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Integrating Molecular Approaches to Understand Diatom Assemblages in Marine Environment

Authors : Shruti Malviya, Chris Bowler

Abstract : Environmental processes acting at multiple spatial scales control marine diatom community structure. However, the contribution of local factors (e.g., temperature, salinity, etc.) in these highly complex systems is poorly understood. We, therefore, investigated the diatom community organization as a function of environmental predictors and determined the relative contribution of various environmental factors on the structure of marine diatoms assemblages in the world's ocean. The dataset for this study was derived from the Tara Oceans expedition, constituting 46 sampling stations from diverse oceanic provinces. The V9 hypervariable region of 18s rDNA was organized into assemblages based on their distributional co-occurrence. Using Ward's hierarchical clustering, nine clusters were defined. The number of ribotypes and reads varied within each cluster-three clusters (II, VIII and IX) contained only a few reads whereas two of them (I and IV) were highly abundant. Of the nine clusters, seven can be divided into two categories defined by a positive correlation with phosphate and nitrate and a negative correlation with longitude and, the other by a negative correlation with salinity, temperature, latitude and positive correlation with Lyapunov exponent. All the clusters were found to be remarkably dominant in South Pacific Ocean and can be placed into three classes, namely Southern Ocean-South Pacific Ocean clusters (I, II, V, VIII, IX), South Pacific Ocean clusters (IV and VII), and cosmopolitan clusters (III and VI). Our findings showed that co-occurring ribotypes can be significantly associated into recognizable clusters which exhibit a distinct response to environmental variables. This study, thus, demonstrated distinct behavior of each recognized assemblage displaying a taxonomic and environmental signature.

Keywords : assemblage, diatoms, hierarchical clustering, Tara Oceans
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