

# The Pacific Ocean is so acidic that it's dissolving Dungeness crabs' shells

By **Scottie Andrew**, CNN

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The Pacific Ocean is acidifying at such a rate that Dungeness crabs, some of the most valuable crustaceans in the Pacific Northwest, are suffering partially dissolved shells and damage to their sensory organs, a new study found.

**(CNN)** The Pacific Ocean is [becoming more acidic](#), and the cash-crabs that live in its coastal waters are some of its first inhabitants to feel its effects.

The [Dungeness crab](#) is vital to commercial fisheries in the Pacific Northwest, but lower pH levels in its habitat are dissolving parts of its shell and damaging its sensory organs, a new study found.

Their injuries could impact coastal economies and forebode the obstacles in a changing sea. And while the results aren't unexpected, the study's authors said the damage to the crabs is premature: The acidity wasn't predicted to damage the crabs this quickly.

"If the crabs are affected already, we really need to make sure we pay much more attention to various components of the food chain before it is too late," said study lead author Nina Bednarsek, a senior scientist with the Southern California Coastal Water Research Project.

The findings were published this month in the journal [Science of the Total Environment](#) and funded by the National Oceanic and Atmospheric Administration (NOAA). The agency studies ocean acidification and how changing pH levels are impacting coasts.

## How the ocean acidifies

The ocean is acidifying because it's absorbing more carbon dioxide from the atmosphere, which lowers pH levels in the water.

Ocean acidification changes the coasts, releasing excess nutrient that can create algae blooms and increasing sea temperatures and salinity, according to [NOAA](#).

But for crustaceans and coral that rely on carbonate ions, which are less abundant in more acidic waters, to build their shells and coral skeletons, it becomes more difficult to build strong shells.

It's not just crabs, either: Oysters, clams and plankton all rely on the same carbonate ions to strengthen themselves. And humans and sea creatures alike rely on them -- some for food, others for economic security.

## How it hurts the crabs

The acidification corroded the young shells of Dungeness crab larvae, which could impair their ability to deter predators and regulate their buoyancy in the water, the researchers said.

The crab larvae that showed signs that their shells were dissolving were smaller than the other larvae, too. This could cause developmental delays that could mess with their rate of maturation.

The tiny hair-like structures crabs use to navigate their environments were damaged by the low pH levels, too -- something scientists had never seen before. Crabs without these mechanoreceptors could move more slowly and have difficulty swimming and searching for food. "We found dissolution impacts to the crab larvae that were not expected to occur until much later in this century," said Richard Feely, study co-author and NOAA senior scientist.

## What's next

It's not clear if the same forces could negatively impact adult Dungeness crabs, a question that requires more research. But with the obstacles a crab larvae faces in its early development, it's got less of a chance to survive to adulthood.

As for the acidifying ocean, NOAA proposes two methods of attack: Reducing our overall carbon footprint to reduce the carbon dioxide absorbed by the sea, or teach wildlife and the people who rely on it to adapt to how the sea will change.

[NOAA works with local fishery manages](#) and policy makers on conservation efforts -- and researchers hope their findings might be enough to convince them to take immediate action.

# Tiny shell fossils reveal how ocean acidification can cause mass extinction

By [Julie Zaugg](#), CNN

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A general view of a school of fish in a healthy coral reef off the coast of Isla Mujeres, Mexico on September 26, 2018.

**(CNN)** Ocean acidification caused a mass extinction of marine life 66 million years ago, research into tiny shell fossils has shown. This could have implications for the current climate crisis, which is also making the oceans more acidic.

Slightly less than 66 million years ago, a giant asteroid hit the earth near the Mexican town of Chicxulub, leading to massive tsunamis, earthquake-driven gravity flows and the ejection of molten rocks, according to [a new paper](#) published in the journal Proceedings of the National Academy of Sciences. This in turn caused acid rain and large scale acidification of the world's oceans, prompting [a mass extinction](#) of most marine and land based life, including all dinosaurs.

Modeling had previously produced evidence of this ecological collapse but the mechanisms through which it occurred were unknown. To overcome this, the team of researchers led by Michael Henehan, a postdoctoral scientist at the GFZ research center in Potsdam, studied sea shells trapped in sediment which formed just after the asteroid hit.

The samples were taken from caves and rivers in the Netherlands, Mississippi and Texas, as well as from deep-sea drilling sites, according to the paper.

