Explore lost worlds of the deep

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Discovering Seamounts

"There is very strong evidence that these seamounts are virtual islands in a deep ocean where creatures have been effectively marooned for millions of years and have evolved independently," Dr Tony Koslow, senior ecologist at CSIRO Marine Research,

Introduction

Seamounts — extinct submarine volcanoes — are virtual oases on a comparatively barren sea floor. Orange roughy and oreos swarm in the water above them and the sea floor may be largely covered by corals and other species adapted to the strong currents typical of this unique deep sea environment.

There are an estimated 30,000 undersea mountains in the world, mostly at depths of 1,500 metres or more.

While comparatively few have been studied, recent international research initiatives in the Tasman and Coral Seas between Australia and France have shed considerable light on the world of seamounts and deep ocean ecosystems.

Seamounts in Australia's oceans

Interest — and concern — about seamounts, their resources and their conservation stems back to the 1980's when substantial orange roughy fisheries developed in the south-west Pacific around New Zealand and Australia, primarily on seamounts between 650 metres and 1500 metres in depth.

In the 1990's, many of Australia's seamounts — predominantly found on the slope that descends from the continental shelf to the deep ocean — were mapped by the Australian Geological Survey Organisation. Prominent among these are seamounts south of Tasmania, north west of Australia, and on the Lord Howe Island and Norfolk Island plateaus in the Tasman and Coral Seas.

The most intensively fished seamounts rise an average height of 400 metres from the seafloor and are between 650 and 1,000 metres below the sea surface. Elsewhere, there are much deeper seamounts at between 1150 and 1700 metres below the sea surface.

Deep discoveries

Oceanographers, biologists, taxonomists, and geoscientists have been applying new technologies to evaluate life forms supported by the seamount ecosystems. Deep ocean video camera systems towed by research vessels provide the most graphic evidence of life and environmental conditions at these depths while nets, corers and dredges are deployed to obtain hard evidence.

Since 1984, French scientists have mounted 24 expeditions to explore seamounts ridges and the adjacent seafloor along the Lord Howe and Norfolk Ridges.
The French research program involved collaboration with approximately 200 researchers worldwide to identify the little-known seamount fauna.

Australia's seamount research is based on a 1997 voyage to the seamounts south of Tasmania on the CSIRO research vessel, Southern Surveyor, and was funded by Environment Australia and the Fisheries Research and Development Corporation.

Although the combined French and Australian studies have sampled fewer than 25 seamounts in the Tasman and Coral Sea region, they uncovered more than 850 species, 42% more than previously reported from all studies of seamounts in the past 125 years. Several of the species are 'living fossils,' relict species from groups believed extinct since the Mesozoic, the time of the dinosaurs.

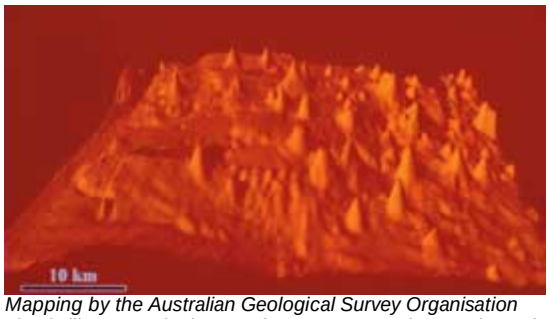
About a third of these species are new to science and are likely to be restricted to the seamount environment. Collaboration between French and Australian researchers has shown very little overlap in the species occurring on seamounts between one ridge system and another, even those at the same latitude and separated only by as much as 1000 km.

The unique biological communities on seamounts are dominated by corals adapted to life in the deep sea, as well as sponges, sea fans and other organisms that filter their prey from the strong currents.

The environment

The seamount ecosystem is sustained by food resources carried by passing currents. Orange roughy, for example, feed on prawns, squid and small fish that drift past the seamounts or migrate down onto them during the day. The corals and other creatures on the sea floor consume mostly plankton that drifts along near the bottom. The system thus draws on food resources generated 'upstream' in the previous weeks or months before it is swept in among the seamounts, perhaps from hundreds of kilometres distant. Current speeds in the vicinity of seamounts are greatly enhanced, similar to accelerating winds on mountain slopes and peaks, as the relatively slow deepwater currents are forced to pass around these obstructions.

Seamounts in Marine Parks



Mapping by the Australian Geological Survey Organisation clearly illustrates the layout of seamounts on the Continental slope, 170 km south of Hobart.

As a result of this research, Environment Australia has initiated, with the support of the fishing industry and conservation groups, a range of conservation measures on seamounts in Australia's EEZ.In 1999 Australia declared its first deep-sea marine reserve on the Continental slope 170 km south of Hobart. The Tasmanian Seamounts Marine Reserve has an area of about 370 square kilometres. The seamount region off Tasmania is a distinct geological feature not found elsewhere on the continental margin of Australia. It includes 70 submerged and extinct volcanoes in water between 1000 and 2000 metres deep on the continental slope. Some 20 per cent of the seamounts have been placed within the Reserve. The area of the Reserve has not been trawled and is therefore in pristine condition.

The seamounts support a distinct benthic (bottom dwelling) community of animals, many of which are native to the Tasmanian seamounts and do not occur anywhere else on earth.

The declaration of the reserve by the Australian Government followed extensive consultations with the community including the fishing industry and conservation groups. The Reserve is divided into two management zones —

- A Highly Protected Zone: The Reserve from a depth of 500 m to 100 m below the sea-bed is managed to protect the integrity of the benthic ecosystem.
  This means that no method of fishing or petroleum and/or mineral exploration is permitted in this zone.

- Managed Resource Zone: The managed resource zone stretches from the surface to the depth of 500 m. The aim is to ensure long-term protection and maintenance of biological diversity while allowing the tuna longline industry access to the surface waters.

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