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PART 2b: MARINE TURTLES

Knowledge and concerns about marine turtles based on scientific research

Introduction

Six of the world's seven species of marine turtles live in northern Australia. This section summarises current scientific knowledge of these species, beginning with a general introduction, followed by more detailed information on each species. Information provided below is based on a recent literature review published by the Australian Government's National Oceans Office⁷⁹ and information on websites of the Great Barrier Reef Marine Parks Authority⁸⁰ and the Department of Environment and Heritage⁸¹. Other references are identified by footnotes throughout the text.

Marine turtles have lived in the oceans for over 100 million years. All species migrate long distances between their feeding grounds and nesting sites. They have a large shell (called a carapace), four strong, paddle-like flippers and, like all reptiles, they have lungs for breathing air. Their characteristic beak-like mouth is used to shear or crush food.

Concerns

During their life cycles, individual marine turtles are subjected to numerous natural dangers, particularly while developing in their eggs, as hatchlings and as free-swimming juveniles. Goannas are known to dig up turtle nests and eat the eggs. Some hatchlings are eaten by birds and crabs as they make their way to the water. Juvenile turtles are eaten by sharks and fish. While these natural predators kill significant numbers of individuals each year, their existence in the world's oceans for tens of millions of years indicates that the survival of marine turtle species is not threatened by these pressures alone. Scientists are concerned, however, that the activities of humans are bringing unsustainable pressures on marine turtles that are

⁷⁹ Limpus and Chatto (2004)

⁸⁰ http://www.gbrmpa.gov.au/corp_site/key_issues/conservation/threatened_species/turtles/

⁸¹ <http://www.deh.gov.au/coasts/species/turtles/>

currently causing severe population declines and may lead to species extinctions if not addressed. The main threats from human activities, which vary from location to location and which have differing impacts on different species, are death and injury to marine turtles caused by:

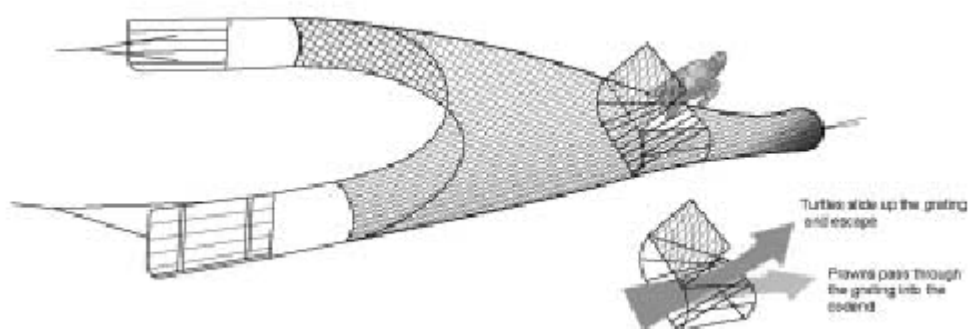
- **Fisheries bycatch** - accidental capture of marine turtles by commercial fisheries;
- **Direct fisheries pressure** – direct harvest for commercial reasons in neighboring countries;
- **Marine debris** – discarded fishing nets, plastic bags and other waste material in the sea and on nesting beaches;
- **Shark nets** – set around popular swimming beaches to protect people from shark attacks;
- **Boat Strikes** – hulls and propellers of ships accidentally striking turtles;
- **Light Pollution** – artificial lighting on or near the coast that disorients nesting females or emerging hatchlings;
- **Vehicles and other recreational activities on nesting beaches** – destroying nests, and/or disturbing nesting females and hatchlings;
- **Predation of eggs and hatchlings by feral animals** – especially foxes, pigs and dogs;
- **Coastal development, aquaculture and other changes to coastal land and sea environments** – habitat changes that reduce nesting opportunities and food supplies (including loss of seagrass);
- **Oil spills and other threats to water quality;**
- **Noise pollution** – disrupting nesting behaviours and disorienting hatchlings;
- **Unsustainable harvest** – turtles and eggs have been harvested by coastal people around the world for thousands of years but in recent times in some places such harvests (both commercial and subsistence) are no longer sustainable.
- **Diseases** – such as fibropapilloma (a wart like disease that occurs on turtles and is caused by an unknown virus)

The accidental catch of marine turtles in the northern prawn trawl fishery has been greatly reduced since the recent introduction of Turtle Exclusion Devices (TEDs) (see Box 4 on the following page). Other threats, such as light pollution (see Box 5 on the following page) are a greater problem in more settled areas of Australia, but have the potential to become more serious in the north as remote communities become more developed.

Based on the ongoing threats and recorded declines in numbers, marine turtles are generally listed as endangered, threatened or vulnerable by Australian and

international conservation agencies. However these listings are based on national or global assessments of each species as a whole. They do not take into account the fact that some populations in some areas may not be in decline or that there is not enough information to determine their conservation status. Measures aimed at addressing each of these concerns or threats are proposed in the Australian Government's *Recovery Plan for Marine Turtles in Australia*⁸², discussed in Part 3 of this *Handbook*.

Box 4: Turtle Exclusion Device (TED)⁸³



TEDs are a device sewn into trawl nets to separate large unwanted animals, generally sea turtles but also other large organisms like sharks and rays, from the smaller target species, generally prawns or fish. They enable large animals to exit the net before reaching the cod-end. There are many designs, although most commonly they consist of a grid (or grating) that directs the turtle towards a hole in the net.

Box 5: Light pollution and marine turtles⁸⁴

Artificial lights on land and sea attract both nesting turtles and hatchlings. As a result, female turtles seeking a nesting beach get attracted to coastal areas unsuitable for nesting or to brightly lit boats or oil rigs in the water. Hatchlings instinctively head for the brightest area, which under natural conditions is usually the sea. However, street lights and other lights on land can attract hatchlings inland so that they never reach the sea. It will be important for communities across northern Australia to consider the possible impact of light pollution on marine turtles when considering development proposals in the years ahead. Options to address the problem include establishing light-free coastal zones near important nesting beaches, using light frequencies less attractive to turtles (e.g. low pressure sodium lights [LPS] reduce Loggerhead turtle disorientation – note not all species react the same to LPS lights) and installing shields to prevent light reaching critical coastal areas.

⁸² <http://www.deh.gov.au/coasts/publications/turtle-recovery/>

⁸³ <http://www.affa.gov.au/content/publications.cfm?ObjectID=26A9E754-A7F8-4368-8861A9BA4D5F5663>

⁸⁴ <http://www.deh.gov.au/coasts/publications/turtle-recovery/>

In many parts of the world, turtle populations have declined to low numbers or even disappeared entirely. There are only a few large nesting populations of the Green, Hawksbill and Loggerhead turtles left in the world. Australia has some of the largest marine turtle nesting areas in the Indo-Pacific region and large (globally significant) nesting populations of Green, Hawksbill and Loggerhead turtles, as well as the only nesting populations of the Flatback turtle.

Whilst marine turtles are in trouble in many parts of the world, recent evidence from long term monitoring studies is showing that with good management, such as by protecting habitat, reducing turtle deaths in fisheries and ensuring that harvests of eggs and turtles are sustainable, turtle populations can recover. One of the best examples comes from Green turtles in Hawaii, where the number of nesting females per year has increased from less than 100 to almost 500 over the last 40 years (Figure18).

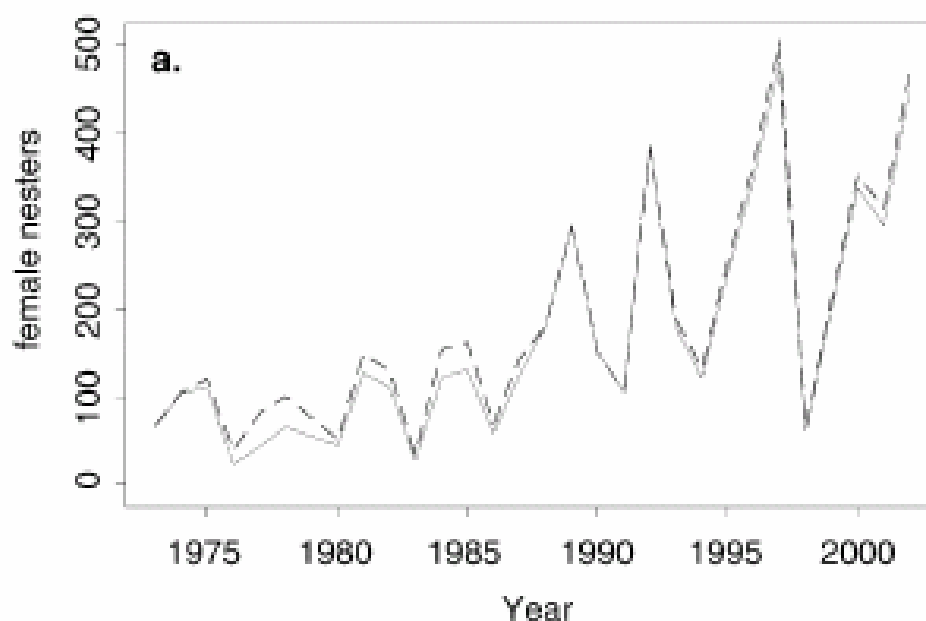


Figure 18: Numbers of nesting female Green turtles in Hawaii 1973 - 2002⁸⁵

⁸⁵ Balazs and Chaloupka (2004)

Biology of marine turtles

The following extract from the Great Barrier Reef Marine Park Authority's website⁸⁶ provides a general summary of the biology of marine turtles. Further information is provided in the sections on each species below.

All species of marine turtles have the same general life cycle (see Figure 19). They grow slowly and take decades to reach sexual maturity. As immature turtles, they may drift on ocean currents for many years or live for years in the one place before maturing and making a long breeding migration of up to 3000 km from the feeding ground to a nesting beach. At an unknown age (believed to be between 20 and 50 years) male and female turtles migrate to a nesting area located in the region of their birth. Both male and female turtles mate with a number of partners. The females store sperm in their bodies to fertilise the three to seven clutches of eggs that are laid during the season.

Mating generally takes place offshore a month or two prior to the turtle's first nesting attempt for the season, which is usually in summer.

Male turtles generally return to their foraging areas once the females commence their fortnightly trips to the beach to lay eggs. When ready, a female turtle crawls out of the sea and uses her front flippers to drag herself up the beach to a nest site. She digs out a body pit with her front flippers and then excavates a vertical egg chamber (between 30 and 60 cm deep) with her hind flippers. If the sand is too dry and unsuitable for nesting, the turtle moves on to another site.

