

NORTH WEST SHOALS TO SHORE RESEARCH PROGRAM

September 2019



Informing the sustainable development of Australia's North West marine estate

Welcome to the quarterly newsletter from the North West Shoals to Shore Research Program (NWSSRP). Produced by the Australian Institute of Marine Science, this bulletin will provide updates on activities within the three-year program.

In this edition:

- Pearl oyster habitats
- Migratory pathway for green turtles
- Pygmy blue whale tagging
- Coral reef hydrodynamics at the Rowley Shoals

What's happening?

Pearl Oyster Habitat

With all the field surveys for the Pearl Oyster Habitat project now complete, early observations are providing some insight as to what the results will be.

This theme of work aims to increase our understanding of seabed biodiversity on the North West Shelf with the Pearl Oyster Habitat project focussing on areas offshore from Eighty Mile Beach. (Continued on p2)



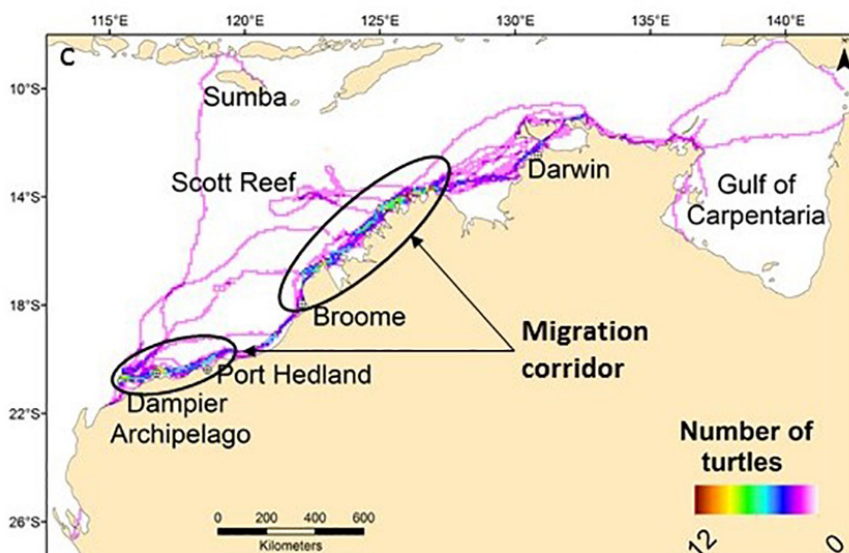
Above: Pearl oyster habitat on the North West Shelf

Green Turtle Highway

The coverage of the green turtle dataset we have compiled is well representative and has allowed us, for the first time, to map the distribution for this stock.

Although not all green turtle tracks have been included in the analysis yet (Muiron Island data is yet to be obtained), so far we have identified a common migratory pathway near the coast where the movements of turtles overlap during their migration from the nesting site to foraging grounds. (Continued on p3)

Left: Common migratory pathways for green turtles on the North West Shelf



Pearl Oyster Habitat Offshore from Eighty Mile Beach (from page 1)

Seabed habitats and biodiversity



Image from the forward-facing camera on the towed video showing pearl oysters on the seabed

While the detailed analysis and interrogation of the data is only just beginning, there are some achievements of note. Overall we undertook 5068 kilometres (km) of multibeam sonar mapping of the sea floor in the areas offshore of Eighty Mile Beach, spanning depths of 20-100 metres (m).

We surveyed 119 towed video transects (covering 179km of seabed) to visualise the animals living on the sea floor and to look for the presence of pearl oysters across the study area.

We took 87 grab samples to characterise the sediments in the area, as well as collecting samples of oysters and other biota using a benthic sled.

The towed video system proved successful for finding pearl oysters and we observed them living on the seabed from 20-70m depth, although most of the oysters were observed in waters shallower than 40m.

