Status of leatherback turtles in Bahrain

By Nicolas Pilcher

1. Introduction
Bahrain consists of a group of 33 low- lying islands in the Gulf off Saudi Arabia. Notable habitats include salt marsh, seagrass beds and mangrove swamps, coral reefs and date groves. National designations of protected areas include wildlife park (*Hema*) and wildlife reserve. The Environmental Protection Committee has divided the protected area categories into three priorities: priority 1: full protected status; priority 2: conservation status; priority 3: seasonal management status. In addition, a degree of protection is given to the southern part of Bahrain Island and the smaller archipelagos, as well as the isolated Hawar islands. In the case of the latter, the government has imposed access restrictions to all but fishermen and those with official permits.

The maritime area of Bahrain falls within the Arabian (Persian) Gulf, between Saudi Arabia and Qatar. The average depth is about 35 m and maximum is 100 m. The Gulf is subject to wide climatic fluctuations, with surface water temperatures generally ranging from 12 in the winter to > 35^{o}C in the summer and salinity from 28-60 ppt. The narrow straits of Hormuz restrict water exchange with the Arabian Sea, causing the Gulf to become highly saline because of high evaporation and low inputs of fresh water. Marine ecosystems include mangrove swamps, seagrass beds, coral reefs and small offshore islands.

2. The legal protection status for leatherback turtles
2.1 Overview
Bahrain has ratified the Kuwait Action Plan under Regional Organization for Protection of the Marine Environment, ROPME. Bahrain's commitment to the preservation of the Hawar Islands was formalized in 1995 with Royal Decree No. 2 (1995), to instigate the creation of a Wildlife Sanctuary around the Hawar Islands. The legislation to protect the islands was completed with Edict No. 16 (1996) issued by the Council of Ministers establishing the islands as a Protected Area. This Edict has since been further reinforced by the nomination of the Islands of Hawar as a Ramsar Site (the islands were nominated on ratification of the Ramsar agreement on 26 February 1997 through Royal decree No. 3 1997), and by the Ministerial Order (MOHME) for the Protection of Wildlife in June 1996.

2.2 Management agencies responsible for marine turtle conservation
The government has used the following mechanisms and protocols for the protection of wildlife: the Establishment of Bahrain Wild Life Committee, now the National Commission for the Protection of Wildlife (NCWP); the formation of a National Biodiversity Committee, with the main objective to formulate a National Biodiversity Strategy and Action Plan (NBSAP); the establishment of Marine Protected Areas (Mashtan Island was adopted in April 2002), membership in the Kuwait Action Plan for the Protection of Marine Environment drafted under the auspices of the Regional Organization for the Protection of the Marine Environment (ROPME) in 1978, ratification of the Convention of Biological Diversity (CBD) in 1993 and of the Convention on Wetlands of International Importance as Waterfowl Habitats (Ramsar) in 1998.

The Directorate of Environmental Affairs of the Ministry of Health is responsible for marine and coastal environmental activities. It works with the Bahrain Petroleum Company (BAPCO) on marine pollution and marine environmental affairs. The Directorate of Fisheries is concerned with environmental studies and the protection of breeding and nursery areas for fish and shrimp and the establishment of fishing bans in spawning seasons and the development of laws and regulations relating to the protection of the marine environment. Non-governmental bodies actively concerned with protected areas include the Bahrain Natural History Society (BNHS).

3. Nesting populations
There are no historical or contemporary records of leatherbacks nesting in Bahrain.

4. Foraging populations

4.1 Overview

Bahrain lists the leatherback as present in its waters (SOMER, 2003), although no contemporary records of any sightings exist. While significant research and conservation action has been implemented for hawksbill turtles, no research of any kind has been carried out on leatherback turtles in Bahrain.

4.2 Threats to leatherback turtles

The most significant of the environmental problems include the extensive damage and destruction through massive urban development programmes and rapid land reclamation programmes. Since oil was first discovered in 1931, many beaches in northern Bahrain have been drastically polluted by oil and potentially there have been serious threats from major oil and chemical spillages such as the Iranian war spills of 1983 and the Gulf War. Discharge of sewage and industrial effluent as well as dredging has caused damage to the seabed and coral reefs.

Several other anthropogenic factors may impact turtles in Bahrain, with commercial trawl fishing, dredging and land reclamation among the most destructive. These activities are unregulated and carried out in an environmentally damaging manner. Land reclamation projects, for instance, have increased the northern and eastern coasts of Bahrain by 11 km^2 in less than 10 years, resulting in a direct loss of marine habitat.

4.3 Protection of foraging areas

The Bahrain National Charter §3(5) proclaims the protection of Hawar Islands as a Nature Reserve and National Heritage. It also states that as a result of increasing pressure on the limited natural resources, the government seeks to create an ideal condition to exploit the natural resources without negatively affecting the environment or the health of the people. The marine environments about the islands embody a myriad of habitats and seascapes that are home to a remarkable array of marine fauna. The protected Area provides habitat for a diverse range of marine and terrestrial species. For example, the endangered Dugong (*Dugong dugon*) and the green sea turtle (*Chelonia mydas*) inhabit the nearshore waters, and over 150 species of birds use the islands as a flyway or as a wintering breeding / foraging area.

4.4. Gaps in capacity and requirements for improved conservation

A major gap for turtle conservation is the lack of dedicated marine protected areas. There is a general lack of funding for marine research activities, and most research is currently funded through volunteer projects. In particular, research needs to be carried out in order to update baseline environmental conditions, and follow-up monitoring should refer to these baselines to detect changes in foraging populations; direct use and indirect development activities that affect turtles and their habitats need to be carefully evaluated in the design stages, and be subject to continued monitoring through the implementation stages; there is a need to develop community education programmes that highlight the role of communities in turtle biology and ecology, particularly the at-sea stages with regard to Bahrain. The designation of marine protectorates needs to become a priority issue within the country. Finally, a larger proportion of funds need to be allocated to protected areas and environmental research needs to be appropriated for marine conservation efforts.

5. References

SOMER (2003) 'State of the Marine Environment Report. ROPME/GC-11/003.' Regional Organization for the Protection of the Marine Environment, Kuwait. 217 pp.

Status of leatherback turtles in Bangladesh

By M. Zahirul Islam

1. The legal protection status for leatherback turtles

1.1. Overview

The Forestry Department, under the Ministry of Environment and Forestry, is the sole authority for the protection, conservation and management of all wildlife in Bangladesh, however, although marine turtles are under the mandate of their protection, they are not included in the list of protected species, Schedule III of the Bangladesh Wildlife (Preservation) (Amendment) Act 1974 (BWPA). The list of protected species is currently under review. Under this revision all wildlife species will be protected, and the government can through gazette notifications, indicate which species are liable for any form of exploitation or trade. Currently, the act is in the final stages of revision by the Forestry Department and marine turtles are included in the list of protected animals.

In addition the MFRI under the aegis of the Department of Fisheries (DOF), Ministry of Fisheries and Livestock (MFL) also claim that they are responsible for the protection and management of marine and freshwater turtles, and marine resources like cetaceans and crustaceans. Considerable revenue is at stake and this might underlie conflict between the two government agencies. This issue needs to be discussed at the top of Government level to strengthen inter-departmental co-operation and co-ordination to ensure the conservation of turtles and other aquatic resources.

The 1999 government notification and declaration of Ecologically Critical Areas (ECA) were done on the basis of protecting the habitat of globally significant migratory species, including the nesting and coastal foraging habitat of marine turtles. There are three ECAs in Bangladesh that are important for marine turtle nesting; a) Sonadia Island, b) Cox's Bazar to Teknaf Peninsular coast and c) St. Martin Island.

The Government of Bangladesh has signed several international or regional agreements, conventions, treaties and protocols related to marine environment and biological resources (Islam 1996), which directly or indirectly affect marine turtles (Table 1). However, there are several limitations or gaps in the existing laws. The first and foremost limitation is the non-inclusion of marine turtles in the Protected List of Animals (Schedule III) of the BWPA. Rashid (1986) suggested their inclusion in the protected list. They will be incorporated in the list in the latest revision of the Act. There is little protection of nesting or foraging habitats, which are critical to marine turtle survival. Beaches are already under intense pressure for development by the tourism industry. Immediate steps have to be taken to identify and protect significant beaches and foraging areas. Some NGOs and Government projects are working on conservation in some areas, but it is not enough and the government has competing sectors such as tourism and infrastructure development that threaten nesting turtle population as human use increases. Coastal development is occurring without Environmental Impact Assessments being conducted regarding marine turtle nesting habitat and overall ecosystem.

1.2. Specific legislation

The following legislation is relevant to wildlife and marine turtles in Bangladesh:

- Bangladesh Wildlife (Preservation) Amendment Act (1974)
- National Environmental conservation Act, 1995;
- New Fisheries Management Policy, Bangladesh (1986)
- Revised Bangladesh Wildlife (Preservation) Amendment Act (1974) (not published)

Declaration of Ecologically Critical Areas (ECA):19 APR 1999 REF # MOEF-4/7/87/99/245

The Government of Bangladesh has become convinced that unplanned activities severely hamper the ecosystem of certain coastal areas of the country. This degradation may continue and the natural system could face future dangers if immediate remediation measures are not taken. Therefore, to protect the natural environment by encouraging conservation, restoration and pollution prevention, and promote sustainable environmental management the Government of Bangladesh under the provision of

Bangladesh Environmental Conservation ACT 1995(1st act of 1995) by its sub-section-1 of Section-5 and Section-4 declared seven areas as Ecologically Critical Areas.

The following activities are banned in the ECA zone:

- Any type of plant and forest destruction or collection,
- All wildlife killing and hunting
- Shell, turtle, coral and other wildlife catching and collection
- Flora and fauna habitat destruction
- Industry and structure establishment that can pollute soil, water, air and create sound pollution,
- Any activities that threaten the natural state of land and water.
- All destructive activities that threaten fish and other aquatic flora and fauna.

Out of seven ECAs the following areas have marine turtle nesting beaches;

1. Coastal Cox's Bazar - Teknaf peninsular beach area (area 10465 hector);
2. St. Martin Island (590 hector); and
3. Sonadia Island (4916 hector).

1.3 International agreements affecting marine turtles

Table 1 lists the international agreements, conventions, treaties and protocols signed, accessed, ratified by the Government of Bangladesh, which directly or indirectly affects marine turtles.

Table 1. List of the international agreements that have been ratified by the Bangladesh Government

Conventions/Treaties/Protocols	**Year ratified (r), signed (s) or accessed (a)**
Convention on the Control of Trans boundary Movements of Hazardous Wastes and their Disposal, Basel, 1989.	1993 (a)
Agreement on the Network of Aquaculture Centres in Asia and the Pacific, Bangkok, 1988.	1990 (r)
Convention on the Continental Shelf, Geneva, 1958.	1990 (r)
Convention on Wetlands of International Importance especially as Waterfowl Habitat, RAMSAR, 1971.	1992 (r)
Convention Concerning the Protection of World Cultural and Natural Heritage, Paris, 1972.	1983 (r)
Convention on International Trade in Endangered Species of Flora and Fauna, Washington, 1973.	1982 (r)
Convention on Biological Diversity, Rio de Janeiro, 1992	1994 (r)
Convention on the Conservation of Migratory Species of Wild Animals, 1979.	2000 (s)
International Convention for the Prevention of Pollution of the Sea by Oil, 1954.	1981 (r)
International Convention on Oil Pollution Preparedness, Response and Cooperation, London, 1990.	1990 (s)
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, Brussels, 1969.	1982 (r)
United Nations Convention on the Law of the Marine, Montego Bay, 1982	1982 (r)
United Nations Framework Convention on Climate Change, New York, 1992.	1994 (r)
MoU Of The IOSEA Marine Turtle	2004 (r)

1.2. Management agencies responsible for marine turtle conservation in Bangladesh

Operational level	**Name and type of agency**
National level	Ministry of Environment & Forestry & Ministry of Fisheries and Livestock
State level	Relevant Government state offices.
Local level	Local Government Departments such as forestry and fisheries, Local NGOs.

