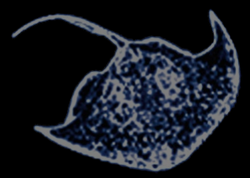

News edited
by Catherine GS Lim

from the deep

NEWS

BALDWIN C, ROBERTSON / CC BY 3.0

A new Haptoclinus blenny (*Teleostei, Labrisomidae*) from deep reefs off Curaçao, southern Caribbean

New ocean zone discovered: The Rhariphotic, full of unknown species

Researchers say the deep "rariphotic zone" around coral reefs could provide a vital refuge for many fish species as shallower regions are threatened by climate change.

About 30 new species identified within an area of just 200 square meters—with such amazing diversity, it is no wonder that researchers are excited about the new rariphotic ocean zone in the Caribbean.

Occurring between 130 and 309m below the surface—just below the mesophotic (40 to 150m)—this newly defined zone on a southern Caribbean reef system in Curaçao has been the subject of a study by Smithsonian researchers.

They had wanted to find out whether the deteriorating conditions of shallow reefs caused the organisms there to flee to deeper reef areas.

During their research, they discovered such an astounding richness and biodiversity within 130 and 309m below the surface, that they decided to define the area as a new oceanic zone.

80 dives in the sub

In the 80 dives in the Curasub minisubmarine, researchers observed about 4,500 fishes from 71 species. Using the Curasub enabled them to stay underwater for up to eight hours at depths of 309m, while remaining at normal atmospheric pressure.

One in five species new

"About one in every five fish we're finding in the rariphotic of the Caribbean is a new species," said Dr Ross Robertson, a marine biologist at the Smithsonian Tropical Research Institute. He is the co-author of a paper on the rariphotic, published in the 20 March issue of the journal *Scientific Reports*.

Possible refuge

Despite its great depth and dark surroundings, the fish in the rariphotic are colorful, not unlike those found in coral reefs. As a result, researchers speculate that the rariphotic zone may serve as a refuge for shallow-dwelling reef fishes seeking relief from shallower waters that have warmed up due to climate change. This vast biodiversity within the rariphotic disputes the perception that reef ecosystems just below the mesophotic—which are generally unexplored—transition directly into those of the deep sea.

Diverse ecosystem

According to lead author, Carole Baldwin, curator of fishes at the Smithsonian's National Museum of Natural History and director of the Smithsonian's Deep Reef Observation Project (DROP), "… tropical deep reefs are not barren landscapes on the deep ocean floor; they are highly diverse ecosystems that warrant further study. We hope that by naming the deep-reef rariphotic zone, we'll draw attention to the need to continue to explore deep reefs." ■

SOURCE: SCIENTIFIC REPORTS

Rariphotic (low light): Newly discovered faunal zone from 130–300m (400–1,000ft), below the reef-building coral zone.

news

Edited by Catherine GS Lim

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The Bajau have genetically adapted spleens due to their lifestyle.

Genes and spleens underlie freediving prowess in sea nomads

The Bajau are an indigenous people in Indonesia, renowned for their breath-holding ability when diving for food. They have been known to dive up to 70m using nothing more than a set of weights and a pair of wooden goggles.

Previously, scientists have speculated on whether dive capacity is related to spleen size. Although there was limited information available about the human spleen in terms of physiology and genetics, deep-diving seals were known to have disproportionately large spleens, which led researchers to suspect the Bajau had genetically adapted spleens due to their lifestyle.

Human dive response

According to the press release issued by St John's College, Cambridge: "The spleen plays a central role in prolonging free diving time as it forms part of what is known as the human dive response. When the human body is submerged under cold water, even for brief amounts of time, this response is triggered as a method of assisting the body to survive in an oxygen-deprived environment. The heart rate slows down, blood vessels in the extremities shrink to preserve blood for vital organs, and the spleen contracts.

"This contraction of the spleen creates an oxygen boost by ejecting oxygenated red blood cells into circulation and has been found to provide up to a 9% increase in oxygen, thereby prolonging dive time."

Genetic basis

The spleens of the Bajau and their land-dwelling neighbours, the Saluan, were scanned by ultrasound and samples taken. The results showed that the Bajau have a median spleen size that was 50 percent larger than the Saluan. And this was true even for non-diving Bajau. It was also discovered that the Bajau possessed a gene called PDE10A, which the Saluan did not. This gene is believed to control levels of the thyroid hormone and in turn spleen size as thyroid hormones and spleen size are connected.

The discovery of this genetic adaptation has implications in the medical field, particularly in the study of acute hypoxia. This is because the human dive response simulates this medical condition, in which body tissue experiences a rapid depletion of oxygen.

Professor Rasmus Nielsen who holds dual positions at the University of Copenhagen and the University of California, Berkeley, said, "This is the first time that we really have a system like that in humans to study. It will help us make the link between the genetics and the physiological response to acute hypoxia. It's a hypoxia experiment that nature has made for us and allows us to study humans in a way that we can't in a laboratory."

The findings have opened up the possibility of investigating other sea nomadic populations like the Moken in Thailand and the Haenyeo women of Jeju, South Korea. Doing so can shed more light on the relationship between human physiology and genetic adaptations to extreme lifestyles, and clarify whether such adaptations have developed separately. ■ SOURCE: CELL