The Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden

(PERSGA)

Regional Action Plan for the Conservation of Marine Turtles and their Habitats in the Red Sea and Gulf of Aden

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LIST OF ABBREVIATIONS AND ACRONYMS

ASEAN	Association of Southeast Asian Nations
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on Migratory Species
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
GIS	Global Information System
HBC	Habitats and Biodiversity Component
IDB	Islamic Development Bank
IOC	Intergovernmental Oceanographic Commission
IOSEA	Indian Ocean–Southeast Asian
IUCN	The World Conservation Union
MARPOL	International Convention for the Prevention of Pollution from Ships
MoU	Memorandum of Understanding
MPA	Marine Protected Area
MTSG	Marine Turtle Specialist Group
NCWCD	National Commission for Wildlife Conservation and Development
NIO	Northern Indian Ocean
NOAA	National Oceanic and Atmospheric Administration
PERSGA	Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden
RAP	Regional Action Plan
ROPME	Regional Organization for the Protection of the Marine Environment
RSGA	Red Sea and Gulf of Aden
SAP	Strategic Action Programme for the Red Sea and Gulf of Aden
SSC	Species Survival Commission
SSM	Standard Survey Method
TED	Turtle Excluder Device
TIHPA	Turtle Islands Heritage Protected Area
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNEP-ROWA	UNEP - Regional Office for Western Asia
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHC	World Heritage Convention
WWF	World-Wide Fund for Nature

ACKNOWLEDGEMENTS

PREFACE

Marine turtles are some of the oldest surviving reptiles on the planet, and have inhabited the tropical seas and oceans for millions of years. More recently our actions have brought many populations to the brink of extinction. Mankind has used sea turtles and their products for thousands of years, for food and a host of other applications. Today, turtles also provide a range of non-consumptive benefits through tourism, education, research, and employment. Turtles are also irreplaceable ecological resources in that they function as key individuals in a number of habitats, and can play the role of indicator species for the relative health of their surroundings. Turtle habitats have a tangible value to society, in that they also support commercial fish and invertebrates (seagrass beds, open oceans and coral reefs, among others), which are highly valued. Turtles can act as flagship species for conservation programmes, and because the conservation of turtles and their habitats addresses vast and diverse marine areas, they indirectly protect the complex and interconnected world on which humans depend.

PERSGA has taken several steps towards the conservation of marine turtles. Initially a set of regionally applicable standard survey methods for marine turtles was developed. The second step involved training regional specialists in these methods. Surveys were then conducted to determine the status of marine turtles within the region. The fourth step was the preparation of this Regional Action Plan (RAP) for the Conservation of Marine Turtles in the Red Sea and Gulf of Aden.

Immediate adoption and implementation of the Marine Turtles RAP will lead to a reduction in threats to marine turtles. Particular attention is given to identifying actions that can be taken to alleviate the threats that are considered to be most severe. The RAP identifies and prioritises a set of actions related to the conservation of marine turtles and their habitats.

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Secretary General of PERSGA

EXECUTIVE SUMMARY

This plan provides a set of priority actions for the conservation of marine turtles and their habitats in the Red Sea and Gulf of Aden (RSGA). All species of marine turtle have been classified as endangered and are listed by CITES in Appendix I. This region supports globally important feeding and nesting grounds for populations of green, hawksbill and loggerhead turtles in particular. Turtles are migratory; they may swim considerable distances from their feeding grounds to their nesting beaches. Recent nesting surveys carried out in Djibouti by PERSGA have discovered a migratory route from as far away as Sri Lanka. Turtle conservation requires international cooperation to be successful, both between countries and between regions.

The main threats to the maintenance of stable turtle populations are now well understood. They range from local threats at nesting beaches caused by litter or marine debris, opportunistic capture or egg removal, to global threats such fishing mortality particularly associated with trawling operations, and threats from pollution incidents.

Following a brief introduction to the marine turtles of the region and activities that have been carried out in the past to promote conservation, this Regional Action Plan addresses the primary causes of turtle mortality with a series of proposed actions. These actions include:

- identifying the populations most at risk
- reducing threats to turtle populations from commercial fisheries, land development operations, and human interference
- implementing programmes that provide alternatives to communities dependent on turtle populations for their survival or livelihood
- regulating direct capture and trade in turtles
- developing nesting beach programmes to maximise hatchling recruitment
- and promoting turtle rescue and rehabilitation along with public awareness activities.

It is recognised however that reducing the threats to marine turtle populations alone will be insufficient to guarantee their survival. Hence a further set of recommendations considers the importance of protecting and conserving marine turtle nesting and feeding habitat, research and monitoring, community education and participation in conservation activities, the capacity of national agencies to carry out the necessary management activities and to enforce legislation, and securing funding for turtle conservation measures.

An extensive reference list is supplemented with suggested additional titles and a set of useful appendices.

For each of the regional and national priority actions identified, expected results and performance indicators are defined. Designation of a level of urgency to each specific priority action allows a phased approach to implementation, subject to budget and available national capacity. The levels of urgency do not necessarily indicate the sequence of priority.

To assist effective implementation, a steering committee will be formed to coordinate the RAP over its initial period of implementation. The committee, composed of representatives from PERSGA and the major regional and national organisations, will act as the interface between governments, major donor agencies and international turtle conservation initiatives. In individual

countries, implementation will occur through integrated networks of national and local working groups, government departments, agencies and personnel, non-governmental organisations and other stakeholders.

SCOPE OF THE PLAN

This plan acknowledges that there exist a number of gaps in the knowledge of the status of marine turtles and their habitats in the Red Sea and Gulf of Aden. It draws on discussions held during the PERSGA-sponsored Sea Turtle Training Workshop held in Yemen in December 2000, the recently-completed preliminary country surveys, and previous scientific literature as the basis for determining the conservation needs and actions that will result in the sustainable management of marine turtles in the region.

The Action Plan takes its structure and recommended courses of action from both the *Conservation and Management Plan* (which was developed as part of the *Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia[1]*), and the *Global Strategy for the Conservation of Marine Turtles* published by the Marine Turtle Specialist Group of the IUCN Species Survival Commission.

The structure of the Plan reflects a combination of the two documents, and where possible attempts to maintain similar language for consistency. The Action Plan is designed to be implemented by the appropriate agencies in each nation with the mandate to conserve marine turtles, although it is acknowledged that in several cases marine turtles are not addressed directly in the mandates of any particular institution, and responsibilities for conservation actions outlined in the Plan may be shared among the relevant bodies.

The actions contained herein concern specific regional needs and conservation actions, but are not intended to restrict any given nation from expanding on these actions depending on individual needs and concerns. PERSGA member states may wish to develop a Memorandum of Understanding (MoU) for the conservation of marine turtles in the region along the same lines as other regional turtle conservation initiatives. (Some suitable activities may be drawn from the Indian Ocean–Southeast Asian MoU and other documents, which are included in Appendices VI-VIII for convenience and reference purposes only.)

USING THIS ACTION PLAN

The conservation of marine turtles and their habitats can be rationalized through prioritisation of activities, projects and programmes grouped into eight major categories, each of which is individually examined below. The actions listed under each of the eight main components are not exclusive, and often overlap. The main components are:

1. Reducing direct and indirect causes of marine turtle mortality
2. Protecting, conserving and rehabilitating marine turtle habitats
3. Research and monitoring
4. Public awareness, information and education

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[1] The *Memorandum* is an agreement reached under the auspices of the Convention on Migratory Species which covers the Indian Ocean and its associated bodies of water.

5. Community participation in conservation

6. Building capacity for conservation, research and management

7. Integrated management for marine turtles, and

8. Funding for marine turtle conservation

In keeping with existing PERSGA documentation, this plan adheres to the format of the Regional Action Plan (RAP) for Coral Reefs in the Red Sea and Gulf of Aden, whereby key issues and actions are outlined under each component of the RAP. Time frames under "expected results and outcomes" indicate the number of months required to achieve the result or outcome, starting from the launching of the Regional Action Plan for Marine Turtles and their Habitats. The level of urgency for each action is indicated as:

*** - **very urgent**, where immediate action or intervention is required, as for example to protect habitats and ecosystems under severe threat;

** - **urgent**, where intervention is required to ensure the continued viability of species, communities or ecosystems of regional or global importance;

* - **priority**, where there is an institutional set-up or there are on-going projects and opportunities for co-operation with existing efforts.

The priority designation for each of the expected results and outcomes was devised using a number of criteria, which included the available knowledge on the effectiveness and response times for various past conservation actions, the potential immediate impacts of prescribed actions on marine turtle populations, the status of marine turtle nesting and foraging populations in the RSGA region, and the expected levels of technical input and investment of resources for the conservation of marine turtles and their habitats by the various government, research and conservation agencies.

1. INTRODUCTION

1.1 Geographical Setting

This Plan addresses the conservation of marine turtles and their habitats in the Red Sea and Gulf of Aden (Figure 1) in line with the objectives and mission of the Habitats and Biodiversity Component (HBC) of the Strategic Action Programme (SAP) for the Red Sea and Gulf of Aden. The region encompasses various distinctly different marine and coastal habitats, containing complex and unique tropical marine ecosystems with high biological diversity and many endemic species. The coastal habitats are surrounded by some of the driest land in the world, such that continental influences are limited, but the waters are major shipping lanes due to regional petroleum reserves, with high-risk bottlenecks at the narrow Bab Al-Mandab, and the Gulf of Suez. While parts of the region are still in a pristine state, environmental threats (notably from habitat destruction, over-exploitation and pollution) are increasing rapidly, requiring immediate action to protect the region's coastal and marine environment.

Figure 1. The Red Sea and Gulf of Aden region

The Red Sea is a semi-enclosed water body and a reservoir of marine biodiversity of global importance, home to the best developed coral reefs in the western Indian Ocean. It is approximately 2000 km long, and 300 km wide at its widest part, with depths that exceed 2,000 m. The Red Sea coast and islands support a variety of coastal and marine habitats. These are related largely to the oceanographic regime, degree of exposure, and topographic features, particularly the distribution of suitable antecedent topography for development of coral reefs, mangrove stands and seagrass beds. With its relative isolation, an extraordinary range of ecosystems, biological diversity and endemism has developed.

The Gulf of Aden extends between the southern reaches of the Arabian Peninsula and the African coast from Djibouti to the easternmost tip of Somalia. It is influenced by seasonal upwellings that limit coral reef development and promote planktonic and macroalgal growth. Despite this, there are many areas of biological importance, including seagrass meadows and mangrove stands. Some of the sandy beaches are major nesting sites for sea turtles, and the Socotra Island Group has been nominated as a UNESCO Man and Biosphere Reserve.

1.2 Marine Turtles in the RSGA

Marine turtles are some of the oldest surviving reptiles on the planet, and have inhabited the tropical seas and oceans for millions of years. Recently, mankind's actions, in particular in the 19th and 20th centuries, have brought many populations to the brink of extinction. Turtles appeared in the late Triassic circa 200 million years ago (PRITCHARD 1997), and have survived relatively unchanged since that time through their adaptation to marine environments. There are several key anatomical and physiological features that are common to all sea turtle species and which set them apart from other Testudines such as non-retractile limbs, extensively roofed skulls, limbs converted to paddle-like flippers, and salt glands to excrete excess salt. As is the case with other reptiles, the sex of hatchlings is dependent on temperature during incubation, particularly during the third and fourth weeks (MILLER 1985; MILLER & LIMPUS 1981).

Sea turtles and their products have been used by mankind for thousands of years as a basis for food and a host of other applications. Today, turtles also provide a range of non-consumptive benefits through tourism, education, research, and employment. Turtles are also irreplaceable ecological resources, in that they function as key individuals in a number of habitats, and can play the role of indicator species for the relative health of their surroundings. These habitats have a tangible value to society, in that they also support commercial fish and invertebrates (seagrass beds, open oceans and coral reefs among others), which are valued by mankind. Turtles can act as flagship species for conservation programmes and, because the conservation of turtles and their habitats addresses vast and diverse marine areas, they indirectly protect the complex and interconnected world on which humans depend.

Today, there are seven species of sea turtles in existence: the leatherback *Dermochelys coriacea* (Family Dermochelydae), the loggerhead *Caretta caretta*, the hawksbill *Eretmochelys imbricata*, the olive ridley *Lepidochelys olivacea*, the Kemp's ridley *Lepidochelys kempi*, the green *Chelonia mydas* and the flatback *Natator depressus* (all in the Family Cheloniidae). An eighth species, the black turtle *Chelonia agassizii* is currently the subject of debate among biologists, having first been described by BOCOURT (1868) but later disputed by BOWEN et al. (1993). Of these, the green, loggerhead and hawksbill are the most common in the Red Sea and Gulf or Aden (RSGA), with the leatherback and olive ridley infrequently seen, and with no recorded nesting. All marine turtles share a similar lifestyle (see Appendix I), which has made them relatively similarly threatened by anthropogenic activities. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) lists all marine turtles on its Appendix I (prohibited from international trade). The World Conservation Union (IUCN) lists *Caretta caretta* as Vulnerable and the remainder are listed as Endangered or Critically Endangered. Marine turtles migrate and disperse over vast distances. This makes their survival dependent on their conservation over a wide area and in a wide range of marine and coastal habitats.

