

# Loggerheads not lost!

*John McGrath examines the plight of an ancient, nomadic mariner, and discovers a cohesive conservation project in a rustic oasis on Western Australia's Coral Coast.*

The Loggerhead Turtle (*Caretta caretta*), or simply Loggerhead, is the world's second largest turtle, and the largest hard-shelled turtle, being eclipsed in size only by the Leatherback Turtle (*Dermochelys coriacea*), which possesses a fleshy carapace. Adults attain an average weight of around 150kg and an average length of about 90cm, but can reach a size of over 450kg and two metres! Loggerheads are distinguished by a red-brown carapace and a pale yellow plastron. They are equipped with a large head and powerful jaws. Maximum longevity is estimated to be in excess of 65 years.



Loggerhead Turtles enjoy a widespread distribution in tropical and subtropical regions, and are commonly found in coastal habitats, where food is more plentiful. They are primarily carnivorous, and have a very varied diet consisting chiefly of bottom-dwelling marine invertebrates such as crustaceans, molluscs and urchins; this may be supplemented with jellyfish, fish, plants and algae. The turtles will forage during daylight hours, and although most dives do not exceed 30 minutes, Loggerheads are capable of staying submerged for several hours, especially in colder waters. They sleep while resting on the seabed.

Male Loggerhead Turtles spend their entire lives at sea, while females emerge onto dry land only briefly to lay their eggs. Sexual maturity is acquired relatively late in life, and although some females first reproduce at 17 years of age, others must wait until they are at least 30. Receptive females may attract males using pheromones. The successful suitor will mount the female, but can expect the unwanted attention of rivals, who will attempt to bite him whilst he is in an amorous embrace and may inflict nasty wounds. Loggerheads are promiscuous and multiple paternity is common.

In what may represent one of the longest seasonal migrations of any marine animal, female Loggerheads are driven to return to the beach where they were born in order to nest. Some years ago one female was tracked from Mexico across the Pacific

to a nesting site in Japan – a distance of 14,500km. In 2015, a female from Western Australia was tracked for more than 2,000km. The turtles navigate both by using visual cues and by sensing and interpreting the Earth's magnetic field. This has recently been proven by correlating subtle changes in the magnetic field with small corresponding shifts in turtle nesting sites.

Mature females reproduce only every second or third year, laying 3-5 clutches of eggs at intervals of roughly 2-3 weeks during spring and summer. Each clutch comprises an average of over 100 eggs, which are deposited in a chamber which the female excavates with her hind limbs, and later conceals as carefully as possible. The most important nesting areas are in Florida and on Masirah Island in Oman. Estimates vary considerably, and can become outdated very quickly, but it is probably safe to say that each of these two sites is home to at least 15,000 Loggerhead nests each year. Australia has two nesting areas, one of which is centred on the southern part of the Great Barrier Reef, in Queensland, and the other which stretches along the Ningaloo coast and includes adjacent islands in Western Australia. The latter can host up to 2,000 nests during the breeding season, with nesting activity usually peaking in December.

Loggerhead Turtles exhibit temperature-dependent sex determination, with an incubation temperature

**'Male Loggerheads spend their entire lives at sea, while females emerge onto dry land only briefly to lay their eggs.'**



All images courtesy of Karen Hattingh, Ningaloo Turtle Conservation Program.

**'Hatchlings usually emerge under cover of darkness, and immediately head for the water.'**



of 30°C producing equal numbers of both sexes, whereas higher temperatures will result in a predominance of females, and lower temperatures produce more males. The hatchlings emerge after about 80 days, usually under cover of darkness, and immediately head for the water, which they recognise by reflections of light from the surface.

Adult Loggerhead Turtles occasionally fall victim to large sharks and Killer Whales, but their sheer size makes predation events rare (although nesting females are in a far more perilous predicament once exposed on land). Adults have a reputation for being somewhat snappy, and will often engage both conspecifics and other turtle species with their formidable jaws, which are routinely used to crush hard-shelled prey such as conchs. They will present the full face of their shell to potential predators as a shield and then use superior manoeuvrability to seize opportunities to counterattack with their fearsome bite.

Turtle eggs and newly-emerged hatchlings, however, represent a convenient delicacy for a veritable army of predators, including birds, reptiles, mammals and invertebrates such as crustaceans, insects and worms. Hatchlings that are not picked off in their dash to the water must then run the gauntlet of a horde of waiting fish, eels and crabs.

