New study reveals coral reefs may support much more biodiversity than previously thought

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The coral reef crustacean *Sadayoshia edwardsii*. Credit: Smithsonian

Smithsonian scientists and colleagues conducted the first DNA barcoding survey of crustaceans living on samples of dead coral taken from the Indian, Pacific and Caribbean oceans. The results suggest that the diversity of organisms living on the world's coral reefs is seriously underestimated. The team's research "The Diversity of Coral Reefs: What Are We Missing?" was published in October in the journal *PLoS ONE.*

At depths of 26 to 39 feet, the scientists collected dead coral from five different locations. At two sites where removing coral is prohibited, the scientists collected man-made sampling devices that had been left in the water for one year. Combined, the coral and devices had a surface area of just 6.3 square meters (20.6 square feet), yet 525 different species of crustaceans were found living on them.

"So much diversity in such a small, limited sample area shows that the diversity of crustaceans in the world's coral reefs -- and by implication the diversity of reefs overall -- is seriously under-detected and underestimated," said Nancy Knowlton, the Sant Chair for Ocean Science at the Smithsonian's National Museum of Natural History and co-author of the survey. "We found almost as many crabs in 6.3-square meters of coral as can be found in all of the seas of Europe. Compared to the results of much longer and labor-intensive surveys, we found a surprisingly large percentage of species with a fraction of the effort."

Here is a *Pilumnus tahitensis*. Credit: Smithsonian

The world's coral reefs are some of the most endangered habitats on Earth. Given coral's rapid decline and global range, DNA barcoding offered the scientists a quick and efficient method for their survey.

"DNA barcoding provides a standardized, cost-effective method of coming to grips with the staggering diversity of the world's oceans," Knowlton said. "It has enormous potential for use in broad global surveys, allowing us to find out what is living in the ocean now, and to keep track of it in the future."

Crustaceans collected for the survey were only those the scientists could see, and ranged from 0.2 to 1.9 inches long. All animals from which DNA was sequenced were preserved so they could be examined later by taxonomists.

"We collected dead corals because live corals defend themselves from being inhabited by other invertebrates," said Laetitia Plaisance of the Smithsonian's National Museum of Natural History and the Scripps Institution of Oceanography, and lead author of the survey.

Once a coral dies its structure becomes covered with algae, sponges, crustaceans, worms, mollusks and other creatures.

"Given the complexity and extent of the world's coral reefs, the survey covered only a very limited depth and habitat range," said Plaisance. "And yet we have so many more species than we ever expected."

Present estimates of species diversity in reefs are 600,000 to more than 9 million species worldwide. "We cannot give a new estimate today, but we may be able to in a few years," Plaisance said. Using man-made sampling structures at some 50 sites around the world, Plaisance is now working with the Smithsonian and the National Oceanographic and Atmospheric Administration on another survey that will include all of the many organisms that live on coral reefs.

Provided by Smithsonian