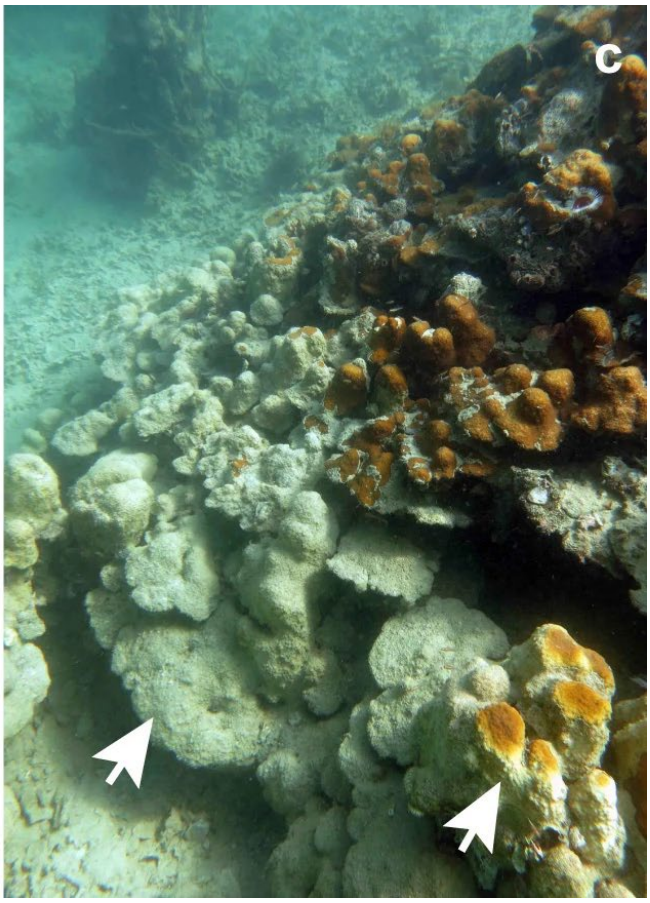


BACKGROUND INFORMATION

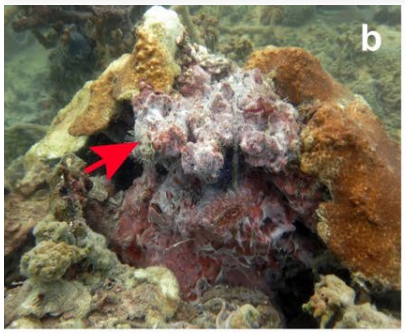
Although they may look like plants or rocks, **corals** are animals related to jellyfish and anemones. Many coral species have a hard outer skeleton and live in large groups called colonies. The skeletons of all the corals in a colony create the structures of coral reefs.

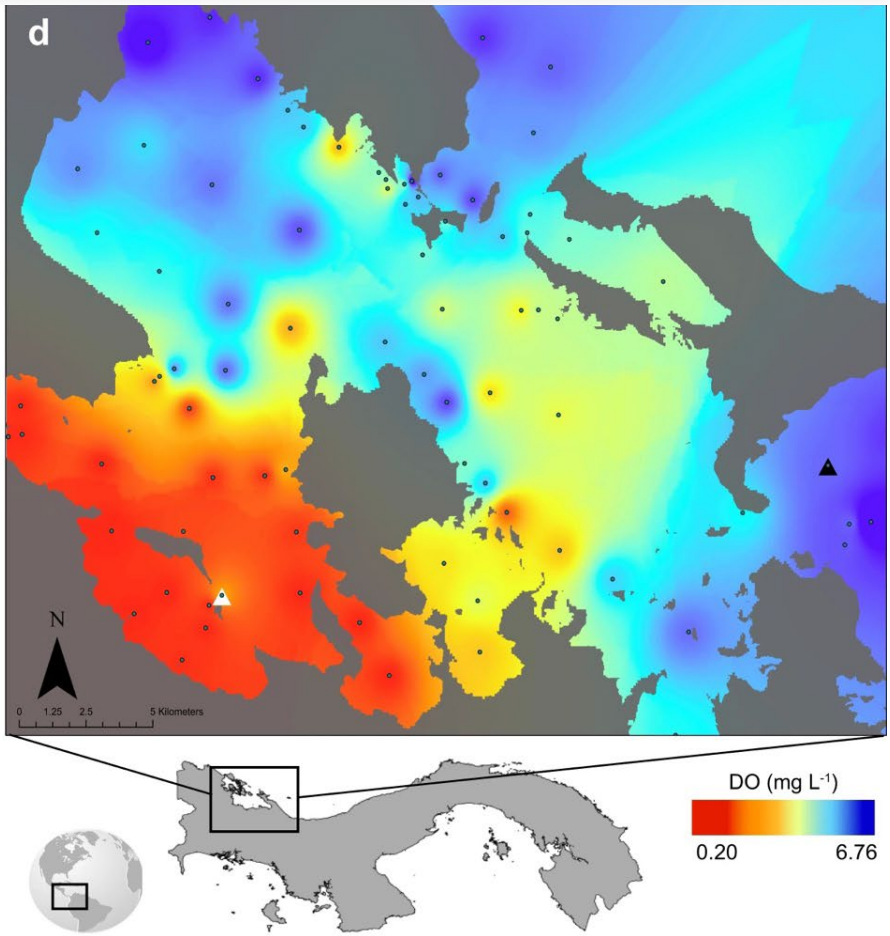
Most corals form a **symbiosis** (a close, long-term relationship between organisms of different species) with tiny **algae** (organisms that perform photosynthesis and typically live underwater). These algae live within the coral's cells and provide the coral with most of the food it needs.

Stressful environmental conditions — such as sudden or prolonged changes in temperature, sunlight, or oxygen — can disrupt the symbiosis between the corals and their algae. Corals may then force the algae out of their cells in a process called **coral bleaching**. Since the algae give corals their color, corals turn white after bleaching.

Though corals can survive short-term bleaching, their risk of disease and death increases. Human activities have led to an increase in coral bleaching worldwide. This impacts corals, coral reef ecosystems, and human communities that rely on coral reefs.

Figures a and c show two different species of corals from a reef off the Caribbean coast of Panama. Parts of both corals have undergone bleaching, which is indicated by the arrows pointing to the white areas.





EXTENSION INFORMATION

All these images are from a reef in Bahía Almirante, a bay on the Caribbean coast of Panama, in 2017. At this time, Bahía Almirante experienced sudden **deoxygenation**, or loss of oxygen. This may have been caused by ocean pollution or changes in water temperature and wind activity.

Similar to heat stress, deoxygenation is a stressful environmental condition that can cause coral bleaching. Figures a and c, which were shown at the beginning of this activity, are of corals that bleached after deoxygenation.

Figure b shows other corals covered in a **microbial mat** (a group of many microbes, typically bacteria and cyanobacteria), which looks like thin white threads. These microbial mats thrive when oxygen is low, allowing them to grow over corals.

Figure d is a map of Bahía Almirante shortly after the 2017 deoxygenation event. The colors indicate the levels of dissolved oxygen (DO) in the water. The white triangle shows the location of the reef where the photos were taken.

Figure e shows dying **brittle stars** (a type of invertebrate that lives on coral reefs) gathered on some corals. Brittle stars are just some of the many reef organisms that were impacted by the loss of oxygen.