For most turtles, digging the nest takes about 45 minutes. Another 10 to 20 minutes are then spent laying the clutch of leathery-shelled eggs. Each clutch contains about 120 eggs, ranging in size from the golf ball-sized egg of the hawksbill to the billiard ball-sized egg of the flatback.

After laying, the turtle fills the egg chamber with sand using her hind flippers, and then fills the body pit using all four flippers. The turtle finally crawls back to the sea about one to two hours after emerging, entering the surf exhausted. In this offshore area she begins to make the next clutch of eggs, fertilising them from her sperm store. After the nesting season, females return to their distant foraging areas and may not nest again for two to eight years.

The temperature of the nest during incubation determines the sex of hatchlings. Warm, dark sand produces mostly females. Eggs laid in cool, white sand result mostly in males and generally take longer to hatch.

⁸⁶ (http://www.gbrmpa.gov.au/corp_site/key_issues/conservation/threatened_species/turtles/lifecycles.html)
Adapted from Lanyon et al. (1989)

After about 7-12 weeks the eggs hatch. The hatchlings take two or more days to reach the surface where they emerge as a group, usually at night. To find the sea, hatchlings orient towards the brightest direction and use the topography of the surrounding horizon line. Once in the sea, hatchlings use a combination of cues (wave direction, current, and magnetic fields) to orient themselves to deeper offshore areas. Crossing the beach and swimming away is believed to imprint the hatchlings with the cues necessary to find their way back when they are ready to breed.

Once in the ocean, hatchlings are believed to enter regions where ocean currents meet. There they associate with floating seaweed mats and other flotsam caught up in ocean currents. Here they feed on tiny sea animals. These young turtles are rarely seen again until their shell length is 20-40 cm, which may be five or ten years after hatching. At this time, the young, free-swimming turtles migrate back to inshore foraging areas. They remain in these areas until they are ready to breed and the cycle begins again.

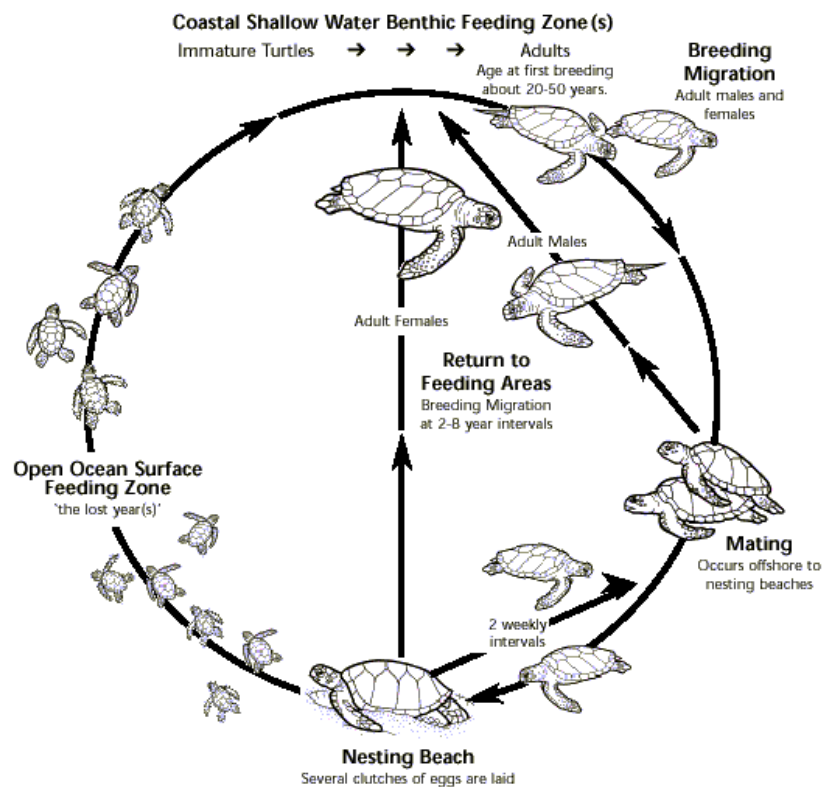


Figure 19: Life cycle typical of marine turtle species⁸⁷.

It is important to remember that individual marine turtles do not migrate and nest every year. Instead they take a break of at least one and sometimes several years

⁸⁷ (http://www.gbrmpa.gov.au/corp_site/key_issues/conservation/threatened_species/turtles/lifecycles.html)

between nesting migrations. They need this break because it takes a long time to gather the energy (stored as fat) to make several clutches of eggs and to fuel the turtle as it swims hundreds, sometimes thousands, of kilometres to a nesting location (and then back again). It may also be risky for a turtle to travel a long distance (e.g. it may get lost or attacked by sharks), so turtles save their energy for many years so they can lay several clutches of eggs in one trip rather than make many trips each year. For these reasons there are often large differences in numbers of nesting turtles each year, and usually a year with many nesting turtles is followed by a year of fewer nesting turtles. This is why at least ten years of turtle nesting information is required to determine long term changes in population size. Records of Green turtles nesting on Heron Island, in the southern Great Barrier Reef, provides a good example of these annual fluctuations in numbers (Figure 20).

***Chelonia mydas* HERON ISLAND, AUSTRALIA**
TOTAL ANNUAL NESTING POPULATION

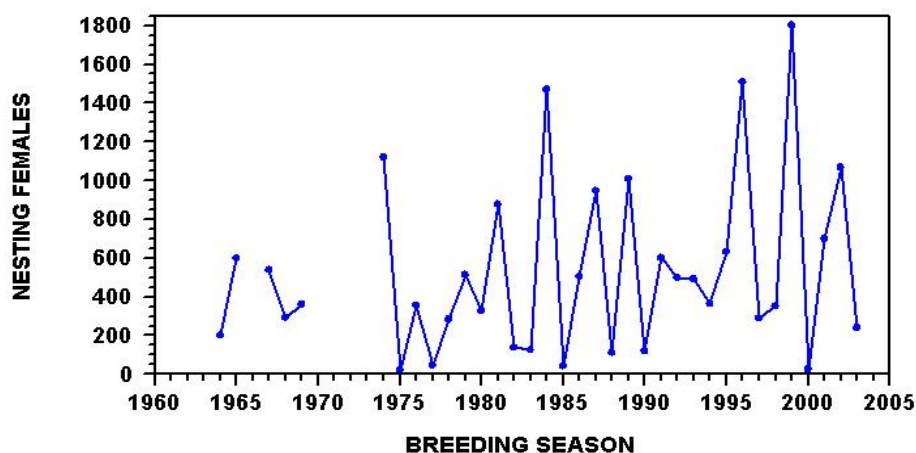


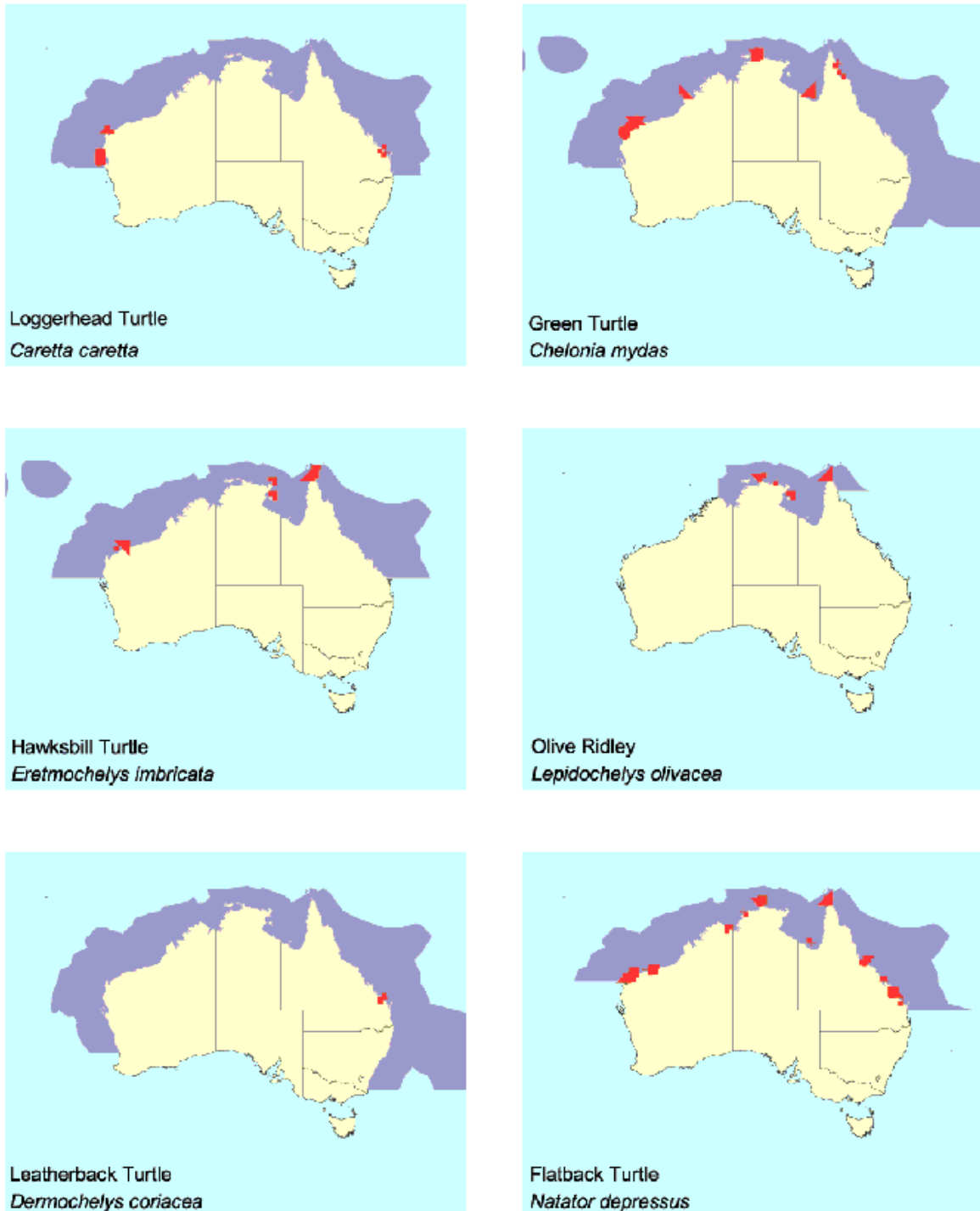
Figure 20: The numbers of nesting green turtles on Heron Island, Queensland⁸⁸.

