Newly described algae species toughens up corals to endure warming oceans

July 17 2017

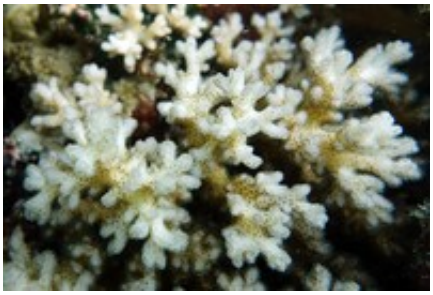
Healthy unbleached (brown) Pocillopora corals from the Eastern Pacific possess a thermally tolerant symbiont species of algae (Symbiodinium glynnii), while unhealthy or dead bleached (white) corals possess a more sensitive symbiont. Credit: Pennsylvania State University

Global climate change has increased water temperatures in the world's

oceans, often causing mass coral bleaching and mortality, which harms not only corals, but also the vast ecosystems they support. Using innovative methods, researchers at Penn State University have identified a new species of stress-tolerant Symbiodinium, a genus of algae that occurs mutualistically with corals in a partnership that promotes the health and growth of coral reef ecosystems. The team's paper, which appears in a recent issue of the journal Phycologia, also describes the geographical distribution of Symbiodinium glynnii, how it differs from other stress-tolerant symbiont species, and its capacity to spread to places around the Pacific and live with different coral hosts.

According to Todd LaJeunesse, associate professor of biology at Penn State, the algae, which he named Symbiodinium glynnii, is common among corals in the pocilloporid and montiporid families that dominate the warm or variable environments of the Pacific Ocean. "Symbiodinium glynnii is a highly abundant species in the Eastern Pacific, which explains, in part, why Pocillopora colonies dominate the coral communities over this broad and environmentally diverse region," said LaJeunesse. "Corals with this species of algal symbiont are physiologically robust and can withstand conditions that would be too extreme for coral colonies harboring other kinds of symbiont."

The researchers relied primarily on genetic evidence gathered from the analysis of hundreds of samples obtained from far-flung sites in the Pacific Ocean, including reefs near Mexico, Panama, the Galapagos Islands, the Phoenix Islands, Hawaii, and Palau. They also examined samples from aquarium collections. The team used a variety of data to identify the new species, including DNA sequences, microsatellite genotyping, host associations, cell sizes, and other traits. They also imported this data into a computer program, pioneering an approach to use machine learning to unambiguously identify species that are normally hard to distinguish.



A variety of corals, including those from the genus Pocillopora, associate with the stress-tolerant species of algae Symbiodinium glynnii in habitats with extreme temperature in Palau in the Western Pacific. Credit: Pennsylvania State University

"We have been studying this coral symbiont for years and how it can significantly change the thermal tolerance of the coral colony in which it resides," said LaJeunesse. "It's good to finally assign a name to this organism, which will allow scientists to better communicate about its biology and ecology, and therefore, accelerate progress in our field. Ultimately, the study of these stress-tolerant symbionts will help us learn about what adaptations, or traits, may allow some reef corals to live in a harsher world."

Seriatopora corals located in extreme habitats in the Western Pacific associate with Symbiodinium glynnii. Todd LaJeunesse is studying how associating with algal symbionts allows these and other corals to adapt to stressful environments.

Credit: Pennsylvania State University

Provided by Pennsylvania State University