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TITLE: Patterns of phytoplankton size structure and productivity in contrasting open-ocean environments

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ABSTRACT:

A total of 94 vertical profiles of size-fractionated chlorophyll a concentration and primary production rate were obtained along a meridional transect from the United Kingdom to the Falkland Islands (50°N to 50°S) during 4 cruises carried out in April and October 1996 and in April and October 1997.This data set allowed us to characterize the patterns of phytoplankton size-structure and productivity in temperate, oligotrophic, upwelling and equatorial regions.On average, picophytoplankton (0.2 to 2 µm) accounted for 56 and 71% of the total integrated carbon (C) fixation and autotrophic biomass, respectively.Enhanced biomass and productivity contributions by nano-and microplankton took place in the temperate regions and in the upwelling area off Mauritania.Small (< 2 µm in diameter) phytoplankton cells should not be regarded as a background, relatively invariant component of the microbial community, given that most of the latitudinal variability in total photoautotrophic biomass and production was driven by changes in the picophytoplankton.In temperate regions and in the upwelling area off Mauritania, small (< 2 µm) and large (> 2 µm) phytoplankton accounted for a proportion of total biomass that was similar to their shares of productivity.In the oligotrophic and equatorial regions, in contrast, large phytoplankton tended to account for a fraction of the total production that was significantly higher than their share of the biomass.We found that the equatorial upwelling causes an increase in phytoplankton biomass and productivity without altering the typical size structure found in less productive regions such as the subtropical gyres.In the oligotrophic ocean, significant changes in C fixation rates take place without accompanying variations in the magnitude of the phytoplankton standing stocks or the size structure of the microbial community.

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