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# Flower-Foraging Insects and their Pollen Loads in French Permanent Grasslands



Patricia Faivre Rampant<sup>1</sup>, Anne Farruggia<sup>2</sup>, Jean Noël Galliot<sup>3</sup>, Alice Michelot-Antalik<sup>4</sup>, Sandra Novak<sup>5</sup>, Aurélie Chauveau<sup>1</sup>, Aurélie Bérard<sup>1</sup>, Isabelle Le Clainche<sup>1</sup>, Jean François Odoux<sup>6</sup>, Jean Louis Fiorelli<sup>7</sup>, Laurent Lanore<sup>2</sup>, Nadia Michel<sup>4</sup>, Marie Christine Le Paslier<sup>1</sup>, Dominique Brunel<sup>1</sup>

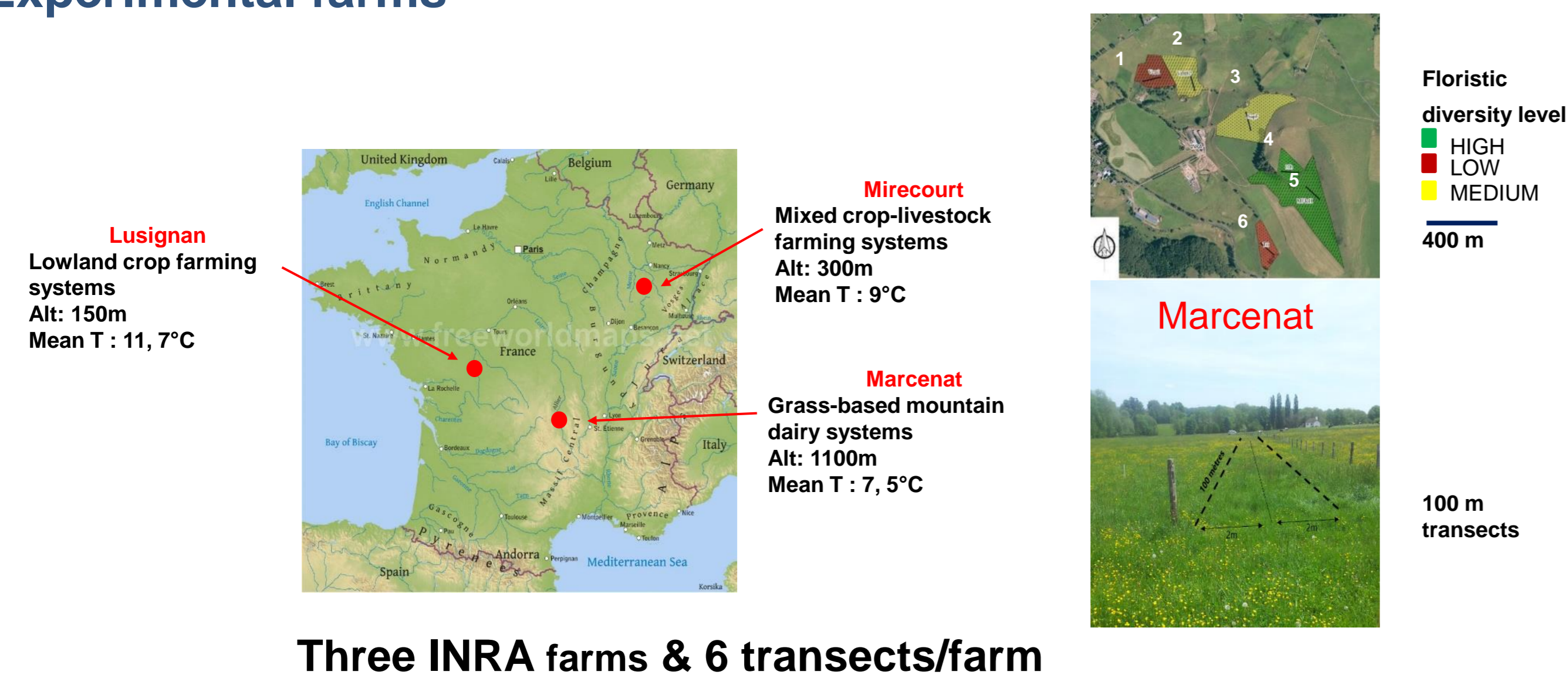
1-INRA, US1279 Etude du Polymorphisme des Génomés Végétaux, F-91000; 2-INRA, UMRH 1213, Centre Auvergne - Rhône-Alpes, F-63122; 3-INRA, UREP 0874, Centre Auvergne - Rhône-Alpes, F-63122; 4-INRA, Université de Lorraine, UMR 1121 LAE Agronomie et Environnement, F-54500; 5-INRA, FERLUS 1373, Centre de recherche Nouvelle-Aquitaine-Poitiers, F-86600; 6-INRA, Entomologie 1255, Centre de recherche Nouvelle-Aquitaine-Poitiers, F-86600; 7-INRA, UR SAD, Centre Grand Est, F-88000

