Plankton are more resilient to nutrient stress than previously thought

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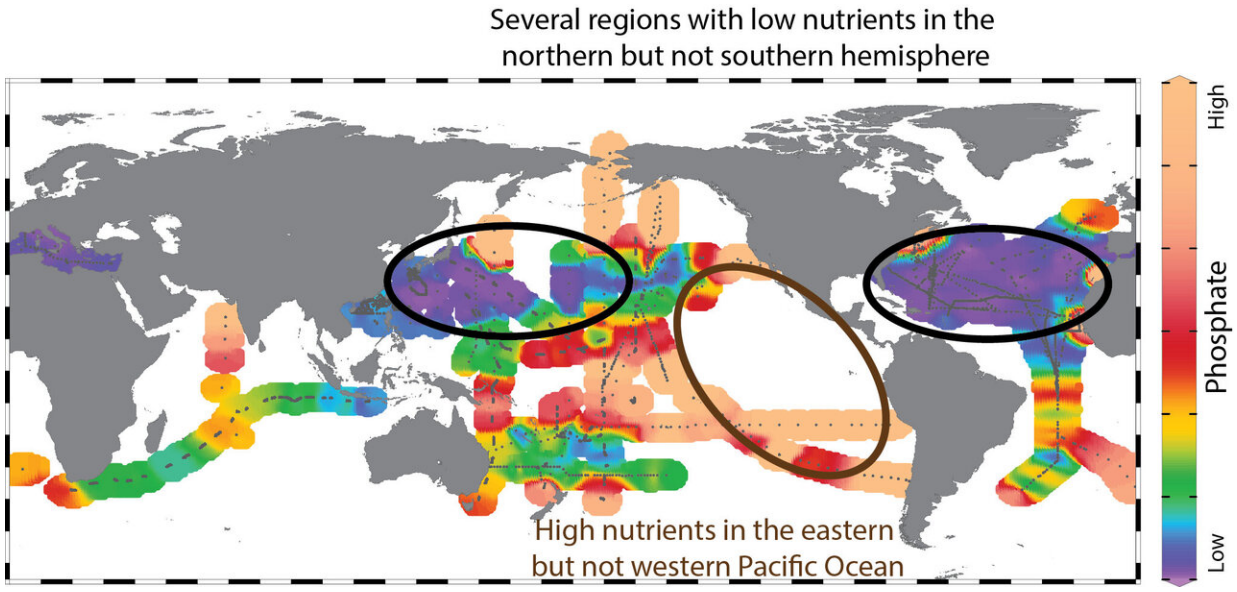

Global distribution of surface phosphate measured using high sensitivity techniques revealing regional difference in nutrient availability. Credit: Figure is done by Adam Martiny at UC Irvine and made possible with NSF support from their '10 Big Ideas' program.

An international team of Earth system scientists and oceanographers has created the first high-resolution global map of surface ocean phosphate, a key mineral supporting the aquatic food chain. In doing so, the University of California, Irvine-led group learned that marine phytoplankton are a lot more resilient to nutrient stress than previously

thought.

The researchers' findings, published today in *Science Advances*, hold important implications for climate change predictions. Ocean algae absorb a significant amount of carbon dioxide from the Earth's atmosphere, thereby providing a valuable service in regulating the planet's temperature.

"Understanding the global distribution of ocean nutrients is fundamental to identifying the link between changes in ocean physics and ocean biology," said lead author Adam Martiny, UCI professor of Earth system science and ecology and evolutionary biology. "One of the outcomes of having this map is that we can show that plankton communities are extremely resilient even in nutrient-deficient environments. As lower ocean nutrient availability is one of the predicted outcomes of climate change, this may be good news for plankton, and for us."

Dissolved inorganic phosphate plays an important biogeochemical role in the ocean habitat, but it is notoriously difficult to detect. Phosphorus is a crucial element in essential-to-life molecules such as DNA and adenosine triphosphate, which stores and transfers chemical energy between cells. Unlike many of the other nutrients useful to phytoplankton, Earth has a finite amount of phosphorus, and it's rare in the ocean.

Knowing how much is out there, and where, helps scientists understand the dynamics of the ocean food web, and how it will be impacted to alterations in ocean chemistry brought on by climate change. Martiny and his colleagues analyzed more than 50,500 seawater samples collected on 42 research voyages covering all of Earth's ocean basins.

Martiny said that in addition to identifying regions where the mineral is in short supply, the team was also able to discover previously unknown

patterns of phosphate levels in major ocean basins in the Atlantic and Pacific.

"We have for too long had this simplistic view of a nutrient-rich ocean at high latitudes and ocean deserts at low latitudes," he said. "However, in this paper we argue that our current predictions of nutrient stress may be too dire and marine organisms are able to handle a limited supply of phosphate better than we previously thought."

More information: A.C. Martiny el al., "Biogeochemical controls of surface ocean phosphate," *Science Advances* (2019). advances.sciencemag.org/content/5/8/eaax0341

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