The distribution of marine turtles in Australia is shown in Figure 21. Note that these maps are incomplete and should include:

- Leatherback turtles occur around the entire coast of Australia and nest on Cobourg Peninsula, NT and in northern NSW;
- Green turtle nesting in the southern Great Barrier Reef and on Groote Eylandt and the north east Arnhem Land coast in the NT;
- Hawksbill turtle nesting on the Kimberly coast, WA.

⁸⁸ Col Limpus, unpublished data

Distribution of Australian Marine Turtles



Source: General distribution as indicated in Cogger, H. (1996). Reptiles and Amphibians of Australia. Red. Breeding (rookery) distribution based on areas defined by Limpus, C.J. (1995) Conservation of marine turtles in the Indo-Pacific. Draft: 1 October 1995. Report to Australian Nature Conservation Agency; and Wildlife Management Section, Environment Australia and Marine Turtle Recovery Team (1998) Draft Recovery Plan for Marine Turtles in Australia. Coastline 100K is © Commonwealth of Australia, Geoscience Australia 1990

■ Recorded Breeding Sites
 Distribution within Australian Waters

Projection: Geographics

Map produced by ERIN, Environment Australia, Canberra, July 2003. © Commonwealth of Australia 2003

Figure 21: Distribution of marine turtles in Australia⁸⁹

⁸⁹ <http://www.deh.gov.au/coasts/publications/turtle-recovery/>

Names and Classification of Marine Turtles

Marine turtles belong to two families of reptiles. The scientific classification of marine turtles is as follows:

Class: Reptilia (reptiles)

Order: Testudines

Family: Chelonidae

Species: *Caretta caretta* (Loggerhead turtle)

Chelonia mydas (Green turtle)

Eretmochelys imbricata (Hawksbill turtle)

Lepidochelys olivacea (Olive Ridley turtle)

Natator depressus (Flatback turtle)

Family: Dermochelyidae

Species: *Dermochelys coriacea* (Leatherback turtle)

Differences between the two families of marine turtles are summarised in Table 2.

Table 2: Differences between the six marine turtle species in Australia

Feature	Family Chelonidae	Family: Dermochelyidae
Flippers	Large paddle-like flippers with one or two claws	Large paddle-like flippers without claws
Scutes (horny scales)	Scutes on head, flippers, carapace (back) and plastron (belly)	Scutes only on hatchlings, not on adults
Ribs and bony covering	Ribs are fused (joined) to the bones that form the carapace	Ribs are separate, with a mosaic of polygonal (many-sided) small bones covering the body
Carapace	Flat or rounded without ridges	With pronounced ridges
Upper jaw	No cusps (pointed parts) on upper jaw	Pronounced cusps on upper jaw
Head	Head can be partially withdrawn beneath the carapace	Head cannot be withdrawn beneath the carapace

LOGGERHEAD TURTLE

Description

Loggerhead turtles have a heart-shaped shell (carapace) that is dark brown with reddish and darker brown patches above and has five pairs of scutes (plates) between the centre and outer edge. The underside (plastron) is white, cream or yellow.

Hatchlings are dark brown, with a shell length of 4.4 cm and weigh approximately 19g. The length of an adult carapace is about 92 cm and average adult weights about 113 kg.

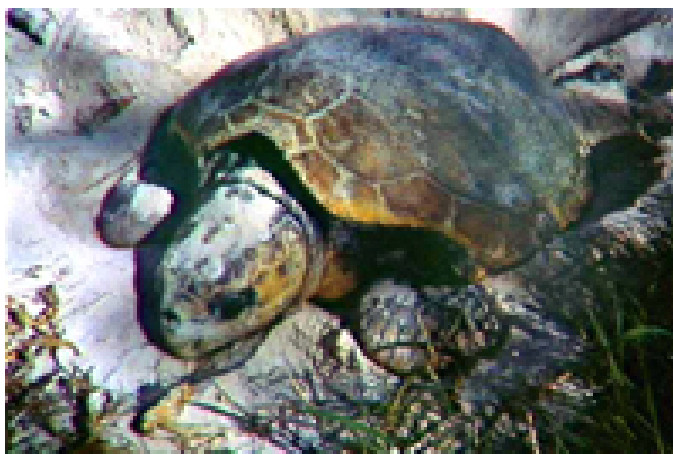


Figure 22: Loggerhead turtle⁹⁰

Distribution and populations

Loggerhead turtles live in all tropical, sub-tropical and temperate oceans, including the waters around eastern, northern and western Australia. In Australia, there are two separate breeding populations of Loggerhead turtles. One breeding population nests on beaches on the central coast of Western Australia; the other breeding population nests mostly on beaches in southern Queensland, but some turtles from this population nest on the Swains Reefs about 300km offshore from Queensland in the southern Great Barrier Reef and on beaches on the north coast of New South Wales (see Figure 23). Research studies, in which hatchlings were tagged and then recaptured later as adults, indicate that Loggerhead turtles mature to become nesting adults after about 30 years. Tag recoveries from Loggerhead turtles indicate

⁹⁰ http://www.gbrmpa.gov.au/corp_site/key_issues/conservation/threatened_species/turtles/facts.html

that foraging turtles in the Gulf of Carpentaria belong to the eastern Australian Loggerhead breeding population, while those that are foraging along the Arnhem Land coast belong to the Western Australian Loggerhead breeding population.

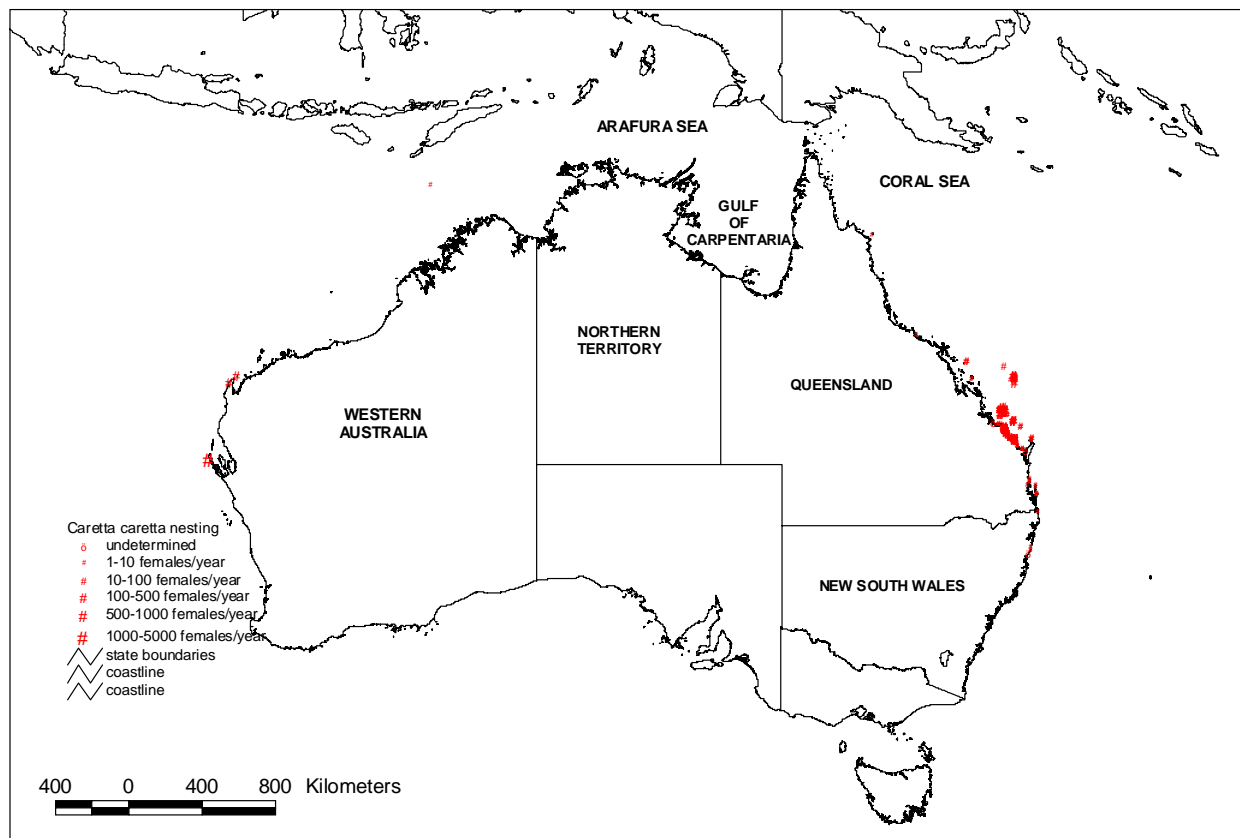


Figure 23: Distribution of Loggerhead turtle nesting in Australia⁹¹

Breeding and life cycle

After entering the water, the hatchlings swim for several days directly out to sea, where they are often found among seaweed and other floating objects. Loggerhead turtles spend about 15 years in the open ocean before they return to Australian waters to feed among soft habitats on the sea floor up to 40m deep. They share their foraging habitats with Olive Ridley turtles and Flatback turtles.

When Loggerhead turtles are ready to breed they return to coastal waters near the beach where they hatched. Mating begins in October and nesting occurs between

⁹¹ Limpus and Chatto (2004)

October and February, with most nesting occurring during December. Hatchlings emerge from nests from December to April.

Females lay approximately three clutches of 125 eggs for the season. Eggs are white and shaped like a ball of about 4 cm diameter and weighing about 36.5 g. The incubation period varies significantly between seasons and is between 45 and 70 days. The time between laying each clutch is about two weeks, during which the females stay within about 10 km of the nesting beach. The period between each nesting season varies from 2 to about 10 years; individual Loggerhead turtles can migrate up to 2,600 km between their foraging areas and their nesting areas, but most travel less than 1000km. Migrations from southern Queensland rookeries to the Northern Territory, Torres Strait, Papua New Guinea, Solomon Islands, New Caledonia and Vanuatu have been recorded.

Feeding

Loggerhead turtles remain carnivorous (eating other animals) throughout their life. Adult Loggerheads feed on a variety of invertebrate animals, such as crabs, shellfish, starfish, and sea cucumbers living on the sea floor. They can burrow into the soft sea floor to find their food.

Indigenous harvest

A small number of large Loggerhead turtles are harvested each year in Torres Strait and along the Papuan coast.

Concerns

For many years, the greatest threat to Loggerhead turtles came from being caught as bycatch in prawn nets. However, since Turtle Excluding Devices (TEDs) were made compulsory on northern Australian prawn vessels, prawn nets are no longer likely to be a significant threat to Loggerhead turtles.

