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On the pivotal role of ciliates in the structure of the marine microbial food web and its biogeochemical implications.

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Different mesocosm experiments have been shown to give surprisingly different responses to similar treatments. Using an idealized model with 6 populations, much of this variability can, however, be captured; indicating that top-down cascading effects from predators strongly control the outcome of bottom-up competition for mineral nutrients. This model can be seen as composed of two adjacent pentagon-shaped trophic structures: a “right” pentagon with copepods as the upper predator and ciliates and diatoms as their prey, and a “left” pentagon with ciliates as the upper predator and heterotrophic and autotrophic flagellates as their prey. Occupying a different trophic position in each pentagon, the cascading effects from ciliates is different in the two. In the right pentagon, they create a positive copepod-chl correlation in flagellate-dominated phytoplankton communities, in the left pentagon they control whether bacterial growth is limited by mineral nutrients or by organic carbon. We show how this model can be used to understand differences in the internal structure of the bacterial and viral communities. The relevance of this model to the Arctic and to the Mediterranean ecosystems is discussed.

Keywords: trophic cascade, Arctic, Mediterranean, mesocosm, bacterial growth limitation, mathematical modelling