

Ningaloo Outlook

A BHP Billiton-CSIRO research partnership – one year on

Ningaloo Outlook is a strategic partnership between BHP Billiton and CSIRO that is carrying out a program of marine research which aims to inform management of the Ningaloo Coast World Heritage Area. The program is a five-year research alliance, which will increase the understanding of Ningaloo's deep and shallow reefs and its iconic megafauna (especially turtles, whale sharks and reef sharks). The partnership has now been operating for one year, and during that year, our scientists tagged 60 animals with three different types of tags, surveyed fish, corals and macroalgae along seven kilometres of the reef, and mapped 12,000 hectares of deep habitat.

Ningaloo Reef is the largest and longest fringing coral reef in the world, extending over 300 kilometres. The reef is home to a range of marine life with the shallow lagoons and deeper offshore waters creating a diverse array of habitats.



Shallow reef system at Ningaloo Reef (CSIRO)

Expected outcomes from the partnership

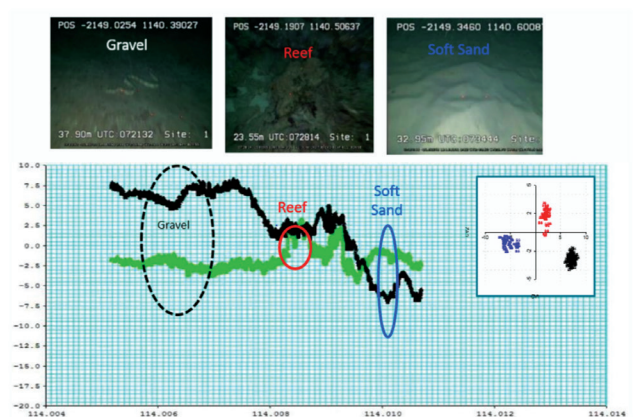
Our scientists will deliver the following outcomes as part of the research partnership:

- Ecological assessments of the status of ecological values of the reef.
- New knowledge and a better understanding of the ecology of Ningaloo Reef to inform conservation and management.
- Community engagement to build capacity and understanding within the local community.
- Training opportunities for the next generation of scientists to become world-class researchers.
- Creating science knowledge transfer opportunities through an annual symposium, and meeting with the people who are responsible for managing the Ningaloo Marine Park and World Heritage Area.

An update – one year on – what are we finding?

Research at Ningaloo Reef is grouped into three distinct themes; shallow reefs, deep reefs, and tagging. Activities commenced in 2015 and will run until 2020.

An update on what's been happening in the first year, and what the CSIRO research team has uncovered is provided over.



Analysis of backscatter from multibeam is being used to classify habitats based on texture and hardness

Deep reefs

The limited research conducted on deep reef habitats at Ningaloo has revealed abundant and highly diverse filter-feeding communities (such as sponges and soft corals), which are identified as important Ecological Values (EVs) in the Ningaloo Marine Park Management Plan.

The first year of the deep reef research has seen the completion of multibeam sonar swath mapping at four deepwater locations at Ningaloo (Osprey, Mangrove Bay, Tantabiddi and Helby Bank). A towed video survey was also undertaken to collect high quality images of the biological communities present in these areas. The data is currently being analysed and will be used to select sites for further surveys being completed in 2016.

Initial analysis of the data is suggesting that the main part of Ningaloo Reef (in the areas surveyed) extends to depths of around 35 metres, with reef building (hard) corals rare or absent at depths greater than 25 to 30 metres. At depths between 35 to 70 metres, few reef structures were observed, with the biological communities predominantly sponges and octocorals. Extensive beds of shell gravel and crustose coralline algal nodules, and solitary corals were noted at the deeper depths.

As the program moves into its second year of work, the focus will include analysis of video, bathymetry and backscatter data to improve habitat characterisation and initial mapping of deep water reef areas as well as further survey work.

Shallow reefs

The shallow reefs of Ningaloo are home to over 200 coral and 500 fish species, provide food and shelter to turtles and sharks and provide physical protection from waves and storms to over 200 kilometres of coastline.

To assess the abundance and diversity of fish, sharks, corals and macroalgae, divers surveyed over 70 shallow reef sites between Osprey (south) and Jurabi (north) in 2015 using a combination of survey techniques. To help assess the potential influence of hydrodynamics and extreme events such as cyclones, a high-resolution wave model was also constructed.

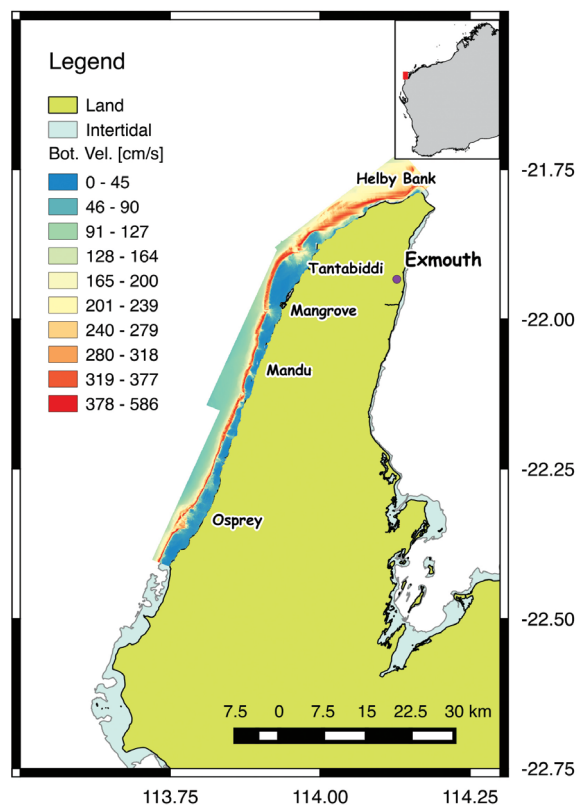


CSIRO research scientist completing a survey to assess relative abundance of coral as part of the shallow reef research (CSIRO)

