



Resource levels, allometric scaling of population abundance, and marine phytoplankton diversity

Cermeño, Pedro, Emilio Maraño, Derek Harbour, Francisco G. Figueiras, Bibiana G. Crespo, María Huete-Ortega, Manuel Varela, Roger P. Harris

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ABSTRACT: We analyzed the relationship between population abundance and cell size in phytoplankton assemblages from coastal, shelf, and open-ocean environments. Our results show that across the entire size spectrum considered, population abundance increases over two orders of magnitude from subtropical to coastal regions. We find a highly significant linear relationship between nutrient concentration and the intercept of the log-log relationship between population abundance and cell size. In contrast to overall patterns reported mainly for vascular plants and animals, marine phytoplankton diversity does not show any consistent trend along either latitudinal or productivity gradients. These results imply that large-scale (biogeographic) variations in phytoplankton standing stocks are controlled by changes in population abundances rather than by systematic variations in species richness. These findings provide a mechanistic connection among nutrient availability, population dynamics, and phytoplankton diversity over macroecological scales.

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