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Scientists create a system for tracking underwater blackouts

Clouds, smoke and fog may darken the skies, but sediment, algal blooms and organic matter can turn day into night on the seafloor. That's why an international team of scientists have created the first framework to identify and compare these marine blackouts. The study, published in Communications Earth & Environment, introduces the concept of a marine darkwave: a short-term but intense episode of underwater darkness that can severely impact kelp forests, seagrass beds and other light-dependent marine life.

"We have long known that light levels are critical for photosynthetic organisms — like algae, seagrasses and corals — and that factors that reduce light to the seafloor can impact them," said co-author Bob Miller, a research biologist at UC Santa Barbara's Marine Science Institute. "This study creates a framework for comparing such events, which we call darkwaves."

The researchers aimed to create a common system for comparing these events across the globe. "Light is a fundamental driver of marine productivity, yet until now we have not had a consistent way to measure extreme reductions in underwater light," said lead author François Thoral, a postdoctoral fellow at the University of Waikato and Earth Sciences New Zealand.

The study draws on 16 years of measurements from the Santa Barbara Coastal Long Term Ecological Research Site (LTER) and 10 years of data from New Zealand coastal sites in Hauraki Gulf/Tīkapa Moana, in the Firth of Thames. The team also tapped 21 years' worth of measurements of light on the seafloor estimated from satellite imagery across New Zealand's East Cape.

Marine darkwaves across these regions lasted from a few days to more than two months. Some events almost completely cut off light to the seabed. The analysis revealed between 25 and 80 marine darkwaves along the East Cape since 2002, many linked to storms and major weather systems including Cyclone Gabrielle.

Scientists had long considered gradual, long-term declines in water clarity as one of the most pressing concerns for coastal ecosystems. But darkwaves may be just as impactful. "Even short periods of reduced light can impair photosynthesis in kelp forests, seagrass and corals," Thoral said. "These events can also influence the behaviour of fish, sharks and marine mammals. When darkness persists, the ecological effects can be significant."

The marine darkwave framework complements existing frameworks for tracking marine heatwaves, ocean acidification and deoxygenation, providing a standardized tool for coastal communities, resource managers and conservation groups to identify when marine ecosystems face acute stress.

Since the Santa Barbara Coastal LTER is one of very few programs worldwide collecting long-term light data on the seafloor, Miller and his colleagues at UCSB plan to further examine the effects of sedimentation and turbidity — which are influenced by fires and mudslides — on California's kelp forests.

Tags
Ocean and Beaches

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