Effects of indirect facilitation on functional diversity, dominance and niche differentiation in tropical alpine communities

Alain Danet*[1,2,3], Fabien Anthelme[2], Nicolas Gross[4], and Sonia Kéfi[3]

[1]Université de Montpellier (UM) – UMR ISEM, UMR AMAP – 163 rue Auguste Broussonnet - 34090 Montpellier, France

[2]Botanique et Modélisation de lÁrchitecture des Plantes et des Végétations (UMR AMAP) – Centre de Coopération Internationale en Recherche Agronomique pour le Développement : UMR51, Institut national de la recherche agronomique [Montpellier] : UMR931, Université de Montpellier : UMR5120, Centre National de la Recherche Scientifique : UMR5120, Institut de Recherche pour le Développement : UMR123 – Bd de la Lironde TA A-51/ PS 2 34398 Montpellier cedex 5, France

[3]Institut des Sciences de lÉvolution de Montpellier (ISEM) – Université de Montpellier, Institut de recherche pour le développement [IRD] : UR226, Centre National de la Recherche Scientifique : UMR5554 – Place E. Bataillon CC 064 34095 Montpellier Cedex 05, France

[4]Centre d'études biologiques de Chizé (CEBC) – CNRS : UPR1934 – Centre d'Études Biologiques de Chizé CNRS 79360 VILLIERS-EN-BOIS, France

Abstract

Positive interactions between plants are common and their effects on community richness via environment improvement are well known. However, the effects of indirect facilitation by a nurse through protection against grazing on its associated plant community have attracted less attention, in particular regarding functional traits. As the characteristics of trait distribution can reveal selective pressure, they offer valuable information for the study of grazing pressure. We tested to what extent indirect facilitation affects the amount of trait combinations (H1), the trait dominance (H2) and the niche differentiation (H3) of associated communities.

We set up a grazing exclusion experiment over two nurse cushion species: one providing indirect facilitation through grazing to its associated community and the other not. We measured on the associated communities three functional traits, which are known to vary according to grazing: LDMC, leaf thickness and maximum height. We assessed the amount of distinct trait combinations by computing the volume of the phenotypic space (H1). The variation in trait dominance was quantified with the kurtosis and skewness of the trait distributions (H2). The variation in niche differentiation was evaluated by using the community-wide overlap of intraspecific trait variation (H3).

We did not find a significant effect of grazing or indirect facilitation on the

*Speaker

volume of the phenotypic space. However, our study revealed a significant effect of indirect facilitation on dominance in the associated community by maintaining the evenness of the trait distributions (H2) and on niche differentiation by maintaining trait overlaps between species in grazed compared to ungrazed contexts (H3). The effects of indirect facilitation were however found to depend on the trait considered. Our results highlight that indirect facilitation promotes evenness of trait distributions and niche differentiation between species, suggesting that it buffers the selective pressures of grazing on plant communities.