Researchers discover a new coral reef in Australia's Great Barrier Reef—the first such discovery in 120 years

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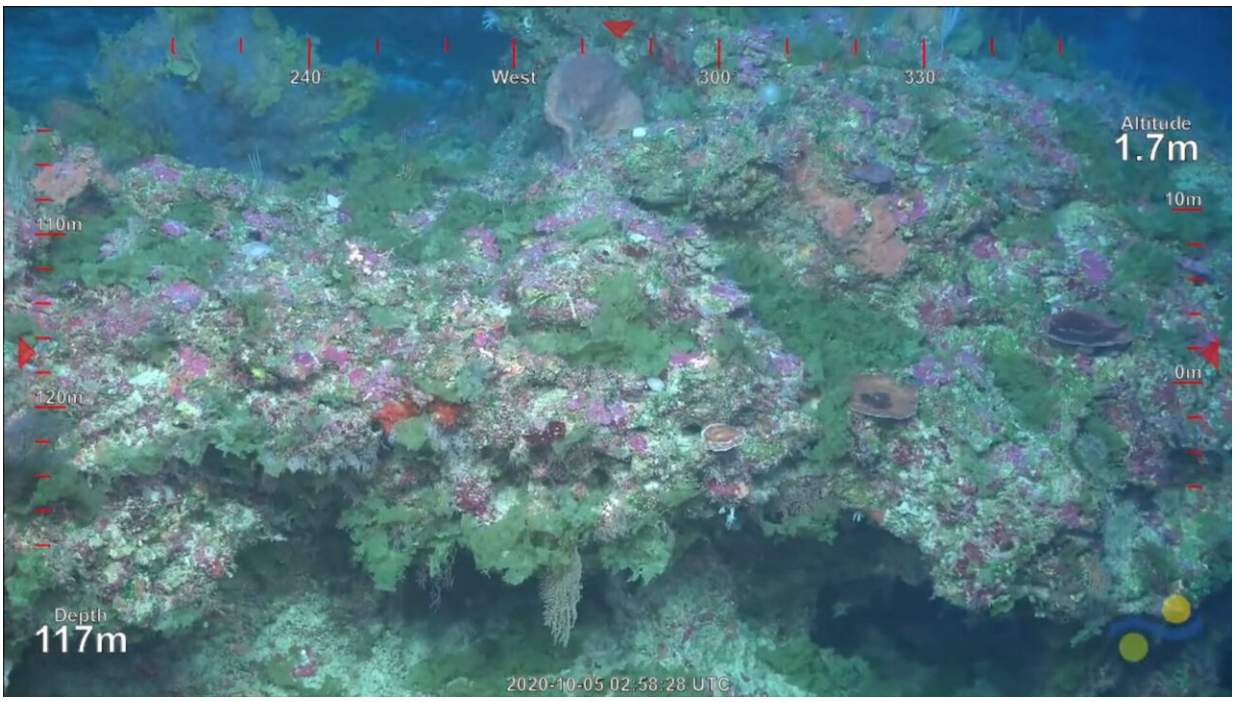

Credit: University of Granada

A researcher from the University of Granada (UGR) is co-leading a geological and biological research campaign that is being carried out at Australia's Great Barrier Reef (GBR)—the largest coral reef in the world. Geologists, biologists, and marine ecologists from various

Australian universities and research centers are participating in the campaign.

The research vessel Falkor has been the focal point of this expedition, starting out on September 30 and continuing until November 17. The work is being funded by the Schmidt Ocean Institute, a not-for-profit organization devoted to advancing and disseminating knowledge about the world's oceans.

Due to the COVID-19 restrictions currently imposed, only a small number of researchers, all of whom are Australian, are physically allowed on board the vessel this year. However, a novel feature of the research is that a large proportion of the team is successfully operating remotely, thanks to the technical resources with which the Falkor is equipped. One team member is Ángel Puga Bernabéu, a researcher at the UGR's Department of Stratigraphy and Paleontology, who is co-directing this campaign remotely from Granada.

