

**Advice to the Minister of the Environment, Heritage, Water and the Arts
from the Threatened Species Scientific Committee (the Committee)
on Amendment to the list of Threatened Species
under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**

1. Scientific name (common name)

Dermochelys coriacea (Leatherback Turtle)

2. Reason for Conservation Assessment by the Committee

This advice follows assessment of information provided by a public nomination to change the category of the Leatherback Turtle from vulnerable to critically endangered. It was originally listed as vulnerable under the *Endangered Species Protection Act 1992*, and this was retained under the EPBC Act in 2000. This is the Committee's first consideration of the species under the EPBC Act.

3. Summary of Conclusion

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 1 and Criterion 3 to make it **eligible** for listing as **endangered**.

The highest category for which the species is eligible to be listed is **endangered**.

4. Taxonomy

The species is conventionally accepted as *Dermochelys coriacea* (Leatherback Turtle, or Leathery Turtle) (Vandelli, 1761).

5. Description

The Leatherback Turtle is the largest species of marine turtle, reaching on average around 1.6 m in length and 500 kg in weight. It is easily differentiated from other sea turtles by its leathery carapace and long front flippers. The species has a black dorsal surface, with longitudinal rows of small, fine dots and usually white or pale pink spots on its sides, and pinkish white colouring on its belly (Cogger, 1996). The large limbs are without webbed or clawed feet and it moves across the beach by pushing all four flippers together. The Leatherback Turtle is unique amongst marine turtles in that it can use changes in blood flow to regulate its body temperature, maintaining its temperature in cold water and avoiding overheating in warm water.

6. National Context

This species has the widest distribution of any marine turtle. It is found in tropical to sub-polar oceans, from the North Sea and the Gulf of Alaska, to the southern Pacific and Atlantic Oceans. In Australia, the Leatherback Turtle has been recorded feeding in coastal waters offshore of all Australian States. Most sightings are in temperate waters, but the species is also less frequently observed in tropical and colder seas.

There is no historical evidence of a large nesting population of Leatherback Turtles in Australia. Small numbers have been reported to nest occasionally along a short stretch of

coast in central Queensland, northern New South Wales and the Northern Territory. No nests have been recorded in eastern Australia since 1996. Sightings of nests in northern Arnhem Land, in the Northern Territory are irregular, and the nesting population there remains unquantified (Limpus & Chatto, 2004). The majority of Leatherback Turtles within Australian waters are likely to be foraging migrants, from breeding populations in neighbouring countries (Limpus & McLachlan, 1990).

Within the Australia-Pacific region, nesting mainly occurs in southern Java, Papua, northern Papua New Guinea, the Solomon Islands, and Vanuatu. Other major nesting areas are found on the coast of Malaysia, western Mexico, Panama, Surinam, French Guiana, Trinidad, the Virgin Island archipelago, Costa Rica and South Africa (Dutton et al., 1999).

The global population of the species can be divided into subpopulations, determined by nesting localities (Dutton et al., 1999; Hamann et al., 2006); ten distinct Leatherback Turtle populations have been identified worldwide (Dutton, 2005). Genetic analysis has shown that two Pacific populations (east and west) are very closely related, and are distinct from the Atlantic population, suggesting a degree of reproductive independence (Dutton et al., 1999).

There is insufficient information to determine which populations are found within Australian waters. There has been only one tag recovery reported from an Australian foraging area: a female tagged while nesting in Java was recaptured from north-western Western Australia (Hamann et al., 2006). Leatherback Turtles observed in the waters of the eastern states are thought to originate from the western Pacific population (Solomon Islands, Indonesia, Vanuatu and Papua New Guinea) on the assumption that they disperse mostly with ocean currents (Limpus & McLachlan, 1979). The western Pacific population of Leatherback Turtles is thought to be the second smallest population globally, in terms of nesting females, after that of the Indian Ocean (Spotila, 1996).

The Leatherback Turtle is included in the list of migratory species (s209) and the list of marine species (s248), under the EPBC Act. The species is also included in Appendix I and II of the Convention on Migratory Species (CMS) and Appendix I of the Convention on International Trade in Endangered Species (CITES).