2. Nesting populations

2.1. Overview

There are numerous beaches in Bangladesh that are used by nesting marine turtles, however, surveys have covered only a few of them. To date most records result from incidental and sporadic records by few researchers.

To date leatherback nesting has not been confirmed in Bangladesh, but the following evidence suggests it may occur (or at least have occurred in the past);

1. Suspected nesting two decades ago at the Badamgonia area in St. Martin Island.
2. Suspected nesting in 2000 at St. Martin Island;
3. Report by an old Sonadia Islander that leatherback still nest at Sonadia Island, this has not been confirmed as regular monitoring was not conducted by local watchers prior to 2005/06.

Summary of surveys that have been conducted and nesting recorded in Bangladesh

Marine turtle surveys have been regularly conducted on St. Martin Island since October 1996. Bangladesh is located on the northern side of the Bay of Bengal in mainland Asia. Bangladesh's territorial waters supports five species of marine turtles including the olive ridley turtle, green turtle, hawksbill turtle, loggerhead turtle and leatherback turtle (Smith 1931, Husain 1976, 1979, Khan 1982, 1987, Sarker and Sarker 1988, Das 1991, Rashid 1997). The total mainland coastline of Bangladesh measures approximately 710 kilometers (ICZM 2003). Not the entire mainland coastline is suitable for nesting. Apart from the mainland coast, there are numerous offshore islands whose sandy beaches are suitable for marine turtle nesting.

Three species of marine turtles have been reported to nest in Bangladesh; olive ridley turtles (Ahmed et al 1986, Khan 1987, Rashid 1984, 1986, Rashid and Islam 1999, and in press, Islam 2002) and green turtles (Khan 1982, 1987, Rashid 1997, Rashid and Islam 1999) are common, while hawksbill turtles are rare (Rashid 1997, Islam 2002). Leatherback turtles are seldom encountered (Rashid and Islam 1999) and with no known records of nesting in Bangladesh. However, a recent crawl mark recorded in Cheradia, St. Martin's Island, in 2000 is suspected to be from a leatherback turtle.

The historical information was in anecdotal notes, district gazetteers, forest department reports, and newspaper reports on marine turtles by fishermen. There were no scientific publications or systematic surveys on marine turtles until recently. Some information from sporadic surveys and observations first started to appear in the 1980s (Khan 1982, 1985, 1987, Rashid 1984, 1986) and provided the impetus to conduct surveys and update available information on the status of marine turtles in Bangladesh. Much of the information was gathered over a period of two decades from irregular surveys and interviews with elderly and young fisher folk, and communities living in remote coastal areas and offshore islands. In October 1996, CARINAM initiated a study and conservation program on marine turtles on St. Martin's Island. There are no records of leatherback turtle nesting aside from the suspected records by local turtle watchers in St. Martin during 2000. Moreover an old islander from St Martin Island emphasized that two decades back leatherback nesting occurred in the Badamgonia area of St. Martin Island. In addition an old islander fisherman said leatherback turtles still nested at Sonadia Island but there was no regular monitoring at this location before 2005-2006 nesting season so the report remains unconfirmed.

Table 2 describes the important nesting beaches identified along the mainland coast and islands of Bangladesh, and the type of turtle nesting activity that occurs. (Species; OR = olive ridley turtle, GT = green turtle, HB = hawksbill turtle).

Table 2. Marine turtle nesting beaches that have been surveyed in Bangladesh, and the species that use them – note that no leatherback turtle nesting has been recorded

Location	Coordinates	Species	Monitoring started	Surveys
St. Martin's Island	20º34'–20º38' N, & 92º18'–92º22' E	OR/GT HB	1996	1984 &1992 1996 to 1998
Shahporir Dwip	20° 45.06N; 92° 19.612E	OR	2000	2000
Khurer mukh	20° 49.112N; 92° 17.204E	OR	2005	2005
Teknaf	20° 50.790N; 92° 16.320E	OR/GT		1987
Bordail	20° 58.068N; 92° 12.079E	OR/GT		1986 & 1989
Kocchopia	20° 57.043N; 92° 12.479E	OR/GT		1985
Monkhali	21 ° 05.813N; 92° 06.859E	OR/GT		1984 & 1985
Inani	21° 13.459N; 92° 02.727E	OR	1999	1989 & 1999
Cox's Bazar	21º25.0N; 91º90.0 E	OR/GT		1988 & 1989
Najirartek	21° 27.676N; 91° 56.984E	OR	2005	
Sonadia Island	21° 31.391N; 91° 50.707E 21° 28.577N; 91° 53.731E	OR	2005	1989, 2000, 2001
Moheskhali Island	21º32.0N; 91º41.0E	OR		1987
Kutubdia Island	21º47.0N; 91º35.0E	OR	2002	1995
Sandwip Island	22º23.0N; 91º30.0E	GT		1985
Nijhum Dwip (island)		OR		2000
Egg Island, Sunderban	21º50.0N; 89º46.0E	OR		1991 & 2003
Mandarbaria, Sunderban	21º41.0N; 89º15.0E	OR		2003
Hiron point, Sunderban				
Dubla Island, Sunderban	21° 45.111N; 89° 39.213E	OR		1994
Kotka beach, Sunderban		OR		2002, 2003
Samchari	21° 10.217N; 92° 03.249E	OR	2005	1999-00
Hiron point	21° 45.861N; 89° 26.881E	OR		2001, 2002, 2004
Pechar Dwip	21° 18.973N; 92° 02.019E	OR	2005	2005

3. Foraging populations

3.1 Details of leatherback turtle foraging area census or tagging results such as tag recovery data

There has been no tag recoveries from leatherback turtles tagged in other countries.

3.2. Seasonality of leatherback turtles caught or seen in foraging areas

In May 2005 a live leatherback (personal observation (news in IOSEA in July 2005) was recorded in Cox's Bazar district inside a saltwater river (Islam 2005). Dead, or alive stranded leatherback turtles have been recorded in April, May, June and July (Zahirul Islam pers. Comm.).

3.3. Approximate size range of leatherback turtles caught or seen in foraging areas

There was one leatherback turtle recorded alive trapped in Cox's Bazar (Islam 2005); Three swimming leatherbacks were recorded by Fishermen during 2002-2003 (Islam 2004); 4 dead bodies recorded (Islam 2004) and two of these individuals were measured and both had CCLs between 137 - 138 cm.

3.4. Information on diet of leatherback turtles

There have been no studies on the diet of leatherback turtles in Bangladesh

3.5. Other biological studies conducted on leatherback turtles in foraging areas

No systematic marine turtle foraging habitat survey have been conducted in Bangladesh. During a survey for cetacean species in February 2004 a group of 14 international scientists observed 1,018 kilometres of water in the Bay of Bengal (Smith 2004). The team searched for cetaceans along track lines for 89.6

hours with a mean vessel speed of 11.4 km/hr). Additionally, the team spent 7.8 hours searching for cetaceans in the Swatch-of-No-Ground, a deep sea canyon that extends to within 42 km of the shore in the far western portion of the Bay of Bengal in Bangladesh. The study revealed the presence of dolphins and whales in the Bangladesh territorial waters. During the survey the observers recorded other species such as marine turtles and no leatherback turtles were sited.

Short incidental offshore boat trips into the Bay of Bengal were made between 1997 and 2005 and the only marine turtle species observed were olive ridley or green turtles. However these incidental surveys lacked scientific rigour and were generally short in length. Naval personnel have not been interviewed. But fishermen in the Bay of Bengal recorded sighting live swimming leatherback turtles in 2002 and 2003 around 200 to 370 km offshore from the Cox's Bazar region (Islam 2004).

3.6. Threats to foraging populations of leatherback turtles

No systematic studies have been conducted in Bangladesh on the threats to leatherback turtles in their foraging habitat. According to local fishermen the deep sea shrimp trawlers and drifting nets from large mechanised boats from Cox's Bazar and Chittagong are the major fishery sectors responsible for turtle by-catch (Rashid 1997). Entanglement of marine turtles during offshore fishing activity have been reported in the following fisheries sectors (Rashid 1997); Marine Set Bag Net, Drifting Gill Net, Long lines etc, Shrimp Trawling etc.

Turtle Excluder Devices are not being used in Bangladesh trawlers. While a survey conducted during 1996 indicated that turtles are not vulnerable to shrimp trawling (Rashid 1997), trawling without TEDs is a potential threat that remains to be examined and its affects quantified in Bangladesh.

All species of marine turtle are in great trouble in Bangladesh water as shrimp trawlers are not using TEDs; gillnets, longlines and other fishing activity do not act to lesson lessen the by catch of endangered species. Anecdotal evidence suggests that hundred to thousands of dead individuals are seen every year in Bangladesh. These are likely to be a mixture of species. However the numbers or the treats have never been effectively investigated. A very short by catch study will be done in offshore areas with shark fisheries trawlers by the researchers of Marine Life Alliance (NGO) within short time by Jan-Feb 2006.

3.7. Fisheries bycatch of leatherback turtles and the fisheries involved

No data available

3.8. Other activities being undertaken to improve the conservation of leatherback turtle foraging populations

Areas of change	**Summary including report references**
Legislation changes	ECA declaration MARINE RESERVE in Bay of Bengal
Awareness raising programmes	Primary school education on environments and marine turtle (by GO and NGO projects)
Research activities	Tagging, low scale hatchery research - Offshore By catch Survey Planned in JAN-FEB 2006.
Physical interventions	Local community based conservation initiative to save nesting beach (in planning position).
Fishery controls	Marine reserve in Bay of Bengal 69,800 hectors, Gazette, October 2000
Managed turtle based tourism	Not yet done, some initiative in planning state
Annual nesting beach surveys	Nesting beach survey, in St. Martin Island, Sonadia Island, part of Kutubdia Island, Cox's Bazar –Teknaf peninsular area by GO and NGO
Managed hatcheries	Hatcheries at St. Martin, Sonadia, Cox's Bazar –Teknaf peninsula
Planned protected areas	Marine reserve in Bay of Bengal 69,800 hectors, Gazette, October 2000 (ICZMP 2004)

4. References

Ahmed B, Huda KMN, Asmat GSM (1986) The breeding of the olive ridley, *Lepidochelys olivacea* (Eschscholtz), at St. Martin's Island, Bangladesh. *Bangladesh Journal of Zoology* **14**, 59-69.

Das I (1991) 'Colour guide to the turtles and tortoises of the Indian subcontinent.' (R & A Publishing Ltd: UK).

Husain KZ (1976) 'Wildlife management in Bangladesh.' Department of Films and Publications, Government of the Peoples' Republic of Bangladesh.