Extensive baiting along the southern Queensland coast over the last 10 years is thought to have reduced the predation by foxes on Loggerhead turtle nests. However, increased coastal development, increased vehicle traffic on nesting

beaches and increased risk from boat strikes are now the major threats to Loggerhead turtles.

The eastern Australian population of Loggerhead turtles has been surveyed for the last 35 years. The number of nesting females has fallen from about 3,500 to about 500 over that time, representing a population decline of about 86%. It is because of this big population decline in just one generation that Loggerhead turtles are listed under the Australian *Environment Protection and Biodiversity Conservation Act* as “endangered”.

Although insufficient information is available to make an accurate assessment of the Western Australian Loggerhead population, researchers have expressed concern about the long term stability of this population. This is because the Western Australian Loggerhead population has been subjected to similar threatening processes as has occurred in eastern Australia, such as bycatch in trawl nets, eggs being eaten by foxes, vehicles driving on nesting beaches and increasing coastal development impacting on nesting beaches.

GREEN TURTLE

Scientific name: *Chelonia mydas* (Family Cheloniidae)

Description

The oval to heart-shaped carapace (shell) of Green turtles is up to 1 metre long, and coloured olive-green, with a mixture of brown, reddish-brown and black. The plastron (belly) is whitish or cream. The carapace has four pairs of scutes (plates) between the centre and outer margin of the shell. Hatchlings are shiny black above, and white below.



Figure 24: Green Turtle⁹²

Distribution and population

Green turtles live in tropical and sub-tropical oceans around the world, and are the most numerous marine turtle in Australian waters. There are seven separate breeding populations of Green turtle in Australia, nesting from the southern Great

⁹² <http://www.cbrentacar.com/Green%20Turtle.jpg>

Barrier Reef in Queensland around the northern Australian coast to Ningaloo in Western Australia (see Figure 25).

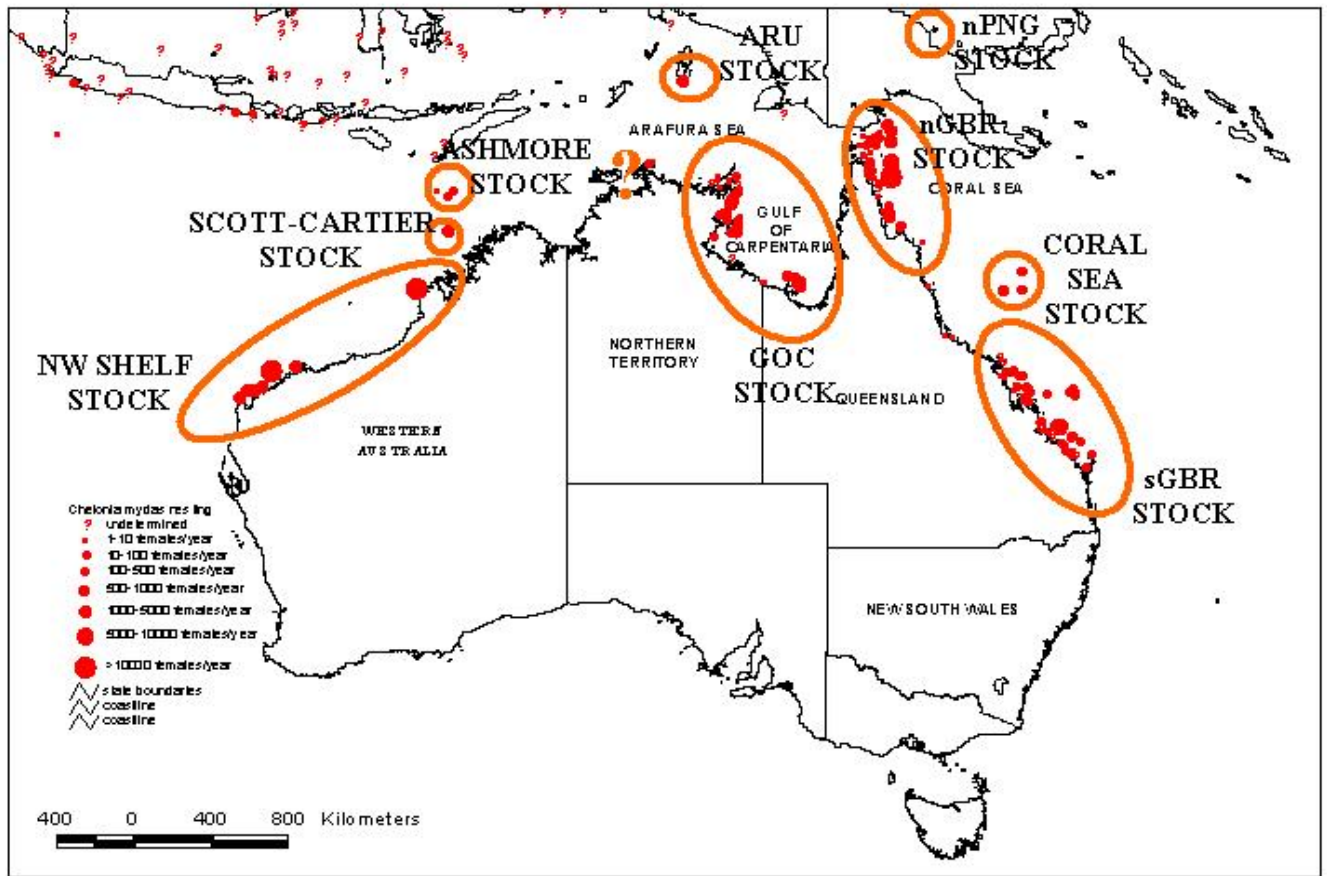


Figure 25: Green turtles breeding populations and nesting locations around northern Australia⁹³

On the east coast of Queensland there are 13 major nesting sites in the southern Great Barrier Reef, including North West Island, Wreck Island, Hoskyn Island, Heron Island, where nesting occurs between late November and January.

The Coral Sea cays host the Coral Sea Islands Territory green turtle stock, with major nesting sites including North East Herald Cay. Nesting occurs between late November and January.

⁹³ Limpus and Chatto (2004)

The northern Great Barrier Reef has five major nesting sites, including Raine Island and nearby cays, as well as Bramble Cay and Murray Island in the Torres Strait. Green turtles from several different breeding populations migrate through Torres Strait at different stages of their lives, making it a critically important habitat for these animals, however the majority of turtles are from the northern Great Barrier Reef breeding stock.

In the southern Gulf of Carpentaria there are three major Green turtle nesting sites within the Wellesley Islands. All these turtles belong to the one breeding population or stock. The large areas of sea grass around the south-west coast of the Gulf of Carpentaria, especially around the Sir Edward Pellew Islands, support large numbers of foraging Green turtles. Tag returns show that some of these turtles travel as far away as southern Queensland and Western Australia to nest, while others nest within the Gulf of Carpentaria. Research undertaken by the Dhimurru Land Management Aboriginal Corporation in Nhulunbuy, in which turtles were fitted with satellite tracking devices, indicate that most (and possibly all) of the Green turtles that nest in north east Arnhem Land remain in the Gulf to feed.⁹⁴

There are Green turtle nesting sites on the north west shelf of Western Australia at the Lacepede Islands, sites north of Broome, and Barrow and the Monte Bello Islands to the south. Green turtles nesting along the Western Australian coast migrate from feeding grounds in Indonesia, western Cape York Peninsula, Northern Territory and Western Australia.

The estimated populations of Green turtles in Australia are summarised in Table 3 below.

Table 3: Estimates of the number of female Green turtles nesting in Australia each year⁹⁵

Breeding area	Estimated annual average number of nesting females
Southern Great Barrier Reef	8,000
Northern Great Barrier Reef	30,000
Southern Gulf of Carpentaria	5,000
Western Australia	20,000

⁹⁴ Kennett et al. (1998)

⁹⁵ <http://www.deh.gov.au/coasts/species/turtles/>

Breeding and life cycle

Female Green turtles lay an average of 5 clutches of eggs per season. Each clutch, laid at intervals of about 14 days, contains about 115 eggs. Green turtle eggs are white balls about 4.4 cm in diameter and weigh approximately 47g. Hatchlings weigh about 25g and have a carapace length of about 5cm.

After leaving their nests, Green turtle hatchlings swim out to sea for at least 24 hours, swimming by day and resting at night. Small juvenile turtles live in the surface waters of the open ocean, but spend less time among seaweed and other floating material than Loggerhead or Hawksbill turtles. Once they grow to between 30 and 40 cm (curved carapace length), which takes about 5 to 7 years, Green turtles begin foraging on the sea floor among habitats containing seagrass or seaweed. These habitats include coral and rocky reefs and seagrass beds close to the coast.

Green turtles take 40-50 years to become mature adults and commence breeding. The timing of the breeding season depends on the nesting location. In the southern Great Barrier Reef, mating begins in October and nesting takes place between October and March, with most nesting occurring in January. A similar nesting season occurs in the northern Great Barrier Reef, but may start earlier and finish later. In the southern Gulf of Carpentaria, nesting occurs all year round with a peak in June and July. In Western Australia, nesting occurs during the summer months.

Green turtles migrate back to their nesting area to breed every 1 to 9 years (average 4 to 6 years), and hence numbers of Green turtles nesting on particular Australian beaches varies considerably from year to year. Figure 20 (page 62) shows the numbers of nesting Green turtles at Heron Island each year over about 40 years.

Migrations between breeding seasons can be up to 2,600 km but average about 400 km. These breeding migrations are linked to the changes in air pressure and water temperature in the Pacific Ocean (measured as the Southern Oscillation Index).

Feeding

Like the other marine turtles, Green turtles feed on small marine animals when they are young, but once they move to their adult foraging grounds Green turtles mainly eat seagrass and seaweed (algae). They also feed on mangrove fruit, jellyfish and sponges.

Indigenous harvest

There are more Green turtles harvested in waters of northern Australia, eastern Indonesia and Papua New Guinea than any other region of the world. There are no accurate counts of the number of Green turtles harvested in this region, but it is estimated to be many tens of thousands, possible as much as 100,000, per year. In Australian waters, many thousands of Green turtles are harvested each year in Torres Strait, the Gulf of Carpentaria, the Top End of the Northern Territory, along the Kimberley coast and along the Queensland east coast (particularly north of Cooktown).

