

What is coral bleaching?

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Corals have a symbiotic relationship with microscopic dinoflagellates of the genus *Symbiodinium*, which live in its tissue. They are also commonly known as “zooxanthellae” due to their yellow-brown color. These zooxanthellae provide the greatest amount of food to the corals and give them their characteristic color. Living in symbiosis, corals and zooxanthellae depend on each other to survive. When the coral is stressed, it causes a break in the symbiosis and expels the zooxanthellae of its tissues, causing coral bleaching. This phenomenon is a biological response to changes in the physical environment of the reef, and in some cases in response to pathogen infection. A sick coral can present diseases and vice versa. Changes in ocean temperature, exposure to air during low tides, overexposure to sunlight, and pollutant runoff are some stressors that can cause bleaching in corals and other invertebrates. Zooxantelados such as gorgonians, anemones and zoanthideans. Although these organisms can survive a bleaching event, if the stress continues for too long (usually several weeks) they will eventually die.

Climate change caused by human activities such as burning fossil fuels and deforestation have dramatically altered the atmospheric concentration of greenhouse gasses such as carbon dioxide and methane. These changes have resulted in the acidification and continued warming of the oceans, threatening coral reefs, due to increased thermal stress caused by rising sea temperatures. Although recent research has shown that corals can exhibit some degree of adaptation to warming oceans, it is unclear whether corals can survive the accelerated rate at which these temperatures change. To safeguard the future of corals, the top priority must be reducing global greenhouse gas emissions. And what can we do about it? When we visit the reefs in Cozumel we must choose dive shops authorized by the Marine Park to carry out underwater activities within the Protected Natural Areas. Dive shops like Dive With Martin® implement good environmental practices such as avoiding single-use plastics, giving dive briefings explaining important rules such as keeping a safe distance from the bottom and not touching marine life, as well as encouraging switching from sunscreen to long-sleeved protective clothing such as rashguards. In our daily lives we must question our consumption habits and change them. Some actions are: eating a diet with foods that have a low carbon footprint, recycling and disposing of garbage properly, saving electricity in the house and home, as well as using environmentally friendly means of transportation. Lastly and most importantly, we must question the performance of politicians and public servants from the nations that govern us. We need a fair climate policy to stop projects that threaten biodiversity, mainly those that promote fossil fuels, deforestation, overfishing, land and marine pollution, etc. Only with individual, local and global solutions can we promote sustainable development to mitigate climate change, prevent ocean warming and stop coral bleaching.



Figure 1. star coral mountainous (*Orbicella faveolata*) with loss of color due to thermal stress. In the image on the left you can see the pale tissue at the top (light yellow color), in the middle you can see complete whitening and at the bottom you can see its normal coloring. The image on the right shows the completely pale coral. Both photographs are one month apart.

For more information:

1. NOAA. What is coral bleaching?. https://oceanservice.noaa.gov/facts/coral_bleach.html
2. United States Environmental Protection Agency. What you can do to protect coral reefs?. <https://www.epa.gov/coral-reefs/what-you-can-do-help-protect-coral-reefs>
3. Hughes, T., Barnes, M., Bellwood, D. et al. Coral reefs in the Anthropocene. Nature 546, 82–90 (2017). <https://doi.org/10.1038/nature22901>
4. Hoegh-Guldberg, O. (2011). The Impact of Climate Change on Coral Reef Ecosystems. In: Dubinsky, Z., Stambler, N. (eds) Coral Reefs: An Ecosystem in Transition. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-0114-4_22
5. Hughes, T.P., Kerry, J.T., Baird, A.H. et al. Global warming transforms coral reef assemblages. Nature 556, 492–496 (2018). <https://doi.org/10.1038/s41586-018-0041-2>
6. Nicole Shumway, Rose Foster, Brian Head, Pedro Fidelman, Policy solutions needed for the future of coral reefs, BioScience, 2023;, biad092, <https://doi.org/10.1093/biosci/biad092>