ENDEMISM AND BIOGEOGRAPHICAL REGIONALISM IN ANTARCTIC DIATOM COMMUNITIES

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Arctic and Antarctic floras and faunas differ strongly in their overall composition and diversity. This reflects the spatial separation between both Polar Regions and different evolutionary origins of lineages in response to interhemispheric contrasts in glacial history and connectivity among land masses.

In contrast, prevailing theory predicts that Arctic and Antarctic habitats should share the same microbial communities, because allopatric speciation is expected to be rare among microorganisms and local environmental factors should act as the major process structuring their metacommunities through lineage sorting. Here we examined the diversity and endemism among extant diatom floras in Arctic and Antarctic lake districts to test this prediction. Contrary to theory, strongly contrasting patterns emerged: in the Southern Hemisphere, diatom floras are impoverished and imbalanced compared with their Arctic counterparts. In particular, Antarctic diatom floras are characterized by high levels of endemism, the lack of important functional groups such as planktonic taxa, the overrepresentation of terrestrial lineages and the general poverty of globally successful genera. Comparison with fossil Miocene assemblages and molecular clock analysis of diversification patterns point to high rates of local extinction during Neogene and Quaternary glacial maxima, in combination with radiations through allopatric speciation in refugia. We conclude that processes generating the distribution and diversification of microorganisms can operate at similar spatial and temporal scales as in macroscopic organisms, leading to strikingly congruent biogeographic patterns. Our findings have implications for the response of polar microbial communities in the face of the accelerated rates of warming, and underscore the pressing need for stringent measures to prevent the introduction of non-native microbes in Antarctic environments.

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