Oil and other Harmful Substances in Cases of Emergency (1982). It is a signatory to the Convention for the Prevention of Pollution of the Sea by Oil (MARPOL), the Convention on Wetlands of International Importance (RAMSAR), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the African Agreement for the Conservation of nature and natural Resources (Algiers 1988) and the Convention on Biological Diversity (CBD).

iii. National Legislation

A number of Presidential decrees and Public laws have been formulated dealing with oil and other forms of pollution, coastal development and tourism, through which coral reefs receive direct and indirect protection (Table V).

Table V: National laws and decrees which directly or indirectly affect coral reef protection.

Law, Ordinance, Regulation	*Year*	*Implementation*
Public Law No. 280	1960	Ministry of Defense
MoD Decree No. 56	1962	Ministry of Defense
Presidential Decree No. 1984	1965	Ministry of Petroleum
Public Law No. 72	1968	Ministry of Tourism
Presidential Decree No. 691	1972	Ministry of Tourism
Establishment of Protectorates Law No. 102	1983	Ministry of Environmental Affairs
Prime Minister's Decree No. 1068 (Ras Mohammed National Park)	1983	Ministry of Environmental Affairs
Prime Minister's Decree No. 1429	1985	Ministry of Environmental Affairs
Presidential Decree No. 152	1986	Ministry of Environmental Affairs
Prime Minister's Decree No. 450	1986	Ministry of Environmental Affairs
Prime Minister's Decree No. 1186	1986	Ministry of Environmental Affairs
Prime Minister's Decree No. 459	1988	Ministry of Environmental Affairs
Presidential Decree No. 478	1988	Ministry of Environmental Affairs
National Environmental Action Plan	1991	Ministry of Environmental Affairs
Prime Minister's Decree No. 1511	1992	EEAA
Public Law No. 4	1994	EEAA
Prime Minister's Decree declaring 22 islands and mangrove areas as protected areas	1995	Ministry of Environment

11. Gaps in Capacity and Requirements for Improved Conservation

i. Summary

One of the major gaps that has been identified in the process of coral reef conservation is that of appropriate information. While there are several hundred publications on Red Sea coral reefs, few of these address specific problems and offer management solutions. There is currently no water quality database on which repeated measurements can be based and compared. There is also a need to establish detailed, refereed species lists for each area covering corals and their associated fauna, and fishery resources. It is also necessary for Egypt to participate in regional and global information networks, and to develop national training and education programmes through the use of local and international experts.

ii. Research

Research needs to be carried out in order to establish baseline environmental conditions, and follow-up monitoring should refer to these baselines to detect changes in environmental quality.

iii. Networking

There is a need to integrate current research into global initiatives such as ICRI and GCRMP.

iv. Training

There is a need for training in the use of modern technology, including SCUBA, ROVs, side-scan sonar, satellite mapping and GIS.

v. Planning

Direct use and indirect development activities that affect reef systems need to be carefully evaluated in the design stages, and be subject to continued monitoring through the implementation stages.

vi. Community Education

There is a need to develop community education programmes that highlight the role of communities in reef ecology, including degradation.

12. Recommendations to Improve the Conservation of Coral Reef Resources

i. Summary

A number of actions are needed to improve Egypt's current response to and mitigation of natural and anthropogenic threats, to allow a more co-ordinated approach to coral reef management and conservation, and to develop the information baselines upon which sound decision making can occur. These involve the development of an integrated coastal area management plan, the review and upgrade of existing regulations and more efficient monitoring and control of pollution sources and coastal development.

ii. Zonation and Protection

Key marine areas should be assigned extra protection through strict planning. A comprehensive coastal zoning scheme is needed in which four land classes are recognised:

- Urban and development areas in which commercial and industrial development assessments should be carried out.
- Standard areas where normal planning regulations apply and in which EIAs should be carried out.
- Multiple Use Management Areas in which development is restricted but traditional uses continue.
- Marine parks and Reserves which afford complete protection to species and habitats.

iii. Coastal Zone Management

A comprehensive, integrated plan is needed to address development along coastal areas, and to harmonize existing conservation projects.

iv. Pollution Control

Local and regional pollution monitoring units should be established, along with the provision of adequate reception facilities for petroleum wastes, guidelines for the use of dispersants, a review of existing pollution control regulations and the development of a contingency plan for pollution control. Also needed are improved sewage treatment facilities and diversion of outfalls away from reef habitats, and effective collection and recycling of solid wastes. To curtail sedimentation, silt curtains, berms and other mechanical aids should be used around coastal construction.

v. Geographical and Biological Data Sets

Complete, up-to-date data sets on the biological components of the coastal zone are needed for effective management. These should include fishery stock assessments, shoreline profiles, land use patterns, and coral reef resources.

vi. Information

National training programmes are needed to raise institutional capacities of key agencies involved in coral reef management, linking decision makers with the facts needed for sound environmental management decisions.