Of the major nesting populations found in the RSGA, the green, hawksbill and loggerhead are the most common. The green is an herbivorous marine turtle that forages on shallow seagrass beds and usually undertakes long sea migrations to nest on isolated sandy beaches (HIRTH 1997). Excluding recent efforts by PERSGA, green turtle populations were surveyed in detail in Saudi Arabia for the first time in 1986 and 1987 (MILLER 1989). This work was followed up by the National Commission for Wildlife Conservation and Development from 1989 until 1997 (AL-MERGHANI et al. 2000; PILCHER 1999a; PILCHER & AL-MERGHANI 2000). A synopsis of all the work carried out in Saudi Arabia is presented in AL-MERGHANI et al. (2000). Green turtles were also studied in Yemen over 20 years ago (HIRTH & CARR 1970; HIRTH et al. 1973), and more

recently through a UNEP study (UNEP/IUCN 1996); in the Egyptian Red Sea fifteen years back (FRAZIER & SALAS 1984), and briefly in Somalia (IUCN 1997; SCHLEYER & BALDWIN 1999).

Hawksbills are circumtropically distributed and often inhabit coral reefs where they feed on a number of invertebrates, sponges in particular (CARR & STANCYK 1975; MEYLAN 1988). Hawksbills have been studied in Sudan (ABDEL LATIF 1980; HIRTH & ABDEL LATIF 1980), Yemen – including the islands of Socotra (FAO 1973; GREEN 1996; UNEP 1985), the Egyptian Red Sea (FRAZIER & SALAS 1984) and Saudi Arabia (MILLER 1989; PILCHER 1999b), where they are found in both the Red Sea and the Arabian Gulf, but are only known to nest in significant aggregations on one of the Gulf's small islands. These studies do not include the recent efforts by PERSGA to address the lack of data at a regional level (PERSGA 2003a-e).

Loggerheads feed predominantly on crustaceans and molluscs, and inhabit shallow water reef assemblages. They have only been studied extensively in Socotra, Yemen (PILCHER & SAAD 2000), with only minor references in other works. No other reports are available.

1.3 Critical Life-History Adaptations and their Relationship with Conservation

The physiological design and biological adaptations of sea turtles have remained unchanged for millions of years. Certain aspects of their natural history set them apart from most marine inhabitants and, when combined with modern technology and population pressures, may prove detrimental to their long-term survival.

Habitat Requirements and Threats

Sea turtles need a number of different habitats to complete their natural life cycle (NRC 1990). From eggs deposited on clean sandy beaches, to hatchlings migrating through unpolluted waters, in shallow foraging sites such as seagrass beds, worm reefs and coral reefs, and in deep oceans teeming with life, turtles depend on habitats that circumscribe the tropics and even extend to far northern and southern latitudes. On some beaches there is a small risk of density dependent nesting mortality as the population size grows exponentially (BALAZS 1980) and nests face higher risks of being disinterred by other nesting adults. Lighting on beaches is hazardous to emerging hatchlings as lights attract hatchlings away from the shoreline (WITHERINGTON & BJORNDAL 1990), and in many developed coastal areas may be responsible for a large percentage of hatchling loss. In Florida, there is legislation that controls light-use close to turtle beaches (LUTCAVAGE et al. 1997). Nesting habitats are threatened by the disappearance of beaches through sea level rise and erosion processes (ACKERMAN 1997), beach nourishment, armouring and sand mining, and through residential development (LUTCAVAGE et al. 1997). In the open sea turtles face the risk of fishery mortality (POINER & HARRIS 1994), and oil pollution (HUTCHINSON & SIMMONDS 1992). At foraging sites turtles are threatened by marine debris (BALAZS 1985), destructive fishing practices such as blast and cyanide fishing (BJORNDAL 1996; PILCHER & OAKLEY 1997), anchors and propellers, siltation and the use of bottom trawls in seagrass ecosystems (BJORNDAL 1996).

Migrations

One of the characteristics that has intrigued biologists through time is the periodic migrations marine turtles make to and from nesting and foraging sites, sometimes over vast distances. Adult females do not necessarily nest at the closest rookery to the feeding area, as noted with green and hawksbill populations along the Great Barrier Reef (LIMPUS et al. 1983). Turtles make "very deliberate journeys to specific geographical targets" with green turtle females showing high site fidelity after remigrations, generally of 2-4 years (LIMPUS et al. 1992).

These migrations entail the use of open oceans and seas, across international boundaries (see Figure 2), and over vast distances. Exploitation of fishery stocks on the high seas threaten the migrating turtles (the long-line fishing industries of the Pacific and Indian Ocean which continually land loggerhead and leatherback turtles are prime examples). Aggregations of turtles close to nesting beaches make them susceptible to capture in trawl-fisheries, and the added complexities brought about by international boundaries and definition of High Seas rights mean that turtles at sea are turtles at risk.
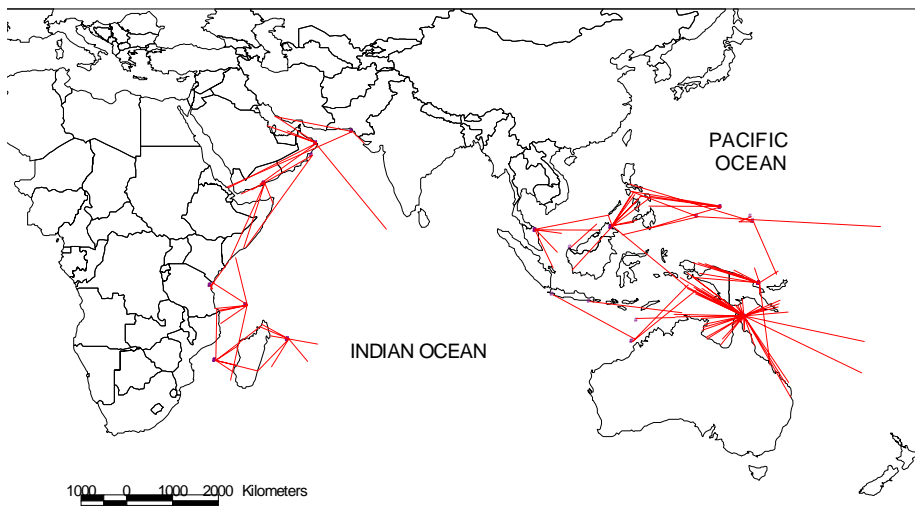
Figure 2. Known migrations of green turtles in the Indian Ocean region, as an example of the distances travelled and international borders crossed by migrating turtles (courtesy of C. LIMPUS).

Age at Maturity

Marine turtles are believed to live long lives, perhaps up to 100 years. They are known to reach sexual maturity only after 15-40 years (MILLER 1997), depending on species, presenting unique management requirements. Turtle hatchlings emerging today might only return to nest after 20-30 years, by which time few, if any, of our present scientists and managers will be following their progress. Additionally, their long absence from known feeding or foraging sites masks any changes to population sizes. For this reason, effects on long-term survival such as egg collection or adult harvesting might not be noted for a number of years, if at all (Figure 3). More importantly, their long maturation period means they face an ever-increasing number of mortality pressures over a long period of time, which hinders population restocking.
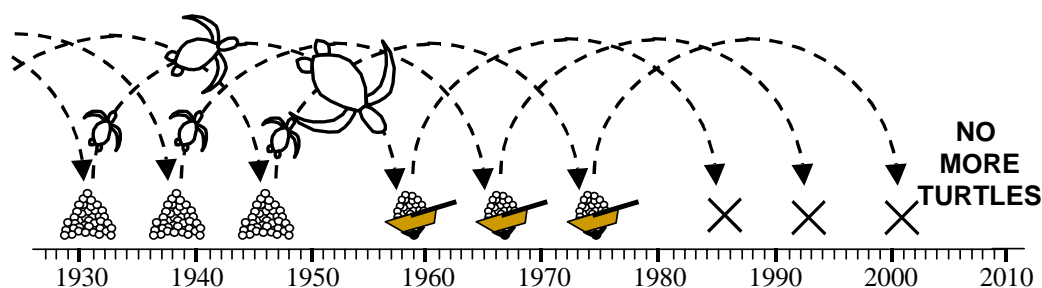
Figure 3. In a simple hypothetical case, while eggs are laid and allowed to hatch, turtles are produced; but if 100% of eggs were harvested or if 100% of turtles were harvested each year before laying eggs, there would reach a point at which no further breeding females would be available. However, this would not become apparent for another 25 years (modified after MORTIMER 1995, with permission).

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1.4 Integration of Marine Turtle Conservation with PERSGA Policy Related to the Regional Protocol on Biological Diversity

The draft *Protocol Concerning the Conservation of Biological Diversity and the Establishment of Protected Areas* provides for the conservation, protection and restoration of the health and integrity of the ecosystems and biological diversity in the PERSGA region; and to safeguard threatened species, critical habitats, sites of particular importance, and representative types of coastal and marine ecosystems, their biodiversity and their sustainable use and management, to ensure long-term viability and diversity.

Within this context the *Regional Action Plan for the Conservation of Marine Turtles and their Habitats* addresses a number of the key objectives and obligations shouldered by each country. These obligations include protecting, conserving and managing natural biological diversity with particular emphasis on threatened species, among which marine turtles are included. In addition the draft includes requirements to protect, preserve and manage in an environmentally sound and sustainable manner, areas that are unique, highly sensitive or regionally representative, notably by the establishment of protected areas many of which include key marine turtle habitat.

The Protocol also call for the adoption of strategies, plans and programmes for the conservation of biodiversity and the sustainable use and management of marine and coastal biological resources. It addresses a number of key issues relevant to marine turtle conservation including support for appropriate planning, management and supervision including legislation and monitoring measures for protected areas, and contingency plans for environmental emergencies. These issues are included within this Regional Action Plan.

1.5 PERSGA Activities in Marine Turtle Conservation

Until recently, most research on marine turtles in the region dated back more than 15-20 years and was relatively limited in scope (summarized by ROSS & BARWANI 1982). However, during 2000 PERSGA developed a standardised set of survey methods and, based on these standard survey methods, conducted a training course for trainers and country representatives in Yemen (December 2000) for 18 national specialists from all the PERSGA member states. In 2003 PERSGA implemented baseline surveys along many portions of previously-unstudied coastlines in five of the seven PERSGA member states. The surveys were led by regional specialists who provided training to national representatives and determined the present marine turtle populations and habitat status (PERSGA 2003a-e).

At present there is still a shortage of data on the distribution of habitats for marine turtles in the region, particularly their foraging sites. Many of the key population statistics such as population size and nesting season are not known. A summary of the major nesting and foraging sites known in the region, morphometric data and population statistics, is presented in Table 1. The location of some of these key sites is given in Figure 4.

Table 1. Key nesting and foraging sites and population statistics for the RSGA region

	Species	Key Nesting Sites	Nesting Season	Size of Nesting Population	CCL (cm)	CCW (cm)	Key Foraging Sites
Djibouti	Green	Iles Moucha & Maskali, Ras Siyyan, Iles des Sept Frères	Jan.-Apr.	~100	66.67	63.3	Gabel
	Hawksbill	Ras Siyyan, Sept Frères	Mar.-Jun.	ND	59.5	65.5	All fringing reefs
	Loggerhead	ND	ND	ND	ND	ND	Haramous Loyada
Egypt	Green	Wadi Al-Gimal, Ras Banas, Sarenka, Siyal, Zabargad & Rowabil Islands	Jun.-Aug.	~200	_ _	____	ND
	Hawksbill	Shedwan, Giftun Kabir & Giftun Sagheir Islds.	May-Jul.	~200	_ _	_ _	All fringing reefs
Jordan	Green	None	n/a	n/a	_ _	_ _	All fringing reefs
	Hawksbill	None	n/a	n/a	_ _	_ _	All fringing reefs
Saudi Arabia	Green	Ras Baridi	Aug.-Nov.	~100	105.69	96.5	Al Wajh Bank, Farasan Islands
	Hawksbill	Farasan Islands	Feb.-May	~50	ND	ND	All fringing reefs
Somalia	Green	Raas Xatiib to Raas Cuuda, Berbera	Jan.-Apr.	<50	ND	ND	ND
	Hawksbill	Sa'adadin, Aibat Islands, Raas Xatiib to Raas Cuuda	Mar.-Jun.	<50	ND	ND	All fringing reefs
Sudan	Green	Seil Ada Kebir Island, Suakin Mukawwar Is.	All year	<50	ND	ND	Unknown
	Hawksbill	Mukawwar Is. Seil Ada Kebir Suakin	Mar.-Jul. ND	ND ND	71.93 66.0	64.63 ND	All fringing and barrier reefs
Yemen	Green	Ras Sharma	July	~6000	106.0	96.0	Khor Umeira
	Hawksbill	Jabal Aziz	ND	~500	ND	ND	All fringing reefs
	Loggerhead	Socotra	Jul.-Aug.	~50-100	94.3	85.8	Unknown

Sources: Djibouti: PERSGA 2003b; Egypt: FRAZIER & SALAS 1984, PERSGA 2003a; Saudi Arabia: PERSGA 2003c, MILLER 1989, PILCHER & AL-MERGHANI 2000; Somalia: SCHLEYER & BALDWIN 1999, IUCN 1997; Sudan: DIAMOND 1976; PERSGA 2003e; Yemen: PERSGA 2003d, PILCHER & SAAD 2000, UNEP/IUCN 1996. ND = No Data.