## A culprit

They found that the shell walls had become very thin because of a sharp drop in the pH of the oceans -- a sign of acidification -- a 100 to 1,000 years after the strike. This demonstrated that the asteroid impact was the main culprit for making the oceans more acidic and causing a mass die-off of marine life, the researchers said. Intense volcanic activity had also been considered as a possible cause.

Today, the world's seas are again becoming more acidic, due to an increase in carbon emissions. At least one quarter of the CO<sub>2</sub> released by burning coal, oil and gas doesn't stay in the air, but instead dissolves into the ocean, [according to](#) The NOAA Ocean Acidification Program, a US government initiative, and The Smithsonian Ocean Portal.

So far, ocean pH has dropped from 8.2 to 8.1 since the industrial revolution, and is expected to fall by another 0.3 to 0.4 pH units by the end of the century, it added. Henehan's research showed a 0.25 pH unit drop 66 million years ago.

Ocean acidification has already caused [massive die-offs](#) of oysters in the Pacific Northwest. Without a plan to reduce carbon emissions, the ocean may be so acidic by 2080, that even creatures like some corals that had been able to withstand these conditions may erode quicker than they can rebuild.

## Earth's fish are disappearing because of climate change, study says

By Isabelle Gerretsen, CNN

Updated 1900 GMT (0300 HKT) February 28, 2019



Fishermen gather to harvest fish in Hangzhou in eastern China.

**(CNN)** Climate change is endangering fish worldwide, shrinking populations by up to 35% in coastal regions near China and Japan, scientists say.

Ocean warming has led to a 4% global decline in sustainable catches, the greatest amount of fish that can be caught without depleting stocks long-term, according to a [study](#) published Thursday in the journal Science.

Using global data on fisheries and ocean temperature maps, scientists from Rutgers University in New Jersey analyzed changes in sustainable catches triggered by temperature rises between 1930 and 2010.

The scientists said they were "stunned" to discover that global warming has significantly affected fish stocks worldwide and warned that the decline could threaten the livelihoods and food supplies of millions of people.

More than 56 million people worldwide work in the fishing industry, and seafood provides up to half of all animal protein eaten in developing countries, the scientists said.



The most drastic decline was recorded in Asia's coastal regions, including the East China Sea and Japan's Kuroshio Current, where stocks plummeted by 15% to 35% over the past 80 years.

"Ecosystems in East Asia have seen enormous declines in productivity. These areas have particularly rapid warming [and] also have historically high levels of overfishing," said lead researcher Chris Free, a quantitative ecologist at the University of California, Santa Barbara.

Shrinking fish stocks in East Asia are concerning, as these regions "support the world's fastest-growing populations and have really large demands for seafood," Free added.

As stocks continue to decline, East Asian countries could start importing fish from other parts of the world, driving up prices, he added. Overfishing is intensifying the impacts of climate change, according to Free. Removing the largest fish diminishes a population's reproductive capacity and makes it more vulnerable to global warming in the long term.

However, not all fish suffered from ocean warming; some species benefited from a rise in temperatures, the study noted.

For example, the black sea bass population off the US East Coast has surged as ocean warming has killed other species and increased its territory, Free said.

But "climate winners cannot be winners forever," he warned. If temperatures continue to rise, the productivity of these populations is also likely to decline.

Governments should eliminate overfishing and establish trade agreements to share stocks between regions benefiting from and hurt by ocean warming, according to Free.

Eva Plaganyi of the Commonwealth Scientific and Industrial Research Organisation Oceans and Atmosphere unit in Canberra, Australia, wrote in an article published alongside the study, that it represented an "important advance" on earlier analyses, as it provided projections to drive forward planning and adaptation strategies.

However, Plaganyi noted that the study did not account for other environmental impacts triggered by climate change, such as ocean acidification.

Another [study](#) published this week said that a failure to achieve the goals of the [2015 Paris climate agreement](#), which calls on countries to reduce carbon output and halt global warming below 2 degrees Celsius by the end of the century, could threaten the livelihoods and food source of millions of people worldwide.

"The largest gains will occur in developing country waters, such as Kiribati, the Maldives and Indonesia, which are at greatest risks due to warming temperatures and rely the most on fish for food security, incomes and employment," said lead researcher Rashid Sumaila, director of the University of British Columbia's Fisheries Economics Research Unit.