

Eawag Seminar Invitation

Phyt to compete: Evolutionary responses to resource limitation in phytoplankton

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When November 25, 16:00 – 17:00, CET

Where Online via Zoom, contact seminars@eawag.ch for access details.

Abstract Resource limitation is a major driver of ecological and evolutionary dynamics of all organisms, including phytoplankton. Short-term responses to resource limitation include plastic re-wiring of the molecular and metabolic phenotypes of cells. Less is known about the evolution of resource requirements and the molecular phenotype after longer-term selection by resource limitation. Can competitive abilities adapt to limiting resources? Do requirements for different resources evolve independently or are trade-offs intrinsic? What is the metabolic basis of this evolutionary adaptation? To answer these questions we have employed a variety of approaches, from highly controlled evolution experiments of a single model green alga in chemostats, to outdoor mesocosm experiments exposed to natural climatic and biotic community complexity. We have investigated ecological and evolutionary change in individual-level traits, protein expression and population-level resource requirements. Across these experiments and levels of biological organization, we found that selection by limiting resources results in adaptive evolutionary change, including reductions in resource requirements. At the molecular level, we found a surprising degree of convergent evolution of core metabolic functions across multiple different low-resource selection environments. We do not observe the evolution of trade-offs between competitive abilities in different low-resource environments, suggesting that phytoplankton may be a unique group among aquatic organisms due to their use of non-substitutable (essential) resources. I discuss the potential ecological consequences of such evolutionary change on the outcome of competitive community assembly.