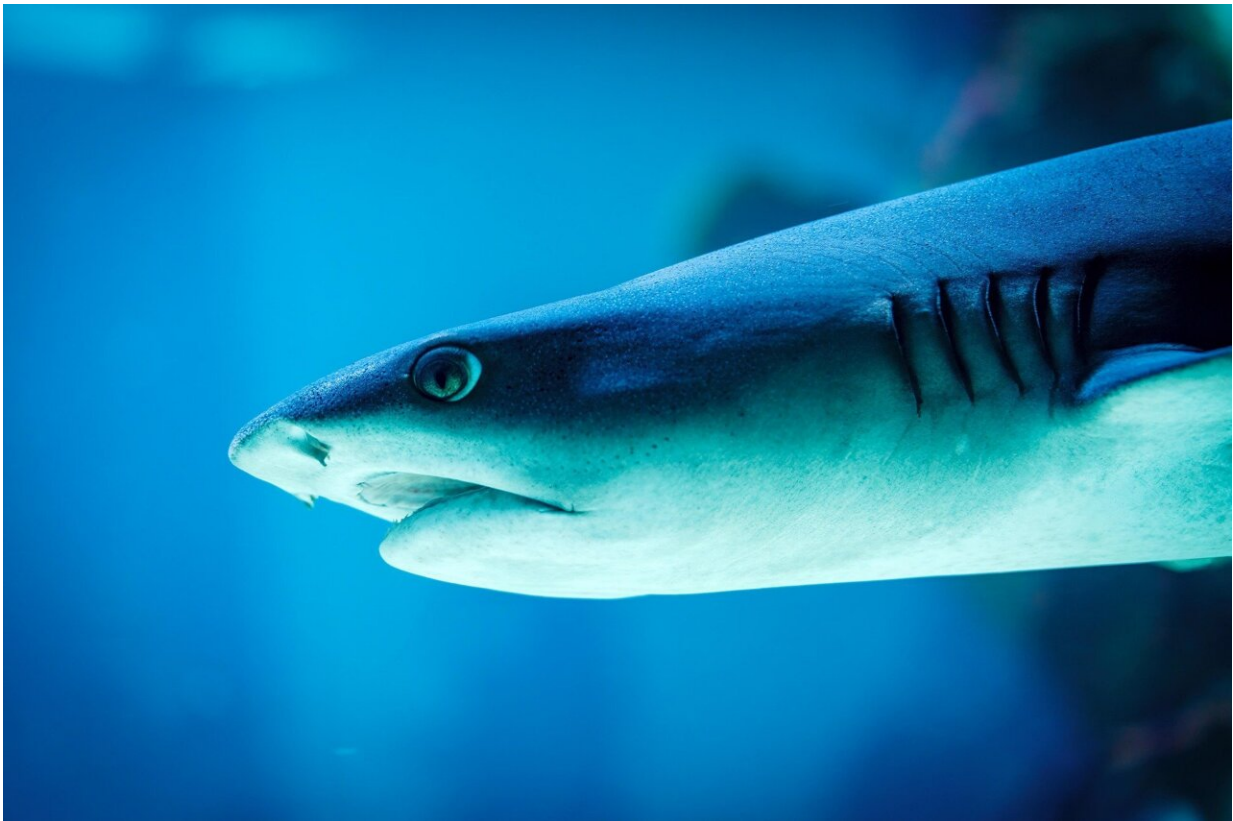


Sharks are abandoning stressed coral reefs in warming oceans, study finds

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Gray reef sharks are having to abandon the coral reefs they call home in the face of warming oceans, new research finds.

Scientists, using a combination of satellite remote sensing and a network of acoustic receivers on the seabed, have discovered that sharks are deserting coral reefs at times of environmental stress, such as high temperatures that can lead to [coral bleaching events](#).

