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September 26, 2024

For more information, contact:
Jonas D. Macapinlac
Chief Marketing and Communications Officer
Tel: 671-735-2944
Email: jmac@triton.uog.edu

UOG scientists discover gene for climate change resilience in soft corals

A researcher at the University of Guam Marine Laboratory led a team of scientists who discovered how a unique gene helps soft corals recover from the stress of climate change.

Dr. Gaurav G. Shimpi joined with fellow UOG Marine Laboratory researcher Dr. Bastian Bentlage and scientists from Ludwig Maximilian University of Munich for a study published in the *Journal of Experimental Marine Biology and Ecology*.

The study revealed that soft corals exhibit unique genetic responses mediated by mitochondria to climate change-related stressors, such as global warming and ocean acidification.

The Role of Soft Corals
Coral reef ecosystems are increasingly threatened by rising sea temperatures, ocean acidification and pollution. High temperatures disrupt the relationship between corals and their symbiotic algal partners, causing coral bleaching, while lower pH weakens coral skeletons, jeopardizing their survival. Stony corals make up the structural foundations of reefs, but soft corals, known as octocorals, are crucial for ecological balance, contributing to biodiversity, habitat provisioning, nutrient cycling, and reef resilience.

"These octocorals have very unique ways to deal with environmental change, and there are studies showing that these corals are resilient to climate stress," Shimpi said. Coral bleaching and erosion in soft corals is not as common, or as devastating, as it is with hard corals.

Doing most of their work in Germany, Shimpi and his team studied a soft coral species from the genus *Sclerophytum*, which is abundant around Guam. They exposed the corals to simulated environmental stressors, including higher temperatures, lower pH and oxidation.

All in the Genes
Soft corals harbor a unique gene in their mitochondrial genome, known as the *mtMutS* gene, that is potentially involved in mitochondrial DNA (mtDNA) repair.

"This gene is not found in any other animal mtDNA, from corals to even humans," Shimpi said. "No other animals have this gene that the soft corals have. And I wanted to figure out whether this gene has some contribution to their resilience to climate change."

He said the study is one of the first to investigate the mitochondrial response in the soft corals under environmental changes.

When the corals were placed under stress, the team's analysis showed elevated levels of the unique gene, highlighting its importance in repairing DNA damage caused by environmental stress.

As coral bleaching becomes more frequent, the shift from stony to soft corals is changing the makeup of coral reefs on Guam and around the world. By understanding the resilience of soft corals, especially their mitochondrial responses to stress, scientists can do a better job of anticipating and managing the effects of increased temperatures and ocean acidification.

"This research lays the groundwork for deeper exploration into the genetic and molecular mechanisms of coral resilience from a mitochondrial perspective, which is crucial for developing effective strategies to mitigate the impacts of climate change on coral reefs, and offers valuable insights into unique facets of mitochondrial biology," he said.

Read the published study:
https://www.sciencedirect.com/science/article/pii/S0022098124000662

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Attachments: Photos

UOG-ML-shimpi.jpg: Dr. Gaurav G. Shimpi led an international team of researchers studying how soft corals recover from climate stress. *(Photo courtesy Dr. Astrid Schuster)*

UOG-ML-softcoral.jpg: The researchers studied a soft coral species from the genus *Sclerophytum*, which is abundant around Guam. (*Photo courtesy Dr. Sergio Vargas)*