Niche conservatism in stream diatoms

Janne Soininen , Aurélien Jamoneau*[1], Juliette Tison-Rosebery , Thibault Leboucher[1], Jianjun Wang , Mikolaj Kokociński , and Sophia Passy

[1]Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture (Irstea) – Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture - IRSTEA (FRANCE) – France

Abstract

Niche conservatism, whereby species niche characteristics are conserved over space and time, is an important cause for large-scale species distributions and diversity gradients on Earth. Dispersal mechanisms are expected to have a strong effect on niche conservatism, considering that high dispersal rate may prevent local adaptation and favor niche conservatism. In freshwater ecosystems, diatoms are usually recognized as cosmopolitan species, due to low dispersal limitation and high reproductive rates. However, the extent to which niche characteristics of diatoms are conserved across space has rarely been tested and should give interesting insights for the understanding of their biogeographic distribution. To address this question, we implemented species distribution modeling and analyses of species niche breadths and optima. Species distribution models (SDMs) along environmental and climatic gradients were developed with data from the US and then tested with datasets from France, Finland, New Zealand, Antilles and La Réunion islands. Given that the US SDMs poorly predicted the species distributions in other regions, we concluded that diatoms do not appear to exhibit niche conservatism. Weak correspondence of niche optima and niche breadths in one region with the respective species properties in another region further indicated a general lack of niche conservatism. Analyses of species differing in occupancy (i.e., core vs. satellite species) and traits (i.e., diatom ecological guilds) further confirmed that niche conservatism was also weak across functional groups. Although diatoms species are considered to be generally dispersal-unlimited, our results indicate that their dispersal rate may be more moderate than previously thought. Finally, the capacity to adapt locally to environmental and climatic conditions may allow diatoms to better cope with global environmental changes.

*Speaker