Status of leatherback turtles in Indonesia

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1. The legal protection status for leatherback turtles

1.1 Overview

Leatherback turtles and their eggs are fully protected under Indonesian law

1. Decision Letter (*Surat Keputusan*) from the Ministry of Agriculture No: 327/Kpts/Um/5/1978 regarding the protection status of the Leatherback turtles in Indonesia. In short it called SK 327/78

2. ACT (Undang – Undang) of the Indonesian Government Number 5/1990 regarding Conservation of Natural Resources and Their Ecosystems (*Konservasi Sumber Daya Alam Hayati dan Ekosistemnya*). In short it called UU No. 5/90

Free translation of the relevant content:

- catching, harming, killing, storing, owning, keeping, transporting, trading in protected wildlife is prohibited, whether dead or alive;
- similarly transporting wildlife to places inside or outside of Indonesia is prohibited;
- trading in, storing or owning skin, bodies or parts of protected wildlife and things made from parts of protected wildlife is prohibited as is moving these to places within or outside Indonesia;
- getting, breaking, destroying, trading in, storing or owning eggs or nests of protected wildlife is also prohibited.
- Those who are undertaking activities as mentioned previously will be sentenced to jail for a maximum 5 years or will be fined a sum of Rp. 100.000.000,00 (one hundred millions rupiah).

3. The Government Regulation (*Peraturan Pemerintah Republik Indonesia*) Number 7/1999. In short it called PP 7/99

Free translation of the relevant content:

- Species listed in the attachment (including all species of marine turtles occurring in Indonesia) are protected AND THEREFORE are subject to the effects of other parts of this law and the effects of UU No.5/1990.
- Species can be added to the protected list (or removed from it) by further laws.
- Sending or transporting protected plants and wildlife can (whether within Indonesia or to outside destinations) can only be done with the permission of the Minister. It also requires a health certificate from a competent agency and can only be done according to technical regulations.

4. The Government Regulation (*Peraturan Pemerintah Republik Indonesia*) Number 8/1999 regarding the Use of Plants and Wildlife

Free translation of the relevant content:

- Those who are using protected plants or wildlife as listed in PP 7/99 for research and development without permit from the Minister of Forest Protection and Nature Conservation will be fined maximum a sum of 50,000,000.00 rupiah (fifty millions rupiah), and/or will not be allowed to carry out any activities that fall into category research and development for a maximum 5 years
- Without permit to take protected plants or wildlife as listed in PP 7/99 for study, ranching (*penangkaran*) and alike will be fined maximum a sum of 25,000,000.00 rupiah (twenty five millions rupiah) and/or their ranching (and alike) license will be disqualified
- Without permit to keep protected plants or wildlife as listed in PP 7/99 for ranching purposes and alike will be fined maximum a sum of 100,000,000.00 rupiah (one hundreds millions rupiah) and will be sentenced to jail for a maximum 5 years
- Captive breeders and alike (*penangkar*) undertaking trade activities of protected plants or wildlife without fulfilling a proper qualification standard or undertake smuggling activities will be fined

maximum a sum of 100,000,000.00 rupiah (one hundreds millions rupiah) and/or their license will be disqualified
- Captive breeders (*penangkar*) who are undertaking wildlife trade will be fined a sum of 200,000,000.00 (two hundreds millions rupiah) and/or their license will be disqualified.

1.2 Management agencies responsible for marine turtle conservation

Operational level	Name and type of agency
National level	The Directorate General of Forest Protection and Nature Conservation (*Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam – PHKA*), Department of Forestry, Indonesia
State level	The Nature Conservation Agency (*Balai Konservasi Sumber Daya Alam - BKSDA*). This is a functional unit of the PHKA
Local level	The Nature Conservation Agency (*Balai Konservasi Sumber Daya Alam - BKSDA*). This is a functional unit of the PHKA

2. Nesting populations

2.1 Summary of nesting records for Indonesia

There are some historical nesting sites for leatherback turtles in Indonesia as summarized below. However, apart from Meru Betiri and Alas Purwo National Parks (both are located in East Java) and the North Coast of Vogelkop - Papua, data are not quantified. While historical nesting population for Meru Betiri and Alas Purwo are predicted to yield less than 50 nests per year (Table 3 and 4 and Figures 1 and 2), North Coast of Vogelkop particularly Jamursba Medi – Warmon is recorded to yield between 2000 – 4000 nests per year (Table 1 and 2). Survey methods vary between nesting sites. In most sites, surveys were done by means of questionnaire. Direct population monitoring or nest census was only conducted in Meru Betiri and Alas Purwo National parks (see Figures 1 and 2 for annual census data) and Jamursba Medi -Warmon.

Historical nesting sites

1. **Sumatra**
   a. Aceh:
      (1) Blok Kluet - Tapaktuan, Gunung Leuser National Park [1]
      (2) Simeulue island [1]
   b. North Sumatra:
      (1) Batu islands (*kep. Batu*) [2]
   c. West Sumatra:
      (1) The islands of Pasaman, Siberut, Penyu, and Sipura [2]
      (2) Coast of the Regency of *South Pesisir* includes the island of Penyu, Beringin, Kerabak Besar, Kerabak Kecil, Katang-Katang and Gosong island [3]
   d. Bengkulu:
      (1) The island of Pendek, Tikus, Sawangatung, Bintuhan, and Muko-Muko [2]
   e. Lampung:
      (1) Cina Peninsula (*Tg. Cina*) [2]
2. **Java**
   a. West Java:
      (1) Pangumbahan – Sukabumi of West Java [4]
      (2) Ujung Kulon and Panaitan island [2]
   b. East Java:
      (1) Sukomade – Meru Betiri National Park, East Java [2]
      (2) Alas Purwo National Park, Est Java [5]
3. **Bali**
   a. Pecatu Beach - Southern part of Bali [6]
   b. Lepang Beach – South Eastern part of Bali [6]
4. **West Nusa Tenggara**
   a. South-West Coast of Sumbawa [2, 7]
5. **Sulawesi**
   a. North Sulawesi

(1) Tangkoko island – Batuangus [2]

b. Central Sulawesi
   (1) Tg Arus – Tg Dako [2]
c. South Sulawesi
   (1) Selayar island, Tg Apatama [2]

6. Maluku (Moluccas)
a. North Coast of Morotai [2]

7. Irian Jaya (Papua)
a. Sayang island, Ayu islands, Asia islands, Dua islands [2]
b. North Coast of Vogelkop [2, 8, 9, 10, 11, 12] and Japen island, Inggresau [2]

References cited:
[1] Database Wetlands International – Indonesia Program
[2] Cited from various sources by Tomascik et al. (1977)
[3] Harfiandri Damanhuri quoted by Antara News, 4 November 2005
[4] Natural Resources Management (NRM) Program, Headline News, Issue No. 2, 22 January 2003.
[5] Database of Alas Purwo National Park
[6] Database of Bali Post
[7] A Quarterly Bulletin of *Suara Batu Hijau*, No. 12 Edition April – July 2004, Published by PT Newmont Nusa Tenggara – PTNNT
[8] Putrawidjaja (2000)
[9] Tapilatu (2000)
[10] Hitipeuw and Maturbongs (2002)
[11] Suganuma et al. (2005)
[12] Teguh (2000)

Current nesting
This section will focus on four leatherback turtle nesting sites in which direct population monitoring programs are in place, i.e. Jamursba Medi – Warmon (Papua) and Meru Betiri - Alas Purwo National Parks (East Java) (see Figure 3).

Jamursba Medi – Warmon
Jamursba Medi (JM) beach is located at 0º20'-0º22' S and 132º25' -132º39 E', between two headlands/cape *Jamursba* and *Medi*, in the north coast of *Vogelkop,* Papua. The northern border is the Pacific Ocean while the southern part is *Tamrau* Mountain with elevation of 45º. The beach is fairly flat and about 21 kilometres long. It is divided into three sections and sequentially disconnected by few small headlands/capes: (1) *Wembrak* beach (approx. 8.2 km) with black sand substrate, (2) *Baturumah* beach (approx. 5 km) with greyish white sand substrate, and (3) *Warmamedi* beach (approx. 4.8 km) with greyish white sand substrate. Based on the WWF study in 1999, the greyish sand of JM constitutes coarse 77.15 – 78.13% and fine 18.83 – 22.38% aggregates. It is suspected that the beach substrates originated from transported sediment from Pacific seabeds due to the high ocean dynamics (during the monsoons of November to February); since the nearby waterways are only perennial streams or dry stream beds. Being located in the southern part of the equator induces the tropical climate with relatively stable air temperature 29-32ºC and humidity 75 - 80% (Petocz 1987***).*** Annual rainfall density ranges from 1500 to 2500 mm during the west monsoon.

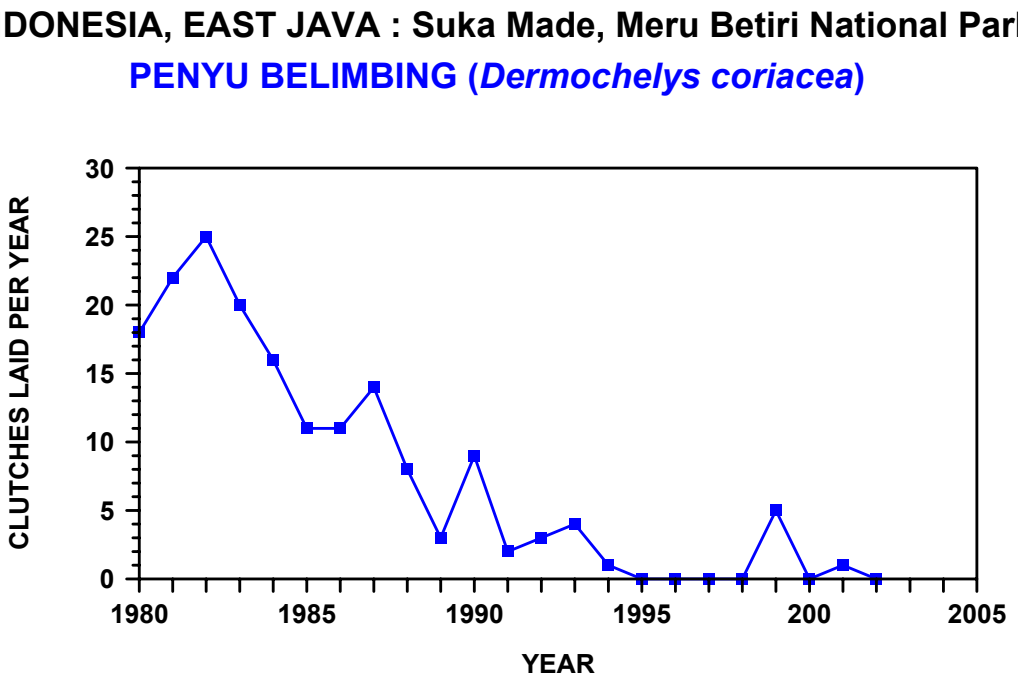
JM beach is located on the northern side of the mountain of North Tamrau, fringed by beach and lowland rain forest (0-100 m above sea level). Mangroves are absent due to the high dynamics of the Pacific Ocean. Littoral vegetation occupying the fringe are *Ipomea pes-caprae*, *Hibiscus tilleaceous*, *Baringtonia asiatica*, and *Pandanus canavalia*, *Pemphis acidula*, *Tournefortia orgentea*, *Scaevola sericea, Terminalia catappa, Calophyllum inophyllum, Crinum asiaticum, Spinifex sp*.

The northern Papua coast, on the eastern perimeter of Southwest Pacific Ocean, is inhabited by four marine turtle species, i.e. leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and olive ridley (*Lepidochelys olivacea*). Leatherback turtles are widely distributed on the northern part of the Bird Head Peninsula. Tomascik et al. (1977) included the

distribution of the species from *Waigeo* Island to *Yapen* Island. However, there is no reliable data on the population size except for JM. Nesting activities in the Bird's Head region are highly dictated by the monsoon. The nesting season in JM starts in March and terminates in September. The peak of the nesting season occurs around June when the sea is considerably calm. Numbers of clutches laid per day in a breeding season is about 20 to 30. Based on the 467 samples, Bhaskar (1987) found the average re-nesting interval to be 9.53 days and as many as eleven clutches were laid per female in a breeding season. Nesting activities later shifted to *War-Mon* beach (four-km beaches), eastward of JM. This is probably related to the strong eastward current (western monsoon) that made it difficult for the turtles to swim westward. It is possible that nesting period of this particular species occur throughout the year along the northern part of Papua, but concentrated at particular site of such an extended coastline depends on the monsoon and consequently ocean current. Following a preliminary survey initiated in 1984, data on the status of the leatherback turtle nesting population has been collected intensively by WWF-Indonesia in collaboration with the Nature Conservation Agency of Sorong since 1993. In addition, several other turtle specialists also visited the area and conducted short-term surveys (e.g. Suganuma et al. 2005). Most activities were conducted during the distinct nesting season (May-September). The data is provided in Tables 1 and 2 of section 2. There is a gap of information on population in 1998 and 2000 due to technical and financial constraint (transition of management authority).

