



Why Climate Change Matters

## Rising Ocean Temps Threaten the Ocean Food Chain

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By [Michael D. Lemonick](#)

Of all the plants and animals facing a potentially dire future because of climate change, a study released Thursday in [Science](#) paints a potentially grim picture for one of the most important and underappreciated groups of living things on Earth. The study reports that [phytoplankton](#) — water-dwelling, single-celled micro-organisms including algae and other species — may have trouble adjusting to rising ocean temperatures.

“Phytoplankton have evolved to do really well at current temperatures,” said lead author Mrudil Thomas, of Michigan State University, “but if they don’t evolve further, the warming this century is going to lead them to move their ranges, and their diversity in tropical oceans may drop considerably.”



*While phytoplankton are microscopic, they're critical to the foundation of the marine food chain like schools of fish.*

*Credit: [Wiborg/flickr](#)*

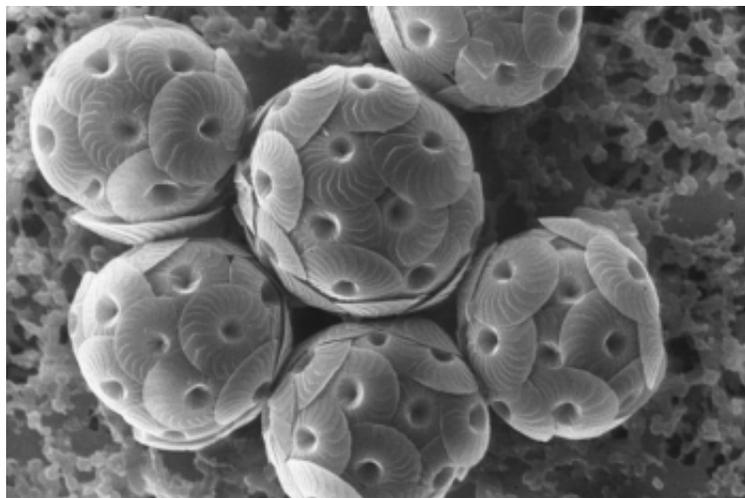
That could be a very big deal. Phytoplankton are not only the very foundation of the [marine food chain](#), but they also consume about half of the carbon dioxide that enters the atmosphere, and take it to the bottom of the sea with them when they die.

Significant disruptions to the world’s phytoplankton could therefore have major repercussions for the world’s

food supply, and at the same time allow more CO<sub>2</sub> to remain in the air to trap heat, accelerating climate change.

All of this is highly speculative at the moment. What Thomas and his co-authors have actually shown is that phytoplankton — or at least, the more than 130 species they studied — are highly sensitive to water temperature. Their growth rate slows considerably when the temperature changes, and especially when it goes up. It's possible that the tiny organisms will be able to evolve and adapt to rising ocean temperatures, but as Thomas said, "we don't know how fast they can do that."

They might also respond by shifting their range: tropical phytoplankton could, in principle, colonize more temperate waters as the tropics heat up. But they don't just need comfortable temperatures: they also need a certain amount of sunlight to carry out photosynthesis, for example, and the sun is most powerful at the Equator.



*A scanning electron microscope (SEM) image of phytoplankton.*

*Credit: Ulf Riebesell/[GEOMAR](#)*

They need a mix of nutrients as well, which might easily be less abundant in a new location. And even if the migration were largely successful, the tropics — currently home to the most diverse and productive phytoplankton communities on Earth — would be left significantly depopulated, removing a major food source for animals that feed on them.

"Food webs are very complicated," said co-author Colin Kremer, also at Michigan State. "But certainly, if phytoplankton are affected, they're connected to many other species that would likely be affected as well."

At this point, nobody knows how likely any of these scenarios might be. "It's even possible, that there will be no disruption," Thomas said. "There's lots of information we simply don't have. There are all sorts of different ways it could play out. But I expect changes to happen."

Nailing down precisely what those are will entail a lot more research. "One of challenges we face is we know so little about how phytoplankton are spread through the ocean," Kremer said. "There are only handful of phytoplankton species whose distribution we understand even in a coarse sense."

Kremer said the current study is an important step toward understanding the effects of ocean warming on these crucial organisms (to say nothing of another climate-related threat, [ocean acidification](#)). But there's a great deal more scientists need to understand.

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