ICZMP (2004) 'Areas with Special Status in the Coastal Zone. Working Paper.' Program Development Office for Integrated Coastal Zone Management Plan (PDO-ICZMP) WP030, Dhaka.

Islam MZ (2001) Notes on the trade in marine turtle products in Bangladesh. *Marine Turtle Newsletter* **94**, 10-11.

Islam MZ (2002) Marine turtle nesting at St. Martin's Island, Bangladesh. *Marine Turtle Newsletter* **96**, 19-21.

Islam MZ (2002) Impact of coastal development on sea turtle at St. Martin and Cox's Bazar coast. Threats to in Bangladesh; Technical Report. Marine Life Alliance. 25.

Islam MZ (2003) 'Records of sea turtle in Cox's Bazar coast, Bangladesh, Marine Life Alliance. Technical Paper.'

Islam MZ (2005) Live leatherback records in Bangladesh: News to IOSEA MoU secretariat 2005.

Islam MZ (2005) Impact of coastal development on sea turtle at St. Martin & Cox's Bazar coast and Sonadia Island in Bangladesh; Technical Report. CWBMP.

Islam MZ (2005) 'Report on ECA delineation: coastal & wetland biodiversity management project, BGD/G31/99, MOEF/DOE/GOB 2005 July.'

Islam MZ (2006) Wildlife Report (3rd & 4th Qtr 2005); Coastal & Wetland Biodiversity Management Project. DOE/MOEF. 2006.

Islam MZ, Islam MS, Rashid SMA (1999) Marine turtle conservation program in St. Martin's Island, Bangladesh by CARINAM: A brief review. *Tiger Paper* **26**, 17-28.

Khan MAR (1982) Wildlife of Bangladesh: A checklist. (University of Dhaka, Dhaka).

Khan MAR (1985) St. Martin's: A vanishing coral island of Bangladesh. *Tiger Paper* **12**, 6-12.

Khan MAR (1987) 'Bangladesher banya prani.' Bangla Academy, Dhaka.

Mitra SC (1914. Reprinted 2001) 'Jessore-Khulnar Itihas.' Rupantar, Khulna.

Rashid SMA (1997) Country report on the marine turtles of Bangladesh. In 'IUCN/SSC MTSG Northern Indian Ocean Workshop'. Bhubaneswar, India

Rashid SMA, Islam MZ (1999) Establishing a marine turtle hatchery on St. Martin's Island. In Proceedings of the 4th Asia-Pacific NGOs Environmental Conference. Singapore: National University of Singapore. 150–162.

Rashid SMA, Zahirul Islam M (2005) Chapter 16 - Research and Conservation of Marine Turtles in Bangladesh. In 'Marine Turtles of India' pp. 200-216)

Smith MA (1931) 'The fauna of British India, including Ceylon and Burma. Reptilia and Amphibia. Vol. 1.' (Taylor & Francis: Loricata, Testudines. London)

Smith BD (2004 (unpublished)) Preliminary report on a survey for cetaceans in the near shore waters of Bangladesh.

Status of leatherback turtles in Brunei – Darussalam

By Mark Hamann and Jen Dryden

No report on leatherback turtles was received from Brunei. However, Brunei beaches support rookeries for green, hawksbill and olive ridley turtles during November to July, and no leatherback turtle nesting has been recorded (Anon 2001 and 2002; Harrisson 1976; Borneo Bulletin, 31 January 2001).

Although no leatherback turtles have been recorded in Brunei waters, it is likely that they pass through Brunei waters given that females tagged post nesting in Malaysia have migrated to the Philippines (Simpol 2002).

The National Turtle Management and Conservation Programme, launched in April 2000, (Borneo Bulletin, 31 January 2001) was a public awareness campaign conducted by the Brunei Fisheries Department to boost turtle conservation (Brunei ASEAN News Exchange, 15 November 2001). It included volunteer nesting beach patrols, collection of turtle eggs for rearing in a hatchery and the release of juvenile olive ridley turtles into Bruneian waters (Brunei ASEAN News Exchange, 15 November 2001). As a signatory of the MOU on ASEAN Sea Turtle Conservation and Protection together with other ASEAN countries, Brunei hopes to further protect the populations of the turtles landing and nesting on its beaches. (Anon 2001 and 2002; Brunei ASEAN News Exchange, 15 November 2001).

References

Anon (2001) Conservationists seek help during turtle nesting season. *Marine Turtle Newsletter* **92**, 29.
Anon (2002) Endangered turtles get new lease of life in Brunei. *Marine Turtle Newsletter* **96**, 30-36.
Harrisson T (1976) Green turtles in Borneo. *Brunei Museum Journal* **3**, 196-198.
Simpol H (2002) National turtle management and conservation programme in Brunei Darussalam: Country status report. In 'Third workshop on southeast Asia sea turtle cooperative research'. Bangkok, Thailand. (SEASTAR 2000)

Status of leatherback turtles in Cambodia

By Mark Hamann and Jen Dryden

No report on the leatherback turtle was received from Cambodia. While there are historic references to the presence of leatherbacks in the waters off Cambodia (Tirant, 1885 in Bourret 1941), the only available contemporary record of a leatherback turtle sighting in Cambodian waters is from 2001 (Stuart and van Dijk 2002). The animal was captured in a fishing net in the Gulf of Thailand, 1.5km offshore of the sourthern point of Koh Sra Mauch Island in the Gulf of Thailand, near Sihanoukville (10º 36'N, 103º 31"E) Cambodia (Stuart and van Dijk 2002). The pink spot on the crown of the turtle suggested it was a mature female (Pritchard 1979) and it was 1.8metres in length. Injuries sustained included superficial lacerations on the flippers from entanglement in the net or manhandling. Messages of good luck and blessings were also engraved into the carapace with stainless steel knives. (Stuart and van Dijk 2002). The turtle was released by the Cambodian Department of Fisheries on the same day of the stranding in 4 m of water near the eastern end of Koh Thmey Island (Stuart and van Dijk 2002).

Although other species such as the green turtle inhabit Cambodian the waters and nest on the islands such as Koh Rong (Try et al. 2002), the fishermen claimed never to have come across a leatherback turtle previously (Stuart and van Dijk 2002). Similarly, interviews of fishers from Vietnamese villages close to the Cambodian border could not recall seeing leatherback turtles (Hamann et al. 2005)

In 2002 the Cambodian Department of Fisheries held a workshop on sea turtle research, biology and conservation in Cambodia for delegations from Cambodia, Thailand and Vietnam (Try et al. 2002). Tag returns and satellite tracking have identified that marine turtles are shared by and migrate through the water of each of these countries (Chan 2003). A National Action Plan for the conservation of marine turtles and habitats was discussed for Cambodia. With training in tagging and collection of data on marine turtles and their eggs, as well as general beach survey methods, local scientists are now better prepared to gain information to enable Cambodia to meet its goals of long – term legislative and physical protection and conservation of marine turtles in Cambodia (Try et al. 2002). Cambodia is a signatory state to the IOSEA MoU.

References

Bourret R (1941) 'Les tortues de l'Indochine. Institut Oceanographique de l'Iindochine.' (Station Maratime de Cauda, Nha Trang)

Chan EH (2003) Status of marine turtle conservation and research in Southeast Asia. In 'Proceedings of Vietnam's First National Workshop on Marine Turtle Conservation, 2001'. Hanoi, Vietnam. (Eds C Schäuble and BTT Hien) p. 8

Hamann M, Chu The Cuong, Nguyen Duy Hong, Pham Thuoc, Bui Thi Thu Hien (2005) Distribution and abundance of marine turtles in the Socialist Republic of Viet Nam. *Biodiversity and Conservation* DOI 10.1007/s10531-005-4880-4.

Pritchard PCH (1979) 'Encyclopedia of Turtles.' (T.F.H. Publications, Inc.: Neptune, New Jersey)

Stuart BL, An D, van Dijk PP (2002) A record of the leatherback sea turtle (*Dermochelys coriacea*) from Cambodia. *Marine Turtle Newsletter* 96.

Try I, Pilcher N, Miller J, Cox N (2002) First steps toward sea turtle conservation in Cambodia. *Marine Turtle Newsletter* 98.

Status of leatherback turtles in China

By I-Jiunn Cheng

1. The legal protection status for leatherback turtles

1.1) Overview

In mainland China all species of marine turtles are classed as “wildlife” under Second Class State Protection. In Taiwan all species of marine turtles are classed as “protected wildlife” and in Hong Kong all species of marine turtles are classed as “protected wild animals”.

1.2) Summary of legislation which protects leatherback turtles

Mainland China: Law of the People’s Republic of China on the Protection of Wildlife
There are five relevant Articles under Chapter II of the Law - Protection of Wildlife

Article 8
The State shall protect wildlife and the environment for its survival, and shall prohibit illegal hunting, catching or destruction of wildlife by any unit or individual.

Article 9
The State shall give special protection to the species of wildlife which are rare or near extinction. The wildlife under special state protection shall consist of two classes: wildlife under first class protection and wildlife under second class protection. Lists or revised lists of wildlife under special state protection shall be drawn up by the department of wildlife administration under the State Council and announced after being submitted to and approved by the State Council. The wildlife under special local protection, being different from the wildlife under special state protection, refers to the wildlife specially protected by provinces, autonomous regions or municipalities directly
under the Central Government. Lists of wildlife under special local protection shall be drawn up and announced by the governments of provinces, autonomous regions or municipalities directly under the Central Government and shall be submitted to the State Council for the record. Lists or revised lists of terrestrial wildlife under state protection, which are beneficial or of important economic or scientific value, shall be drawn up and announced by the department of wildlife administration under the State Council.

Article 16
The hunting, catching or killing of wildlife under special state protection shall be prohibited. Where the catching or fishing of wildlife under first class state protection is necessary for scientific
research, domestication and breeding, exhibition or other special purposes, the unit concerned must apply to the department of wildlife administration under the State Council for a special hunting and catching license; where the catching or hunting of wildlife under second class state protection is
intended, the unit concerned must apply to the relevant department of wildlife administration under the government of a province, an autonomous region or a municipality directly under the Central Government for a special hunting and catching license.

Article 22
The sale and purchase of wildlife under special state protection or the products thereof shall be prohibited. Where the sale, purchase or use of wildlife under first class state protection or the products thereof is necessary for scientific research, domestication and breeding, exhibition or other special purposes, the unit concerned must apply for approval by the department of wildlife administration under the
State Council or by a unit authorized by the same department. Where the sale, purchase or use of wildlife under second class state protection or the products thereof is necessary, the unit concerned must apply for approval by the department of wildlife administration under the government of the relevant province, autonomous region or municipality directly under
the Central Government or by a unit authorized by the same department. Units and individuals that domesticate and breed wildlife under special state protection may, by presenting their domestication and

breeding licenses, sell wildlife under special state protection or the products thereof, in accordance with the relevant regulations, to purchasing units designated by the government.
The administrative authorities for industry and commerce shall exercise supervision and control over wildlife or the products thereof that are placed on the market.

Article 24
The export of wildlife under special state protection or the products thereof, and the import or export of wildlife or the products thereof, whose import or export is restricted by international conventions to which China is a party, must be approved by the department of wildlife administration under the State Council or by the State Council, and an import or export permit must be obtained from the state administrative organ in charge of the import and export of the species which are near extinction. The Customs shall clear the imports or exports after examining the import or export permit. The export of the species of wildlife involving scientific and technological secrets shall be dealt with in accordance with relevant provisions of the State Council.

