



Research Flier⁸

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Green Turtles that call the Gulf of Carpentaria home

*New research highlights the importance
of collaborative land and sea
management by indigenous communities*

Green turtles are important to the livelihoods of Indigenous people across north Australia as a significant natural, cultural and economic resource.

The sustainable management of turtles for the benefit of future generations is an important responsibility for coastal Indigenous Australians (Saltwater People). However, management is complicated by long distance migrations of green turtles that take them across regions and even between countries.

Saltwater People are working with researchers to better understand green turtle migrations and so to identify the people who share their responsibilities for looking after turtles.

For further information

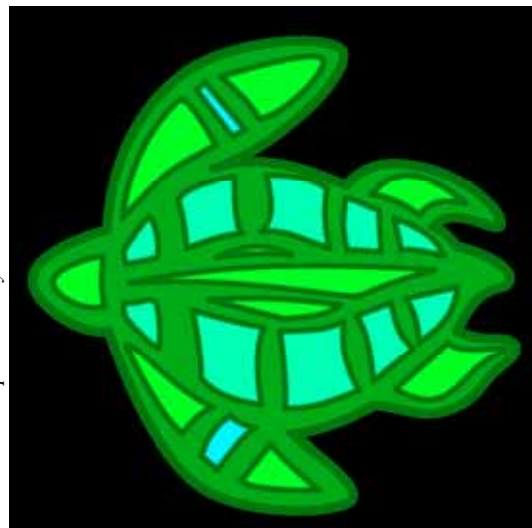
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As hatchlings, green turtles spend many years drifting around in ocean currents, moving between feeding grounds before selecting a sea grass pasture where they will spend their adult lives. As adults, female green turtles spend much of their lives on their feeding ground, migrating every five years or so, back to the region they were born in, to mate and nest. Male green turtles also migrate every 1-3 years back to mate in the region they were born.

So, the management of green turtles is actually quite complicated - because the turtles that live together on a feeding ground will all migrate to several different nesting areas every few years. Likewise, turtles found nesting on the same beach are likely to have migrated to that place from many different feeding grounds around Australia or even overseas.



Graphics: Tony Lee & Ian Lee

While it is very difficult to study the drifting migrations of hatchlings, there are a number of ways we can study the migrations of adults.

Turtle tagging allows us to see how far apart their nesting and feeding grounds are, but to increase the chance to recapture a tagged turtle we need to tag thousands of turtles and there can be many years between recaptures.

Tracking turtles with satellite radio transmitters gives us accurate “real-time” data on migration routes and behaviour, but is expensive and transmitters only last a year or so at most.

Many Indigenous communities have tagged turtles and some have tracked them by satellite tracking programs. The Dhimurru story of satellite tracking is a good example of how Indigenous rangers used satellite tracking to understand green turtle migrations. Many communities have also participated in genetic studies by providing tissue (skin) samples to researchers, but these studies can take many years to complete.



Skin samples are collected from a green turtle

Through genetic studies at different nesting beaches around Australia, researchers can identify distinct families of turtles that breed and nest in the same regions. Because female turtles always gather together to breed in the same region, their offspring inherit a specific ‘family code’ that identifies them as a distinct family or ‘stock’ of turtles. Genetic studies have shown that there are many different stocks of green turtles around Australia defined by the different geographic regions from where they come from. Using this information we can also study turtles at a feeding ground, discover which stock they are and therefore where they have come from.

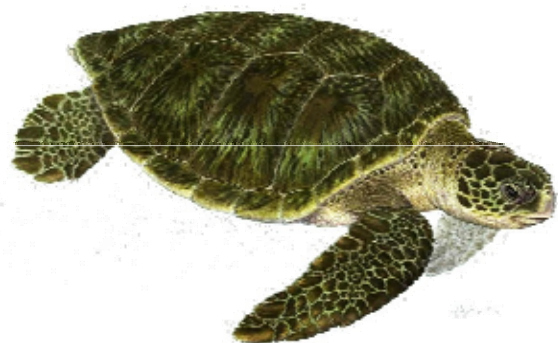


Sample analysis in the Wildlife Genetics Lab.

