Cleveland Bay Field Research

Update #2

The Rivers to Reef to Turtles Project

We all made our way from various parts of Queensland to our reference site at Cleveland Bay in order to sample the environment and turtles for the Rivers to Reef to Turtles (RRT) project. This marks our second field trip of the project.

The first step in the RRT project is to characterise and quantify the environmental (water, sediment and seagrass) and bio-accumulated contaminant exposure of green turtle populations in the study sites. These data will be used to determine if environmental pollutants exist and if so, whether exposure can be correlated to turtle health at both the individual and population level. This knowledge will help us understand whether exposure to land-based pollutants may be adversely affecting coastal green turtle populations of the GBR.

The Field Trip – 13 to 19 October 2014

Study site #2 – the ‘reference’ site at the southern end of Cleveland Bay. Contaminant exposure to green turtles at this site will be compared to Upstart Bay where the mass turtle stranding event occurred in 2012.

Cleveland Bay hosts the major port city of Townsville, which is the largest population centre outside of south east Queensland.

Southern Cleveland Bay abuts a RAMSAR site and the area surveyed is contained within a conservation park zone under marine park legislation.

The research team hit the water on the morning of October 13 facing not the best of weather. Southern Cleveland Bay lived up to its expectations.
and we worked in its murky waters closest to the township of Townsville searching for any signs of a turtle head bobbing or bow wave to be spotted.

The trip focus was to undertake turtle toxicological and health sampling, tag, weigh and measure turtles for mark recapture population studies, and undertake environmental sampling.

The opportunity to collect data for complimentary and other projects was also available to the researchers participating in the field trip, including turtle photo identification and a future turtle health project to investigate the effects of contaminant exposure on green turtle physiology, but too soon to tell all!

The research team consisted of volunteers and scientists from all over Queensland including turtle biologists, water quality scientists, traditional owners, rangers, government representatives and WWF – and we all hit the water to catch turtles!

Unfortunately the weather wasn’t the best for the majority of the field trip but the tides were fantastic. We focussed our efforts on collecting the environmental samples as representatives from the Great Barrier Reef Marine Park Authority (GBRMPA) guided by scientists from TropWATER astutely deployed passive samplers (which accumulate a range of environmental pollutants) and grabbed sediment and seagrass for chemical analysis.

Working an infrequently surveyed section of southern Cleveland Bay, it took the first few days of small catch numbers to find the ‘sweet spot’ for turtles, but that despite the conditions we delivered on the project priorities and caught as close to 200 turtles (as we could).

We worked three foraging sites within southern Cleveland Bay. These were chosen for previously known seagrass patches, weather protection, the influence of anthropogenic effects, and turtle “catchability”.

With so much to achieve, we started with turtle rodeo and assessment training and briefing all on things boating and safety.

From sun up to sun down, we were busy! Each day we hit the water and rodeoed turtles – we caught, tagged, weighed, measured and took lavage (diet), blood, tissue, and scute (shell) samples. We deployed and retrieved passive water samplers, and worked in teams to collect grab samples of benthic habitat over the duration of the trip. At night, we were still processing turtles, blood samples and entering data until late.

After 7 days in the field, challenged by the wind, waxing and waning energy levels, and uncooperative turtles, we slowly worked towards collecting the required data.
**The Science:**

Southern Cleveland Bay was chosen as a ‘reference’ site as it provides a comparative coastal site to Upstart Bay where the mass turtle strandings occurred in 2012. It is similar to Upstart Bay in aspect (i.e. that it is a north facing bay) but the potential sources of contamination from the upper catchment and within the Bay itself, are notably different. If as expected the contaminant profiles differ between each of the Bays, this will increase the chances of scientists to identify whether exposure can be linked to a different input or source.

The green turtle size class “sub-adults” (65-85cm curved carapace length) are the primary target of this project. It is believed this size class will give the most unbiased result of pollutant loads in turtles because once they recruit from their oceanic phase to a feeding ground they show strong site fidelity (i.e. stay in the one place) until they breed. Although turtles are not believed to feed during a reproductive migration, choosing this size class will provide additional certainty that pubescent (adolescent) turtles are not accumulating pollutants from elsewhere at an inter-nesting or breeding ground, or at a nesting beach. Both blood and scute samples will show the short and longer term accumulation levels, respectively.

Mark-recapture studies have been previously conducted in southern Cleveland Bay but no dedicated program has attempted to determine the population biology. These studies are important for determining recruitment, growth and survival rates of the population, and if the population is increasing or decreasing in numbers. Combining the new three year study with the previous limited dataset will improve the understanding of the local green turtle population.

