Turtle Cooling Phase II

DRONE SURVEYS • NOVEMBER 2021

Turtle Cooling Phase II: Mating Season Drone Surveys

Rapid human-induced climate change is increasing global temperatures, including sand temperatures. All marine turtles have temperature-dependent sex determination (TSD), a process that determines the turtles' sex based on the temperature of the sand in the nest. Cooler incubation temperatures produce males, and warmer temperatures produce females. This means that as temperatures warm, more female marine turtles will be produced. Currently, in the northern Great Barrier Reef at Raine Island, 99.1% of the green turtle hatchlings being produced are female. This increase in female production – or 'feminisation' – is detrimental to the entire population if there are not enough males to reproduce. With funding from furniture company Koala, WWF-Australia, in partnership with the University of Queensland and the Conflict Island Conservation Initiative, have taken proactive measures to find effective ways to reduce nest temperatures and produce males to conserve the species. In July and October 2021, a team of scientists headed to Heron Island, on the southern Great Barrier Reef to investigate the green turtle population. The aim was to determine the "operational" sex ratio (the ratio of breeding adult males to females) of the southern population of green turtles (sGBR). It is hoped that scientists can use the breeding sex ratio of the sGBR population as a model for what a healthy population's sex ratio should be.

How many males do we need?

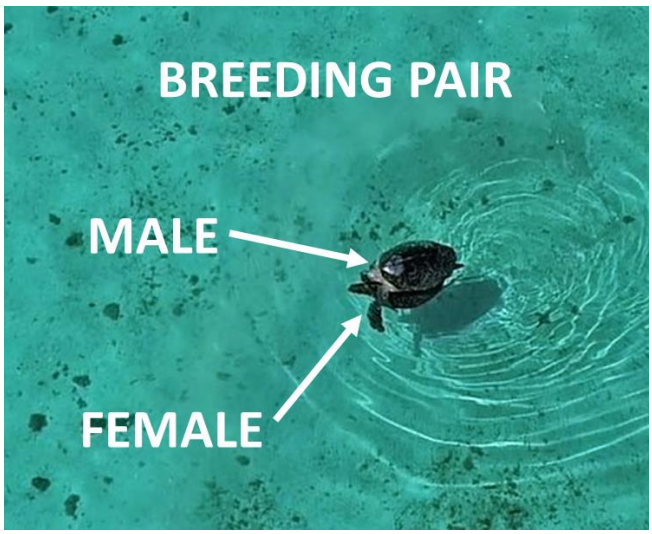
Over the last two years we have trialled innovative sand cooling methods that could increase male hatchling production. The research team experienced great success with last season's research - a nest temperature reduction with no decrease in turtle hatching success between seawater irrigated nests compared to natural conditions. So, now that we've identified the problem and outlined potential on-ground solutions, what's next? We need to determine how many males we should be producing on nesting beaches to maintain viable green turtle populations.

Marine turtles don't necessarily need a 1:1 ratio between males and females. A female-biased sex ratio might be naturally occurring in the foraging population. But we know the ratio of females to males in the juvenile and subadult cohorts of the northern Great Barrier Reef is a problem for this population of green turtles' future.

With the invention and innovation of drones we can conduct surveys on the breeding population from 20 meters in the air. This survey method is not only significantly less invasive, allowing turtles to continue their natural behaviours, we can also collect similar data on species, age class, sex and behaviours across a very large area.

How do we tell if a turtle is male or female?

Sea turtles cannot be sexed until they reach sexual maturity, so all males and females in the juvenile and subadult age class look the same. For green turtles, sexual maturity can occur anywhere between 20 to 40 years, the average being 30 years. When they are mature, telling a male and female apart is quite simple. Male turtles have a long tail that protrudes from the back of their shell (carapace) by 20-40 cm. Whereas females have a very small tail that is mostly covered by their shell. On closer inspection, females typically have a higher dome shell (lots of space for storing eggs) and small flipper claws, whereas males generally have a flattened shell and long, recurved flipper claws (to be able to hold onto a female better).

