Evolution and climate impact of newly discovered marine phytoplankton

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Project description:

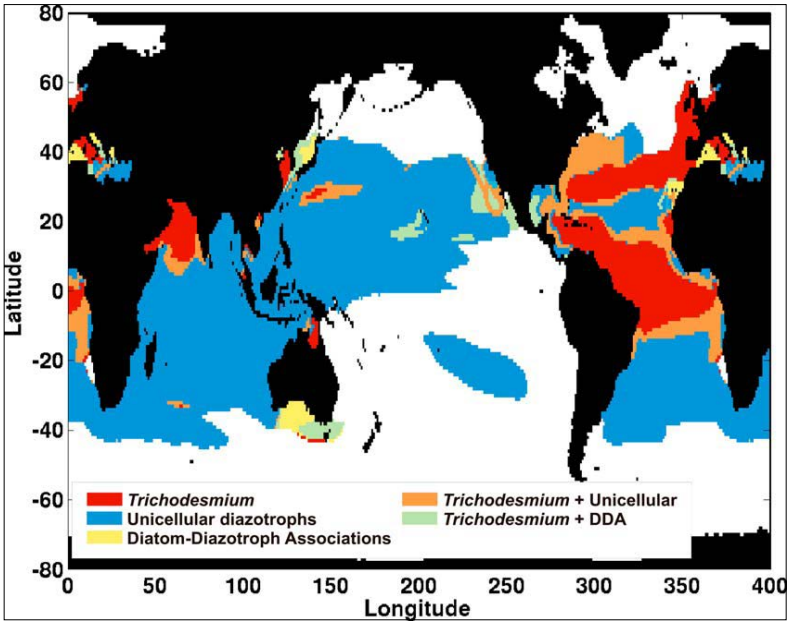

Figure 1: Diversity of main marine nitrogen fixers in the MIT-Darwin model [1]

Ocean phytoplankton diversity is essential for marine ecosystems not only because it contributes to primary productivity but also regulates the Earth's climate system. Some phytoplankton species are able to transform atmospheric nitrogen, which is unavailable to most organisms, into a biological source; these organisms are known as nitrogen fixers. Since nitrogen is a limiting nutrient in the ocean, nitrogen fixers are crucial in helping support marine productivity. Recently, biologists have discovered new species of marine phytoplankton able to fix nitrogen [2].

This project aims to study the evolutionary relationships of these newly discovered marine nitrogen fixers using a phylogenomic approach combined with a unique global ocean model. Evolutionary relationships will provide a framework in which to study genetic differences (e.g. gene structure, gene content) amongst nitrogen fixing phytoplankton and to understand ecological differences. The outcome knowledge on the genetics, ecology and evolution will assist on how to model modern diverse nitrogen fixers including newly discovered ones, using the innovative MIT-Darwin model (Figure 1) [1]. The model will be used to better understand how nitrogen fixers contribute to the marine nitrogen biogeochemical cycle and climate.

<u>References:</u>
[1] Monteiro, F. M., Follows, M. J., & Dutkiewicz, S. (2010). Distribution of diverse nitrogen fixers in the global ocean. Global Biogeochemical Cycles, 24(3), GB3017. doi:10.1029/2009GB003731
[2] Thompson, A. W., Foster, R. A., Krupke, A., Carter, B. J., Musat, N., Vaulot, D., Kuypers, M. M. M., and Zehr, J. P. (2012). Unicellular Cyanobacterium Symbiotic with a Single-Celled Eukaryotic Alga. Science *337*, 1546-1550.