Marine Futures:
pulling back the blue curtain

An ambitious, ground-breaking and collaborative project in Western Australia has started to reveal some 'treasures' beneath our ocean's surface. Our hidden ocean floor is being mapped in exquisite detail as part of a $4.2 million project—**Securing WA's Marine Futures**—a major marine investment in WA, funded through the Natural Heritage Trust.

by Heather Taylor and Jessica Meeuwig

Our use of the marine environment is increasing rapidly. The 'sea change' phenomena means that more and more people are moving to the coast and either earning their living from the sea or pursuing recreational interests on or near it. We need to establish baseline information on the state of our marine environment so we can monitor how it changes over time and make sure that we manage for those changes.

Although we have a reasonable amount of knowledge about some marine species, particularly those of commercial and recreational interest, our knowledge of many other species as well as their interactions with the habitats they call home is still fairly limited. 'Marine Futures' is mapping the ocean floor to put many of these pieces together. In doing so, it is building a comprehensive picture of the relationships between marine habitats and the plants and animals associated with them. New video footage collected through the project shows grey nurse sharks, which are listed as threatened, associated with deep water wrecks off Rottnest Island and camera work at Cape Naturaliste is allowing the team to measure the relative abundance of a range of key species such as snapper.

The Marine Futures team, led by The University of Western Australia (UWA) and comprising representatives from WA's five coastal natural resource management councils, State Government agencies and surveying company Fugro, is helping to establish baseline information by producing state-of-the-art, detailed habitat maps of priority areas covering more than 1400 square kilometres of Western Australia's south-west marine environment. The maps will also have detailed layers describing the biodiversity values and human uses at the sites.

Information from the project will also be invaluable in other planning processes such as the State Government's regional marine planning process (see 'Oceans of opportunity for our south coast', *LANDSCOPE*, Autumn 2007). It will also help with planning for new marine conservation reserves and fisheries management.

The information gathered through Marine Futures will increase our understanding of WA's marine environment and provide some great tools for planning processes that will allow managers, stakeholders and the community to make informed decisions about what areas, and exactly how much of them, they want to protect and manage for future generations.

Mapping the sea floor

In the project's first 12 months, bathymetric maps—showing the contours and the texture of the sea floor—have been produced for eight sites, extending from the Houtman Abrolhos Islands offshore from Geraldton to Middle Island in the Recherche Archipelago near Esperance. The complexity of habitats under the Indian and Southern oceans is amazing and the project is uncovering lumps and bumps that are both uncharted and unknown in terms of the organisms associated with them.

Now we can start answering questions such as how much of these representative areas are composed of reef, seagrass or sponge gardens? Where are these habitats? What animals are living in them and how abundant are these animals? Answers to these questions allow us to make better decisions about how we are going to manage these resources, whether it be by setting up marine conservation reserves, planning a sub-sea pipeline or determining how many fish we

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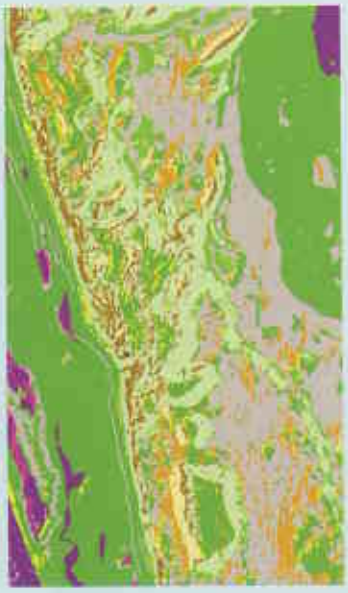
Main Pocillopora Reef at Rottnest Island.
Photo – Peter and Margy Nicholas/ Lochman Transparencies
Insets from top Underwater baited camera; sea squirts; western blue devil.

Above Common kelp.

Left Sponges at Jurien Bay Marine Park.
Photos – Heather Taylor

Developing habitat maps in Jurien Bay Marine Park (west)



The bathymetric data is synthesised with the analysed towed video information to produce full coverage habitat maps.

Left The *Macedon*, a historic shipwreck on Rottnest Island's Kingston Reef. *Photo – Eva Boogaard/Lochman Transparencies*

can sustainably harvest. By taking a snapshot of the state of our marine environment in 2007, we will also be able to monitor for change and ask ourselves whether these changes are acceptable for the long term.

The Marine Futures project comprises three teams—habitat mapping, biodiversity and human use. Team members from UWA and the international survey company Fugro have been developing the internationally cutting edge mapping techniques. This habitat mapping team develops the 'base layer' of information in the project. This process involves hydroacoustic surveys, underwater video surveys and habitat modelling.

During the hydroacoustic surveys, a multi-beam sonar device is attached to the hull of the survey vessel. This enables data to be collected from depths ranging from 10 metres to deeper than 120 metres. The ship works 24 hours a day, seven days a week, weather and logistics permitting. The vessel moves back and forth in a grid, just like mowing a lawn, sending acoustic signals to the seabed. When these signals come back to the ship, they are used to generate a full coverage, highly accurate map that reveals the depth and the 'texture'—whether soft or hard—of the bottom.