The few that survive this maelstrom will orientate themselves perpendicularly to the waves and continue to swim for many hours until they are far offshore. Juveniles will often utilise the protection afforded by mats of floating Sargassum algae, which they share with many other organisms. They will drift in this pelagic environment until about 45cm in size, whereupon they migrate to coastal waters.

The combination of a prolonged generation time, coupled with low natural recruitment and total reliance upon scattered nesting beaches renders the Loggerhead Turtle especially vulnerable to any additional threat. As a measure of the fragile

**'As little as one in 2,000 female Loggerheads will eventually return to the beach of their birth.'**

ecology of the species, as little as one in 2,000 female Loggerhead Turtles will eventually return to nest at the

beach of their birth. Loggerheads have been accorded endangered status by the IUCN, and international trade is prohibited under CITES. In Australia, the species is protected by both Commonwealth and State legislation. But despite the difficulty in forming reliable population estimates of such a cosmopolitan and migratory species, available data from nesting sites continues to indicate persistent and marked declines. This is easily attributed to a suite of factors with a single common causal agent: mankind. Incredibly, turtles and their eggs are still consumed by humans in many parts of the world where effective protection is lacking.



The addition of exotic or displaced predators can wreak havoc in a delicate ecosystem. Foxes were introduced to Australia by the early settlers, and almost completely obliterated turtle nests in some parts of the country prior to aggressive control measures in the latter part of the last century. Similarly, in the United States, the proliferation of the Raccoon in association with urban development has resulted in devastating losses of turtle nests on some Florida beaches. This has been successfully combated by covering nests with wire mesh, although due to concerns that this material may interfere with the turtles' magnetic navigation, alternatives are being investigated.

Encroaching development also poses a number of other threats to nesting beaches. Physical obstacles may be created by devices designed to arrest erosion, piers, jetties and other structures. Artificial lighting may deter nesting females and confuse hatchlings' sense of direction in their attempts to reach the water. Human and boat traffic is another consideration, while ironically, the shadows thrown by tall buildings may actually assist to negate the effects of climate change, as turtle nests are cooled by the resultant shade.

Commercial fishing activities have taken a heavy toll on Loggerhead Turtles, in particular since many productive fishing grounds appear to overlap with the turtles' favoured foraging areas. Animals that become ensnared or tangled in fishing equipment will, if unaided, almost inevitably drown. Longlines, seines and gill nets have all been responsible for significant casualties, however, these pale in comparison to the destruction wrought by shrimp trawlers in the Gulf of Mexico. Once estimated to account for around 80% of all turtle deaths due to commercial fishing in the US, as recently as 1990 the trawlers were believed to have caused a staggering 50,000 or more Loggerhead fatalities annually. Fortunately, the numbers of turtles killed in US fisheries have decreased by more than 90% in the last 25 years, in response to the introduction of conservative measures such as circle hooks on longlines and, most significantly, Turtle Excluder Devices (or TEDs) in shrimp nets.

Conceived in the 1970s, TEDs simply consist of a metal grid which prevents larger 'bycatch' items from passing into the back of the trawl net. These organisms are then able to escape via a small window in the net which is adjacent to the grid. Turtle Exclusion Devices became mandatory in the US in 1987. Although they have been successful in dramatically reducing turtle mortalities, they are not without flaws and may cause some of the shrimp catch to be lost. It is a relatively simple matter for trawlers to disable their TEDs once out of port, and this is difficult to police – as are limitations on tow times, which have also been implemented. More recently, the World Wide Fund For Nature (WWF), in conjunction with a number of other organisations, has developed the Trash and Turtle Excluder Device (TTED), which is a significant improvement on the original design. The TTED has the advantage of improving the overall quality of the catch, as well as conserving fuel, and has therefore rapidly gained the acceptance of the shrimp industry.

Pollution, especially in the form of plastic waste, also constitutes a serious threat to marine turtles, which commonly ingest this material as it is easily mistaken for jellyfish. Considering the Loggerhead's sensitive natural ecology and the raft of recent pressures imposed, it is perhaps surprising that the species still survives at all.



## Gnaraloo delivers the goods.

The far-flung nature of the Loggerhead's nesting beaches is a basic hindrance to the implementation of any universal, coordinated conservation program. There are a number of local and regional organisations dedicated to the conservation of marine turtles, and these typically rely heavily upon volunteers to identify and protect - or in some instances relocate - nests, and to collect data and assist in other studies. Hatchlings may be assisted or raised for some time in special facilities. The importance of these activities cannot be underestimated, as the IUCN now believes that the Loggerhead's continued survival is dependent largely on conservation efforts.