A summary of the conservation status of the Leatherback Turtle in Australian jurisdictions is as follows:

Jurisdiction	Status	Legislation
Tasmania	vulnerable	<i>Threatened Species Protection Act 1995</i>
Victoria	critically endangered	<i>Advisory List of Threatened Vertebrate Fauna in Victoria 2003</i>
New South Wales	vulnerable	<i>Threatened Species Conservation Act 1995</i>
Queensland	endangered	<i>Nature Conservation Act 1992,</i>
Western Australia	rare or likely to become extinct	<i>Wildlife Conservation Act 1950</i>
Northern Territory	vulnerable	<i>Territory Parks and Wildlife Conservation Act 2000</i>
South Australia	vulnerable	<i>National Parks and Wildlife Act 1972</i>

7. Relevant Biology/Ecology

The habitat of the Leatherback Turtle is pelagic marine foraging areas, in tropical and cool temperate waters, with some individuals reaching sub-polar oceans. The large body size of adults, with a thick adipose tissue layer and regulation of blood flow, allows them to venture into cold water to forage for food. Foraging occurs throughout the water column, from the surface layer to depths of several hundred metres. The Leatherback Turtle's diet consists primarily of soft bodied invertebrates such as jellyfish (e.g. *Catostylus mosaicus*), and tunicates (e.g. *Pyrosoma* and salps), which occur in greatest concentrations near the surface where ocean currents converge (Glasby et al., 1993). Nesting beaches are comprised of soft sand and have a shallow approach angle from the sea.

Little is known about the species' migratory patterns. Female Leatherback Turtles usually return to their natal beaches to breed, however the natal homing instinct in this species may not be as rigid as in other sea turtles (Dutton et al., 1999). The breeding ecology of Leatherback Turtles varies with specific populations. Females lay around four to eight clutches per season, each with around 60 to 120 eggs per clutch; these numbers do not include the many yolkless eggs that are produced by this species (Limpus & McLachlan, 1990; Reina, 2002). The incubation period is around 60 to 90 days (Limpus & McLachlan, 1979). Females do not normally breed in successive years. The mean period between nesting seasons for an individual turtle is 3.7 years (Spotila, 2000).

Leatherback Turtle numbers fluctuate greatly from year to year on the best studied beaches; this may be due to variations in reproductive cycles, food supply and environmental conditions on their foraging grounds, as well as the effects of mortality at various stages of their life histories (Spotila, 1996).

The nesting environment is an important determinant for hatching success. For successful incubation, eggs require a temperature range of 25° to 33° and a high humidity, low salinity, well-ventilated nest substrate that is not subject to flooding. Poor hatching success in Queensland nests has been attributed to fine moist sand causing poor gas exchange (Limpus et al., 1984). Nest temperature determines incubation period (69 days at 29 °C) and the sex of the hatchlings, with warm nests producing females and cool nests producing males (Mrosovsky et al., 1984). The hatchlings dig their way to the surface at night time and make their way to sea, where they swim offshore for several days. They then remain undetected from human monitoring for several years, with few records of this species until they are over 100 cm curved carapace length. Adults maintain a solitary, pelagic lifestyle, although they may aggregate in areas of abundant food and off nesting beaches.

This species is thought to live at least 30 years and may live up to 100 years, reaching maturity at 5-14 years (Zug & Parham, 1996). It has been speculated that sea turtles have a long reproductive life, probably over 50 years (Dutton et al., 1999). The generation length of the Leatherback Turtle is estimated to be 22 years (Martinez, 2000).

8. Description of Threats

Threats to Leatherback Turtles are predominantly anthropogenic. Incidental capture in commercial fisheries, ingestion of marine debris and boat strike occur in all open waters. Adult turtles are harvested in Indonesia and in Papua New Guinea waters, and eggs are harvested in Malaysia, Indonesia, Papua New Guinea and Thailand (Limpus, 1997); it is unknown what impact indigenous harvest has on nests in northern Australia. Disturbance of

nesting beaches from coastal development may occur throughout the species' range (particularly from artificial lighting, vehicles and sand mining).

Predation of eggs by wild pigs (*Sus scrofa*), monitor lizards (*Varanus salvator*) and domestic dogs (*Canis familiaris*) is detrimental to the species in parts of Papua New Guinea and Indonesia (Hamann et al., 2006).

Pelagic longline bycatch has been implicated as a proximate cause for the decline in Pacific Leatherback Turtle populations (Spotila et al., 2000). Longlines are a specific type of fishing gear, characterised by multiple baited hooks attached individually to a mainline. Pelagic longlines drift freely near the surface in the high seas and target pelagic fishes. The pelagic environment is also where most sea turtles spend most of their time. The likelihood of a Leatherback Turtle swallowing longline bait is considered to be low due to the fact that they do not naturally feed on squid or fish, the most common longline bait. However, there is a high proportion of Leatherback Turtles externally hooked or entangled (Robins et al., 2002). An estimated 50 000 Leatherback Turtles globally and 20 000 in the Pacific were caught in 2000 as bycatch by pelagic longliners (Lewison et al., 2004).

