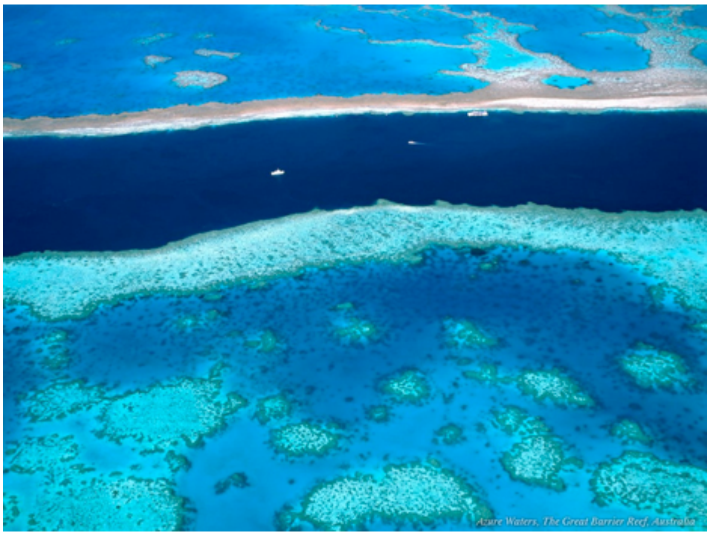
Cairns Bulletin

Unlocking the Secrets of Sea- Level Change -Great Barrier Reef Expedition



An international team of researchers and technicians is taking part in the Great Barrier Reef Environmental Changes Expedition.

During the next six weeks the team will collect samples of fossil corals that will help them understand sea-level changes in recent Earth history.

The expedition is carried out under the auspices of the Integrated Ocean Drilling Program (IODP) and has been organised by the European Consortium for Ocean Research Drilling (ECORD).

The expedition team, including 24 scientists and technicians from 7 countries, will recover shallow sediment cores from several key sites in three regions at the outer edge of the Great Barrier Reef using the *Greatship Maya*, a newly built, 94 metres long and 20 metres wide vessel. Coring of fossil (old, non-living) reef material will take place at the outer reef edge, about 40 to 150 kilometres offshore in water depths of 40 to 200 metres.

The recovery of fossil corals that grew throughout the last deglaciation about 20,000 to 10,000 years ago will allow scientists to gain a better understanding of sea-level changes during that period.

Climate variations based on information such as ocean temperature, salinity and chemistry can also be reconstructed.

The cores will also be studied to see how the reef ecosystem responded to these rapid rise of sea level and changes in climate. Scientists currently believe that there were three such periods of accelerated sea-level rise about 19,000, 13,800, and 11,300 years ago.

Gaining deeper insights in those events is especially important to our understanding of how the modern Great Barrier Reef, a World Heritage Site since 1980, will respond to future changes.

"To construct global sea-level models that help to predict future changes we need records of sea-level change from as many locations as possible", co-chief scientist Dr. Jody Webster from Sydney University points out. The importance of the Great Barrier Reef is that the Earth`s crust underlying the Australian Shelf has not been moved vertically by seismic activities over the last 20,000 years.

The area is also far from the vast ice-sheets that existed in the northern hemisphere during the last ice age and so less sensitive to the Earth's response to melting of the ice. These factors makes it an ideal place to investigate how sea level and climate varied throughout this period.

There are considerable uncertainties as to how the Great Barrier Reef will respond to changes in our oceans, such as acidification, increasing sea-level rise and sea-surface temperatures in the next 20 to 30 years.

"Scientific coring will provide important insights into how robust the reef is over different timescales and under different environmental conditions", co-chief scientist Dr Yusuke Yokoyama, Tokyo University adds.

The expedition is a European/Canadian contribution to the Integrated Ocean Drilling Program and has been organised by the European Consortium for Ocean Research Drilling (ECORD).

The Great Barrier Reef Marine Park Authority (GBRMPA) has been consulted through the permitting and Environmental Impact Assessment process for the expedition.

The samples cored during the expedition will be shipped to Germany. In July 2010 a detailed analysis of the material will take place at the IODP Core Repository at the University of Bremen.

You are invited to follow the progress of the expedition on the logbook website http://www.eso.ecord.org/index.php.

New theory could help save biodiversity

Australian scientists have announced a major new finding that helps explain how natural systems like coral reefs and forests maintain the richness of their mix of species.

Their findings have important implications for understanding how humans can better protect biodiversity during one of the worst episodes of species extinction in the Earth's history.

The research also may help to explain why, in habitats fragmented by human activity, the loss of species can be especially high – despite our best attempts at conservation.

Mathematical modelling by a team from the ARC Centre of Excellence for Coral Reef Studies and James Cook University, published today in the prestigious journal Ecology Letters, identifies the way species disperse across fragmented habitats as one of the keys to biodiversity – and how to preserve it.

"One of the great unanswered questions in ecology for the past 80 years is how species-rich communities like reefs and rainforests maintain their diversity. When resources are limited, you'd expect that the most competitive species would eventually dominate and the others be wiped out," says lead author Mr Yacov Salomon, now a PhD candidate at the University of Melbourne.

Until now explanations have focused on what goes on in the habitats themselves. However, in their latest paper, the team argues that the answer lies also in how corals and rainforests spread their offspring across surrounding fragments of available habitat. By dispersing offspring unevenly – on winds, current or carried by other creatures – across patchworks of reefs or forest fragments, the richness of biodiversity is perpetuated.

