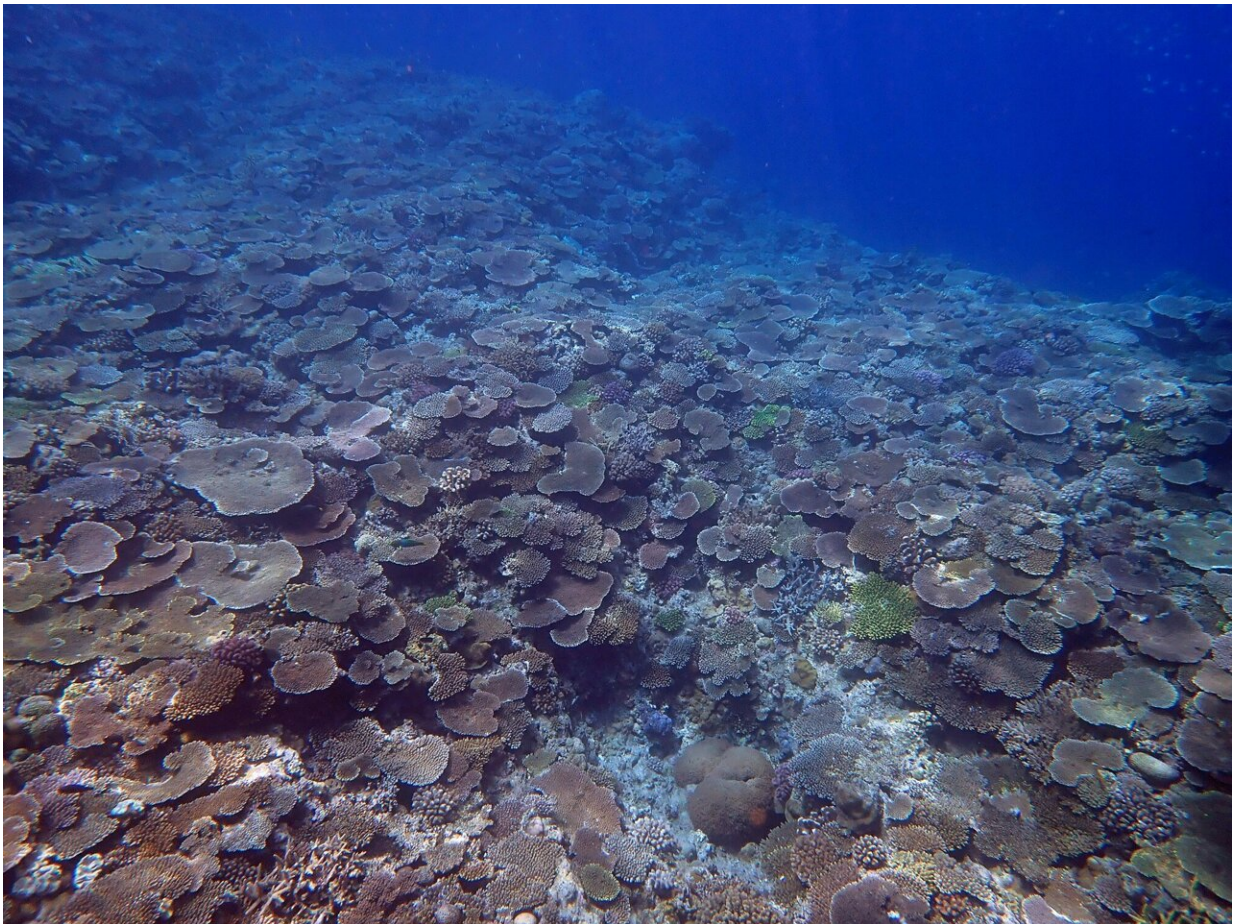


Detecting coral biodiversity in seawater samples

March 29 2023, by Lucy Dickie



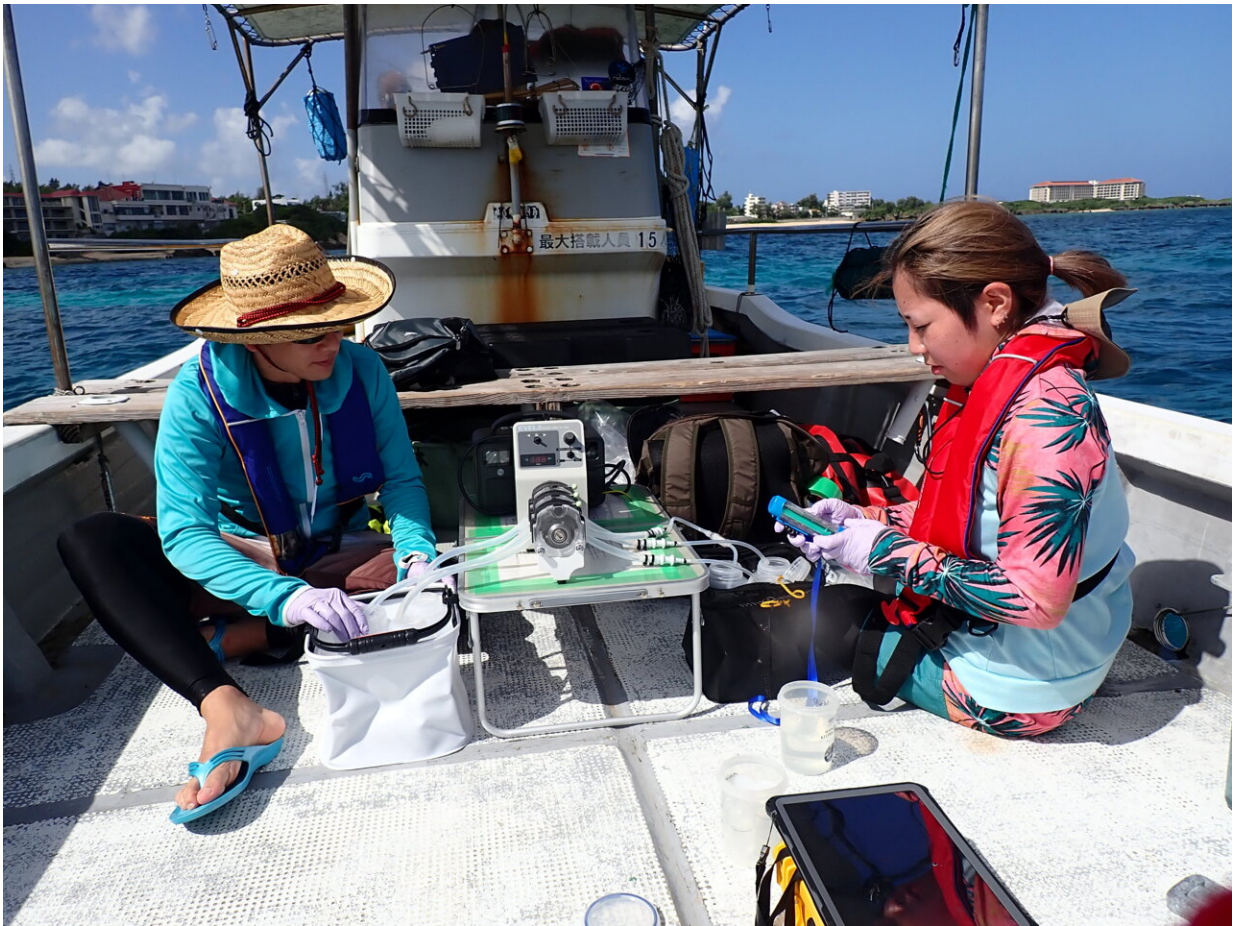
Coral reefs are home to around 30% of marine life but researchers say that recent global warming and other factors have caused bleaching, and many coral reefs are in danger of disappearing. The new eDNA method is set to make monitoring of the coral reefs faster, easier, and cheaper. The coral reef pictured is just one of the reefs that researchers looked at around Okinawa. Credit: OIST

Researchers from the Okinawa Institute of Science and Technology (OIST) have developed a method to measure coral biodiversity through extracting the environmental DNA (or eDNA) from a liter of surface seawater collected from above a reef. The method has been confirmed to work through observations made by scientific divers in the same areas of ocean.

