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Biodiversity studies in the Ningaloo Reef lagoon

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As part of the CSIRO Wealth from Oceans Flagship's Ningaloo Collaboration Cluster program currently underway in Western Australia, this study aims to examine the habitats and biodiversity of lagoonal areas within Ningaloo Reef. Key habitat types were identified using information from hyperspectral remote sensing and were used to develop a stratified sampling approach. Two focal areas were selected, based on sanctuary zones within Ningaloo Marine Park: Osprey Bay in the north and Coral Bay in the central section; an additional site has recently been added at Gnaraloo in the south. A nested sampling programme was initiated within each location, consisting of surveying transects at different spatial scales: cross-reef transects (shore to back-reef) to identify major habitat types and boundaries between habitats; and finer-scale habitat surveys of biodiversity and abundance of different major groups of organisms, focussing on non-scleractinian cnidarians, macroalgae, sponges, echinoderms and molluscs. Three geomorphological categories have been sampled at each location: back-reef, lagoon and inner reef-flat. Ground-truthing was carried out on the extent of habitats along defined transects selected to maximize the diversity of each site. A nested quadrat sampling regime was used to validate remotely-sensed data with field-collected data.

Preliminary results confirm that the northern section of Ningaloo Reef differs greatly from the central section, with a greater diversity of habitats present in the broader lagoons in the south. Greater areas of coral are found close inshore and across the entire reef at the central location, compared with the northern section, which has a broad expanse of sand and limestone pavement before grading to corals further offshore (the back-reef and reef-crest). These differences in habitat may have implications

on the overall biodiversity of the two locations.

A team led by Greg Skilleter (UQ) is determining the value and applicability of the maps showing the distribution of habitat categories, derived from the analysis of the hyperspectral data, as surrogates for the on-ground assessment of biodiversity across Ningaloo Reef. This involves detailed validation of selected substrate categories and then determining the extent to which these habitat categories can act as surrogates for non-substrate invertebrate species using the reef. The focus of this process is on macro-invertebrates including molluscs, echinoderms, soft coral and sponges. Substrate composition is being determined by detailed examination of 1 x 1 m sub-quadrats within the nested quadrat sample design already in use, based on a range of pre-selected substrate categories identified from the habitat maps produced from the processed hyperspectral imagery. The first field trip for this study was conducted in April-May 2009 and a second field trip is planned for July 2009.

Qualitative sampling for diversity of macro-invertebrates in targeted groups is being carried out at the three geographical locations within Ningaloo Marine Park, focusing on macroalgae, seagrasses, echinoderms, clams, soft corals and sponges. Sub-sampling for macro-invertebrates was conducted along 50 m transects, with counts of holothurians, urchins, the gastropod *Drupella cornus* and clams (*Tridacna* spp.). As some of these taxonomic groups have been targeted by concurrent programmes (especially C-Reefs), a synthesis report on distribution and abundance data available for Ningaloo Reef from all sources is being compiled, in consultation with WA Museum, AIMS and university researchers; it is anticipated that a draft of this report will be available by the end of 2009.