Flower-foraging insects and their pollen loads in french permanent grasslands

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INTRODUCTION

Semi natural grasslands are considered as a vital habitat for wild pollinators, which in return contribute to preserve the floristic diversity of this environment. The role and the importance of many flower-foraging insects in pollen transport are still poorly understood in grassland context. To study the interactions between pollinators and plants, flower-foraging insects were caught from beginning of May to end of July along three contrasted dairy farming systems in France. Sampling was carried out along six walking transects for each farming system. We developed and test in parallel a method based on DNA barcoding analysis, allowing a quick identification of the insect and its pollen load at the same time.

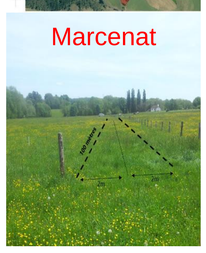
MATERIAL AND METHODS

Experimental farms

Lusignan
Lowland crop farming systems
Alt: 150m
Mean T : 11, 7°C

Mirecourt
Mixed crop-livestock farming systems
Alt: 300m
Mean T : 9°C

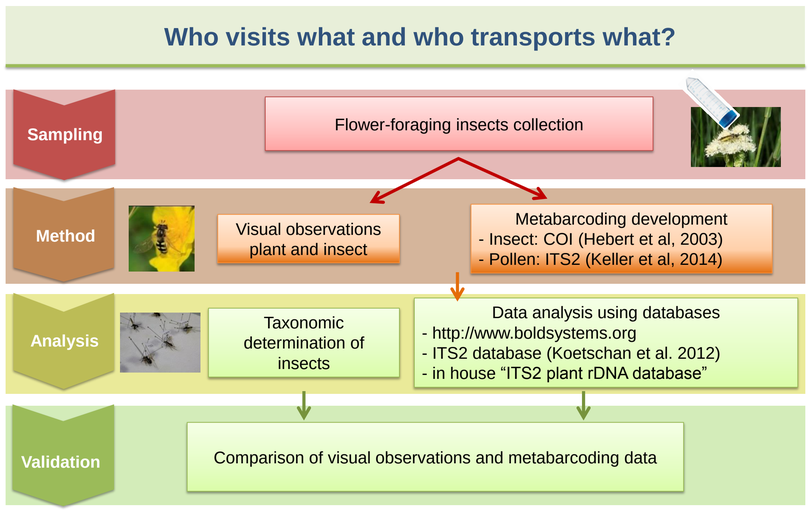
Marcenat
Grass-based mountain dairy systems
Alt: 1100m
Mean T : 7, 5°C



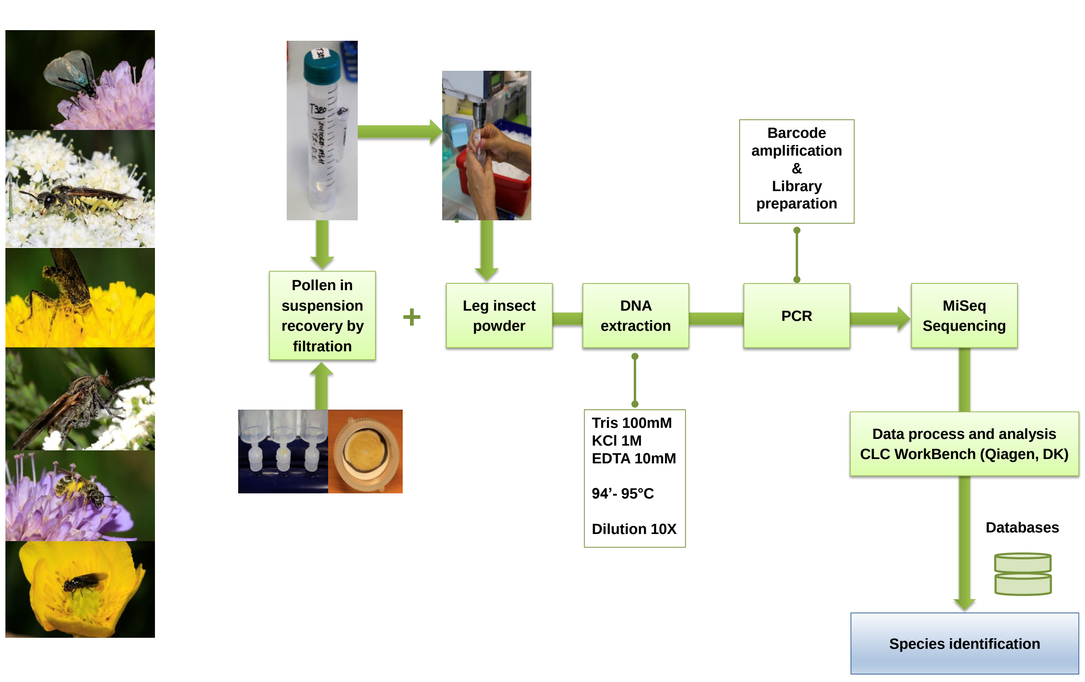
Floristic diversity level
HIGH
LOW
MEDIUM
400 m
100 m transects