In Australia, around 240 Leatherback Turtles are caught in Australian pelagic longline fishing operations each year (Robins et al., 2002). Mortality rates for this bycatch have been estimated to be between 4 and 16 per cent (Beverly and Chapman, 2007; Lewison et al., 2004). Based on these figures, around 10 to 40 Leatherback Turtles may die through longline fishery operations in Australian waters annually.

Lobster fisheries in Tasmania, Victoria, South Australian and south-west Western Australia pose a threat to Leatherback Turtles, which can become entangled in the floatlines of the traps. A Tasmanian study indicates that 75% of Leatherback Turtles entangled in lobster pot lines are released alive, although post release survival rates are unknown (Bone 1998). Crab fisheries in Queensland also pose a threat to the Leatherback Turtle, as does boat strike, however deaths through these causes are thought to be limited (Hamann et al., 2006). Newly developing jellyfish fisheries throughout the species' range also pose a potential threat to the Leatherback Turtle, as the species' diet consists primarily of jellyfish.

Sea turtles are known to eat plastic bags, which resemble jellyfish. Ingestion of plastic bags is usually fatal, as the bags become blocked in the digestive tract, causing the turtle to die of starvation. It is unknown to what extent marine pollution, including plastics, contributes to Leatherback Turtle mortality. Hamann et al. (2006) reports about one death in Australia during the period 1990-2003, but notes that because ingestion of marine debris often occurs at sea, it is hard to detect and rarely documented.

It is unknown how Leatherback Turtles will respond to climate change impacts, but this is considered to be a potential future threat to the species, particularly through increased air temperature (Hamann et al., 2007). If average seasonal sand temperatures at marine turtle nesting beaches consistently rise above 30°C, they are likely to impact embryo development through alterations to sex ratios (in favour of females), phenotype, or through direct mortality. On the other hand, increased water temperature could lead to increased growth rates, increased reproductive output and changes to distribution and abundance (Hamann et al., 2007). Marine turtles are also vulnerable to shifts in the frequency and intensity of storms and rainfall, especially at nesting beaches (Hamann et al., 2007). Sea level rise will impact nesting beach stability and foraging ground distribution and Leatherback Turtles may have to seek new nesting and foraging locations. In the short term the effects will be most noticeable at rookeries that have had long-term marine turtle monitoring programs. Over the longer-term (more than 50 years) other nesting sites may become available. Alternatively, sea level rise may remove

available nesting habitat and the remaining sites might not be suitable, because of human interactions, such as coastal development (Hamann et al., 2007).

9. Public Consultation

The nomination was made available for public exhibition and comment for 30 business days. No public comments were received.

10. How judged by the Committee in relation to the criteria of the EPBC Act and Regulations

The Committee judges that the species is **eligible** for listing as **endangered** under the EPBC Act. The assessment against the criteria is as follows:

Criterion 1: It has undergone, is suspected to have undergone or is likely to undergo in the immediate future a very severe, severe or substantial reduction in numbers

Population data for Leatherback Turtles are determined and monitored by counting the number of females and nests laid. Leatherback Turtle nesting occurs in northern Arnhem Land to a limited extent (Limpus & Chatto, 2004). The majority of turtles that exist in Australian waters are likely to be foraging migrants from breeding populations in neighboring countries (Limpus & McLachlan, 1990).

Regionally, Leatherback Turtle nesting occurs in northern Papua New Guinea, the Solomon Islands, Papua, Vanuatu, and southern Java. These islands are considered to comprise the 'western Pacific' stock of Leatherback Turtles (Dutton et al., 2005; Dutton, 2007). This is the likely origin of the majority of Leatherback Turtles visiting eastern Australia, on the assumption that they disperse mostly with ocean currents. The origin of individuals observed on the west coast of Australia is unknown, however many could also originate from the western Pacific stock, as there is a record of a female tagged while nesting in Java being recaptured in north-west Western Australia (Hamann et al., 2006).

There have been anecdotal reports of a rapid decline in nesting populations in the western Pacific region (attributed to egg and adult turtle harvest, pig predation, and bycatch in gillnets and longlines) (Limpus, 1997; Hamann et al., 2006); and the western Pacific stock of Leatherback Turtles is thought to be one of the smallest globally (Spotila, 1996). However, long term data are not available to quantify this population decline.

