Elemental composition of marine Prochlorococcus and Synechococcus: Implications for the ecological stoichiometry of the sea

Bertilsson, S., O. Berglund, D. M. Karl, S. W. Chisholm

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ABSTRACT: The elemental composition of marine cyanobacteria is an important determinant of the ecological stoichiometry in low-latitude marine biomes. We analyzed the cellular carbon (C), nitrogen (N), and phosphorus (P) contents of *Prochlorococcus* (MED4) and *Synechococcus* (WH8103 and WH8012) under nutrient-replete and P-starved conditions. Under nutrient-replete conditions, C, N, and P quotas (femtogram cell21) of the three strains were 46 ± 4, 9.4 ± 0.9, and 1.0 ± 0.2 for MED4; 92 ± 13, 20 6 3, and 1.8 ± 0.1 for WH8012; and 213 ± 7, 50 ± 2, 3.3 ± 0.5 for WH8103. In P-limited cultures, they were 61 ± 2, 9.6 ± 0.1, and 0.3 ± 0.1 for MED4; 132 ± 6, 21 ± 2, and 0.5 ± 0.2 for WH8012; and 244 ± 21, 40 ± 4, and 0.8 ± 0.01 for WH8103. P limitation had no effect on the N cell quota of MED4 and WH8012 but reduced the N content of WH8103. The cellular C quota was consistently higher in P-limited than in nutrient-replete cultures. All three strains had higher C: P and N: P ratios than the Redfield ratio under both nutrient-replete and P-limited conditions. The C:N molar ratios ranged 5-5.7 in replete cultures and 7.1-7.5 in P-limited cultures; C: P ranged 121-165 in the replete cultures and 464-779 under P limitation; N: P ranged 21-33 in the replete cultures and 59-109 under P limitation. Our results suggest that *Prochlorococcus* and *Synechococcus* may have relatively low P requirements in the field, and thus the particulate organic matter they produce would differ from the Redfield ratio (106C : 16N : 1P) often assumed for the production of new particulate organic matter in the sea.