Cyclones carry coral across WA reefs

April 1 2014, by Rob Payne

Western Australia has the highest frequency of cyclones in the Southern Hemisphere – an average of 3-4 per season. Credit: NASA Goddard Space Flight Centre

New modelling suggests cyclones in WA's north-west create conditions that allow coral larvae to rapidly travel distances between inland and mid-shelf reefs.

Led by the Australian Institute of Marine Science, the findings help explain why less genetic variation exists between reefs in WA than for

those separated by similar distances in the Great Barrier Reef.

"Despite greater geographical isolation, significant cyclone-induced currents have been shown to enhance connectivity between coastal and mid-shelf reefs in a way not seen on the Great Barrier Reef," says co-author Dr Ben Radford.

"Inshore reefs in the Dampier region and mid-shelf reefs surrounding Barrow and Montebello Islands are separated in some cases by over 100km across the North West Shelf, and by a long-shore direction of the prevailing currents, which would usually provide a barrier to larval mixing.

"However, modelling suggests current patterns across the shelf may change dramatically before, during and after cyclones."

Connectivity was modelled between reef zones for 1996 and 2001, when cyclones occurred around the time of coral spawning, and 2002, when no cyclones occurred and spawning took place under more typical wind patterns.

For cyclonic years, results suggest 63 to 86 per cent of coral larvae were transported between reef zones within six days—within the period when larvae are able to settle onto the substratum and enter the juvenile stage.

The 2002 non-cyclonic year showed no larval movement between reef zones; instead larvae remained in their respective regions resulting in reef self-seeding.

The models were created using OILMAP, a surface wind stress model, and GCOM3D, a three-dimensional hydrodynamic current model that simulates the effects of current and wind patterns on the dispersal of buoyant coral eggs.

Dr Radford says because WA has the highest frequency of cyclones in the Southern Hemisphere – an average of 3-4 per season – understanding how connectivity influences biodiversity patterns is critical for management and conservation, including how species populations within ecosystems might recover from disturbances that cause mortality.

They can also help interpret the effects of climate forecasts from the Intergovernmental Panel on Climate Change which predict less frequent but higher intensity cyclones for WA, with a more southerly range.

"If cyclones do migrate to a more southerly range, this could result in increased connection with the North West Shelf and neighbouring coral reef systems associated with the Ningaloo region," Dr Radford says.

"Similarly, it could reduce the current connectivity patterns between some of the more isolated northerly coral reef systems of the North West Shelf.

"Understanding patterns of connectivity is vital now and for the future."

More information: Radford, B., Babcock, R., Van Niel, K., Done, T. (2014), "Are cyclones agents for connectivity between reefs?" *Journal of Biogeography*. doi: 10.1111/jbi.12295

Provided by Science Network WA