In the absence of long term population data, an index of occurrence of Leatherback Turtles in eastern Australian waters may be gained from Queensland Shark Control Program records. Data regarding marine turtles that become entangled in drumline hooks recorded from 1984 to 2002 indicate a declining annual capture of the species in southern Queensland waters. From sixteen turtles recorded from July-December 1984, the numbers dropped to seven captured in 1985, then only a few were caught each year until 1993 when none were caught and a total of three were recorded from then until 2001 (Hamann et al., 2006). While these data may be influenced by changes in drumline technology to reduce bycatch alongside adaptive behavioural change by Leatherback Turtles to avoid drumlines, the Committee judges that they are also likely to reflect a decline in abundance of Leatherback Turtles in the region.

A study of the global population of Leatherback Turtles in 1982 estimated that there were 115 000 adult female Leatherback Turtles extant (Pritchard, 1982). In 1996, the population was estimated to be about 34 500 (within the range of 26 200 to 42 900) (Spotila et al., 1996). A recent report has revised this figure up to around 36 500, with information on additional nesting sites that were not previously available (Dutton, 2007). This represents about a 68% reduction in adult female Leatherback Turtle numbers globally over the last 25 years, that is, in approximately one generation.

While there are insufficient data available to quantify the reduction in numbers of Leatherback Turtles in Australian waters or of the western Pacific population of the species, the Committee notes the migratory life history of the species and therefore accepts that the individuals found within Australian waters are a subset of the global population, which has experienced a 68% reduction in adult female Leatherback Turtle numbers over the last 25 years. Given the long generation length of Leatherback Turtles and the ongoing threats operating against the species regionally and globally, the Committee judges that this rate of decline is severe. Therefore, the species has been demonstrated to have met sufficient elements of Criterion 3 to make it **eligible** for listing as **endangered**.

Criterion 2: Its geographic distribution is precarious for the survival of the species and is very restricted, restricted or limited

The Leatherback Turtle is a migratory marine species, found in all oceans. Female Leatherback Turtles usually return to their natal beaches to breed, therefore, the breeding habitat of this species is limited to beaches currently used for nesting, and may include suitable nearby beaches.

Leatherback Turtles are rarely found nesting in Australia, with only four nesting sites identified (Limpus & Chatto, 2004). However, whilst the geographic distribution of nesting sites in Australia is limited, the vast majority of Leatherback Turtles in Australian waters are thought to originate from breeding populations in neighbouring countries (Limpus & McLachlan, 1990). Some 28 nesting sites in the western Pacific region have been reported, with approximately 75% of nesting activity concentrated at four sites along the northwest coast of Papua, Indonesia (Dutton, 2007).

A large number of threats operate against the Leatherback Turtle at these nesting beaches in neighbouring countries. These include egg predation by feral pigs (*Sus scrofa*), monitor lizards (*Varanus salvator*) and domestic dogs (*Canis familiaris*), adult turtle harvest, disturbance of nesting beaches from coastal development and the possibility of impacts on nesting success caused by climate change. Anecdotal evidence suggests that these threats are causing a decline in the area and quality of nesting habitat (Limpus, 1997; Hamann et al., 2006). If unabated, the decline in population in the western Pacific region will continue. Given a limited number of nesting sites and a continued decline in the area and quality of nesting

beaches, the geographic distribution of nesting beaches is considered to be precarious for the survival of the species.

Whilst nesting sites for the western Pacific population of Leatherback Turtle are known to exist at limited locations, there are no data available that quantify the area of occupancy of these sites. Therefore, there are no data to judge whether the geographic distribution of nesting sites is very restricted, restricted, limited, or not limited. As the species has not been demonstrated to have met this required element of Criterion 2, it is **not eligible** for listing in any category under this criterion.

- Criterion 3: The estimated total number of mature individuals is limited to a particular degree; and either**
- (a) evidence suggests that the number will continue to decline at a particular rate; or**
 - (b) the number is likely to continue to decline and its geographic distribution is precarious for its survival**

Population data for Leatherback Turtles are determined and monitored by counting the number of females and nests laid. Leatherback Turtle nesting occurs to a limited extent in northern Arnhem Land, The majority of turtles that are found in Australian waters are likely to be foraging migrants from breeding populations in neighboring countries (Limpus & McLachlan, 1990).

The population of Leatherback Turtles offshore of the east coast of Australia is likely to derive from the western Pacific population (Hamann et al., 2006). The origin of Leatherback Turtles observed offshore of the west coast of Australia is unknown, however may also originate from the western Pacific population, as there is a record of a female tagged while nesting in Java being recaptured in north-west Western Australian waters (Hamann et al., 2006). Dutton (2007) estimates that there are around 2800 adult female Leatherback Turtles in the western Pacific population. This population estimate is judged by the Committee to be limited.