"We're basically proposing a novel mechanism by which biodiversity can be maintained, which helps to explain how some of our most marvelous natural systems retain their richness.

"For example, for every reef that receives plenty of offspring from dominant coral types floating in on the current, there will be other reefs that receive fewer offspring from those corals – giving the less competitive species an opportunity to thrive."

The new theory may also help explain why native bush surrounding Australia's cities and farms also tends to lose species over time, as growing human impacts further fragment the habitat that helps protect biodiversity and disrupt the process of dispersal of their seeds and offspring.

James Cook University's Professor Sean Connolly said that there was a practical angle to this idea.

"The take-home message from a conservation standpoint is that losing fragmented habitats is likely to result in greater loss of species than you might otherwise expect," he said.

"The models that scientists currently use to predict biodiversity loss focus on the overall reduction in dispersal between increasingly far-flung habitats. Our study shows that fragmentation also reduces the opportunities for different species to have different dispersal patterns.

"That can mean a double whammy for species that aren't good competitors: less success dispersing offspring into suitable habitat, and fewer habitats that offer some respite from competitively dominant species," Professor Connolly said.

"On the flip side, though, it also means that restoring degraded patches of habitat may have greater beneficial effects on biodiversity than we previously thought.

"The bottom line is that, if your aim is to maintain a rich community of species, like on coral reefs or in rainforests, real-world complexities in dispersal need to be considered."

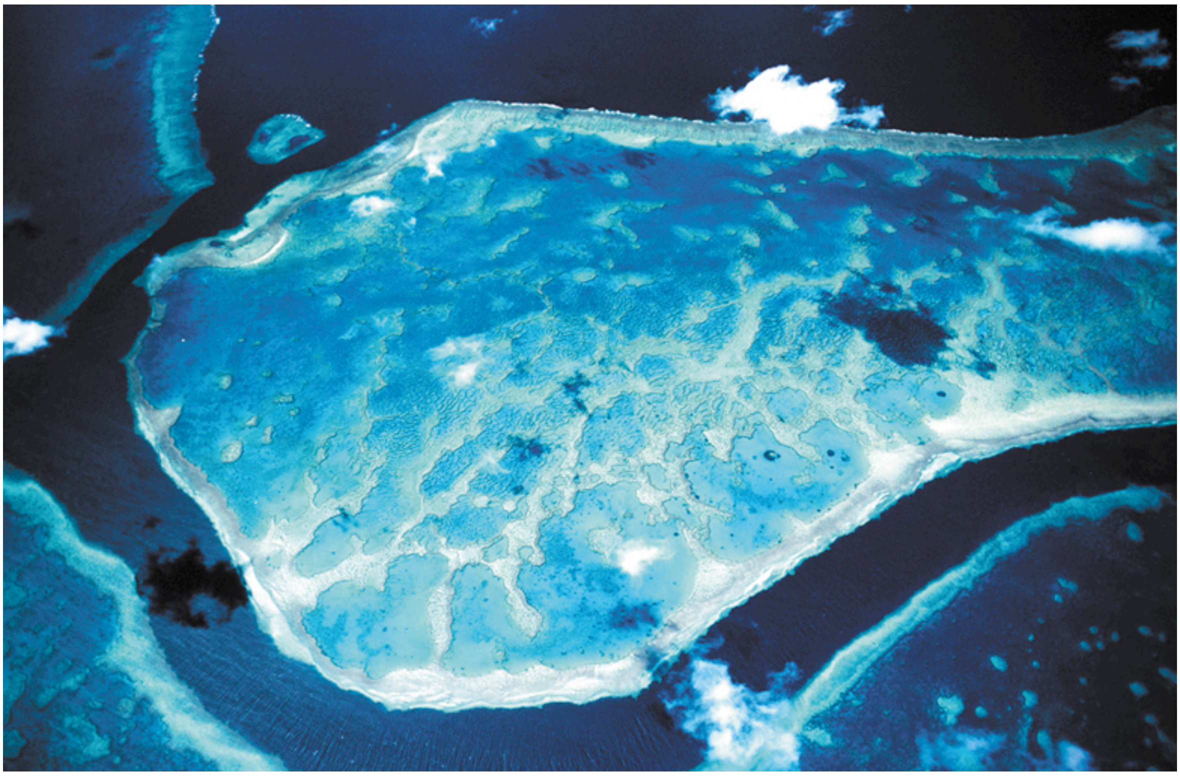
According to Mr Salomon, "Until now, researchers didn't consider complex dispersal patterns as something that could help explain biodiversity. Our study shows that it can be quite important. That's what science uses mathematical models for: to uncover the universe of the possible."

"The next step is to go out and measure how species that compete for scarce resources in nature differ in their dispersal. Those measurements will help us understand just how important this new mechanism is in particular ecosystems, like on the Great Barrier Reef."

Professor Connolly said there was a growing consensus that the loss of species worldwide has reached such a pitch it was now comparable to the great mass extinctions of species which occurred in the Earth's past, the best-known example being the disappearance of the dinosaurs.

"This underlines the importance of finding ways to protect biodiversity as a whole in complex biological systems, like reefs and forests, not just one species at a time" he said.

The paper "Effects of asymmetric dispersal on the coexistence of competing species" by Yacov Salomon, Sean Connolly and Lance Bode appears in the current issue of Ecology Letters online.



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