Taiwan: Wildlife Conservation Act
Article 16
Protected Wildlife shall not be disturbed, abused, hunted, killed, traded, exhibited, displayed, owned, imported, exported, raised or bred, unless under special circumstances recognized in this or related legislation. Protected Wildlife products shall not be traded, exhibited, displayed, owned, imported, exported or processed, unless under special circumstances recognized in this or related legislation.

Article 18
Protected Wildlife should be conserved and shall not be disturbed, abused, hunted, killed or otherwise utilized, except in the following cases:
1.When population size exceeds the carrying capacity of the area; or
2.for academic research or educational purposes and with proper approval from the National Principal Authority (NPA). The first condition for utilization listed above shall be approved by the local authorities and the species, location and range, as well as utilization number, season and method shall be announced by the NPA. The application process, fee and other related matters for the second condition shall be set by the NPA.

Article 24
No import or export of live wildlife or Protected Wildlife products is allowed without prior approval from the NPA. The import or export of live specimens of Protected Wildlife is limited to academic research institutes, colleges or universities, public or licensed private zoos for education or academic research and circus performances.

Article 35
Protected Wildlife, Endangered Species or Rare and Valuable Species products shall not be traded or displayed or exhibited in public areas without the permission of the Authorities.

Hong Kong: Chapter 170 Wild Animals Protection Ordinance

Schedule 2 – All chelonians (turtles, terrapins, tortoises etc.) are “Protected Wild Animals”.

Section 4 Hunting, etc. of protected wild animals prohibited - No person shall, except in accordance with a special permit, hunt or willfully disturb any protected wild animal.

Section 5 Protection of nests and eggs - No person shall, except in accordance with a special permit, take, remove, injure, destroy or willfully disturb a nest or egg of any protected wild animal.

Section 8 Possession of protected wild animals –

(1) No person shall, except in accordance with a special permit, have in his possession or under his control-

(a) any live protected wild animal taken in Hong Kong;
(b) any dead protected wild animal, or part of a protected wild animal, killed or taken in Hong Kong; or
(c) any nest or egg of any protected wild animal taken in Hong Kong.

(2) For the purposes of subsection (1), where-
(a) a person has in his possession or under his control a live protected wild animal, a dead protected wild animal, a part of a protected wild animal, or a nest or egg of a protected wild animal, in a nature area; or
(b) (i) a person has in his possession or under his control a live protected wild animal, a dead protected wild animal, a part of a protected wild animal, or a nest or egg of a protected wild animal, for a commercial purpose; and (ii) the person, on demand by an authorized officer, fails without lawful authority or reasonable excuse to produce documentary proof that- (A) in the case of a live protected wild animal, or a nest or egg of a protected wild animal, the same was not taken in Hong Kong; (B) in the case of a dead protected wild animal, or a part of a protected wild animal, the same was not killed or taken in Hong Kong, it shall be presumed, unless the contrary is proved, that- (i) in the case of a live protected wild animal, or a nest or egg of a protected wild animal- (A) the same was taken in Hong Kong; and (B) the person knows that the same was taken in Hong Kong; (ii) in the case of a dead protected wild animal, or a part of a protected wild animal- (A) the same was killed or taken in Hong Kong; and (B) the person knows that the same was killed or taken in Hong Kong.

Section 9 Sale and export of protected wild animals –

(1) No person shall, except in accordance with a special permit, buy, sell, export or offer for sale or export-
(a) any protected wild animal, or part of a protected wild animal, killed or taken in Hong Kong; or
(b) any nest or egg of any protected wild animal taken in Hong Kong.

(2) For the purposes of subsection (1), where-
(a) a person buys, sells, exports or offers for sale or export a protected wild animal, a part of a protected wild animal, or a nest or egg of a protected wild animal, for a commercial purpose; and
(b) the person, on demand by an authorized officer, fails without lawful authority or reasonable excuse to produce documentary proof that- (i) in the case of a protected wild animal, or a part of a protected wild animal, the same was not killed or taken in Hong Kong; (ii) in the case of a nest or egg of a protected wild animal, the same was not taken in Hong Kong, it shall be presumed, unless the contrary is proved, that- (i) in the case of a protected wild animal, or a part of a protected wild animal- (A) the same was killed or taken in Hong Kong; and (B) the person knows that the same was killed or taken in Hong Kong; (ii) in the case of a nest or egg of a protected wild animal- (A) the same was taken in Hong Kong; and (B) the person knows that the same was taken in Hong Kong.

1.3) Management agency responsible for marine turtle conservation

Operational level	Name and type of agency
National level	o Bureau of Fisheries, Ministry of Agriculture, People's Republic of China
State level	o Guangdong Provincial Oceanic and Fishery Administration, Guangdong Province o Council of Agriculture, Executive Yuen, Taiwan
Local level	o Gangkou Sea Turtle National Nature Reserve, Huidong County o Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government, Hong Kong

2. Nesting populations

2.1) Overview

Leatherback turtles have not been recorded nesting in China.

3. Foraging populations

3.1) Details of leatherback turtle foraging area census or tagging results.

There have been confirmed captures, sightings or stranding events of leatherback turtles in China (see Figure 1). Leatherback turtles tagged while nesting at Terengganu in Peninsula Malaysia during the 1960s and 1970s have been recaptured in coastal waters of China, including off Hainan (see Malaysian report Figure 3).

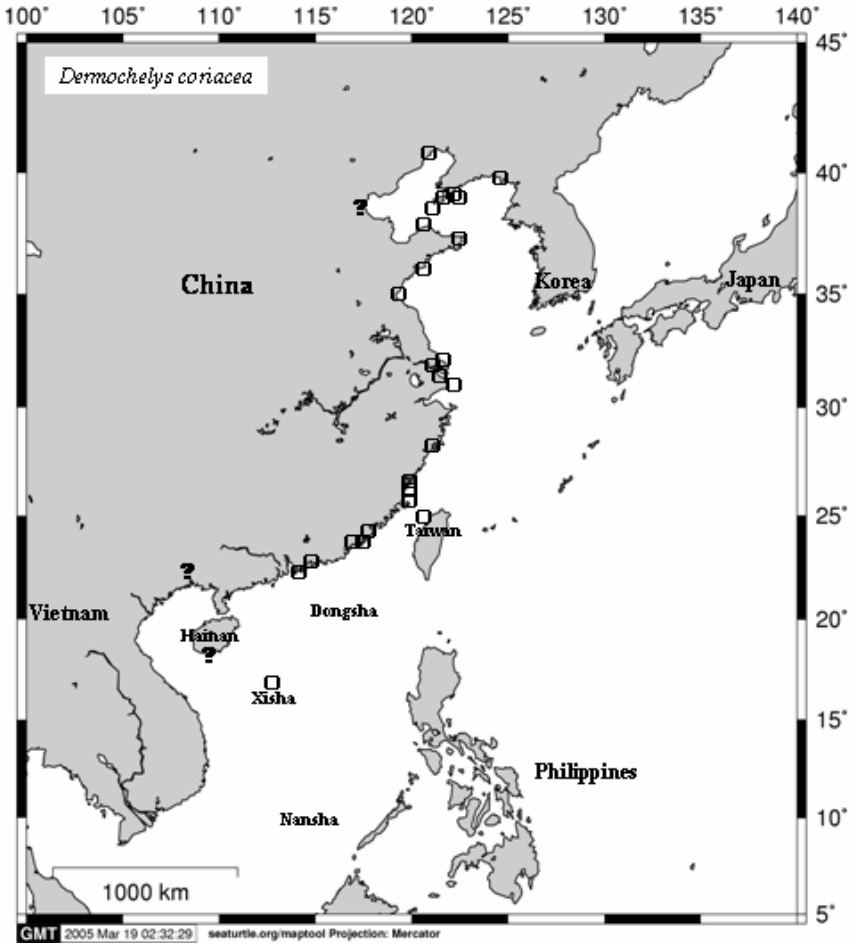

Figure 1. The distribution of leatherback turtle sightings in China

3.2) Seasonality of leatherback turtles in coastal and offshore waters

In general most sightings of leatherback turtles in China occur from April to December. Specific records from the literature include the following seasonal trends:

- Hong Kong waters, Guangdong Province from April to December (Simon Chan, personal communication)
- Zhangjiang, Guangdong in December (Zhou Ting, personal communication)
- Dongshan Island, Zhangpu, Xiamen, Pingtan Island, Changle and Luoyuan of Fujian Province in unknown months (Zheng 1985)
- Xingcheng, Dalian, Zhanghai, Xinjin, Biliu estuary and Donggou of Liaoning Province from May to September (Huang and Zhu 1987).
- Lianyungang, Lusi and Haimen of Jiangsu Province from August to October (Zhou 1983).
- Biliu estuary and Dalian of Liaoning Province in May (Zhao and Huang 1982).
- Coastal waters along the provinces of Guangdong, Guangxi, Fujian, Zhejiang, Jiangsu, Shangdong, Hebei and Liaoning in unknown months (Huang 1979).

- Waters between Dongshan Island and Lianjiang, Guangdong Province and Xisha Archipelago from May to October (Frazier et al. 1988)

3.3) Approximate size range of leatherback turtles

In general, the carapace length of leatherback turtles found in China's waters range from 98 to 159cm. Specific records from the literature include the following sizes.

- Body length 164cm; width 128cm specimen from Zhangjiang, Guangdong in December (Zhou Ting, personal communication)
- Body length 153-160cm; width 65-90cm specimens from Lianyungang, Lusi and Haimen of Jiangsu Province (Zhou 1983).
- Carapace length 98-159cm; width 52-86cm specimens from Biliu estuary and Dalian of Liaoning Province (Zhao and Huang 1982).
- CCL 115.5 to 152.5cm specimens from the waters between Dongshan Island and Lianjiang, Guangdong Province and Xisha Archipelago (Frazier et al. 1988)

3.4) Information on the diet of leatherback turtles.

There are no data on the diet of leatherback turtles that forage in China's waters.

3.5) Other biological studies conducted on leatherback turtles in foraging areas.

There is no information available about where leatherbacks prefer to forage in China.

3.6) Threats to foraging populations of leatherback turtles.

Fisheries bycatch is main threat to leatherback turtles in China (Cheng and Chen 1997). No other threats have been identified in China.

3.7) Fisheries bycatch of leatherback turtles and the fisheries involved

There has been no quantitative study on the current threat level of the set net fishery.

4. Concluding remarks

While an uncommon species in China, the leatherback is distributed throughout its waters. The leatherback is a pelagic species, spending most of its life in the offshore waters. Both adult and sub-adult specimens can be found in China. This information was obtained mainly from fishery by-catchments or beach stranding events. Leatherbacks are not known to nest in China. A comprehensive assessment of marine turtles in China has been prepared by Chan et al. (submitted)

5. References

Chan SKF, Cheng IJ, Zhou T, Wang HJ, Gu HX, Song XJ (submitted) A comprehensive overview on the population and conservation status of sea turtles in China. *Chelonian Conservation and Biology*.

Cheng IJ, Chen TH (1997) The incidental capture of five species of sea turtle by coastal setnet fisheries in the eastern waters of Taiwan. *Biological Conservation* **82**, 255-259.