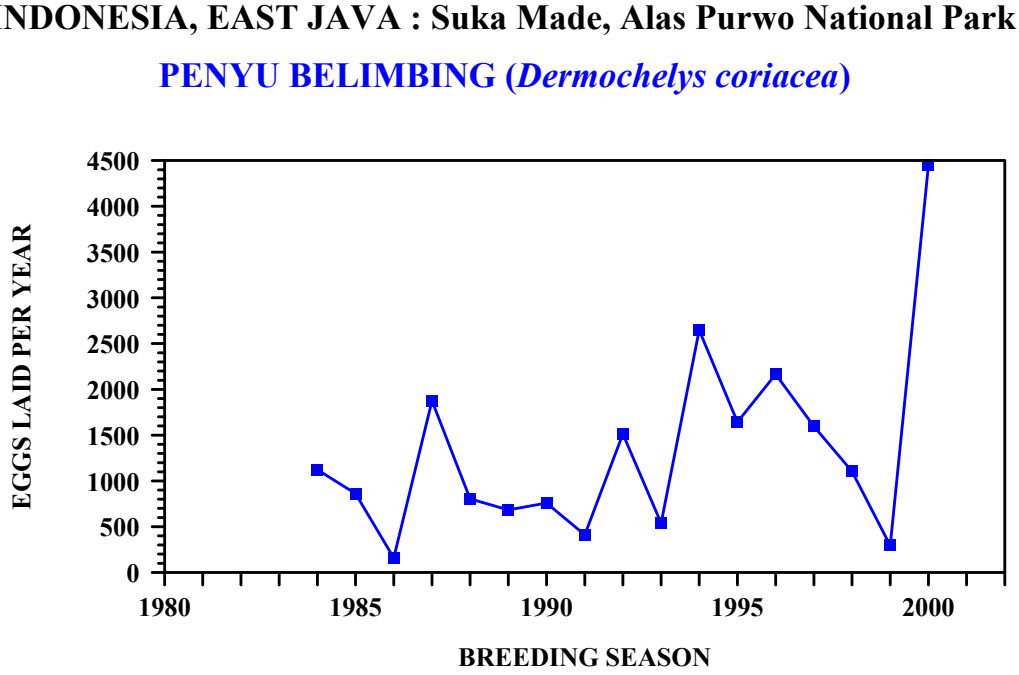
Sukamade, Meru Betiri National Park (East Java).
Sukamade beach is located between 8°21' - 8°35' S and 113°40' - 113°58' E in the Coast of South-Eastern Part of Java. The south border is Indian Ocean while the northern part is the Forest of Betiri Mountain (1213 m); the previous home of the Javan tiger. The Sukamade beach is fairly flat (5 – 17^0) and about three kilometres long, with greyish white sand substrate. The sand is dominated by fine (> 80%) aggregates measuring 0.02 – 0.2 mm. Annual rainfall density ranges from 2000 to 4000 mm during the west monsoon (November to March). Beach vegetation can be categorized into four, i.e.: beach forest (*Hibiscus telectus*, *Calophyllum inophyllum*, *Pandanus tectorius* and *Terminalia catappa*), mangroves (*Rhizopora sp*, *Avicennia marina*, *Bruguiera sp*, *Sonneratia sp* and *Nypafrutican*), swamp forest (*Gluta renghas*, *Lagerstromia sp*, *Alstonia scularis*), *Sterculia foetida* and *Coripha gebang*), and lowland rain forest (*Artocarpus elasticus*, *Pterospermum javanicum*, *Dendrocalamus asper*, and *Bambusa sp*). The beach has been known inhabited by four marine turtle species, i.e. leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and olive ridley (*Lepidochelys olivacea*). Based on the records compiled by National Park officers, the green turtle is predominant, while the other three species, including the leatherback turtles nest occasionally (see Table 1 in Section 2. 1 for data).

Alas Purwo National Park (East Java)
Alas Purwo National Park (East Java) is located in the eastern tip of Java island, between 8°26'46" - 8 ° 47'00'' S and 114 ° 20'16" - 114 ° 36'00" E. Similarly, with Sukamade, the south border is Indian Ocean while the other side is lowland forest of Alas Purwo. Nesting occurs in Ngagelan beach, a fairly flat beach (0,86 ° – 10,76 °) about 18 kilometers long, with greyish white sand substrate with diameter between 0.05 – 0.2 mm. Annual rainfall density ranges from 1300 to 2000 mm during the west monsoon (November to March). Beach vegetation is predominated by *Pandanus tectorius*. The beach has been known inhabited by four marine turtle species, i.e. leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and olive ridley (*Lepidochelys olivacea*). Based on the records compiled by the National Park officers, the latter species is predominant. The other three species, including the leatherback turtle nest occasionally (see Table 1 in Section 2.1 for leatherback turtle data).



Arinal (1997); Database of Muru Betiri National Park

Figure 1. Annual variation in the numbers of leatherback turtle clutches laid at Sukamade Beach in Meru Betiri National Park (East Java).



Database of Alas Purwo National Park

Figure 2. Annual variation in the numbers of leatherback turtle eggs laid at Alas Purwo National Park (East Java).

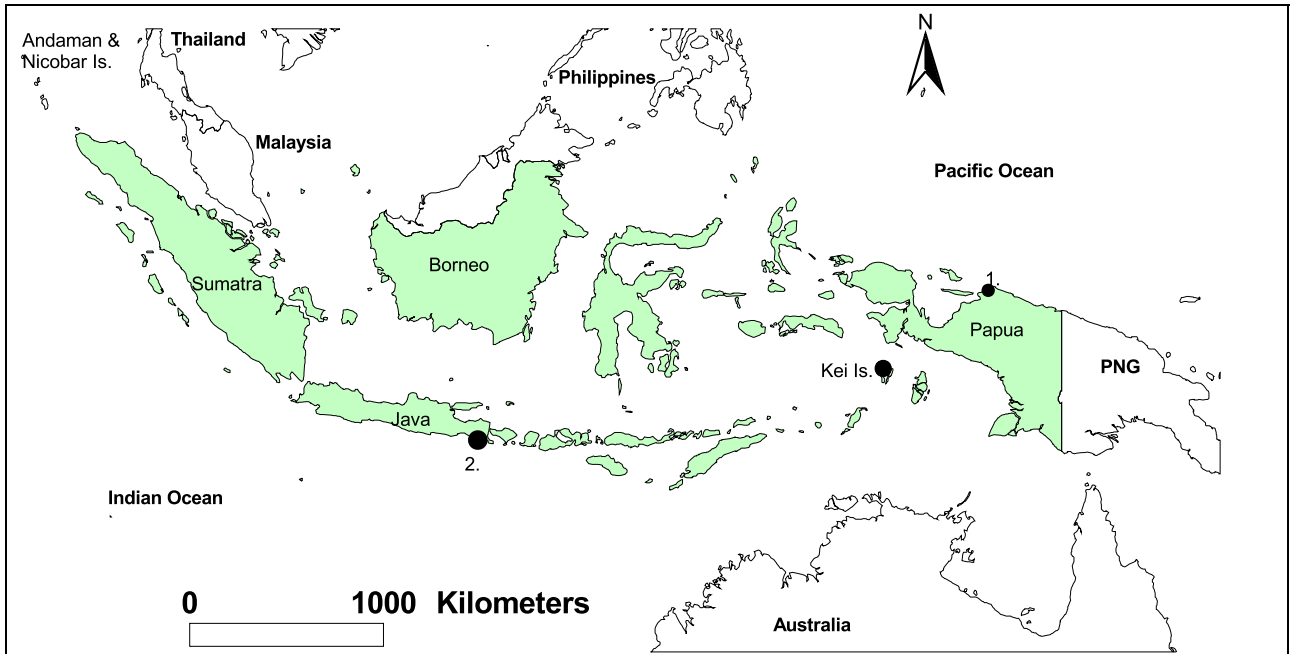


Figure 3. Locations of current leatherback turtle nesting sites in Indonesia. 1 = Jamursba Medi and 2 = Suka Made and Alas Purdo.

Table 1. Leatherback turtle nesting census data for Jamursba Medi - Papua

Beach name	Latitude of beach	Longitude of beach	Year of survey	Annual number*	Type of data	Reference
Jamursba Medi	0°20' – 0°22' S	132°25'-132°39'E	Aug & Sept 1984	2210	Nests	Database WWF
Jamursba Medi			June to Sept 1993	3247	Nests	Database WWF
Jamursba Medi			June to Sept 1994	3298	Nests	Database WWF
Jamursba Medi			June to Sept 1995	3382	Nests	Database WWF
Jamursba Medi			June to Sept 1996	5058	Nests	Database WWF
Jamursba Medi			May – Aug 1997	4001	Nests	Database WWF
Jamursba Medi			May – Oct 1999	2983	Nests	Teguh (2000)
Jamursba Medi			March – Aug 2002	3646	Nests	Database WWF
Jamursba Medi			March – Nov 2003	3601	Nests	Database WWF

* the data for Jamursba presented here is not the annual number but total nests recorded during the survey.

Table 2. Leatherback turtle nesting census data for Warmon Beach – Papua (± 30 km toward North-East from Jamursba Medi)

Beach name	Latitude of beach	Longitude of beach	Year of survey	Annual number*	Type of data	Reference
Warmon Beach			January – May 2003	1442	Nest	Database WWF
Warmon Beach			Nov 2003 to June 2004	2320	Nests	Database WWF
Warmon Beach			July – Dec 2004	1191	Nests	Database WWF
Warmon Beach			Nov 2003 to Sept 2004 (continuous data)#	2881	Nests	Thebu & Hitipeuw (2005)
Warmon Beach			Jan – Feb 2005	460	Nests	Suganuma et al. (2005)

* data for Warmon presented here is not the annual number but total nests recorded during the survey.
# data incorporates the data listed in the data for the same time period contained in the WWF database.

Table 3. Leatherback turtle nesting census data for Sukomade (Meru Betiri National Park), East Java.

Beach name	Latitude of beach	Longitude of beach	Year	Annual number	Type of data	Reference
Sukomade	8°21' – 8°35' S	113°40' - 113°58' E	1980	18	Nests	Database of Meru Betiri National Park
Sukomade			1981	22	Nests	MBNP database
Sukomade			1982	25	Nests	MBNP database
Sukomade			1983	20	Nests	MBNP database
Sukomade			1984	16	Nests	MBNP database
Sukomade			1985	11	Nests	MBNP database
Sukomade			1986	11	Nests	MBNP database
Sukomade			1987	14	Nests	MBNP database
Sukomade			1988	8	Nests	MBNP database
Sukomade			1989	7	Nests	MBNP database
Sukomade			1990	9	Nests	MBNP database
Sukomade			1991	2	Nests	MBNP database
Sukomade			1992	3	Nests	MBNP database
Sukomade			1993	4	Nests	MBNP database
Sukomade			1994	1	Nests	MBNP database
Sukomade			1995	0	Nests	MBNP database
Sukomade			1996	0	Nests	MBNP database
Sukomade			1997	0	Nests	MBNP database
Sukomade			1998	0	Nests	MBNP database
Sukomade			1999	5	Nests	MBNP database
Sukomade			2000	0	Nests	MBNP database
Sukomade			2001	1	Nests	MBNP database
Sukomade			2002	0	Nests	MBNP database

Table 4. Leatherback turtle nesting census data for Alas Purwo National Park of East Java.

Beach name	Latitude of beach	Longitude of beach	Year of survey	Annual number	Type of data	Reference
Alas Purwo	8°26'46" - 8° 47'00" S	114° 20'16" - 114° 36'00" E	1984	1,121	Eggs	Database of Alas Purwo National Park
Alas Purwo			1985	861	Eggs	Database of APNP
Alas Purwo			1986	158	Eggs	Database of APNP
Alas Purwo			1987	1,875	Eggs	Database of APNP
Alas Purwo			1988	804	Eggs	Database of APNP
Alas Purwo			1989	683	Eggs	Database of APNP
Alas Purwo			1990	758	Eggs	Database of APNP
Alas Purwo			1991	410	Eggs	Database of APNP
Alas Purwo			1992	1,513	Eggs	Database of APNP
Alas Purwo			1993	538	Eggs	Database of APNP
Alas Purwo			1994	2,647	Eggs	Database of APNP
Alas Purwo			1995	1,643	Eggs	Database of APNP
Alas Purwo			1996	2,166	Eggs	Database of APNP
Alas Purwo			1997	1,595	Eggs	Database of APNP
Alas Purwo			1998	1,105	Eggs	Database of APNP
Alas Purwo			1999	294	Eggs	Database of APNP
Alas Purwo			2000	4,452	Eggs	Database of APNP
Alas Purwo			2001	1,520	Eggs	Database of APNP
Alas Purwo			2002	1,748	Eggs	Database of APNP

2.2) Seasonality of leatherback turtle nesting

The nesting season for leatherback turtles in Jamursba Medi starts in March and terminates in September. The peak of the nesting season occurs around June. Nesting activities have lately shifted to *War-Mon* beach (four-km beaches), eastward of Jamursba Medi. This is probably related to the strong eastward current (western monsoon) that unable the turtles to swim westward. It is possible that nesting period of this particular species occurs throughout the year along the northern part of Papua, but concentrated at particular sites along the extended coastline depending on the monsoon and consequently ocean current (WWF 2003a).

The nesting season for leatherback turtles on Sukamade and Alas Purwo Beaches varies throughout the year, but most frequently between October – January (WWF 2003b).

2.3) Genetic studies on leatherback turtles

Leatherback population genetic studies have been done only for Jamursba Medi. The work was done collaboratively between NOAA and WWF Indonesia in 2003 – 2004. The total number of genetic samples collected was 100. Dutton et al. 1999 and Benson et al. (in press) state that the nesting turtles in Jamursba Medi are in the same genetic population as those that nest in Papua New Guinea and the Solomon Islands.

2.4) Biological parametres.

The biological parameters for the nesting leatherback turtle population are detailed in Tables 5 and 6

Table 5. Details of clutch parameters for leatherback turtle nests in Papua

Average per nest	Bhaskar (1987) N=25	WWF (1994) N=27	WWF (2001) N=136
Eggs	107	109	70
Yolked eggs	72 (67% of total eggs)	72 (66% of total eggs)	45 (64% of total eggs)
Hatched eggs	31 (*43% of Yolked eggs*)	53 (73% of yolked eggs)	21 (47% of yolked eggs)
Hatchlings emerged	25 (*80% of hatched eggs*)	51 (*96% of hatched eggs*)	18 (*72% of hatched eggs*)

Table 6. Details of biological parameters for leatherback turtles nesting in Indonesia

Category of data	Average	Standard deviation	Range	Sample size	References
Size of nesting females	No data available				
Number of eggs per clutch	No data available				
Clutches per season	No data available				
Re-nesting interval (days)	9.53	-	-	467	Bhaskar (1987)
Number of years between breeding seasons (years)	No data available				
Size of eggs (cm)	No data available				
Size of hatchlings (cm)	No data available				

2.5). Pivotal temperature studies
None

2.6) Migration records
Post-nesting migration of Papuan Leatherback have been studied extensively by satellite telemetry in 2003 – 2004 nesting season by NOAA and WWF - Indonesia. The turtles swam mostly into the waters of the northern Pacific – Philippines, Korea/Japan and mid northern Pacific Ocean (Dutton, Benson, Hitipeuw and Rei unpublished data).

2.7) Protection of nesting beaches

Name of the beach(s)	Name of the National Park
Jamursba Medi – Warmon	Proposed to be a turtle sanctuary
Sukamade beach	Meru Betiri National Park
Ngagelan beach	Alas Purwo National Park

2.8) Use of hatcheries to leatherback turtle nests
Hatcheries are not used to protect leatherback turtle nests in Indonesia

2.9) Threats to nesting populations of leatherback turtles
Threats to sea turtles are broadly defined as any factor that jeopardizes the survival of turtles and impedes the recovery of the populations. They exist in almost all phases of the sea turtle life cycle. Main threats identified for leatherback turtles in Indonesia are: adult poaching, egg harvests, feral predations and incidental take by fisheries. Additionally, natural threats such as tidal inundation and hatching failure were observed and therefore required specific studies to confirm the clue. Below is the short description for Jamursba Medi – Warmon. Similar situation is believed to occur in Meru Betiri and Alas Purwo National Parks. An overall summary of threats to nesting leatherback turtles in Indonesia is presented in Table 7.

