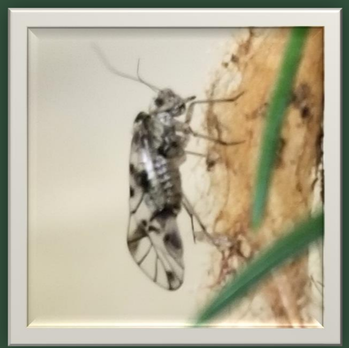

Defoliator diversity of *Picea glauca* in plantation and natural mix-wood forest

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Introduction

This study focuses on the identification of insect biodiversity and the defoliation on white spruce of northern mixed-wood forests and plantations of Quebec.

-Higher tree diversity leads to a higher diversity of arthropods (1,2).

-Environmental factors, could affect the distribution of species (3).

-Canopy openness promotes the reproduction some insects (4)

Figure 1: Forest sites (left), plantation sites (right)

Species diversity will be higher in forest rather than plantations. Abundance of insects and defoliation will be higher in plantations because of canopy openness.

Methods

Sampling site were in the Forest d'enseignement et de recherche du lac duparquet (FERLD)

Two to three-meter white spruce, with glacio-lacustrine clay soil, will be sampled.

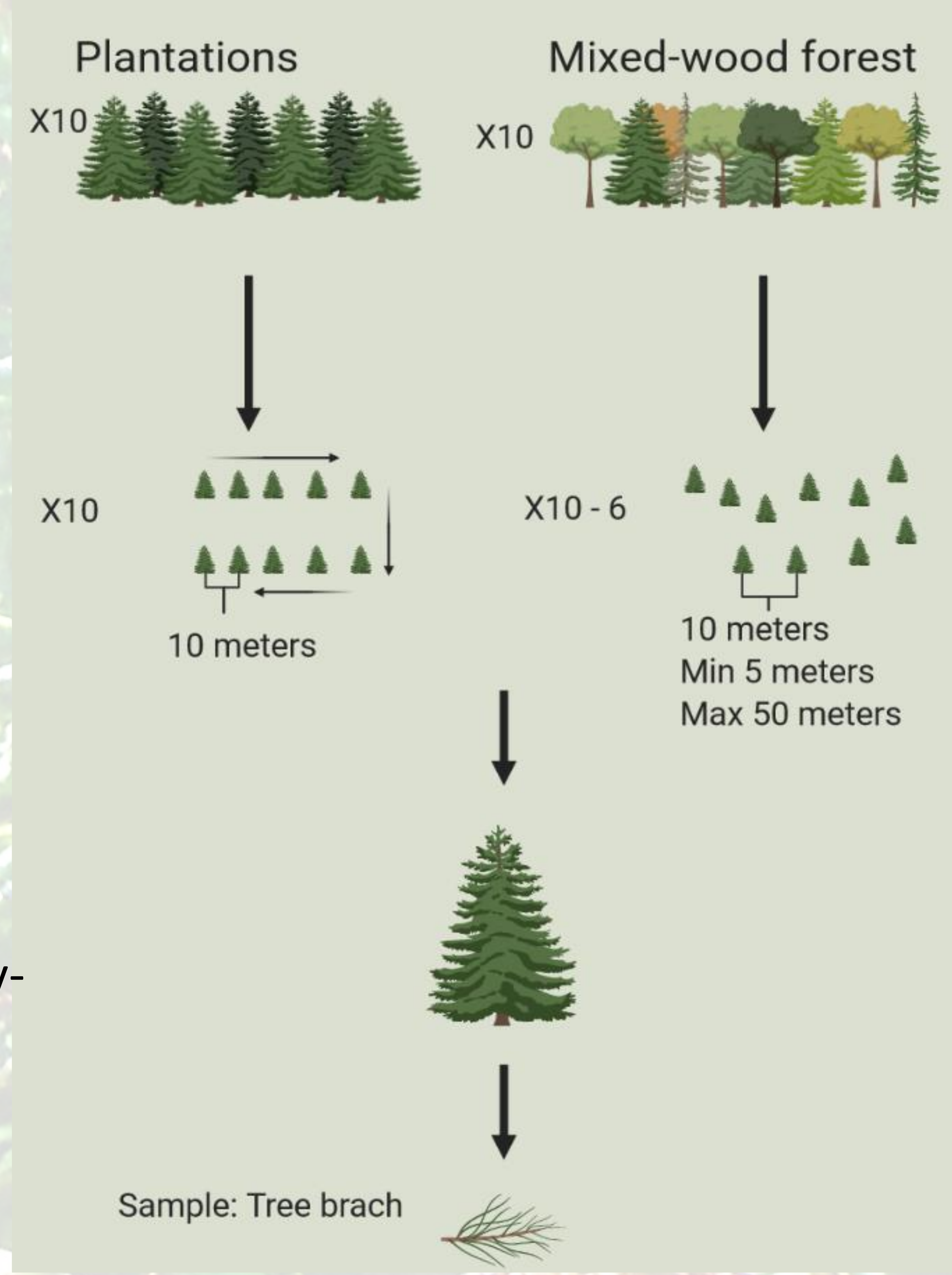


Figure 2: Project structure. Ten sites in each treatment. There are ten to six trees per site. One branch was sampled from tree.

Invertebrates from a thirty-centimeter branch will be sampled and identified to the species level when possible.

Defoliation types for white spruce were identified using : Insect of eastern spruce, fir and hemlock (5).

Methods (Part 2)

The current year defoliation rate was estimated using the Fettes method (6).
Percentage of insect bud damaged and galls measured.
We used R for statistical analysis (6).
Principal component analysis (PCoA) (7) and distance-based redundancy analysis(db-RDA)(8) was used analyze insect and defoliation diversity and to test the effect which factors had on the distribution.

Results (part 1)

Insect diversity:

- Treatment had a significant effect on the Shannon index(9)(P = 0.02833) using a general linear model(10). Sites was not a significant factor (P = 0.08586).
- PCoA showed aphid species (a_ms_2) and pale spruce adelgid (PSA) were more present in plantation.
- RDA showed that there is a significant difference between plantations and mixed wood locations in the first axis (P = 0.001).

