

Press Release

For Immediate Release

HKU study unlocks the secret of corals' tolerance to climate change: their diet

April 15, 2020

Researchers at School of Biological Sciences and Swire Institute of Marine Science, The University of Hong Kong have developed a new method for determining what corals eat, and demonstrated that reliance on certain nutritional sources underpins their bleaching susceptibility in warming oceans.

The research, published in the prestigious journal *Science Advances*, solves a conundrum scientists have struggled with for decades; determining the diet of a coral involves measuring how much prey it captures with stinging tentacles as well as how much food is provided by the photosynthetic algae inside their cells. To overcome this challenge, the team, led by Dr Inga Conti-Jerpe, compared the stable isotope “fingerprint” of hundreds of corals collected in Hong Kong to that of their associated algae. The results showed that some corals have isotopic fingerprints that match that of their algae, indicating the two partners share nutrients. Other corals have fingerprints distinct from their algae due to a diet based on the capture and consumption of prey particles in the water. The researchers found that more predatory corals had significantly larger polyps (an individual coral unit – much like an anemone) than corals more dependent on photosynthesis, a previously contentious relationship first proposed in 1974.

“We knew that polyp size is a factor that affects the surface area to volume ratio of a coral, a trait that other scientists have observed might be linked to delayed bleaching in the field. We decided to run a warming experiment with our Hong Kong corals to see if their diet accurately predicted how long they could withstand elevated temperatures without bleaching – and it did.” explains Dr Conti-Jerpe.

These results have implications for how coral reefs will change as climate change progresses. Corals dependent on photosynthesis bleach faster while predatory corals can withstand warming temperatures longer. *“The results of our study help predict which coral species are more likely to survive as oceans warm. Unfortunately, what we found is that the most susceptible species are those that are commonly used in coral reef restoration efforts. To ensure the long-term success of reef rehabilitation, restoration initiatives should shift their focus to bleaching-resistant species.”* said Dr David Baker, Associate Professor of School of Biological Sciences and Swire Institute of Marine Science who supervised the study.

While predatory nutrition can confer protection from bleaching, the scientists note that given sustained elevated temperatures, all the species in the study eventually bleached. *“Capturing a lot of food doesn't save corals from bleaching,”* explains Dr Conti-Jerpe, *“it just buys them a little more time – time that they desperately need.”* The findings of this study will help scientists, conservationists and policy makers anticipate which corals will disappear first and how this will change reef ecosystems overall, including the services they provide.

Stable isotope data are an established tool for investigating diet – they are derived from measuring the different forms of common elements, such as carbon and nitrogen that have the same function biologically but differ ever so slightly in mass. For instance, nitrogen – an essential building block for DNA and protein – comes in a common ‘light’ isotope (^{14}N) and a rare ‘heavy’ isotope (^{15}N). When it comes to diet, animals accumulate ^{15}N if they are sitting higher on the food chain – a carnivore will have more ^{15}N than an herbivore. The corals in this study that had stable isotope values different from that of their algae had more ^{15}N and thus must be more predatory.

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About the journal paper

Citation: I. E. Conti-Jerpe, P. D. Thompson, C. W. M. Wong, N. L. Oliveira, N. N. Duprey, M. A. Moynihan, D. M. Baker, Trophic strategy and bleaching resistance in reef-building corals. *Sci. Adv.* **6**, eaaz5443 (2020).

About the research team

Dr Inga Conti-Jerpe spearheaded the work as part of her PhD in the Division of Ecology & Biodiversity and Swire Institute of Marine Science at HKU. She is now a postdoctoral associate in the same department. Dr Phil Thompson is a Research Technician in the Division of Ecology & Biodiversity and Swire Institute of Marine Science at HKU. Mr. Martin Wong contributed to the work during his MPhil degree in the Division of Ecology & Biodiversity and Swire Institute of Marine Science at HKU. Dr Nara Oliveira contributed as a visiting scholar at HKU during her PhD at the Universidade Estadual de Santa Cruz (State University of Santa Cruz, Ilhéus, Brazil). Dr Nicolas Duprey, formally a Postdoctoral Associate at HKU, is currently a Postdoctoral Researcher at the Max Planck Institute for Chemistry (Mainz, Germany). Ms. Molly Moynihan is currently a PhD student at the Earth Observatory of Singapore and Asian School of the Environment at Nanyang Technological University (Singapore). Dr David Baker is an Associate Professor in the School of Biological Sciences and the Swire Institute of Marine Science at The University of Hong Kong (www.thelifeistopic.com).

For media enquiries, please contact Ms Cindy Chan, Assistant Director of Communications of HKU Faculty of Science (tel: 3917 5286; email: cindycst@hku.hk) or Dr. Baker (dmbaker@hku.hk).

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Image/ video captions:



	<p>Image 1</p> <p>File: Coral Farm.jpg Credit: Dr. Jane Wong Caption: Dr. Inga Conti-Jerpe, along with other lab members, overlooks corals recovering from bleaching in the coral farm at the Swire Institute of Marine Science, The University of Hong Kong.</p>
	<p>Image 2</p> <p>File: Coral Platygyra.JPG Credit: Dr. Philip D. Thompson Caption: A close up of a large-polyped coral (<i>Platygyra</i> sp.)</p>



Image 3
File: Coral Favites.JPG
Credit: Dr. Philip D. Thompson
Caption: The large-polyped coral *Favites abdita*

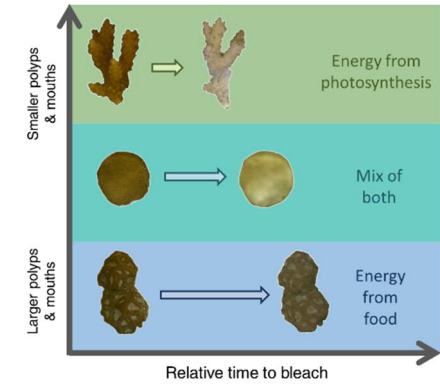


Image 4
File: Conti-Jerpe et al Schematic.png
Credit: Photos by Dr. Nara L. Oliveira, schematic by Dr. Inga E. Conti-Jerpe
Caption: The results of this study show that corals with larger polyps and larger mouths are more reliant on energy from food, while corals with smaller polyps and mouths are more reliant on energy from photosynthesis, performed by symbiotic algae that live inside the coral. These differences in diet were then linked to resistance to bleaching under warming temperature: corals with smaller polyp bleached first, while corals with larger polyps took longer to bleach.



Image 5
File: Warming setup 4.jpg
Credit: Dr. Inga E. Conti-Jerpe
Caption: Coral fragments incubating in a ten-week warming experiment. Some coral species have begun to exhibit bleaching, or a loss of color due to prolonged unusually warm conditions.

Video 6
File: HK coral community 2.MP4
Credit: Dr. Philip D. Thompson
Caption: A typical coral community in Hong Kong

Video 7
File: Porites polyps.MP4
Credit: Dr. Philip D. Thompson
Caption: A close up of the coral *Porites lobata*

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