

OUR PACIFIC OCEAN, OUR STORIES

Understanding marine heatwaves and how they impact the Pacific



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The Pacific is the world's largest ocean, covering nearly one-third of the Earth's surface. It is our region's largest resource that helps define us as Pacific people, underpinning our livelihoods and way of life.

Although most Members of the Secretariat of the Pacific Regional Environment Programme (SPREP) have small populations and economies, they are Large Ocean Island States responsible for managing more than ten per cent of the planet's oceans. Approximately 98% of this area, totalling over 30 million square kilometres, is contained within the Exclusive Economic Zones (EEZs) of SPREP Members.

Our Pacific Ocean is home to many of the world's marine species, and supports Pacific island ecosystems with its diverse corals reefs, the deepest oceanic trenches and the healthiest and in some cases largest, remaining populations of many globally rare and threatened species such as whales, sea turtles, dugongs and saltwater crocodiles.

According to the Intergovernmental Panel on Climate Change (IPCC)'s Special Report on the Ocean and Cryosphere in a Changing Climate (2019), the future ocean will suffer from more damaging marine heatwaves:

"Marine heatwaves will further increase in frequency, duration, spatial extent and intensity (maximum temperature) under future global warming (very high confidence), pushing some marine organisms, fisheries and ecosystems beyond the limits of their resilience, with cascading impacts on economies and societies (high confidence)."

The scale of scientific confidence used by the IPCC:

Confidence Terminology	Degree of confidence in being correct
Very high confidence	At least 9 out of 10 chance
High confidence	About 8 out of 10 chance
Medium confidence	About 5 out of 10 chance
Low confidence	About 2 out of 10 chance
Very low confidence	Less than 1 out of 10 chance

Source: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch1s1-6.html

What is a marine heatwave?

A **marine heatwave** can be described as when sea surface temperatures exceed a seasonally-varying threshold for at least five consecutive days. If the marine heatwave continues with gaps of two days or less, this is considered to be part of the same marine heatwave event. It is the result of a period of extreme warm near-sea surface temperature that persists for days to months and can extend over thousands of kilometres.

The IPCC defines a heatwave when the daily sea surface temperature is warmer than 99% of all recorded temperatures. These are extreme conditions.



What are the impacts of marine heatwaves?

We have all heard that warming ocean temperatures are increasing stress to coral reefs. In particular marine heatwaves can cause serious impacts on reefs including:

- Large-scale coral bleaching
- Disease and mortality of marine species
- Loss of biodiversity and ecosystem services
- Harmful algal blooms
- Shifts in species ranges, including local and global extinctions of certain coral species.

Marine heatwaves and our Pacific islands

Physical changes as a result of marine heatwaves are very likely, and scientists have warned that impacts of marine heatwaves on Pacific marine life and human communities can be expected. But what does this mean for our Pacific islands?

- Our tropical islands will bear the brunt: the largest increases in the probability of marine heatwaves will occur in the tropical ocean, especially the western tropical Pacific.
- High temperatures can also combine with high nutrient levels to result in “dead zones” where the oxygen level in the water drops too low for fish and other animals to survive.
- While many species have temperature limits, certain species are more sensitive, and these species include many Pacific corals.
- Water temperature is a key factor determining where species live – *Gambierdiscus toxicus* that causes ciguatera poisoning is considered a warm-water species, and its range is growing as the ocean warms (Kohli et al. 2014; Bravo et al. 2015; Sparrow et al. 2017).
- The Pacific Ocean Blob, discovered by scientists in 2014, has been steadily growing and is now around the same size as Australia. The unnaturally warm water is killing corals and other marine life, and threatens to spawn a warm-water species that could decimate fish populations, threatening and endangering whales, orcas and sea-lions (Mandenberg, 2019).

What is more concerning, is that under 1.5°C to 2°C increase in global temperature, marine heatwaves are expected to be more frequent and severe in the tropics than they are currently, proof that Pacific islands are among the most vulnerable to climate change.

What does the science say?

- Recent marine heatwaves have been caused by anthropogenic temperature increase.
- Globally, marine heatwaves have already doubled in frequency since 1982 and have become longer-lasting, more intense and more extensive (*very likely*), and are more common than in the pre-industrial era.
- Even if warming is limited to 1.5°C, the number of heatwave days is expected to be approximately 16 times higher than in the pre-industrial era.
- However, at 1.5°C, marine heatwaves are expected to cover a smaller area (25% of the area expected under 3.5°C warming) and last for fewer days at a time. This lowered risk would have significant impacts on Pacific species resilience and survival.

Under future climate change, marine heatwaves will:

- be more frequent,
- be more intense with higher maximum temperature,
- last for a greater number of days, and
- increase in area affected.

About the IPCC SROCC

The full title of the Report is the Special Report on the Ocean and Cryosphere in a Changing Climate. It is often referred to the SROCC, or the report on Climate and Ocean.

- 104 leading scientists who acted as Coordinating Lead Authors, Lead Authors and Review Editors prepared the Report
- The author team were from 36 different countries, 19 of these were developing countries or countries with economies in transition
- 6,981 publications are referenced in the SROCC
- Over 31,000 comments were received in the three reviews of the Report from governments, agencies, NGOs and academia from across 80 countries.

Our Collective Responsibility

Our Pacific Ocean is our collective responsibility, and reporting about stories that can connect your readers to the real life people involved can go a long way in the fight to protect our ocean and our environment.

It may be a challenge trying to translate news from this report into very real news stories for which people can relate to – you may wish to try developing news on your coral reefs, or marine species and speak to your Pacific Meteorologists or those with marine expertise, including that of traditional knowledge.

One impactful way to strengthen your reporting on ocean issues is incorporating scientific definitions, facts, and information. Wherever you can, tie the facts you have read from credible sources like the IPCC to the real life impacts your story is sharing, and the real life experiences of the people whose experiences you are highlighting.

Definitions

Seasonally-varying threshold: A seasonal variation is variation in a time series within one year that is repeated more or less regularly. Seasonal variation may be caused by the temperature, rainfall, public holidays, cycles of seasons or holidays. The threshold of a seasonal variation is the level or point we expect the seasonal variation to change.

Species ranges: area in which a species is found.

Anthropogenic: Resulting from or produced by human beings.

Pre-industrial era: the period of time before there were machines and tools to help perform tasks en masse (between 1750 and 1850).

This factsheet was developed with the Intergovernmental Panel on Climate Change (IPCC)'s Special Report on the Ocean and Cryosphere in a Changing Climate (2019).



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