Variable light illuminates the distribution of picophytoplankton

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Tiny photosynthetic plankton less than a millionth of a millimeter in diameter numerically dominate marine phytoplankton. Their photosynthesis uses light to drive carbon dioxide uptake, fueling the marine food web over vast areas of the oceans. A new study published in this week's *PLoS ONE* by post-doctoral researcher Dr Christophe Six and a team of scientists from MountAllison University, Sackville, New Brunswick, Canada, illuminates how the environment regulates the distributions of these ecologically important species.

Dr Doug Campbell, Canadian Research Chair in Environmental Processes and co-author explains, "Phytoplankton are entrained in the water column and are thus subject to rapid changes in light as they mix through the upper layer of the ocean."

Dr Christophe Six adds, "Phytoplankton need light for photosynthesis and survival, but surprisingly this light also inactivates a key component of the photosynthetic apparatus, photosystem II. This Photoinactivation of photosystem II decreases photosynthesis and can even kill cells, unless they can counteract the damage through repair, which requires nutrients."

"We found the picophytoplankton species isolated from different regions of the ocean have different abilities for this repair, and therefore have different abilities to tolerate increases in light. Their repair capacities are consistent with the different light and nutrient regimes in their local environments; species from deep ocean regions with stable

light and low nutrients have very limited repair capacity, but species from coastal regions with more variable light and higher nutrients are more able to cope with variable light through rapid repair."

This result indicates that picophytoplankton species' tolerance of exposures to high light can help to explain how these organisms are distributed throughout the ocean. The group measures the rates of photoinactivation and the rates of the counteracting repair in a wide variety of phytoplankton species, and next plans to contribute to ocean models to predict phytoplankton carbon cycling in response to future climate change.

Source: Public Library of Science