Concerns

Surveys of the two eastern Australian populations of Green turtle since 1974 show that the average size of females nesting for the first time is decreasing, suggesting that these populations may be declining. At Raine Island in the northern Great Barrier Reef, which has the world's largest number of breeding Green turtles in the world, the success of nesting is less than 10% and may have failed completely in recent years because of flooding of the nests. As a result of this nesting failure, populations of Green turtles in northern Great Barrier Reef and Torres Strait can be expected to continue to decline over the next few decades.

There is no long term survey information about the breeding populations of Green turtles in the Gulf of Carpentaria, Northern Territory and Western Australia, however some Traditional Owners in north-east Arnhem Land have expressed concern about a reduction in turtle numbers.

HAWKSBILL TURTLE

Scientific name: *Eretmochelys imbricata*

Description

Hawksbill turtle hatchlings are brown to black on top and light coloured below. They are about four cm long (carapace length) and weigh around 13 - 14g. Adult Hawksbill turtles have an olive-green or brown shell (carapace) with reddish brown, brown or black markings. The shell is high-domed, heart-shaped with overlapping scales. The underside (plastron) is cream to yellowish. Adult female Hawksbill turtles weigh about 50 kg and have a curved carapace length of about 82 cm.



Figure 26: Hawksbill turtle⁹⁶

Distribution and population

Hawksbill turtles live in tropical, subtropical and temperate oceans around the world, though nesting mostly takes place only on tropical beaches. There are probably three separate breeding populations of Hawksbill turtles in Australia (see Figure 27). One population nests on beaches in the northern Great Barrier Reef and in Torres

⁹⁶ Copyright Caroline Rogers 2005

Strait; another population nests on the western side of the Gulf of Carpentaria and a third populations nests along the Arnhem Land coast. The other breeding population nests on islands on the north-west shelf of Western Australia.

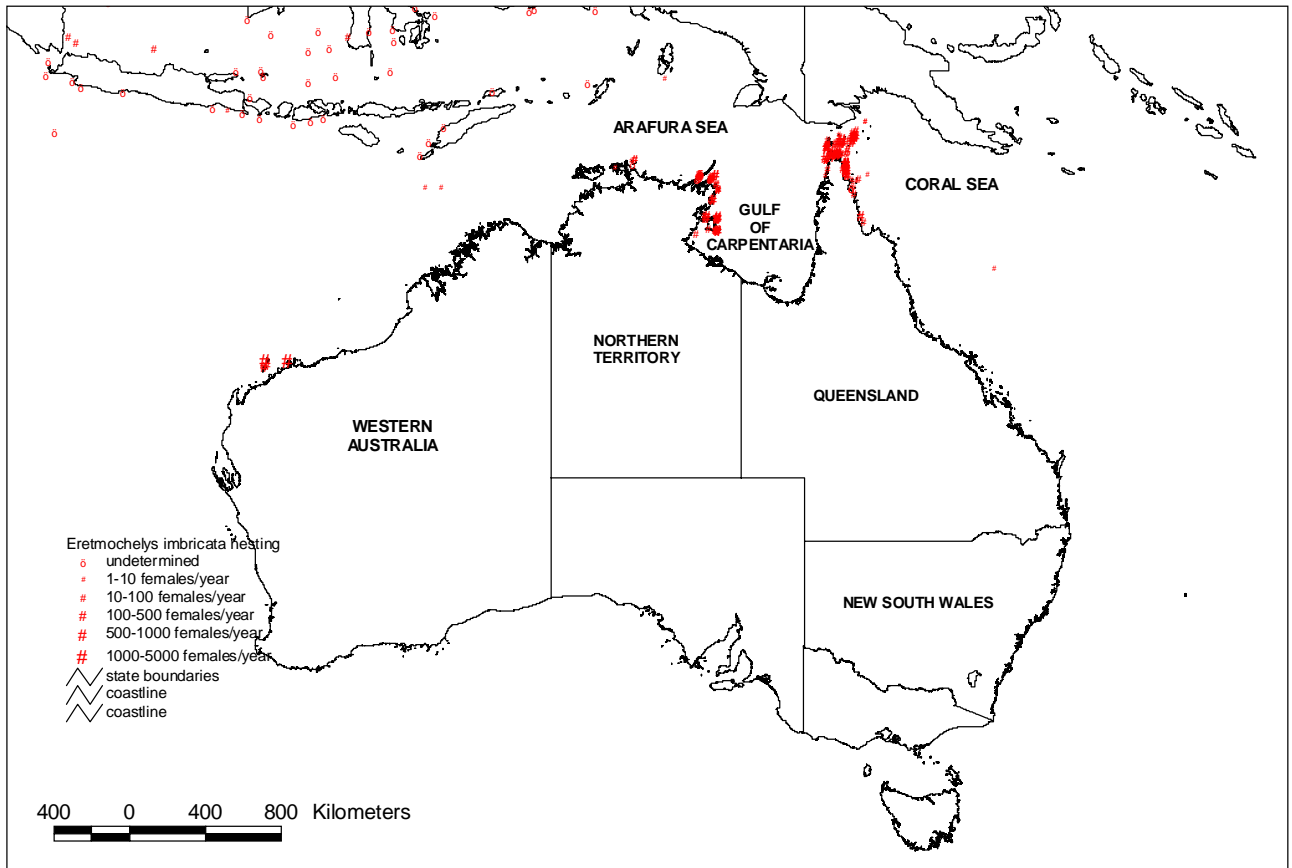


Figure 27: Hawksbill turtle nesting distribution in Australia⁹⁷

Researchers' estimates of nesting females Hawksbill turtles in Australia are shown in Table 4.

Table 4: Estimates of females Hawksbill turtles nesting in Australia each year⁹⁸

Nesting area	Estimated annual average number of nesting females
Northern Great Barrier Reef and Torres Strait	4,000
Arnhem Land	1,000
Western Australia	1,000 to 2,000

⁹⁷ Limpus and Chatto (2004)

⁹⁸ <http://www.deh.gov.au/coasts/species/turtles/>

Breeding and life cycle

After hatchlings leave the nest they enter the water and swim for several days directly out to sea. They spend from five to ten years on the water surface being carried by ocean currents. Hawksbill turtles grow slowly and take at least 30 - 35 years to become mature adults.

Research has shown that Hawksbill turtles can migrate up to 2,400 km between their foraging and nesting locations. Females nesting in the northern Great Barrier Reef migrate as far as the Solomon Islands, Papua New Guinea and Indonesia (see Figure 28). However most turtles probably only migrate less than 100km between their home foraging and breeding areas.

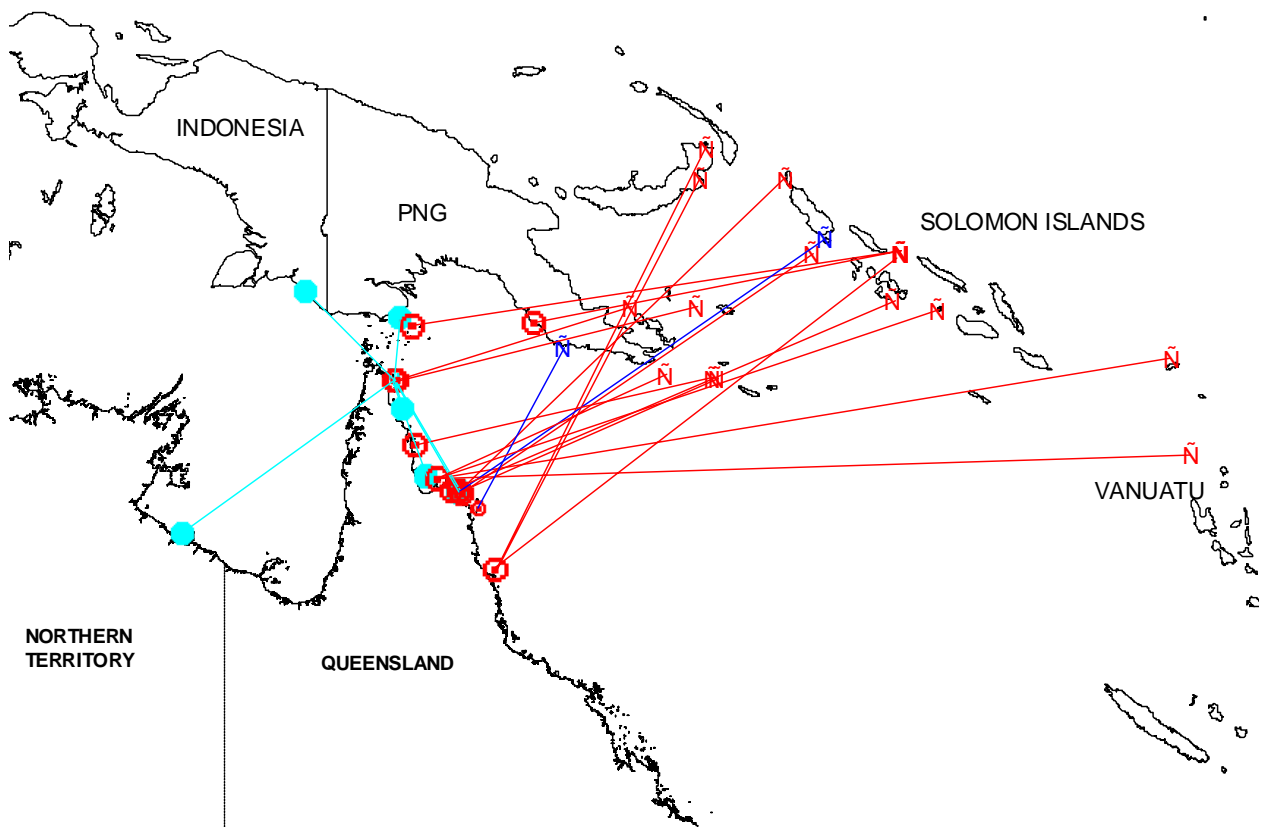


Figure 28: Migration of Hawksbill turtles from nesting beaches in north Qld.⁹⁹

Breeding migration captures of hawksbill turtles from the Coral Sea region. N = breeding site; dot = foraging site for a turtle breeding in Australia; open circle = foraging site for a turtle breeding internationally.

⁹⁹ Limpus and Chatto (2004)

Hawksbill turtle nesting takes place between January and April in the northern Great Barrier Reef and Torres Strait, in the second half of the year in the Northern Territory and all year round (mainly between October and January) in Western Australia.

Female Hawksbill turtles lay between 1 and 6 clutches of eggs each year, with about 120 eggs in each clutch. The clutches are laid about 14 days apart, and each mature female nests every two to five years.