Frazier SS, Frazier JG, Ding HB, Huang ZJ, Zheng J, Lu L (1988) Sea turtles in Fujian and Guangdong Provinces. *Acta Herpetologica Sinica* **7**, 16-46.

Huang ZJ (1979) Marine amphibians and reptiles. *Marine Science* **4**, 32-34.

Huang KC, Zhu ZX (1987) Investigation on the reptiles of the coastal sea of Liaoning. *Acta Herpetologica Sinica* **6**, 78-79.

Zhao EM, Huang KC (1982) A survey of amphibians and reptiles in Liaoning Province. *Acta Herpetologica Sinica* **1**, 11-12.

Zheng J (1985) Preliminary survey of the sea turtles of Fujian. *Acta Herpetologica Sinica* **4**, 156-157.

Zhou KY (1983) Loggerhead, olive ridley and leatherback from the coastal waters of Jiangsu Province. *Acta Herpetologica Sinica* **2**, 57-62.

Status of Leatherback turtles in the Comores

By Abdallah Fatouma

1. The legal protection status for leatherback turtles

1.1. Overview

All turtles are protected by law. The following legislation is relevant to wildlife and marine turtles:

- Decree N°92/015. Prohibits the fishing of, capture of, and commercialisation of certain marine species, as well as degradation of the coastline.
  - 1st Article: The fishing of shells and corals, the capture of turtles as well as their commercialization is prohibited within national territories in particular within marine reserves.
- Framework of Environmental Law 1664.
- Decree N°01/31/MPE/CAB. Protects wild species of fauna and flora of Comores since 14/05/2001

1.2. Management agencies responsible for marine turtle conservation

Operational level	**Name and type of agency**
National level	National Management for the Environment
State level	General Management for the Environment
Local level	Marine Park of Moheli, & the community associations

2. Nesting populations

2.1. Overview

Historical Evidence

No historical evidence for leatherback nesting in Comores has been reported.

Current Situation

The fieldwork conducted in Comores shows the marine park of Moheli is frequented by marine turtles, some of which are marked, tagged, and followed. There have been no records of nesting leatherback turtles reported. All sites within the Comores that have marine turtle nesting have been surveyed and there have never been any records of leatherback turtle nesting (data contained in the Action Plan for the Conservation of Marine Turtles of Comores (14-05-2001).

3. Foraging populations

3.1. Details on any leatherback turtle foraging area census or tagging studies

There have been no recoveries of leatherback turtles in Comores of turtles that were tagged in other countries. Nor have any leatherback turtles foraging in Comores been tagged.

3.2. Seasonality of leatherback turtles in coastal or offshore waters

There is no available data

3.3. Approximate size range of leatherback turtles

There is no available data

3.4. Information on diet of leatherback turtles

There has been no study of diet of leatherback turtles foraging in Comores.

3.5. Threats to foraging populations, and fisheries bycatch of leatherback turtles

There is no available data

3.6. Other activities being undertaken to improve conservation of leatherback turtles

Not applicable

Status of leatherback turtles in Djibouti

By Nicolas Pilcher

1. Introduction

Djibouti has a coastline of 372 km which is often fringed by extensive reefs and limiting to leatherback turtle nesting. The north coast near Eritrea at Ras Bir which faces the Straits of Bab al-Mandab is generally shallow and sandy. The southern coast toward Somalia is also shallow with several estuaries and poorly developed reefs, linked to the cold water up-welling from the Indian Ocean. Djibouti lies in a hot and semi-arid zone where the weather is influenced by the Indian Ocean monsoon. Mean air temperatures vary between 25 ºC in the winter to 35 ºC in the summer. During the south-west monsoon, from June to September, northerly winds move surface waters from the Gulf of Aden out into the Arabian Sea. This is reversed during October to May, bringing cooler waters into nearshore areas. Salinity ranges from 36 to 39 p.p.t., increasing during south-west monsoon periods, and the water temperature ranges between 25 ºC and 29 ºC. The international port of Djibouti contributes significantly to the national economy. Coastal and marine tourism is still in its infancy. At the confluence of three biogeographic zones, Djibouti is home to a unique assemblage of marine diversity, and ecologically, the confluence of warm-water tropical biota (from the Indian Ocean and Red Sea), with cold water up-welling habitats (from the Somali and Arabian regions) resembles marine conditions seen in only a few other parts of the world.

2. The legal protection status for leatherback turtles

2.1 Overview

The Republic of Djibouti is a signatory to the London Convention (modified 1954) which is applicable through National Law No. 64/83; the London Convention (1971) on international compensation funds; the London Convention (1973, modified 1978) and its four annexes; the Brussels Convention (1969) on the intervention at high sea; and the United Nations convention on the Law of the Sea (UNCLOS 1982). The first three were approved by Law No. 94/AN/89 2º L in 1989, while the last one was approved by Law in 1985. The Republic of Djibouti is also a signatory to the CITES Convention. Decree 80-62/PR/MCTT of 25 May 1980 provides for the protection of the seabed and the marine fauna, whereby the capture of marine mammals and turtles is illegal, as well as the trade with or export of these animals.

The present fisheries law was drafted before the independence, with the exception of some articles, and is part of the Code. Articles 148, 149 and 220 to 225 (enacted by law 212/AN/82), and Articles 16 to 19 of Law No. 52/AN/78 (1979) regulate the fishery. Certain fishing techniques, such as the use of explosives and poisons, are illegal. They determine the conditions for the exploitation of fishery resources including fishing zones and closed seasons. They also include sanctions in case of violation of these regulations by fishermen. The law in Djibouti punishes anyone who catches a turtle with a 50,000 Djibouti frank fine (~USD 300) and six months jail.

2.2 Management agencies responsible for marine turtle conservation

At present the number of environmental initiatives in Djibouti is limited. The most important ones are a sub-regional contingency plan for the Gulf of Aden developed in 1990. Through this an oil spill response centre was established for Djibouti, Yemen and Somalia, and the rules for the management of marine protected areas and the exploitation of reef associated species were issued in 1992 by the Maritime Administration. A number of institutions in Djibouti are involved with coastal and marine area and resource management. These are the Ministry of Agriculture and Hydraulics through the Directorate of Stock-farming and Fisheries; the Ministry of Transport and Telecommunications through its Directorate of Maritime Affairs; the National Office for Tourism, Arts and Crafts; the Presidency of the Republic, through the Institute of Higher Studies, Scientific and Technical Research; the Service for Management and Environment, the Inter-ministerial Co-ordination Commission on the Protection of the Marine Fauna and the Seabed and the National Council of the Sea.

3. Nesting populations
No reported or otherwise known records of leatherback turtle nesting exist for Djibouti.

4. Foraging populations
4.1 Overview
According to fishermen and shell collectors along the coast, who reportedly showed great knowledge about marine turtles, four species of marine turtles can be seen Djibouti's waters: the hawksbill, green, loggerhead and leatherback turtles (Al-Mansi et al. 2003). Thus the leatherback turtle, as would be expected from similar observations along other Red Sea bordering nations, spends at least some time in the waters off Djibouti, but it is unknown whether this is a permanent foraging area or simply a transit area.

No research of any kind takes place on marine turtles at present. A short training session was provided to trainers in 2001 and a follow-up in-country training session for local researchers in 2003, but since that time no focused work has been implemented related to marine turtles. PERSGA sponsored conservation initiatives flourished and were effective for a five-year period during which funding was on hand, but since the conclusion of the start-up phase, no funds are available to conduct research or conservation activities for marine turtles. Records exist for four tagged turtles (two from Sri Lanka, one from Oman and one from Socotra) being recovered in Djibouti but two of these were green turtles (Sri Lanka) and the other two were loggerhead turtles (Al-Mansi et al. 2003).

4.2 Threats to leatherback turtles
The main threats to turtles in the Republic of Djibouti come from the illegal harvest of marine turtles by fishermen and shell (carapace/scutes) collection despite the legal protection given to the turtles (Al-Mansi et al. 2003). Other current threats to marine life come from the tourism, shipping and coastal development sectors. A national biodiversity project supported by GEF is currently being implemented in the country with a draft a strategy and an action plan for conservation of the biodiversity in Djibouti. The major economic sectors in the coastal zone are maritime transport and port-related activities. At present, fisheries play a limited role, although subsistence fisheries are locally important. There are about 90 artisanal fishing boats, of which 75 are small, open boats (6 - 8 m) powered by outboard engines. Each boat operates with an average of three fishermen over one day trips. Some 15 of the boats are longer (10-14 m) and equipped with inboard engines. These carry an average of five fishermen each and go out for four days. Most of the fisheries are at the subsistence level and fishing effort is generally low. The majority of the catch is landed by hook and line. To a lesser extent gill nets and throw nets are used. Catches consist almost entirely of large food fish which is marketed fresh.

4.3 Protection of foraging areas
Djibouti has two declared marine protected areas, which have been established for more than ten years: Moucha Territorial Park, established in 1972, covers an area of ca. 3 km^2 at 11°43'N 43°12'E and encompasses extensive reefs and rich reef-associated fish and invertebrate fauna and mangroves. South Mascali Islands Integral Reserve, established in 1980, covers an area of ca. 10 km^2 at 11°40'N 43°10'E and contains coral reefs and rich reef associated fish and invertebrate fauna. There are two additional areas proposed for protected status, one of which is of regional importance: Godoriya, an extensive mangrove area, rich in mangrove-associated fauna, and Iles des Sept Frères and Ras Siyan, lying at the junction of the Red Sea and the Gulf of Aden. This is a group of high-aspect islands and an adjacent coastal stretch with a mangrove-fringed bay.

4.4. Gaps in capacity and requirements for improved conservation
The two major requirements in Djibouti are staff with expertise in turtle biology and ecology, with an understanding of research and monitoring practices, and funding to undertake conservation work. The lack of trained staff stems largely from the lack of a higher education system and the funding avenues for post-graduate study of Djibouti nationals.

Personnel for managing marine resources are lacking, although recently the PERSGA-funded field project and the National Biodiversity Project have initiated training of national counterparts in turtle survey techniques. At present there is no monitoring or conservation program for marine turtles. The Environment

Department was created recently (1996) and finalised the National Environmental Action Plan (NEAP) in April 2000 and a National Strategy for Biodiversity Conservation with financial support from the GEF. These include a National Law which will require mandatory Environmental Impact Assessments for all projects concerning the marine environment. It is assumed that with the adoption of the NEAP and Biodiversity Strategy, the Environment Department will be involved in all development projects. There is a need for the managerial staff of the key national institutions to be trained in the basics of the biology and ecology, and conservation needs of marine turtles.

Financial constraints are a major obstacle towards the conservation of marine turtles. There have been no funds for short surveys to assess the status of turtles in Djibouti, except for foreign-based research. The Environment Department has had to rely on GEF and PERSGA financial support to conduct the first assessments of turtles in 2003. It is possible that financial resources could be raised through levying of fines and fees for infringements of national laws. The NEAP calls for the creation of an Environmental Fund which should be established in the near future. It is expected that this fund will be used for conservation of key ecosystems and species such as coral reefs and marine turtles.

Finally, there is a general lack of experts at tertiary education levels with knowledge of coral reefs because Djibouti does not have a University. There has been a proposal for the development of a National University, but it will take 5 years or longer before it offers a degree in Marine Biology and Ecology of a post-graduate level. Additionally, there is a proposal to create a Marine Research Institute which will be in charge of conservation of marine ecosystems.