## 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.

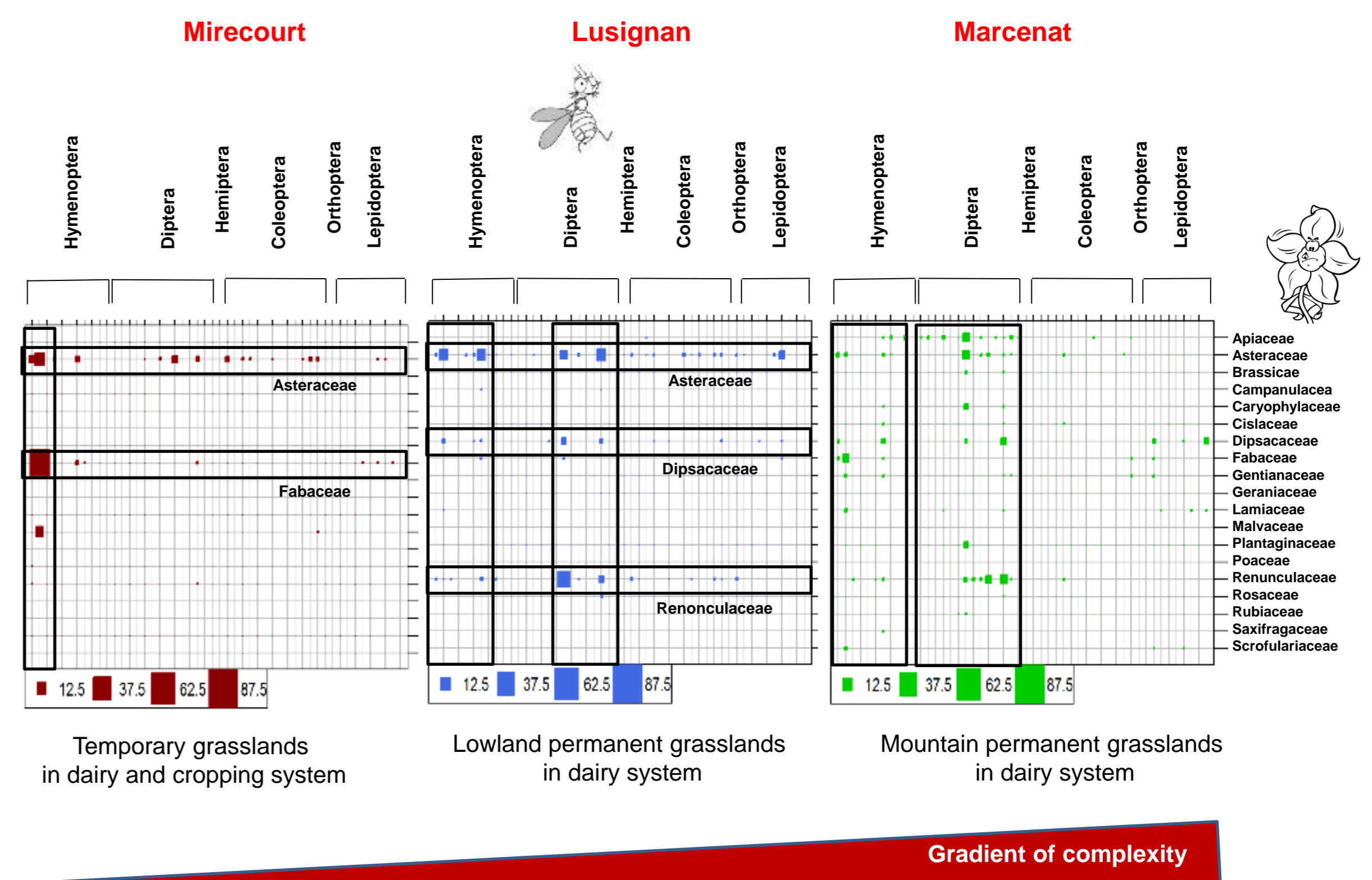
## MATERIAL AND METHODS

### Experimental farms



## RESULTS

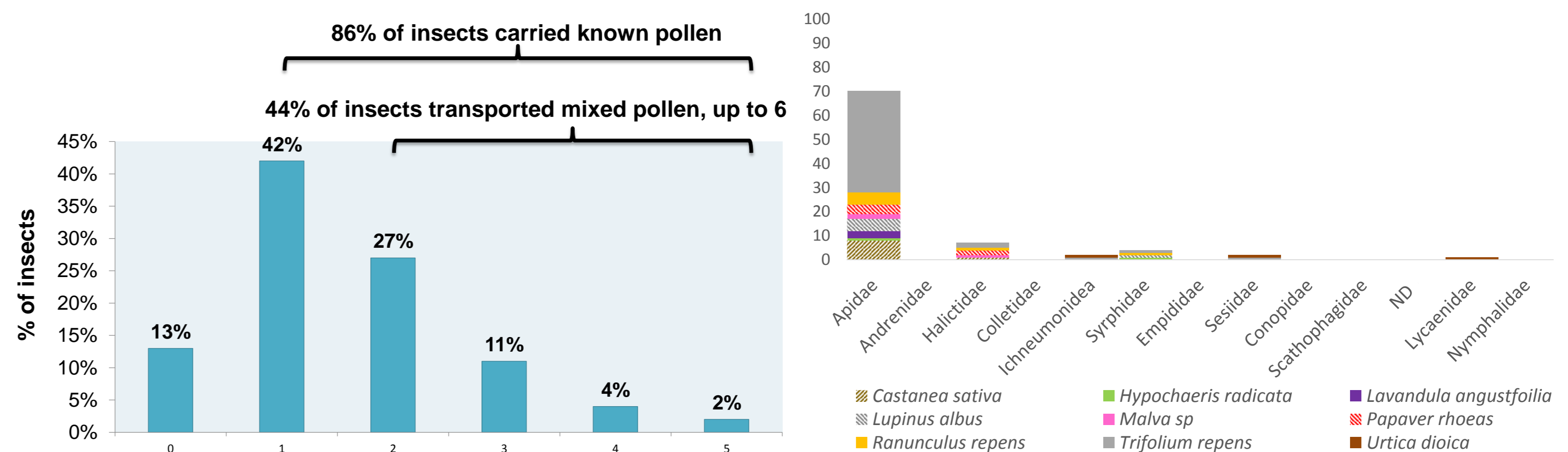
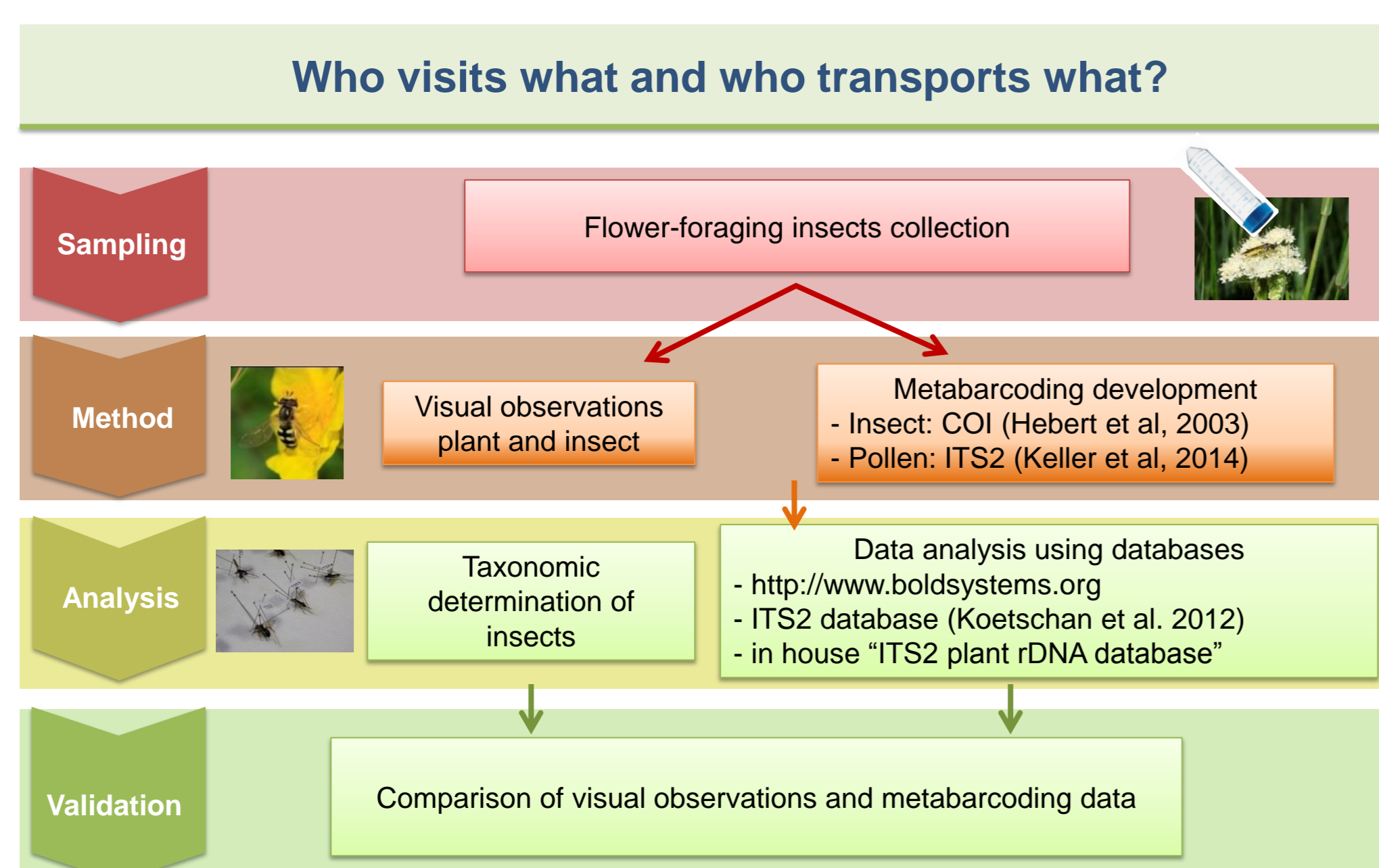
### Flower-forager network obtained from visual surveys



### Metabarcoding results at the experimental dairy farm in Marcenat



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



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

### 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 *Empididae* 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.

### REFERENCES

- Galliot et al. 2017. Investigating a flower-insect forager network in a mountain grassland community using pollen DNA barcoding. *J. Insect Conserv.* DOI 10.1007/s10841-017-0022-z
- Hebert P.D.N. et al. 2013. A DNA 'Barcode Blitz': Rapid Digitization and Sequencing of a Natural History Collection. *PLoS ONE* 8, e6853
- Keller A. et al. 2015. Evaluating multiplexed next-generation sequencing as a method in palynology for mixed pollen samples. *Plant Biol.* 17(2):558-566

### Sampling of flower-foraging insects and metabarcoding workflow