Feeding

Hawksbill hatchlings feed on very small (planktonic) plants and animals floating in the ocean. When they grow to between 30 and 40 cm (curved carapace length) they begin feeding among coral and rocky reef habitats on the sea floor. Juvenile and adults Hawksbill turtles eat a variety of marine plants and animals, particularly algae, seagrass, sponges and shellfish.

Indigenous harvest

There are only small a number of Hawksbill turtles harvested across northern Australia. Hawksbill eggs, however, are harvested by Aboriginal and Torres Strait and communities across the north. As Hawksbills usually nest on islands, it may be particularly important to ensure that the Indigenous harvest in Torres Strait is sustainable.

Concerns

Researchers have identified the threats to survival of Hawksbill turtles include international harvest of immature and adult turtles for tortoiseshell, unsustainable Indigenous harvest of adults and eggs both within Australia and overseas, predation of eggs at nesting beaches by feral animals, ingestion of synthetic materials, boat strike, entanglement in commercial fisheries gear (including ghost nets) and increased incidence of disease.

Numbers of Hawksbill turtles have declined in other countries; Australia probably now has the largest breeding populations in the world. The only Hawksbill turtle nesting population for which there is sufficient information, at Milman Island (northern Great Barrier Reef), indicates a downward trend.

OLIVE RIDLEY TURTLE

Scientific name: *Lepidochelys olivacea*

Description

Olive Ridley turtle hatchlings are blackish brown in colour with a shell about 4 cm long. The shell of adult Olive Ridley turtles is olive-grey and there are five pairs or more of scales between the centre and outer edge of the shell. Adults weigh about 40 kg, with a curved carapace length of about 70 cm and are the smallest marine turtle in Australia.

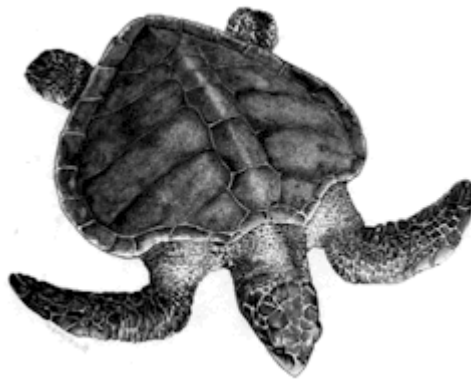


Figure 29: Olive Ridley turtle¹⁰⁰

Distribution and population

Olive Ridley turtles are the most abundant species of marine turtle in the tropical and subtropical oceans waters throughout the world; however they are one of the least common species of marine turtles in Australia. Olive Ridley turtles nest in low numbers on Melville Island and along the coast of Arnhem Land, in the Gulf of Carpentaria and on the north-west coast of Cape York Peninsula (see Figure 30). There are probably only several thousand Olive Ridley turtles living in Australian waters.

Large nesting populations are found in the eastern Pacific and in India, and low density nesting occurs in Papua New Guinea and Indonesia, but the biggest nesting populations are in the eastern Pacific Ocean and south-east Asia. On the coasts of

¹⁰⁰ www.gbrmpa.gov.au/corp_site/info_services/publications/turtle_conservation/images/turtle_olive_ridley.gif

Central America, South America and India, Olive Ridley turtles come together in large nesting aggregations (known as “Arribadas”) of up to 600,000 animals.

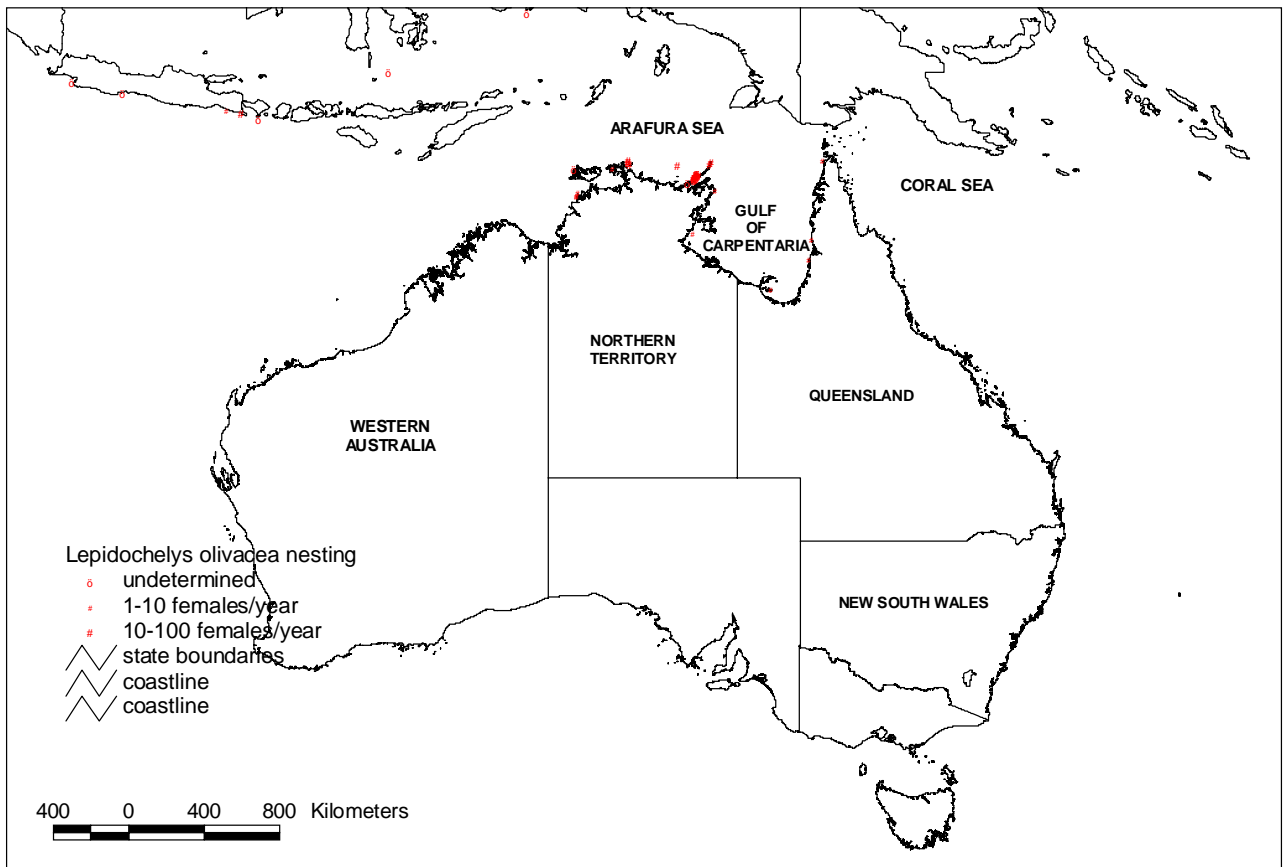


Figure 30: Nesting distribution of Olive Ridley turtles in Australia¹⁰¹

Breeding and life cycle

Olive Ridley turtles mainly breed between May and August in northern Australia. Females usually lay one or two clutches of about 100 eggs per year, but may lay up to 8 clutches in a season. The period between laying each clutch varies between 17 and 45 days.

Very little is known about where the hatchlings go after entering the sea. It is likely that the young turtles drift in the surface waters of the open ocean. Large juvenile and adult Olive Ridley turtles feed both on the sea floor and in the water between

¹⁰¹ Limpus and Chatto (2004)

about 10 and 40 metres, and are rarely seen in shallow waters. Olive Ridley turtles are known to migrate up to 2,600 km between nesting and foraging habitats.

Four Olive Ridley turtles were tracked by satellite for several months during 2005, having been released from the Wessel Islands in northeast Arnhem Land with radio transmitters attached to them. The research involved collaboration between Gumurr Marthakal Rangers, the Northern Land Council and Charles Darwin University¹⁰². By the time the transmitters stopped sending information one turtle was well on her way to the Kimberley region of Western Australia, one was near Aru Island (Indonesia), another was near Groote Eylandt while the fourth was mid-way between Wessel Islands and Aru Island (see Figure 31). The deepest dive recorded for all 4 turtles was 140 metres, and the longest dive was 200 minutes. However, most turtles dived regularly to about 90 - 100 metres, seemingly feeding off the bottom. The animal that spent all its time off Groote Island was in shallower water and dived mostly to 50-60 metres.

Feeding

Little is known about what hatchling Olive Ridley turtles eat. Studies on adult Olive Ridley turtles in Australia show that they mainly eat shellfish. Studies in other countries show that Olive Ridley turtles also eat crabs, shrimps, jellyfish and algae.

Indigenous harvest

An unknown number of Olive Ridley turtles and eggs are harvested across northern Australia.

Concerns

Hundreds of Olive Ridley turtles were killed in prawn trawl nets around northern Australia each year until Turtle Excluding Devices (TEDs) were introduced several years ago. Although TEDs now largely prevent turtles dying in prawn nets, the loss of so many turtles in the past will have an impact on the Olive Ridley population for many decades in the future.

¹⁰² Satellite tracking information provided by Corey Bradshaw, Charles Darwin University

It is not known what impact gill nets have on Olive Ridley turtles. However, over 200 Olive Ridley turtles were killed in a set shark net in Fog Bay in the Northern Territory in 1990. Abandoned fishing nets (ghost nets) that are washed up on beaches and then float back out to sea are known to kill Olive Ridley turtles. About 400 marine turtles, a large proportion of which are Olive Ridley turtles, are killed each year in these nets in the Gulf of Carpentaria. Feral pig predation is a threat to the Olive Ridley turtle population that nests along the western Cape York Peninsula coast.

Populations of Olive Ridley turtles are declining around the world and some formerly large Arribadas (breeding aggregations) are now reduced to several hundred nesting females.