There have been anecdotal reports of a rapid decline in nesting populations in the western Pacific region, attributed to egg and adult turtle harvest, predation on eggs by feral pigs (*Sus scrofa*), monitor lizards (*Varanus salvator*) and domestic dogs (*Canis familiaris*), and bycatch in gillnets and longlines (Limpus, 1997; Hamann et al., 2006). The western Pacific stock of Leatherback Turtles is thought to be one of the smallest globally (Spotila, 1996). However, long term data are not available to quantify population decline.

As discussed under Criterion 1, the estimated global population of adult female Leatherback Turtles has declined from 115 000 in 1982 to around 36 500 in 2007 (Pritchard, 1982, Spotila et al., 1996; Dutton, 2007). This represents about a 68% reduction in adult female Leatherback Turtle numbers globally over the last 25 years, that is, in approximately one generation. The Committee accepts that the Western Pacific population is a subset of the global population and concludes that it has probably experienced at least a similar very high rate of decline.

The Committee judges that the Leatherback Turtle population in the western Pacific region is limited, and that the population of Leatherback Turtles that inhabits the Australian jurisdiction is also limited. The Committee further judges that this population has experienced a very high rate of decline over the last generation and that this decline is expected to continue in the face of current threats and the possible future threat of climate change. Therefore, the species has been demonstrated to have met sufficient elements of Criterion 3 to make it **eligible** for listing as **endangered**.

- Criterion 4: The estimated total number of mature individuals is extremely low, very low or low**

Population estimates for the Leatherback Turtle are determined and monitored by counting the number of females and nests laid. Leatherback Turtle nesting in Australia is rare. Whilst

nesting is believed to occur in northern Arnhem Land, the nesting population there remains unquantified (Limpus & Chatto, 2004). The majority of turtles that exist in Australian waters are likely to be foraging migrants from breeding populations in neighboring countries (Limpus & McLachlan, 1990).

Regionally, Leatherback Turtle nesting occurs in northern Papua New Guinea, the Solomon Islands, Papua, Vanuatu, and southern Java. These islands are considered to comprise the 'western Pacific' stock of Leatherback Turtles (Dutton et al., 2005; Dutton, 2007). This is the likely origin of the majority of Leatherback Turtles visiting eastern Australia, on the assumption that they disperse mostly with ocean currents.

The population of Leatherback Turtles in the western Pacific is estimated to comprise around 2800 adult females. The Committee does not consider that the estimated total number of mature individuals of the species is extremely low, very low or low. Therefore, as the species has not been demonstrated to have met any required element of Criterion 4, it is **not eligible** for listing in any category under this criterion.

Criterion 5: Probability of extinction in the wild that is at least:

- a) **50% in the immediate future; or**
- b) **20% in the near future; or**
- c) **10% in the medium-term future.**

There are insufficient data available to estimate a probability of extinction of the species in the wild over a relevant timeframe. Therefore, as the species has not been demonstrated to have met the required elements of Criterion 5, it is **not eligible** for listing in any category under this criterion.

11. CONCLUSION

Conservation Status

Dermochelys coriacea (Leatherback Turtle) was nominated for transferring between the categories of vulnerable and critically endangered in the list of threatened species referred to in section 178 of the EPBC Act.

The Committee accepts that there is a small population of nesting Leatherback Turtles in the Northern Territory; however, the majority of Leatherback Turtles within Australian waters are likely to be foraging migrants, derived from the western Pacific population.

The Committee judges that the Leatherback Turtle population in the western Pacific region is limited, and that this infers that the population of Leatherback Turtles that inhabits the Australian jurisdiction is also limited. The Committee further judges that this population has experienced a very high rate of decline over the last generation and that this decline is expected to continue in the face of current threats and the possible future threat of climate change. Therefore, the species has been demonstrated to have met sufficient elements of Criterion 1 and Criterion 3 to make it **eligible** for listing as **endangered**.

The Committee accepts that the highest category for which the species is eligible to be listed is **endangered**.

Recovery Plan

The Minister has decided that there should be a Recovery Plan for this species. A recovery plan for the Leatherback Turtle (including other marine turtle species) is in preparation. The Committee recommends no change to the Minister's initial recovery plan decision.

12. Recommendations

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **transferring** from the **vulnerable** category to the **endangered** category:

***Dermochelys coriacea* (Leatherback Turtle)**

- (ii) The Committee recommends no change to the Minister's initial recovery plan decision (to have a recovery plan for the species).

Associate Professor Robert J.S. Beeton

Chair

Threatened Species Scientific Committee

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