Breathless oceans: Warming waters could suffocate marine life and disrupt fisheries

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Some scientists say global warming is linked to more severe weather events such as hurricanes, but there are no near-term projections that the world will become totally

uninhabitable.Then, the scientists would have to drag the shark—if it was a shark—to the boat’s side, drill two holes in its dorsal fin, and attach a device resembling an oversize neon orange lightbulb. If all went well, within minutes the shark would return to the waters off the southern tip of Gran Canaria, an island 210 kilometers west of the Moroccan coast. The device it now carried would record every twitch of its scythe-shaped tail, every dive into the twilight depths, every current through which it swam.

Its journey would offer a window into an unsettling environmental trend, called ocean deoxygenation, that is affecting marine life, including some of the sea’s most potent predators.

Off Gran Canaria, one of the Canary Islands, a small fishing boat carried a team of scientists hoping to tag sharks swimming toward an expanding low-oxygen zone.

Climate change is leaching oxygen from the ocean by warming surface waters.

Two other climate-related threats to the seas —ocean acidification and marine heat waves —get more attention from scientists and the public.shows mostly cloudy conditions across the region.But some researchers believe deoxygenation could ultimately pose a more significant threat, making vast swaths of ocean less hospitable to sea life, altering ecosystems, and pushing valuable fisheries into unfamiliar waters.

As global warming continues, the problem is sure to get worse, with disturbing forecasts that by 2100 ocean oxygen could decline by as much as 20%.Sharks—fast-moving fish that burn lots of oxygen, sit at the top of food chains and crisscross huge ocean expanses —should be sensitive indicators of the effects.”

Highs warm into the upper 40s to near 50.This is why a group of U.K. and Portuguese scientists took to the sea aboard Garcia Habas’s boat in November 2022.

His announcement of a shark on the line jolted them into action. Marine Biological Association and the University of Southampton, has experienced his share of drama, disappointment, and occasional comedy over 3 decades of studying sharks.He’s donned a chainmail suit to swim with 3-meter bull sharks.He once led a boat in hot pursuit of what he thought was a school bus–size basking shark—only to find the wake he was following came from a lone salmon.He tangled with a feisty catshark that sprang from the water and latched onto his flashlight.

The lanky 53-year-old recounts these tales with a delight seemingly undiminished since, as a young child, he was enchanted by

sharks that washed up on the beaches near his home on England’s southeast coast.Sims first noticed a link between shark behavior and oxygen levels in the early 2000s.He and several friends had spent years deciphering the feeding and mating habits of small-spotted catsharks, meter-long, cream-colored fish with cartoonishly large eyes.They worked in an inlet on the southwest Irish coast, where the deeper waters grew stagnant over the summer.When Sims looked at data from tracking tags attached to the sharks, he saw the fish swam closer to the surface in summer, skirting a pocket of low oxygen.

“It was really a classic case of decreasing oxygen clearly displacing the sharks from where they wanted to be,” Sims says.The discovery was just a footnote in his catshark work.But the observation came back to him around 2011, when he was tracking blue and shortfin mako sharks traversing the eastern side of the Atlantic Ocean.After affixing

satellite-connected tags to a handful of the fish, he was mystified when the sharks seemed drawn to a large patch of water where northwest Africa bulges into the Atlantic, a region known to be low in oxygen.These open-ocean sharks are the Olympic sprinters of the marine world—makos are capable of bursts of up to 35 kilometers per hour.

Why would they head toward places with less oxygen? And what could it mean for the future of marine life as vast stretches of low-oxygen water grow bigger around the world? Ivo da Costa, a Ph.D.student at the University of Porto, subdues a blue shark, which will be fitted with sensors to study how ocean oxygen levels affect its behavior.W.Cornwall/ Science SCIENTISTS FOR YEARS have documented oxygen-starved dead zones in places like the Gulf of Mexico and the Baltic Sea.

There, pollution from nutrients running off the land, such as synthetic fertilizer, sparks algae blooms.Microbes feast on the rotting vegetation, consuming oxygen.A surge of low-oxygen water can flood an area so quickly that crabs, sea stars, and even fish suffocate before they escape.Low-oxygen zones also form naturally along the western edges of the Americas and Africa, where oxygen-depleted water that hasn’t seen daylight for decades wells up.In the open ocean, currents and storms churn the water, keeping oxygen levels higher.

Yet since the 1990s climate models have foretold that a warming climate would deplete oxygen there, too.Surface water warmed by rising air temperatures holds less oxygen, and the growing temperature contrast between surface layers and colder, deeper water slows the mixing that transports oxygen into the depths.At higher latitudes, melting ice can flood surface layers with

fresh, low-density meltwater, strengthening the layering and reducing mixing.In 2008, a Science sounded the alarm.German and U.

S.scientists found that the low-oxygen zones off Africa and the Americas were growing deeper and losing still more oxygen.Since the 1960s these areas had expanded by about 4.5 million square kilometers, close to the area of the European Union.In the waters frequented by Sims's sharks off Africa's northwest coast, the low-oxygen layer had nearly doubled in thickness over 5 decades, from 370 meters to 690 meters.

By 2008 its top had risen to less than 150 meters below the surface.The global trend, the scientists warned, "may have dramatic consequences for ecosystems and coastal economies." In 2017, scientists delivered more troubling news Nature.Overall, the world's oceans had already lost some 2% of their oxygen since 1960, roughly double what

climate models predicted.For Andreas Oschlies, a biogeochemist at the GEOMAR Helmholtz Centre for Ocean Research Kiel and a leading expert on modeling oxygen in the ocean, the implications were staggering.

If the trend continues, it could mean a potential loss of 20% by 2100, he says.That's equal to going from sea level to more than 2000 meters elevation on land.“I thought 'Wow!'” Oschlies recalls.“That's the biggest change and maybe the most worrying change that we see in the ocean.Immediately I thought of (past) major extinction events.

” For example, at the end of the Permian period 256 million years ago, rising ocean temperatures and an 80% plunge in oxygen levels helped drive the largest extinction in Earth's history.Up to 96% of all marine species disappeared.By comparison, the 2% drop in oxygen levels seen so far might not sound like much.But global averages can be

misleading, warns Lisa Levin, a biological oceanographer at the Scripps Institution of Oceanography who has studied the effects of low oxygen on ocean ecosystems for more than 30 years.“There are places in the ocean where there’s been much bigger declines,” Levin says.

“These changes are probably very important.” OFF THE COAST OF OREGON , fishers in 2002 began pulling up traps full of suffocated crabs.Low oxygen levels are routine in those waters, which are fed by a deep, oxygen-depleted current from the North Pacific Ocean that wells up near the coast.Nutrients in the upwelling make the area a fertile fishing ground.They also nourish algae that deplete oxygen even further as they decay.

But 2002 was extreme.Scientists found oxygen levels had fallen by 65%, compared with historical averages, in more than 800

square kilometers of coastal waters.“I thought it was just a one-off.This is the Pacific Ocean with waves and winds.We’re not supposed to run out of oxygen,” says Francis Chan, a marine ecologist at Oregon State University (OSU), Corvallis, who studied the event.

“Then it happened again the next year, and then the year after, and the year after, and the year after.” Sea changes Low-oxygen zones that form where currents concentrate depleted water along the western edges of continents have grown over the past half-century. Migratory blue and shortfin mako sharks tagged with tracking devices showed a preference for a large patch of low-oxygen water off the northwest coast of Africa, perhaps because it confines their prey in shallower waters.(GRAPHIC) K.FRANKLIN/.