

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 interesting 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 Peninsular Malaysia or Sabah and Sarawak nesting of leatherback turtles has only occurred in significant numbers along the beaches of eastern Peninsular 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in the 1960s down to less than 10 nests per year in the 2000s (Chan and Liew 1996; Fisheries Department of Terengganu unpublished data).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 approx. 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 = Balasingam 1967, 4 = Chan and Liew (1989)

2.5. Pivotal temperature studies

Beach temperatures have been reported by Chan and Liew (1995) and Kamurruddin Ibrahim unpublished data. Chan and Liew (1995) 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 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)

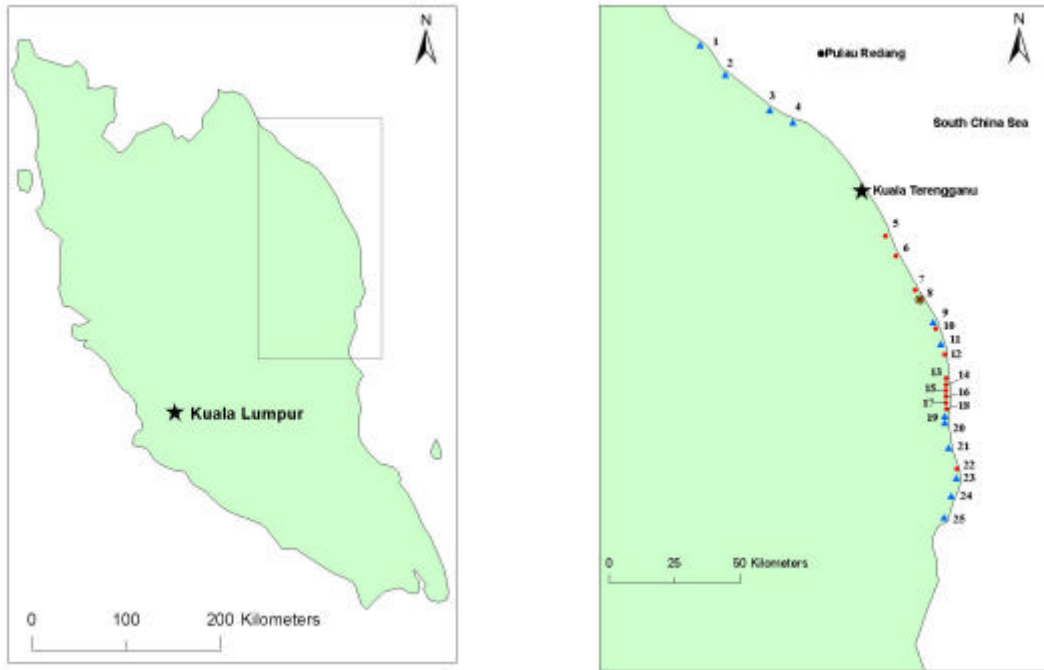
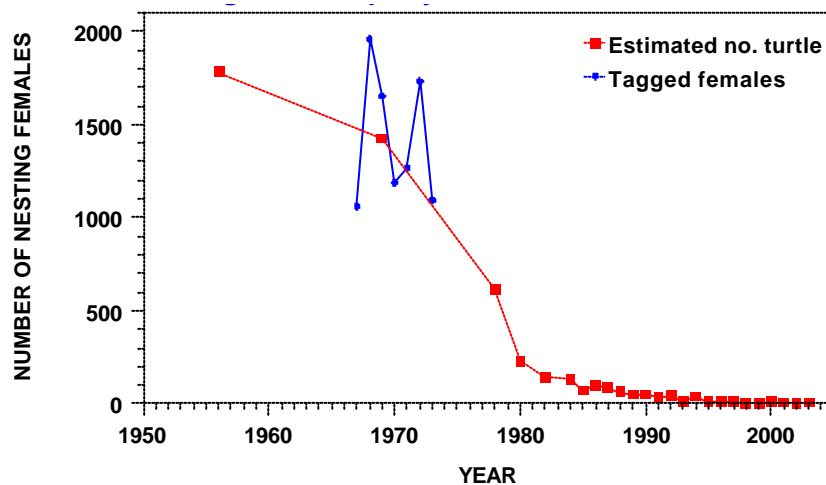


Figure 1. (a) Peninsular Malaysia and (b) the State of Terengganu – showing the locations of leatherback turtle nesting beaches. Blue triangles represent minor nesting areas, red dots medium nesting beaches and * represents the important site of Rantau Abang. 1 = Telaga Papan, 2 = Megabang Sekeping, 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



Malaysian Fisheries Department data.

