Plant-insect networks in French calcareous grasslands: how does phenology affect the probability of interaction and the number of visits?

Natasha De Manincor*[1], François Massol[1], Yves Piquot[2], and Nina Hautekèete[2]

[1]Université de Lille, Sciences et Technologies – CNRS : UMR8198 – Cité Scientifique - 59655 Villeneuve dÁscq Cedex, France

[2]Université de Lille, Sciences et Technologies – Université de Lille - Sciences et Technologies – Cité Scientifique - 59655 Villeneuve dÁscq Cedex, France

Abstract

Plant-pollinator networks are one of the most studied types of mutualistic networks. On latitudinal gradients, plant and pollinator abundance, richness and presence are expected to vary, with potential impacts on network structure. Moreover, temporal and phenological mismatch could have an impact on the probability of interaction between species. Despite considerable theoretical advances, there are still few models available to predict the probability of interaction in such networks. I will present results of a project aimed at understanding the consequences of environmental gradients on species interactions in calcareous grasslands. The presentation will focus on networks involving hoverflies (Diptera: Syrphidae), using taxonomically precise data from observations of pollinator visits obtained during monthly samplings from April to October in six different sites in France. To predict the probability of species interaction and how it can vary in time and space, we used a Bayesian Structural Equation Modeling approach with latent variables and random species effects linking the number of visits to abundance and phenology. We tested 16 models with varying numbers of parameters and we used the leave-one-out cross-validation criterion (LOO) for the purpose of comparing models. We found that insect and plant abundances are strong determinants of the expected number of visits. The strength of the effect of phenology overlap on both the probability of interaction and the expected number of visits varies with network modularity and along the gradient. We also found that two models better predict the probability of species interaction. Our results highlight the importance of taking into account both species relative abundances and phenology to better assess their interactions in pollination networks. Our findings could foster reflection towards conservation policies while accounting for both community structure and species co-phenologies. The next step of our research is to extend this analysis to native bee species (Hymenoptera: Anthophila).

*Speaker