Remnants of Gondwana

A German–Australian collaboration may have solved the mystery of the Indian Ocean seamounts, including Christmas Island. In the process they have offered a new vision of how such volcanic objects can form.

The German research vessel *Sonne* mapped and sampled 60 seamounts 1–3 km high off the north-west Australian coast. The results, and conclusions drawn, have been published in *Nature Geoscience*.

"These particular seamounts lie in a 200 km-thick band almost parallel to the Equator," says Prof Dietmar Müller of the University of Sydney.

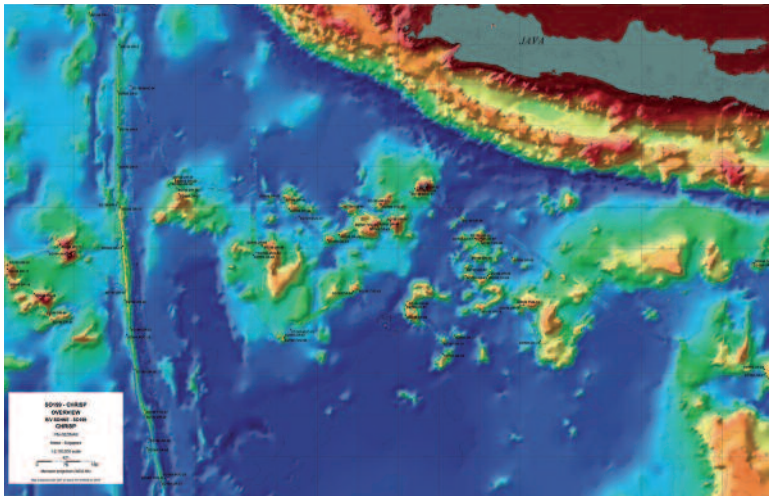
"In contrast to other seamount zones, such as Hawaii or the Canary Islands, their existence was something of a mystery because there was no known hotspot nearby. The seamounts' ages also didn't show a progression in any particular direction – something we'd normally expect to see in volcanoes formed over hotspots."

Analysis of the samples revealed the presence of continental rocks at unexpected distances into the ocean, forcing a further rethink of the formation process. The team concluded that continental break-ups are messier than previously realised.

"When Gondwana was splitting apart millions of years ago, small fragments of deep, gooey continental rocks managed to get separated, lost, buried and then drawn out underneath the Indian Ocean while India and Australia drifted apart," says PhD student Ana Gibbons. "Since these continental leftovers were incubated in the depths of the Earth's crust for about 200 million years, they were still quite warm and buoyant. They gradually floated up when their thick continental blankets were replaced with the Indian Ocean's younger and thinner crust."

The rising continental rocks created what Gibbons calls a "lava flow cocktail" where impurities in the lava lowered the melting point so it could flow more easily. She refers to the seamounts as the party-hats left behind when the cocktail party was over.

Gibbons is unsure whether any other seamount provinces were formed in the same way, noting that the Atlantic break-up, for example, was a much simpler process, whereas the formation of the Indian Ocean occurred with the Indian plate changing direction part-way through.



The seamounts off north-western Australia have been explained.

Endangered Species off the List

The US *Endangered Species Act* (ESA) is considered a world leader in protecting threatened species, coming as it does with legal force. However, a new study has noted how few endangered species are actually making it onto the Act's list by comparing it with the International Union for the Conservation of Nature's Red List.

While such a comparison may seem obvious it took a PhD student from the University of Adelaide's School of Earth and Environmental Sciences to point the discrepancy out as part of a study published in *Conservation Letters* in collaboration with three other universities, only one of them American.

Mr Bert Harris suggests that the surprising oversight is a result of the Red List gaining relatively little attention in the United States compared with the ranking given by a separate organisation, NatureServe. Previous studies have shown that many species classified as threatened or endangered by NatureServe are also not protected under the Endangered Species Act.

As a bird specialist Harris noted the absence of Kittlitz's murrelet, the ashy storm petrel and the cerulean warbler from ESA listing. The Red List considers these critically endangered, endangered and vulnerable, respectively.

"The ESA has protected species since its establishment in 1973, and it may have prevented 227 extinctions. However, the implementation of the ESA by successive US governments has been problematic, including poor coverage of imperiled species, inadequate funding and political intervention," Harris says.

Kittlitz's murrelet, for example, was left off because climate change is considered the primary threat, making action to protect it difficult. Other species have been classified as "warranted but precluded" on the basis that higher priorities exist.

Harris also blames the vagueness of the US government's definitions of "endangered" and "threatened" in comparison with the more rigorous IUCN assessment.

Harris is not aware of a similar comparison of Australian species with IUCN listing.