

STORY

Context

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As Marine Heatwaves Intensify, Bali's Fishers Hunt Far and Wide

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INDONESIA

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KEDONGANAN, Indonesia—Leaning against the hull of a fishing boat, Eko Sulistiono could not hide his disappointment at the day's catch at the Kedonganan Port in Indonesia's province of Bali.

The 58-year-old dockworker has spent more than 20 years unloading yellowfin tuna, squid, skipjack tuna and decapterus at the port. But the haul has significantly decreased in recent years, which scientists believe has been caused by rising ocean temperatures.

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"There are fewer and fewer fish coming here," said Sulistiono, who earns about 2,000,000 Indonesian rupiah (\$126) a month, less than half of what he made five years ago. "And it's not uncommon for ships to come home with no fish. If that happens, it means we have no work to do."

Indonesia's waters, rich with marine diversity, have made it the world's second-largest fish producer, contributing about 2.5% to the nation's gross domestic product.

But dwindling fish stocks caused by climate change are leaving fishers with empty nets.

Bali recorded 133,858 tonnes of fish caught in 2022, down from 141,581 tonnes in 2021 and 244,325 tonnes about a decade ago, according to government data.

Marine heatwaves, or extreme spikes in ocean temperatures, are becoming more frequent, due to climate change, according to the Marine Stewardship Council, a non-profit organisation that promotes sustainable fishing.

These hot spells disrupt biodiversity and ecosystems, including fish stocks and their distribution, it said.

The National Oceanic and Atmospheric Administration (NOAA), a U.S. government agency, says marine heatwaves are characterised by persistent, unusually high temperatures, similar to inland heatwaves.

"It can lead to die-off of certain species of fish," said Dillon Amaya, a research scientist at the NOAA Physical Sciences Laboratory in Colorado.

"Obviously, that's (going to) trickle down to affect humans and severely impact local economies and food supply."

Prolonged, intense heatwaves

Oceans are the largest carbon sink, absorbing 25% of all emissions, and capture 90% of the excess heat from these emissions, according to scientists. Oceans also generate 50% of the world's oxygen, but warmer waters can reduce oxygenation, threatening marine life.

"The majority of the excess heat associated with global warming is going into the ocean," said Amaya. "So we know that marine heatwaves are becoming hotter and hotter."

A study published in the scientific journal Nature Climate Change in 2023 found

that marine heatwaves occur not only at the surface, but more intensely at a depth between 50 and 250 metres, where large fish like tuna dwell, making them particularly vulnerable to changing temperatures.

Eliza Fragkopoulou, the lead author of the study and a researcher at the Centre of Marine Sciences in Portugal, said marine heatwaves, defined as lasting five or more days, are becoming longer, more intense and more frequent.

"We have seen that heatwaves can actually kill fish, the corals and other species," Fragkopoulou told Context. "While it does not mean that certain species will go completely extinct, [they may] go extinct from specific regions."

In the study, Fragkopoulou and her team looked at daily temperatures for the last 30 years from open-source data at Copernicus Marine to estimate how often temperatures rose above a threshold and at what depth.

Other studies in recent years have shown the number of days of marine heatwaves has increased globally, and that the average global sea surface hit a record 20.96 degrees Celsius (69.73°F) in the first week of August 2023.

"We know marine heatwaves are occurring across the world, but there are regions in the ocean that get more intense and more frequent heatwaves, such as in boundary current regions and in different depths," Fragkopoulou said.

Indonesia, which acts as an oceanic passage for the Pacific and Indian Oceans, may be particularly vulnerable to warmer oceans.

Research published in the Journal of Marine Science and Engineering in 2023 showed marine heatwaves are more likely to occur in tropical areas like Indonesia and that the country's Indian Ocean waters saw an average of two to three marine heatwaves a year, which impacted the fishery sector.

Even small increases in temperatures can kill coral, kelp forests or seagrass, which all support animal populations. Hotter waters can force predators like sharks and tuna to move to new areas to hunt as other species seek more suitable habitats.