Poaching of adult turtles and eggs
Poaching of the adult leatherback turtles while they are nesting does not occur. Fishermen catch the adult turtles, but the green and hawksbill turtles. Leatherback egg, however, have become an important protein source for the coastal communities. Exploitation of turtle eggs on Jamursba Medi beach was relatively intense for a long time, mostly by outside fishermen (from Sorong, Manokwari, Biak, North Maluku). During 1984 and 1985, four to five fishing boats were observed visiting the beach weekly and loaded 10,000-15,000 eggs per boat. The right to collect eggs is given by local people through a trade with household needs such as sugar, rice, salt, soap, cigarettes, and cooking utensils. The beaches became crowded with temporarily huts when the nesting season comes. This activity has declined significantly since the intensive monitoring initiated by WWF started in 1993 (Suarez et al. 2000).

Depredation of eggs
WWF preliminary work through Bhaskar in 1985 explored a more detail information about nest depredation by wild pigs (*Sus scrofa*). This animal was introduced long ago to the island of New Guinea and the most probably responsible for the decline of the nesting population in addition to the human poaching. Nests located close to the fringe of the forests are likely safe from inundation and beach

erosion, but vulnerable to the pig depredation. Besides, the wild pigs, monitor lizards (*Varanus salvator*) and domestic dogs also dig up nests which have been formerly raided by the pigs.

Based on the survey done in early July 1985 on JM, an average of 50 nests per night was being deposited and at hatching time, 56 days later, there was evidence of only three or four nests were successfully hatched per day. 17% of the nests were likely to have been inundated; up to 93% of the rest of the nests were destroyed by pigs. The situation in War-Mon Beach is also similar to the JM. Surveys done by WWF-Papua (Stark 1992) counted 387 leatherbacks nests destroyed by feral pigs on Warmamedi beach nest Lawalata et al. (2005) during daytime. The characteristic funnel shaped pit of a nest destroyed by feral pigs may extend up to one meter depth and two meters across, giving the beaches a pock-marked "war zone" appearance. Interviews done with local people and observations on numerous empty shells lying in and around the nest excavation clearly indicated that wild pigs were the greatest cause of egg mortality. In July to September 1993, 181 out of 1300 nests (14%) depredated by wild pigs. Monitor lizards and dogs also depredate the emerging hatchlings, in addition to ghost crabs (*Ocypode sp*), birds (crows, *Corvus orrea*), sea eagles (*Haliaetus leucogaster),* brahmini kites (*Haliastus indus*), sharks and finally fishes (threadfin). Water-birds such as sea gulls usually wait for the hatching time in late afternoon. When the hatchlings emerged the bird took their head together with their gut content.

In addition, Thebu and Hitipeuw (2005) examined 2881 leatherback turtle nests laid at Warmon beach between November 2003 and September 2004. These authors indicated that of the 2881 nests laid 369 (13%) were depredated by pigs, 136 (5%) were depredated by dogs and 310 (11% were inundated.

Suganuma (2005) report data on egg predation from Jamursba-Medi beach for September 1999, July 2001, July 2002, September 2002 and September 2003. In this study he found that the predation rate in July 1999 was 63.3% of all nests laid in Jamursba Medi. Following this finding the beach was protected by a series of electric fences to prevent pig predation. The first fence was constructed in March 2001 – and in June 2001 predation rates were 24%. The second fence was constructed in July 2002 – and predation rates were 17.5% in July 2002, 11.2% in September 2002 and 7.1% in September 2003 (Suganuma 2005).

Fisheries impacts
Although the rapid collapse happened to most populations of leatherback turtles was due primarily to poaching of eggs, the indigenous harvest of adult leatherbacks, the high rate of incidental mortality in fishing gear exceedingly accelerated this process. Facing the Pacific Ocean made the waters off the north coast of Papua potential for pelagic fisheries of both national or foreign fishing industries. Based on the licensing records issued by Department of Fisheries in Sorong, there has been a substantial increase of pelagic fishing activities (for boats less that 30 gross tonnage). These types of fisheries include tuna longline, gillnet, trammel net and some other traditional type of fisheries, trap nets, floating cages with submerged lights (*bagan*). In addition, being bordered with national economic exclusive zone (over 200 nautical miles) induced illegal fishing activities in the area. Assuming that leatherbacks migrate across the Pacific Ocean, fisheries activities both on the west and east side will harm them. The Asian longline and drift net fisheries killed at least 500 to 1000 leatherbacks per year during the 1980s and they still kill hundreds of leatherbacks per year in the 1990s (Nishimura and Nakahigashi 1990; Wetherall et al. 1993). The Chilean swordfish fishery killed a minimum of 250 leatherbacks per year in 1988 and 1989 (Frazier and Brito 1990). Pritchard (1982) recorded many dead leatherbacks on nesting beaches along the Pacific coast of Mexico in 1980. Fishing activities around the north coast of Vogelkop occur during the eastern monsoon, when the sea surface is calm. Unfortunately, this period coincides with nesting season in JM beach. No quantification of the fisheries induced mortality problem being done so far. However, communities living along the north coast and north islands of Papua witnessed some leatherbacks entangled in fishing nets. Emerged Hatchlings seemed to attract sharks. This opportunity is taken by fishermen to catch sharks with gillnets. Adult turtles if often found entangled in the nets in front of the beach.

Nesting success and beach stability
Nesting success of leatherbacks is dependent on the dynamic seasonal erosion and accretion of the beaches. In JM beach three to six day periods of windy weather occurred each year in late August or

early September. During this period the sea surface abruptly gets rough and this is probably associated with the beginning of the northwest monsoon. Most parts of the beach concurrently with the hatching eggs are washed away. From October onwards the sea is constantly rough. By December/ January there may be 5 to 10 m of beach left between the high tide mark and the forest, and nothing on other stretches. Accretion starts around April each year and the width of the beach slowly increased (coinciding with the increase in turtle nesting) and reached 65 m by late August. At present, the logging concessions are not allowed in the southern boundary of the nesting beach, which is gazetted as limited production forest. The logging activities include lumber harvest and transportation, and the construction of a log pond and base camps. These activities potentially threaten the beach structure, due to changes to the physical environment, not to mention a potential threat of increased opportunity for poaching in the future. Logging and log transportation will likely cause upstream erosion of rivers and consequently the degradation of nesting habitats. The use of the beach as an access for harvested lumber to log pond also has a direct impact on nesting turtles as the logs will potentially block turtle access to the nesting beach.

Hatchling failure and sex ratio variation are two areas in need of further study

Table 7. Summary of threats occurring towards leatherback turtles in Indonesia

Threats at this site/area	**Current occurrence**			**Historical occurrence**			
	Low	**Med**	**High**	**Unknown**	**Low**	**Med**	**High**
Exploitation of nesting females	X				X		
Egg collection			X				X
Agricultural development	X				X		
Tourist development	X				X		
Urban development	X				X		
Industrial development	X				X		
Artificial lighting	X				X		
Coastal erosion			X				X
Vehicles on the beach	X				X		
Sand mining	X				X		
Unregulated hatchery practices	NA				NA		
Natural threats/predation			X				X
Fisheries bycatch			X				X

2.10) Impacts of coastal development and/or sand mining on leatherback turtles nesting
None

2.11) Major existing threats to nesting leatherback turtles

Priority 1 Egg poaching

Priority 2 Habitat degradation

Priority 3 Fisheries by catch

2.12) Other biological studies conducted on nesting leatherback turtles
None

3. Foraging populations

3.1) Overview
There have been no studies on foraging leatherback turtles in Indonesia

3.2) Seasonality of leatherback turtles in coastal or offshore waters
Lawalata et al. (2005) reports that Kei Islanders predominately hunt leatherback turtles during November to February when the waters are calm.

3.3) Size range of leatherback turtles in coastal or offshore waters
Size data (curved carapace length) of hunted leatherback turtles from the Kei Islands

- October and November 1994 – ranged in size from 145 to 173 cm (average 154 and N = 22) Suarez and Starbird (1996)
- October 1994 to November 1995 – average size 147cm (range 136 to 173; N = 65) Suarez (2000)
- November 2003 and October 2004 - ranged from 52cm to 187 cm (N = 16) (Lawalata et al. 2005).

3.4) Information on the diet of leatherback turtles
The only available information is from the Kei Islands - Jelly fish (Kei island, Creusa Hitipeuw, Pers. Comm.).

3.5) Other biological studies
None have been conducted

3.6) Threats to foraging populations of leatherback turtles
Incidental catch of leatherback turtles in Indonesian waters, or by Indonesian fishing fleets is not quantified. However, the direct take (subsistence hunting) of leatherback turtles by people of Kei is a cultural practice that has occurred for generations (Suarez and Starbird 1996; Suarez 2000; Lawalata et al. 2005). Suarez and Starbird (1996) monitored the harvest between October and November 1994 and reported a catch of 23 leatherback turtles by Kei Islanders (six males and 17 females), and between October 1994 and February 1995 Suarez (2000) found 65 leatherback turtle captures (both sexes). More recently the Kei Islands were surveyed between November 2003 and October 2004 (Lawalata et al. 2005). Lawalata et al. (2005) found that at least 29 leatherback turtles were hunted from seven villages in the Kei Islands during this period (18 females and 11 males). An overall summary of threats to foraging populations of leatherback turtles in Indonesia is presented in Table 8.

Table 8. Summary of threats to foraging populations of leatherback turtles in Indonesia

Threats at this site/area	**Current occurrence**			**Historical occurrence**			
	Low	**Med**	**High**	**Unknown**	**Low**	**Med**	**High**
Directed take of leatherback turtles at sea			X				
Longline fisheries			X				

3.7) Fisheries bycatch of leatherback turtles and the fisheries involved
There are no data available, however, WWF –Indonesia, together with there partners are conducting studies to identify and quantify fisheries bycatch.

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

- Policy advocacy to manage fishery bycatch is being conducted by WWF
- Community based conservation and awareness programs are being conducted in the Kei Islands (see Lawalata et al. 2005).
- Substantial community based awareness raising and public discussions continue between WWF and the local communities with regard to leatherback turtle conservation (see Thebu & Hitipeuw 2005 and Lawalata et al. 2005)

4. Conservation actions

The following areas are currently being addressed in Indonesia to help protect leatherback turtles.

Areas of change	Summary including report references
Legislation changes	for fisheries licensing
Annual nesting beach surveys	Only for Jamursba Medi

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Status of leatherback turtles in Iran

By Nicolas Pilcher

1. Introduction
Iran lies along the eastern shores of the Arabian (Persian) Gulf and is bounded by Iraq, Pakistan, Afghanistan, USSR and Turkey. Iran consists mostly of a rugged, mountainous rim with a high, central basin with deserts, high mountains, and small, discontinuous plains along both coasts (the Caspian Sea and the Gulf). The climate is generally mostly arid or semiarid, and subtropical along the Caspian coast. Approximately 60 % of the country is classified as desert and semi-desert with sparse open scrub. There are up to 3.75 million ha of woodland, with an estimated 8,900 ha of *Avicennia* mangrove along the coast, and a rich and diverse marine fauna, seagrass beds and coral (Harrington 1977). Iran's major mineral resources are coal, chromium, copper, iron ore, lead, manganese, zinc, and sulfur. Iran is a major producer of natural gas and petroleum.

2. The legal protection status for leatherback turtles
2.1 Overview
The current main law covering nature conservation, the Environmental Protection and Enhancement Act of 1974, supersedes all previous enabling legislation. Four categories of protected natural area can be established and protected; any previously designated sites have been reclassified under this law.

Iran is a signatory to Convention on Biological Diversity (CBD), the Convention on Climate Change, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Wetlands of International Importance (RAMSAR) - not ratified, the convention on the Law of the Sea, and the IOSEA Sea Turtle MoU, among others.

2.2 Management agencies responsible for marine turtle conservation
The main administrative and management body is the Department of the Environment, which was established in March 1972 and is divided into a series of divisions dealing with different environmental matters. Under the Environmental Protection and Enhancement Act it superseded the Game and Fish Department in 1974. The latter Department was established in 1967 and had been responsible for the protection of wildlife, hunting, and fishing in inland waters as well as protection of the natural environment. It had succeeded the original Game Council of Iran established in 1956.

The Division of Parks and Wildlife, Department of the Environment is the main body undertaking protected areas management. Generally, the Department undertakes long-term environmental studies and management projects, with responsibilities which include the conservation and enhancement of wildlife resources and the prevention of pollution. It also puts forward regulations on habitat management. Its long-term programmes for the conservation of wilderness sites and wildlife include the cleaning of the Caspian Sea and Iranian rivers and prevention of air pollution in Tehran and Isfahan. The Department has introduced environmental legislation regarding pollution (Sardar 1982). Recommendations for the establishment of reserves or changes in reserve classification are prepared by the Division of Parks and Wildlife, reviewed by all appropriate divisions of the Department of the Environment, and presented to the High Council of the Environment for approval. The arrangement ensures that all government organisations with jurisdiction over lands proposed for protection have an opportunity to assess the impact on resources administered by their organisations (Firouz and Harrington 1976).

Research is conducted in ministries and universities. Almost all ministries have their own research institutes and centres (Coad 1980-1981).

3. Nesting populations
There are no historical or contemporary records of leatherback nesting in Iran.

4. Foraging populations

4.1 Overview

While there are no historical or contemporary records of any sightings of leatherbacks in Iran's territorial seas, it is unlikely that they are not at least an infrequent visitor to Iran's waters given they are reported as being found occasionally in other Gulf-bordering nations. Marine turtle research and conservation efforts are in their infancy in Iran, with recent baseline coastal and tagging surveys directed primarily at the hawksbill and green turtles. There are no dedicated research or conservation efforts aimed at the leatherback turtle in the Islamic Republic of Iran.

4.2 Threats to leatherback turtles

One of the major environmental threats lasting much of the 1980-1990 decade was the consequences of the military conflict between Iran and Iraq, although the effects of air pollution from burning Kuwaiti oil wells in the 1990-91 Iraq-Kuwait conflict was also reported in Iran (WCMC 1991). In 1983, the Nowruz oil field in the Persian Gulf, north-west of Kharg Island, was damaged, resulting in severe pollution of the sea by oil and gas leakage. The petro- chemical industry on the Gulf shore and islands continues to pose a number of threats to the environment, not least pollution. The movement of oil tankers through the Gulf presents a continued threat to marine life and to the increasingly important Gulf fishery.

