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Mapping the marine benthic habitats of Ningaloo Reef lagoon

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Effective management and monitoring of large marine protected areas requires detailed baseline data on distribution of benthic habitats (as a surrogate for marine biodiversity). Large areas with complex bathymetry and very clear waters such as the Ningaloo Marine Park (NMP) naturally lend themselves to the application of optical remote sensing as a means of gathering data on substrates and depth. An airborne hyperspectral remote sensing mission of the NMP was flown in April 2006 over 10 days to acquire data over 3400 km², at 3.5 m pixel resolution, using 125 bands in the visible to near infrared range of the electromagnetic spectrum and 21 bands sensing over the water areas.

Hyperspectral data have been corrected for the influences of the atmosphere, air-water interface, water depth and water constituents (phytoplankton, suspended matter and Gelbstoff absorption). These images have now been processed to retrieve bathymetry over shallow lagoons (0-20 m depth) in order to create slope and aspect images to assist in understanding the distribution of benthic cover types. Further, combined depth, aspect and slope

images can aid in designing stratified sampling schemes for detailed biodiversity studies. Visible bands from the sensor have been used to detect and map the distribution of a number of cover forming benthic components such as sand, limestone pavement, rubble, macroalgae and different coral types/growth forms such as tabular, branching, digitate and soft corals. Ten field trips have been completed to collect underwater spectra of dominant, cover forming benthic components and to acquire high resolution benthic cover data for training and validation of the final benthic cover maps. A quadrat, transect and single point sampling approach has been used to collect nearly 3,500 field validation points. Data products generated in this project include the distribution of the major benthic cover types as well as per-class probability maps. Hyperspectral data for the 1-2 km coastal strip adjacent to the NMP has also enabled mapping of 4WD tracks, vegetation cover and bare areas based on their spectral properties.