

How to document plant-insect interaction networks?

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Species interactions in a warmer climate

Climate change should promote species range shifts toward **higher elevation**.

- Due to good **dispersal abilities**, herbivores would respond faster than plants.
- This increase of **herbivory pressure** at higher elevation is expected to impact alpine plant communities, known to be poorly defended [1].

We need to understand the current structure of interaction networks to forecast the consequences of global warming on alpine plant communities.

Spatial variation of interaction networks

We are expecting **changes** in the networks structure **along the elevation gradient** which is characterized by strong climatic variations.



Fig.1 Low elevation site (845m) in Canton du Valais (Orsières transect).

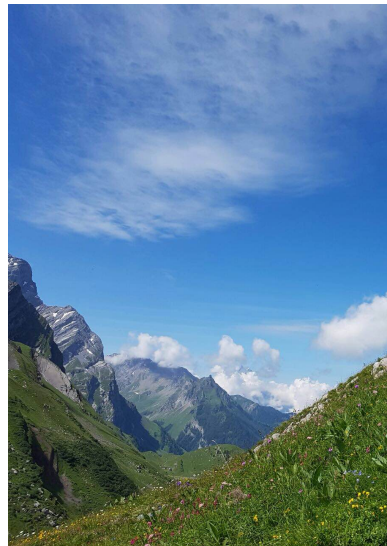


Fig.2 High elevation site (2074m) in Canton de Vaud (Bex transect).

We selected:

- **6 transects** across the Swiss Alps to represent climatic regional differences (Fig.3).
- **8 study locations per transect**, separated by 150m interval and ranging from 580m to 2'400m.

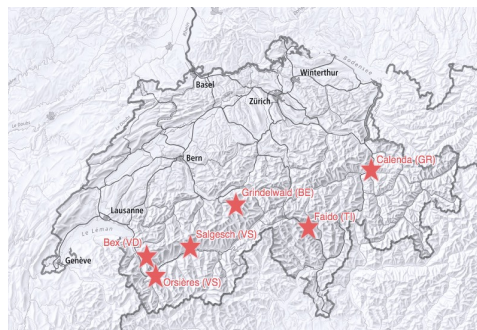


Fig.3 Illustration of the 6 transects locations distributed across the Swiss Alps.

Collection of faeces samples on the field



- Here we use **Orthoptera** insects that we **collect** in falcon tubes and **release** after faecal excretion (Fig.4).
- To compare the plants ingested with the standing vegetation, we undertake **vegetation surveys** for all study sites.

Fig. 4 Collection and release of the Orthoptera specimens used for faeces sampling.

DNA metabarcoding of faeces samples

DNA metabarcoding combines NGS technology to PCR amplification of short genetic markers (e.g. P6 loop, ITS2 short). It is a powerful tool to study **insects diet** [2-3].

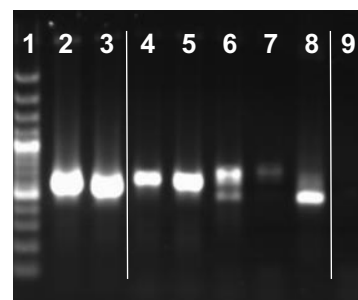


Fig.5 Amplification of the **trnL gene** (350-640bp). Samples order: 1 Ladder 100bp; 2-3 Plant samples (positive controls); 4-8 Faeces samples; 9 Negative control. Faeces samples can display amplification of various sequence lengths (see 6) which correspond to the lengths of the trnL marker that differ between the plant species ingested by the insect.

Expectations

- We should observe **variations** of plant-insect interactions **along the elevation gradient**.
- **Specialization** levels should decrease with elevation.

Using this ecological knowledge and the understanding of the mechanisms shaping interaction networks, we will be able to forecast future interactions and their impact on alpine plant communities.

References

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3. Ibanez et al. 2013. Plant functional traits reveal the relative contribution of habitat and food preferences to the diet of grasshoppers *Oecologia* 1459-1470.