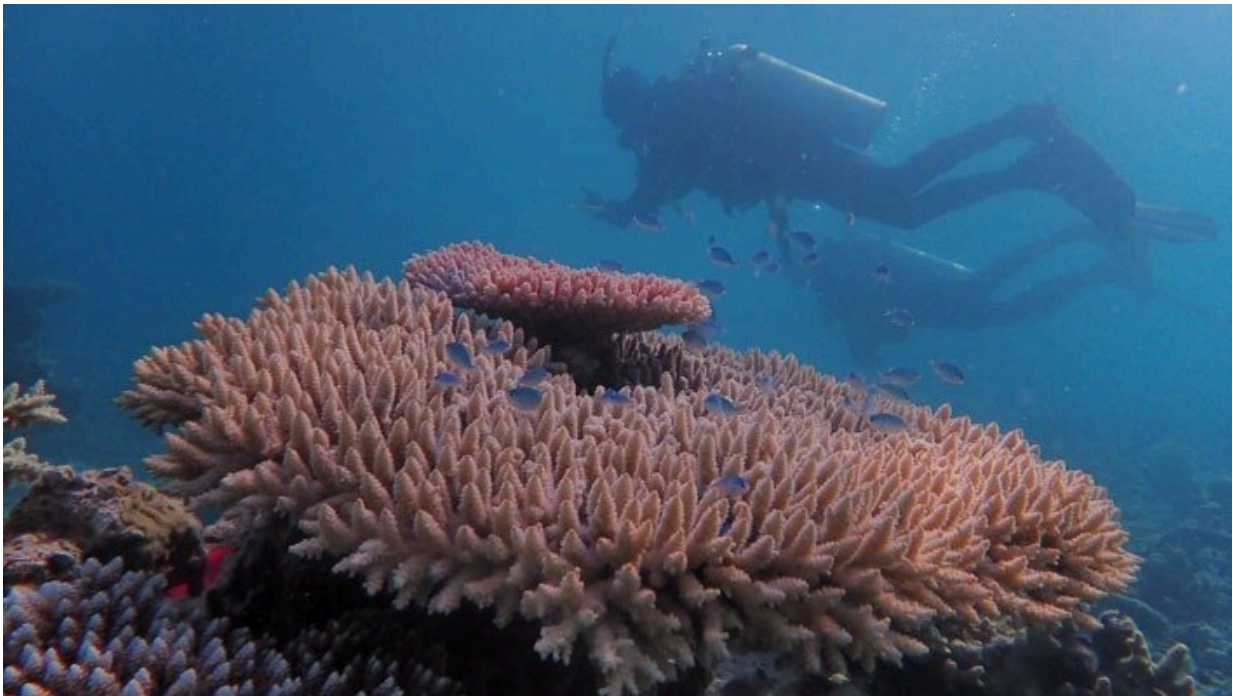


Underwater phenomenon bringing relief to hot corals

May 5 2023



Divers at mermaid reef. Credit: Camille Grimaldi

Naturally fluctuating temperatures on coral reefs caused by tides, waves and currents can bring relief from marine heat waves and may even help corals adapt to higher temperatures, a new study by Australian Institute of Marine Science (AIMS) and the University of Western Australia (UWA) scientists has found.

Dr. Camille Grimaldi and a team of researchers studied Mermaid Reef in the Rowley Shoals, offshore from Broome in north-Western Australia, for almost a year to understand more about how water flow affects temperature and [coral bleaching](#) risk in different parts of the remote atoll. A paper on their findings has been published in the journal *Coral Reefs*.

Bleaching is a coral's response to heat stress, causing them to turn pale or white after they expel the algae which gives them their color and provides them with food. While corals can recover, bleaching may result in reduced growth, limited reproduction, increased disease risk and even death. Climate change is driving the [marine heat waves](#) which cause coral bleaching.

Located on the edge of the continental shelf, Mermaid Reef is part of a system known for its healthy and resilient coral reef habitat. This system has not experienced any major coral bleaching events since the mid-1990s.

Dr. Grimaldi said they found some significant temperature changes in different areas of Mermaid Reef occurring in timescales from a few hours to weeks and caused by tides of up to three meters and [large waves](#) of up to two meters.

"We found that Mermaid Reef is a very lively place in some areas and quieter in others in terms of oceanographic processes like tides, currents and waves," said Dr. Grimaldi.

"Calm areas of the reef such as the lagoon are poorly connected to offshore waters, which provide little cooling to these areas. Other parts of the reef, like the slopes and flats, are exposed to tides and waves which increases the connection with cooler offshore waters. This has contributed to changing the reef's temperatures in those areas

significantly.

"Given the future trajectory of coral reefs under a warming climate, understanding this natural variability at Mermaid Reef will help us to identify environmental conditions that promote coral reef resilience and recovery more widely. This is pivotal to advancing our ability to conserve and manage [coral reefs](#) around the world.

"As the planet warms, reefs with the best chance of survival are likely to be the ones that are better connected to offshore ocean waters through the currents created by tides and waves. This is where we could be focusing conservation efforts."

To understand how water flow controls reef temperatures and affects reef health, the researchers deployed a series of instruments in the waters surrounding Mermaid Reef atoll, including temperature and velocity sensors to track the strength of incoming waves and tides.

They found that because of the large tidal ranges, tidal flows were responsible for temperature changes occurring over just a matter of hours (up to 5.6°C in an hour), in locations separated by just a few hundred meters.

The resulting flow from the waves at Mermaid Reef also led to cooling over several days to weeks, suggesting that waves could provide relief from thermal stress over longer periods of time.

"This is important because several studies have suggested that temperature fluctuations over hourly or shorter timescales can expose corals to stressful temperatures for periods short enough to avoid coral mortality, but long enough to drive adaptation," added Dr. Grimaldi.

"Understanding finer scale temperature variations and their drivers at

Mermaid Reef is important given that most satellite sea surface temperature (SST) measurements—the standard tool used by managers to monitor reef temperatures—are too coarse to pick up the temperature variabilities we recorded."

More information: C. M. Grimaldi et al, Hydrodynamic and atmospheric drivers create distinct thermal environments within a coral reef atoll, *Coral Reefs* (2023). [DOI: 10.1007/s00338-023-02371-x](https://doi.org/10.1007/s00338-023-02371-x)

Provided by Australian Institute of Marine Science

Citation: Underwater phenomenon bringing relief to hot corals (2023, May 5) retrieved 16 July 2024 from <https://phys.org/news/2023-05-underwater-phenomenon-relief-hot-corals.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.