The effects on these sharks, normally strongly attached to particular areas of shallow reef habitats, include lower residency, more widespread and frequent movements to different areas and longer periods of absence entirely. Worryingly, these effects persisted for extended periods of up to 16 months following extreme stress periods such as the 2015-2016 El Niño event, which caused substantial bleaching in the study region.

The research is [published](#) in the journal *Communications Biology*.

As [climate change](#) is predicted to cause bleaching events annually by 2043, this behavioral change is "concerning," say the scientists.

An international research team, led by marine scientists at Lancaster University and ZSL, attached acoustic trackers to more than 120 sharks and installed receivers around coral atolls to monitor shark movements at reefs in the Indian Ocean between 2013 to 2020.

They recorded more than 714,000 acoustic detections and, in collaboration with Earth Observation scientists at King's College London, combined these with [satellite data](#) recording different metrics of reef environmental stress.

Scientists behind the study say this has important consequences for both the sharks and the reefs.

"These results provide some of the first evidence of how reef change in response to environmental stress, something that is becoming both more extreme and more frequent, is affecting the movement of sharks," said

Dr. David Jacoby of Lancaster University and principal investigator on the research project. "Gray reef sharks are a common, resident predator on the reefs of the Indo-Pacific, venturing away from the reef to feed, but many are having to decide whether to escape the stressed reefs.

"Faced with a tradeoff, sharks must decide whether to leave the relative safety of the reef and expend greater energy to remain cool or stay on a reef in suboptimal conditions but conserve energy. We think many are choosing to move into offshore, deeper and cooler waters, which is concerning. Many reefs around the globe have already seen significant declines in sharks due to exploitation and this finding has the potential to exacerbate these trends."

Although the study didn't examine the precise mechanisms linking reef stress to shark movement and residency, stress on coral reefs is often closely linked to sea surface temperatures.

"Sharks are ectotherms—cold-blooded animals whose body temperature is regulated by their external environment," said Dr. Michael Williamson from ZSL's Institute of Zoology, and lead author of the paper. "Reef sharks in other regions exhibit behavioral thermoregulation to avoid physiological damage from adverse water temperatures, and this is one of the potential drivers of the findings in this study."

Importantly, sharks moving away could impact the fragile balance in reef ecosystems.

"As [large predators](#), gray reef sharks play a very important role in coral reef ecosystems," said Dr. Williamson. "They maintain a delicately balanced food web on the reef and they also cycle nutrients onto coral reefs from deeper waters where they often feed. A loss of sharks, and the nutrients they bring, could affect the resilience of reefs during periods of high environmental stress."

Dr. Jacoby said, "As climate change brings increasing uncertainty and more and more frequent extreme stress events, the important ecological role these predators play on coral reefs is likely to change, as they spend more time away from the reefs they are attached to. The implications of this are not yet fully understood, but given the complex balance of species and trophic interactions that occur on [coral reefs](#), there will certainly be substantial changes."

However, there is also some room for optimism in the study's findings.

Not all the monitored locations saw a decline in habitat use. In fact, some acoustic receivers at specific locations saw shark residency actually increase. These findings indicate that there could be localized factors influencing shark decisions, and that some reefs are more resilient to stress.

"We now need to find out what exactly is driving decision-making in these animals during periods of stressful conditions," says Dr. Jacoby.

Although these factors were not included in the study, scientists suggest that different reefs can respond differently when exposed to stress.

"Recent research in the Chagos Archipelago, where we conducted our study, has shown that those reefs that have greater nutrient flows from seabirds have significantly enhanced fish biomass and therefore a higher likelihood to be resilient to multiple stressors," said Dr. Williamson.

"Some of our receivers that were seeing a greater number of sharks residing were also near islands with seabird populations."

More information: Michael J. Williamson et al, Environmental stress reduces shark residency to coral reefs, *Communications Biology* (2024). [DOI: 10.1038/s42003-024-06707-3](https://doi.org/10.1038/s42003-024-06707-3)

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