

Filling in the holes

Alistair Green works with communities to improve our knowledge of sea turtles in a remote part of Western Australia.



A loggerhead turtle (*Caretta caretta*) photographed during a daytime survey. Image: Nicholas Goldsmith.

Sea turtles are widely accepted as functionally important, flagship species for marine conservation. They have a high public profile, are widely distributed in tropical and warm temperate ecosystems and are susceptible to many well-known anthropogenic threats (e.g. fisheries by-catch, habitat loss and climate change) throughout their complex life cycles. However, despite the high level of attention turtles receive, there are still important gaps in our knowledge of their basic biology in many regions, particularly those that are remote or otherwise inaccessible.

The South-East Indian Ocean population of loggerhead sea turtles (*Caretta caretta*) is the least well-studied of the seven management units for this species. Information on the status of this population is limited; therefore, it is critical that we implement research and monitoring programmes to answer basic questions such as: how many females in this population nest in a

given year? Where do they nest and why? How many clutches do females lay per year? What influences hatching success? How often do females migrate between feeding and breeding grounds? Where are their primary feeding sites?

The Gnaraloo Turtle Conservation Program (GTCP) is a monitoring, research and community engagement programme located in a remote part of Western Australia (WA), approximately 1,100 km north of the city of Perth. It was initiated in 2008 by a private wilderness tourism business—making it unusual among turtle conservation programmes—based at Gnaraloo Station, a working pastoral station covering some 90,000 ha of coastal outback. The GTCP aims to identify, monitor and protect sea turtle rookeries found within the southern part of the Ningaloo Coast World Heritage Area, where little research has taken place historically. Furthermore, the GTCP aims to increase public awareness of turtle and marine conservation by giving

presentations to school and community groups on-site and throughout WA and the rest of Australia.

Each turtle nesting season, the GTCP recruits a small field team (typically five people) who conduct daily beach surveys to count and interpret turtle tracks in order to establish the size and species composition of rookeries at Gnaraloo. Annual monitoring since 2008/2009 has revealed that Gnaraloo Bay—the main turtle nesting beach on the station—receives an average of just over 400 nests per season. Preliminary surveys on Cape Farquhar, a more isolated beach, 22 km north of Gnaraloo Bay, suggest that this site may receive a comparable, or slightly lower, number of nests each year. Approximately 97% of nests on Gnaraloo beaches are from loggerhead turtles, with green turtles (2%) and, possibly, hawksbill turtles, nesting rarely.

The main loggerhead turtle rookery for the south-east Indian Ocean is located on Dirk Hartog Island, at the

mouth of Shark Bay, approximately 200 km south of Gnaraloo. Some 1000–3000 females nest on 80 km of beach at this site annually. Thus, the rookeries at Gnaraloo are relatively small. However, small rookeries that are geographically distant from primary, high-density nesting sites can still play an important role in population dynamics. Due to a condensed nesting area, the main nesting site at Dirk Hartog Island has the potential to be wiped out by extreme events. Should this happen, the sea turtle population at Gnaraloo Bay can act as a population buffer. Therefore, Gnaraloo Bay Rookery is an important nesting beach that contributes to genetic diversity for this understudied population.

The GTCP operates in cooperation with the Gnaraloo Feral Animal Control Program (GFACP), which was implemented to reduce the impact of feral predators on sea turtle nests on the Gnaraloo coast. Prior to 2008 nest predation was a major issue,

Spreading the word

The GTCP provides a strong focus on community engagement. Public engagement and widespread awareness of environmental issues provides a connection between researchers and members of the public that can inspire conservation. In the field at Gnaraloo, community members and school groups are invited to join the GTCP on day/night beach surveys to learn about monitoring techniques and sea turtle conservation. Once the nesting season concludes, the team travels south along the WA coast, stopping at different towns between Gnaraloo and Perth to give presentations to students and community members. During the 2014/2015 season, the field team reached over 7,000 people, highlighting the programme's focus on raising awareness for sea turtles and conservation through education.

turtle eggs and hatchlings from foxes, feral cats, and wild dogs. The effectiveness of the GFACP is independently monitored by the GTCP team during field surveys (i.e. feral predator track counts). The work carried out by the field team and their collaboration with GFACP is critical for the on-going protection of Gnaraloo rookeries.

In 2016 the GTCP began satellite tagging of the nesting loggerheads led by Aub Strydom (University of Queensland). Little is known of the foraging

built turtle tracking app has been created. The “Turtle Tracker” app allows users around the world to view and track the female turtles making their migrations. This novel approach utilizes current technology and interlinks it with conservation, enabling mainstream audiences to learn about research. The satellite tags will regularly fix and transmit a GPS location when the turtle comes to the surface to breathe or is returning to nest. The app is already up and running with five females having been released, so you can follow them throughout the nesting season and beyond. We are hoping to discover how these turtles move while on the breeding ground near Gnaraloo and identify where they go to feed once they are done nesting. Turtles spend around 75% of their adult life cycle in their feeding zones, so it is vital to know where the females that nest at Gnaraloo go for their effective conservation. “Turtle Tracker” is free and can be downloaded for Apple, Google and Windows phones.

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Above: a loggerhead turtle being fitted with a satellite tag. Image: Alistair Green. Right: a tagged loggerhead turtle is released. Images: Kimberly Nielsen.

with over 80% of nests being affected by feral animals; however, since the 2010/2011 season, feral predation has been reduced and maintained at 0%, providing complete protection of sea

habitats and breeding grounds for this population, therefore, this will enable critical spatial and temporal data to be gleaned. To coincide with the tagging programme, the world's first purpose-

