

## Distant processes influence marine heatwaves around the world

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The frequency of marine heatwave days increased by 50% over the past century but our ability to predict them has been limited by a lack of understanding around the key global processes that cause and amplify these events.

Now, an international team, led by Australian researchers from the ARC Centre of Excellence for Climate Extremes (CLEX) and the Institute for Marine and Antarctic (IMAS) studies, has published in *Nature* 



*Communications* the first global assessment of the major drivers of marine heatwaves.

They found that known climate phenomena, like the El Niño—Southern Oscillation or the North Atlantic Oscillation, with their centre-of-action in one <u>ocean basin</u> can increase the odds of marine heatwaves in other regions thousands of kilometres away.

"Scientific understanding of marine heatwaves is in its infancy but the damage these events do to <u>marine ecosystems</u>, fisheries and tourism can be immense and makes them an important area of study," said lead author of the study, IMAS Professor Neil Holbrook.

"Given marine heatwaves are increasing in frequency and this trend is expected to continue, our team wanted to set a baseline for our understanding of the physical mechanisms that drive them. Also, we were interested to get a sense of whether the likelihood of marine heatwaves may be increased or decreased based on climatic influences."

The assessment considered marine heatwaves and their drivers in 22 regions across four ocean and climate zones, based on published papers since 1950.

The team also further examined relationships between marine heatwaves and nine known climate ocscillations/patterns, and whether marine heatwave likelihood might be enhanced or suppressed by these factors. Finally, the team estimated the intensities, duration and extent of the reported marine heatwaves over the satellite observing period since 1982.

The researchers found that marine heatwaves may be influenced by several factors in combination, where processes may be both local and remote to the events.



"The El Niño—Southern Oscillation not only influences marine heatwaves in the Pacific Ocean but also in the Indian Ocean and played a leading role in the extreme marine heatwave known as the Ningaloo Niño in Western Australia in 2011," said CLEX co-author Dr. Alex Sen Gupta.

"We also found that other climate phenomena such as the Indian Ocean Dipole and North Atlantic Oscillation influence marine heatwave probabilities."

The global assessment also revealed some startling extreme marine heatwave records.

The researchers found the largest area affected by the heatwaves occurred in the northeast Pacific where, in 2015, a marine heatwave covered an area almost twice as large as other previous reports around the globe.

The most intense <u>heatwave</u> they found was in the northwest Atlantic Ocean during 2012, where the temperature peaked at 10.3°C degrees above average for that time of year.

While the records are remarkable, the baseline knowledge from this study regarding the important drivers of marine heatwaves across the globe will be invaluable to researchers.

**More information:** Neil J. Holbrook et al, A global assessment of marine heatwaves and their drivers, *Nature Communications* (2019). DOI: 10.1038/s41467-019-10206-z

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