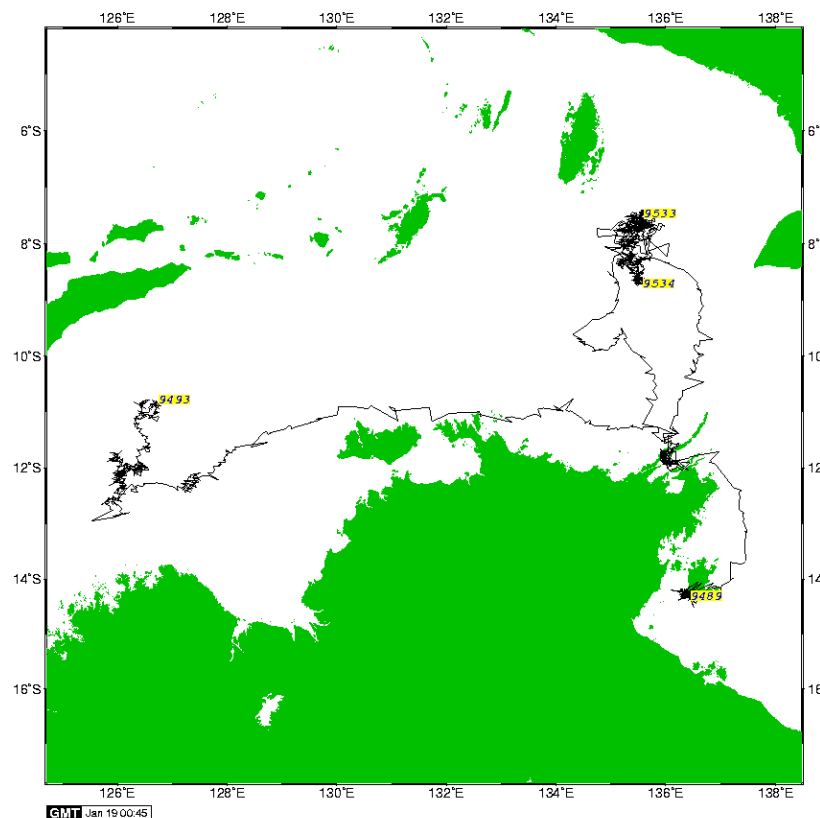


Figure 31: Satellite tracking map of Olive Ridley turtles released in NE Arnhemland¹⁰³

¹⁰³ Map courtesy of Corey Bradshaw, Charles Darwin University

FLATBACK TURTLE

Scientific Name: *Natator depressus*

Description

Flatback turtle hatchlings are olive-green with scales outlined in black; their carapace is about 6 cm long and they weigh about 43 g. The carapace of Flatback turtles is upturned at its edges, fleshy, low-domed and grey, pale grey-green or olive in colour. The curved carapace length of adult females is about 92 cm. The turtles have upturned edges to their carapace.



Figure 32: Flatback turtle¹⁰⁴

Distribution and population

Flatback turtles live only in the tropical seas around northern Australia, Papua New Guinea and West Papua. In Australia, there are two breeding populations of Flatback turtles. One population nests on beaches in the southern Great Barrier Reef; the other breeding population nests in Torres Strait, the Gulf of Carpentaria, along the Northern Territory coast and along the north-west coast of Western Australia (see Fig 33).

The main nesting sites for Flatback turtles are show in Table 5.

¹⁰⁴ Photo courtesy Chloe Schauble

Table 5: Main nesting sites for Flatback turtles in Australia¹⁰⁵

Region	Nesting sites
Southern Great Barrier Reef	Peak Island Wild Duck Island Avoid Island Curtis Island Facing Island
Torres Strait and northern Gulf of Carpentaria	Crab Island *largest in the world Deliverance Island Kerr Island Mainland beaches
Southern Gulf of Carpentaria	Wellesley Islands Sir Edward Pellew Islands
Northern Territory Top End	Cobourg Peninsula Greenhill Island Field Island McCluer Island Bare Sand Cay, Fog Bay
Kimberley Region and North-west Shelf	Cape Drommit Lacrosse Island Barrow Island Cape Thouin

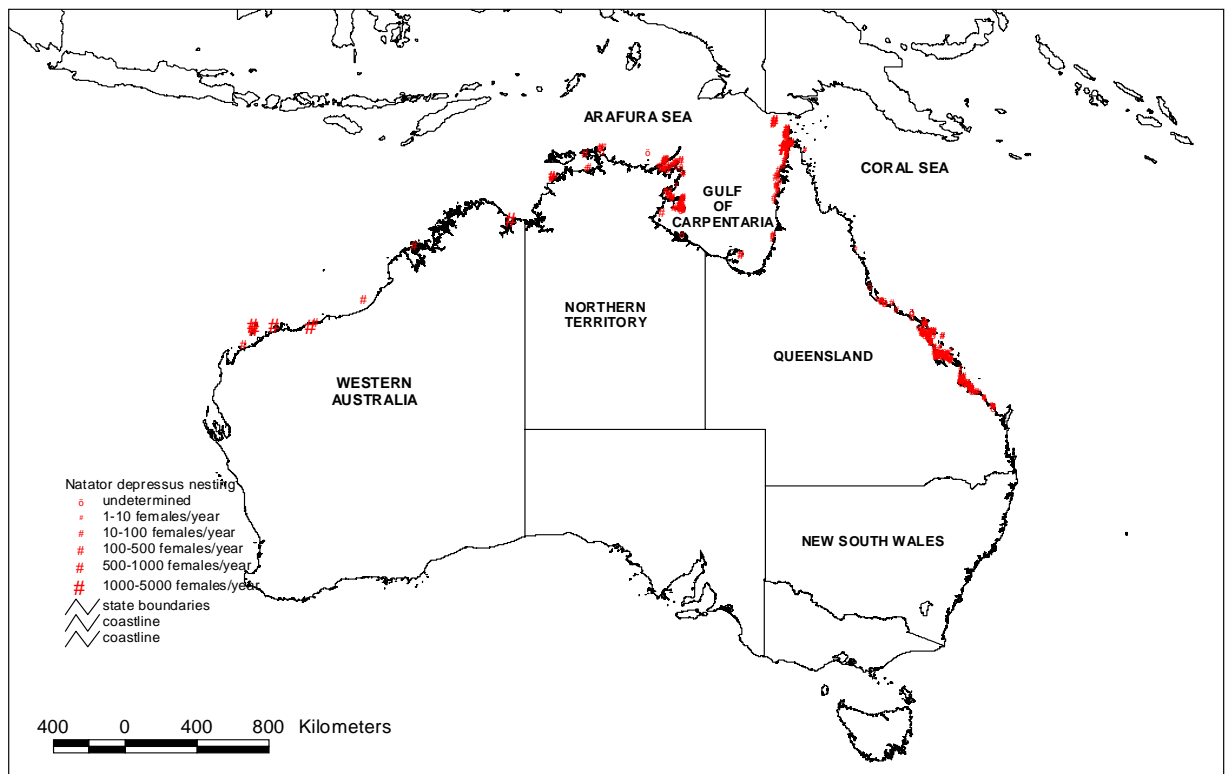


Figure 33: Distribution of Flatback turtle nesting Australia¹⁰⁶

¹⁰⁵ <http://www.deh.gov.au/coasts/species/turtles/>

¹⁰⁶ Limpus and Chatto (2004)

Breeding and life cycle

Unlike other marine turtles, Flatback turtles do not travel long distances out to sea from their nesting beaches. They remain in the surface waters over the continental shelf but do migrate long distances within coastal waters – e.g. from Papua New Guinea to southern Queensland. Adult Flatback turtles forage in coastal waters around northern Australia, Papua New Guinea and West Papua (see Figure 34). Nesting Flatback turtles tagged in southern Queensland have been recaptured between 216 and 1300 km from their nesting beach. They lay eggs the size of billiard balls and hence lay fewer eggs in each clutch (only about 50). They lay 2-3 clutches per season.

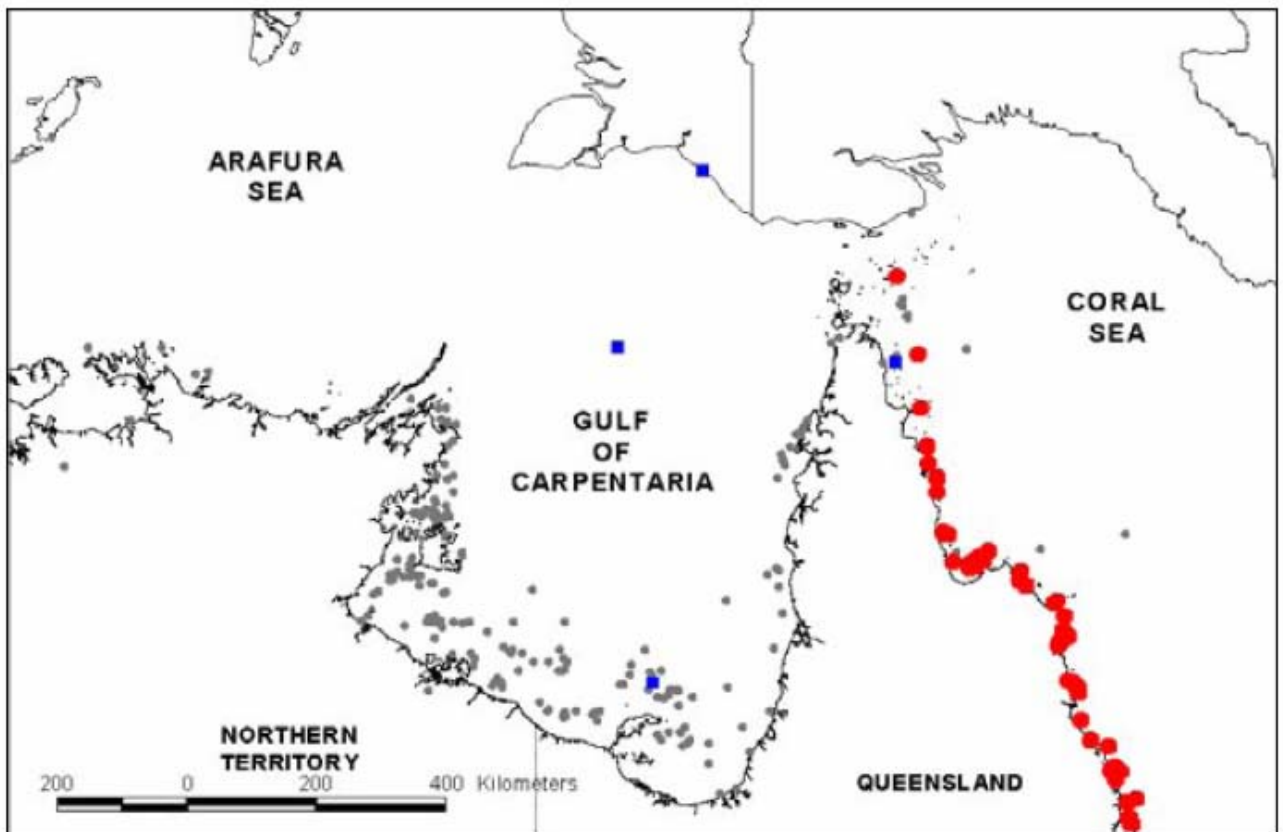


Figure 34: Foraging areas of Flatback turtles in north-eastern Australia¹⁰⁷

- Large dots: Flatback from mid-eastern Queensland breeding stock;
- Squares: Flatbacks from Gulf of Carpentaria nesting populations;
- Small dot: Flatbacks caught in trawl and gill nets, unknown breeding stock.