Figure 4. Location of key sites for marine turtles in the Red Sea and Gulf of Aden

1.6 The PERSGA Marine Protected Areas Programme and Marine Turtle Conservation

A regional network of Marine Protected Areas (MPAs) in the Red Sea and Gulf of Aden has been established through the PERSGA Strategic Action Programme (SAP) to facilitate the achievement of regional objectives for sustainable resource use, conservation of biodiversity and for economic development. Concurrent with the development of the network, a Regional Master Plan (PERSGA/GEF 2002) was developed which is comprehensive in its coverage of objectives while being attentive to the differences between the PERSGA member states.

Marine turtle habitats in many cases overlap with the established network of MPAs, and the linkages provided through the strategic Master Plan allow for the management of these highly migratory species. For instance, marine turtles that were tagged while nesting on Socotra have been recaptured in the vicinity of the Sept Frères islands in Djibouti, providing concrete evidence of biological connectivity. The twelve MPAs in the network and key marine turtle habitats in the region are outlined in Table 2.

Table 2. Overlap (shaded regions) between regional network of MPAs and key marine turtle habitats

Country	Key Marine Turtle Habitats	PERSGA Network of Established and Proposed MPAs
Djibouti	Iles des Sept Frères / Ras Siyyan Moucha & Maskali Islands	Iles des Sept Frères / Ras Siyyan Moucha & Maskali Islands
Egypt	Giftun Islands	Giftun Islands and Straits of Gubal
	Shedwan Wadi Al-Gimal Ras Banas Sarenka Siyal Islands Zabargad Rowabil Islands	Straits of Tiran Ras Mohammed National Park
Jordan		Aqaba Marine Park
Saudi Arabia	Farasan Islands Wajh Bank	Farasan Islands Protected Area Wajh Bank
	Ras Baridi	Straits of Tiran
Somalia	Aibat and Sa'adadin, Islands	Aibat and Sa'adadin Islands
	Raas Xatiib to Raas Cuuda	
Sudan	Mukawwar Island and Dungonab Bay	Mukawwar Island and Dungonab Bay
		Sanganeb Marine National Park
Yemen	Jabal Aziz	Belhaf Bir Ali Area
	Socotra	Socotra Islands Group

2. REDUCING DIRECT AND INDIRECT CAUSES OF MARINE TURTLE MORTALITY

Turtles have been used by coastal people for many generations, particularly in the southern states of the PERGSA region. They have formed an important nutritional addition to villagers' diets in remote locations, such as on the Socotra archipelago. Turtle carapaces have been used as cooking vats, dwelling hut apexes, and for storage.

Female turtles are slaughtered as they emerge on the beaches to nest, and adults and juveniles are harvested with nets and harpoons in shallow water environments. Turtles are also frequently killed accidentally in shrimp trawlers, which operate in the southern Red Sea. A number of cultural practices also entail killing the turtles through decapitation when they become fouled in nets, to prevent reoccurrence of the problem. Hatchlings and eggs are threatened through beach use for tourism and development.

Marine turtles have a low intrinsic rate of population growth resulting from a combination of long maturation period and low survivorship from egg to adult. For this reason marine turtle populations that have been depleted take several hundred years to restore their original population size. Due to the long period between egg-deposition and adult nesting, many people are unaware of the changes in population structure as little change is detected during their working lifetimes. For example, the continued and near-complete removal of eggs from nesting beaches would not change the number of females emerging to nest for several decades, leading many to believe the population was in a healthy state. However, after a long period, few animals would be recruiting to juvenile and adult sub-classes, and the viability of the population would be in danger.

The Regional Action Plan for Marine Turtles and their Habitats in the RSGA identifies important sources of mortality, both direct and indirect (such as incidental mortality through commercial fishing operations), in all life stages. The mitigating solutions must then be designed and implemented.

Action 1: Identify and Document the Threats to Marine Turtle Populations

a) Document and collate existing data on the nature and magnitude of threats to marine turtle populations;

b) Determine those populations affected by traditional and direct harvest, incidental capture in fisheries, and other sources of mortality.

Action 2: Minimise Threats to Marine Turtle Populations

a) Enact and enforce legislation requiring the use of gear, devices and techniques to minimise incidental capture of marine turtles on commercial trawlers in the southern Red Sea, in particular promoting the use of Turtle Exclusion Devices (TEDs);

b) Develop procedures and training programmes to promote implementation of these measures, such as vessel monitoring systems and inspections at sea, in port and at landing sites, and national on-board observer programmes;

c) Regulate landfilling and dredging of key foraging sites;

d) Reduce, and where possible eliminate, pollution from light at key nesting sites;

e) Regulate vehicular traffic access to key nesting sites, particularly during peak nesting and hatchling emergence periods;

f) Regulate, and where possible eliminate, development and modification of key nesting sites;

g) Reduce, and where possible eliminate, direct harvests of adult turtles through the development of alternative livelihoods and public awareness programmes;

h) Reduce, and where possible eliminate, predation on marine turtles by feral animals at nesting sites;

i) Adopt the best conservation and management practices for marine turtle populations, reflecting the latest scientific and technical knowledge, particularly with regard to nesting populations and hatchery operations.

Action 3: Implement Programmes which Provide Alternatives to Communities Dependant on Marine Turtle Populations

a) Conduct socio-economic studies within communities that interact with marine turtles and their habitats;

b) Identify economic incentives in order to reduce threats and mortality, and develop programmes to implement them;

c) Identify resources and sources of funding for the programmes.

Action 4: Regulate the Direct Capture or Killing of, and Domestic Trade in, Marine Turtles, their Eggs, Parts or Products

a) Enact legislation to prohibit direct harvest and domestic trade, allowing exceptions only for traditional take;

b) Regulate, and where appropriate eliminate, fishery practices and gear types at key foraging sites, and at nesting sites during reproduction seasons;

c) Establish management programmes that may include limits on levels of intentional harvest;

d) Determine the cultural and traditional values and economic uses of marine turtles (both consumptive and non-consumptive);

e) Develop a management agreement on the sustainable level of traditional harvest to ensure that such harvest does not undermine conservation efforts at a regional level.

Action 5: Develop Nesting Beach Management Programmes to Maximise Hatchling Recruitment

a) Evaluate the effectiveness of nest and beach management programmes;

b) Reduce the mortality of eggs and hatchlings to maximise hatchling recruitment and survival, preferably using conservation techniques that emphasise natural processes wherever possible;

c) Minimise the mortality of eggs, hatchlings and nesting female turtles caused by feral and domestic animals.

Action 6: Promote Marine Turtle Rescue and Rehabilitation Activities

  a) Where appropriate, incorporate turtle rehabilitation activities with existing wildlife management and educational / research facilities;

  b) Promote collaboration and information exchange among regional agencies during emergency or disaster situations;

  c) Provide specialised training in sea turtle rescue and rehabilitation procedures;

  d) Develop public awareness programmes to inform the general public of the existence and role of rehabilitation centres.

Expected Results – Outcomes and Time Frame

  a) A workshop dedicated exclusively at determining methods to minimize or eliminate regional threats to marine turtles and their habitats (***)(3 months);

  b) The promotion and development of legal instruments which regulate the levels of indirect mortality in commercial fisheries though the adoption of gears, TEDs and technology (***)(12 months);

  c) Fishing operators initiate by-catch monitoring and reduction efforts (***)(12 months);

  d) Training workshops for commercial fishing operators and law enforcement personnel in the use of turtle friendly fishing gears and relevant laws (**)(6 months);

  e) Development of alternatives to direct harvest which are in keeping with local community and traditional or customary needs (**)(24 months);

  f) Regulatory measures for the control of development and activities at key nesting and foraging habitats (***)(12 months);

  g) Implementation of best practice conservation methods as outlined by the IUCN-SSC Marine Turtle Specialist Group (***)(12 months and onward).

Performance Indicators and Quality Assurance

  a) Clear guidelines exist as to the threats to marine turtles and methods to eliminate and reduce these to levels where marine turtles are not negatively impacted;

  b) Legal leverage exists through which threats to marine turtles and their habitats can be addressed;

  c) Government agencies work in partnerships with local communities to moderate and where possible eliminate direct take;

  d) Commercial and artisanal fishing operations no longer cause the mortality of marine turtles, evidenced through lower reports of incidental capture and infrequent strandings of dead turtles on coastlines.

3. PROTECTING AND CONSERVING MARINE TURTLE HABITATS

An assessment of the distribution and status of critical habitat in the RSGA (i.e. habitat critical to the survival of sea turtle populations), and the protection of such habitat from threats is fundamental to the conservation of marine turtles. Major threats to nesting beaches include shoreline development (e.g. refinery facilities), artificial lighting, coastal sand mining, and beachfront stabilisation structures. Major threats to foraging grounds and migratory corridors include industrial and agricultural discharges (point and non-point sources), destructive fishing practices, petroleum industry activities (e.g. refining and transport), seabed destruction (e.g. dredging and anchoring), and other forms of marine pollution, including persistent marine debris.

The RSGA region is, for the most part, in good condition but threats from unregulated development, pinpoint pollution sources and shipping accidents have already, or threaten to, reduce the quality of nesting beaches and foraging sites. Coupled with this are natural factors such as global warming which impact coral reefs through bleaching, further reducing the quality and nutritional content of coral reefs.

Given that turtles choose nest sites based on a complex of beach characteristics and nearby anthropogenic activities (see MORTIMER 1980; MORTIMER 1982), the females are less likely to emerge on cluttered or developed beaches, or close to bright lights, particularly if these are moving. Nesting beaches need relatively clean sand, and a suitable depth at the dune area that is not flooded by high tides. An accumulation of debris such as logs, discarded nets, solid waste and plastics can deter nesting females. Nesting beaches are also threatened by erosion that can expose egg clutches, and sea level rise that can flood nesting habitat.

Long-term conservation of sea turtles will depend on the availability and condition of nesting beaches. It is necessary to identify suitable nesting habitat and gather evidence of historic and/or current nesting. Nesting beaches should be inventoried by area, habitat type, ownership, and conservation status, and records should be maintained regarding the loss or degradation of nesting beaches due to natural or anthropogenic causes.

Action 1: Establish Necessary Measures to Protect and Conserve Marine Turtle Habitats

a) Identify and establish the condition of all areas of critical habitat such as migratory corridors, nesting beaches, inter-nesting zones and feeding areas;

b) Designate, declare and manage protected/conservation areas, sanctuaries or temporary exclusion zones for key nesting sites and any critical foraging habitats;

c) Develop incentives for adequate protection of areas of critical habitat outside protected areas;

d) Manage and regulate within each jurisdiction the use of beaches, for example: location and design of buildings, use of artificial lighting, and transit of vehicles in nesting areas;

e) Monitor and promote the protection of water quality from maritime pollution, including marine debris and petroleum industry derivatives;

f) Implement best practice waste disposal programmes to reduce impact of debris at key turtle habitats;

g) Incorporate marine turtle conservation issues in integrated coastal zone management plans.

Action 2: Rehabilitate Degraded Marine Turtle Habitats

    a) Remove debris that impedes turtle nesting and hatchling production;

    b) Enhance recovery of degraded coral reefs;

    c) Enhance recovery of degraded mangrove and seagrass habitats.

Expected Results – Outcomes and Time Frame

    a) Critical habitats needed by marine turtles of all life stages (e.g. nesting, developmental, foraging) are protected through legal and practical means (***)(18 months);

    b) Regional marine pollution reduction programmes are developed with a resulting reduction in fouling, spillages and collisions which impact turtles and their habitats (**)(24 months);

    c) General marine conservation programmes are developed and implemented which indirectly benefit marine turtles (*)(12 months and onward);

    d) A prioritisation exercise is performed through which immediate action to rehabilitate degraded habitats takes place, taking into account concerns about funding and implementation logistics (**)(3 months).

Performance Indicators and Quality Assurance

    a) Legal and public support drive programmes to protect key nesting and foraging habitats;

    b) Nesting and hatchling emergence rates improve over the long-term through beach protection and rehabilitation;

    c) Marine habitats support stable or growing turtle populations, reflected through increases in numbers of nesting females, sightings during underwater visual census, and monitoring of foraging populations.

4. RESEARCH AND MONITORING

Although a number of turtle surveys have recently been conducted in the region the complete picture regarding their status is still inadequately understood. In addition, given the life history characteristics of marine turtles, long-term monitoring is needed to detect changes in population structure and size. Information on the habitats where juvenile turtles grow and develop within the RSGA region is virtually non-existent. While some progress has been made with regard to determining the effects of human actions on regional turtle populations, there is a wide gap between present knowledge and information needs.

