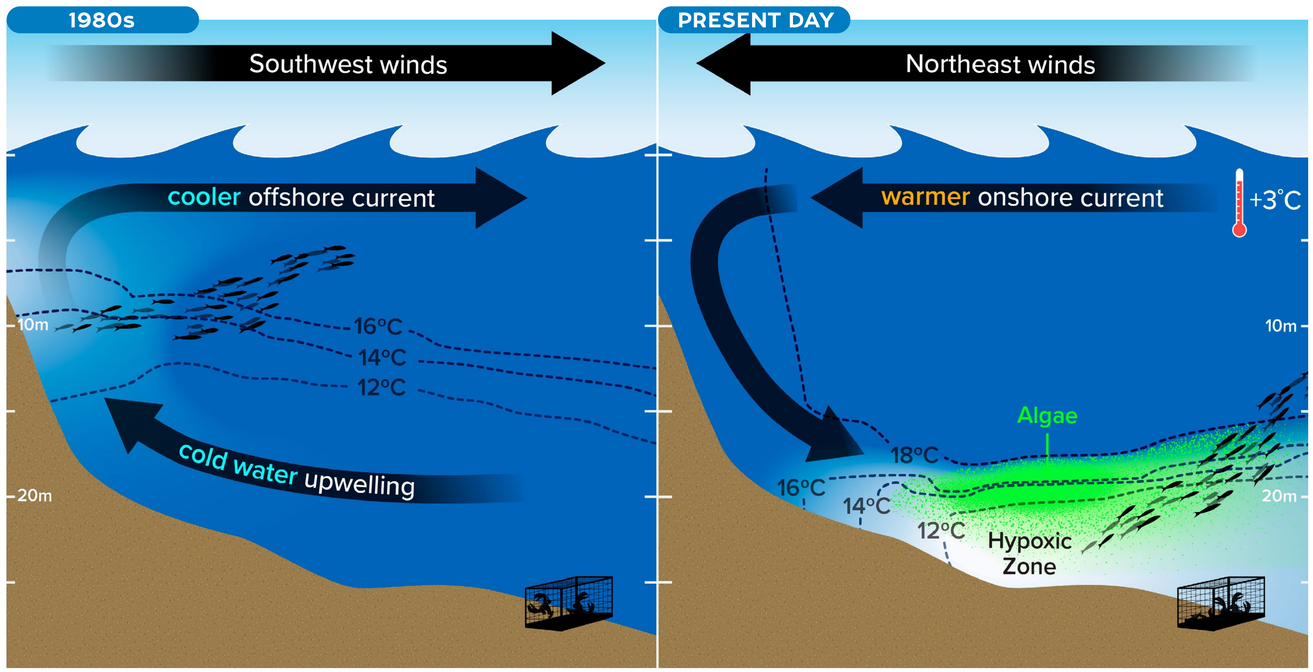
The Science Behind the Oxygen Depleted Zones in Cape Cod Bay

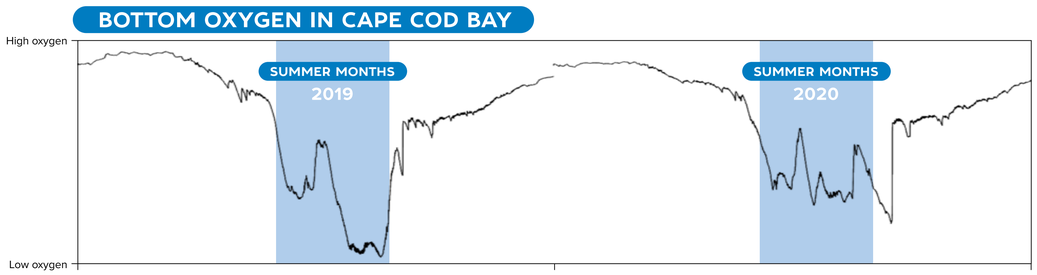
In the summers of 2019 and 2020, lobstermen working in Cape Cod Bay hauled up their pots to find them full of dead lobsters. With funding from Sea Grant, WHOI Associate Scientist Malcolm Scully and his team developed a model using numerous datasets to unravel this mystery. They found these unprecedented episodes were caused by low dissolved oxygen, or hypoxia, connected to climate-related changes in Cape Cod Bay.

A COLLISION OF FACTORS ALTERED BY CLIMATE CHANGE

Over the last 40 years, Cape Cod Bay has felt the effects of climate change. The surface waters have warmed seven times faster than the rest of the ocean. In the summer, strong winds from the southwest have become less common while winds from the northeast have increased substantially. Together, the warming water and shifting wind pattern make the Bay more stratified, with surface water less likely to mix with colder, denser deep water.

Scully's model shows that these changes in the physical environment make hypoxia in Cape Cod Bay more likely. It illustrates that the altered environment set up the ideal conditions for a bloom of *Karenia mikimotoi*, a species of algae new to the region. After the algae blooms and dies, microbes decompose the organic matter, using up the oxygen in the water and causing hypoxia. The model has been able to simulate these hypoxic events and will be a valuable tool for understanding the impacts of climate change.





Scully's newly developed numerical model simulated the summertime low oxygen levels in Cape Cod Bay.

ADAPTING TO CLIMATE CHANGE

Given that larger climate patterns are a major contributing factor to these hypoxic events, mitigating actions are not feasible. However, good predictions of when and where hypoxia will form can help fishermen avoid hypoxic zones to reduce their financial losses.

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