Cleveland Bay is home to both the southern and northern green turtle genetic populations which primarily nest at either the Capricorn Bunker Group in the southern GBR or the Far Northern GBR (with Raine Island a principal site), respectively. The haplotype (genetic) diversity within a near-by representative bay (Edgecumbe Bay) was previously determined by Dr Michael Jensen in 2008, where approximately 80% of the population was determined to be from the southern stock and 20% from northern. This is basically the opposite of the stock composition of the Howicks Group of Islands. However, these differences are unlikely to alter the outcomes of the study as the focus here is on contaminant exposure, which will occur predominantly in foraging grounds, and analysis is being carried out on the size class of “sub-adults”, which have not yet begun their breeding migrations. Both passive and grab environmental samples (water, sediment, seagrass) were collected during this trip for comparison to turtle bio-monitoring results to establish which contaminants are being transferred to and accumulating in turtles. The seagrass beds in southern Cleveland Bay were plentiful and of high density, and apparently well recovered from recent cyclone damage.

The first year of this project is a non-targeted ‘screening phase’, meaning we are not targeting any pollutant in particular. The results of these analyses will guide the future targeted monitoring program.
**Turtle Stats:**
- 176 green turtles caught, tagged and measured
- 168 primary (first time) turtles caught
- 2 within season recaptures
- 9 inter-season recaptures
- Smallest was 35.5 cm and largest 110.7 cm
- 1 female caught was known to have previously bred in the Capricorn Bunker Group dating as far back as 1984
- 72 blood and scute turtle samples from all age classes taken for toxicological (metal and organic) and health analysis
- 29 turtles of all age classes lavaged (to determine diet composition and for toxicological analysis)

**Environment Stats:**
- 3 DGT (diffusive gradients in thin-film) passive samplers deployed, for assessment of metal contamination
- 3 EDs (empore discs) and PDFMs (polydimethylsiloxane) passive samplers deployed for assessment of organic contaminants
- 3 different foraging areas sampled for water, sediment and seagrass with multiple grab sub-samples collected

With limited recaptures to date, there seems to be no mixing of turtles between the foraging areas we sampled. Of the 176 turtles caught 34 were adults (24 females; 9 males; 1 undetermined sex), 30 sub-adults, and 112 juveniles. The sex ratios of females to males for adults was approximately 2.5:1.

Contrary to results from the Howick Group of Islands, the lavage samples showed that the turtles were feeding primarily on seagrass with limited evidence of algae and mangrove fruits. There seemed to be two species of seagrass flourishing in many areas of each of the foraging areas.

Only one turtle was caught showing signs of fibropapilloma, and at least 3 turtles presented with significant boat strikes. A number of turtles caught were emaciated.

Other samples were taken for complementary or other projects including:
- 32 blood samples from 11 adults, 8 subadults and 13 juveniles turtles were taken for future investigations into the physiological effects of contaminant exposure in green turtles
- 139 photos of turtles’ post-ocular scutes were taken to add to the new Turtle Photo ID database.

The remaining samples and data collected will be taken back to our RRT collaborative partners for the screening analysis and future comparison to the other study sites as part of the RRT project.
Highlights from the trip:

- We saw and captured 1 dugong to tag, measure, determine sex and take tissue samples.
- A three-metre tiger shark in one of the foraging grounds and a half-bitten turtle as possible evidence a predator – prey interaction may be occurring.
- Our crackers, spam and bottle cheese!
- Seeing two turtle mating courtship pairs
- Polly, the yellow submarine, in all her glory
- Innovative naming of turtles being processed on the beach “Max Steel” and “Rainbow”
- Night times spinning blood, making friends, and sharing daily adventures

The field trip was primarily supported by WWF, and the Queensland Government’s Department of Environment and Heritage Protection (EHP). A big thanks to Dr Ian Bell for all the logistical support and role as principal investigator for the trip – without the assistance of government departments and their support - this trip could not have occurred.

WWF-Australia and its partners are leading this pioneering research to protect the Great Barrier Reef and the turtles that call it home.

Collaborative project partners of the RRT project include the National Research Centre for Environmental Toxicology at the University of Queensland, the Centre for Tropical Water & Aquatic Research at James Cook University, Vet-MARTI School of Veterinary Science at the University of Queensland, state and Commonwealth government agencies, local Traditional Owner and natural resource management groups and other supporters and volunteers in the local community.

The next field research trip will be conducted at the ‘first event’ in – Upstart and Cleveland Bays, as we continue to sample our way to unravelling how much a turtle can take...

Until then, I’m signing off – Chris Hof.
Why we make a difference

Reaching new audiences
We will create new ways to inspire and motivate a new generation of Australians and truly realise our collective power to make a difference to the world in which we live.

Building a strong network
We will draw strength from WWF’s 50 years of rich history, knowledge and experience, harnessing our network of people around the world.

High Impact Initiatives
Over the next 5 years, we will accelerate our on-ground conservation and advocacy work, focusing on new priority areas where we have the greatest impact and influence.

Walking the talk
We will continue to commit to reducing our overall environmental footprint, with an ambitious vision to reduce energy consumption by 30% and emissions from travel by 50% by 2015.

Loyal supporters
WWF’s supporters make an invaluable contribution to our conservation work. We couldn’t do without their loyalty, generosity and personal involvement. We will expand the ways in which supporters can connect with WWF, giving them a greater choice of programs from which they can choose to protect our planet’s future.

Transforming business
Through building influential relationships with business and industry, we will continue to create solutions to address the major threats to our natural environments.

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