PERSGA has made significant progress in the standardization of research methods, with a training course for trainers held in Yemen in December 2000, and the development of standardised survey methods (SSMs) for marine turtles in nesting and foraging habitats of the region (PERSGA/GEF in press). However, surveys since that time have been limited by funding and the practical experience of the survey teams, and more complete nation-wide surveys are still needed to determine the extent and distribution of key habitats.

Key issues which need resolving are the lack of data on size, distribution, and condition of nesting and feeding habitats, incomplete data on size and ecological integrity of breeding populations, survivorship of turtles at each key life stage, and inadequate information on threats, use and trade which might affect turtle populations.

Action 1: Conduct Studies on Marine Turtles and their Habitats

For each country, conduct extensive and thorough baseline studies, or update previous baseline studies, on key turtle populations and habitats using PERSGA's Standard Survey Methods for Marine Turtles:

a) Prioritise key nesting and foraging sites and determine their research and management needs;

b) Identify key regional sites, and initiate and/or continue long-term monitoring to assess conservation status;

c) Identify key populations through the use of genetic analysis;

d) Carry out studies on marine turtle population dynamics and survival rates, using tagging as a key study tool;

e) Conduct research on the frequency and pathology of diseases of marine turtles;

f) Assess survivorship of eggs and hatchlings, particularly in instances in which there is human intervention;

g) Assess the condition of nesting and foraging habitats;

h) Determine the impact of changes to nesting and foraging habitats on turtle survival;

i) Determine migration routes and patterns of movement at different life stages, possibly through the use of satellite tracking;

j) Develop a GIS system to accommodate nesting, tagging, and migration data;

k) Assess predation by feral and domestic animals;

l) Determine levels of intentional (direct) and accidental (indirect) mortality, particularly that caused by shrimp trawlers, and evaluate domestic and international harvests and trade;

m) Develop guidelines on sustainable use of turtles and their products;

n) Explore alternatives to turtle utilisation.

Action 2: Strengthen Collaborative Research and Monitoring

a) Strengthen collaborative studies and monitoring on genetic identity, conservation status, migrations, and other biological and ecological aspects of marine turtles among PERSGA member states, other nations, scientific institutions, non-governmental and international organisations.

Action 3: Exchange Information

a) Compile, on a regular basis, data on marine turtle populations of regional interest;

b) Exchange, on an annual basis, information between the PERSGA Secretariat and the PERSGA member countries;

c) Exchange, at regular intervals, scientific and technical information and expertise among nations, scientific institutions, non-governmental and international organisations.

Tagging as a Learning Tool

Often researchers labour under the false impression that tagging sea turtles in some way miraculously protects them from harm, and often governments lay claim to efficient conservation efforts based on tagging projects. However, tagging is a merely a research tool, albeit a powerful one, which can provide information on turtle movements and international linkages, and can foster a sense of commitment and ownership among those involved in the process. For a tagging programme to be effective there must be a commitment to continuing the work over a long period, so that tag returns and recaptures in future surveys provide a better understanding of the population dynamics. If the objective is simply to count turtles, this can be done without tagging, and several non-invasive options exist.

The basic premise behind tagging requires consistent and correct use of the tags, which should be applied to the proximal trailing edge of each front flipper to reduce the chances of abrasion, entanglement and tag dislocation. If the tags are not applied correctly, or if the tag material deteriorates rapidly in salt water, tags might not provide the feedback that was originally expected.

Some basic points to keep in mind for tagging programmes are: numbers should be consecutive and prefixed by the country's international ISO code; tags should not be ordered as double sets (i.e. bearing the same number) as this is unnecessary and increases the risk of two turtles accidentally being tagged with the same number; tag numbers should bear a message indicating the return address and not be duplicated within a project or among projects; workers should apply two tags to each turtle, one on each front flipper; workers should check turtles for presence of previous tags or signs of tag loss prior to placing new tags, to maintain a long-term history of the turtle, and replace old tags only if they appear heavily corroded and might be lost easily. Workers should also tag turtles only once they have completed covering the nest cavity with the rear flippers to minimise the possibility of disturbing the turtle and causing her to abandon the nesting effort. Tags should be made of titanium, as it has been determined to be the longest-lasting material when in water.

Tagging has resulted in the understanding of migration patterns for turtles in the southern Red Sea and the Gulf of Aden, through which it is now known that turtles migrate to and from Socotra and the southern coast of Yemen to Oman, and from Sri Lanka, Oman and Socotra to Djibouti. The more extensive the tagging programmes in the region, the better understanding scientists and managers will have of turtles' migration routes, with which to design and implement more efficient conservation measures.

Expected Results – Outcomes and Time Frame

a) Country reports highlighting updated, comprehensive survey data for the coastlines of each country detailing geographic location and extent of nesting and foraging habitats and the species composition within each habitat (**)(6 months);

b) A threats-analysis document leading to a prioritisation exercise and subsequent identification of key habitats and populations (*)(3 months);

c) The implementation of long-term studies on key populations to provide continuous feedback to management institutions (**)(6 months and onwards);

d) A regional summary on key threats to habitats and populations, mortality rates, diseases and levels / forms of turtle utilisation (*)(3 months);

e) A computer database to accommodate research and monitoring information in keeping with standard international protocols (*)(3 months);

f) Frequent and periodic international workshops to share project results, information and ideas related to the conservation of marine turtles and their habitats (*)(18 months).

Performance Indicators and Quality Assurance

a) Reports indicate the extent of habitats and clearly demonstrate a thorough coverage of the coastal areas;

b) Key habitats and populations are identified and monitoring programmes are implemented at each key site (funding permitting);

c) Updated information on key populations, tagging programmes and migrations are readily available through the PERSGA Secretariat;

d) The threats-analysis leads to the reduction of impacts on marine turtle populations evidenced through population growth over the long-term and the restoration/rejuvenation of degraded habitats;

e) Nesting populations remain stable and/or increase over time (at least ten years monitoring required).

5. COMMUNITY PARTICIPATION, PUBLIC AWARENESS, INFORMATION AND EDUCATION

For hundreds, if not thousands of years marine turtles have played a minor role in the livelihoods of coastal populations in the region. While subsistence take occurred in the past in a number of RSGA countries, in general it was at low levels limited by equipment and storage considerations. In modern times, with the advent of mechanised boats, refrigeration systems and a network of distribution opportunities, the demand by coastal communities has begun to exceed the sustainable harvest levels of days past, and threatens many regional populations.

Many coastal communities however, remain unaware of the dire condition of many turtle populations, with little knowledge of nesting patterns and virtually no knowledge of maturation periods, natural survival, and the impacts of man's actions. As depicted in Figure 3 (Introduction, above) the sheer time between egg deposition and the return of adult females to nesting beaches (where they are most often captured) is the length of a typical working lifetime for many coastal dwellers, and changes to population structure therefore often go unnoticed. Turtle conservation issues are generally not widely publicised, nor made available in an understandable manner to remote coastal communities, tourist markets, commercial enterprises and government policy makers, further compounding the problem.

Government agencies and funding institutions often fail to make marine turtle conservation a priority issue. Some funding institutions are opposed to species-specific conservation approaches, and fail to recognise the wider conservation benefits that marine turtle conservation can impart on coastal communities and the environment in general. Given that the protection of marine turtles entails the protection of a wide range of marine habitats, from coral reefs to seagrass beds and mangroves, turtles have the potential to act as exemplary ambassadors in a diverse marine conservation strategy.

The participation of local communities in conservation actions and decision-making is critical to the success of management interventions particularly when these affect livelihoods or traditional cultures. Anyone who benefits from sea turtles (either through consumptive or non-consumptive practices), or from their marine and coastal habitats, is a stakeholder, for they depend in one way or another on the condition of the turtle populations. Ultimately, stakeholders need to become the stewards of those resources as it is to their advantage that these resources survive through time, and along with the rights of use, they have the responsibility of collaborating in conservation activities.

Over the years there has generally been inadequate involvement of local communities in conservation measures, these being designed by scientific and other institutions, and implemented by government agencies. Local communities have not benefited greatly from conservation measures, which they have come to regard as over-conservative and infringing on their culture and traditional activities. However, at the same time, local communities have not been given a clear understanding of the conservation needs of marine turtles and the potential long-term benefits from conservation.

Action 1: Develop and Implement Public Education, Awareness and Information Programmes

 a) Collect, develop and disseminate educational materials which demonstrate the ecological and economic value of sea turtles;

 b) Establish community learning/information centres;

c) Develop and implement accurate mass media information programmes;

d) Develop and conduct focused education and awareness programmes for target groups (e.g. teachers, schools, fishing communities, media);

e) Encourage the incorporation of marine turtle biology and conservation issues into school curricula;

f) Promote the development of eco-tourism alternatives that integrate marine turtle conservation issues into commercial ventures, concurrently providing alternative livelihood opportunities to communities who depend on marine turtle resources;

g) Organise special events related to marine turtle conservation and biology (e.g. Year of the Turtle, symposia, etc.);

h) Disseminate information on marine turtles at local, national and regional levels.

Action 2: Promote General Public Participation

a) Involve stakeholders and local communities in planning and implementation of conservation and management measures;

b) Encourage the participation of government institutions, non-governmental organisations, the private sector and the general community (e.g. students, volunteers, fishing communities, SCUBA diving associations, local communities) in research and conservation efforts;

c) Encourage the adoption of sea turtle education, research and conservation issues within interest groups and NGOs;

d) Implement, where appropriate, incentive schemes to encourage public participation;

e) Enable and promote community participation in turtle surveys, monitoring programmes, and management;

f) Promote the transfer and integration of community skills in conservation activities;

g) Determine the extent, and incorporate into management strategies the traditional knowledge of local communities;

h) Promote ecotourism activities related to marine turtles and their habitats, and ensure equitable sharing of benefits with local communities.

Action 3: Develop Government Involvement and Raise Awareness of Shared Responsibilities

a) Promote adoption and implementation of relevant international instruments which relate to turtle conservation;

b) Raise awareness among relevant authorities of the obligations resulting from accession to international conventions;

c) Promote marine turtle conservation as a priority among policy-makers;

d) Provide training and learning opportunities to government officers in issues relating to turtle conservation.

Action 4: Integrate Community Development with Environmental Education
    a) Facilitate liaisons with existing rural development organisations;

    b) Include community infrastructure components in conservation agendas;

    c) Incorporate community development into wildlife and environmental training programmes;

    d) Develop programmes in collaboration with the appropriate regional and international organizations.

Action 5: Evaluate Community Practices as they Impact Marine Turtles and their Habitats
    a) Evaluate impacts of local communities on nesting and foraging turtle populations;

    b) Identify impacts of fishing techniques, and promote best practice fishing techniques to minimise impacts to marine turtle populations;

    c) Evaluate impacts of local communities on turtle habitats, including beaches, coral reefs and seagrass beds;

    d) Promote the immediate release of accidentally-caught turtles among fishermen, and encourage sharing of any tag return information;

    e) In conjunction with local communities, develop alternative livelihood practices that are environmentally conscious and ecologically sustainable.

Expected Results – Outcomes and Time Frame

    a) Public awareness materials are designed, developed and disseminated to a wide range of societal levels, governments, and non-government agencies (**)(18 months);

    b) Governments are provided with clear and succinct materials and data upon which to base sound decisions relating to marine turtle conservation (**)(12 months);

    c) All relevant stakeholders receive adequate information to meet their respective needs (**) (24 months and onward);

    d) Stakeholder groups are involved, to a certain extent, in research and conservation activities (such as schoolchildren helping with data collection on nesting beaches) (*) (12 months and onward);

    e) Training and capacity-building opportunities are provided for relevant policy-makers (*) (12 months and onward);

    f) Local communities are trained in research and monitoring methods, and contribute significantly to conservation agendas (**)(18 months);

    g) Local communities grow and develop through integrated conservation approaches which take into account the socio-economic needs of the communities and balance these with environmental conservation (*)(24 months and onward);

    h) Local knowledge is incorporated into scientific-based and government-led conservation programmes (*)(12 months);

    i) The extent of traditional impacts on marine turtles and their habitats is examined, and suitable alternatives are identified, developed and implemented (**)(6 months).

Performance Indicators and Quality Assurance

a) Schoolchildren, fishermen, the general public and policy-makers have a rudimentary knowledge of turtle conservation issues;

b) Mass-media agencies (television, radio, newspapers) play an integral role in disseminating information;

c) Implementation of international legal instruments is enhanced;

d) Governments play a key role in driving conservation activities through implementation of legislation, policy, and guidelines;

e) Marine conservation issues, beyond those concerning marine turtles, are regularly considered and acted upon;

f) Local communities assume conservation initiatives independent of government-led programmes aimed at reducing and/or eliminating impacts on turtles and their habitats;

g) Bi-directional information exchange (from communities to policy-makers and conservationists, and *vice versa*) is enhanced and productive;

h) Marine turtle populations and their habitats notably improve in status following community integration and participation in conservation measures.