Preliminary results from 2015 surveys suggest coral communities between Osprey and Jurabi are generally in good condition, with the exception of some localised impacts as a result of the 2010/2011 heatwave event. 2015 surveys revealed the highest coral cover at Osprey, followed by Mangrove and then Jurabi. Model predictions of water velocity during Tropical Cyclone Quang suggest that these extreme events may be particularly important in shaping these communities.

Surveys of fish that inhabit the shallow reefs yielded 208 different species from 45 families, with two dominant fish families recorded, *Lutjanidae* (snappers) and *Scaridae* (parrotfishes). The mean biomass recorded was $781 \pm 76.2 \text{ kg ha}^{-1}$.

As the program moves into its second year of work the focus will be on better understanding processes which structure shallow reef fish and benthic communities.



Predicted maximum bottom velocities (cm/s-1) along the western Ningaloo coast during TC Quang on 01 May 2015. The scale bar in the figure represents increasing (predicted) bottom velocities from green to red



A green turtle with a satellite tag secured to its carapace (CSIRO, Richard Pillans)



Three whale sharks were tagged as part of the Ningaloo Outlook project in 2015 (CSIRO, Richard Pillans)

Tagging

Turtles, whale sharks and reef sharks are iconic species that capture the attention of the community, both locally and more broadly. These species are important ecological assets of the Ningaloo Coast World Heritage Area. Animals tagged so far include green turtles, whale sharks and four species of reef sharks.

During 2015, the CSIRO research team attached:

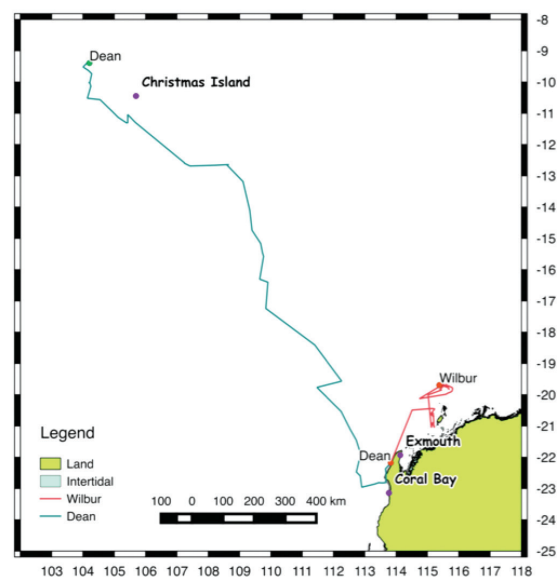
- satellite tags to eight green turtles (*Chelonia mydas*), acoustic tags to 25 green turtles and flipper tags to 42 green turtles.
- satellite tags to three whale sharks (*Rhincodon typus*), and acoustic tags to six whale sharks.
- acoustic tags to 13 lemon sharks (*Negaprion acutidens*), four grey reef sharks (*Carcharhinus amblyrhynchos*), two blacktip reef sharks (*Carcharhinus melanopterus*) and one tiger shark (*Galeocerdo cuvier*).

Volunteers from the Cape Conservation Group played an important role in the tagging of green turtles and participated in taking important measurements prior to the release of the animals.

To enable the public to view the movements of satellite-tagged animals, a website was established in September 2015 using the seaturtle.org platform. Interestingly, the green turtles tagged in May 2015 (outside the nesting season) have so far exhibited very residential movement patterns, whilst nesting turtles have moved much greater distances even in the short time they have been tagged — up to 190 kilometres from the nesting beaches.

Two of the whale sharks tagged to date exhibited contrasting movement patterns, one remaining relatively local to the Pilbara region, the other moving almost 2,000 kilometres in 42 days.

To enable the public to view the movements of satellite-tagged animals, a website was established in September 2015 using the www.seaturtle.org/tracking platform.



Movement of two whale sharks (Wilbur and Dean) using satellite tags show very different movement patterns



Training our future scientists

A key element of the Ningaloo Outlook partnership is to provide training opportunities for future scientists. Our three PhD scholars (Anna Cresswell, Joe Turner and Jessica Stubbs), all based at the University of Western Australia and receiving co-supervision from CSIRO scientists, are developing their research proposals, and preparing for field trips, which will occur throughout 2016.

Did you know?

Science generated from the Ningaloo Outlook research partnership will inform future management of the Ningaloo reef area through the generation of knowledge, monitoring techniques and input into key environmental baselines.

Key users of this information include government departments responsible for managing and monitoring the Ningaloo reef area and industries (e.g. resource companies, fisheries, tourism) operating in the vicinity of the Ningaloo reef.

Like to know more and keep up-to-date?

Visit our webpages:

<https://research.csiro.au/ningaloo/>

Or email:

- CSIRO Team: Ningaloo.outlook@csiro.au
- BHP Billiton: Claire.Hall@bhpbilliton.com