References

Al-Mansi A, Nasser NA, Aden A (2003) 'The marine turtles in the Republic of Djibouti: their biology and conservation.' PERSGA, Jeddah.

Status of leatherback turtles in Eritrea

By Nicolas Pilcher, Sammy Mahmud and Johannes Tecklemariam

1. Introduction

Eritrea is located in the Horn of Africa and is bordered on the northeast and east by the Red Sea, on the west and northwest by Sudan, on the west by Ethiopia, and on the south by Djibouti. The Eritrean coastline is formed by an extension of the Ethiopian north-south trending highlands, descending on the east to a coastal desert plain. It is home to globally important coral reefs, mangroves, seagrasses and other habitats, as well as numerous vulnerable or globally endangered species including marine turtles, dugong, seabirds, dolphins and whales. Eritrea's coastal, marine and island shores front more than 2,200 km of the Red Sea. There are over 350 islands in Eritrean waters (a large proportion of which form the Dahlak Archipelago which spans some 15,000 km^2), but many are small and a full survey is still pending. Only fifteen of the islands have a land area >10 km^2. The mainland coast spans some 1150 km and another 1083 km of coastline are contributed by the islands. Eritrea retained the entire coastline of Ethiopia along the Red Sea upon independence from Ethiopia on 24 May, 1993. The long struggle for independence with Ethiopia, which ended in 1991, resulted in some 30 years of minimal levels of human impact on Eritrea's coastal and marine areas, and the marine resources and environment of Eritrea are therefore generally in very good condition.

2. The legal protection status for leatherback turtles

2.1 Overview

Responsibility for the conservation of marine turtles in Eritrea lies with the Ministry of Fisheries and the Ministry of Agriculture. At a National level, marine turtles are addressed by the Coastal Zone Management Proclamation (although this is as yet unsigned) and the Ministry of Agriculture is including marine turtles in other upcoming laws. However, it is likely that in future the responsibility of implementing the National Action Plan and activities related to the IOSEA MoU (which Eritrea recently signed) will be borne by the Ministry of Fisheries after a transfer of authority from the Ministry of Agriculture.

At a greater regional level, Eritrea is a signatory to the Convention on International Trade in Endangered Species and Wild Flora and Fauna (CITES), and the Convention on Biological Diversity (CBD), both of which address marine turtles due to their globally endangered status. Eritrea is also a signatory to the IOSEA Sea Turtle MoU.

2.2 Management agencies responsible for marine turtle conservation

Responsibility for the conservation of marine turtles in Eritrea lies with the Ministry of Fisheries and the Ministry of Agriculture. In addition, Eritrea benefits significantly from a GEF-funded (US$5m) Eritrea Coastal, Marine and Island Biodiversity (ECMIB) project to ensure the conservation and sustainable use of the globally significant biodiversity of the coastal, marine and island (CMI) ecosystems. The ECMIB Project aims to facilitate sustainable development of Eritrea's CMI resources through a participatory management framework; establishment of conservation areas and species protection programmes; an operational information system; and increased public awareness of the needs and benefits of CMI biodiversity.

While there is still a substantial lack of data on direct harvests and distribution of marine turtles and their habitats in Eritrea, particularly foraging sites, and while many of the key population statistics such as nesting season and population sizes and trends are also lacking (due to the relatively recent commencement of research and monitoring activities), there are a number of known population parameters, key threats and knowledge and enforcement gaps. The development of the National Action Plan for Marine Turtles in Eritrea falls within the scope of the greater ECMIB project. It follows as a logical progression the development and implementation of in-situ training and oversight to develop capacity to design and implement marine turtle surveys, and subsequent monitoring and conservation of marine turtles within the scope of the ECMIB Project, in collaboration with the Ministry of Fisheries, the Ministry of Agriculture, and other key stakeholders.

3. Nesting populations

Previous work in Eritrea (Hillman and Gebremariam 1995; Howe et al. 2003) and in the region (Frazier and Salas 1984; Gasparetti et al. 1993) have indicated the presence of the leatherback turtles in the Red Sea, but none suggest nesting had ever been documented, and no contemporary records suggest otherwise. No leatherback turtle nesting was recorded during extensive surveys by the Eritrea Coastal, Marine and Island Biodiversity (ECMIB) project staff in 2004 or 2005.

4. Foraging populations

4.1 Overview

Bycatch records from the foreign trawl fleet, which carries 100% observer coverage, recorded 39 leatherback turtle catches between 1996 and 2005 (Eritrea Ministry of Fisheries, unpub. data) out of a total 2404 marine turtles that were caught (about 1.6%). This represents the single, largest confirmed record of leatherback turtles in the Red Sea to date, and while the records span a decade and take rates per year are not high, they do suggest a significant population of leatherback turtles resides in the southern Red Sea, rather than just existing only as transients. The geographical distribution of these takes is illustrated in Figure 1a,b. While the reliability of the observer coverage is not high, it is believed for the most part that all records under-represent actual catch rates – that is, if anything, these numbers are lower than actual take rates. In addition, while the identification accuracy among hard shelled turtles may be in question (a full 45% of all bycatch was classified as 'unidentified'), it is unlikely that the leatherback turtle's distinctive carapace would be as easily misidentified.

There is currently no research conducted on leatherback turtles in Eritrea. However, with the advent of the ECMIB project, significant effort is being invested in marine turtle conservation, and leatherback turtles will benefit from project activities. For instance, the ECBMIB project has conducted several training sessions on the biology and conservation of marine turtles, and has conducted a baseline survey along the entire coastline, focused on beach monitoring and involving interviews and field site visits. In conjunction with the Ministry of Fisheries, the Project also recently completed a 'National Action Plan for the Conservation of Marine Turtles and their Habitats'. Future plans include extensions of this work to the fisheries sector, with the possible introduction of Turtle Excluder Devices for all trawlers, trawl soak time limits, and time/area closures.

4.2 Threats to leatherback turtles

Eritrea's coastal areas are now threatened by industrial development, tourism, fisheries and oil exploration, by natural and synthetic organic pollutants, and loss of infrastructure from civil warfare. Contrary to past reports, turtle eggs and hatchlings are regularly lost to wild and feral predators, and human take at a subsistence level is significant and absolute at some locations. Bycatch in artisanal and commercial fisheries (trawlers) is significant, and likely the largest source of mortality in the country after artisanal take. Coastal villagers take turtles both opportunistically and as directed take using home-made harpoons, but records suggest they prefer only green turtles, and no leatherback turtle carcasses or bones have ever been found during the beach surveys.

4.3 Protection of foraging areas

There are no current MPAs in Eritrea, although plans exist to establish a small number of test sites through which public participation and acceptance will be gauged. Some plans include creating a multiple-use MPA which covers the entire maritime and coastal zone of Eritrea, others suggest zoning the Dahlak archipelago, off Massawa, while others propose a network of smaller sites. These are all currently under deliberation.

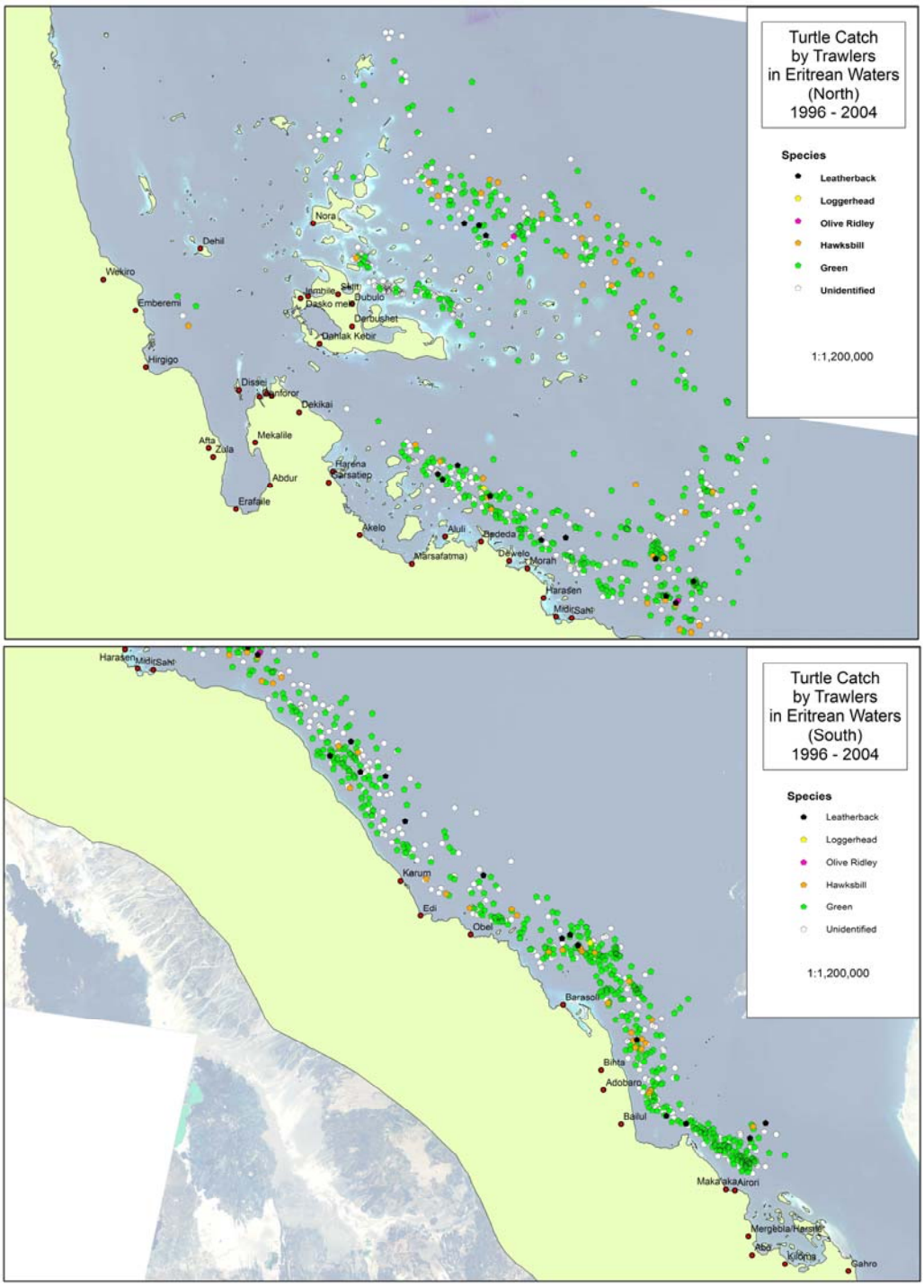

Figure. 1 Turtle bycatch by trawlers in Eritrea 1996-2005; a = northern region and b = southern region. Black dots equal leatherback turtle captures. Source: Ministry of Fisheries / ECMIB Project, Eritrea, 2005.

4.4. Gaps in capacity and requirements for improved conservation

At present there is little effort aimed at protecting foraging turtles of any species. While the ECMIB project has begun focused work on marine turtles, and their efforts are constantly expanding, the logistics of conducting foraging area studies, coupled with the wide and scattered distribution of leatherback turtle encounters with the fishery and vast coastal area, suggest this will be a continuing problem. Certainly there is a need for better trained observers, and better fishery practices, bycatch handling and release methods, along with more vigilant and effective enforcement. Finally, the ECMIB project will one day come to an end, and it is imperative that the skills that are being transferred to the relevant Ministries are not lost and that the valuable conservation efforts do not simply end at that time.

