

Marine heatwave alert

Marine heatwaves have existed for decades.
But they are now tending to be longer,
more frequent and have a greater impact
on both the environment and the economy.



© IRD/M. Bousson

Coral reef bleaching, New Caledonia.

PARTNERS

French Research Institute
for Exploitation of the Sea, France

Louis Malardé Institute, French
Polynesia

CNRS, France

New Caledonia Agronomic Institute,
France

University of Western Brittany, France

University of New Caledonia, France

Météo-France, France

Southern, Northern and Loyalty Islands
Provinces, New Caledonia, France

Directorate of Marine Resources,
French Polynesia

Directorate of Health and Social
Affairs, New Caledonia, France

New Caledonia Development Agency,
France

Heatwaves do not just affect land: they also occur in the marine environment, with surface waters becoming abnormally warm, affecting both the environment and the economy. In 2011, a marine heatwave along the west coast of Australia led to major destruction of coastal ecosystems and their habitats, massive coral bleaching and serious repercussions for aquaculture and fishing.

Since then, similar phenomena have proliferated around the world, with varying impacts. The most well-known episode, nicknamed the “Blob”, lasted several months in the North Pacific in 2014-2015. It led to harmful algal blooms and affected the entire food chain, right down to seabirds. In 2016, in New Caledonia, another marine heatwave led to unprecedented coral bleaching, which until then had been remarkably well preserved. In recent years, there has been worldwide interest in studying these marine heatwaves. For many researchers, the aim is to gain a better understanding of the processes behind these extreme events, measure their impact, and better anticipate the consequences for island societies. In New Caledonia and French Polynesia, for example, transdisciplinary work began in 2024 to develop practical solutions, starting with sending marine heatwave alerts to local actors. They will be prepared in advance to respond to different crisis scenarios through dedicated units. Eventually, vulnerability maps will also be drawn up jointly with decision-makers.

At the same time, and more surprisingly, studies are beginning to improve the resilience of oysters and other marine species sold during marine heatwaves, by stressing them when they are young and/or selecting the hardiest ones. Similar work will be carried out on corals that are highly exposed to marine heatwaves.

- ... New Caledonia is trying to adapt to marine heatwaves by launching transdisciplinary studies to find practical solutions ...



© IRD/M. Bousson

Reefs of the Chesterfield "V", near the Loop Islet.

“The goal of the educational coral farm in Lifou is to raise environmental awareness and restore damaged coral reefs. The Mahewa project’s research aims to optimise coral restoration methods, by targeting reefs with heat-resistant coral, and identify ideal restoration sites around the island of Lifou. The results of this scientific work will be shared with the general public, to raise awareness and inform them. This synergy between researchers, the private sector and local authorities strengthens our efforts to reduce the impact of human activity and meet the challenges of global warming.”

Georges Kakue, Loyalty Islands Province, New Caledonia, France

Gregory Lasne, Biocénose Marine, New Caledonia, France

OUR SHARED OCEAN

Science in the Global South
for a Sustainable World

IRD Éditions
Collection Grands enjeux
Marseille, 2025

Editorial management

Marie-Lise Sabrié

Editorial coordination

Corinne Lavagne

Jasmine Portal-Cabanel

Iconographic research

Daina Rechner

Written by

Viviane Thivent

Marie-Lise Sabrié

Design and page layout

Charlotte Devanz

Traduction

Fluent Planet

Proofreading

Anne Causse

Distribution coordination

Christel Bec

Cover photo

Children fishing on a reef flat in Reao, French Polynesia. © IRD/S.Andréfouët

This open-access publication is available to the public under the terms of the Creative Commons CC BY-NC-ND 4.0 license, which can be viewed at <https://creativecommons.org/licenses/by-nc-nd/4.0/deed.fr>. It authorizes any dissemination of the original work in its entirety, provided that the authors and publishers are mentioned and that a link to the CC BY-NC-ND 4.0 license is included. No modification or commercial use is allowed.



© IRD, 2025

ISBN Papier: 978-2-7099-3070-3

ISBN PDF: 978-2-7099-3071-0

ISBN Open/epub: 978-2-7099-3072-7

LIST OF SCIENTIFIC CONTRIBUTORS

Evolving environments

El Niño in the spotlight

Jérôme Vialard, physical oceanographer and climatologist, UMR LOCEAN

PIRATA, the observatory in the Tropical Atlantic

Bernard Boulès, physical oceanographer, UAR IMAGO

Extreme waves and tropical cyclones

Christophe Menkes, climatologist, UMR ENTROPIE

Jérôme Lefèvre, ecologist, UMR ENTROPIE

The variability of upwellings

Vincent Échevin, physical oceanographer, UMR LOCEAN

Mapping the tsunami hazard

Mansour Ioualalen, physicist, UMR Géoazur

Understanding the complexity of Southeast Asia's climate

Marine Herrmann, physical oceanographer, UMR LEGOS

The unsuspected variability of lagoons

Thomas Stieglitz, coastal ecohydrologist, UMR CEREGE

Resilient Mexican mangroves

Johanna Jupin, Geochemist, UMR LOCEAN

An oasis in an ocean desert

Sophie Bonnet, oceanographer and biogeochemist, UMR MIO

Cécile Guieu, biogeochemist, UMR LOV

Resilient coral in New Caledonia

Riccardo Rodolfo-Metalpa, ecophysiologicalist, UMR ENTROPIE

Sargassum taking over

Julien Jouanno, physical oceanographer, UMR LEGOS

Soot in the water

Xavier Mari, oceanographer and biogeochemist, UMR MIO

Marc Tedetti, oceanographer and biogeochemist, UMR MIO

Plastics: from the rivers to the ocean

Lisa Weiss, physical oceanographer, UMR LEGOS, UMR LOPS

The fate of river water in the ocean

Nadia Ayoub, physical oceanographer, UMR LEGOS

On the trail of ocean plastic

Christophe Maes, physical oceanographer, UMR LOPS

Our friends from the deep

Leandro Nole-Eduardo, ecologist, UMR MARBEC

From micronekton to tuna

Christophe Menkès, climatologist, UMR ENTROPIE

Anne Lebourges-Dhaussy, ecosystem acoustician, UMR LEMAR

The end of the reign of the anchovy?