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Appendix II – Names and Addresses of Key Contacts for Egypt

Dr. Mohammed Mahmoud Abou Zaid
Associate Professor of Environmental Pollution
Al-Azhar University
Marine Science College
Nasr City,
Cairo, Egypt

Email: zizo90@hotmail.com

Dr. Mohammed Fauzi
Head, Environmental management Sector
Egyptian Environmental Affairs Agency
30 Misr-Helwan Agricultural Road
Back of Maadi Sovotel
Cairo
Egypt

Mahmoud H. Hanafyy
Marine Science Department,
Faculty of Science
Suez Canal University,
Ismailia, Egypt.

Mohammed M. A. Kotb
Marine Science Department,
Faculty of Science
Suez Canal University,
Ismailia, Egypt

Mohammed Amine
National Institute of Oceanography and Fisheries
Kayet Bay, Alexandria
Egypt

Mohammed Shokry A. Ammar
National Institute of Oceanography and Fisheries
Suez Branch
P.O. Box 182
Egypt

Yasser Awadalla
National Parks of Egypt,
Nature Conservation Sector
Egyptian Environmental Affairs Agency
30 Misr-Helwan Agricultural Road
Back of Maadi Sovotel
Cairo, Egypt

Ashraf El Cibahy
Deputy Manager of Gulf of Aqaba Protectorate Sector
Ras Mohammed Marine National Park
P.O.Box 19, Sharm Elsheikh
South Sinai,
Egypt

E-mail: sinaiparks@sinainet.com.eg

Dr. Ali I. Beltagy
National Institute of Oceanography and Fisheries
Kayet Bay, Alexandria
Egypt

Dr. Sherif E. Ramadan
National Institute of Oceanography and Fisheries
Kayet Bay, Alexandria
Egypt

Dr. Magdi A. Saleh
General Authority for Fish Resources Development
4, Tayaran Street, Nasr City
Cairo,
Egypt

Fax: 202 2620117

Dr. Mostafa A. Saleh
Al-Azhar University
Faculty of Science
Nasr City, Cairo
Egypt

Fax: 202 570 3491

Prof. Yousef Halim
University of Alexandria
Faculty of Science
Alexandria 21511
Egypt

Fax: 203 5457611

Dr. Mahmoud Khamis El-Sayed
Alexandria University
Dept. of Oceanography
Alexandria
Egypt

Fax: 203 4837221

Appendix III: Physical condition of dive sites in the northern Red Sea.

Site	*Location*	*Average Hard Coral Cover < 30 %*	*Average Recently broken Hard Coral > 5 %*	*Average Recently Dead Hard Coral > 3 %*	*Average Rubble > 5 %*	*Physical Damage at Selected Areas*
Abu Hashish	Hurghada		o			
Abu Hashish Isl.	Hurghada	o	o	o		
Abu Kafan E.	Safaga				o	
Abu Kafan W.	Safaga				o	
Abu Makhadeg	Safaga			o		
Abu Nugar	Hurghada				o	
Abu Ramada SE	Hurghada	o			o	
Abu Ramada SW	Hurghada					o
Big Giftun	Hurghada	o	o		o	
Carlos Reef	Hurghada		o	o		
El Arg	Hurghada		o	o	o	
El Arg 1	Hurghada	o	o		o	
El Arg 3	Hurghada		o			
El Eruk	Hurghada	o		o		
El Fanous	Hurghada			o		
El Fanous W.	Hurghada	o	o			
El Maalka	Hurghada	o	o		o	
Erg Megawish	Hurghada		o	o	o	
Erg Sabina	Hurghada		o			
Eshta	Hurghada		o	o		
Fanadir	Hurghada	o	o			
Gamul Sagir	Safaga			o		
Gifton Canal	Hurghada			o		
Gotta Ramada	Hurghada	o		o		
Gotta Dorfa E.	Hurghada	o			o	
Gotta Dorfa SW.	Hurghada	o			o	
Middle reeef	Safaga	o		o		
Panorama	Safaga		o			
Ras Abu Soma	Safaga			o		
Ras Um Hesswa	Safaga		o		o	
Shaab Abdallah	Safaga					o
Shaab Disha 2	Hurghada	o		o		
Shaab Disha 3	Hurghada	o		o	o	
Shaab Sabina	Hurghada			o	o	
Shaab Sheer	Safaga			o		
Shabror U Gamar	Hurghada			o		
Shahr (Salem)	Safaga			o		
Sharm El Arab	Safaga	o			o	
Sharm El Naga	Safaga			o		
Small Gifton	Hurghada	o		o		
Somaya	Hurghada	o		o		
Stone Beach	Hurghada			o		
Tobya Arba	Safaga	o				
Tobya Bada S.	Safaga					o
Tobya Hamera	Safaga			o		
Tobya kabir	Safaga			o		
Tobya Sorya	Safaga			o		
Um Gamar	Hurghada	o	o	o		

Source: Jameson et al. (1997).

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