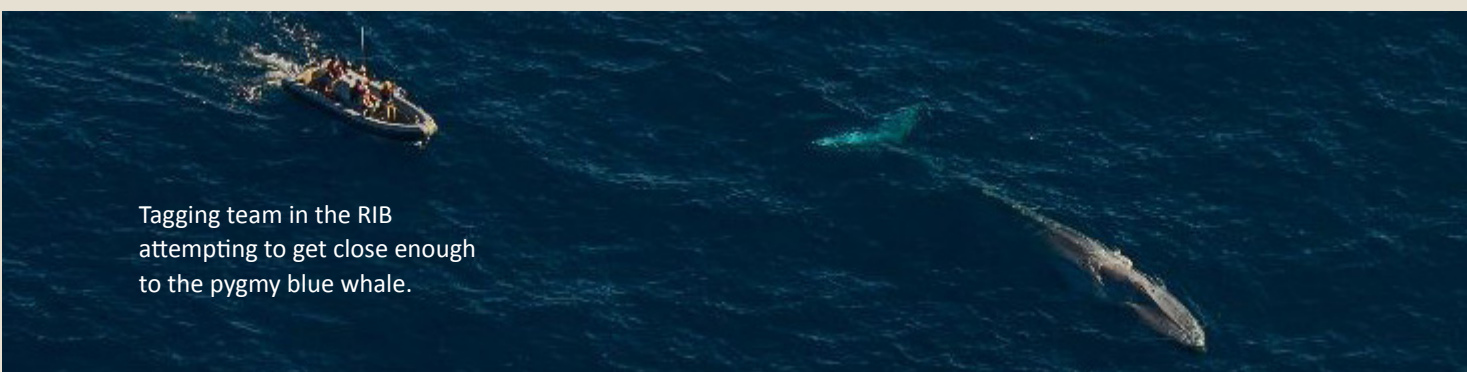
From our towed video data we will also be able to determine the type and abundance of species that live in association with the pearl oysters. In combination with sediment data we will be able to determine what it is about certain habitats that appeals to oysters, and hence why they are common in some areas and less common in others.

We can then combine this information with the multibeam data, to make predictions about where those habitat

types occur, and the likelihood of finding pearl oysters across the study area. This information will be useful for managing the fishery, but importantly for informing decisions about any proposed activities in the area that might affect the fishery in the future.

During our surveys, most of which were across sandy, gently sloping areas of sea floor that had only low cover of epibenthic species, we did find a few areas of hard ground where there was high cover of hard corals, sponges and gorgonians. While seemingly not prime habitat for oysters, they are clearly areas of high biodiversity.

Pygmy Blue Whale Tagging Threatened Species



Tagging team in the RIB attempting to get close enough to the pygmy blue whale.

In July, Dr Michele Thums led a field trip to deploy the first satellite tag on a pygmy blue whale off Ningaloo for the Northwest Shoals to Shore Research Program.

Pygmy blue whales, up to 24 metres long, aggregate in the Perth Canyon for feeding and migrate along the WA coast to the Banda Sea in Timor for breeding in winter.

Previous tagging has occurred in the Perth Canyon but there is a paucity of data from the North West Shelf.

Michele and the team set out to attempt to tag at Ningaloo on the northern migration and are also planning to tag at Ashmore Reef on the southern migration in October.

The tags (called limpet tags) being used provide high spatial resolution

location estimates, crucial for identifying important foraging areas along their migration, which is a key goal of this project.

The research was done in collaboration with the Centre for Whale Research on board the RV Whale Song.

The whales were located acoustically via the use of sonobuoys and also a spotter plane.

Green Turtle Highway (from page 1)

Threatened Species

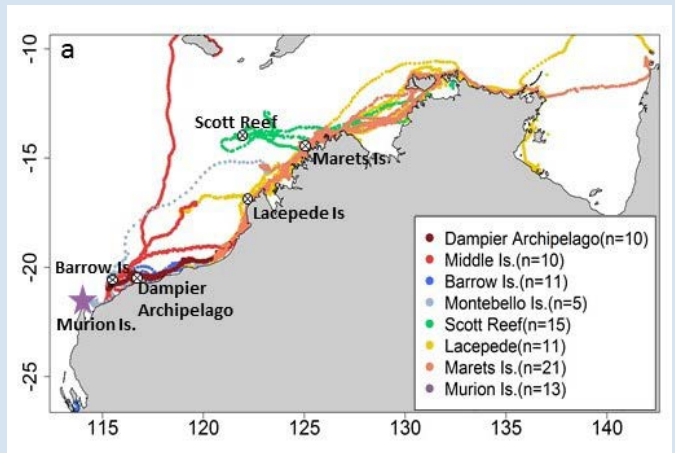
The satellite tracking data from green and hawksbill turtles tagged by AIMS in late 2017 have been combined with multiple existing satellite tracking datasets¹ from these species on the North West Shelf.

The final dataset comprises the tracks of 95 green turtles and 41 hawksbills, with coverage of all the main nesting beaches across the North West Shelf.

