The spectrum of phytoplankton trophic strategies: cultivating a deeper understanding

The smallest phytoplankton play a large role in most of the ocean, but among the smallest eukaryotes are many ancient lineages whose functional and ecological differences are poorly understood. Here I describe work done in collaboration with Grieg Steward and others that takes advantage of a unique collection of diverse phytoplankton isolates from the oligotrophic North Pacific. We show that many of these phytoplankton are predators of Prochlorococcus, and we document tradeoffs characterizing a wide range of trophic strategies along an autotrophy-mixotrophy spectrum. We find that the niches of these phytoplankton are strongly correlated with their trophic strategies, leading to consistent shifts in community structure and function across multiple environmental gradients. A trait-based model of resource competition suggests that covarying nutrient and light availabilities jointly drive the observed patterns. Our results point to a more mixotrophic future for the oceans, with likely consequences for multiple ecosystem processes.

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