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Phytoplankton Population Drops 40 Percent Since 1950

Lauren Morello, ClimateWire on July 29, 2010

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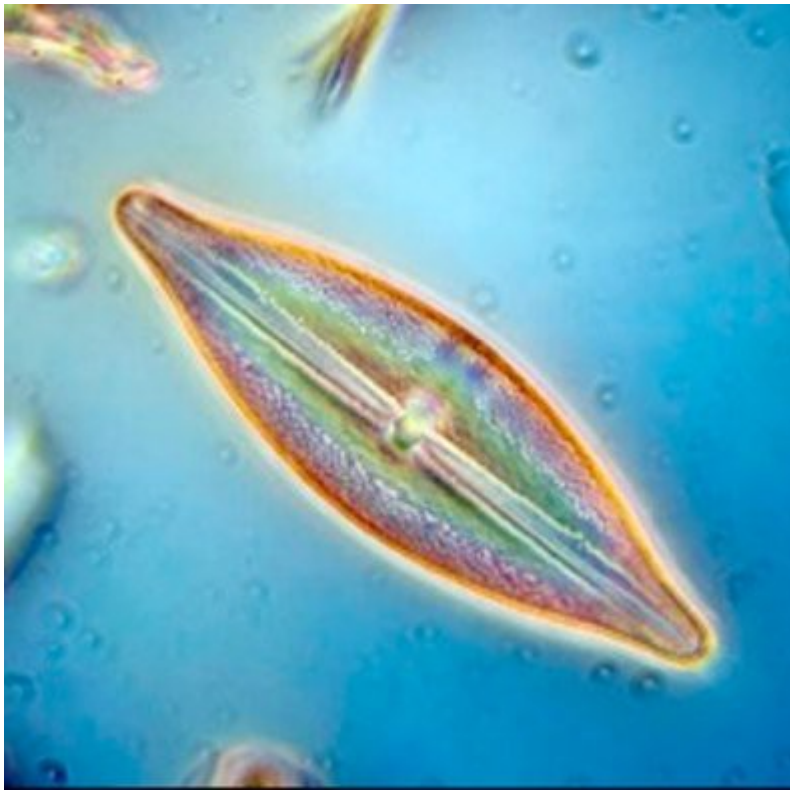
Researchers find trouble among phytoplankton, the base of the food chain, which has implications for the marine food web and the world's carbon cycle



Credit: Photo courtesy of Nikon Small World

The microscopic plants that form the foundation of the ocean's food web are declining, reports a study published July 29 in *Nature*.

The tiny organisms, known as phytoplankton, also gobble up carbon dioxide to produce half the world's oxygen output—equaling that of trees and plants on land.

But their numbers have dwindled since the dawn of the 20th century, with unknown consequences for ocean ecosystems and the planet's carbon cycle.

Researchers at Canada's Dalhousie University say the global population of phytoplankton has fallen about 40 percent since 1950. That translates to an annual drop of about 1 percent of the average plankton population between 1899 and 2008.

The scientists believe that rising sea surface temperatures are to blame.

"It's very disturbing to think about the potential implications of a century-long decline of the base of the food chain," said lead author Daniel Boyce, a marine ecologist.

They include disruption to the marine food web and effects on the world's carbon cycle. In addition to consuming CO2, phytoplankton can influence how much heat is absorbed by the world's oceans, and some species emit sulfate molecules that promote cloud formation.

A continuing mystery story

"In some respect, these findings are the beginning of the story, not the end," Boyce said. "The first question is what will happen in the future. We looked at these trends over the past century but don't know what will happen 10 years down the road."

The study "makes a sorely needed contribution to our knowledge of historical changes in the ocean biosphere," said David Siegel of the University of California, Santa Barbara, and Bryan Franz of NASA in an essay, also published in *Nature*.

"Their identification of a connection between long-term global declines in phytoplankton biomass and increasing ocean temperatures does not portend well for [ocean] ecosystems in a world that is likely to be warmer," they wrote. "Phytoplankton productivity is the base of the food web, and all life in the sea depends on it."

Boyce said he and his co-authors began their study in an attempt to get a clearer picture of how phytoplankton were faring, given that earlier studies that relied on satellite measurements produced conflicting results.

Biggest declines at the poles

The scientists dug back into the historical record, well past 1997, the year continuous satellite measurements began. They examined a half-million data points collected using a tool called a Secchi disk, as well as measurements of chlorophyll—a pigment produced by the plankton.

The Secchi disk was developed in the 19th century by a Jesuit astronomer, Father Pietro Angelo Secchi, when the Papal navy asked him to map the transparency of the Mediterranean Sea.

What Secchi produced was a dinner plate-sized white disk that is lowered into ocean water until it cannot be seen anymore. The depth it reaches before disappearing gives a measure of water clarity.

That can be used as a proxy for phytoplankton population in a given area, since the tiny organisms live close to the ocean's surface, where they are exposed to sunlight they use to produce energy.

Data gathered with a Secchi disk are roughly as accurate as observations collected by satellites, Boyce said, although satellites have greater global reach.

The researchers found the most notable phytoplankton declines in waters near the poles and in the tropics, as well as the open ocean.

They believe that rising sea temperatures are driving the decline. As surface water warms, it tends to form a distinct layer that does not mix well with cooler, nutrient-rich water below, depriving phytoplankton of some of the materials they need to turn CO2 and sunlight into energy.

ABOUT THE AUTHOR

Lauren Morello works for *Nature* magazine.

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