Iran is faced with a host of environmental problems, many of which the country is only beginning to tackle, as the problems reach a crisis point. Although Iran established the Department of Environment in 1971, long-term environmental concerns often have been subjugated to shorter-term industrial production and political goals. Iranian environmental protection efforts in the 1970s focused on conservation, with the establishment of a number of national parks, national monuments, and wildlife refuges throughout the country. However, after eight years of war with Iraq, international political isolation, and economic sanctions, environmental goals have largely been put on the back-burner. In addition to deforestation and desertification issues, overfishing has caused a drop in fishing levels; industrial and urban waste water runoff has contaminated a number of rivers and coastal waters and threatened drinking water supplies; and oil and chemical spills in the Persian Gulf and Caspian Sea continue to pollute the seas and harm aquatic life.

4.3 Protection of foraging areas

There are a number of protected areas along the Iranian coast. These include two of the three biogeographic zones covered by this country's coastline, the exception being the Indo-Pacific. However, the majority of these seem to be coastal terrestrial areas with others being proposed marine areas (for example, Hara Marine Park). Only one established MPA could be confirmed (Shidvar Wildlife Refuge). Its present legal status is not clear because it was declared prior to the Revolution in 1979. Likewise, its level of management, the extent of degradation following eight years of war with Iraq, and possible impacts from the more recent Gulf War are not known.

4.4. Gaps in capacity and requirements for improved conservation

Effective conservation measures for Iran's marine turtles and their habitats can only be based on the timely delivery of accurate data concerning the state of the marine environment. There is a need for monitoring programmes that feed information into management plans, as opposed to one-time 'snapshot' surveys. Monitoring programmes need to provide regular updates and highlight changes in marine environmental quality which are the basic building blocks on which conservation measures are developed. There is also a need to develop and expand local capacity to monitor and carry out research on marine turtles. This must also include the designation, where applicable, of competent authorities to manage and conserve marine turtles, and detailed management plans to promote the development / replenishment of turtle populations.

Public education campaigns are also needed to increase understanding of the importance of marine turtles and their sensitivity to direct and indirect take, and pollution. These should highlight the use of time-area closures to prevent further damage to turtle populations, the need for restrictions / guidance on fishing practices, the problems caused by direct and indirect take, and the need for public and private participation in the management of turtles and their habitats.

There is also a need to designate additional Marine National Parks and Marine Protected Areas within integrated management plans. Only within these protected areas will Iran be able to fully protect its marine turtle populations.

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Status of leatherback turtles in Iraq

By Nicolas Pilcher

1. Introduction

Extending over an area of approximately 434,317 sq. km, Iraq is located in south-west Asia bordering Turkey to the north, Syria to the north-west, Jordan and Saudi Arabia to the west, Kuwait to the south and Iran to the east. Iraq is a country of mostly broad plains, reedy marshes along the Iranian border in the south, with large flooded areas. It lies at the northeastern tip of the Arabian (Persian) Gulf and has a total coastline of 58 km. The climate is mostly desert; with mild to cool winters with dry, hot, cloudless summers. Occasional heavy snows that melt in early spring sometimes cause extensive flooding in central and southern Iraq.

The maritime area of Iraq falls within the northwestern Arabian (Persian) Gulf. The Gulf region extends from Shatt Al-Arab and the coastal lowlands in the north to the Strait of Hormuz and the high mountains of Oman in the south. It is a semi enclosed shallow continental water body measuring 1000 km in length and varying in width from a maximum of 340 to 60 km (at the Straits of Hormuz). The average depth is about 35 m and maximum is 100m. The Gulf is subject to wide climatic fluctuations, with surface water temperatures generally ranging from 12 in the winter to > 35^0C 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

Information available indicates that there is no legislation to protect habitats and ecosystems for nature conservation. The Iraqi government appears to generally give low priority to nature conservation, with only a few conservation laws known to exist, mostly relating to restrictions on hunting and fishing. These laws, Forestry Law No. 75, Environment wildlife Law and Hunting Laws Nos. 40 and 41, seem to only exist on paper and have never been implemented or enforced.

At a broader international level, Iraq is a contracting party to the World Heritage Convention, but has yet to designate any natural World Heritage Sites. Key biodiversity conventions Iraq has not signed include the Convention on Biological Diversity (CBD) and Convention on Migratory Species (CMS). Iraq is a member of ROPME, the Regional Organisation for the Protection of the Marine Environment, and a signatory to the Convention on the Law of the Sea (1982).

2.2 Management agencies responsible for marine turtle conservation

It is unclear what current management of monitoring capacity, if any, exists in Iraq as it goes through reconstruction following the recent war.

3. Nesting populations

There are no historical or contemporary records of leatherbacks nesting in Iraq.

4. Foraging populations

4.1 Overview

There are no records of leatherbacks having been seen in Iraq's waters. No research of any kind or directed conservation action has been carried out on leatherbacks in Iraq.

4.2 Threats to leatherback turtles

Prior to the Gulf War clear evidence of mangrove die-off close to Khore Zubair and Khor abd Allah was available in satellite imagery, and aerial surveillance immediately after the war showed strong indications of impact from oil spills, as well as other war damage. Drainage of the marsh areas of the Tigris-Euphrates Delta and the damming of these two rivers may have a very large impact on the northern Gulf marine ecosystems. Government water control projects have drained most of the inhabited marsh areas

east of An Nasiriyah by drying up or diverting the feeder streams and rivers, and a once sizable population of Marsh Arabs, who inhabited these areas for thousands of years, has been displaced. The destruction of the natural habitat poses serious threats to the area's wildlife populations.

In addition, the Gulf is one of the largest known oil fields in the world. Oil exploitation and other activities lead to pollution input into the marine environment from well blow-outs, oil leakage from pipelines, loading terminals and discharges from refineries. Natural oil seepage is another source of pollution, estimated at about 10% of the overall chronic oil discharges. Up to 35,000 tankers pass through the Straits of Hormuz annually, making the Gulf among the busiest tanker routes in the world. It is unknown what, if any, impacts these factors might have on the few leatherbacks in the Gulf.

4.3 Protection of foraging areas

There are no declared MPAs along the relatively short Iraqi Arabian Gulf coastline, which is restricted to an area next to the town of Faw by the mouth of the Shatt al Arab (mouth of the Euphrates and Tigris rivers). Areas that have not been developed and that are recommended for protection include the mudflats near Khore Zubair and Khor abd Allah.

4.4. Gaps in capacity and requirements for improved conservation

Unknown.

Status of leatherback turtles in Japan

By Mark Hamann, Colin Limpus and Naoki Kamezaki

1. The legal protection status for leatherback turtles

1.1 Overview

The Japanese government banned capture of leatherback turtle and its eggs not only in the territory of Japan but also in the high-seas between 70 N and 50 S (the Law for Conservation of Aquatic Resources).

2. Nesting populations

Extensive surveys of Japanese beaches for marine turtle nesting has been conducted (see Uchida and Nishiwaki 1982 and Kikukawa et al. 1999). There have been only two records of leatherback turtle clutches being laid in Japan (Kamezaki et al. 2002).

3. Foraging populations

Some stranded leatherback turtles have been found along the coastline both in the Pacific Ocean coast and the Sea of Japan, indicating that this species migrates into Japanese waters (Nishimura 1964; Oike and Kato 1997; Horikoshi et al. 2000; Israel 2002, Oike et al. 2004). At least on tag recovery was reported from off southern Japan of a leatherback turtle tagged as a nesting female at Terengganu, Malaysia, in the 1970s (See Malaysian section). Furthermore, one of the post nesting female leatherback turtles released from Papua – Indonesia was tracked via satellite telemetry into Japanese waters (Benson and Dutton unpublished data). The complete stranding data for marine turtles in Japan has not been published yet and although bycatch has been recorded in some fisheries it has not been accurately quantified for leatherback turtles (Horikoshi et al. 2000; Israel 2002).

3.1 Threats to leatherback turtles

The most significant current threats to leatherback turtles in Japan, or by Japanese fleets in international waters, is bycatch in fishing gear (Yatsu et al. 1991; Wetherall et al. 1993; Horikoshi et al. 2000; Israel 2002; Nakano 2005). However, the Japanese National Research Institute of Far Seas Fisheries has embarked on a project to quantify marine turtle bycatch and reduce the impacts of fishing on marine turtles (see Nakano 2005). There have been recent efforts to reduce fisheries related bycatch by Japanese fisheries in the Pacific Ocean (see Bellagio Blueprint for Action on Pacific Sea Turtles and the Proceedings of the International Tuna Fishers Conference on Responsible Fisheries July 2005).

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Status of leatherback turtles in Jordon

By Nicolas Pilcher

1. Introduction
The coastline of the Hashemite Kingdom of Jordan extends approximately 27 km along the north eastern-reaches of the Gulf of Aqaba. The coast is home to Jordan's only seaport and is a center of industry, tourism and transportation. Approximately 30 % of the coast is used for port facilities. The climate in the region is arid with an annual rainfall of 20 - 30 mm and a mean daily air temperature of 14 to 32 ºC. The Gulf of Aqaba is a semi-enclosed system with limited water circulation. Fringing reefs border up to 50 % of the coast, supporting a high diversity of coral and associated fauna, but limiting nesting potential for leatherback turtles.

2. The legal protection status for leatherback turtles
2.1 Overview
Jordan is party to several international conventions which are relevant to the conservation of turtles. These are, among others, the Convention on International Trade in Endangered Species of Wild Fauna or Flora (CITES), the International Convention for the Prevention of Pollution from Ships (MARPOL); the Regional Convention for the Conservation of the Red Sea and the Gulf of Aden Environment (Jeddah Convention); the United Nations Convention on Biological Diversity (CBD); and the United Nations Framework Convention on Climate Change. The Middle East peace process and the opening up of relations between Jordan and Israel have also created commitments for regional cooperation on a range of environmental issues. Jordan is also a signatory to the IOSEA Sea Turtle MoU.

A number of national laws exist that are directly or indirectly pertinent to reef conservation, in particular the Law of Environmental Protection and several Articles within. The Law of the Aqaba Region Authority No. 7 (1987) delegates the power to plan and execute tourism, industrial and agricultural projects in the region. The law has been the key instrument for strengthening environmental controls including the use of Environmental Impact Assessments and coastal zone management guidelines. Regulations for the Jordanian Red Sea Marine Park are being developed under this law. The Law of Environmental Protection No. 12 (1995) establishes a national framework for environmental policy, including the formation of a Higher Council for Environmental Protection (HCEP). The HCEP sets national environmental policy and reviews proposed laws, specifications and standards prepared by the General Corporation for Environmental Protection (GCEP). The GCEP implements pollution prevention regulations including inspection and monitoring.

2.2 Management agencies responsible for marine turtle conservation
The responsibility for development of the Aqaba region is borne by the Aqaba Regional Authority (ARA), with conservation works carried out through the ARA Environment Unit (established in 1994). ARA supervises town planning, tenders and public works, finance, administration, regional planning and research and studies. The Aqaba Marine Science Station (MSS) monitors trends on coral reefs and provides facilities for training and research, but little of this is related to marine turtles. Studies are conducted on water quality, impacts of pollutants and baseline coral reef ecology. The MSS also administers the Aqaba Marine Science Centre which occupies 500 m of the coastline (making it a *de facto* protected area). Three NGOs also address marine environmental concerns in Aqaba: The Royal Society for the Conservation of Nature, which funds an inspector to patrol merchant vessels; the Jordan Environment Society, which introduces awareness programmes, and the Jordan Royal Ecological Diving Society, which organises underwater cleanups, awareness programmes and monitoring of coral reefs.

3. Nesting populations
Jordan’s coastline is short and practically entirely fronted by reefs or developments, and no nesting of any marine turtles takes place.

4. Foraging populations

4.1 Overview

While hawksbill and green turtles are known to feed along the reefs fronting Jordan, no leatherback turtle records of any kind exist. It is possible that the relative isolation of the Red Sea, where most of the few leatherback turtles are found in the south, coupled with the further seclusion of the Gulf of Aqaba far in the north, combine to limit leatherback turtle distribution into Jordanian waters. The Gulf of Aqaba is deep and relatively narrow, and is characterized by its geographical isolation and the number of species that are either restricted to or from the area, including several species of reef-building corals and fish. Cool sea temperatures and a dispersal 'bottle-neck' into and out of the Straits of Tiran may be important factors in turtle distributions.

4.2 Threats to leatherback turtles

The Gulf of Aqaba is highly susceptible to pollution. At present, however, pollution is limited and localised. The main threats are oil spills and discharges, industrial discharges, municipal and ship-based sewage and solid waste. Fisheries are limited to some 25 small fibreglass power boats, and no commercial-sized vessels operate in the region.

4.3 Protection of foraging areas

There are currently no marine protected areas in Jordan, although one is proposed that will encompass coral reefs at the northern tip of the Gulf of Aqaba. The Aqaba Coral Reef Protected Area is the only proposed protected area for Jordan. It will enclose an undefined area of diverse reefs and associated fauna at the northern tip of the Gulf of Aqaba.

4.4. Gaps in capacity and requirements for improved conservation

Most of Jordan's departments and organisations appear to be reasonably well staffed. Certain areas including coastal zone management and computing need to be strengthened to meet the demands of effective development and implementation of legislature, and for the establishment of a Marine Park. Recommendations have been made to develop and implement a training programme to strengthen the capacity to regulate industrial performance (Pilcher and Al-Moghrabi 2000). Essential for the development of this program are an industrial pollution prevention specialist and an environmental monitoring technician to implement the new permitting process, conduct facility inspections and review specific industry documents and practices relevant to control of industrial pollution, and for collection and analysis of both air and water samples.

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Status of leatherback turtles in Kenya

By Gladys Okemwa

1. The legal protection status for leatherback turtles

1.1 Overview

Kenya is a signatory to international and regional instruments such as CITES, CBD, CMS convention, IOSEA MOU. Leatherbacks are considered critically endangered in Kenya according to the IUCN red list and are protected under national legislation (Fisheries Act- Cap 378 and the Wild Act-Cap 376) which prohibits killing, consumption or sale of all marine turtle species, their eggs and products. Enforcement effort is however hampered due to jurisdictional overlaps (between the Kenya Wildlife Services and the Fisheries Department), reduced manpower capacity and lack of deterrent penalties. There is no legislation protecting key nesting and foraging habitats utilized by marine turtles except for those within marine protected areas (Okemwa et al. 2004).