Figure 2. Decline of the nesting population of leatherback turtles in Peninsular Malaysia

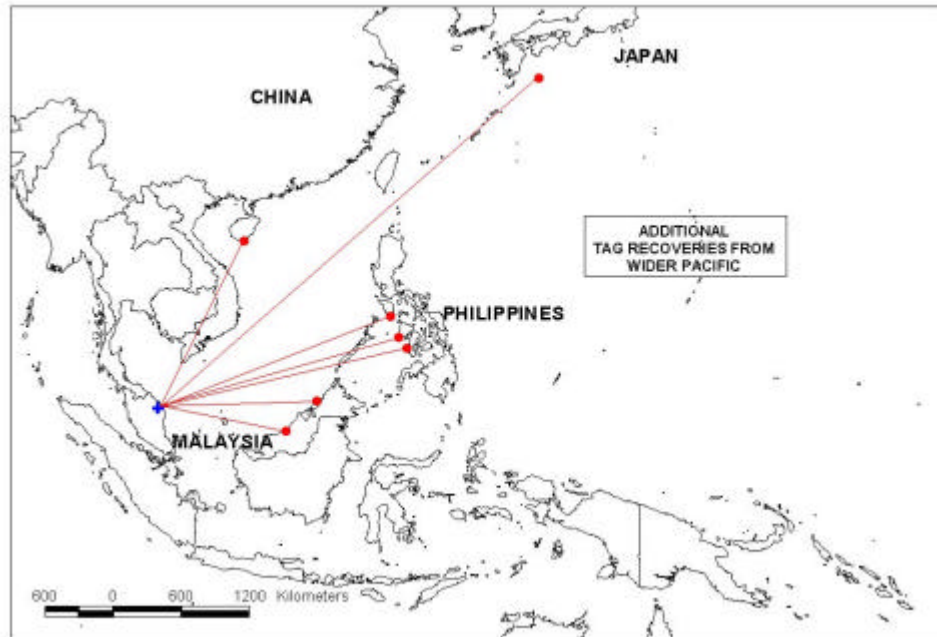


Figure 3. Locations of leatherback turtle tag recoveries of females originally caught and tagged while nesting in Peninsular Malaysia

2.6 Migration records of nesting leatherback turtles

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 also Leong and Siow (1980 and Kamarruddin Ibrahim unpublished data)

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

Interesting 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.

4. References

- Balasingham E (1967) The ecology and conservation of the leathery turtle, *Dermochelys coreacea* (Linn.) in central Trengganu, Malaysia. In proceedings of the 11th Pacific Sciences Congress, Tokyo.
- Balasingham E, Pong TY (1972) Preliminary observation on nesting returns of the leathery turtle (*Dermochelys coriacea* Linn.) in central Trengganu, Malaysia. *Malayan Nature Journal* **25**, 6-9.
- Chan EH (1985) Twin embryos in an unhatched egg of *Dermochelys coriacea*. *Marine Turtle Newsletter* **32**, 2-3.
- Chan EH (1989) White spot development, incubation and hatchling success of leatherback turtle (*Dermochelys coriacea*) eggs from Rantau Abang, Malaysia. *Copeia* **1989**, 42-47.
- Chan EH, Liew HC (1989a) The leatherback turtle: A Malaysian Heritage. Tropical Press, Kuala Lumpur.
- Chan EH, Liew HC (1989b) The offshore protection of Malaysian leatherback turtles. In 'Proceedings of the Twelfth Annual Seminar of the Malaysian Society of Marine Sciences' pp. 213-217.
- Chan EH, Solomon S (1989) The structure and function of the eggshell of the leatherback turtle, (*Dermochelys coriacea*) from Malaysia, with notes on infective fungal forms. *Animal Technology* **40**, 91-102.
- Chan EH, Liew HC (1995) Incubation temperatures and sex-ratios in the Malaysian leatherback turtle *Dermochelys coriacea*. *Biological Conservation* **74**, 169-174.
- Chan EH, Liew HC (1996) Decline of the leatherback population in Terengganu, Malaysia, 1956-1995. *Chelonian Conservation and Biology* **2**, 196-203.
- Chan EH, Salleh H, Liew HC (1985) Effects of handling on hatchability of eggs of the leatherback turtle (*Dermochelys coriacea*)(L.). *Pertanika* **8**, 265-271.
- Chan EH, Liew HC, Mazlan AG (1988) The incidental capture of sea turtles in fishing gear in Terengganu, Malaysia. *Biological Conservation* **43**, 1-7.
- Chan EH, Eckert S, Liew HC, Eckert K (1991) Locating the internesting habitats of leatherback turtles (*Dermochelys coriacea*) in Malaysian waters using radio telemetry. In 'Biotelemetry XI: Proceedings of the eleventh international symposium on biotelemetry'. Yokohama, Japan. (Eds A Uchiyama and C Amlaner).

