

Tropical phytoplankton feel the heat

NSF Award: [CAREER: Modeling Complexity in Plankton Communities](#) (Michigan State University)
[CAREER: Mechanisms of Phytoplankton Community Re-organization Under Global Change](#) (Michigan State University)
[Phytoplankton Traits, Functional Groups and Community Organization: A Synthesis](#) (Michigan State University)
[BEACON: An NSF Center for the Study of Evolution in Action](#) (Michigan State University)

State: [Michigan](#)

Congressional Districts: Michigan District 08

Research Areas: [Biology](#)

As drifting microorganisms, individual phytoplankton species should be able to show up anywhere in the ocean, but they don't. To learn why, NSF-funded researchers studied water temperatures (among several other factors) to see if they somehow limit phytoplankton distribution.

Through a combination of ocean sampling, experimentation and eco-evolutionary modeling, the team found evidence that the species evolved over time in response to local average ocean temperatures; essentially each species became best-suited to a local temperature. This adaptation prevents other species from moving in but also prevents the native species from invading areas beyond its local area.

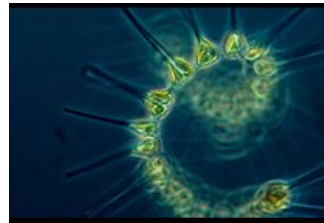
The study showed that phytoplankton grow best at an optimum temperature and that the drop from peak growth is different above and below that temperature. Water cooler than optimum favors phytoplankton growth, while water warmer than optimum does not. Ocean temperatures at tropical latitudes, however, are already at or above the optimal temperature for phytoplankton found in the same region. This implies that species currently inhabiting tropical waters will be under pressure to move, adapt or face extinction as ocean temperatures continue to rise.

As warmer waters spread toward the poles, some species may be able to follow the areas of optimal temperature to higher latitudes. Species that remain in the tropics will have to adapt quickly. Without such changes, diversity and production in tropical waters will experience a sharp decline under projected climate change.

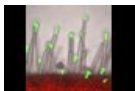
Future studies may reveal whether the genetic variation within tropical phytoplankton species can support survival in a warmer world.

[Learn more](#)

Image



Recent Award Highlights



[Pest Protection Depends on Location](#)

Enzyme protects tomatoes and their wild relatives in some locations but not others

Research Areas: [Biology](#)

Locations: [Michigan](#), [International](#)



[Modular Biological Networks Avoid Costly Connections](#)

Study reveals how modularity hastens adaptation while limiting costly solutions

Research Areas: [Biology](#)

Locations: [Michigan](#), [International](#)