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TITLE: Increasing importance of small phytoplankton in a warmer ocean

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ABSTRACT:

Abstract The macroecological relationships among marine phytoplankton total cell density, community size structure and temperature have lacked a theoretical explanation. The tiniest members of this planktonic group comprise cyanobacteria and eukaryotic algae smaller than 2 μ m in diameter, collectively known as picophytoplankton. We combine here two ecological rules, the temperature-size relationship with the allometric size-scaling of population abundance to explain a remarkably consistent pattern of increasing picophytoplankton biomass with temperature over the 0.6 to 22 °C range in a merged dataset obtained in the eastern and western temperate North Atlantic Ocean across a diverse range of environmental conditions. Our results show that temperature alone was able to explain 73% of the variance in the relative contribution of small cells to total phytoplankton biomass regardless of differences in trophic status or inorganic nutrient loading. Our analysis predicts a gradual shift toward smaller primary producers in a warmer ocean. Because the fate of photosynthesized organic carbon largely depends on phytoplankton size, we anticipate future alterations in the functioning of oceanic ecosystems.

SOURCE: Global change biology

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