Ningaloo

Collaboration Cluster

Mapping marine and terrestrial habitat in Ningaloo reef

Scientists have developed an approach for using remote sensing to classify the marine habitats and terrestrial environment of the entire Ningaloo Reef – one of the largest attempts to use this technology on a reef system anywhere in the world.

Remote sensing data on seabed habitats and effective marine management

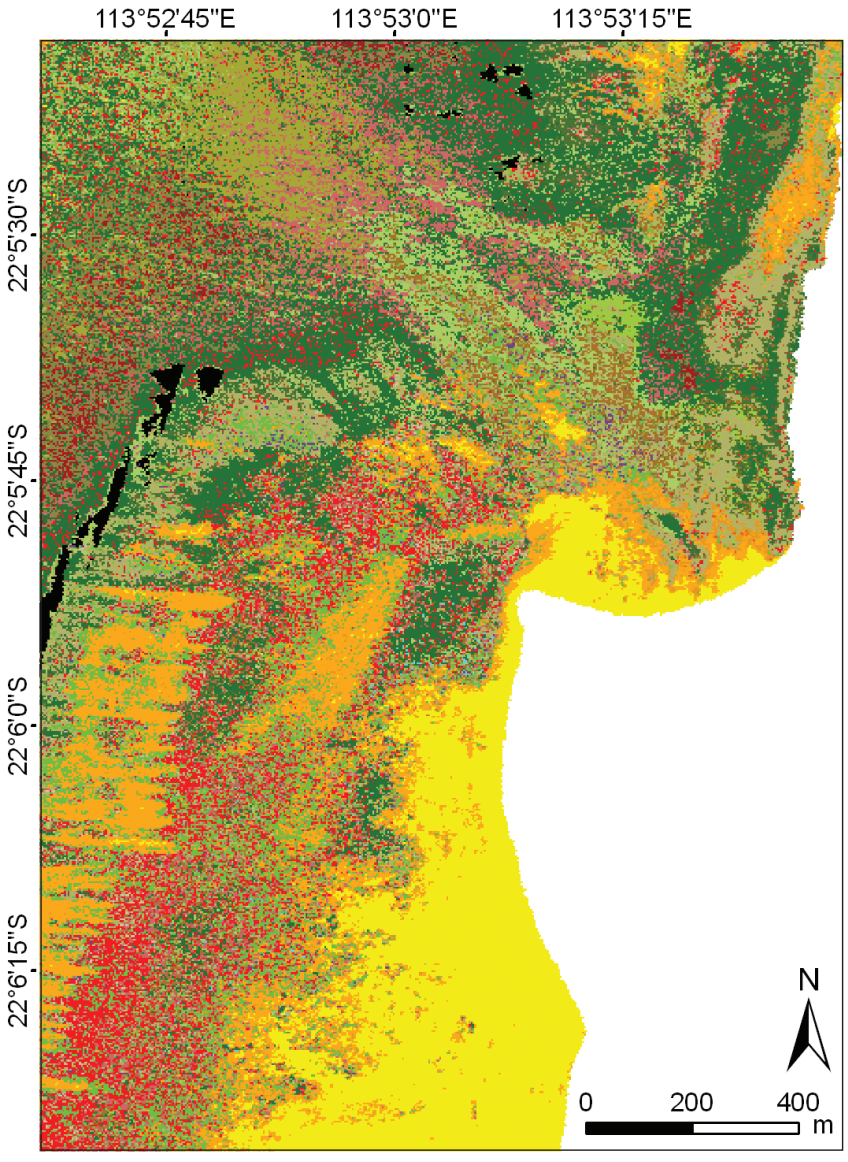
Effective management and monitoring of large marine protected areas requires detailed baseline data about the distribution of marine habitats as this information has the potential to provide indicators of marine biodiversity in an area.

Large areas with complex seabed depth contours (bathymetry) and clear waters, such as the Ningaloo Marine Park (NMP) in Western Australia, naturally lend themselves to the application of optical remote sensing (hyperspectral data) as a means of gathering data about seabed habitats and depth.

In addition, coastal areas accessed by a range of means, including off-road vehicles, are susceptible to erosion, weed invasion and pollution. Remote sensing identifies areas at risk of degradation from high usage and increasing numbers of visitors.

Mapping

The information provided by the remote sensing data was used to detect and map the distribution of seabed habitats such as sand, limestone pavement, rubble, macroalgae, hard and soft coral as well as different coral growth forms, and a classification was allocated. The classifications were then checked against information collected from previous biodiversity studies that included habitat information from nearly 3,500 points in the Ningaloo lagoon. Information about the depth contours were also obtained from the data and used to model how depth changes throughout the lagoon and to understand the distribution of seabed habitat cover.



Example of marine habitat map for Turquoise Bay area. Red colours show hard coral cover, shades of green, macroalgae, orange to brown, limestone pavement and yellow indicates sand.

In coastal areas the aim was to map the network of roads and tracks, describe the vegetation cover and map areas which have low or no vegetative cover.