Surveys in the southern Great Barrier Reef indicate that Flatback turtle numbers have been stable in this region over the last 30 years. There is no data to indicate if Flatbacks in the rest of northern Australia are stable or decreasing.

¹⁰⁷ Modified from Limpus and Chatto (2004)

Flatback turtles begin mating in the southern Great Barrier Reef in October and nest between October and January; in northern Australia Flatback turtles mostly nest between June and August. In the Pilbara region of Western Australia most nesting takes place during the summer, and in the Kimberley nesting occurs in the middle of the year.

Adult Flatback turtles breed once every one to five years. Females lay clutches of about 50 eggs, usually two or three times each year, about 15 days apart.

Feeding

Juvenile Flatback turtles eat shellfish, squid and jellyfish. Adult Flatback turtles are known to forage soft-bottom habitats and eat cuttlefish, hydroids, soft corals, crinoids, shellfish and jellyfish.

Indigenous harvest

Unknown numbers of Flatback turtles and eggs are harvested annually across northern Australia.

Concerns

Hundreds of Flatback turtles were killed in prawn trawl nets around northern Australia each year until the Turtle Excluding Devices (TEDs) were introduced several years ago. Although TEDs now largely prevent turtles dying in prawn nets, the loss of so many turtles in the past will have an impact on the Flatback turtle population for many decades into the future. Flatback turtles are still caught in trawl nets in neighbouring countries, such as Indonesia and Papua New Guinea.

Abandoned fishing nets (ghost nets) that are washed up on beaches and then float back out to sea are known to kill Flatback turtles, though fewer Flatbacks are caught in ghost nets than Greens, Hawksbills or Olive Rидleys.

Other threats to Flatback turtle populations include feral pig predation on eggs, and damage caused by vehicles driving on nesting beaches. Researchers have expressed concern that unsustainable levels of egg harvesting by Indigenous people may result in a decline in Flatback turtle numbers.

LEATHERBACK TURTLE

Scientific name: *Dermochelys coriacea*

Description

Leatherback turtles are the largest of all sea turtles, reaching an average length of 1.6 metres. The carapace is black and leathery with pale spots but without scales; there are prominent ridges running the length of the shell. Leatherback turtles can use changes in blood flow to regulate their temperature, maintaining their temperature in cold water and avoiding overheating in warm water. The pale spots turn pinkish when the turtle is out of the water as blood flows to the surface of the skin to cool the body.



Figure 35: Leatherback turtle¹⁰⁸

Distribution and population

Leatherback turtles live in all tropical, sub-tropical and temperate oceans of the world, but nest mainly on tropical beaches. Leatherback turtles are more widely distributed than any other marine turtle (see Figure 36). Their large size and ability to keep their body temperature higher than the surrounding water enables them to forage in colder and deeper waters than other marine turtles.

¹⁰⁸ <http://seamap.env.duke.edu/seamap/species/images/leatherback-turtle-106.jpg>

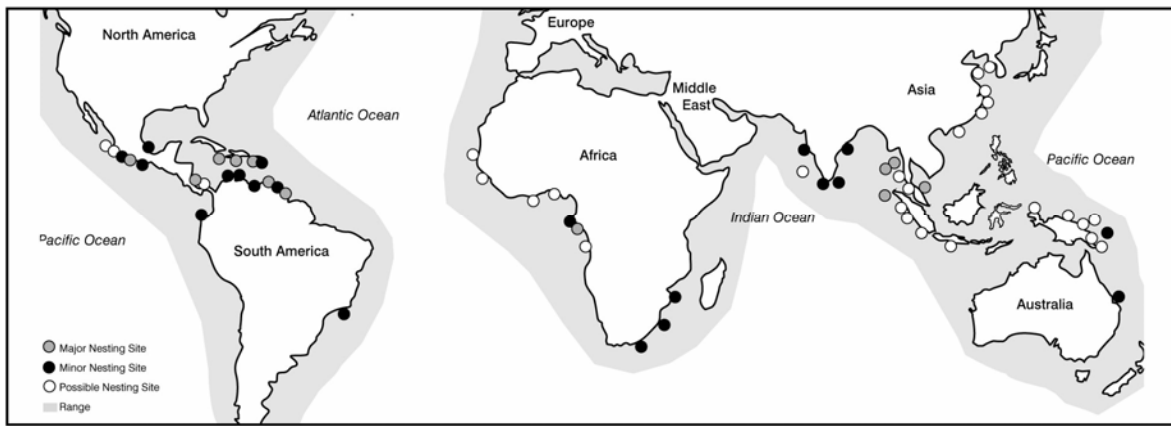


Figure 36: World distribution of Leatherback nesting sites¹⁰⁹

Leatherback turtles feed in coastal waters around the whole of Australia, but nest in only a few locations along the northern coast of the Northern Territory. The number of Leatherback turtles appears to be declining in the Pacific Ocean, suggesting that the population of leatherbacks along the eastern Australian coast may also be declining¹¹⁰. Nesting populations of Leatherback turtles are declining in some parts of the world, such as Malaysia, and rising in other parts, such as South Africa. Nesting and foraging locations for Leatherback turtles in northern Australian are shown in Figure 37

Breeding and life cycle

Leatherback hatchlings swim out to sea after leaving their nesting beach. Little is known about the movement of leatherback turtles. They take about 15 to 20 years to become mature adults, which is ten or twenty years less than for other marine turtles.

Female Leatherback turtles in other parts of the world nest every two or three years during December and January, and lay between 4 to 5 clutches per season, each clutch with between 64 and 100 eggs. The time between laying each clutch is about 9 days. The eggs are white and spherical with a diameter of about 5.3 cm. The eggs hatch after 63 to 93 days.

¹⁰⁹ Modified from www.ccturtle.org/leatherback.htm

¹¹⁰ Spotila et al. (2000)

Some Leatherback turtles feeding in Australian coastal waters probably migrate to neighbouring countries to the north to nest.

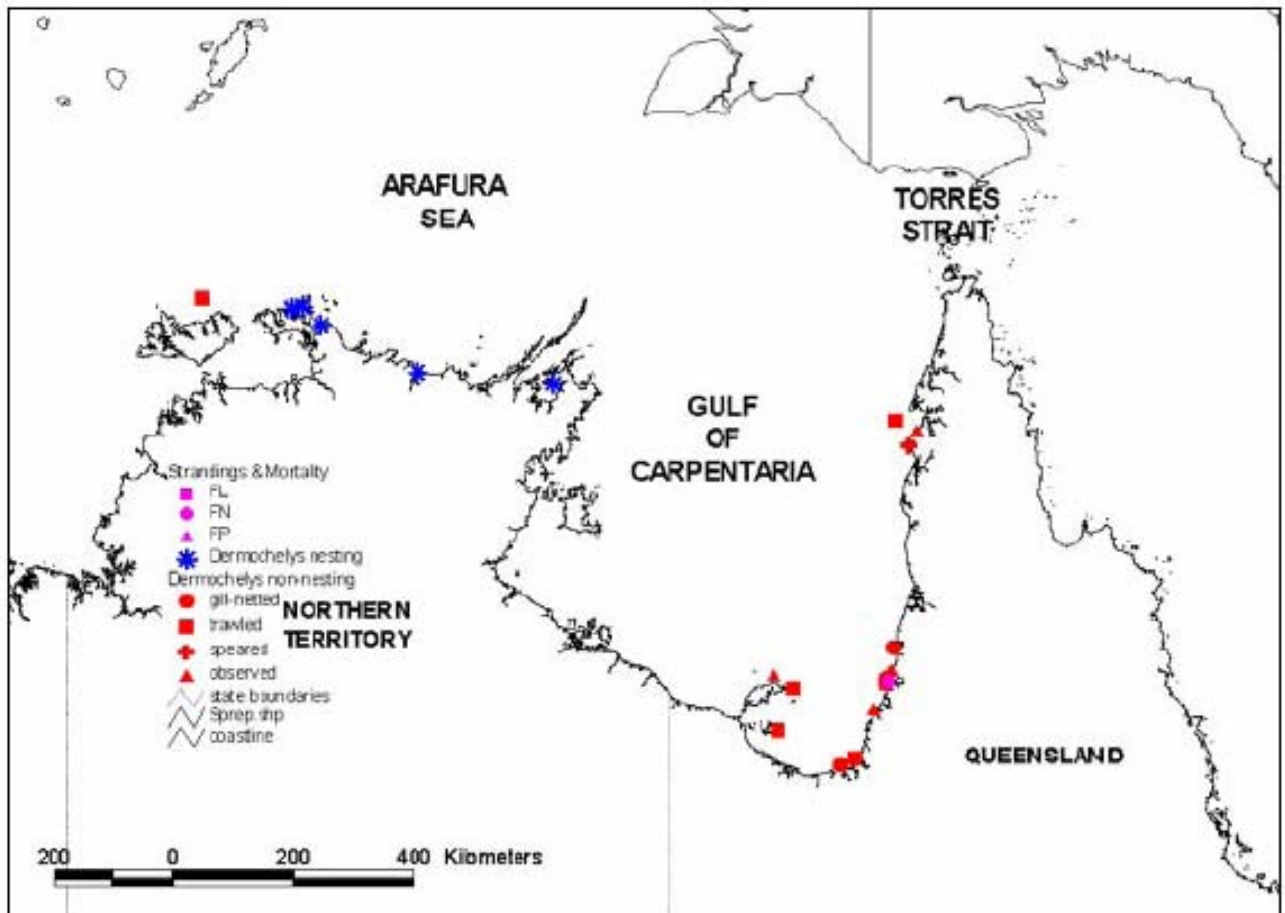


Figure 37: Leatherback turtle nesting and foraging locations in northern Australia¹¹¹

Feeding

The diet of Leatherback hatchlings and juveniles is not known. Adult Leatherbacks feed on jellyfish, salps and squid on the ocean surface and down to depths of 200 metres.

Indigenous harvest

Leatherback turtles are rarely hunted in Australia.

Concerns

Recent reports of a significant decline in the populations of Leatherback turtles in the Pacific Ocean raises concerns for the species in Australian waters. Leatherback

¹¹¹ Limpus and Chatto (2004)

turtles have also been found entangled in marine debris, including fishing lines and nets in many parts of the world including Australia.

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