The research, conducted in collaboration with the Okinawa Prefecture Environmental Science Center and University of Tokyo, was published in the *Proceedings of the Royal Society B: Biological Sciences*. It has paved the way for large-scale comprehensive surveys of reef-building coral to take place and removes the reliance of direct observations made through scientific scuba diving or snorkeling.

"Beautiful coral reefs in subtropical and tropical seas account for only 0.2% of the entire ocean," said co-author Prof. Nori Satoh, Principal Investigator of OIST's Marine Genomics Unit. "However, they are the most biodiverse areas of the oceans, home to about 30% of all marine life. Reef-building corals play a key role in creating coral reefs, but recent global warming and other factors have caused bleaching, and many coral reefs are in danger of disappearing."

To conserve and protect the coral reefs, it's important to first know which coral exists on the reef and how the make-up of a reef is changing over time. Previously, the only way to effectively survey a reef was through divers and snorkelers directly observing the coral and recording the species and the changes over time. This was time consuming, expensive, and labor intensive. But researchers are now utilizing the DNA that living creatures release into the environment, through skin, waste products, and mucus. By extracting this eDNA from the seawater and analyzing it, a clear picture of the organisms that inhabit that part of the ocean can be found, without ever having to enter the water.



On a reef in Okinawa, a snorkeler notes the different coral genera present. In this research, the scientists compared the two different methods for monitoring a reef—direct observations made by scientific snorkelers and the new method that utilizes eDNA. Credit: OIST/Noriyuki Satoh

Reef-building, or hard, coral are vital parts of [coral reefs](#). It is estimated that there are approximately 1,300 species of reef-building corals in 236 genera worldwide. These corals release mucus into the surrounding seawater, which contains a portion of DNA. In 2021, researchers from OIST and the University of Tokyo succeeded in developing tools that amplify and identify the DNA of 45 genera of reef-building coral.

Now, the researchers have tested whether these tools are effective and accurate by conducting a large-scale survey of the ocean surrounding Okinawa using both the eDNA method and scientific divers. This involved direct visual observation by two divers to identify dominant coral genera and collecting two or three one-liter bottles of surface seawater at each site. Seawater was filtered as soon as possible to fix environmental DNA trapped in the filters and the filters were brought back to the OIST laboratory for analysis. Over a four-month period, from early September to late December 2021, 62 sites from around the main Okinawa Island were surveyed and two to four dominant coral genera at each [reef](#) were recorded.

"We found that the eDNA analysis matched that of the direct scientific observations with more than 91% accuracy," said OIST Research Scientist, Dr. Koki Nishitsuji, first author of the paper. "In fact, 41 out of the 62 sites were identical. The eDNA method indicated the presence of five dominant coral genera at all 62 sites surveyed. What's more the results of the environmental DNA method suggest the presence of corals never before recorded along the coast of Okinawa."

The eDNA method requires complex sequencing information, and due to this, only 45 of the estimated 236 genera can currently be detected. With more information, the effectiveness of the eDNA method will increase. And, although further research is needed, the eDNA method may be able to indicate the presence of corals that are difficult to detect by [direct observation](#).

More information: Koki Nishitsuji et al, An environmental DNA metabarcoding survey reveals generic-level occurrence of scleractinian corals at reef slopes of Okinawa Island, *Proceedings of the Royal Society B: Biological Sciences* (2023). [DOI: 10.1098/rspb.2023.0026](https://doi.org/10.1098/rspb.2023.0026)

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