1.2 Management agency responsible for marine turtle conservation in Kenya

Name of agency: Kenya Wildlife Services

Type of agency: Government Agency

2. Nesting populations

2.1 Overview

The Kenya Sea Turtle Conservation Committee (KESCOM) has been in operation since 1993 and is the umbrella body that coordinates surveys of beaches in Kenya for nesting turtles. KESCOM surveys reveal that three species of marine turtle nest on Kenya's beaches (green, hawksbill and olive ridley turtles). Leatherback turtles have not been recorded nesting in Kenya (Frazier 1975; Okemwa 2002; Okemwa et al. 2004). In addition, KESCOM have established community based turtle conservation groups along the Kenya coast covering over 50% of potential nesting grounds which have led to increased reports of nesting activity and better assessment of nesting trends. However, there are still gaps in the knowledge of nesting turtles, in particular the distribution of nests is less known for sections of the coast where accessibility is poor (e.g. between Malindi and Lamu; Figure 1) (Okemwa 2002; Okemwa et al. 2004). There have been no surveys to identify whether anecdotal or traditional records indicating that leatherback turtles' nest, or have nested, in Kenya.

3. Foraging populations

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

Aerial surveys in 1994 found that marine turtles are widely distributed along the Kenyan coast (Wamukoya et al. 1996). No foraging area surveys have been carried out on leatherback turtles in Kenya. Sightings are rare because leatherbacks would most probably be sighted in deeper offshore waters and Kenya's artisanal fishers are not equipment to fish in such deep waters. Artisanal fishers comprise approximately 80% of the fleet and contribute approximately 60% of the catch (Okemwa et al. 2004).

3.2) Seasonality of leatherback turtles in coastal and offshore waters

Leatherback turtles are most likely to be seen in Kenya's waters between October and March, which is the northeast monsoon season.

3.3) Approximate size range of leatherback turtles

There is only one mortality report sent to KESCOM by a community member who reported a leatherback turtle that was caught by fishermen using large mesh gillnets (used to catch sharks). This leatherback turtle measured 49cm CCL and 47 cm CCW. However KESCOM were unable to gain any photographic confirmation that this animal was a leatherback turtle.

3.4) Information on the diet of leatherback turtles.
There are no data on the diet of leatherback turtles that forage in Kenya'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 Kenya.

3.6) Threats to foraging populations of leatherback turtles.
There is only one record of leatherback turtles stranding in Kenya (Okemwa et al. 2004). However, threats for foraging turtles are listed in Table 2; with the exception of trawling these threats have not been quantified. Surveys by Mueni and Mwangi (2002) indicate that at least three turtles are caught by trawl nets per fishing day (in the fishing season).

Table 2. Threats to foraging turtles in Kenya

Threats at this site/area	**Current occurrence**	**Historical occurrence & year**
Exploitation of live animals at sea	Yes	Yes
Incidental capture in fisheries	Yes	Yes
Boat strikes	NA	NA
Plastics (at sea)	Yes	NA
Industrial effluent	NA	NA
Inshore oil pollution	Yes	NA
Natural threats/predation	Yes	Yes

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
Artisanal gill net (large mesh) fisheries	October to March	Unknown	Low

3.8) Other activities being undertaken to improve the conservation of leatherback turtle foraging populations.
The Kenya Sea Turtle Conservation Committee (KESCOM), the national coordinating body, was set up to coordinate monitoring and surveillance of nesting beaches and to implement the national marine turtle recovery action plan. KESCOM collaborates with government agencies (including Kenya Wildlife Services, Fisheries Department and Kenya Marine and Fisheries Research Institute), non governmental organizations, fishing communities, hoteliers and conservationist) to advocate for marine turtle conservation. Community based turtle conservation groups have been established along the Kenya coast covering over 50% of potential nesting grounds which have led to increased reports of nesting activity and better assessment of nesting trends. KESCOM carries out targeted awareness activities (training workshops, production of brochures and posters, news articles etc). The conservation of foraging leatherback populations lags behind other marine turtle species, mainly because leatherback observations/strandings are rare in Kenya. However gear regulations on TED usage have been gazetted to reduce bycatch in prawn trawlers. Intense awareness campaigns among fishing communities is also being undertaken by KESCOM. KESCOM has also succeeded in building up conservation action among the relevant government agencies and is advocating for a policy review on marine turtle conservation guided by findings of research and monitoring activities. A marine turtle recovery action plan for Kenya has also been published (Wamukoya et al. 1997).

4. Concluding remarks
Generally, little information is known about the status of leatherback foraging populations in Kenya. Funding is being sourced to increase mapping, monitoring and surveillance of key foraging grounds and to increase tagging of foraging turtles. There is need to build capacity especially in the use of satellite

telemetry which will aid in identifying critical foraging grounds and leatherback migratory pathways as well as provide the supportive evidence needed to influence our national policy as regards the conservation of key turtle foraging grounds. (nb: only one unconfirmed incidental capture has been reported to KESCOM within the Pemba channel next to the Tanzanian border of the southcoast of Kenya in October 2004).

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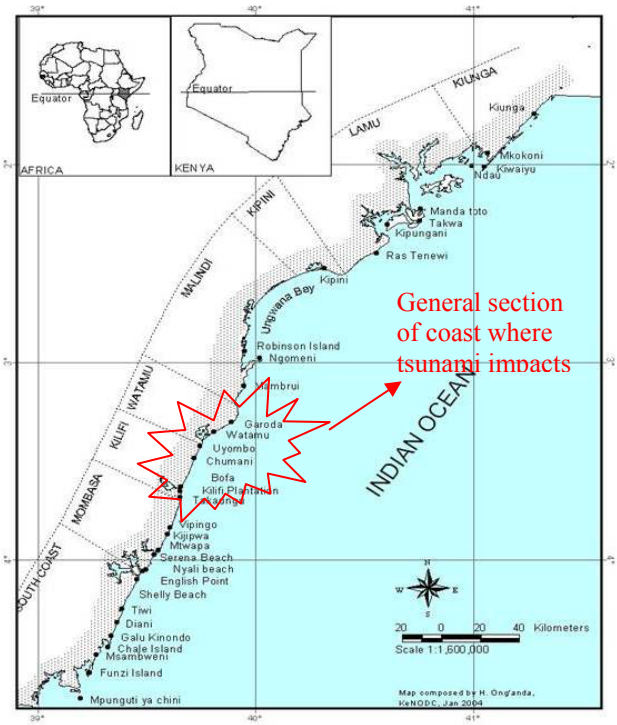

Figure 1. Map of Kenya coast showing identified turtle nesting sites and the section of coast where impacts from the tsunami were felt.

Status of leatherback turtles in Korea

By Mark Hamann

No report on leatherback turtles in Korea was submitted. However, a search of literature (electronic and printed) has revealed that leatherback turtles are known from Korean waters (Doi 1936). Satellite telemetry of post nesting neatherback turtles from Indonesia Papua indicated that one female swam into Korean waters (see Indonesia section). Leatherback turtles have also been recorded as bycatch by the Korean North Pacific Squid fishery (International North Pacific Fisheries Commission 1991).

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Status of leatherback turtles in Kuwait

By Nicolas Pilcher

1. Introduction
Kuwait is bounded in the east by the Arabian or Persian Gulf, north and west by Iraq and south and west by Saudi Arabia. Situated at the 'crossroads' between the Palaearctic, Afro-Tropical and Indo-Malayan realms, Kuwait harbours a varied fauna and flora, but with relatively few species and a very low incidence of endemism. The Kuwaiti Gulf is represented by at least four critical marine habitats: coastal marsh and mudflat, coral reef, seagrass bed and mangrove. Several coral islands are major nesting areas for eight species of tern, Socotra cormorant and of two species of globally threatened turtle. Kuwait has traditionally long been regarded as a vast *hema*, or culturally protected area. However, over the last two decades traditional practices have broken down as a consequence of urban development and industrialisation (Alsdirawi in lit. 1991). Today, virtually the entire coastline is built-up with residential or commercial buildings, and no public access is available to the beach. Only the few small offshore islands permit access to the shore.

The maritime area of Kuwait falls within the north-western Arabian (Persian) Gulf. The Gulf region extends from Shatt Al-Arab and the coastal lowlands in the north to the Strait of Hormuz and the high mountains of Oman in the south. It is a semi enclosed shallow continental water body measuring 1000 km in length and varying in width from a maximum of 340 to 60 km (at the Straits of Hormuz). 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°C in the winter to > 35°C in the summer and salinity from 28-60 p.p.t. 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
Kuwait is a contracting part to the Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution, and actively participates in meetings concerned with additional protocols and the Kuwait Action Plan.

Legislation relating to protected areas is based on Decree No. 18 (1968). As such, Kuwait municipality has control of the land-use in all designated nature conservation areas and has the right to remove unauthorised users. The main piece of legislation governing protected areas and the protection of the environment is Decree Law No. 62/1980. Article 3 Item 1 indicates a general policy for the protection of the environment. This encompasses five main areas of which the conservation of nature and natural resources is one. Section 2 of the general framework for environmental protection deals with the preservation of nature and natural resources. Section 2a covers nature; it encompasses the necessary legislation, regulations and codes of practice, the provisions of adequate funds, manpower and legal capabilities to implement a comprehensive national plan. Measures have also been included to prevent the decline of marine turtles.

2.2 Management agencies responsible for marine turtle conservation
The Environment Protection Council (EPC) is empowered to develop a general policy for the protection of the environment and to propose protected areas, working with the municipality and other relevant agencies. The EPC is charted to develop short and long-term integrated work plans, to coordinate activities, study pollution problems and prepare research policies, regulations and coordinate Kuwait's ratification of appropriate regional and international agreements. The EPC has also been empowered to carry out flora and faunal surveys and be involved in active protected area management. The protected areas system is under the management and direct supervision of the Public Authority for Agriculture and Fisheries (PAAF).

The Kuwait Institute for Scientific Research (KISR) is involved in protection and management of the environment in addition to undertaking research on coastal ecosystems and in providing scientific support for the oil sector. Amongst the many bodies, in addition to KISR, which undertake environmentally related research in protected areas is the Department of Agriculture of the Ministry of Public Works. The Regional Organisation for the Protection of the Marine Environment (ROPME), with offices based in Kuwait, has been actively involved in evaluating the action plan, including its marine pollution monitoring and research programme. Non-governmental agencies involved in nature conservation and environmental assessment include the Ahmadi Natural History and Field Studies Group.

3. Nesting populations

There are no historical or contemporary records of leatherback turtles nesting in Kuwait.

4. Foraging populations

4.1 Overview

Al-Mohanna & Meakins (2000) reported a leatherback being seen in Kuwait, although there are no additional contemporary records of leatherbacks having been seen in Kuwaiti waters. 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 Kuwait.

4.2 Threats to leatherback turtles

Given the physical nature of the Gulf, with its narrow bottle-neck opening and shallow shore approaches, it is unlikely leatherback turtles are anything more than transients or waifs. If leatherback turtles were to be found in Kuwaiti waters, they would be threatened by coastal gillnets if they came close to shore (not a common event for foraging leatherback turtles), or by shipping and petroleum-related accidents/discharges. There are no commercial trawlers operating in Kuwaiti waters.

4.3 Protection of foraging areas

At the present there are no protected areas. The Department of Mari-culture and Fisheries, Food Resources Division of the Kuwait Institute for Science and Research has proposed five Kuwaiti islands as marine parks (Kubbar, Qaru, Bubiyan, Umm al-Muradum and part of Failaka), but no action has been taken to date.

Before the suspension of legislative activities in August 1990, as a result of Iraqi occupation, Kuwait was in the final stages of developing a detailed protected areas system.

To protect the ecological integrity of the coastal and marine environment, a peace park was proposed by the World Conservation Monitoring Centre, incorporating the headwaters and north-east shore of the Arabian Gulf (WCMC, 1991).

4.4. Gaps in capacity and requirements for improved conservation

Amongst the various management constraints, perhaps the chief concern is the poor practical coordination between the various administrative and management bodies. Although active within the country, the applied activities of non-governmental conservation bodies appear to provide little input into protected areas conservation. Environmental problems, due to a number of factors, have been identified, principally population growth, urban expansion, industrialisation, transport and recreation and climate.

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Status of leatherback turtles in Madagascar

By Mark Hamann

No report was received from Madagascar. However, Rakotonirina and Cooke (1994) and Rakotonirina et al. (2004) state that leatherback turtles reside in Madagascan waters but do not nest along any of the surveyed nesting beach in Madagascar. Leatherback turtles are most often sighted along the southern and western coastline (Hughes 1982; Rakotonirina et al. 2004). While Walker et al. (2004) state that leatherback turtles are taken as both bycatch and direct harvest, during their study they found no evidence of leatherback turtles in the market.

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Status of leatherback turtles in Malaysia

By Mark Hamann, Kamarruddin Ibrahim and Colin Limpus

1. The legal protection status for leatherback turtles

1.1. Overview

The Terengganu State Government adopted the Turtles Enactment, 1951 (Amendment (1987) to provide for more protection of leatherback turtles in the state. In 1988 the Terengganu State Government banned the commercial sale and consumption of leatherback turtle eggs as long as 100% of eggs could be saved for hatching. Two fishing regulations were adopted; The Fisheries regulation (Prohibition of Fishing Methods) 1985 (Amendment 1989) bans large meshed gill nets throughout Malaysian coastal waters and the Fisheries Regulation (Fisheries Areas) Regulation 1991 provides offshore protection to leatherback turtles during their internesting period.

2. Nesting populations

2.1. Overview

The nesting population of leatherback turtles in Malaysia has been well described (see Chan and Liew 1996). While it is likely that rare individuals have come ashore on beach in western Peninsula Malaysia or Sabah and Sarawak nesting of leatherback turtles has only occurred in significant numbers along the beaches of eastern Peninsula Malaysia (Figure 1a,b; see de Silva 1982; and Chan and Liew 1996 for references). There have been several recent media accounts of scattered leatherback turtle nesting along the north west coast of Sabah (Nicolas Pilcher Pers Com.).