The Story of the Socotra Islands and Marine Turtle Conservation

Socotra lies due south of the Arabian peninsula and eastward off the Horn of Africa, at approximately 13ºN, 54ºE. Politically it is part of the Republic of Yemen and is home to approximately 80,000 people. The main island measures approximately 120 km by 40 km and covers a total area of 3,625 sq km. Its outlying islands are Abd Al-Kuri, Darsa, Samha (also known as the Two Brothers), and the Kal Faraon and Sabouniyah rocks. Until recently, little or no scientific studies had been undertaken on Socotra since a British expedition in 1967, and none had investigated the sea turtle populations.

Sea turtle nesting takes place primarily on the main island of Socotra, with only scattered nesting on Abd Al-Kuri and Samha. No nesting has been found on Darsa, Kal Faraon or Sabouniyah. A stretch from the town of Gubba to Ras Gaddama is the main nesting beach during the pre-monsoon period on Socotra, with most nesting (~ 90 %) occurring two and a half kilometres on either side of Ras Abalhan, halfway along the beach. Nesting averages approximately two turtles per night over five kilometres of beach, translating to a nesting population of about 50-100 females per season and an unknown number of accompanying males. Although green *Chelonia mydas* and hawksbill *Eretmochelys imbricata* remains were identified on the beaches, only the loggerhead *Caretta caretta* was found nesting at any of the beaches.

The use of turtle meat and eggs by the northern and southern Socotri people is pronounced, with turtles brought to the market in Hadibo daily, having been captured from as far distant as Gubba. Options for conservation will require the participation of the Socotri people, and may include: protecting the area between Gubba and Ras Gaddama extending 1-2 nautical miles offshore, education programmes to discourage turtle meat consumption, and a 'Turtle Safe' certification programme to curb harvests and demand.

6. BUILDING CAPACITY FOR CONSERVATION, RESEARCH AND MANAGEMENT

Acknowledging that there is a shortage of skilled personnel, equipment and resources to carry out research and monitoring, to liaise with coastal communities, and to enforce regulations, important first steps have been taken by PERSGA and national governments to increase the number of researchers in the region and provide training for them.

This deficiency in manpower and lack of basic knowledge on turtle biology and conservation needs has resulted in inappropriate management of nests, eggs and hatchlings, inadequate surveillance and enforcement on nesting beaches and foraging grounds, and a shortage of guidelines and understanding related to turtle management and use.

Action 1: Training and Capacity-Building

a) Build capacity at regional and national levels to strengthen conservation measures;

b) Identify needs for capacity-building in terms of human resources, knowledge and facilities;

c) Provide training (e.g. through workshops) in marine turtle conservation and management techniques to relevant agencies, individuals and local communities;

d) Coordinate training programmes and workshops at a regional level;

e) Develop partnerships with universities, research institutions, training bodies and other organisations that can provide twinning and educational opportunities to PERSGA member states, relevant to marine turtle conservation issues.

Action 2: Provision of Resources to Support Training, Research and Monitoring

a) Conduct a 'needs assessment' of essential equipment;

b) Develop country and regional proposals incorporating requests for equipment;

c) Maintain the regional tagging and tag distribution scheme.

Expected Results – Outcomes and Time Frame

a) A significant complement of policy-makers, enforcement officers and research and monitoring personnel trained and knowledgeable in the biology and conservation needs of marine turtles (**)(12 months);

b) Adequate equipment, human and financial resources for the long-term implementation of enforcement, research and monitoring efforts (**)(18 months).

Performance Indicators and Quality Assurance

a) Trainers exist at a regional level who can implement adequate educational activities which result in the protection of marine turtles and their habitats;

b) Adequate resources exist which allow for the enforcement of regulations and the study of marine turtles.

7. INTEGRATED MANAGEMENT FOR MARINE TURTLES

Conflicts of interest arise because of competing demands for the same resources. The habitats on which marine turtles depend are also used for a number of community activities including tourism, shipping, housing and defence. Often the interconnectivity of marine ecosystems and their inhabitants with sectors upon which human cultures depend are poorly understood. For instance, nesting and foraging habitats need to be considered in coastal planning but often commerce and tourism predominate in decision-making.

Within the PERSGA member states there often exists a level of overlap, or gaps in the legal mandates of environmentally-associated agencies and legislation is often lacking or insufficiently focused on marine turtles and their conservation needs.

Marine turtle conservation will ultimately depend on the effective integration of management actions based on sound legislative frameworks, land-use planning, stakeholder participation, and regional cooperation.

Action 1: Cooperation and Promotion of Information Exchange

a) Use PERSGA networks to strengthen existing mechanisms for cooperation and information exchange at the national, regional and global levels;

b) Establish relationships with national fisheries bodies with a view to obtaining data on incidental capture and encourage them to adopt marine turtle conservation measures;

c) Use PERSGA networks for cooperative management of shared populations within the region and, where appropriate, formalise cooperative management arrangements at national and regional levels;

d) Promote the integration of marine turtle issues in the design, development and implementation of marine protected areas;

e) Develop, where appropriate, transboundary marine protected areas using ecological rather than political boundaries.

Action 2: Enforcement and Legislation

a) Strengthen and improve enforcement of conservation legislation;

b) Review national policies and laws where appropriate to address gaps or impediments to marine turtle conservation;

c) Clarify mandates, and promote collaboration among, responsible agencies for the conservation of marine turtle and their habitats;

d) Identify provincial authorities and encourage and facilitate implementation of their commitments under national legislation and international agreements;

e) Cooperate regionally in law enforcement to ensure compatible application of laws across and between PERSGA member states;

f) Collaborate with appropriate enforcement agencies to protect nesting beaches from degradation due to coastal development, including sand-mining, beachfront construction, destruction and alteration of coastal habitats and agricultural/pastoral habits.

Action 3: Use of data in Management

a) Use data to mitigate threats and assess/improve conservation policies;

b) Prioritise populations for conservation actions and identify responsible agencies;

c) Identify population trends;

d) Use research results to improve management, mitigate threats and assess the usefulness of conservation activities (e.g. hatchery management practices, habitat loss, etc.);

e) Continue the establishment of protected areas that incorporate habitats for marine turtles and appropriate management regimes based on research and monitoring data.

Action 4: Adoption and / or Implementation of International Legal Instruments

a) Encourage PERSGA member states that have not already done so to become Parties to relevant international agreements relating to turtle conservation.

b) Review and facilitate at a national level compliance with obligations under relevant international agreements acceded to by each nation relating to trade in marine turtles, their eggs, parts or products (CITES);

c) Identify and eliminate routes of international illegal trade through monitoring;

d) Identify, prevent, deter and, where possible, eliminate domestic illegal trade through monitoring, implementation of legislation, identification of gaps in enforcement capabilities in each country, and training of enforcement officers;

e) Exchange and discuss information on compliance and trade issues at regular intervals, such as through annual reporting and at regional meetings.

Action 5: National and Regional Action Plan Implementation

a) Assist PERSGA member states, upon request, to develop and implement national action plans for the conservation and management of marine turtles and their habitats;

b) Identify and implement specific local management issues required for successful conservation and management;

c) Identify overlaps between marine turtle conservation needs and other regional initiatives, such as the PERSGA Marine Protected Area (MPA) network, and integrate conservation activities to maximise efficiency of resources;

d) Identify specific local management issues where cooperation among PERSGA member nations is required;

e) Review action plans at regular intervals to take into account recent advances in skills and knowledge regarding marine turtle conservation and management, as well as changes in conservation status of marine turtle populations.

Expected Results – Outcomes and Time Frame

a) Cooperation mechanisms are established among national government agencies, non-governmental organisations, commercial operations and other relevant institutions to address marine turtle conservation issues (**)(12 months);

b) Marine protected areas are established which incorporate marine turtle habitats and migratory routes (**)(18 months);

c) Legislation and legal mandates of government agencies and legal authorities are clarified and acted upon, with minimal overlap (*)(18 months);

d) PERSGA member states accede to international conventions which directly address marine turtle conservation (*)(18 months);

e) Illegal trade is eliminated through enactment and enforcement of adequate legislation (*) (18 months);

f) National plans and the Regional Action Plan are implemented and enforced, and cooperation among member states is enhanced to accommodate the migratory nature of marine turtles (***)(12 months and onward).

Performance Indicators and Quality Assurance

a) Clarity and understanding exists of the roles and responsibilities of all relevant agencies;

b) Illegal trade in marine turtles and their products is eliminated;

c) National plans exist which address action requirements outlined in the Regional Action Plan for Marine Turtles in the RSGA;

d) Marine turtle populations are stable or increasing and their habitats notably improve in status following establishment of marine protected areas, and the inclusion of marine turtle conservation issues in cross-sectoral planning.

Lack of Funding for Conservation Activities

Widespread is the lack of funding for conservation activities, mostly as a result of the developing status of most of the countries in the region, whose resources are limited, and invested in industrial, agricultural and human development rather than conservation. In the RSGA region and in similar developing areas, the concept of conservation is often thought to be counterproductive to development plans. Many of these countries rely on natural resources to build a strong enough economy to diversify into new markets. Coupled with growing human population densities, especially in coastal areas, the fate of marine resources is in a delicate state. It is imperative that funding for conservation measures be sought to bring about a positive change and restore some of these turtle populations to some semblance of stability. It is also imperative that these conservation measures be developed with the input of local stakeholders, so that livelihoods that potentially might be affected are rewarded in some manner. Little of this is news. On the contrary, people have been talking about protecting marine ecosystems for years, but on the whole, implementation of conservation plans rarely meets with the agreement of all stakeholders, or interested parties, often because funding infrastructure is lacking.

8. FUNDING FOR MARINE TURTLE CONSERVATION

Funding for marine turtle conservation and management activities has generally taken a backseat to wider-coverage conservation action plans and proposals, due largely to a lack of understanding and appreciation of the multi-sectoral impact of efficient turtle conservation programmes, and also due to a lack of capacity to develop and submit suitable funding proposals to donor agencies.

There is a clear lack of funding for species-specific programmes at a global level. However this Regional Action Plan, its preceding training courses and country surveys, were carried out through the Strategic Action Programme executed by the PERSGA Secretariat and the member states. For marine turtles to be addressed in a significant manner, conservation programmes need to integrate a host of marine conservation issues, and specifically to address the socio-economic well-being of communities impacted by conservation activities.

Action 1: Securing Funding for Marine Turtle Conservation

a) Identify available funding sources at a number of levels, including government and inter-governmental (e.g. Ministerial, Global Environment Facility, UNEP, UNDP, Overseas Aid packages), non-profit organisations (e.g. WWF, IUCN, Ramsar), and private foundations;

b) Develop the capacity at a national and regional level to prepare proposals which secure funding from government and inter-governmental programmes and non-government institutions;

c) Publish a reference guide for fundraising which lists ideas for sponsorship and provides information on successful proposals and funding sources;

d) Develop regional proposals for fundraising which address multi-sectoral and integrated conservation approaches;

e) Establish a Trust Fund for long-term administration of conservation and management.

Expected Results – Outcomes and Time Frame

a) Funding sources are identified and suitable proposals are submitted which address multi-sectoral and integrated approaches to marine turtle conservation over the long-term (**)(12 months);

b) Research and management actions are carried out and maintained through funding sources which are less dependant on government support (*)(12 months and onward);

c) Enforcement activities are frequent and regular, reduce direct and indirect mortality of marine turtles, and reduce negative impacts to their habitats (**)(6 months).

Performance Indicators and Quality Assurance

a) The capacity exists at a national level to identify funding sources and prepare proposals for funding marine turtle conservation activities;

b) Funding is secured to expand on current research, monitoring, enforcement and conservation measures.

