

Undiscovered biological communities off the northeast coast of Australia

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Stalked sea lily. Credit: marum.de

Osprey Reef is the tip of an isolated seamount in the Coral Sea off the northeast coast of Australia. The seamount rises some 1500 meters to near sea level, and the submerged atoll, with a perimeter of nearly 70 km, encloses a shallow lagoon. Thanks to its colorful corals and rich fish fauna, the reef is a popular and spectacular playground for divers. "But on its seaward side, and beyond the depths accessible to divers, Osprey Reef is home to a number of unique and highly diverse biological communities," says Professor Gert Wörheide of LMU's Department of Earth and Environmental Sciences and Geobio-Center. In collaboration with PD Dr. Carsten Lüter (Natural History Museum, Berlin), Professor Joachim Reitner (Göttingen University) and Australian colleagues from James Cook University in Cairns, Wörheide and his team have carried

out a detailed biological survey of the previously unexplored seaward side of Osprey Reef along a traverse extending from depths of 92 to nearly 800 m. The survey revealed several unknown ecological communities – including many so-called living fossils – which have survived here undisturbed for millions of years. The new findings have now been published in the journal *Marine Biodiversity*.

The sea bottom around Osprey Reef is part of the Queensland Plateau, a crustal fragment that separated from the Australian continent about 65 million years ago. The plateau, which now lies at an average depth of around 1 km, sank below the surface about 40 million years ago, and has never been exposed since. "This is what makes the area so interesting," Wörheide remarks. "The [sea level](#) fluctuations produced by widespread glaciations have never been sufficient to expose the plateau to the elements. So the ecosystems here have hardly changed at all for many millions of years, allowing relict fauna and living fossils to survive here that have long vanished from comparable habitats elsewhere.

Remote reconnaissance

The survey was carried out with the aid of a so-called Remotely Operated Vehicle (ROV), a robotic submersible equipped with cameras and a mechanical arm. "In the course of our Deep Down Under Expedition in 2009, we explored the seaward slope of the reef in a straight line from a depth of 800 meters almost as far as the ocean surface with our cameras. The analysis of the videos made during that traverse is now complete. The results demonstrate a remarkable degree of diversity both in the geomorphology of the reef itself, and in the communities of organisms that inhabit it," says Robin Beaman, first author on the new publication. "Our study is the first ever made of this deep-sea habitat and demonstrates that faunal communities exist here which are quite unique."

The researchers were able to identify five different communities in all. At depths of between 92 and 150 meters the steeply sloping outer wall of reef is densely populated, primarily by so-called gorgonian corals (sea whips and sea fans), soft corals and sponges. Very little sunlight penetrates further and, from here on down to 450 m the ecosystem is dominated by black corals of the genus *Sibopathes*, lace corals (*Stylaster*), soft corals and stalked sea lilies (Crinoidea).

At the greatest depths, below 450 m, where the slope of the reef becomes gentler, the researchers discovered three distinct biological communities, which differ from one another depending on the nature of the substrate. Where there is lots of sand, species spend most of their time buried within it, and are therefore rarely captured on video. But the cameras can find tell-tale signs of their presence – in the form of tracks, depressions and burrows. Where the bottom is stony and is covered by only a thin layer of sand, the faunal community is dominated by glass sponges (Hexactinellida), which settle on small rocks together with scattered colonies of bamboo corals belonging to the genus *Lepidisis*. Spoon worms (*Echiura*), as well as sea cucumbers and small crustaceans, are also found here. However, the most densely populated habitat at this depth is characterized by large rocks, which offer sessile organisms protected and stable niches. Here, the geobiologists discovered a diverse community including the gastropod molluscs known as worm shells (*Vermetidae*), crustaceans, stalked sea lilies, and various corals. Among this last group are large colonies of the shimmering golden corals of the genus *Chrysogorgia* and the so-called precious red coral (*Corallium*), which has never been found anywhere else in tropical Australian waters.

Living fossils and unidentified species

"Our survey of biodiversity has brought to light many species that have survived here for millions of years, as so-called living fossils," Wörheide says. "Among these are representatives of the stalked [sea lilies](#) and the

glass sponges. The latter were a cosmopolitan group of reef-builders during the Mesozoic, but nowadays they are found virtually only in the deep [sea](#). At Osprey Reef, we have actually identified some species of glass sponge that are new to science." Other examples of living fossils found around Osprey Reef include the brachiopods (which at first sight look like molluscs but are not closely related to them) and the chambered nautilus, which belongs to a very ancient family of cephalopods.

Osprey Reef forms part of the Coral Sea Commonwealth Marine Reserve, which extends to the east of the Great Barrier Reef, and covers an area of almost 1 million square kilometers. In common with all other marine reserves in Australian waters, strategies for its future management are now being evaluated. "The current management plan only takes the shallow-water fauna into account. No one had any idea that such unique ecosystems could be found in the deeper sections of the reserve. Our results provide important support for the argument that this habitat should enjoy a greater measure of protection," Wörheide concludes.

More information: Robin J. Beaman et al. Spatial patterns in the distribution of benthic assemblages across a large depth gradient in the Coral Sea, Australia, *Marine Biodiversity* (2016). [DOI: 10.1007/s12526-015-0434-5](https://doi.org/10.1007/s12526-015-0434-5)

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