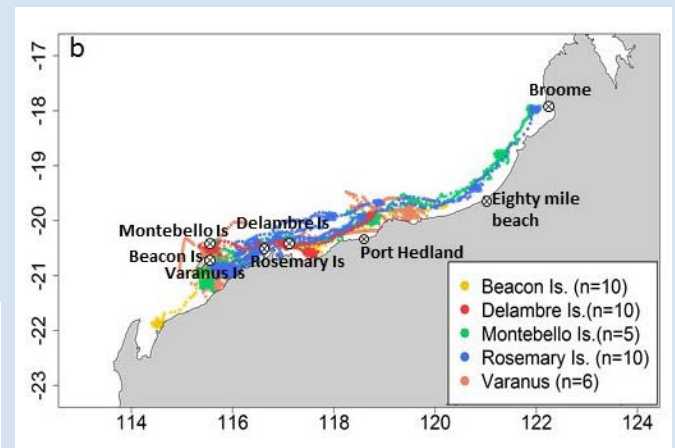
We are using this large dataset to quantify the at-sea distributions, to identify important areas associated with nesting, foraging and migration, and assess overlap with potential pressures.

A common migratory pathway has been identified near the coast where the movements of turtles overlap during their migration from the nesting site to foraging grounds. We have also established that green turtles across the stock do not seem to have a common feeding ground, with individual turtles using relatively discrete areas during foraging.

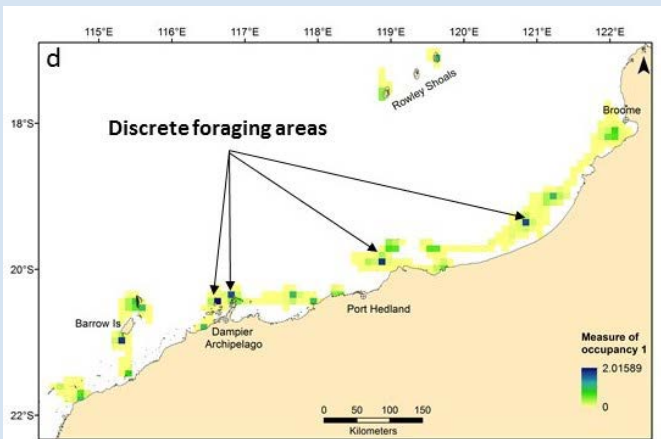
Results for the hawksbill turtles and also the results of our analysis of pressures will be in the next edition.



Above: Final datasets comprise the tracks of 95 green turtles covering main nesting beaches across the North West Shelf



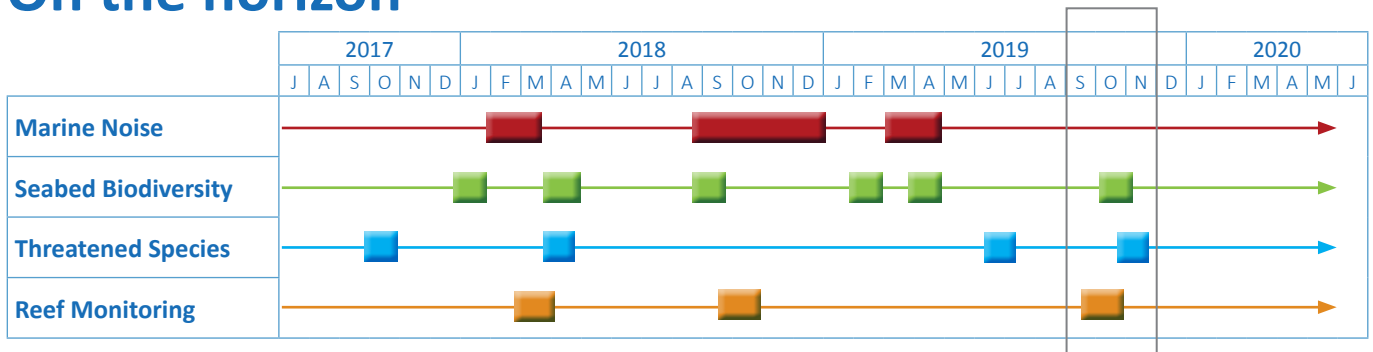
Above: Final datasets comprise the tracks of 41 hawksbill turtles covering main nesting beaches across the North West Shelf



Left: Green turtles across the North West Shelf stock do not seem to have a common feeding ground.

¹ The data includes research results provided by the Department of Biodiversity Conservation and Attractions, Woodside, Inpex and Pendoley Environmental.

On the horizon



October 2019

Theme: Isolated Coral Reef Atolls

Collect physical oceanographic data and predatory fish and shark data at Rowley Shoals.

