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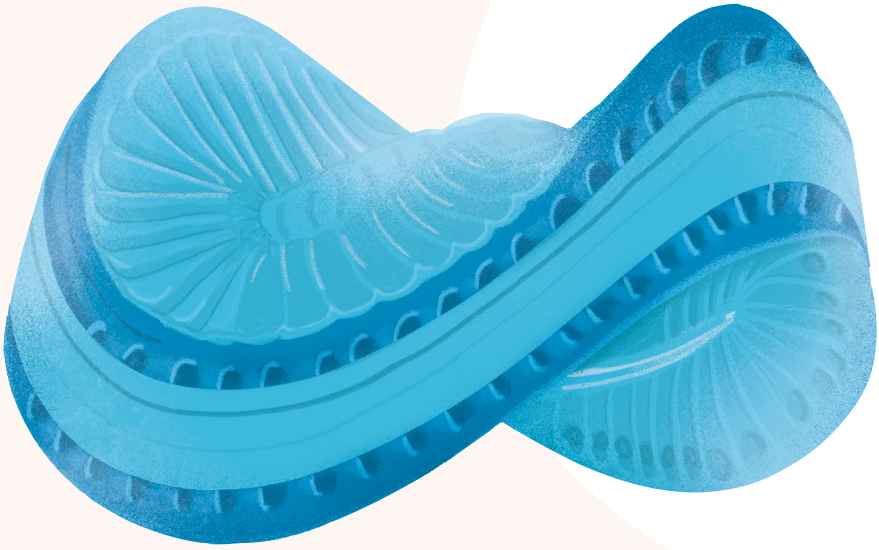

BOOK OF ABSTRACTS

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SEASONAL "WINDOWS OF OPPORTUNITY" IN ALPINE HEADWATERS: IMPLICATIONS FOR DIATOM ASSEMBLAGES

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In the European Alps, around 80% of glacier volume is predicted to vanish within the end of this century because of global warming. The progressing glacier retreat is affecting the Alpine hydrological dynamics as well as the distribution and biodiversity of glacier-fed streams. Within this scenario of vanishing glaciers, mountain permafrost is becoming increasingly significant since the thawing of its subsurface ice occurs at a slower rate in comparison to surface glacier ice. The most common evidence of mountain permafrost are the rock glaciers, i.e., creeping rocky landforms made of rock fragments that host subsurface ice. Springs and streams emerging from intact (containing ice) and relict (not containing ice) rock glaciers are increasingly considered as a climate-resistant source of cold water, as well as ecological refugia for cold-stenothermic aquatic organisms. Nonetheless, the knowledge of benthic biodiversity and dynamics in relation to the seasonal changes of habitat and water chemical setting is still patchy and incomplete.

Ecological Windows of Opportunity (WOs) are defined as seasonal periods of mild environmental conditions supporting the development of benthic primary producers, especially diatoms, in Alpine glacial streams. The primary WO occurs in autumn when glacier ablation is reduced, and glacier-fed streams have stable channels and less turbid waters. Differently, the spring WO more strongly depends on stochastic meteorological factors and is more irregularly paralleled by benthic growth. Although WOs have been conceptually modelled based on field surveys of primary producers in glacial streams of the European Alps,

much scarcer field evidence is available for headwaters of different origin. In particular, the seasonal development of diatom biomass and diversity in Alpine headwaters fed by rock-glaciers and in non-glacial reference streams (i.e., not influenced by permafrost and glaciers) in the present context of Alpine deglaciation is poorly known.

Here we present the first results of a two-year investigation on seasonal development of diatom biomass and diversity in headwater streams of different origin in two deglaciating catchments of the Italian Central-Eastern Alps. The study has been conducted within the Euregio project "Rock-me" (2022-2025, https://rock-glaciers-euregio.fmach.it/) by investigating physical (temperature, turbidity) and chemical (nutrients, major ions, and trace elements) parameters of water, organic and chlorophyll-a content of epilithic biofilm, as well as density and taxonomic composition of epilithic diatoms in streams fed by glaciers and rock glaciers, and in non-glacial reference streams in both catchments.

We found different patterns of seasonal WOs, outlined by higher diatom density and biofilm chlorophyll content, either in early or late summer, in headwaters of different origin in relation to differing hydrological dynamics and habitat settings. The early summer WO appears to be more pronounced in headwaters fed by glaciers or rock glaciers, as a possible effect of the climate-related hydrological dynamics in deglaciating Alpine catchments. On the other hand, non-glacial springs and streams with more stable water discharge are characterised by a more evident late summer WO. Seasonal changes of diatom biodiversity seem to be related to differing hydrological dynamics at catchment scale.