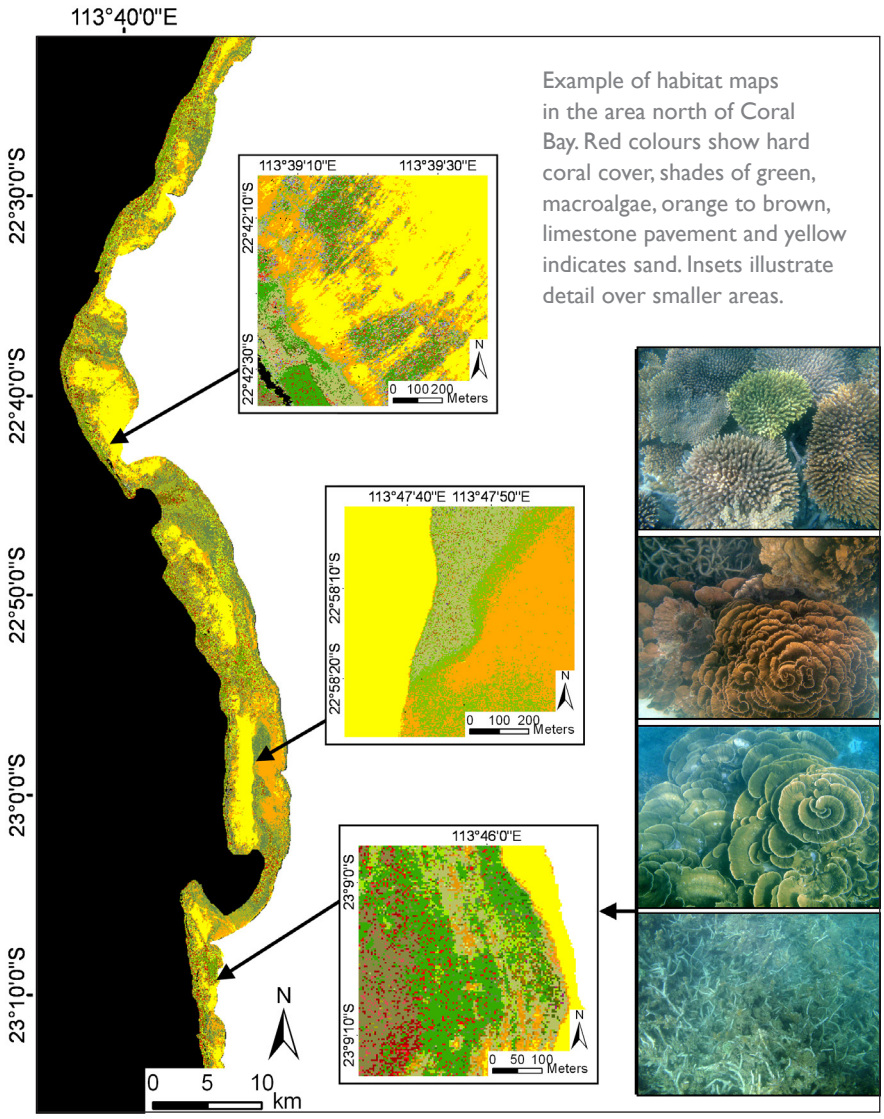
This work has shown that it is possible to map coral reef habitats over large areas using remote sensing and this technique is well suited for semi-automated mapping tasks.

Results

Using the remote sensing data we were able to retrieve very detailed information about the Ningaloo Reef including:

- over 50% of the cover is composed of macroalgal and turfing algae communities (54%)
- hard and soft coral cover makes up only about 7%, with many found within 500m of shore
- about 14% of the coral communities were in the near-shore zone (within 500m of shore) and 52% (875ha) of the corals were located within the sanctuary zones
- the majority of the corals (66%) are a mix of different densities and shapes or morphologies of the coral Acropora and large corals in three main categories: dense plate like Acropora, sparse finger-like Acropora and sparse massive corals
- the majority of the hard coral cover occurs as either very dense (continuous >90%) cover or as patchy distribution (20-45%).

From the analyses completed so far, it is clear that the biodiversity of different parts of the Ningaloo Reef differs greatly between areas. The data show that the northern section is different from the south, with a separation likely at Point Cloates; specific locations also differ in biodiversity from their surrounding environment. These differences are likely due to a combination of local environmental conditions and habitat preferences of specific organisms. Numerous plants and animals have their northern or southern geographic limits along the Ningaloo Reef, leading to substantially different ecological communities.



Example of habitat maps in the area north of Coral Bay. Red colours show hard coral cover, shades of green, macroalgae, orange to brown, limestone pavement and yellow indicates sand. Insets illustrate detail over smaller areas.

Outcomes

These baseline data sets will aid managers and scientists in the future to manage, monitor, plan and conduct further biological studies.

The biodiversity studies will help to raise the awareness of the public and management about the unique flora and fauna of the Ningaloo Marine Park and the diversity of the habitats to be found.

The counts of key invertebrate groups will be added to on-going monitoring programs and may be used as performance indicators for the ecological health of the Marine Park

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Ningaloo research is an initiative of the Western Australian Marine Science Institution, CSIRO's Ningaloo Collaboration Cluster and the Australian Institute of Marine Science, working in partnership with government, local communities and enterprises.