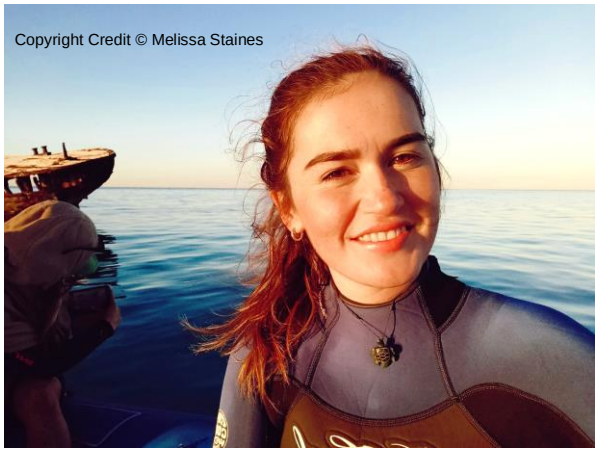


Permit: G20/44440.1

A typical day in the field

"We start off the day by checking the weather conditions, making sure that the wind is below 15 kts and there is no rain forecast. If the conditions look good, we let the skipper know what time the research vessel needs to be launched, get ready to go out and collect some drone footage. I check that the batteries and tablet are charged for flying the drone, and pack our day kit bag with datasheets, permit documents, a radio (to listen to incoming helicopters) and essential snacks. Then it's out on the boat with the rising tide to the lagoons where the foraging and breeding adult green turtles are found.

Once the drone has been launched, I program it to fly a pre-planned autonomous flight path in the survey area for about 20 minutes, hovering on occasion to record any interesting turtle behaviour. The entire time, we maintain line-of-sight on the drone, so that I can focus on the screen. After we've landed the drone, we put in a fresh battery and repeat the process two more times along different flight paths.



Once we've finished flying the drone, we put on our wetsuits, masks, and fins to start a 15-minute snorkel survey with a GoPro camera. After about three hours of data collection on the boat, we head back to the jetty to clean up and charge the equipment and download the footage. On most occasions, we would return to the research station before low tide, meaning the sea turtles still have access to the lagoons.

Then, we head out to the beach to do a survey around the entire island. Counting the number of adult-sized green turtles we see, and if possible, recording the sex and breeding activities. Heron Island reef is unique because that much of the courtship occurs in shallow water and often breeding turtles wash up on shore or females will beach themselves to rest from courtship. The beach surveys were very successful and took around 45 minutes to complete. We're very lucky to have the Heron Island Research Station staff onboard to help us continue to collect data for the beach surveys even after we've left the station. Unlike other sea turtle research trips, these trips involved no night work, so it was a great opportunity to get a full night sleep before repeating everything again the next day."

- Melissa Staines, PhD Candidate at the University of Queensland

2021 July/October Field Statistics

- 41 drone flights
- 20 hours of drone footage
- 10 snorkel surveys
- 28 days in-the-field
- 10 days on the research boat
- Over 50 turtles sighted

Acknowledgements

We would like to acknowledge the Traditional Owners on whose Country our research takes place, and extend this courtesy to Traditional Owners past, present and emerging. The Turtle Cooling Project is a partnership between the World Wide Fund for Nature-Australia, the University of Queensland, and the Conflict Islands Conservation Initiative with funding support from furniture company, Koala.

We would like to acknowledge the time, effort and passion given by our partners from the University of Queensland throughout this field season. We would specifically like to thank Melissa Staines for her unbelievable hard work, unwavering support, wisdom and motivation to complete this season's work.

We would like to thank Koala for their ongoing support throughout the Turtle Cooling Project, without their help, our research would not be possible.

We would also like to extend our wholehearted thanks to the team at the Heron Island Research Station, in particular, Megan Skelton and skippers Dave Abate and Ricky Jones.

We had a brilliant time surveying the mating population this year and are excited for what's to come! Until next time, this is me signing off.

- Caitlin Smith, Marine Species Conservation Project Officer

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