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10. APPENDICES

Appendix I: Generalised Life Cycle of Marine Turtles
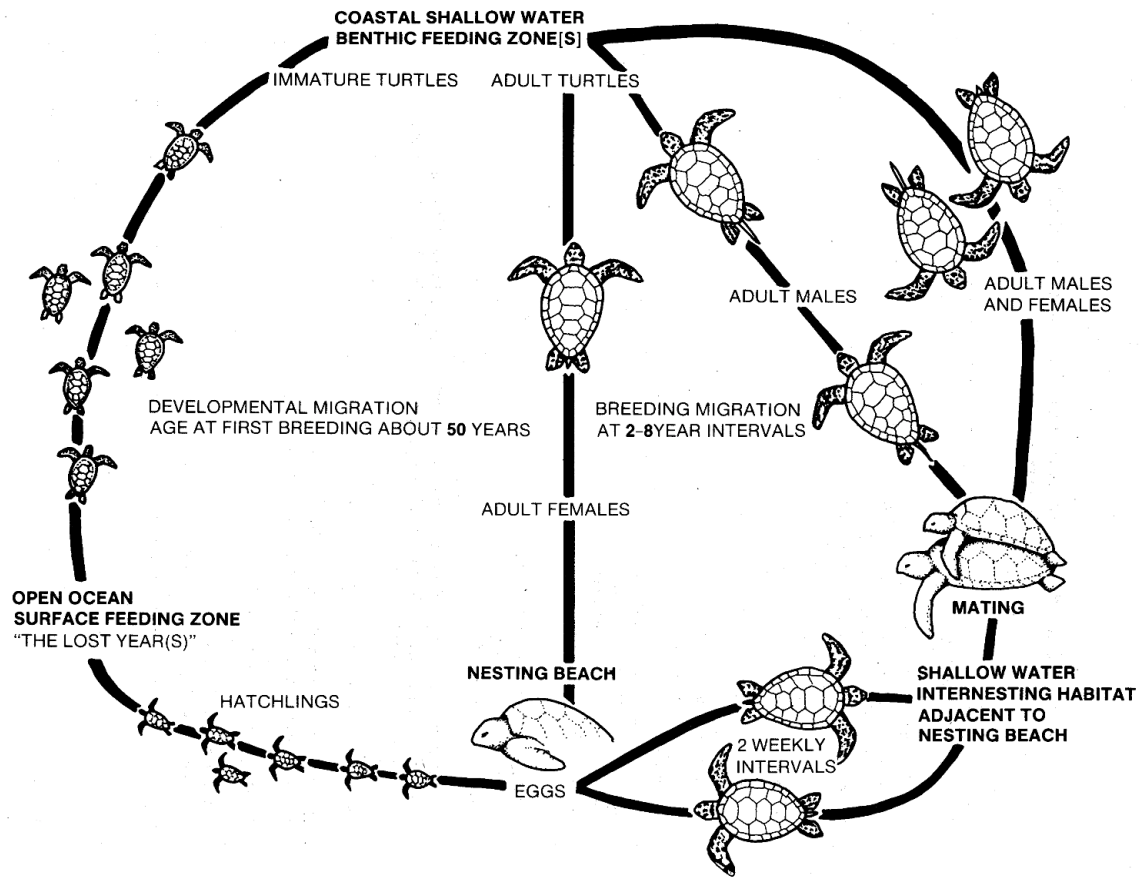
Figure after LANYON et al. (1989)

Marine turtles share similar life histories, varying slightly among species. When physiologically ready, they migrate from distant feeding grounds to different nesting areas and once the males and females arrive, they mate during a period of 1-2 months. After mating, females take 2-4 weeks to emerge on the beach and lay the first clutch of eggs. After this, they may return 4-8 more times to lay again in the same season. The nesting process begins when the turtles leave the ocean and crawl up the beach, where a large body pit is excavated using the front flippers. An egg chamber is then excavated using the rear flippers, into which the eggs are deposited. The turtles then cover the nest with sand back to the original beach level, and crawl back down the beach to the ocean. Each nest contains around 100 eggs, which measure 3-6 cm and weigh 20-50 g. The eggs take ca. 60 days to incubate, and invariably hatch after dark, when the sand surface cools. The hatchlings excavate through the sand for two or three days before emerging, and weigh 15-35 g and measure 3-7 cm in length. Hatchlings crawl down the beach and head directly offshore using light, wave direction and the earth's magnetic field for guidance. They swim for 1-2 days in what is known as a 'swimming frenzy' to get as far offshore as possible. After this, they generally float as part of the ocean's plankton for several years until they migrate from oceanic waters onshore to shallow feeding areas. After five to ten years they may grow to juveniles 20-40 cm in length. They remain at their feeding grounds for 5-10 or more years until they reach sexual maturity, and undertake their first migration to the mating and nesting areas, whereupon the cycle is repeated.

Appendix II: Potential and Existing Threats to Marine Turtles

Major threats to the marine environments in the region include landfilling and dredging for coastal expansion; destructive fishing methods; impacts from tourism, shipping and maritime activities, sewage and other pollution discharges; lack of public awareness, and insufficient implementation of legal instruments that affect marine turtle conservation. Most threats are shared by all countries due to the enclosed nature of seas in the region, but are often more applicable or important to one country. Many are potential threats rather than existing ones (e.g. coastal development in Somalia is virtually at a standstill, compared to Saudi Arabia), but with political stability, growth of coastal settlement will increase and result in sediment runoff, sewage pollution, and landfilling. The major threats can be classified into several distinct categories:

a. Habitat Destruction - Extensive coastal development, including dredging and filling, is destroying large tracts of shallow marine habitats (particularly in the Gulf and major urban centres along the Red Sea). Additional habitat destruction takes place through commercial shipping and groundings, and from the recreational diving industry, through anchor and flipper damage. Urban, industrial and port development coupled with inadequate environmental planning, and little or no environmental assessment near developed areas is severe. Sedimentation is an invariable result of poor construction, dredging and land reclamation (landfilling). There is a lack of management, awareness, and enforcement of regulations, which often results in physical damage to coral reefs through ignorance or wilful neglect.

b. Industrial Activities - The chronic release of industrial pollutants has reduced water quality in many parts of the region. This includes the discharge of untreated oily wastes from refineries, and sewage and phosphate ore washing are principal causes of nutrient enrichment in the Red Sea. Other polluting industries include power generation, desalination and fertilizer manufacturing.

c. Oil and other Hydrocarbons - Oil pollution comes from both production and transport; many millions of tonnes per annum pass through the region. There have been more than 20 oil spills along the Egyptian Red Sea since 1982 which have smothered and poisoned coastal ecosystems. Chronic contamination is common from the oil terminals and tankers. Medium sized spills from ballast and bilge water discharges, and leakages from terminals cause localised damage and smother intertidal habitats. Few ports have reception facilities to collect oily wastes and the problem will continue mostly through a lack of enforcement of existing regulations. Throughout the region, there is inadequate control and monitoring of procedures, equipment and personnel and training. The potential exists for large oil spills and disasters from oil tank ruptures and collisions at sea, and in some areas, particularly the Red Sea, there are no mechanisms to contain or clean up oil spills. Other activities associated with hydrocarbon exploration/production also threaten marine life (e.g. seismic surveying).

d. Maritime Transport - Major shipping routes run past the coral reefs of the region e.g. about 16,000 ships pass through the Straits of Bab al-Mandab each year and 25,000 to 30,000 ships transit the Red Sea annually. Apart from ship-related pollution (e.g. discharges of garbage and oily wastes; bunkering activities) tanker accidents and discharges from unloading operations are serious current and future pollution risks. Added to this is physical damage to coral reefs by anchors and groundings; often the coral reefs are regarded as navigation hazards. Damage is particularly severe near major ports, where ships pass through narrow channels among large reef

complexes (e.g. Straits of Tiran, Jeddah, Bab Al Mandab), and navigation markers are currently lacking. Vessel sewage and ship discharges of solid waste pose additional threats. There are poor navigational control systems, and a lack of suitable moorings throughout the region.

e. Fisheries - Shark resources are depleting rapidly and shark-fin catches by local fishermen show rapid declines, exacerbated by poaching by foreign vessels, particularly in the Gulf of Aden and Arabian Sea. Some of these fishermen operate with licences, but most fish illegally. Industrial fishing results in large bycatches that include turtles, dolphins and non-commercial fin-fish. There is a lack of surveillance and enforcement of existing regulations. Damage by discarded or lost fishing nets is a major threat. These nets, and especially 'active' nets, are also a very significant threat to marine megafauna, particularly marine turtles and cetaceans.

f. Recreational Activities - Some damage is observed around major tourist dive sites as anchor, trampling and flipper damage to fragile corals, particularly in the Red Sea. This is particularly evident around the major tourist sites in Egypt at Ras Mohammed and Hurghada, in Sudan at Sanganeb and at Sept Frères and Moucha and Maskali in Djibouti, where it is estimated that there are thousands of tourist divers each year. Large quantities of coral, molluscs and fish are also collected for the curio and aquarium trades in Egypt; this was also widespread in Saudi Arabia in the 1970s and 1980s, though it is somewhat reduced today. Recreational driving on beaches is also a major threat to coastal habitats, particularly Saudi Arabia.

g. Domestic Sewage Pollution - Most sewage in the region is discharged untreated or partially treated into nearshore waters and often directly into sensitive marine habitats off major urban areas. There are virtually no sewage treatment plants in the region; the existing plants require regular maintenance and damage is occurring to coastal habitats because there are inadequate pollution control regulations, monitoring and enforcement. Algal blooms have been reported as a result of sewage discharges, and these pollution blooms have been linked to the deadly fibropapillomatosis disease among sea turtles.

h. Coral Bleaching – Hawksbill turtles depend on healthy coral reefs for foraging on sponges. There has recently been extensive coral mortality on many reefs, including those in the Saudi Arabian portion of the Gulf, the northern nearshore area of the Red Sea, in the southern Red Sea, the Socotra archipelago and north east Gulf of Aden. A number of Red Sea sites that had healthy coral cover in the 1980s, experienced near total mortality.

i. Desalination - There is extensive production of desalinated water to meet the demands of the population and industry. There are at least 18 desalination plants operating along the Red Sea coast which discharge hot brine and maintenance chemicals (chorine and anti-scalants) directly near coral reefs, which are habitats for many turtles. Power stations also discharge saline high-temperature water that result in temperature increases in the local surroundings.

Appendix III: Threats and Conservation Initiatives Matrix for the RSGA Region

The following threats and conservation initiatives matrix was compiled using the preliminary results of recent country surveys sponsored by PERSGA (PERSGA/GEF 2003a-e), and through publicly-existing information sources. It is acknowledged that a far greater number of threats and conservation initiatives could be considered, but the selection of the five major sections under each category are deemed representative of the threats status and of the conservation potential of loggerhead, green and hawksbill turtles in each country.

Country	Major Threats				
	Dredging / Land-filling	Commercial Fisheries	Artisanal Fisheries	Habitat Destruction	Oil Industry
Djibouti	3	2	4	2	2
Egypt	1	2	4	3	2
Jordan	2	1	3	2	2
Saudi Arabia	3	4	2	4	2
Somalia	1	4	4	1	2
Sudan	2	2	2	2	2
Yemen	2	2	3	2	2
Value Average (Ranking)	14 2.0 (5)	17 2.4 (2)	24 3.4 (1)	16 2.3 (3)	15 2.1 (4)
Country	Conservation Initiatives				
	Legislation & Coordination	Research & Monitoring	Enforcement & Implementation	Education & Awareness	Community Participation
Djibouti	2	2	2	2	3
Egypt	1	2	2	2	3
Jordan	2	3	1	2	2
Saudi Arabia	2	1	3	2	3
Somalia	3	3	3	3	3
Sudan	3	3	3	3	3
Yemen	1	2	3	2	2
Value Average (Ranking)	16 2.3 (5)	17 2.4 (3)	19 2.7 (2)	17 2.4 (3)	21 3.0 (1)

Notes:

Major Threats Scale: (1)-None; (2)-Small; (3)-Moderate; (4)-High; (5)-Critical

Conservation Initiatives Scale: (3)-Negligible; (2)-Moderate; (1)-Established & Operational

Artisanal (Traditional) Fishing includes egg collection

Appendix IV: Accession of PERSGA States to Relevant International Legal Instruments Relevant to Turtle Conservation

	Djibouti	Egypt	Saudi Arabia	Somalia	Sudan	Yemen
CITES$_1$	X	X	X	X	X	X
CBD$_2$	X	X	X		X	X
BONN$_3$		X	X	X		
RAMSAR$_4$	X	X				
MARPOL$_5$	X	X				
ROPME$_6$			X			
PERSGA$_7$	X	X	X	X	X	X
LONDON$_8$		X				
UNCLOS$_9$	X	X	X	X	X	X
ALGIERS$_{10}$	X	X			X	
BAMAKO$_{11}$	X	X		X		
JEDDAH$_{12}$	X	X	X	X	X	X
JEDDAH$_{13}$	X	X	X	X	X	X
UNESCO$_{14}$		X			X	X
VIENNA$_{15}$	X	X	X	X	X	X
BRUSSELS$_{16}$						
EAST AFRICA$_{17}$				X		
NAIROBI$_{18}$				X		
BASEL$_{19}$	X	X	X			X

1. Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)
2. Convention on Biological Diversity (1992)
3. Convention on the Conservation of Migratory Species of Wild Animals (1979)
4. Convention on Wetlands of International Importance Especially as Waterfowl Habitat (1971)
5. International Convention for the Prevention of Pollution from Ships (1973/78)
7. Declaration of the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (1995)
6. Regional Organization for the Protection of the Marine Environment (1979)
8. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972)
9. United Nations Convention on the Law of the Sea (UNCLOS 1982)
10. African Agreement for the Conservation of Nature and Natural Resources (Algiers 1968)
11. Bamako Convention on the Ban of the Import into Africa and the Control of Trans-boundary Movement and Management of Hazardous Wastes within Africa (1991)
12. Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment (1982)
13. Protocol Concerning Regional Co-operation in Combating Pollution by Oil and other Harmful Substances in Cases of Emergency (1982)
14. Convention Concerning the Protection of the World Cultural and Natural Heritage (1974)
15. Vienna Convention for the Protection of the Ozone Layer (1996)
16. Convention Relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite (1974)
17. Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (1985)
18. Protocol Concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region (1988)
19. Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal (1989)