Arnaud Bertrand, ecologist, UMR MARBEC

Societies facing the ocean

Senegal: the emergence of a resilient fishing industry

Ndickou Gaye, geographer, Cheikh Anta Diop University, Dakar and UMI SOURCE

The future of the Vezo

Francis Veriza, geographer, University of Toliara and UMR Passages

Alexandria, how not to adapt?

Sylvie Fanchette, geographer, UMR CESSMA

Is the sinking of the Mekong Delta inevitable?

Nicolas Gratiot, geophysicist, UMR IGE

Reducing vulnerability in the city of Douala

Raphaël Onguene, physical oceanographer, University of Douala

Food security in Polynesia

Marianna Cavallo, ecologist, UMR LEMAR

The role of women in fishing

Ariadna Burgos, ethnoecologist, UMR PALOC

Nokoué, a lagoon under pressure

Alexis Chaigneau, physical oceanographer, UMR LEGOS

Yves Morel, physical oceanographer, UMR LEGOS

Victor Okpeitcha, physical oceanographer, Prodata SARL

Zacharie Sohoun, oceanographer, fisherman and biologist, IRHOB and UAC

Thomas Stieglitz, coastal ecohydrologist, UMR CEREGE

Towards sustainable resources

A plankton model

Olivier Maury, oceanologist, UMR MARBEC

Tropical tuna under surveillance

Daniel Gaertner, biologist, UMR MARBEC

Towards more sustainable baits

Pascal Bach, ecologist, UMR MARBEC

The birds' share

Philippe Cury, oceanographer and biologist, UMR MARBEC

Artisanal fishing on an industrial level

Arnaud Bertrand, ecologist, UMR MARBEC

Food biodiversity

Fany Sardenne, ecologist, UMR LEMAR

Aquaculture for better nutrition

Maria Darias, biologist, UMR MARBEC

Gathering data by sailboat

Éric Machu, biogeochemist, UMR LEGOS

Swimming over underwater habitats

Rodolphe Devillers, geographer, UMR Espace-Dev

Priscilla Dupont, biologist, UMR Espace-Dev

Shining a light on invisible biodiversity

Laurent Vigliola, ecologist, UMR ENTROPIE

Using artificial intelligence to measure biodiversity

Laurent Vigliola, ecologist, UMR ENTROPIE

The AI that thought it was a seabird

Sophie Lanco, ecologist, UMR MARBEC

Bacteria on the back of plastic

Thierry Bouvier, ecologist, UMR MARBEC

Towards home-made electricity?

Pierre-Pol Liebgott, biochemist and ecologist, UMR MIO

The Comoros in need of sand

Gilbert David, geographer, UMR Espace-Dev

Nourddine Mirhani, geographer, University of Comoros

Let the mangroves grow back on their own

Marie-Christine Cormier-Salem, geographer, UMR PALOC

Shared knowledge

The sound of silence

Timothée Brochier, ocean modeller, UMI UMMISCO

Nicolas Puig, anthropologist, UMR Urmis

Changing our approach to corals

Pascale Chabanet, ecologist, UMR ENTROPIE

Lola Massé, biologist, UMR ENTROPIE

Changing estuary water flows

Stéphanie Duvail, geographer, UMR PALOC

Draw me the sea

Élodie Fache, anthropologist, UMR SENS

Stéphanie Carrière, ethnoecologist, UMR SENS,

Catherine Sabinot, anthropologist, UMR Espace-Dev

Towards a sustainable mangrove crab industry in Madagascar

Jennifer Beckensteiner, fisheries expert, UMR AMURE

Marc Léopold, economist, UMR AMURE, UMR ENTROPIE

Managing milky waters

François Colas, physical oceanographer, UMR LOPS

Jonathan Flye-Sainte-Marie, ecologist, UMR LEMAR

Alice Pietri, physical oceanographer, UMR LOCEAN

Marine heatwave alert

Sophie Cravatte, physical oceanographer, UMR LEGOS

A little-known but coveted deep-sea

Valelia Muni Toke, anthropologist, UMR SeDyl

Puerre-Yves Le Meur, anthropologist, UMR Sens

Towards a new ocean governance

The Seychelles: towards a truly sustainable blue economy?

Patrice Guillotreau, economist, UMR MARBEC

Regulations based on local realities

Catherine Sabinot, anthropologist, UMR Espace-Dev

Marc Léopold, economist, UMR AMURE, UMR ENTROPIE

The Mediterranean Sea as a legal entity

Victor David, environmental lawyer, UMR IMBE

Gabon proactive in protecting biodiversity

François Le Loc'h, ecologist, UMR LEMAR

Making assessments for more effective steering

Adrien Comte, economist, UMR LEMAR

AI at the service of marine environmental law

Marie Bonnin, environmental lawyer, UMR LEMAR

Protecting marine areas more effectively

Tarik Dahou, socioanthropologist, UMR PALOC

When science emancipates people

Latifa Pelage, ecologist, UMR MARBEC