5. References

Frazier J, Salas S (1984) The status of marine turtles in the Egyptian Red Sea. *Biological Conservation* **30**, 41-67.

Gasparetti J, Stimson A, Miller J, Ross P, Gasparetti P (1993) Turtles of Arabia. *Fauna of Saudi Arabia* **13**, 170-367.

Hillman JC, Gebremariam T (1995) 'The status of marine turtle conservation in Eritrea.' Resources and Environment Division. Ministry of Marine Resources, Massawa.

Howe SA, Asfaha B, Kemp JM (2003) Turtle strandings along the Southern Eritrean Red Sea. *Marine Turtle Newsletter* **103**, 4-7.

Status of leatherback turtles in the French Territories of West Indian Ocean: La Reunion Island, Mayotte and Iles Eparses

By Stephane Ciccione

1. The legal protection status for leatherback turtles

1.1 Overview

Marine turtles including leatherback turtles are protected by a Ministry Text of November 2000. This is a legally binding text that protects marine turtles and their eggs from use, killing and/or direct capture in all French Territories.

1.2 Management agency responsible for marine turtle conservation in the French Territories of West Indian Ocean

Name of agency: Ministry of Ecology and Sustainable Development (MoESD)*

Type of agency: Governmental

* The MoESD is one of the French Government ministries, not specifically for French territories of Indian Ocean but for all French territories.

2. Nesting populations

2.1 & 2.2) Overview and details of leatherback turtle nesting populations

Leatherback turtles have not been recorded nesting in any of the French Territories of the west Indian Ocean: La Reunion Island, Mayotte and Iles Eparses (Rolland and Boullet 2005 and Ciccione et al. in press).

3. Foraging populations

3.1) Details of leatherback turtle foraging areas census or tagging results such as tag recovery data.

From August 1996 to October 1999 logbooks were filled in by fishermen and then used by the Institut Français pour l'Etude et l'Exploitation des MERs (IFREMER - French institute for seas survey and exploitation for its scientific research which included an assessment of the accidental capture of marine turtles: leatherback represent 52% of marine turtles bycatch (40 turtles from august 1996 to October 1999), and 92% of these turtles were released alive Poisson (2001). These turtles were caught across the Economic Exclusive Zone of all Indian Ocean French Territories, however most captures came from the French ZEE in Mozambique Channel.

3.2) Seasonality of leatherback turtles caught or seen in foraging areas

No available data

3.3) Approximate size range of leatherback turtles caught or seen in foraging areas

No available data

3.4) Information on the diet of leatherback turtles

No available data

3.5) Other biological studies conducted on leatherback turtles in foraging areas

No other biological studies have been conducted on leatherback turtles in any of the French Territories of the west Indian Ocean.

3.6) Threats to foraging populations of leatherback turtles

Threats at this site/area	Current occurrence	Historical occurrence & year
Exploitation of live animals at sea	No accounts of it occurring	
Incidental capture in fisheries	Less than 10 per year*	40 turtles from August 1996 to October 1999+
Boat strikes	No accounts of it occurring	
Plastics (at sea)	No accounts of it occurring	
Industrial effluent	No accounts of it occurring	
Inshore oil pollution	No accounts of it occurring	
Natural threats/predation	No accounts of it occurring	
Other (type in):	None	

* = CTOI 2004 [data from 2003] and IFREMER (2005)
+ = Poisson (2001).

3.7) Fisheries bycatch of leatherback turtles and the fisheries involved

Type of fishery	Season of operation	Approx number of boats/operators	Impact – low, medium or high
Long Line Fishing	Not known	30*	LOW+

* = CTOI 2004 [data from 2003] and IFREMER (2005)
+ = Poisson (2001).

3.8) Other activities being undertaken to improve the conservation of leatherback turtle foraging populations

- Fisheries bycatch monitoring and reduction efforts were carried out and a bycatch survey was conducted between August 1996 and October 1999
- Nesting beach surveys have been conducted since 1984 on Europa, Juan de Nova, Glorieuses and Tromelin, since 1986 on La Réunion, since 1994 on Mayotte.
- Education programs: since 1985 in La Réunion and 1998 in Mayotte
  Also see section 3.8

4. References

Ciccione S, Rolland R, Quillard M (in press) 'Les tortues marines de Mayotte.' Bilan et perspectives.
CTOI (2004) Scientific report of CTOI (Indian Ocean Tuna Commission) 2004, data 2003.
IFREMER (2005) Data base 2005, IFREMER of La Reunion Island.
Poisson F (2001) Knowledge and conservation of marine turtles in south-west of Indian Ocean. In 'Etudes et colloques du CEDTM N°1'. (Eds S Ciccione, D Roos and JY Legal) pp. 135).
Rolland R, Boullet V (2005) 'Mayotte, Biodiversité et Evaluation Patrimoniale.' Contribution à la mise en oeuvre de l'inventaire ZNIEFF.

Status of Leatherback turtles in India

By BC Choudhury and Jack Frazier

1. The legal protection status for leatherback turtles

1.1. Overview

Leatherback turtles in India are fully protected in Schedule I of the Wildlife Protection Act (WLPA). Upadhyay and Upadhyay (2002) provide a detailed discussion of the national legislation and international instruments of India as they pertain to marine turtles in general. There is no specific legislation for leatherback turtles, but there are a wide variety of national and international instruments that are germane to protecting both the turtles and their habitats. For example; the National Biodiversity Bill, 2000; Habitat Protection: Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Act (MZA); Coast Guard Act (CGA); Environmental Protection Act (EPA); Coastal Regulation Zone Notification; Ocean Regulation Zone (ORZ); Regulation of the Use of Marine Areas: Marine Products Export Development Authority Act (MPEDA); Indian Fisheries Act (IFA); Indian Ports Act (IPA); Coast Guard Act (CGA); Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981. (See Upadhyay and Upadhyay 2002, for details).

1.3. Management agencies responsible for marine turtle conservation

Operational level	Name and type of agency
National level	Specifically: Ministry of Environment and Forests (including Chief Wildlife Wardens' Offices in each state, and Wildlife Institute of India); Also: Coast Guard, Ministry of Transport, Department of Ocean Development, Ministry of Commerce (particularly Marine Products Export Development Authority), Ministry of Petroleum and Natural Gas, Ministry of Tourism, Ministry of Defence, Ministry of Shipping
State level	At least Fisheries and Wildlife Departments of the states of West Bengal, Orissa, Andhra Pradesh, Tamil Nadu, Kerala, Karnataka, Goa, Maharastra, and Gujarat, as well as Union Territories of Andaman & Nicobars and Lakshadveep Islands
Local level	Highly diverse from township to township and from state to state

2. Nesting populations

2.1. Evidence of leatherback turtle nesting

Historical Evidence:

The first documented record of leatherback nesting in India seems to be from 1923, off Quilon (now "Kollam"), Kerala (Cameron 1923), with a second record 36 years later from near Calicut (now "Kozhikode"), Kerala (Jones 1959). Pillai et al. (2003) reported 13 leatherback records from the Indian mainland between 1923 and 2003. Of these, there were only two reports of nesting, just cited above. The only evidence of regular nesting outside of the Andaman and Nicobar Islands is recounted in Cameron (1923), who was told by fishermen that some 40 turtles used to nest annually at Kollam in the early part of the 20th century.

Current Situation:

The Andaman and Nicobar Islands is a globally significant region for nesting marine turtles especially the leatherback turtles (*Dermochelys coriacea*) in the Indian Ocean. Most rookeries were only found in 1979 and 1990; in 1997 two nesting beaches in the Andamans were discovered and in 2001 three nesting beaches were found on the east coast of Great Nicobar Island (Andrews et al. 2002). Three main islands have been identified (Bhaskar 1981; Bhaskar 1993), and more recently, for containing sites with intensive nesting of leatherback turtles (Andrews et al. 2001). These include:

- Andaman Archipelago. Little Andaman in the Andaman archipelago (South and West Bay beaches) and two islands;

- Nicobar Islands. 17 locations have been confirmed in the Nicobar archipelago (Little Nicobar and Great Nicobar Island) (Andrews et al. 2002; Choudhury 2005) Figure 1

    - Little Nicobar Islands: Five nesting locations have been identified on the western shores (Andrews et al. 2002). Important nesting beaches identified in the Little Nicobar Islands were mainly on the west coast including Pulo Kiyang, Pulo Baha, and beaches on Kiyang and Akupa hamlets (see table 1).
    - Great Nicobar Islands: Five nesting locations along the west and east coasts (Andrews et al. 2002) these contain two important nesting sites, one on the West Coast (beaches at the mouth of Alexandra and Dogma rivers) and other on the South east coast (Galathea bay) (in Choudhury (2005): See table 1).
    - Other Islands: Other islands where the species has been observed to nest include, Teressa and Katchal (West bay) in the Central Nicobar Islands (in Andrews et al. 2002; Choudhury 2005): see table 1).

- Mainland. The paucity of records – only 13 between 1923 and 2003 (Pillai et al., 2003) – indicates that the species is rarely sighted along the coast of the Indian mainland, from both the waters of the Bay of Bengal as well as the Arabian Sea. Cameron's (1923) account indicates that the species was extirpated, at least from the coast of Kerala. Given the intensity of fishing activities along much of the mainland coast of India, it would not be surprising if human impacts had had strong negative impacts on leatherbacks, but with the lack of records, and systematic sampling efforts, great caution much be used when interpreting the little available information.

While scattered data from the Andaman and Nicobars are available for the last decade, there is not sufficient data to provide an adequate historic baseline, or estimate trends. Data from the Indian mainland are too sparse to be able to interpret accurately, but all available evidence indicates that leatherbacks rarely nest on mainland beaches (Pillai et al. 2003).

