Voyage SS07-2007

Evolution of drowned shelf edge reefs in the Great Barrier Reef: Implications for understanding abrupt climate change, coral reef response and modern deep water benthic habitats

Dr Jody Webster, James Cook University (Chief Scientist)

Contribution to Australia's national benefit:

The voyage mapped the fossil reefs and terraces at the shelf edge of the Great Barrier Reef (GBR) in four different regions along the North Queensland margin. The new maps also reveal for the first time, a network of submarine canyons, slump scars and landslide deposits on the continental slope.

We discovered a diverse suite of submarine terraces, complex relict fringing, barrier, patch reef and lagoonal systems, along with paleo-river channels and relict dune systems. Images taken by an autonomous underwater vehicle (AUV) of the fossil reefs show they are now home to a diverse community of benthic organisms. A detailed study of the AUV imagery will provide new information about the relationships between deep GBR marine life and their seabed habitats.

Geochemical and sedimentological analyses of the recovered limestone rock samples will establish the age of the reefs and allow us to reconstruct the growth and demise of the GBR during successive periods of sea-level and climate variability.

As a result of this voyage:

1. We have a better understanding of the morphology, spatial extent and biological composition of the fossil reef structures. We also have an improved understanding of the morphology of the upper slope and canyon systems that border the GBR margin.
2. We have found that the shelf edge is characterised by a diverse suite of submarine terraces, complex relict fringing, barrier, patch reef, and lagoonal systems, along with paleo-river channels and relict dune systems. These features are now home to diverse modern benthic communities.
3. We have mapped the margin of the GBR from the shallow shelf in 40 m to over 2000 m into the Queensland Trough in four different regions. This survey represents a combined area of 6215 km^2 and involved multibeam bathymetry mapping, sub-bottom profiling, bottom sampling and AUV imaging.
4. We have commenced a post-voyage program of geophysical, geological, and biological data analysis that is focused on accurate high-precision dating, paleo-climate proxy reconstructions, sedimentary facies, community dynamics, and geomorphic studies.
5. We also discovered a new cold-water coral habitat lying at 1100 m in the Queensland Trough. Further analysis of the voyage data will generate significant discoveries as well as stimulate new expeditions to understand the biological and geological evolution of the deep GBR.

Addressing National Research Priorities:

An Environmentally Sustainable Australia

- Goal 1: Water – a critical resource
- Goal 5: Sustainable use of Australia's biodiversity
- Goal 7: Responding to climate change and variability

Itinerary

Departed Cairns 1700 hrs
Wednesday 26 September 2007

Arrived Mackay 0800 hrs
Tuesday 16 October 2007

> Voyage track SS07-2007