Gnaraloo Station is situated on the coast of Western Australia, about 1,100km north of Perth. It abuts

65km of coastline at the southern tip of the Ningaloo Reef that has attracted World Heritage status from both the IUCN and UNESCO, and is recognised as a National Heritage area. Adjacent to remote beaches in the Ningaloo Marine Park that constitute important nesting sites for Loggerhead Turtles, Gnaraloo also contains unique endemic flora and fauna, and borders an important wetland that hosts over 20 species of migratory birds, with rare subterranean fauna that inhabits a labyrinth of caves and caverns.

Yet despite being accepted as a biodiversity 'hotspot' and being accorded a 'high status of protection' by the Western Australian Planning Commission, this important landscape has nevertheless recently been threatened by development of one of the key Loggerhead nesting beaches. The Gnaraloo Wilderness Foundation was established with the intention of preserving these precious

There were simply too many amazing images from Gnaraloo, so we have included several more in slide shows:

**Left:** this collection of photos gives a glimpse of the turtle conservation work being conducted.

**Right:** Gnaraloo is home to some spectacular environments—both marine and terrestrial.

natural assets, and is committed to public education and scientific research. In 2008, the predecessor of this not-for-profit organisation (the Gnaraloo Station Trust) commenced the Gnaraloo Turtle Conservation Program and the Gnaraloo Feral Animal Control Program – two projects that, for obvious reasons, share a close association. Foxes (which are previously likely to have been responsible for significant predation on turtle nests in Gnaraloo) together with feral cats and wild dogs are targeted by the control program, which has been so successful that there has been no evidence of predation on turtle nests by feral animals since 2010.

The Gnaraloo Turtle Conservation Program currently focuses on two high-density turtle rookeries, in which Loggerheads are the primary nesting species. Baseline data is collected, with the goals of identifying trends and effective management strategies, and protecting the turtles and their critical nesting habitat. Surveys have revealed that the southern extremity of the Ningaloo Coast is visited by larger aggregations of nesting turtles than previously believed. Gnaraloo's comprehensive program offers scientific internships and training for other professionals, and findings are published in detailed scientific reports that have achieved international recognition. Informative educational



presentations are conducted for schools and other groups, both face-to-face and (for those further afield and overseas) through Skype in the Classroom. School groups also have the opportunity to join the Gnaraloo Turtle Conservation Program and to participate in onsite turtle research and conservation.

This innovative project is starting to bear real fruit; for nearly a decade, the total number of Loggerhead nests recorded at Gnaraloo had shown a steady decline, but in 2016-7 more than 400 nests were located, up from just over 300 in 2015-6.

"We were super surprised," said Karen Hattingh, the chief scientist of the Gnaraloo Turtle Conservation Program. "The nesting activities went up much more than we expected."

Although the reason for the substantial increase in nesting activity is not known, Ms Hattingh did credit the control of feral predators as being of significant assistance to nest protection, which is an investment in the future return of the turtles.

Gnaraloo offers campsites and cabin-style accommodation, with attractions including swimming, snorkelling, diving, fishing, world-class surfing, and the opportunity to experience turtle conservation work firsthand in a pristine wilderness location. This innovative enterprise has won a number of awards, and some sense of the extraordinary unspoilt



beauty of the local environment can be derived from the magnificent images kindly provided.

If Gnaraloo serves as a sustainable model for both wilderness-based tourism and turtle conservation, then perhaps there is hope that similar initiatives can provide protection for nesting beaches in other parts of the world.

For further information, or to plan an amazing Gnaraloo experience, go to: [www.gnaraloo.org](http://www.gnaraloo.org)  
Facebook: Gnaraloo Wilderness Foundation and Gnaraloo Turtle Conservation Program.

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# Turtle Trivia:



Since first being described in 1758, the Loggerhead Turtle has been assigned more than 30 different scientific names!



Loggerheads are capable of naturally hybridizing with several other species of sea turtles.



An assemblage of turtles is called a flotilla.



Out of water, marine turtles appear to 'cry' due to the activity of highly modified lachrymal (or lacrimal) glands, which excrete a concentrated salt solution, thereby allowing the turtles to drink seawater and consume marine plants and animals that contain a high salt concentration.



Magnetite is a naturally-occurring iron oxide and has the strongest magnetic properties of any mineral. Magnetite crystals have been discovered in the brains of marine turtles and this is doubtless instrumental in their ability to navigate by magnetic compass..