seamount ecosystems

conserved in the Huon Commonwealth Marine Reserve

Huon and its seamounts

The Huon Commonwealth Marine Reserve (CMR) off southern Tasmania covers 12,780 km^2 of outer continental shelf, continental slope and deeper seabed. It contains the smaller Tasmanian Seamounts Marine Reserve that was declared in 1999 when the conservation significance of Australia's seamounts and the impact of commercial bottom trawl fishing was first recognized[1].

The Huon CMR encloses almost all of Australia's largest known seamount cluster. In April 2007, we mapped about 2200 sq km of the Huon CMR and identified 123 seamounts in 1,000-2,000 m depths – most of which were previously unknown (Figure 1). The seamounts are the cone-shaped remnants of extinct volcanoes, up to 25 km across at the base, and rising 200-500 m from the seabed.

This seamount area differs from all others identified in the Australian marine jurisdiction and the adjacent Tasman and Coral Seas[2], in the large number of seamounts, their relatively shallow depth range, and the preponderance of cone-shape forms.

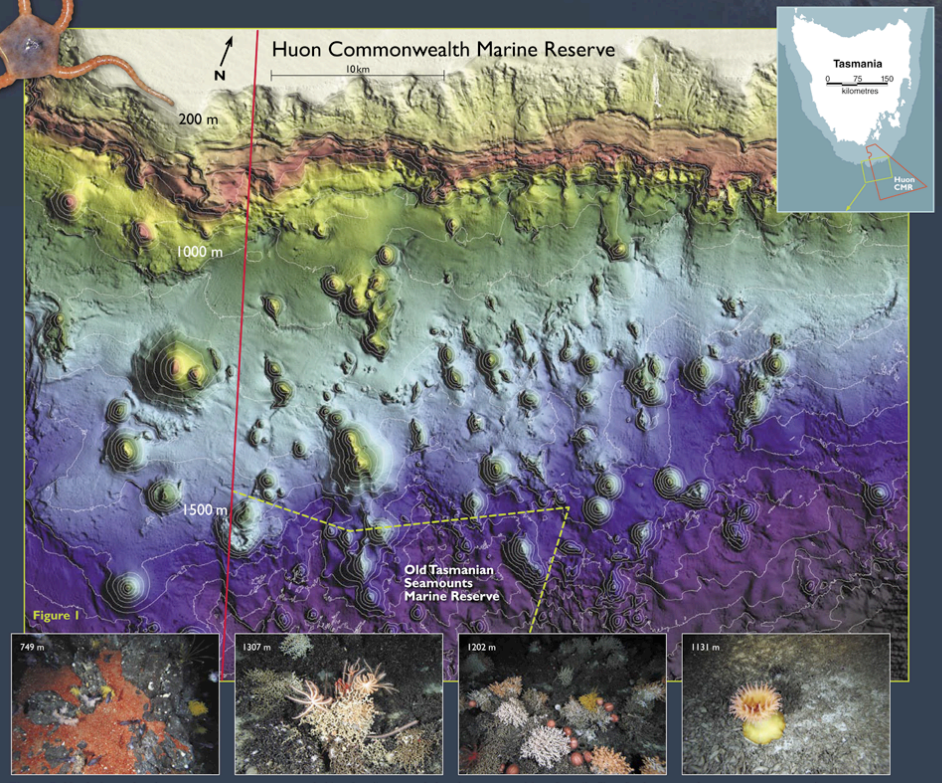


Figure 2: Hard, elevated and current-swept seamounts are habitat for diverse and abundant communities of sessile filter feeders – corals, sponges, seastars and anemones.

The importance of conserving Australia's seamount biodiversity

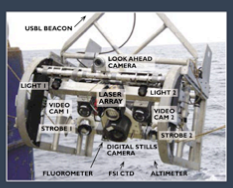
Seamounts are oases on the massive and predominantly muddy floor of the deep sea because they provide hard, elevated and current-swept attachment sites for rich communities of 'emergent' filter-feeding animals such as corals, sponges, seastars and anemones (Figure 2).

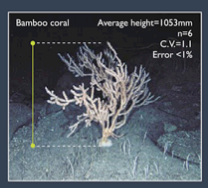
Over long periods, stony corals build complex reefs covering large areas of rocky substratum that provide the base for the seamount community. Their structural forms provide habitat for a great diversity of smaller mobile animals including crustaceans, brittle stars, urchins and molluscs (Figure 3). Physical removal of this habitat will take years if not decades to reverse.

Non-destructive photographic surveys revealed that the distribution of stony coral on the Huon seamounts extends from seamount peaks down to about 1,400 m depth (Figure 4).