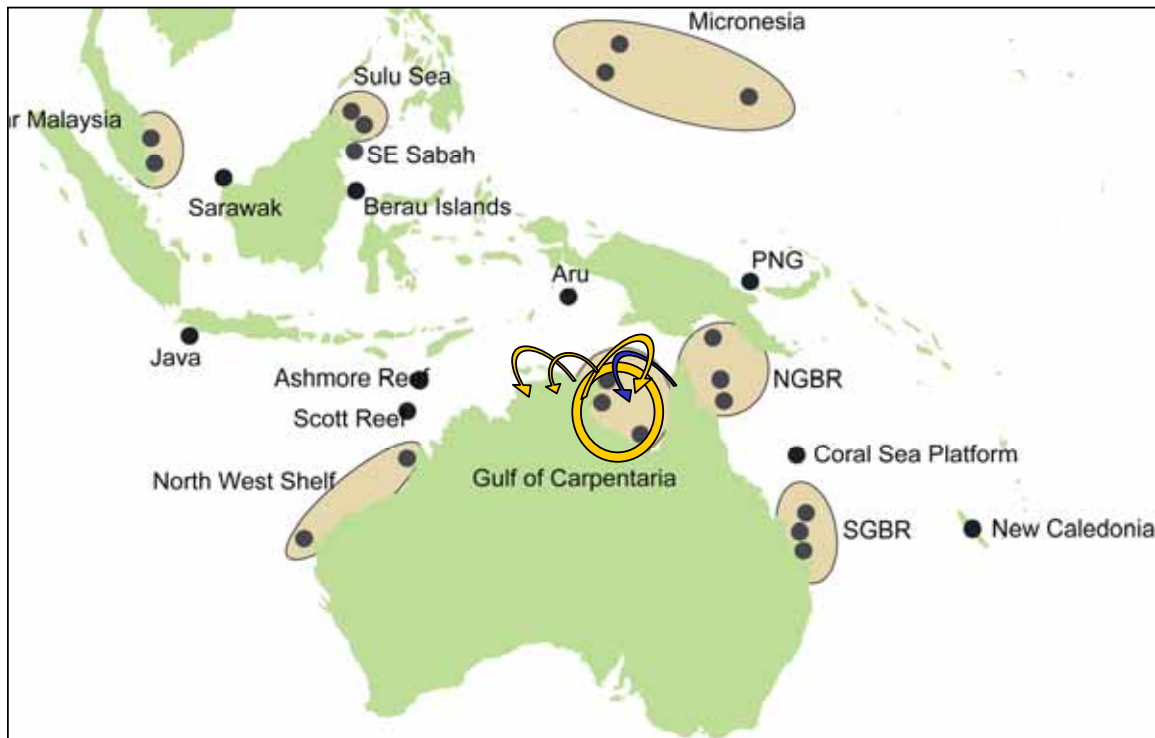
How do we learn about turtles from their DNA?

Genetics is the study of DNA and genes – the basic building blocks of life that are contained in every living cell of all creatures. Just as each individual is unique, the DNA within the cells of one individual is a bit different to the DNA of every other individual. Also, the more closely related two individuals are, the greater the similarity there will be between their DNA. Different categories of DNA (called genetic markers) are used to find different types of information. Several such markers are found in the mitochondrial DNA, a type of DNA that is inherited only from the mother regardless of whether we are talking about people or turtles. This makes these markers particularly useful for distinguishing between groups or populations of nesting turtles. It is a very good tool to help understand population histories, and to identify the origins of turtles at feeding grounds or captured in harvests.

Together with the tagging information and satellite tracking, genetic studies of turtle stocks can be used to understand where turtles come from and where they spend their time.



This story is about genetic studies on green turtles in the Gulf of Carpentaria. For more than 10 years, Indigenous rangers and Traditional Owners around the Gulf have been collecting tissue samples from turtles as part of their turtle management programs. Results from these genetic studies have now been analysed, and reveal some unusual characteristics about the Gulf of Carpentaria green turtle stock.



