Promiscuity may help some corals survive bleaching events

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Severe bleaching of corals at Lord Howe Island during 2010 and 2011. Credit: Peter Harrison

Researchers have shown for the first time that some corals surviving bleaching events can acquire and host new types of algae from their

environment, which may make the coral more heat-tolerant and enhance their recovery.

The research, published in *The ISME Journal*, was led by Southern Cross University postgraduate student Ms Nadine Boulotte and included scientists from SCU's Marine Ecology Research Centre, the University of Melbourne, the Australian Institute of Marine Science (AIMS) and the University of Hawai'i.

"This new study will cause a paradigm shift in our understanding of corals that build reefs," Ms Boulotte said.

"Most corals were previously believed to only acquire microalgae in their juvenile stage, and to house the same algae types for their lifetime.

"Our study shows for the first time that some adult corals can be promiscuous, and swap their algal partners later in life.

"This algae partner-swapping could help corals to better adapt to climate change and survive bleaching events if they can acquire more heat-tolerant microalgae."

Coral bleaching occurs when the microalgae living within coral polyps die off, leaving the coral tissues white. These microalgae are essential for coral survival and live in a symbiotic (mutually beneficial) relationship, providing corals with much of the energy they need for reef building.

The team used very sensitive new DNA sequencing techniques to analyse thousands of algal symbionts from corals in the beautiful subtropical reef at Lord Howe Island during and after the coral bleaching events of 2010 and 2011.

"We monitored the diversity and dominance patterns of the symbiotic microalgae present in polyp tissues of two coral species and found an extraordinary range of different types of microalgae present in the corals," said Ms Boulotte.

"Even more exciting was that some of the corals surviving the bleaching events appeared to have acquired new algal types from the surrounding environment.

"One of these new types of microalgae became very abundant, occupying about one-third of the microalgal community present in the coral population sampled."

Professor Madeleine van Oppen from the University of Melbourne and Australian Institute of Marine Science (AIMS) was a co-author on the study.

"This is the first evidence that symbiont switching can occur in adult corals, as previously it was believed that uptake of new types of symbiotic microalgae was restricted to coral larvae or juvenile coral polyps," Professor van Oppen said.

"The relative bleaching tolerance of corals is partly determined by the microalgal symbiont community composition, and some algal types are known to provide higher heat tolerance to the coral than others.

"These results highlight a mechanism of corals to cope with increased sea temperatures that had previously been hypothesised to exist, but never been shown to actually occur."

Professor Peter Harrison, director of SCU's Marine Ecology Research Centre and also a co-author, said the findings were significant.

"Given the severe coral bleaching event on the northern Great Barrier Reef and some other regions around the world that is killing many corals, and the increasing threat of catastrophic bleaching events into the future as sea temperatures continue to warm, the research is timely.

"We need to expand this research from the subtropical region into tropical reef areas, where most coral reefs occur and where mass bleaching events are severely impacting coral communities, to see if other types of corals can select new algal symbionts.

"Fortunately, the corals at Lord Howe Island have not bleached so far this year so we are hoping that they will escape this stress as the offshore subtropical waters start to cool. But as the 2010 and 2011 bleaching events showed even the southernmost coral reef in the world is not immune from major bleaching impacts."

More information: Nadine M Boulotte et al. Exploring the Symbiodinium rare biosphere provides evidence for symbiont switching in reef-building corals, *The ISME Journal* (2016). DOI: 10.1038/ismej.2016.54

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