Three INRA farms & 6 transects/farm

Outline of the experimental workflow (Galliot et al, 2017)

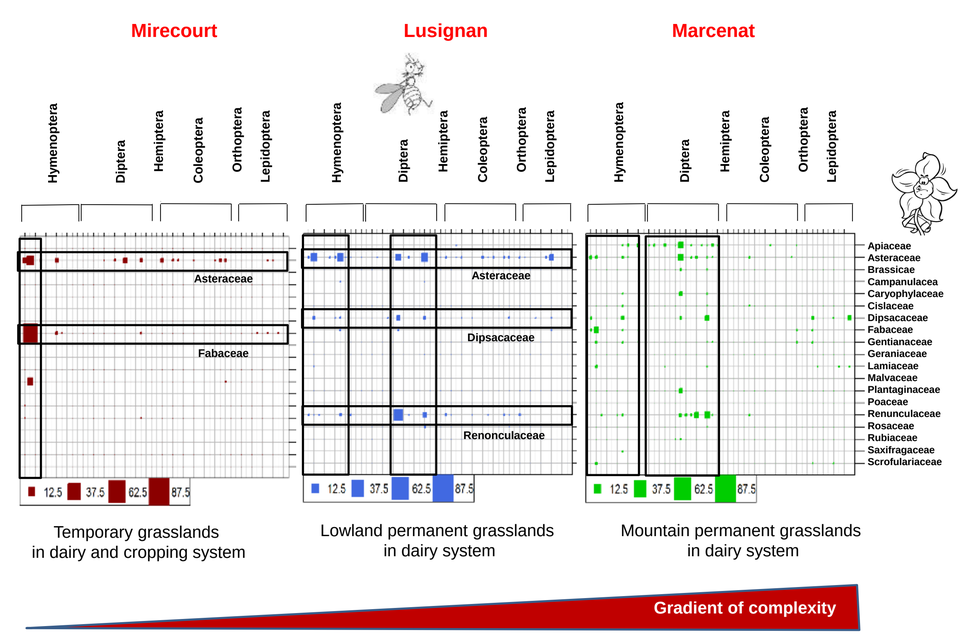


Sampling of flower-foraging insects and metabarcoding worflow



RESULTS

Flower-forager network obtained from visual surveys

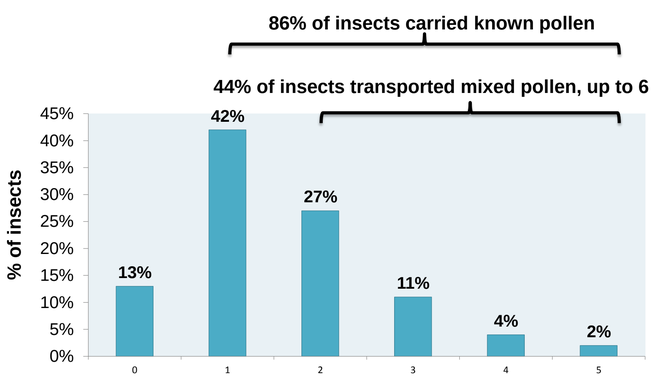


Temporary grasslands in dairy and cropping system

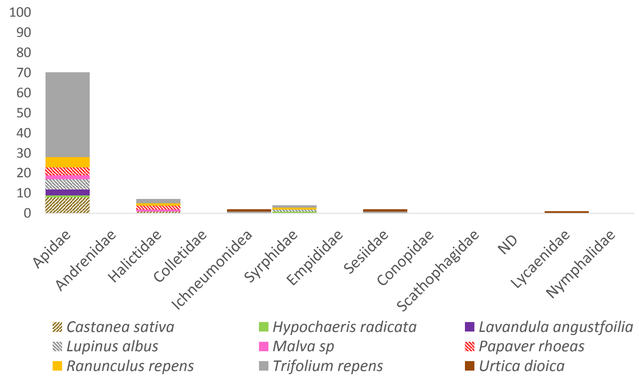
Lowland permanent grasslands in dairy system

Mountain permanent grasslands in dairy system

Metabarcoding results at the experimental dairy farm in Marcenat



% of flower foraging insects carrying pollen and number of pollen genera found in pollen loads



Number of interactions between insects and plants *via* pollen transportation

Comparison of visual observations and metabarcoding data

Only 27% of the flower-foraging insects were identified; most of the insects were not referenced in the Database. Our workflow doesn't work for small flies, DNA extraction should be improved.

86% of the flowers seen to be foraged by the insects were identified.
20% of notified species with metabarcoding were not recorded by visual surveys.

CONCLUSIONS

Our study has also proved the powerfulness of the DNA barcoding for pollination study applications.
DNA barcoding will be a new tool in the taxonomists toolbox as well as being an innovative device for ecological studies.
Diptera may play an important role in pollination in grasslands especially the *Empidae* family in our mountain grasslands.
Insect transported non grassland species such as *Betula* sp, *Quercus* sp, *Salix* sp, *Castanea* sp
Metabarcoding studies highlighted the urgent need of improved database.

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