

Climate crisis drives Mediterranean coral populations to collapse

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A colony of '*Paramuricea clavata*' which is partially dead due to the extreme heat conditions experienced during a marine heatwave. While the left part of the colony exhibits living tissue, the right part has the skeleton exposed. Credit: Eneko Aspillaga

A new study led by teams of the Faculty of Biology, the Biodiversity Research Institute (IRBio) of the University of Barcelona, and the Institute of Marine Sciences (ICM-CSIC) of Barcelona has revealed that marine heatwaves associated with the climate crisis are bringing down the populations of coral in the Mediterranean, the biomass of which in some cases has been reduced by 80 to 90%.

According to the study, published in the journal *Proceedings of the Royal Society B*, coral populations of the Mediterranean —essential for the functioning of the coral reefs, one of the most emblematic habitats in this sea— could be unable to recover from the recurrent impact of these extreme episodes, with water temperatures reaching high degrees for days and even weeks.

This is the first study to assess the long-term recovery capacity of populations of two emblematic species of Mediterranean coral: the red gorgonian (*Paramuricea clavata*) and the red coral (*Corallium rubrum*), which provide complex habitats that are essential for a great diversity of associated fauna. Therefore, it is essential to understand their resilience regarding the more frequent and [intense heatwaves](#).

Mass mortality events

The climate crisis is severely affecting the [marine ecosystems](#) worldwide, and the Mediterranean is no exception. In particular, the marine heatwaves associated to the climate crisis are causing [mass mortality events](#) in all the coastal ecosystems of this basin, and among the most affected species are the Mediterranean corals.

Knowledge on the coral's long-term resilience is still scarce, despite the studies that analyzed the immediate impact of marine heatwaves on these organisms. These are long-lived species (more than a hundred years in some cases) and with slow populational dynamics (that is,

organisms with low growth and recruitment rates), and therefore researchers need long temporary series (decades) to assess their recovery capacity.

As part of the study, the team analyzed the results obtained in a long-term monitoring on different populations of coral affected by a great mass mortality caused by a [heatwave](#) in 2003 in the protected marine area of Scandola (Corsega, France). In particular, they analyzed data on the state of these populations (density, size structure and biomass) collected during the following fifteen years to the heatwave, by the researchers of the MedRecover research group, formed by experts of the UB and ICM-CSIC, among other centers.

Far from recovery, the results show that all the analyzed populations tended to collapse since they were affected by the 2003 heatwave. Fifteen years after this event, these populations are practically considered to be extinct from a functional perspective.

"We observed an average biomass loss regarding the initial biomass of 80% in populations of red gorgonian, and up to a 93% regarding the studied [population](#) of red coral," notes Daniel Gómez, researcher at ICM-CSIC.

"These data are worrying for the conservation of these emblematic species, and it indicates that the effects of the climate crisis are speeding up with obvious consequences for the submarine landscapes, where the loss of coral equals the loss of trees in forests," notes Joaquim Garrabou, also member of ICM-CSIC.

Recurrent exposure to heatwaves

Cristina Linares, professor at the Department of Evolutionary Biology, Ecology and Environmental Sciences of the Faculty of Biology and

member of IRBio, says that "we believe one of the main reasons why we observed these collapse trajectories is the potential recurrent exposure to heatwaves, incompatible with the slow populational dynamics of these species." In particular, during the study period (2003–2018), they registered important heatwaves in at least four years: 2009, 2016, 2017, 2018.

"During these heatwaves," continues Linares, "the temperature conditions in the studied area reached extreme levels which are incompatible with the life of these corals, which probably caused new mortality events to the decimated populations and made the recovery impossible."

Since we expect the number and intensity of [marine heatwaves](#) to increase over the following decades due to the climate crisis, the viability of many coral populations could be seriously threatened.

"However, there will probably be some areas in the Mediterranean in which, due to several factors, the recurrence of such climate impacts may be lower. This makes it especially relevant to keep —regarding other potential impacts— these [climate](#) refuges where the trajectories of coral populations could be more positive than those observed in this study," notes the research team.

"Nevertheless, there is an urgent need for stronger measures to be implemented against the [climate crisis](#) before the loss of biodiversity becomes irreplaceable," conclude the experts.

More information: D. Gómez-Gras et al, Population collapse of habitat-forming species in the Mediterranean: a long-term study of gorgonian populations affected by recurrent marine heatwaves, *Proceedings of the Royal Society B: Biological Sciences* (2021). [DOI: 10.1098/rspb.2021.2384](https://doi.org/10.1098/rspb.2021.2384)

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