The decline of the nesting population of leatherback turtles in Malaysia has been well documented (see Chan and Liew 1996 and Spotila et al 1996). The Fisheries Department of Terengganu, Malaysia has kept nearly annual records of the leatherback turtle hatchery program and the number of clutches laid per year from 1956 until 1995 (including records of number of females from 1984 until 2003). These long term data indicate that the population has been severely depleted over the last four decades (Figure 2). Essentially the population has declined from ~5000 nests per year in the 1960s down to less than 10 nests per year in the 2000s (Chan and Liew 1996; Fisheries Department of Terengganu unpublished data). Although Chan et al. 1988 and Chan and Liew 1996 state that the largest decline coincided with the rapid expansion of fisheries in Malaysia; the declining nesting population was evident during the 1960s.Indeed Hendrickson (see Limpus 1993 for details) strongly advocated for the hatchery system because there was zero hatchling production during the late 1950s (because of near 100% egg harvest). Hence, they did not protect soon enough for the population to be able to cope with fisheries and other pressures in the 1970s and 1980s.

2.2. Seasonality of leatherback turtle nesting

The leatherback turtle nesting season runs from approximately June to September (Chan and Liew 1989).

2.3. Genetic studies on nesting populations of leatherback turtles

Genetic studies have indicated that the Malaysian nesting population is genetically distinct from the Solomon Islands and South African rookeries (Dutton et al. 1999). It is yet to be determined whether genetic similarities exist between the Malaysian rookeries and rookeries in Sumatra (Indonesia) or the Andman and Nicobar Islands/Western Thailand rookeries.

2.4. Biological parameters

Category of data	Average	Range	Sample size	References
Size of nesting females				
Number of eggs per clutch	82.3	-	627	Ref 1,2 & 3
Clutches per season	5.5	1-10	-	Ref 1,3
Re-nesting interval (days)	9 days	0-49	-	Ref 1, 2
Number of years between breeding seasons (years)	1.95	-	-	Ref 2
Size of eggs (cm)				
Size of hatchlings (cm)	5.73	-	-	Ref 4

1 = Balasingam and Tho Yow Pong (1972), 2 = Chua and Furtado (1988), 3 = Balasingham 1967, 4 = Chan and Liew (1989)

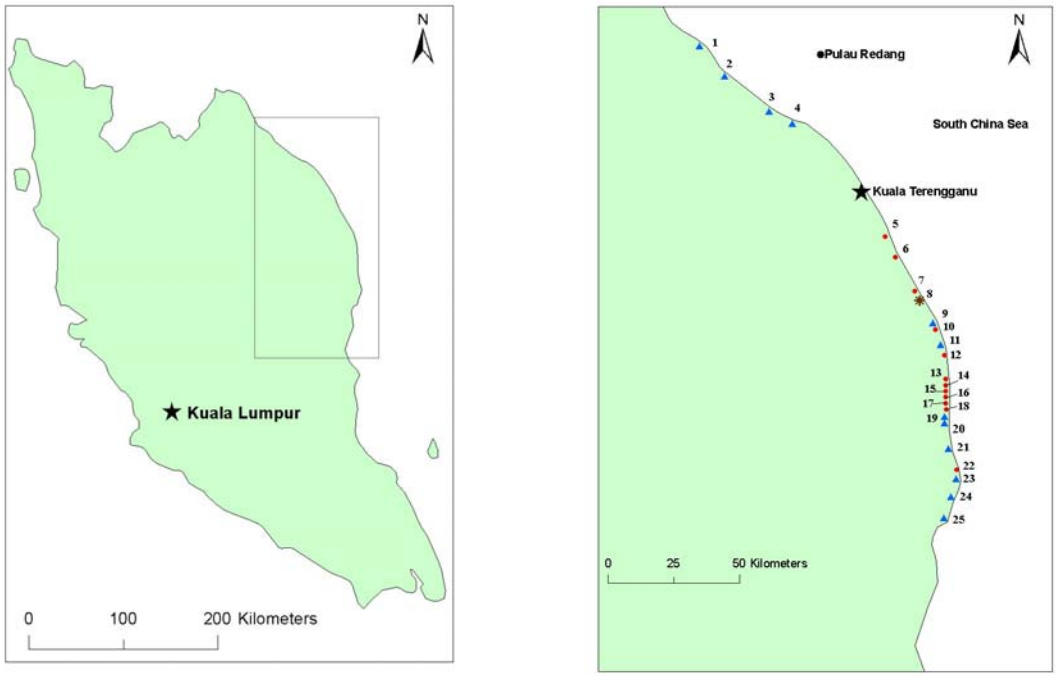

Figure 1. (a) Peninsula Malaysia and (b) the State of Terenggannu – showing the locations of leatherback turtle nesting beaches. Blue triangles represent minor nesting areas, red dots medium nesting beaches and * represents the important site of Rantau Abang. 1 = Telaga Papan, 2 = Megabang Sekeping, 3 = Kuala Bharu, 4 = Tanjung Kanan, 5 = Pulau Kerengga, 6 = Rantau Merchang, 7 = Jambu Bongkok, 8 = Rantau Abang, 9 = Kuala Abang, 10, Rhu Tiga, 11 = Kuala Dungun, 12 = Tanjung Sura, 13 = Kuala Paka, 14 = Kebun Pakar, 15 = Rhu Kudung, 16 = Tanjung Batu, 17 = Chakar Hutan, 18 = Ma Daerah, 19 = Penarik, 20 = Pantai Kerteh, 21 = Pantai Kemasik, 22 = Kijal, 23 = Senanjang, 24 = Tanjung Mengkuang, 25 = Geliga

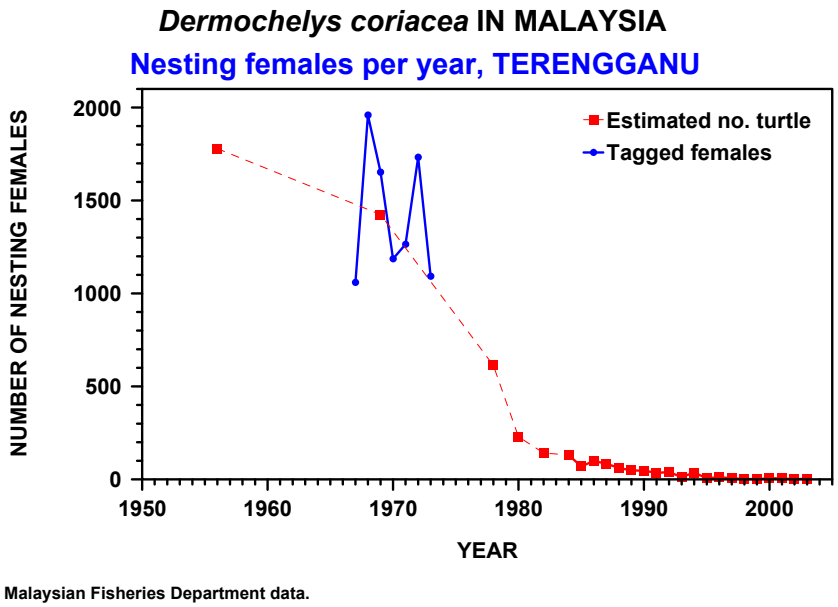

Figure 2. Decline of the nesting population of leatherback turtles in Peninsula Malaysis

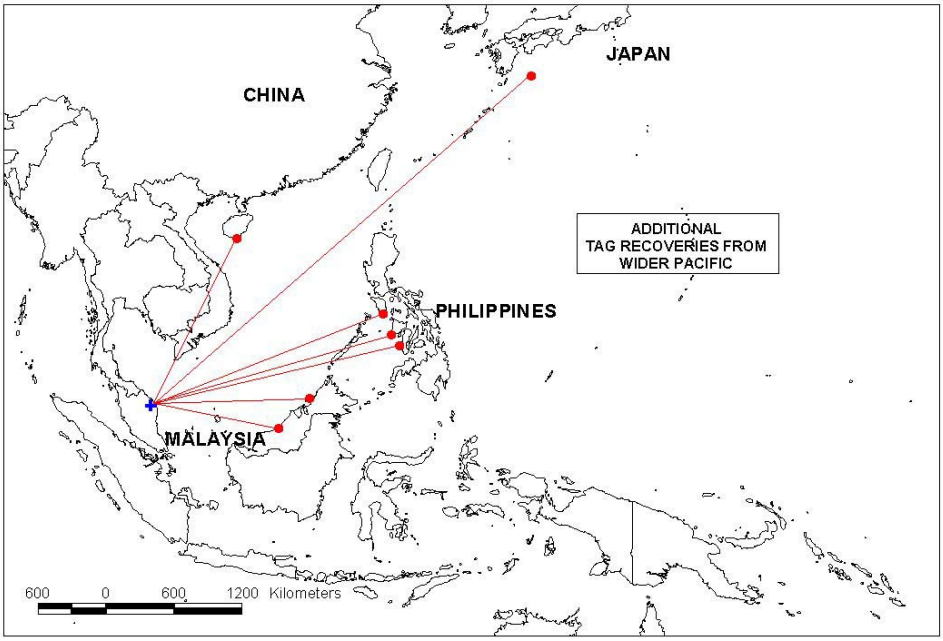

Figure 3. Locations of leatherback turtle tag recoveries of females originally caught and tagged while nesting in Peninsula Malaysia

2.5. Pivotal temperature studies

Beach temperatures have been reported by Chan and Liew (1995) and Kamurruddin Ibrahim unpublished data. Chan and Liew (1995) found report a pivotal temperature between 29.2°C and 30.4°C and that at 30.4°C 100% females were produced. Both Chan and Liew (1995) and unpublished data from Kamurruddin Ibrahim report the mean sand temperatures along the Rantau Abang nesting beach, and in the hatcheries during the breeding season is nearly always above 30.5°C at nest depth (40 to 80 cm)

2.6 Migration records of nesting leatherback turtles

Turtles tagged on beaches in Peninsula Malaysia have been caught or stranded in China, Indonesia, Japan, Philippines and Borneo Malaysia. (Figure 3. also Leong and Siow (1980 and Kamarruddin Ibrahim Pers. Comm.)

2.6. Protection of nesting beaches (e.g. National Parks)
In 1988 the Terengganu State Government established the development of the Rantau Abang Turtle Sanctuary. The sanctuary covered 14km of nesting beaches, including the areas that received the highest density of nesting. Turtle watching guidelines were also implemented, although, they were largely ineffective due to a lack of enforcement.

2.7. Use of hatcheries to protect marine turtle nests
In 1961 the use of hatcheries was the first conservation measure to be used to protect leatherback turtle nests in Malaysia (Wyatt-Smith 1960). The use of hatcheries to protect leatherback turtle nests (and those of other species) still continues to be the main conservation measure employed on mainland nesting beaches (Chan and Liew 1996; Kamarruddin Ibrahim pers. Comm.)

2.8. Threats to nesting leatherbacks turtles
The threats to the leatherback turtle population in Malaysia have been well documented (see Chan and Liew 1996 for details). Essentially, fisheries bycatch (both in Malaysian and International waters) and commercial egg collection were the main threatening process operating over the last four decades (especially in the 1950s, 1960s, 1970s and 1980s). Other listed threats are ineffective hatchery management, tourism related impacts and more recently coastal development by the petroleum industry (Chan et al. 1988; Chan and Liew 1996 and Kamarruddin Ibrahim Pers. Comm.).

2.9. Other biological studies conducted on leatherback turtles
Internesting movements (Chan et al. 1991)
Hatchling biology and behaviour (Liew and Chan 1995; Malaverni 1989)
Incubation and hatchling emergence studies (Chan 1985; 1989; Chan et al. 1985)
Eggshell structure and function (Chan and Solomon 1989)

3. Foraging populations

3.1. Details on any leatherback turtle foraging area census or tagging results
No tagging studies have been conducted on foraging populations of leatherback turtles in Malaysia

3.2. Seasonality of foraging leatherback turtles in coastal or offshore waters
Unknown if there is a main time for leatherback turtle sightings

3.3. Approximate size range of leatherback turtles
Unknown

3.4. Information on diet of leatherback turtles
Unknown

3.6. Threats to foraging populations of leatherback turtles

Threats at this site/area	**Current occurrence**			**Historical occurrence**			
	Low	**Med**	**High**	**Unknown**	**Low**	**Med**	**High**
Directed take of leatherback turtles at sea	X[1]				X[1]		
Trawl fisheries			X[2]				X[2]
Gillnet fisheries		X[2]					X[2]
Longline fisheries		X[3]				X[3]	

1. possibly in Indonesia (Kie Islands – Suarez and Starbird 1996)

2. Chan et al. (1988)
3. Yatsu et al. (1991) and Wetherall et al. (1993).

3.7. Fisheries bycatch of leatherback turtles and the fisheries involved

See Chan et al. (1988) for details of incidental catch by Malaysian Fisheries. However, outside of Malaysian waters leatherback turtles are often caught as bycatch by fisheries operating in the Pacific high seas (Yatsu et al. 1991; Wetherall et al. 1993).

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

Aside from the legislative changes several organizations (e.g. WWF, SEATRU, SEAFDEC, Malaysian Society of Marine Sciences and Department of Fisheries Malaysia) have implemented a variety of educational and awareness raising activities such as the production of leaflets, school materials and turtle conservation posters.

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Status of Leatherback turtles in Maldives

By Hussein Zahir

1. The legal protection status for leatherback turtles

1.1. Overview

The Moratoriums of 1995-2005 and 2006-2016

All turtle species, but not their eggs, have been legally protected under a presidential decree for 10 years since 1995. July 2005 ended the 10 year ban on capture, killing and handling of what is reported to be the five species of marine turtles seen in the Maldivian waters: green turtle, hawksbill turtle, olive ridley turtle, loggerhead turtle and leatherback turtle. In fact, however, most likely only green turtles and hawksbills nest in the Maldives.

Deciding on a new Moratorium.

During the moratorium of 1995-2005, information on egg harvesting was reported to Ministry of Fisheries Agriculture and Marine Resources (MFAMR), thus providing the principle source of information about the extent and pattern of turtle nesting in the islands. In 2005, levels of egg harvest were reviewed by MRC (a research arm of MFARM that provides technical information and recommendations for marine resource management and policy decisions.) MRC assessed the impact of the moratorium and recommended that MFAMR strengthen the existing conservation efforts. Based on the relative intensity of egg harvesting recorded at various sites, field trips were made to some of the most important beaches. Two islands in the south of Maldives; Gaadhoo in Laamu atoll and Gan in south Huvadhoo atoll were found to be exclusively green turtle nesting beaches with a nesting population of approximately 60 and 80 females (based on monthly egg harvesting from 1995-2005). Based on this information, recommendations were made to MFAMR to enhance conservation effort.