"We have what we call species expansion," said Fragkopoulou. "Fish can migrate to a better environment, but they are changing the geographical distribution and this will have impacts."

Months at sea

At Benoa Port, on the southern tip of the island of Bali, 70-year-old Wardai, a captain who has been fishing since 1975, said boats are now forced to spend as long as 10 months at sea as tuna move to further distances. This has driven up fuel and other costs, he said.

In the past, "you just needed two days and you could get a good catch," said Wardai. "Then it became five days, weeks and then months."

Indonesia boasts the world's largest tuna catch of 1 million tonnes a year, and Benoa has served as a major centre of the fishing industry.

Higher operating costs, unpredictable weather and declining fish stocks have slashed the amount of fish brought back to Benoa. In the first half of 2023, Benoa produced 9.700 tonnes of yellowfin tuna. compared with 15.000 tonnes in the

same period of 2022, according to government data.

This September, the once bustling port was quiet. Only a handful of boats were unloading cargo from the dozens of vessels anchored at shore. About 200 fishing vessels relocated from Benoa to eastern Indonesia between 2016 and 2018, according to media reports citing local authorities.

The fishing agency in Benoa did not respond to a request for comment.

Some activists want the government to expand aquaculture, including of tuna, to offset the economic harm to fishing communities.

"The government needs to increase efforts to cultivate tuna amidst increasing market demand," said Abdi Suhufan, the Director of the Jakarta-based Destructive Fishing Watch (DFW). "Because if not, we will definitely run out of tuna in the future."

Haeru Rahayu, the director general of aquaculture at the Ministry of Maritime and Fisheries, said the country has nearly 18 million hectares that could be used for cultivating fish, but just 6% is currently being used.

"We hope to boost investment," Rahayu said. "We have helped small farmers cultivate aquaculture at coastal areas through various programmes."

The government has also introduced the Measured Fishing Programme, which includes a quota on hauls to protect fish populations and the ecosystem.

Fishing crews, whose wages can depend on the size of a catch, have seen their pay roughly halved over the last half-decade, said Wardai.

After working for almost a decade on board a tuna fishing vessel in Bali, Irfan, a 35-year-old crew member from Java, has decided against returning to sea.

"I gave up," he told Context. "The workload was too heavy. I was at sea for nine months, far from my family, with no access to a telephone, let alone the internet."

(Editing by Amruta Byatnal, Ana Nicolaci da Costa and Ayla Jean Yackley.)

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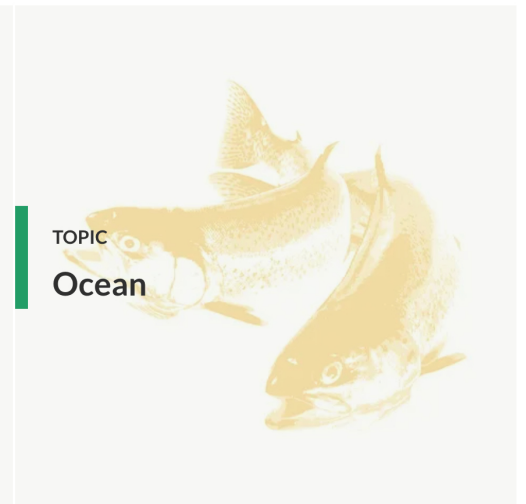
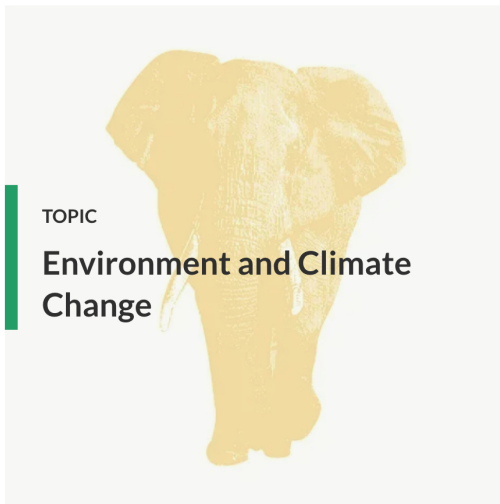
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