Appendix V: Components of a Regional Programme to Identify and Monitor Marine Turtle Populations and their Migrations

The following comprises Annex II of the Emirates Declaration, 2000

Objective: To provide a scientific/biological basis for regional cooperation and collaboration

1. Identify funding sources
2. Procure funding for turtle studies
3. Identify rookeries and foraging sites
4. Select lesser-studied areas for initial surveys
5. Prioritise where research and monitoring is realistic and appropriate at the regional and national levels
6. Establish national databases and a regional data coordinating centre/database
7. Promote exchange of information regarding data collection, sampling and tagging programmes within the region
8. Ensure national involvement in project design, fieldwork, data collection, analysis and publication
9. Establish an appropriate system to reward tag returns (monetary, letters, certificates, etc.)
10. Promote awareness of tagging programmes among individuals likely to encounter tagged turtles
11. Assess approximate population sizes in feeding and nesting sites in order to decide how many tags to distribute
12. Coordinate tag series use, including use of ISO country codes
13. Conduct workshops to train fieldworkers with best-known practices including the design of studies that will determine tag loss, collection of tissue samples, and database management
14. Obtain appropriate CITES permits for tissue import and export for genetic analysis
15. Supply equipment (e.g. tags, applicators, etc.)
16. Commit staff and resources (e.g. vehicles, boats, tags, applicators, salaries, etc.) to turtle monitoring and research
17. Involve volunteers and local communities in data gathering
18. Carry out fieldwork
    - Identify species
    - Tag turtles on nesting and feeding grounds
    - Sample tissues on nesting and feeding grounds
    - Measure turtles on nesting and feeding grounds
19. Analyse data
20. Report annually to the coordinating bodies on activities and general findings
21. Incorporate results into Action/Management plan for the Indian Ocean and Southeast Asian region
22. Publish/disseminate results promptly

Appendix VI: The IOSEA MoU, & the Conservation and Management Plan

The IOSEA Memorandum of Understanding

THE SIGNATORY STATES,

Aware that the populations of the six species of marine turtles of the Region are listed as vulnerable, endangered or critically endangered on the IUCN - The World Conservation Union Red List of Threatened Species;

Noting that marine turtles have a priority for conservation action through their listing in the respective texts or appendices of the Convention on the Conservation of Migratory Species of Wild Animals (CMS), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the African Convention on the Conservation of Nature and Natural Resources, and the Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region and related protocols;

Recognising that the conservation of marine turtles and their habitats is specifically addressed in the Memorandum of Understanding on ASEAN Sea Turtle Conservation and Protection and the Memorandum of Agreement on the Turtle Islands Heritage Protected Area (TIHPA);

Recognising that other international instruments, including the United Nations Convention on Law of the Sea (UNCLOS), the FAO Code of Conduct for Responsible Fisheries, the International Convention for the Prevention of Pollution from Ships (MARPOL), and the Convention on Biological Diversity (CBD), are relevant to the conservation of marine turtles and their habitats;

Aware that existing regional organisations, including the Association of Southeast Asian Nations (ASEAN), the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA), and the Regional Organization for the Protection of the Marine Environment (ROPME) operate programmes relevant to the conservation of marine turtles and their habitats;

Recognising that marine turtles migrate and disperse over vast distances, which makes their survival dependent on their conservation over a wide area and in a wide range of marine and coastal habitats;

Acknowledging that human activities that may threaten marine turtle populations directly or indirectly include harvesting of eggs and turtles, inappropriate hatchery operations, destruction or modification of habitats, coastal development, pollution, fishing activities, mariculture and tourism;

Recognising the importance of integrating actions to conserve marine turtles and their habitats with activities related to the socio-economic development of the signatory States, including coastal development and maritime activities;

Acknowledging their shared responsibility for the conservation and management of marine turtle populations and their habitats;

Recognising the importance of involving all the States in the Region, as well as relevant inter-governmental, non-governmental and private sector organisations, in co-operative conservation and management of marine turtles and their habitats;

Noting the desirability of involving other States whose nationals or vessels conduct activities that may affect marine turtles of the Region, as well as States that may be in a position to contribute resources or expertise that may promote the implementation of this Memorandum of Understanding;

Recognising that concerted and coordinated action must be taken immediately to address the threats posed to marine turtle populations and their habitats;

Desiring to establish through this Memorandum of Understanding co-operative measures for the protection, conservation and management of marine turtles and their habitats throughout the Region;

AGREE to pursue the actions set forth in this Memorandum of Understanding, individually and collectively, to improve the conservation status of marine turtles and their habitats.

DEFINITIONS

1. Marine turtles means any of the species listed below:

Common name	**Species**
Loggerhead turtle	*Caretta caretta*
Olive ridley turtle	*Lepidochelys olivacea*
Green turtle	*Chelonia mydas*
Hawksbill turtle	*Eretmochelys imbricata*
Leatherback turtle	*Dermochelys coriacea*
Flatback turtle	*Natator depressus*

2. Habitats means all those aquatic and terrestrial environments which marine turtles use at any stage of their life cycles.

3. Region means all of the waters and coastal States of the Indian Ocean and South-East Asia and adjacent seas, extending eastwards to the Torres Strait.

4. Conservation status of marine turtles means the sum of the influences acting on a marine turtle species that may affect its long-term distribution and abundance.

5. Conservation status will be taken as favourable when:

   a. population dynamics data indicate that the marine turtle species is maintaining itself on a long-term basis as a viable component of its ecosystems;

   b. the range of the marine turtle species is neither currently being reduced, nor is likely to be reduced, on a long-term basis;

   c. there is, and will be in the foreseeable future, sufficient habitat to maintain the population of the marine turtle species on a long-term basis; and

   d. the distribution and abundance of the marine turtle species approach historic coverage and levels to the extent that potentially suitable ecosystems exist and to the extent consistent with wise wildlife management.

OBJECTIVE

The objective of this Memorandum of Understanding is to protect, conserve, replenish and recover marine turtles and their habitats, based on the best scientific evidence, taking into account the environmental, socio-economic and cultural characteristics of the signatory States.

ACTIONS

1. To achieve the objective of the Memorandum of Understanding, in a spirit of mutual understanding and co-operation, the signatory States will:

2. Co-operate closely in order to achieve and maintain a favourable conservation status for marine turtles and the habitats on which they depend.

3. Implement, subject to availability of necessary resources, the provisions of the Conservation and Management Plan, which shall be annexed to this Memorandum of Understanding. The Conservation and Management Plan shall address: marine turtle habitat protection; management of direct harvesting and trade; reduction of threats, including fisheries bycatch; research and education; information exchange; and capacity building.

4. As necessary, review, formulate, revise and harmonise national legislation relevant to the conservation of marine turtles and their habitats, and make every effort to implement such legislation effectively.

5. Consider ratifying or acceding to those international instruments most relevant to the conservation of marine turtles and their habitats in order to enhance the legal protection of these species in the Region.

6. Establish a Secretariat that will assist communication, encourage reporting and facilitate activities between and among signatory States, sub-regional institutions and other interested States and organisations. The Secretariat shall transmit to all of the signatory States and to each of the sub-regional institutions created pursuant to paragraphs 5 and 6 of the Basic Principles, all of the national reports it receives, prepare a periodic overview of progress in implementation of the Conservation and Management Plan, and perform such other functions as may be assigned by the signatory States. The Secretariat shall be based in the office of an appropriate national, regional or international organisation, as agreed by consensus of the signatory States at their first meeting, after consideration of all offers received.

7. Establish an Advisory Committee to provide scientific, technical and legal advice to the signatory States, individually and collectively, on the conservation and management of marine turtles and their habitats in the Region. The signatory States may nominate for membership on the Committee individuals with expertise in the fields of marine turtle biology, marine resource management, coastal development, socio-economics, law, fisheries technology, and other relevant disciplines. The size, composition and terms of appointment of the Advisory Committee shall be determined by the signatory States at their first meeting.

8. Designate a competent national Authority to serve as a focal point for communication between signatory States and activities under this Memorandum of Understanding, and communicate the complete contact details of this Authority (and any changes thereto) to the Secretariat.

9. Provide to the Secretariat a regular report on their implementation of this Memorandum of Understanding, the periodicity of which will be determined at the first meeting of the signatory States.

10. Assess at their first meeting, the extent of the need for and possibilities of obtaining financial resources, including the establishment of a special fund for purposes such as:

    a. meeting the expenses required for the operation of the Secretariat, the Advisory Committee and activities carried out under this Memorandum of Understanding; and

    b. assisting the signatory States to carry out their responsibilities under this Memorandum of Understanding.

BASIC PRINCIPLES

1. This Memorandum of Understanding shall be considered an agreement under Article IV, paragraph 4, of the CMS. It shall take effect on the first day of the third month following its signature by the second State. It shall remain open for signature indefinitely for subsequent States, and will come into effect for those States on the first day of the third month after their signature.

2. Each signatory State will implement, within the limits of its jurisdiction, the Memorandum of Understanding with respect to:

    a. its land territory in the Region;

    b. marine areas in the Region under its national jurisdiction; and

    c. vessels operating in the Region under its flag.

3. Implementation of this Memorandum of Understanding, including the Conservation and Management Plan, shall be assessed at regular meetings to be attended by representatives of each of the signatory States and persons or organisations technically qualified in, or relevant to, the conservation of marine turtles. Such meetings shall be convened by the Secretariat and shall be hosted by, and organised in collaboration with, one of the signatory States. Such meetings should be held annually, at least initially. The periodicity of these meetings may be reviewed and revised by consensus of the signatory States at any of their regular meetings.

4. This Memorandum of Understanding, including the Conservation and Management Plan, may be amended by consensus of the signatory States. When appropriate, the signatory States will consider amending this Memorandum of Understanding to make it legally binding.

5. Signatory States may establish, by mutual agreement, bilateral, sub-regional or regional management plans that are consistent with this Memorandum of Understanding.

6. Actions under this Memorandum of Understanding will be coordinated with signatory States, as well as with sub-regional institutions in the Region.

7. The original text of this Memorandum of Understanding, in the Arabic, English and French languages shall be deposited with the UNEP/CMS Secretariat, which shall be the Depositary. In the event of any discrepancies, the English version will be considered definitive.

8. Nothing in this Memorandum of Understanding shall preclude signatory States from implementing stronger national measures than those specified in the Conservation and Management Plan, in accordance with international law.

9. This Memorandum of Understanding shall remain in effect indefinitely, subject to the right of any signatory State to terminate its participation by providing one year's notice to the Depositary.

IOSEA MoU – Conservation and Management Plan

Objective 1. Reduce direct and indirect causes of marine turtle mortality

Programme	Activity
1.1 Identify and document the threats to marine turtle populations and their habitats	a) Collate and organise existing data on threats to marine turtle populations b) Establish baseline data collection and monitoring programmes to gather information on the nature and magnitude of threats c) Determine those populations affected by traditional and direct harvest, incidental capture in fisheries, and other sources of mortality
1.2 Determine and apply best practice approaches to minimising those threats to marine turtle populations and their habitats	a) Identify and document best practice protocols for conserving and managing marine turtle populations within the region b) Adapt and adopt the best conservation and management practices for marine turtle populations
1.3 Implement programmes to correct adverse economic incentives that threaten marine turtle populations	a) Conduct socio-economic studies among communities that interact with marine turtles and their habitats b) Identify desired modifications to the economic incentives in order to reduce threats and mortality, and develop programmes to implement the modifications c) Identify resources and sources of funding for the programmes
1.4 Reduce to the greatest extent practicable the incidental capture and mortality of marine turtles in the course of fishing activities	a) Develop and use gear, devices and techniques to minimise incidental capture of marine turtles in fisheries, such as devices that effectively allow the escape of marine turtles, and spatial and seasonal closures b) Develop procedures and training programmes to promote implementation of these measures, such as vessel monitoring systems and inspections at sea, in port and at landing sites, and national on-board observer programmes

	c) Exchange information and, upon request, provide technical assistance to other signatory States to promote these activities
	d) Liaise and coordinate with fisheries industries and fisheries management organisations to develop and implement incidental capture mitigation mechanisms in national waters and on the high seas
	e) Support the UN General Assembly resolution 46/215 concerning the moratorium on the use of large-scale driftnets on the high seas
	f) Develop and implement net retention and recycling schemes to minimise the disposal of fishing gear at sea and on beaches
	g) Provide and ensure the use of port facilities for the disposal of ship-borne waste
1.5 Prohibit the direct harvest (capture or killing) of, and domestic trade in, marine turtles, their eggs, parts or products, whilst allowing exceptions for traditional harvest by communities within each jurisdiction provided that: such harvest does not undermine efforts to protect, conserve and recover marine turtle populations and their habitats; and the marine turtle populations in question are able to sustain the harvest	a) Enact, where not already in place, legislation to prohibit direct harvest and domestic trade b) Assess the level and impact of traditional harvest on marine turtles and their eggs c) Establish management programmes that may include limits on levels of intentional harvest d) Determine the cultural and traditional values and economic uses of marine turtles (both consumptive and non-consumptive) e) Negotiate, where appropriate, management agreements on the sustainable level of traditional harvest, in consultation with other concerned States, to ensure that such harvest does not undermine conservation efforts
1.6 Develop nesting beach management programmes to maximize hatchling recruitment	a) Evaluate the effectiveness of nest and beach management programmes b) Reduce the mortality of eggs and hatchlings to maximise hatchling recruitment and survival, preferably using conservation techniques that emphasize natural processes wherever possible c) Minimise the mortality of eggs, hatchlings and nesting female turtles caused by feral and domestic animals