After the reviewing the moratorium, the management decision was to extend the moratorium for another 10 years (2006-2016) with the following enhancement of conservation measures:

- No nationwide ban on egg harvesting, but eleven islands to be designated as "No Egg Harvesting" islands for the 10 year period.
- Initially, egg harvest will be allowed at Gaadhoo and Gan Islands; but starting in 2007 these two islands will become "No Egg Harvesting" islands

1.2. Legislation protecting leatherback turtles

No legislation is specific to leatherback turtles, but there is legislation in general for the protection of marine turtles

1. Bill no. 24/87 prohibiting catching of hawksbill turtles of under two feet in carapace length and all the other species under 2 ½ in carapace length.
2. Bill no 31/79 prohibits the export of unprocessed product of hawksbill or hawksbills.
3. Presidential decree for the 10 years from 1995-2005 banned the catching, killing or handling of marine turtles (but not the collection of turtle eggs).
4. New 10 year moratorium (2006-2016) recently adopted that will provide partial protection for turtle eggs as described in section 1.1.

1.3. Management agencies responsible for marine turtle conservation

Operational level	**Ministry of Fisheries Agriculture and Marine Resources**
National level	Marine Research Centre
State level	-
Local level	-

2. Nesting populations

2.1. Overview

Historical evidence

There is very little evidence that leatherbacks ever nested in the Maldives. Gardiner in 1906 reported a gravid female from Addu atoll. Deraniyagala in 1956 (in Frazier and Salas, 1984) gave a description of a turtle resembling a leatherback. There is not a single report of nesting of this species in the Maldives. Historically there are five species of marine turtles reported from the Maldives: green turtle, hawksbill turtle, olive ridley turtle, loggerhead turtle and leatherback turtle. But this is historical information only. There have been no confirmed reports of nesting except by greens and hawksbills.

Current situation

There is no evidence that leatherbacks currently nest in the Maldives.

Summary of surveys conducted & what beaches have been surveyed

There is no systematic monitoring program for nesting marine turtles in the Maldives. But there is a reporting and data collection process implemented by the Ministry of Fisheries Agriculture and Marine Resources (MFAMR) which started as an effort to estimate the number of turtles caught and eggs harvested, and which has been used to evaluate the impact of the Moratorium of 1995-2006 which banned the harvest of all species of turtles (but did not ban egg harvest). During the moratorium information of egg harvesting was reported to MFAMR and is the principle source of extent and pattern of nesting in the islands. Review of the information on egg harvesting was carried out in 2005 by MRC, a research arm of MFARM to provide technical information and recommendations for marine resource management and policy decisions.

2. Foraging populations

Much of the information provided in this section derives from the accidental capture of a single leatherback in an exploratory fishing survey that was carried out in 1988 (Zahir 2000).
Size: Curved carapace length: 120 cm
Date of Capture: 27 November 1988
Location of capture: 5° 34´ N; 74° 5´ E
Fate of turtle: Captured in experimental gill net (live & entangled) and was freed and released.

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

There have been no tagging studies conducted on leatherback turtles foraging in the Maldives

2.2. Seasonality of foraging leatherback turtles in coastal or offshore waters

Single known entanglement occurred in November 1988 (Zahir 1988).

3.3. Approximate size range of leatherback turtles

Single known entangled leatherback measured 120 cm curved carapace length (Zahir 1988).

3.4. Information on diet of leatherback turtles

No information reported

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

No other biological studies have been conducted on foraging populations of leatherback turtles

3.6. Threats to foraging populations of leatherback turtles

One individual leatherback was caught during an off shore fishing experimental fishing project in 1988 entangled in a gill net at latitude 5^{o} 34'N and 74^{o} 5'E (Zahir 2000). Sightings of olive ridley turtles have been reported in several occasions both within atolls and off shore. Most of these are found entangled in ghost nets.

Drift gill netting is illegal under fisheries law which is specific to the economic fishing zone (75-200 miles offshore). However several types of set gill nets are used by the local fishermen in near shore fisheries such as shark fishing and reef fishing. This is not widely practiced.

3.7. Fisheries bycatch of leatherback turtles and the fisheries involved
Not applicable

3.8. Other activities being undertaken to improve the conservation of leatherback turtle foraging populations
None

4. Conservation Actions

Areas of change	**Summary including report references**
Legislation changes	Legislations not specific of the leatherbacks but all turtle species
Awareness raising programmes	

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Status of leatherback turtles in Mauritius

By Mark Hamann and Mangar Vijay

1. The legal protection status for leatherback turtles

1.1. Overview

The Fisheries and Marine Resources Act 1988 makes provisions for the protection of marine turtles and their eggs. Under Para 10 (1) c) of Section IV the sale and possession is also banned. The Fisheries Protection Service of the Ministry of Fisheries and the National Coast Guard of the Mauritius are responsible for enforcement.

2. Nesting populations

2.1. Overview

There are no records of leatherback turtle nesting in Mauritius (Mangar Vijay pers. Comm.).

3. Foraging populations

There are no records of leatherback turtle foraging in Mauritius waters (Mangar Vijay pers. Comm.).

Status of leatherback turtles in Mozambique

By Cristina Maria Madureira Louro

1. The legal protection status for leatherback turtles

1.1 Overview

All five species of marine turtles (*Caretta caretta*, *Chelonia mydas*, *Dermochelys coriacea*, *Eretmochelys imbricata* and *Lepidochelys olivacea*) are protected under its environmental legislation. However it is poorly implemented.

The environmental legislation under which these species are protected are:

1. Forestry and Wildlife Regulation. Decree nº12/2002, of 6th of June
   Article 43. Number 5. Totally protects all five species of marine turtles
2. Sports and Recreational Fishing. Decree nº51/99, of 31st of August
   Article 14. Number 1. Totally forbids the fishing of all five species of marine turtles
3. Maritime Fishery General Regulation. Decree nº43/2003,
   Article 110. Number 1. States the obligatory use of the Turtle Excluder Devices (TEDs) in the trawling and motor fisheries.

1.2 Management agencies responsible for marine turtle conservation in Mozambique?

Name of agency: National Directorate of Forestry and Wildlife – Agriculture Ministry (MAG)
Development Centre for Sustainable Development of the Coastal Zones – Ministry for the Coordination of Environmental Affairs (MICOA)
National Directorate for Conservation Areas – Tourism Ministry (MITUR)
However, it is important to state that these government agencies have the support of several local non-governmental organizations such as the Grupo de Trabalho de Tartarugas Marinhas de Moçambique (GTT), Fórum para a Natureza em Perigo (FNP), Centro Terra Viva (CTV) as well as international NGOs, such as the World Wildlife Fund (WWF). To mention that several local associations (e.g. Associação dos Naturais e Amigos da Ilha da Inhca – ANAII) as well as private tourism projects do support on the conservation and research of marine turtles along the Mozambican coastline(e.g. Ponta Malongane Marine Turtle Conservation Project).

Type of agency: Government Organizations
Non- Government Organizations

2. Nesting populations

2.1) Overview

Leatherback turtles nest at Bazaruto Archipelago and Ponta Malongane (Figure 1). For details of the nesting census surveys see Table 1.

Figure 1. Location of leatherback turtle nesting beaches in Mozambique

Table 1. Number of nesting leatherback turtles recorded in Mozambique rookeries

Rookery	Latitude	Longitude	Year[1]	Number	Data type
Bazaruto Archipelago	21°43'S	35°28'E	1997	132	Eggs
			1999	180	Eggs
			2000	690	Eggs
			2001	150	Eggs
			2003	75	Eggs
			2004	115	Eggs
Ponta Malongane			1994	0	Females
			1995	5	Females
			1996	14	Females
			1997	6	Females
			1998	16	Females
			1999	12	Females
			2000	14	Females
			2001	6	Females
			2002	19	Females
			2003	8	Females
			2004	14	Females

1. Year given is the first year of the survey; i.e. 1997 refers to the 1997- 1998 season

2.2) Seasonality of leatherback turtle nesting

Nesting occurs regularly from September to March each year. In the Bazaruto Archipelago National Park and the Maputo Special Reserve, data has been collected and female leatherback turtles nest from October until February, the months of November, December and January is when there is a high nesting activity.

2.3 Genetic studies on nesting populations of leatherback turtles
No genetic studies have been conducted on nesting populations of leatherback turtles in Mozambique.

2.4) Biological parameters
See Table 2.

Table 2. Summary of biological data on leatherback turtles nesting in Mozambique

Category of data	Average & Standard deviation	Range	Sample size
Size of nesting females*	Length (cm): 157.5 ± 80.4 Width (mm): 113.3 ± 64.1	Length (cm): 145.5 – 175.0 Width (mm): 100.0 – 125.0	15
Number of eggs per clutch	134.2 ± 51.8	62 - 199	10
Clutches per season*	Bazaruto Archipelago 2.00 ± 2.00 Ponta Malongane 2.25 ± 3.86	Bazaruto Arhipelago 0 - 5 Ponta Malongane 0 - 10	11
Re-nesting interval (days)	No data available		
Number of years between breeding seasons (years)	No data available		
Size of eggs (cm)	No data available		
Size of hatchlings (cm)	No data available		
Incubation success (%)	No data available		

* Data compiled from; Kyle & Lombard (1996), Lombard (1997), Louro (2005), Magane & João (2002) and Videira & Louro (2005).

2.5) Pivotal temperature studies
There has been a study on pivotal temperatures, but unfortunately, we do not have access to that information. The study was made by a foreigner student - Carla Ng in 1999/2000. The project was a collaboration, between the Universidade Eduardo Mondlane and the Faculdade de Ciencias de Lisboa, Portugal. The research was made along Inhaca Island's east coast.

2.6) Migration records
Since 1994 the Ponta Malongane Project has been tagging leatherback turtles with the support of the Kwazulu Natal Wildlife (KZN). However, we do not have all the information regarding migration records, these details may be acquired from them. The methods used are tag returns/recapture. The Mozambique Marine Turtle Tagging Programme has recaptured turtles from the Malongane Project, however the recaptures have only been from loggerheads. The programme has not recaptured any leatherback turtles yet. Please see details for season of 1996-1997 of 2 within season recaptured leatherbacks at Ponta Malongane:
FF401 – 5.12.1996 – Nest – 9.8 Km north of Ponta Malongane
FF401 – 15.12.1996 – Nest – 28.9 Km north of Ponta Malongane
FF401 – 25.12.1996 – Nest – 21.4 Km north of Ponta Malongane
FF501 – 1.12.1996 – Nest – 9.3 Km north of Ponta Malongane
FF501 – 13.12.1996 – Nest – 5.3 Km north of Ponta Malongane
FF501 – 23.12.1996 – Nest – 2.7 Km north of Ponta Malongane

2.7) Protection of nesting beaches (e.g. National Parks)
Three nesting beaches in Mozambique are within national parks -
- The Maputo Special Reserve – Maputo Province (Southern Mozambique)
- The Bazaruto Archipelago National Park – Inhambane Province (Southern Mozambique)
- The Quirimbas Archipelago National Park – Cabo Delgado Province (Northern Mozambique)

2.8) Use of hatcheries to protect marine turtle nests
There was once a hatchery in Bazaruto Archipelago National Park, but it is not functioning at the present moment.

2.9) Threats to nesting marine turtles

A summary of the threats to nesting leatherback turtles in Mozambique is presented in Table 3.

Table 3. Summary of the threats to nesting leatherback turtles in Mozambique

Threats at this site/area	Current occurrence	Historical occurrence & year of records
Exploitation of nesting females	We don't have reports on the number of turtles killed but Lombard (2005) sums the number of turtles killed at Ponta Malongane (these include also loggerhead turtles), this number being 32 turtles in eleven years. The area of high number of killings being from Madedjanine to Mamoli.	Yes. South of Inhambane province females were slaughtered whenever encountered (Hughes, 1971)
Egg collection	Lombard (2005) affirms the current occurrence of egg collecting. In Bazaruto Archipelago egg collection used to be one of the main causes of disturbance, this having reduced in the last three seasons, due to environmental awareness.	Yes. South of Inhambane province eggs were consumed (Hughes, 1971)
Agricultural/urban/tourism development	Tourism is rising high, especially on the southern coast of Mozambique. However, no data was found.	No data found
Artificial lighting	No data found	No data found
Coastal erosion	Yes. In Bazaruto Archipelago one of the main causes (11.76%) in 10 seasons of monitoring for the destruction of nests has been coastal erosion and the rising of the seawater level (Videira & Louro, 20005).	No data found
Vehicles	Yes. There is no legislation in Mozambique regarding driving on the beach, and this has turned into a very serious problem, due to the high rise of tourism and the weak enforcement by the local authorities. In Ponta Malongane, especially in the Ponta Techobanine region up north there has been a high rise in the driving of vehicles (Lombard, 2005). In Bazaruto Archipelago the main nesting areas are in the Bazaruto Island and these have been affected with a high incidence of vehicle driving belonging to the hotels.	No data was found.
Sand mining	No data found	No data found
Natural threats/predation	Yes. But no data was found	Yes. But no data was found

2.10) Impacts of coastal development and/or sand mining on leatherback turtle nesting.

See table above

2.11) Major existing threats to nesting turtles.

1. Exploitation of nesting females for food
2. Collection of eggs for food
3. Beach driving (vehicles – there is no legislation, and the level of control is very weak)
4. Tourism development (e.g. there is legislation regarding construction of tourism infrastructure, however, the level of implementation and control is very weak, there has been an uncontrolled growth.

2.12) Other biological studies conducted on nesting leatherback turtles

- Bazaruto Archipelago National Park Nesting Programme (Nesting and tagging monitoring);
- Ponta Malongane Marine Turtle Conservation Project (Nesting and tagging monitoring);
- Reserva Especial de Maputo (Nesting and tagging monitoring);
- Projecto Maçaneta (Nesting and tagging monitoring);
- Projecto de Biodiversidade e Turismo de Cabo Delgado (no data found, it needs also to confirm what species are being monitored);

2.13) Activities underway to improve the conservation of nesting populations of marine turtles

- Capacity training courses for community guards and volunteers
- Promotion of monitoring and research activities
- Sensitization and awareness campaigns (e.g. Boas Vindas 2000 Campaign; Precisam-se Vivas Campaign, among others)
- Development of current activities that promote the collaboration of local communities and tourism operators

3. Foraging populations

3.1) Details on any leatherback turtle foraging area census or tagging results

Mozambique Marine Turtle Tagging Programme: 1 turtle has been tagged since 2003/2004 and no tag recoveries.

3.2 & 3.3) Seasonality and size range of leatherback turtles occurring in offshore waters

The leatherback (MO 803) that was caught accidentally in a fishing net at Macaneta, was found in the high peak of the nesting season in December 2003. This turtle (MO 803) measured - CCL =160 cm and CCW= 100 cm.