- Chua TH, Furtado JI (1988) Nesting frequency and clutch size in *Dermochelys coreacea* in Malaysia, *Journal of Herpetology* **22**, 208-218.
- de Silva G (1982) The status of sea turtle populations in east Malaysia and the South China Sea. In 'The Biology and Conservation of Sea Turtles'. (Ed. KABjorndal). (Smithsonian Institution Press).
- Dutton PH, Bowen BW, Owens DW, Barragan A, Davis S (1999) Global phylogeography of the leatherback turtle (*Dermochelys coriacea*). *Journal of Zoology* **248**, 397-409.
- Leong T, Siow K (1980) Sea turtles in the east coast of Peninsula Malaysia and their economic importance. In 'Coastal resources of east coast Peninsula Malaysia'. (Eds T Chua and J Charles). (Universiti Sains, Malaysia)
- Liew HC, Chan EH (1995) Radio tracked leatherback turtle hatchlings during their swimming frenzy. In 'Proceedings of the 12th annual symposium on sea turtle biology and conservation'. (Eds J Richardson and T Richardson). (NOAA Technical Memorandum NMFS-SEFSC-361).
- Limpus CJ (1993) 'Recommendations for conservation of marine turtles in Peninsula Malaysia.' Report to Department of Fisheries, Minister of Agriculture, Malaysia.
- Malaverni P (1989) 'Orientation and response of leatherback (*Dermochelys coriacea*) hatchlings to selected physical and chemical parameters.' Project report: Faculty of Fisheries and Marine Science, Universiti Pertanian, Malaysia.
- Spotila JR, Dunham AE, Leslie AJ, Steyermark AC, Plotkin PT, Paladino FV (1996) Worldwide decline of *Dermochelys coriacea*: are leatherback turtles going extinct? *Chelonian Conservation and Biology* **2**, 209-223.
- Suarez A, Starbird C (1996) Subsistence hunting of leatherback turtles, *Dermochelys coriacea*, in the Kei Islands, Indonesia. *Chelonian Conservation and Biology*, 190-195.
- Wetherall JA, Balazs GH, Tokunaga RA, Yong MYY (1993) Bycatch of marine turtles in north Pacific high-seas driftnet fisheries and impacts on the stocks. In 'INPFC Symposium on Biology, Distribution, and Stock Assessment of Species Caught in the High Seas Driftnet Fisheries in the North Pacific Ocean. International North Pacific Fisheries Commission Bulletin'. Vancouver, Canada. (Ed. J Ito, et al) pp. 519-538.
- Wyatt-Smith J (1960) The conservation of the leathery turtle *Dermochelys coriacea*. *Malayan Nature Journal* **14**, 194-199.
- Yatsu A, Hiramatsu K, Hayase S (1991) Outline of the Japanese squid driftnet fishery with notes on bycatch. In 'INPFC Symposium, 4-6 Nov. 1991. Tokyo'.