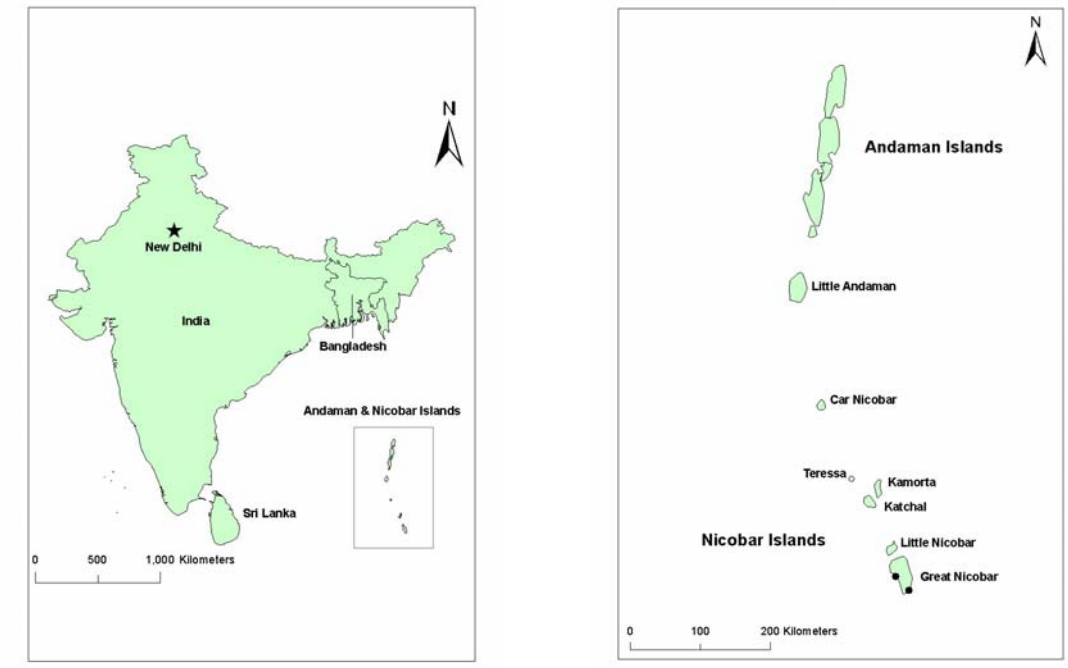

Figure 1. (a) Mainland India in relation to other nations and (b) the Andaman and Nicobar Islands

Table 1: Locations of leatherback turtle nesting beaches, and results of annual surveys

Beach name	Latitude of beach	Longitude of beach	Year of survey	Annual number	Type of data (e.g. turtles, nests, eggs)	Reference
Little Andaman						
All beaches			2000/01	100[1]	Turtles	Ref 1
South Bay	10°32.58'N	92°24.68'E	1981	10[1]	Nests	Ref 3
West Bay	10°38.26'N	92°24.8'E	1984	84[1]	Nests	Ref 3
			1999	34[1]	Nests	
Little Nicobar (on west coast)						
All beaches			2000/01	100	Turtles	Ref 1
Great Nicobar						
West coast at Alexandra river	7°00.75'N	93°41.88'E	1991/92	343	Nests	Ref 6
			2000/01	866*	Nests	Ref 6
West coast at of Dogma river	6°59.25'N	93°43.63'E	1991/92	171	Nests	Ref 6
			2000/01	362*	Nests	Ref 6
South east coast at Galathea bay	6°48.93'N	93°51.25'E	1991/92	158	Turtles	Ref 4
			1993/94	237[2]	Nests	Ref 5
			1995/96	282[3]	Nests	Ref 6
			1997/98	124[3]	Nests	Ref 6
			2000/01	146	Turtles	Ref 6
				444	Nests	
			2001/02	177	Turtles	Ref 6
				425	Nests	
			2003/04	290	Females	Ref 7
All beaches			1991/92	166#	Turtles	Ref 2
Central Nicobar Islands						
Teressa Is.			2000/01	25	Turtles	Ref 1
Katchal Is. (West bay)	7°54.81'N	93°20.76'E	2000/01	25	Turtles	Ref 1

* Survey results from March, April and July 2001

Possible under estimated – as only 8 of 9 sites were surveyed and many only surveyed at the end of the season (Andrews 2002).

1. Monitoring of less than a complete season at the location
2. Monitoring in March 1993 and April 1994
3. Forest Department records; December 1995 to February 1996 and December 1997 to February 1998.

Andrews et al. (2002) state that during the 2000 and 2001 nesting season, data from tagging studies and nest counts the nesting population sizes for the Andaman Nicobar Island rookeries are:

- Great Nicobar Island is 483 females
- Little Andaman is 100 females
- Katchal Island is 25 females
- Teressa Island is 25 females
- Little Nicobar is 100 females

References

1. = Andrews et al. (2002)
2. = Andrews (2000)
3. = Bhaskar (1993)
4. = Bhaskar and Tiwari (1992)
5. = Bhaskar (1994)
6. = Andrews et al. (in press)
7. = Andrews and Tripathy (2004)

2.2. Seasonality of leatherback turtle nesting

In the Andaman and Nicobar Islands the nesting season starts in late September, peaks during the month of December and spreads to April with scattered nesting occurring until July (Andrews et al. (in press).

2.3. Genetic studies on nesting populations of leatherback turtles

Unknown

2.4. Biological parameters

See Table 2.

Table 2. Summary of biological data collected from leatherback turtles from India

Category of data	Average	Standard deviation	Range	Sample size	References
Size of nesting females	190&212cm	-	-	-	Pillai et al. (2003)
	155.7cm	-	-	125	Andrews et al. (in press)
Number of eggs per clutch	No data available				
Clutches per season	3.96	-	-	82	Andrews et al. (2002)
	4.9	-	1-7	-	Bhaskar (1993)
Re-nesting interval (days)	10.1	-	8-14	-	Bhaskar (1993)
	12.5	-	7-47	82	Andrews et al. (in press)
Number of years between breeding seasons (years)	8	-	-	1	Andrews et al. (in press)
Size of eggs (cm)	No data available				
Size of hatchlings (cm)	No data available				
Incubation success (%)	No data available				

Various measurements of 13 leatherbacks recorded from mainland beaches are reported by Pillai et al., (2003). These include curved carapace lengths (CCL) that varied from 93 to 212 cm and body weights that ranged from 110 to 350 kg. The two nesting females were reported to be 190 and 212 cm CCL, and the larger to weigh 272 kg (Pillai et al., 2003).

2.5. Pivotal Temperatures studies

Unknown

2.6. Migration records of nesting leatherback turtles

Unknown, however Andrews (2000) mentions that Australian tagged leatherback turtles have been observed nesting on Galathea Beach (Great Nicobar Island). However, given that tags with an Australian return address had been previously supplied for use in that study area and no tag recoveries were reported to the projects that have tagged leatherback turtles in Australia, it is highly likely that these turtles, supposedly from Australia, had in fact been tagged and recaptured in the Nicobar Islands (Col Limpus Pers. Comm.).

2.7. Protection of nesting beaches (e.g. National Parks)

Protected area status is conferred on the Nicobar Islands, for access is strictly controlled; even Indian citizens (not including residents of the Islands) must have permission to visit. In the Andaman Group 69% of the land is comprised of reserves and protected areas (36% as tribal reserves) and the entire Nicobar Group is designated as a tribal reserve, and there are four wildlife sanctuaries.

2.8. Hatcheries used to protect leatherback turtle nests

Unknown

2.9. Threats to nesting leatherback turtles

Potential threats on mainland beaches include intentional predation of nesting females and/or their eggs, egg predation by feral dogs and other predatory mammals, and entanglement in gear, such as nets on beaches (see also section 3.7 on bycatch). However, the numbers of leatherback turtles nesting on the mainland is so small that these are not likely to be substantive issues, at least for this species. Depredation of eggs, turtles and hatchlings by feral dogs is a major problem for beaches in the Andaman-Nicobar Islands. Indeed it has been estimated that feral dogs may predate 70% of eggs at some locations.

On the west coast of Great Nicobar between December 2000 and March 2001 feral dogs and domestic pigs predated 60 and 10% respectively of the 866 nests recorded (Andrews et al in press).

Incidental capture and consumption of meat and eggs are also threats to the nesting populations of leatherback turtles. However, these have not been quantified specifically for leatherback turtles (Andrews et al. in press).

2.10. Coastal development & sand mining
Beach armouring is a significant problem at least in Kerala (Dileepkumar and Jayakumar in press). However, the numbers of leatherbacks nesting on the mainland is so small that this is not likely to be a substantive issue, at least for this species. On the Andaman-Nicobar Islands the main threat for all species of nesting turtles is sand mining for construction (Andrews et al. in press).

3. Foraging populations

3.1. Details of any leatherback turtle foraging area census or tagging results.
Unknown

3.2. Seasonality of leatherback turtles in coastal and offshore waters
Unknown

3.3. Approximate size range of leatherback turtles caught or seen in foraging areas
Unknown

3.4. Information on diet of leatherback turtles
No specific studies are known

3.5. Other biological studies conducted on leatherback turtles in foraging areas
Unknown

3.6. Threats to foraging populations of leatherback turtles
See section 3.7 on bycatch

3.7. Fisheries bycatch of Leatherback Turtles
Leatherback turtles are reported to be caught accidentally in a variety of fishing gear: gillnets (Tamil Nadu and Kerala); trawl nets (Tamil Nadu); and beach seines (Kerala) (Pillai et al., 2003). It is not know if these sorts of fishing present specific threats to females that are approaching or leaving nesting beaches, or simply general threats to the species. As only eleven leatherbacks have been reported captured in diverse fisheries over the eighty-year period from 1923 to 2003, it appears that incidental catch is not a common problem. Andrews et al. in (press) indicate that incidental capture of turtles is a threat to nesting and foraging populations in the Andaman-Nicobar Islands, however the numbers per species are not stated (Andrews et al. in press).

2. Conservation Actions

Areas of change	**Summary including report references**
Awareness raising programmes	Various and diverse initiatives on the mainland, but of limited direct relevance to leatherbacks
Fishery controls	Various and diverse initiatives on the mainland, but of limited direct relevance to leatherbacks

5. References

Andrews HV (2000) Current marine turtle situation in the Andaman and Nicobar Islands - An urgent need for conservation action. *Kachhapa* **3**, 19-23.

Andrews HV, Krishnan S, Biswas P (2001) 'The status and distribution of marine turtles around the Andaman and Nicobar Archipelago.' GOI-UNDP Sea Turtle Project.

Andrews HV, Krishnan S, Biswas P (2002) Leatherback nesting in the Andaman & Nicobar Islands. *Kachhapa* **6**, 15-17.

Andrews HV, Krishnan S, Biswas P (in press) Distribution and status of marine turtles in the Andaman and Nicobar Islands. In 'Marine Turtles of India.' (Eds K Shanker and BC Choudhury). (Universities Press; Hyderabad, India).

Bhaskar S (1981) 'Sea turtle survey of Great Nicobar and Little Andaman Islands.' WWF-India.

Bhaskar S (1993) 'The status and ecology of sea turtles in the Andaman and Nicobar Islands. ST 1/93.' Centre for herpetology, MCBT. India.

Bhaskar S (1994) 'Andaman and Nicobar sea turtle project. Phase V.' Unpublished report for the Centre for Herpetology Madras Crocodile Bank Trust, Tamil Nadu, India.

Bhaskar S, Tiwari M (1992) 'Andaman and Nicobar sea turtle project. Phase 1: Great Nicobar Island.' Unpublished report for the Centre for Herpetology Madras Crocodile Bank Trust, Tamil Nadu, India.

Cameron TH (1923) Notes on turtles. *Journal of the Bombay Natural History Society* **29**, 299-300.

Choudhury BC (2005) 'Compiled report on the Impact of tsunami on the leatherback turtle (*Dermochelys coriacea*) nesting beaches in the Andaman and Nicobar Islands, India.' IOSEA Advisory Committee. Unpublished report prepared for the IOSEA Advisory Committee. 9 pages.

Dileepkumar N, Jayakumar C (In press) Sea turtles of Kerala. In 'Marine Turtles of the Indian sub-continent'. (Eds K Shanker and BC Choudhury) pp. 137-140. (Universities Press: Hyderabad, India).

Jones S (1959) A leathery turtle *Dermochelys coriacea* (Linnaeus) coming ashore to lay eggs during the day. *Journal of the Bombay Natural History Society* **56**, 137-139.

Pillai SK, Suresh KK, Kannan P (2003) Leatherback turtle released into the sea at Vizhinjam in Kerala, India. *Kachappa* **9**.

Upadhyay S, Upadhyay V (2002) International and national instruments for marine turtle conservation in India. In: J. Frazier (ed.) International instruments and marine turtle conservation - Special issue. *Journal of International Wildlife Law and Policy* **5**, 65-86.