3.4) Information on the diet of leatherback turtles

No information available

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

No other studies have been conducted on foraging leatherback turtles in Mozambique.

3.6) Threats to foraging populations of leatherback turtles

A summary of the threats to foraging leatherback turtles in Mozambique is presented in Table 4.

3.7) Fisheries bycatch of leatherback turtles and the fisheries involved

A summary of fisheries based threats to leatherback turtles in Mozambique is presented in Table 5.

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

- Approval of the Turtle Excluder Device (TEDs) since January 2005 in the General Regulation of Mitime Fisheries (Article 110. Number 1, Decree 43/2003)
- Sensitization and awareness (e.g. Boas Vindas 2000 Campaign; Precisam-se Vivas Campaign)
- Capacity training courses to community guards and volunteers, tourist and industrial and semi-industrial prawn fisheries operators and
- Development of current activities that promote the collaboration of local communities and tourism operators

Table 4. Summary of the threats to foraging leatherback turtles in Mozambique

Threats at this site/area	**Current occurrence**	**Historical occurrence & year**
Exploitation of live animals at sea	Yes. Mozambique is currently being assaulted by illegal longliners mainly dedicated to shark fining. However, these not only capture sharks but also all the marine biodiversity they find. Some years ago heads of marine turtles were found on the beaches of the Bazaruto Archipelago National Park. Unfortunately we do not have the means to patrol our offshore waters. And currently a new project has been developed called Eyes on the Horizon, this is supported by the Fisheries, the Army and the Tourist Operators whenever strange activities are spotted along the coast.	No data found
Incidental capture in fisheries	Gove et al. (2001) states that 12 marine turtles per trawler per month are caught accidentally in shrimp trawlers, and that this number tends to increase during the high nesting season. And more than 6 leatherbacks were caught alive during the beginning of the shrimp fishing season, the main area being Chami-Chami 2 at Sofala Bank. This data was collected during October 2001.	No data found
Boat strikes	Possibly. But no data found.	Possibly. But no data found.
Plastics (at sea)	Possibly.	No data found
Industrial effluent	No data found	No data found
Inshore oil pollution	No data found	
Natural threats/predation	No data found	No data found

Table 5. Summary of the fisheries based threats to leatherback turtles in Mozambique

Type of fishery	**Season of operation**	**Approx number of boats/operators**	**Impact –** low, medium or high
Prawn trawling fisheries *			
Industrial	Winter (March – September)	52 (93% Sofala Bank)	1305 – 3672 marine turtles (mixed species) per year caught accidentally (Winter and Summer Seasons)
Semi-Industrial	Winter (March – September)	73 (67% Sofala Bank)	627 – 1764 marine turtles (mixed species) per year caught accidentally (Winter and Summer Seasons)

* Gove et al. (2001)

4. Concluding remarks

Regarding leatherback turtle biology and management a lot needs still needs to be done. And the same applies to all the remaining four species of marine turtles that occur and nest in our coastline. This can only be achieved if all the implementing research and management institutions work together.

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Status of leatherback turtles in Myanmar

By Mark Hamann and Jen Dryden

No report on the leatherback turtle was received from Myanmar. However, leatherback turtles are listed as historically being a rare nesting species on the island and mainland beaches known as the "turtle banks" (Thorbjarnarson et al. 2000). No recent records of leatherback turtle nesting exist (Thorbjarnarson et al. 2000 and U. Cho Hla Aung 2002). In the past turtle eggs were harvested from beaches in the turtle banks and sold - 1.5 million olive ridley turtle eggs and 1.6 million green turtle eggs harvested annually (Maxwell, 1911). No data is available for the sale of leatherback turtle eggs.

Legal protection status for leatherback turtles
Taken from the Department of Fisheries information for the Myanmar National Report http://www.ioseaturtles.org/).

- Sea turtle conservation programme started in Myanmar since 1905 under Burma Fisheries Act (III – 1905). Protection for the turtle hatching areas and turtle included and also trespassed on those areas without official consent was prohibited.
- In 1990, Myanmar Marine Fisheries Law (DoF); no person shall search for and collect any marine products without a License (Section 40). In Myanmar Marine Fisheries Law (1990), mentioned in Chapter 1, Section (2), Subsection (r) there are "Marine Products mean fishes obtained from the sea, aquatic organisms, excrete, scales, bones, skins, plants, non-living. The expression also includes Marine Turtle and eggs,
- In 1993, the Department of Fisheries declared the Notification No. II/93 for "Sea Turtle Conservation".
- New regulations issued in 2005 by the Ministry of Fisheries prohibit the eating of turtle meat and eggs and require that turtles caught as bycatch in fishing nets be released, and trawlers must be equipped with devices to minimize the risk of turtle capture.

Education and awareness programs
Taken from the Department of Fisheries information for the Myanmar National Report http://www.ioseaturtles.org/).

- DoF has distributed pamphlets to fishermen on the fishing areas, fishing gears and fishing season prohibited by notification and fishery laws.
- In Myanmar turtle conservation and management course was conducted for the first time from (21-12-2001) to (31-12-2001) at Gayet Gyi Conservation Station with the participation of 17 trainees.
- Also in the Inspector Course No. 6/2003 conducted by DoF, Myanmar at Institute of Fishing Technology (IFT) in Yangon sea turtle conservation and management was introduced.
- In Ayeyarwady Division, District and Township Officers and Staff of DoF held workshop on sea turtles to draw public awareness on 7 October 2004.
- Similarly during the fish replenishing ceremony on 7.10.2004 DoF also held talks about Sea Turtle Conservation for the Armed Forces, members of the Union Solidarity and Development Association and students in Pathein township, Ayeyarwady Division.
- On (30.12.2004), DoF has talks about Sea Turtle Conservation and Management for 37 number of teachers and students from Pathein University in Ayeyarwady Yangon University.

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Status of leatherback turtles in Oman

By Nicolas Pilcher

1. Introduction

Oman is the second largest country in the Arabian Peninsula, bounded in the north-east by the Gulf of Oman and Straits of Hormuz opposite Iran, in the south-east by the Arabian Sea (Indian Ocean), in the south-west by the Republic of Yemen and north-west by Saudi Arabia and the United Arab Emirates. An enclave, the Musandam Peninsula, is surrounded by the United Arab Emirates (Hunter, 1991). Oman possesses about 1,800 km of coastline bordering on the Indian Ocean. The legal system subscribes to the Islamic law, Sharia, which is both state and religious, and encourages great respect for the environment, embodied with the need for the traditional Islamic respect for nature. Traditional forms of protected area or range reserves may have origins over 2,000 years ago in the pre-Islamic period and still occur to some extent in Oman.

Seawater temperature is an important factor controlling the distribution of marine flora and fauna in the Northern Arabian Sea and Gulf of Oman. There are differences in the thermal environment between the Gulf of Oman and the Northern Arabian Sea during the summer southwest monsoon season, and this is reflected in the nature and distribution of coral communities in along the coast of Oman. During this period the Gulf of Oman is highly stratified with warm water (28-32ºC) in upper layer separated from underlying cooler water (24-25ºC) by a shallow, sharp thermocline. Wind is probably the main factor to cause the depth of the thermocline to rise and fall and this results in a highly fluctuating temperature regime with changes at 10m of up to 8ºC in 2 hours (Coles, 1997). In contrast, upwelling in the northern Arabian Sea results in low (approximately 19ºC) seawater temperatures in throughout coastal waters during summer months that moderates annual maximum temperatures.

2. The legal protection status for leatherback turtles

2.1 Overview

Existing legislation for wildlife and nature conservation is largely based on the following: Decree No. 26/79 of 15 May 1979 providing authority to establish national parks and nature reserves. The Decree calls for the establishment of a technical and consultative committee of members from specific ministries to prepare and study draft schemes for establishing protected areas. It also specifies the kinds of activities to be regulated in such areas. Local authority regulations have been in force for some time and three sites have been granted protected area status. Other pieces of legislation include Royal Decree No. 53, 1981 entitled the "Law of Sea Fishing and the Preservation of Marine Biological Wealth", which regulates fishing. The Royal Decree was followed by Ministerial Decree No. 3/82, 1982 which includes executive regulations for law of marine fishing and conservation of aquatic resources. All capture of turtles is prohibited during the nesting season, as determined by the appropriate authority (the Ministry of Rural Municipalities, Environment and Water Resources). Specific areas are protected by law and collection of eggs within them is prohibited within a distance of the coast to be determined by the MRMEWR. Hunting of turtles on their way to lay eggs on the islands and coasts is prohibited during periods which are determined by the MRMEWR.

In addition to specific protected area legislation is a whole series of planning controls which have evolved to include environmental protection. There are obligations of building developers to obtain a certificate of No Environmental Objection (NEO) from the Ministry of Rural Municipalities, Environment and Water Resources, which is applicable to all areas of Oman. Important nature conservation areas can thus be protected by declining to grant NEO certificates (Munton 1991). In addition, the Ministry is working on the principle of undertaking ecosystem conservation in wider areas extending beyond reserve boundaries: these are most finely tuned in the Development Plan for the Southern Region, where all areas are classified according to the degree of planning control in operation or category of use, and legislated through the authority of the PCDESR which was set up under Royal Decree No. 48 of 1984. Two classes of nature conservation area have been approved in 1991: reserve zone 1 and reserve zone 2 (Munton 1991).

At the international level, the Sultanate of Oman has entered a number of cooperative agreements and legal obligations. Oman is party to the Convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention), which it accepted on 6 October 1981. In 1979 the Sultanate of Oman ratified the Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution (Kuwait Action Plan). Oman actively participates in meetings concerned with additional protocols to the Kuwait Regional Agreement, and is a signatory to the IOSEA Marine Turtle MoU.

2.2 Management agencies responsible for marine turtle conservation

In 1991 responsibility for nature conservation was passed from the Dewan (Royal Court) to the (now named) Ministry of Rural Municipalities, Environment and Water Resources. With this change, the emphasis of ideas and activities shifted from the conservation of high profile species through specification of protected areas to the development of a national conservation strategy (NCS), with its emphasis on ecosystem conservation. As a result of this evolution of ideas over the past 20 years, the Sultanate now has a variety of strategies and plans for conserving natural resources and a number of administrative measures that can be taken to conserve and ensure the sustainable use of resources. The NCS is broad, and if effectively implemented, will change both attitude towards nature and natural resources and action towards such resources by government agencies (Munton 1991).

The Ministry now controls the work of 43 municipalities, 14 municipal sections and 22 cleaning units in remote areas of the Sultanate. The Ministry is responsible for the continued monitoring and research of marine turtles in Oman. The turtle breeding beaches at Ras al-Hadd / Ras al Jinz are protected by Royal Decree as a nature reserve, to which entry is controlled by the Ministry. There are plans to extend the protection of turtles in other areas and to further train Omanis as rangers to monitor the beaches where they lay their eggs. Since the turtles are proving to be a major eco-tourist attraction, the Ministry has introduced a code of conduct for visitors and imposed a limit on their numbers. The Ministry has also has measures in place to protect its flora and fauna, and the newly-proposed National Biodiversity Strategy and Action Plan (NBSAP) will ensure a coordinated and systematic approach by all concerned.

3. Nesting populations

There are no historical or contemporary accounts of leatherback turtles nesting in Oman.

4. Foraging populations

4.1 Overview

Both SOMER (2000) and Ross & Barwani (1982) suggest leatherback turtles are occasionally seen in coastal waters, but these do not occur on a regular basis and no contemporary records exist of any sightings. While Oman has extremely well-developed marine turtle conservation projects at Ras Al Hadd and at Masirah Island, there are no research projects aimed at foraging turtles, and none at leatherback turtles in coastal waters. Similarly, there are no conservation projects aimed specifically at the leatherback turtle, although all marine turtles protected by law in the Sultanate.

4.2 Threats to leatherback turtles

Fishing is likely a significant threat to leatherback turtles in Oman, as they may be entangled/drowned in long line fisheries. Fishermen operate from bases and landing sites spread along the mainland coastline down to Salalah and from Masirah Island. While nesting turtles have received great attention in the Sultanate, foraging turtles have not been so high on the list. For leatherback and other turtles to be completely protected there is a need for in-water research and conservation activities to complement the nesting beach protection and research work. The Sultanate also straddles one of the world's major shipping routes, with over 20,000 ships passing through the Straits of Hormuz annually. Ships are known to dump their wastes and dirty ballast water in open waters but still close to shore, and dirty ballast waters result in the formation of tar balls which have been found along the coastline of the Arabian Sea and Indian Ocean proper.

4.3 Protection of foraging areas

Oman has a strong commitment to a coastal zone management program, which has been developed with IUCN, that includes the identification, declaration and management of MPAs. Oman is a particularly successful example of coastal zone management planning in the Arabian Seas. The government's commitment to coastal zone management has resulted in significant contributions to conservation of coastal and marine environments.

There are five coastal protected areas, three of which are MPAs and cover a range of environments, species, objectives and management issues. These vary from the remote Daymaniyat Islands where there are minimal resource use conflicts and globally significant habitats for hawksbill turtles and seabirds to the Qurum mangroves that lie in the heart of a major residential area (Price and Humphrey 1993). Other factors also contributing to marine conservation include traditional fishing controls, fisheries legislation and strict controls over land developments. The following MPAs have been identified:

1. Daymaniyat Islands National Nature Reserve
2. Khawr Salalah BS Managed Nature Reserve
3. Quru Managed Nature Reserve
4. Ra's al Hadd (Turtle Reserve) Managed Nature Reserve
5. Ra's al Jumayz National Nature Reserve

In addition, the Barr Al Hikman and Masirah Island area is important for wetland birds, turtles, coral reefs and others, and is currently being proposed as an MPA. The policy of promoting sustainable utilization of these types of areas, in accordance with Oman's policy of controlled domestic tourism, is one the major objectives of the MRMEWR.

4.4. Gaps in capacity and requirements for improved conservation

Of the potential administrative and management constraints in the country, there is still a need to strengthen the activities of the Ministry of Rural Municipalities, Environment and Water Resources with regard to management of turtle populations and analysis if long-term data sets.

There is still a significant lack of on-the-ground monitoring and enforcement and a need for a strong educational component in the NCS to explain the basis of sustainable resource conservation. For the NCS to be effective, funds need to be devoted both to an active educational programme and also to on-the-ground monitoring of natural resources and enforcement of their proper use. It has been indicated that such monitoring should take place in nature conservation areas where the natural resources has been identified as being of particular importance and outside such areas where particular ecosystems have to be conserved because of their value or sensitivity. At present, although there are many plans, provisions, legal and administrative measures available, there is a lack of application on the ground (Munton 1991).

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