Regional distributions of nitrogen-fixing bacteria in the Pacific Ocean

Church, Matthew J., Karin M. Björkman, David M. Karl, Mak A. Saito, Jonathan P. Zehr

Limnol. Oceanogr., 53(1), 2008, 63-77 | DOI: 10.4319/lo.2008.53.1.0063

ABSTRACT: We evaluated the regional distributions of six nitrogen (N_2)-fixing bacteria in the North Pacific Ocean using quantitative polymerase chain reaction amplification of planktonic *nifH* genes. Samples were collected on four oceanographic research cruises between March 2002 and May 2005 that spanned a latitudinal range from 12° S and 54° N between 152° W and 170° W. Samples were collected throughout the upper ocean (<200 m) in the northern regions of the South Pacific Subtropical Gyre (SPSG), equatorial waters, the North Pacific Subtropical Gyre (NPSG), the North Pacific Transitional Zone (NPTZ), and within the Pacific Sub Arctic Gyre (PSAG). There were distinct spatial gradients in concentrations of nutrients, chlorophyll, and the abundances of N_2-fixing bacteria within the various oceanic biomes. In general, *nifH*-containing bacteria were most abundant in the midregions of the NPSG (latitudes between ~14° N and 29° N), where unicellular cyanobacterial phylotypes dominated *nifH* gene abundances. The abundances of all *nifH*-containing groups declined within the northern and southern regions of NPSG. Although *nifH*-containing groups were detectable in the northern regions of the SPSG, throughout the equatorial waters, and within the NPTZ, gene copy abundances of most groups were lower in these regions than those found the in the NPSG. In the NPSG, surface water abundances of the various *nifH* phylotypes examined ranged from <50 copies L^{-1} to ~10^5 nifH copies L^{-1}. Overall, the abundances of an uncultivated, presumed unicellular *nifH* sequence-type (termed Group A) were the most abundant and widely distributed of the phylotypes examined. Our results indicate that the distributions of N_2-fixing plankton were largely restricted to the subtropical regions of the North and South Pacific Oceans.

Article Links

Download Full-text PDF

Return to Table of Contents

Please Note

Articles in L&O appear in PDF format. Open access articles may be freely downloaded by anyone. Other articles are available for download to subscribers only, or may be purchased for $10 per article. All L&O articles are moved into Open Access after three years.