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Institute for Applied Ecology
University of Canberra



North Australian Indigenous
Land and Sea Management Alliance

Green Turtles in the Gulf of Carpentaria

New research highlights the importance of collaborative land and sea management by Indigenous communities.

For Further Information on Marine Turtle Genetics...

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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 saltwater people. However, management is complicated by long distance migrations of green turtles that take them across regions and even between countries. Saltwater people need to understand where the turtles are travelling so they can identify who they share management responsibilities with.

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.

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.



Graphics: Tony Lee & Ian Lee



Lft: Skin samples are collected from a green turtle. Rgt: Satellite radio transmitter attached to a green turtle.

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.

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.

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 programmes. Results from these genetic studies have now been analysed, and reveal some unusual characteristics about the Gulf of Carpentaria green turtle stock.

So how can we learn about turtles from their DNA?

Genetics is the study of genes or DNA – the basic building blocks of life that are contained in every living cell of all creatures. The DNA contained within the cells of one individual is different to the DNA of every other individual ie: no two individuals’ DNA will ever be the same. Different categories of DNA (called markers) are used to find different types of information. One such category is the mitochondrial DNA, which is particularly useful to distinguish between groups or populations of turtles. Because this mitochondrial DNA is passed on through the mother turtles only, it is a very good method to help understand family histories, relationships between turtles and identifying different stocks.



Skin samples are analysed in a make-shift genetics lab.

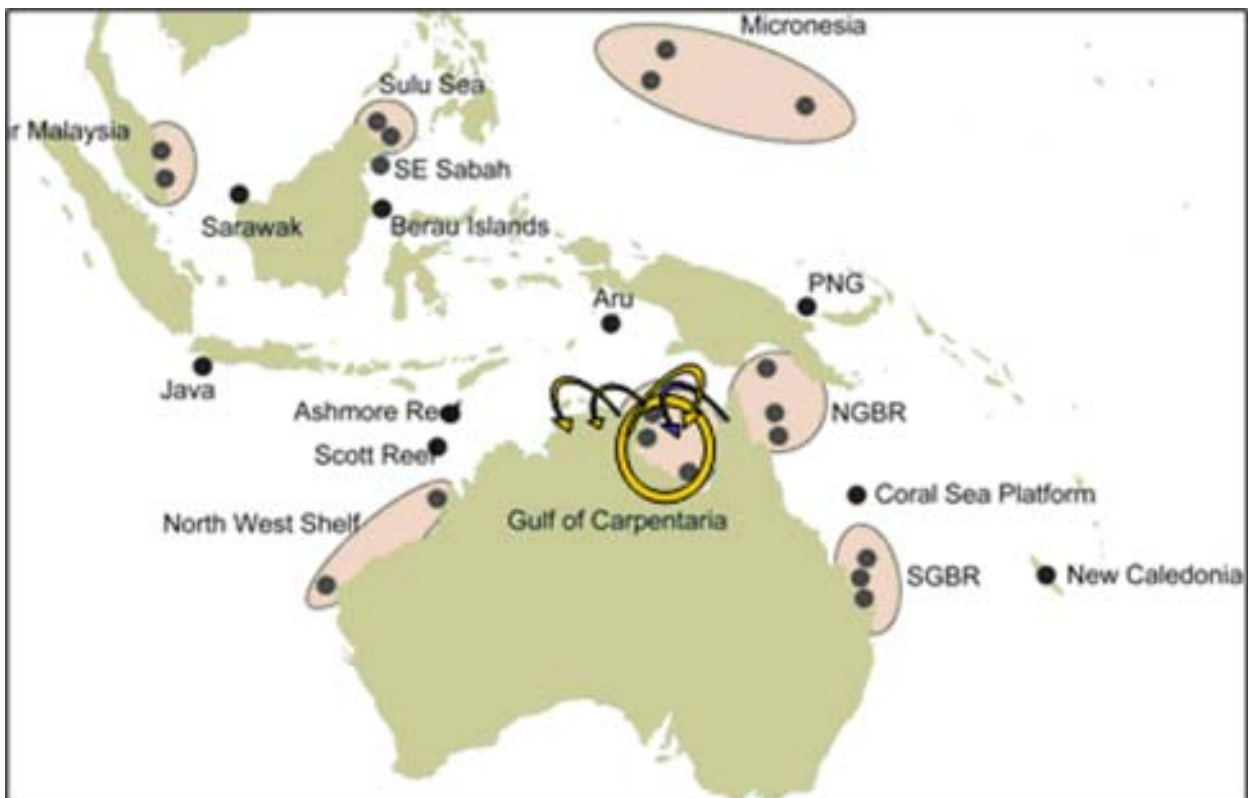
What have we learnt about turtles in the Gulf of Carpentaria?

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 belong to the GoC stock do not migrate out of the Gulf, instead they are living on feeding grounds, mating and nesting in the Gulf. 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.

- Most of the turtles that feed in the 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.
- There are few green turtles feeding within the Gulf (less than 10%) that have come from other areas. The green turtles that do come from elsewhere mostly come from the Northern Great Barrier Reef.

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.



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 elsewhere (10%). The blue arrow indicates the small number of turtles from the northern Great Barrier Reef stock that migrate for feeding into the Gulf.

How does the genetic study fit with turtle tagging and tracking studies?



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. 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.

Photo: Dhimurru Land Management Aboriginal Corporation



Community involvement is the key to protecting turtles in the Gulf

What does the research mean for green turtle management in the Gulf?

From the tagging, tracking and genetic studies we now know that most of the green turtles found in the Gulf of Carpentaria 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 new turtles will arrive from outside the Gulf to rebuild the population.

Importantly, the research results mean that 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 NAILSMA Dugong and Marine Turtle Project and the Carpentaria Ghost Net Programme are good examples of people working together.

Aboriginal management around the Gulf is also protecting important habitat for marine turtles. The nesting beaches on mainland northeast Arnhem Land, on Groote Eylandt, on Mornington and Bountiful Island are all under either existing or proposed Indigenous Protected Areas (IPAs). The Yanyuwah people are seeking a marine park that will protect much of the feeding and nesting beaches of the Sir Edward Pellew Islands. This highlights the important role that Indigenous people through IPAs and other protected areas play in protecting migratory species as well as wildlife that are resident in IPAs.

By Kiki Dethmers, Nancy FitzSimmons and Rod Kennett, August, 2006



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