Desert dusts convert coral reefs into carbon storage

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Coral reef on the Gulf of Aqaba. Credit: Geological Survey Israel; The University of Queensland

An international study comparing data from Heron Reef and the Middle East's Gulf of Aqaba has disproved the long-held theory that coral reefs

only have the capacity to emit CO_2.

The first-of-its-kind discovery is the result of an international study led by The University of Queensland which found that dust blown in from nearby deserts can convert coral reefs into CO_2 sinks.

Professor Hamish McGowan from UQ's School of Earth and Environmental Sciences said the discovery was made after researchers observed a correlation between influxes of CO_2 and periods of increased dust concentrations in the atmosphere around the reefs.

"We were surprised at how significant a role dust accumulation played in switching coral reefs from a CO_2 source to a CO_2 sink," Professor McGowan said.

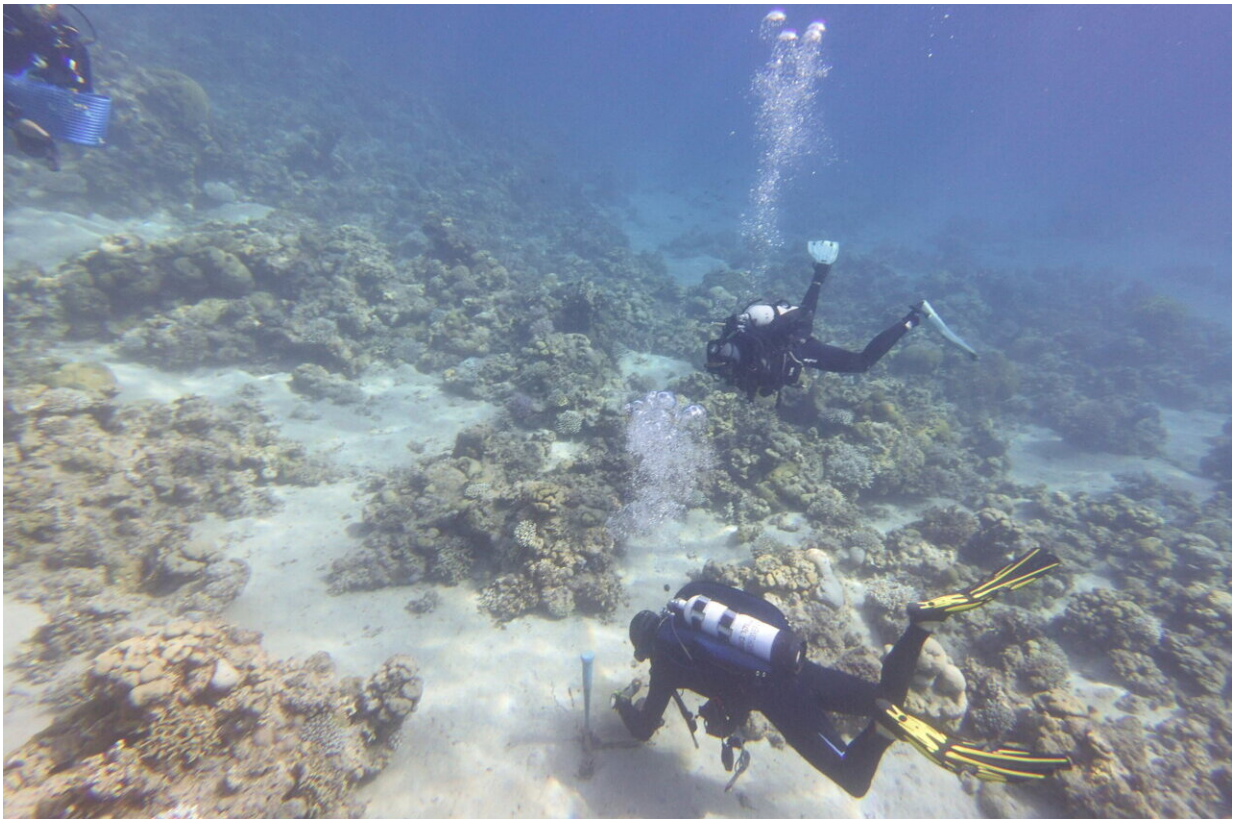
"This process was previously thought to be impossible, but our research proves otherwise.

"We found that the build-up of dust in the traditionally low-nutrient and low-chlorophyll waters of the Gulf of Aqaba actually fertilizes and improves coral-growing conditions and photosynthesis in reef ecosystems."

Professor McGowan said the results will allow for the development of more accurate carbon budgets for the world's oceans.

"The process we have identified in this study actually contributes to more accurate accounting of carbon around the globe," Professor McGowan said.

"This informs predictions of the impact of atmospheric carbon on climate and climate sensitive ecosystems such as coral reefs."



Researchers observe coral reefs on the Gulf of Aqaba. Credit: Geological Survey Israel; The University of Queensland

Professor Nadav Lensky from Geological Survey Israel said these improved conditions mean desert reefs have the potential to act as a place of refuge for coral.

"In this study we also measured extreme evaporation rates over the coral reefs in the Gulf of Aqaba, at the most northern tip of the Red Sea," Professor Lensky said.

"This process consumes large amounts of heat and keeps water temperatures typically below the threshold that causes coral bleaching.

"Combined with the positive impact of dust deposition, these processes make the Gulf of Aqaba a more supportive environment for growing coral."

The research establishes the causal controls on reef water temperatures, as opposed to previous predictions which were more focused on the correlation of global warming and coral bleaching.

Professor Lensky said these findings will allow researchers to correctly attribute the cause of, for example, extreme high water temperature events that result in coral bleaching.

"Our research, which included analysis of data collected at Heron Reef on the Great Barrier Reef, has confirmed the crucial role of local meteorology and the prevailing weather patterns in determining reef water temperatures," Professor Lensky said.

"To further test and understand how dust may influence air-sea CO_2 exchange, we need to do more research into how this may change in different seasons and locations, such as over coral reefs like Ningaloo reef in northwest Australia."

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More information: Hamish McGowan et al, Direct Measurement of CO 2 Air-Sea Exchange Over a Desert Fringing Coral Reef, Gulf of Eilat (Aqaba), Israel, *Journal of Geophysical Research: Oceans* (2022). DOI: 10.1029/2022JC018548

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