Objective 2. Protect, conserve and rehabilitate marine turtle habitats

Programme	Activity
2.1 Establish necessary measures to protect and conserve marine turtle habitats	a) Identify areas of critical habitat such as migratory corridors, nesting beaches, inter-nesting and feeding areas b) Designate and manage protected/conservation areas, sanctuaries or temporary exclusion zones in areas of critical habitat, or take other measures (e.g. modification of fishing gear, restrictions on vessel traffic) to remove threats to such areas c) Develop incentives for adequate protection of areas of critical habitat outside protected areas d) Undertake assessments of the environmental impact of marine and coastal development and other human activities that may affect marine turtle populations and their habitats e) Manage and regulate within each jurisdiction the use of beaches and coastal dunes, for example location and design of buildings, use of artificial lighting, and transit of vehicles in nesting areas f) Monitor and promote the protection of water quality from land-based and maritime pollution, including marine debris, that may adversely affect marine turtles g) Strengthen the application of existing bans on the use of poisonous chemicals and explosives in the exploitation of marine resources
2.2 Rehabilitate degraded marine turtle habitats	a) Re-vegetate, where appropriate, frontal dunes at nesting beaches, with indigenous flora as far as possible, in order to provide visual barriers to coastal development and to restore appropriate beach temperature regimes b) Remove debris that impedes turtle nesting and hatchling production c) Enhance recovery of degraded coral reefs d) Enhance recovery of degraded mangrove and seagrass habitats

Objective 3. Improve understanding of marine turtle ecology and populations through research, monitoring and information exchange

Programme	Activity
3.1 Conduct studies on marine turtles and their habitats targeted to their conservation and management	a) Conduct baseline studies or gather secondary information on marine turtle populations and their habitats b) Initiate and/or continue long-term monitoring of priority marine turtle populations in order to assess conservation status c) Characterise genetic identity of marine turtle populations d) Identify migratory routes through the use of tagging, genetic studies and/or satellite tracking e) Carry out studies on marine turtle population dynamics and survival rates f) Conduct research on the frequency and pathology of diseases of marine turtles g) Promote the use of traditional ecological knowledge in research studies h) Review periodically and evaluate research and monitoring activities
3.2 Conduct collaborative research and monitoring	a) Identify and include priority research and monitoring needs in regional and sub-regional action plans b) Conduct collaborative studies and monitoring on genetic identity, conservation status, migrations, and other biological and ecological aspects of marine turtles
3.3 Analyse data to support mitigation of threats and to assess and improve conservation politics	a) Prioritise populations for conservation actions b) Identify population trends c) Use research results to improve management, mitigate threats and assess the efficacy of conservation activities (e.g. hatchery management practices, habitat loss, etc.)

3.4 Exchange information	a) Standardise methods and levels of data collection and adopt or develop an agreed set of protocols for *inter alia:* monitoring of nesting beaches, feeding ground studies, genetic sampling, and collection of mortality data
	b) Determine the most appropriate methods for information dissemination
	c) Exchange at regular intervals scientific and technical information and expertise among nations, scientific institutions, non-governmental and international organisations, in order to develop and implement best practice approaches to conservation of marine turtles and their habitats
	d) Disseminate traditional knowledge on marine turtles and their habitats for conservation and management
	e) Compile on a regular basis data on marine turtle populations of regional interest

Objective 4. Increase public awareness of the threats to marine turtles and their habitats, and enhance public participation in conservation activities

Programme	Activity
4.1 Establish public education, awareness and information programmes	a) Collect, develop and disseminate education materials b) Establish community learning/information centres c) Develop and implement accurate mass media information programmes d) Develop and conduct focused education and awareness programmes for target groups (e.g. policy makers, teachers, schools, fishing communities, media) e) Encourage the incorporation of marine turtle biology and conservation issues into school curricula f) Organise special events related to marine turtle conservation and biology (e.g. Turtle Day, Year of the Turtle, symposia, Track-a-turtle)
4.2 Develop alternative livelihood opportunities for local communities to encourage their active participation in conservation efforts	a) Identify and facilitate alternative livelihoods (including income generating activities) that are not detrimental to marine turtles and their habitats, in consultation with local communities and other stakeholders
4.3 Promote public participation	a) Involve stakeholders, and local communities in particular, in planning and implementation of conservation and management measures b) Encourage the participation of government institutions, non-governmental organisations, the private sector and the general community (e.g. students, volunteers, fishing communities, local communities) in research and conservation efforts c) Implement, where appropriate, incentive schemes to encourage public participation (e.g. T-shirts for tag returns, public acknowledgement, certificates)

Objective 5. Enhance national, regional and international cooperation

Programme	Activity
5.1 Collaborate with and assist signatory and non-signatory States to regulate and share information on trade, to combat illegal trade, and to cooperate in enforcement activities relating to marine turtle products	a) Encourage signatory States that have not already done so to become Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) b) Review at a national level compliance with obligations under CITES relating to trade in marine turtles, their eggs, parts or products c) Facilitate better compliance with CITES through training of relevant authorities in cooperation with other signatory States, the CITES Secretariat and other relevant organisations d) Identify routes of international illegal trade through monitoring, and seek cooperation to take action to prevent, deter and, where possible, eliminate illegal trade e) Exchange and discuss information on compliance and trade issues at regular intervals, such as through annual reporting to the MoU Secretariat and at meetings of the signatory States f) Identify, prevent, deter and, where possible, eliminate domestic illegal trade through monitoring, implementation of legislation, identification of gaps in enforcement capabilities in each country, and training of enforcement officers
5.2 Assist signatory and non-signatory States, upon request, to develop and implement national, sub-regional and regional action plans for the conservation and management of marine turtles and their habitats	a) Develop a set of key management measures that could be used as a basis for action plans, through consultation with concerned Government authorities, research institutions, NGOs, local communities and other stakeholders b) Identify existing action plans that could be used as models c) Identify specific local management issues where cooperation among States is required for successful conservation and management d) Review action plans at regular intervals to take into account recent advances in skills and knowledge regarding marine turtle conservation and management, as well as changes in conservation status of marine turtle populations
5.3 Enhance mechanisms for cooperation and	a) Identify and strengthen existing mechanisms for cooperation at the sub-regional level

promote information exchange	b) Develop a website and/or newsletter to facilitate networking and exchange of information
	c) Develop a web-based information resource for marine turtle conservation (including data on populations, nesting, migration, on-going projects)
	d) Create a directory of experts and organisations concerned with marine turtle conservation
	e) Develop networks for cooperative management of shared populations, within or across sub-regions, and, where appropriate, formalise cooperative management arrangements
	f) Cooperate where possible in the establishment of transboundary marine protected areas using ecological rather than political boundaries
	g) Develop a streamlined format for reporting and exchanging information (through the MoU Secretariat and among signatory States) on the state of marine turtle conservation at the national level
	h) Encourage MoU signatory States that have not already done so to become Parties to the Convention on Migratory Species (CMS)
	i) Encourage signatory States to become Parties to global fisheries agreements such as the UN Fish Stocks Agreement (1995) and the FAO Compliance Agreement (1993) and implement the FAO Code of Conduct for Responsible Fisheries (1995)
	j) Establish relationships with regional fisheries bodies with a view to obtaining data on incidental capture and encourage them to adopt marine turtle conservation measures within EEZs and on the high seas
5.4 Build capacity to strengthen conservation measures	a) Identify needs for capacity-building in terms of human resources, knowledge and facilities
	b) Provide training (e.g. through workshops) in marine turtle conservation and management techniques to relevant agencies, individuals and local communities
	c) Coordinate training programmes and workshops
	d) Develop partnerships with universities, research institutions, training bodies and other relevant organisations
5.5 Strengthen and improve enforcement of conservation legislation	a) Review domestic policies and laws to address gaps or impediments to marine turtle conservation
	b) Cooperate in law enforcement to ensure compatible application of laws across and between jurisdictions (including through bilateral/multilateral agreements and intelligence sharing)

Objective 6. Promote implementation of the MoU including the Conservation and Management Plan

Programme	Activity
6.1 Broaden membership in the MoU, and ensure continuity of MoU activities	a) Encourage non-signatory States to sign the MoU b) Arrange sub-regional workshops involving non-signatory States to raise awareness of the MoU c) Consider at the first meeting of the signatory States the development of a timetable for possible amendment of the MoU to make it a legally binding instrument
6.2 Promote the role of the Secretariat and the Advisory Committee of the MoU in ensuring the objectives of the Conservation and Management Plan are met	a) Secure reliable sources of funding to support the MoU Secretariat b) Appoint at the first meeting of the signatory States the members of the Advisory Committee c) Establish lines of communication between the MoU Secretariat and the Advisory Committee to facilitate advice to the signatory States
6.3 Seek resources to support the implementation of the MoU	a) Prioritise conservation and management activities for funding b) Explore funding options with Governments and other donors such as the Asian Development Bank, World Bank, UNDP, European Union, UNEP, GEF, etc. c) Solicit funding and other contributions from industries that have impacts on marine turtles and their habitats (e.g. fisheries, tourism, oil industry, real estate) d) Explore the use of economic instruments for the conservation of marine turtles and their habitats e) Approach the private sector, foundations and NGOs that may have an interest in funding activities in particular countries to catalyse the creation of a small grants fund f) Generate funding for conservation and management activities through managed ecotourism and other self-supporting schemes (while benefiting local communities) g) Seek synergies (with respect to fund-raising, provision of institutional support, etc.) with other regional/global convention secretariats h) Explore international funding support and other incentives for signatory States that effectively manage marine turtle populations, which might include the complete prohibition of direct harvest (capture or killing)

6.4 Improve coordination among government and non-government sectors in the conservation of marine turtles and their habitats	a) Review the roles and responsibilities of government agencies related to the conservation and management of marine turtles and their habitats b) Designate a lead agency responsible for coordinating national marine turtle conservation and management policy c) Encourage cooperation within and among government and non-government sectors, including through the development and/or strengthening of national networks

Appendix VII: Priority Actions for the Conservation of Marine Turtles in the Western Indian Ocean

The following priorities were identified as important actions that need to be taken at the regional level to promote marine turtle conservation throughout the Western Indian Ocean (WIO). The priority actions are drawn from the *Marine Turtle Conservation Strategy and Action Plan for the Western Indian Ocean*, published by the IUCN-SSC Marine Turtle Specialist Group, following a workshop in Sodwana Bay, South Africa, in 1995. This meeting was the first in a series of regional workshops organized by the IUCN/SSC Marine Turtle Specialist Group.

Priority Actions

- Obtain government endorsement of regional strategy

- Establish communication and information exchange

- Establish WIO regional steering committee

- Appoint regional coordinator for marine turtle conservation

- Declare "Year of the Sea Turtle" for the Indian Ocean

- Implement training, study tours, personnel exchanges

- Coordinate regional database, including distribution of tags

- Standardise methodologies for research and management

- Identify independent management units for each species of marine turtles in the WIO through tagging and genetic assessment

- Monitor direct harvest in the WIO

- Intensify monitoring of impact of fisheries operating in the WIO

- Reduce fisheries bycatch mortality, including promotion of Turtle Excluder Device (TED) implementation.

Appendix VIII: Priority Actions for the Conservation of Marine Turtles in the Northern Indian Ocean

The following priorities were identified as important actions, which need to be taken at the regional level to promote marine turtle conservation throughout the Northern Indian Ocean (NIO). The priority actions are drawn from the *Marine Turtle Conservation Strategy and Action Plan in the Northern Indian Ocean*, published by the IUCN-SSC Marine Turtle Specialist Group, following a workshop in Bhubaneswar, Orissa, India in 1997. This meeting was the second in a series of regional workshops organized by the IUCN/SSC Marine Turtle Specialist Group (MTSG).

Priority Actions

- Obtain government endorsement of NIO strategy

- Obtain funding for and appoint a regional coordinator for NIO

- Initiate development of national strategy and action plans

- Identify critical habitats for nesting, feeding, migratory and breeding areas of marine turtles in the NIO and ensure their protection

- Extend marine turtle programmes throughout the region by identifying independent management units for each species of marine turtle in the NIO through tagging studies and genetic assessment

- Generate information on biology of marine turtles and exchange information among regional countries

- Standardize methodologies for research and management

- Implement training and personnel exchange programmes

- Establish a database network

- Substantially reduce mortality of turtles and their eggs from harvest, predation and habitat destruction

- Regulate fisheries that incidentally capture marine turtles to reduce injury and mortality

- Create greater public awareness through the declaration of the "Year of the Sea Turtle" for the NIO

- Promote community participation in marine turtle research, conservation, and management