Following the hydroacoustic surveys, the team tows an underwater video camera across major structures that can be seen on the maps of depth and texture. So far, more than 200 hours of video footage has been collected. The final step is to develop the maps by relating the images from the video to the hydroacoustic data. Detailed habitat maps showing the distribution of sponge gardens, macroalgal reefs and seagrass meadows have been developed for around 800 square kilometres at both the Rottnest and Capes sites.

The patterns in marine habitats are, however, just the beginning of the details unveiled by the mapping activities. The ancient shoreline beyond Rottnest Island can be traced along its meandering path, submerged for 18,000 years. As mapping continues to the north, we can also trace this ancient shoreline offshore from Jurien (within the magnificent Jurien Bay Marine Park). Myriad vessels can also be seen resting in the area known as the Ships' Graveyard off Fremantle, with details down to the direction in which the wrecks are lying. Some of these shipwrecks were previously unknown to the WA Maritime Museum.

Left Colourful invertebrates vie for space on a temperate reef.
Photo – Eva Boogaard/Lochman Transparencies

Below left A cuttlefish.
Photo – Heather Taylor

Sampling biodiversity

The biodiversity team builds on the habitat maps by surveying the distribution and abundance of plants and animals at each site. This team has a broad array of expertise in marine biodiversity, with members drawn from the WA Museum, the Department of Fisheries and UWA.

As part of the process to develop the biodiversity sampling plan, Marine Futures held a workshop to get input from top marine scientists in Australia. The biodiversity team began work in the field last summer using a wide range of camera-based and diver-based techniques to collect data on fish, invertebrates, seagrass and larger seaweeds. The camera footage is particularly exciting: as well as capturing data on the types and numbers of fish, it depicts amazing behaviour such as deep water octopuses wrestling with small sharks!

Identifying patterns of human use

Marine Futures also aims to help us understand if and how our marine environment is changing as a result of human activities. Through a targeted interview program and spatial reviews on the patterns of human uses over time at each site, a human use team is providing critical information to illustrate patterns of human activity and help identify 'drivers of change' in the marine environment. This team has interviewed more than 60 people who either earn their living from or enjoy recreational activities on the ocean.

Combined, the outputs from the three teams are enabling us to identify marine indicators that tell us what's out there and how things are changing. This information is supporting regional Natural Resource Management Councils in establishing targets to maintain the quality of their marine environment.

Knitting together the three strands within Marine Futures is an education program to increase community awareness and capacity for marine resource management. The program includes events such as regional 'ports of call'. These ports of call are an opportunity for the community to come on board the survey vessel, the *Kimberley Quest*, to find out more about the project. To date, ports of call have been held in Busselton, Fremantle, Geraldton, Jurien, Esperance and Albany. The ports of call have been an excellent opportunity for the public to glimpse what lies beneath the ocean surface of their marine environments.

Capes

Information so far uncovered by Marine Futures is already proving useful for marine park planning. In September 2006, an indicative management plan for the Geographe Bay/Leeuwin-Naturaliste/Flinders Bay ('Capes') Marine Park was released by the Minister for the Environment for a three-month public comment period. Marine Futures mapping at Cape Naturaliste/Geographe Bay includes areas proposed as both sanctuary zones

Above Fugro's Marine Futures Operations Manager Paul Kennedy with an Albany school group.
Photo – Heather Taylor

Right Blue groper.
Photo – Eva Boogaard/Lochman Transparencies

and general use zones. It is hoped that the detailed information on the habitats found within both types of zones may assist the State Government in finalising the Capes marine park, which should hopefully be established in late 2007 or early 2008.

The project is also providing valuable information on the plants and animals found in the proposed marine park, including the relative abundance of species such as jewfish and blue groper, which are targeted by recreational fishers, enjoyed by divers and are important from a conservation point of view. The baselines it establishes will assist in monitoring any changes in the marine environment and help to determine if or how the area responds to the new management. In this way, the information can be used for both planning and ongoing monitoring and evaluation, using the biodiversity indicators developed through Marine Futures.

Where next?

Marine Futures has now completed the hydroacoustic surveys at the Houtman Abrolhos Islands, Jurien Bay (including Jurien Bay Marine Park), Rottnest Island, Albany, offshore from Fitzgerald River National Park, Two Peoples Bay and Broke Inlet, and eastern Esperance. These sites were selected in collaboration with resource managers and key stakeholders. Towed video work on the south coast is ongoing and biodiversity sampling has occurred across all eight sites.

Marine Futures is an ambitious project, representing the largest investment in marine resource management by the Natural Heritage Trust to date. Its success is flowing from the partnerships underpinning the project. These partnerships span the five regional catchment councils (Northern Agricultural, Swan, South West, Avon and Rangelands) as well as the South Coast Regional Initiative Planning Team, State Government agencies (Department of Environment and Conservation, Department of Fisheries, Department for Planning and Infrastructure and the WA Museum), and the Department of the Environment and Water Resources, Fugro and UWA.

The strong collaboration will help ensure the outcomes from Marine Futures are useful to both marine resource users and managers.

For more information on the project visit www.marinefutures.com.au or email marinefutures@uwa.edu.au.

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