Australia's Department of the Environment and Water Resources (DEW) is protecting the unique and vulnerable seabed communities of a representative set of Australia's seamounts within a National Representative System of Marine Protected Areas to be implemented over the next few years. Scientific research to increase knowledge of seamount ecosystems is included in their management plans.

Figure 3: Massive accumulations of the reef-building stony coral *Solenosmilia variabilis* provides attachment sites for sessile animals; together, stony coral and sessile animals form habitats for a myriad of small associated mobile animals. These include many species of crustaceans, echinoderms and molluscs that live on the filter feeders, or in the complex reef matrix provided by the stony coral. Faunal collections made in 2007 will greatly advance our knowledge of the taxonomy and ecology of the fauna, and the natural values they represent. Initial results show (1) many species are new, (2) many species appear to be endemic (restricted) to seamounts, and (3) that while some 'seamount species' are also found on the adjacent continental slope, the 'seamount community' is much more diverse and occurs in considerably greater abundance on the seamounts.





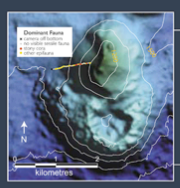


Figure 4: The stony coral *Solenosmilia variabilis* and its associated communities are distributed on seamounts from peaks to about 1400 m depth: e.g. Hill U in the Huon CMR. Non-destructive photographic sampling can provide accurate quantitative estimates of distributions, abundance and size for many distinctive species to monitor recovery of impacted areas and ecosystem health.

Science contributing to the management process

- Mapping surveys and biological collections reveal the characteristics of biodiversity and habitats – species identifications, uniqueness, richness, abundance, age – to determine the unique values of the biodiversity included in the CMR[3].
- Comparing seamount habitat and fauna in different areas shows how their biodiversity differs, and guides management for their protection [3].
- Genetic studies are determining whether seamounts are biologically connected and whether 'down-stream' seamounts rely on recruitment from those 'upstream' to maintain healthy animal populations [4].
- Estimating the resistance and resilience of animals and habitats (e.g. age, growth, size and fragility) determines their vulnerability to human activities [5,6].
- Developing quantitative and non-destructive photographic sampling techniques enables changes through time to be measured [7,8]. This is necessary to monitor recovery from human impacts and the possible effects of climate change.

References

1 Koslow, J.A. & Gowlett-Holmes, K. (1999). The seamount fauna off southern Tasmania: benthic communities, their conservation and impacts of trawling. Final report to Environment Australia & the Fisheries Research and Development Corporation

2 Williams, A., Althaus, F. & Furlani, D. (2006). Assessment of the Conservation Values of the Norfolk Seamounts area: a component of the Commonwealth Marine Conservation Assessment Program 2002-2004. Final report to the Department of Environment and Heritage.

3 Williams, A, Kloser, R.J. & Bax, N.J. (current project). Review and survey of the Tasmanian Seamounts Marine Reserve and other soon to be declared Marine Reserves, to provide inventories of biodiversity and habitats, and develop operational detail for monitoring and performance assessment. Department of Environment and Water Resources.

4 Miller, K., Knowles, C., Williams, A., Ward, R. and Rowde n, A. (2007). Connectivity and conservation of Australian and New Zealand seamounts: a molecular approach to assess relationships among their deep sea coral populations. Final report to the Department of Environment and Heritage.

5 Bax, N.J. and Williams, A. (2001). Seabed habitat on the southeast Australian continental shelf – context, vulnerability and monitoring. Marine and Freshwater Research 52: 491-512

6 Hobday, A. J., A. Smith, H. Webb, R. Daley, S. Wayte, C. Bulman, J. Dowdney, A. Williams, M. Sporcic, J. Dambacher, M. Fuller, & Walker, T. (2006) Ecological Risk Assessment for the Effects of Fishing: Methodology. Report R04/1072 for the Australian Fisheries Management Authority, Canberra.

7 Williams, A., Althaus, F., Barker, B., Kloser, R. and Keith, G. (2007). Using data from the Zeehan candidate CMR to provide an inventory of benthic habitats and biodiversity, and evaluate prospective indicators for monitoring and performance assessment. Draft final report to the Department of Environment and Heritage.

8 Shortis, M. R., Seager, J. W., Williams, A., Barker, B. A. and Sherlock, M. (2007). A towed body stereo-video system for deep water benthic habitat surveys. Conference paper: Techniques for 3-D optical measurement techniques, Zurich.

Acknowledgements

Seabed photography: Matt Sherlock, Bruce Barker, Jeff Cordell, Mark Lewis (CSIRO)
Specimen photography: Karen Gowlett-Holmes (CSIRO)
Swath mapping: Cameron Buchanan (GA)
Poster Design: Lea Crosswell (CSIRO)

Further information

contact: Alan Williams
CSIRO Marine and Atmospheric Research
phone: (03) 6232 5222
email: alan.williams@csiro.au
www.csiro.au