This map shows the GoC stock circled in yellow. The yellow arrows show the turtles that hatched in the GoC and either stay there to feed, or migrate to feeding grounds found elsewhere (10% of turtles sampled). The blue arrow indicates the smaller number of turtles from the northern Great Barrier Reef stock that migrate for feeding into the Gulf.

What have we learned?

The results of genetic studies on green turtles in the Gulf of Carpentaria have shown us:

- The green turtles that mate and nest in the Gulf of Carpentaria are closely related to each other and form a distinct family or 'stock' called the Gulf of Carpentaria (GoC) stock. The GoC stock is genetically different from all the other 17 green turtle stocks that nest in different parts of Australia and nearby countries.
- Most of the turtles that feed in the southern portion of Gulf of Carpentaria belong to the GoC stock. For example, more than 90% of the green turtles that feed within the Gulf at the Sir Edward Pellew Islands are GoC stock and so hatched in the Gulf.

- Of the less than 10% of green turtles feeding within the southern Gulf of Carpentaria that have come from other areas, most have come from the northern Great Barrier Reef breeding population.
- Only a small number of GoC stock turtles were found to live on feeding grounds outside the Gulf. These were turtles that live on feeding grounds near Fog Bay (south of Darwin, NT) and near Field Island (Kakadu National Park) and only migrate into the Gulf to nest. The GoC stock turtles did not appear in any of the other feeding grounds around Australia. These observations suggest that most of the turtles that belong to the GoC stock do not migrate out of the Gulf.

In other words – the green turtles found in the Gulf of Carpentaria are a relatively self-contained family – feeding, and nesting all within the Gulf of Carpentaria. This is quite unusual – as compared with other green turtle stocks that migrate hundreds, even thousands of kilometres between their feeding and nesting grounds.

How does genetics fit with turtle tagging and tracking?

Satellite tracking of nesting green turtles by Dhimurru rangers and others in 1999 and 2000 found that all 25 turtles tracked (20 from NE Arnhem Land, 4 from Groote Eylandt and 1 from Sir Edward Pellew Islands) migrated to feeding grounds in the south of the Gulf of Carpentaria - mainly around the Limmen Bight and Sir Edward Pellew Islands.



Community involvement is the key to protecting turtles in the Gulf (Photo: Dhimurru Land Management Aboriginal Corporation)

Dhimurru and the researchers suggested that perhaps all or most of the nesting turtles in the GoC lived on feeding grounds in the Gulf rather than migrating elsewhere in Australia or overseas. The genetics work now tells the same story.

Interestingly, we know from turtle tagging that green turtles from the southern Great Barrier Reef stock also feed in the Gulf but weren't detected by the genetic study. This tells us that one method does not always tell the full story, and we need to use a combination of methods.



What does the research mean for green turtle management?

From the tagging, tracking and genetic studies we now know that most of the green turtles found in the Gulf of Carpentaria probably spend most of their adult lives within the Gulf and so are mostly only impacted by events within the Gulf. For example the harvest of green turtles in Indonesia has little or no impact on the GoC stock.

It also means that if the GoC green turtle stock declines, then it may take many years (possibly hundreds) before enough new turtles will arrive from outside the Gulf to rebuild the population.

Importantly, the research results mean that most of the people who share the responsibility for the GoC green turtle stock also live and work within the Gulf of Carpentaria. This is good news because Aboriginal communities around the Gulf are already working together to look after turtles. Turtle management work being done by Indigenous communities under the North Australian Indigenous Land and Sea Management Alliance Dugong and Marine Turtle Project and the Carpentaria Ghost Net Programme are good examples of people working together.

Aboriginal land and sea management around the Gulf is also protecting important turtle habitat. The nesting beaches of eastern Arnhem Land and Groote Eylandt are managed under the Dhimurru, Laynhapuy and Anindilyakwa Indigenous Protected Areas (www.environment.gov.au/indigenous/ipa).

While nesting beaches and foraging foraging grounds of the Sir Edward Pellew and Wellesley Islands in the southern Gulf are featured in Sea Country Plans (www.environment.gov.au/indigenous/scp), and Traditional Owners are exploring options for declaring Indigenous Protected Areas over these important habitats. These developments show that Indigenous Australians are taking a leading role in the sustainable management of marine turtles in northern Australia.