Puga explains one particularly important new addition to the knowledge-base regarding the GBR: "On October 21, the Falkor discovered a new 'detached' reef, measuring 500 meters high off the seafloor. Its shallowest part, measuring 300 meters long and 50 wide, is located at a depth of about 40 meters [IMAGE 7]." This new reef is the first to be discovered in the GBR in 120 years. Furthermore, the images taken by the remotely-operated underwater vehicle (ROUV) show a tremendous diversity of benthic organisms (that is, those living on the seabed) and fish on this new reef.

The primary objective of the research campaign is to study the deep marine environment along Cape York Peninsula, located at the northernmost tip of the GBR—one of the most remote and isolated regions of Australia. Such environments in this region constitute one of the great mysteries for the scientific community, as the only information

available to date has been gathered from disparate data obtained by other research vessels during their passage through these waters (just five in the last 12 years). For this reason, the area is considered a "frontier" of scientific knowledge.

To shed light on the many unknowns that remain, the Falkor is carrying out extensive mapping of the seafloor using a high-resolution multibeam sonar. Coupled with the video images and biological, rock, and sediment samples obtained by the ROUV SuBastian (named after the Disney character from The Little Mermaid and making its 400th dive during this campaign), this mapping aims to answer some important geological questions. For example: What shape are the submarine canyons in this area and what activity is taking place there? Are there any "drowned" reefs in the area? What is the origin of the extraordinary detached reefs?

Submarine canyons are large underwater steep-sided valleys, similar to the valleys through which rivers flow on land. Just like rivers, submarine canyons transport loose materials along their channels, but, in this case, the material derives from the shallows located in the coastal areas and the continental slope. From there, sediment (along with associated nutrients and organic carbon) moves through the canyons and accumulates where they end, similar to deltas at the mouth of rivers.

So-called "drowned" reefs are similar to the reefs of today, but they developed at a time when the sea level was much lower than it is now, for example, during the Last Glacial Maximum about 20,000 years ago, when the sea level was about 120 m lower than at present. With the progressive rise of the sea level, these reefs were submerged along with the biological communities that formed them, especially the corals—hence, "drowned."

The identification of this type of reefs provides invaluable information with which to reconstruct the variations in sea level in the recent past.

Furthermore, many of these reefs provide an important habitat for mesophotic reef communities (those that live at greater depths than the typical shallow waters).

Detached reefs are those that have become separated from the GBR a few kilometers from the edge of the shelf. Their origins are unclear but they may have developed on small fragments of the continent that broke away from the land due to tectonic shifts.

Fascinating discoveries

"At this stage in the campaign, we have already made some fascinating discoveries that point to several years of work ahead for scientists," explains Puga. For example, researchers have successfully mapped the entire SwainSlide underwater landslide. This large displacement consists of reefs and sediments that fell away from the continental shelf and slid down the margin, about 250 km from the coast.

"This landslide is about 10 kilometers wide and the loose material has traveled over 20 kilometers across the seafloor. The images taken in this campaign show huge blocks of intact material surrounded by many smaller blocks and debris," says Puga.

Understanding what triggered this major underwater shift is of great scientific interest. Crucially, catastrophic events of this type can generate tsunamis that affect the entire coast in a matter of a few hours, as well as damaging underwater infrastructures such as communication cables or pipelines. Yet, both the walls of the scar left by the landslide and the detached blocks also provide an ideal environment for colonization by various different organisms.

The researchers have also observed rich marine ecosystems at the edge of the continental shelf at unexpected depths of over 100 m and in deep

marine environments on the walls and at the foot of underwater canyons. This shows that the tremendous ecological richness and diversity of the GBR are not restricted solely to the better-known shallow waters.

The cartography of the continental margin of the northernmost sector of the GBR has revealed the existence of submarine canyons that are much more complex than those located in the central sector and that present a different morphology. ROUV images suggest that many of these canyons have been active in relatively recent times. The rock and sediment samples obtained from the walls and channels of the canyons will be used to extract information about their age and the characteristics of the material that is transported through them.

Among the more striking shapes and forms that have been observed in this area are the so-called plunge pools. These are large depressions, roughly semi-circular, that formed at the foot of a large escarpment (in this case, several hundred meters deep), similar to those that develop at the foot of waterfalls on the mainland. Their origins are still unknown. They may be ancient land-based waterfalls that are now submerged; they may have originated underwater; or they may be related to tectonic structures such as faults.

Provided by University of Granada

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