Theme: Threatened Species

Attach satellite trackers to pygmy blue whales at Ashmore Reef during their southward bound migration.

Theme: Seabed habitats and biodiversity

Finalise sampling on the Ancient Coastline KEF.

Characterising the Drivers of Coral Reef Hydrodynamics at the Rowley Shoals Spatial Dynamics of Isolated Coral Reef Atolls

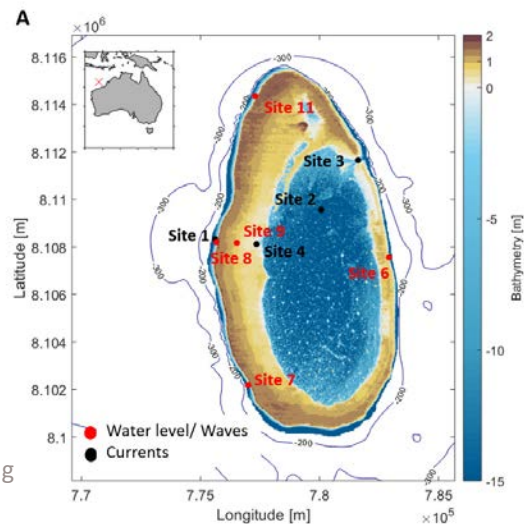
Mermaid Reef is one of three atolls of the Rowley Shoals located on the edge of the northwestern Australian continental shelf. It is regularly exposed to a combination of energetic wave and tide conditions, making it an ideal site to investigate how waves and tides interact in a non linear way to influence the overall circulation of coral reef atolls.

Using the findings of a unique one-year experiment monitoring surface waves, currents and water levels at several locations spanning the reef flat, lagoon, and channel regions of the atoll, we want to quantify how both wave and tidal forcing drive the circulation and flushing of this reef system. Very few atolls around the world have demonstrated to be both wave and tide dominated.

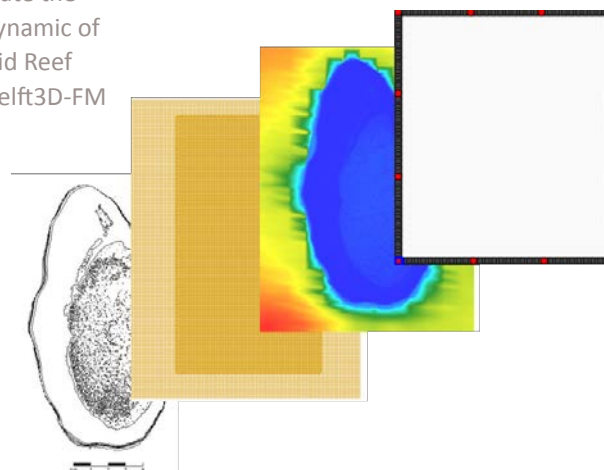
The incorporation of numerical simulations integrating high-resolution LiDAR bathymetry and offshore forcing, by both water levels and incident wave conditions, will allow us to resolve the detailed hydrodynamics of the entire reef at very fine resolution (~30m), including the dominant flow pathways and connectivity patterns.

The combination of in situ observations and numerical simulations provide a key insight into the physical processes controlling the movement of water masses, which ultimately contribute to regulate many of the biological and chemical processes within reef systems.

Right:
Mermaid
reef field
observation



Below: Modelling
framework to
investigate the
hydrodynamic of
Mermaid Reef
using Delft3D-FM



Building Capacity in Research

Camille Grimaldi received the 2019 Diversity Journal Award for Coral Reef Research for her PhD work at the Australian Institute of Marine Science (AIMS) in collaboration with The University of Western Australia.

Camille's research fits into the AIMS North West Shoals to Shore Research Program goal to better understand the isolated coral reef systems (e.g. Rowley Shoals, Scott Reef and Ashmore Reef) of the North West Shelf of Australia. Led by Dr James Gilmour, The Isolated Coral Reef Atolls project has been studying the

ecological importance of the coral reefs and Camille's PhD will provide a better understanding of the physical oceanography around and within those reefs.

Originally from France, where she did her undergraduate studies, Camille graduated from a joint MSc in Marine Environment and Resources at the University of Southampton (UK), Bordeaux (France) and Bilbao (Spain) with master's research project at Scripps Institution of Oceanography (SIO; USA).



Above: Camille Grimaldi's PhD goal is to provide a better understanding of the physical oceanography around and within the isolated coral reef system of the North West Shelf.

For more information on the full program, head to www.aims.gov.au/nw-shoals-to-shore

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Santos

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marine environment.