Temperature-dependence of minimum resource requirements alters competitive hierarchies in phytoplankton - DTU Orbit (17/08/2019)

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Resource competition theory is a conceptual framework that provides mechanistic insights into competition and community assembly of species with different resource requirements. However, there has been little exploration of how resource requirements depend on other environmental factors, including temperature. Changes in resource requirements as influenced by environmental temperature would imply that climate warming can alter the outcomes of competition and community assembly.

We experimentally demonstrate that environmental temperature alters the minimum light and nitrogen requirements – as well as other growth parameters – of six widespread phytoplankton species from distinct taxonomic groups. We found that species require the most nitrogen at the highest temperatures while light requirements tend to be lowest at intermediate temperatures, although there are substantial interspecific differences in the exact shape of this relationship.

We also experimentally parameterize two competition models, which we use to illustrate how temperature, through its effects on species’ traits, alters competitive hierarchies in multispecies assemblages, determining community dynamics. Developing a mechanistic understanding of how temperature influences the ability to compete for limiting resources is a critical step towards improving forecasts of community dynamics under climate warming.

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Corresponding author: Kratina, P.
Contributors: Lewington-Pearce, L., Narwani, A., Thomas, M., Kremer, C. T., Vogler, H., Kratina, P.
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