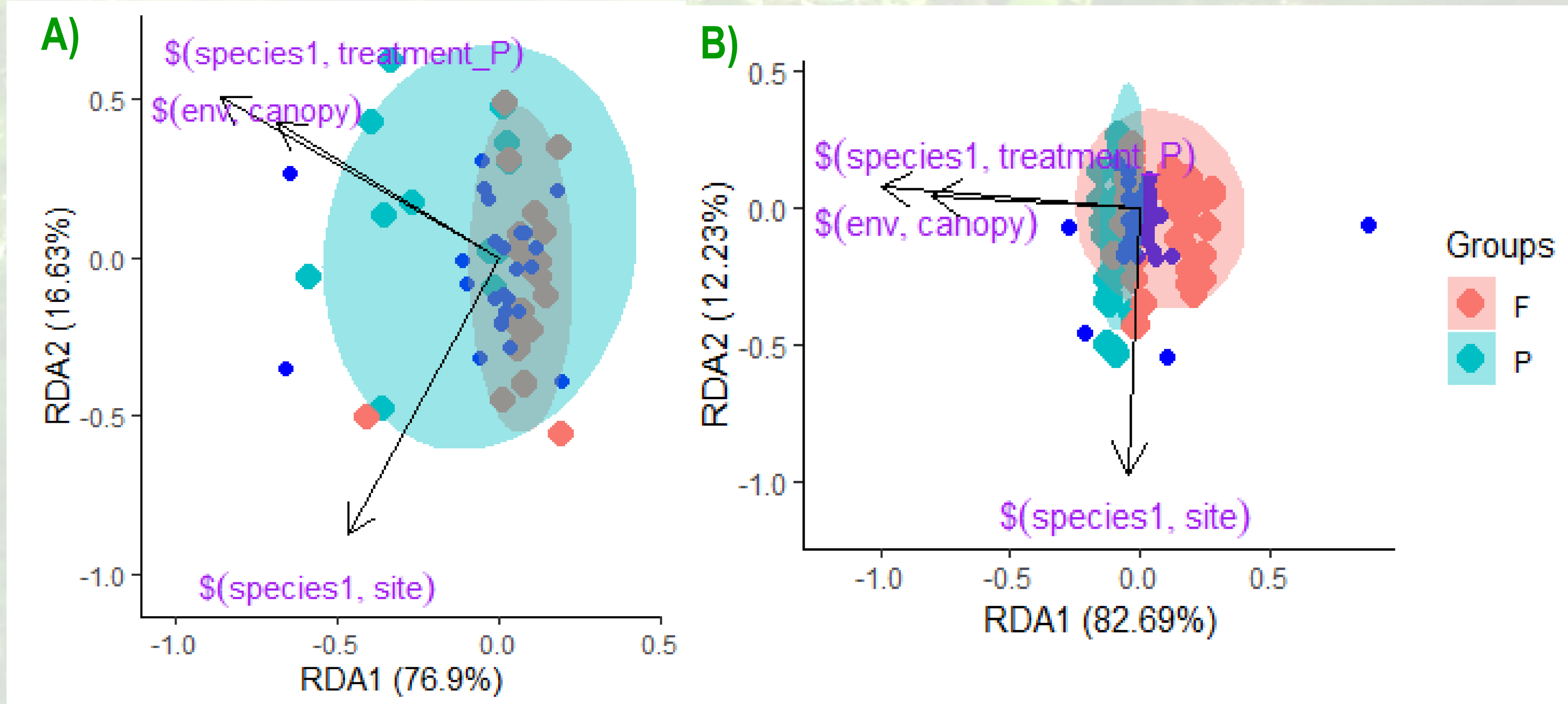


Figure 3: PCA of herbivore species diversity. Forest sites (F) are I red, plantation sites (P) are in blue. A) RDA of herbivore diversity, factors: treatment, site, canopy. B) RDA of all invertebrate diversity, factors: treatment, site, canopy.

Defilation (Fettes) did not differ in both treatments (P = 0.05548). Galls (P = 4.129x10^-06) and damaged buds (P = 0.004048) was higher in plantations.

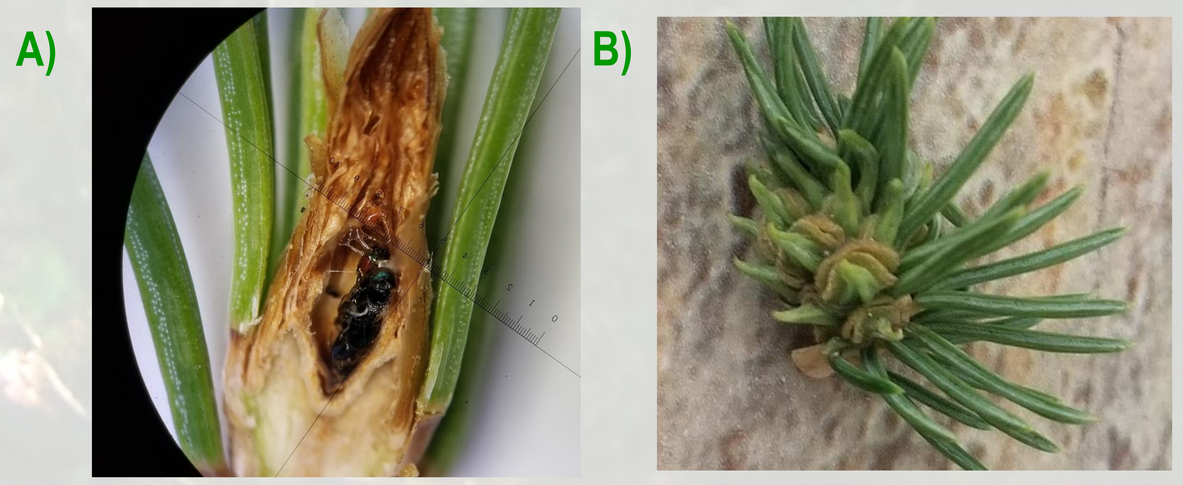


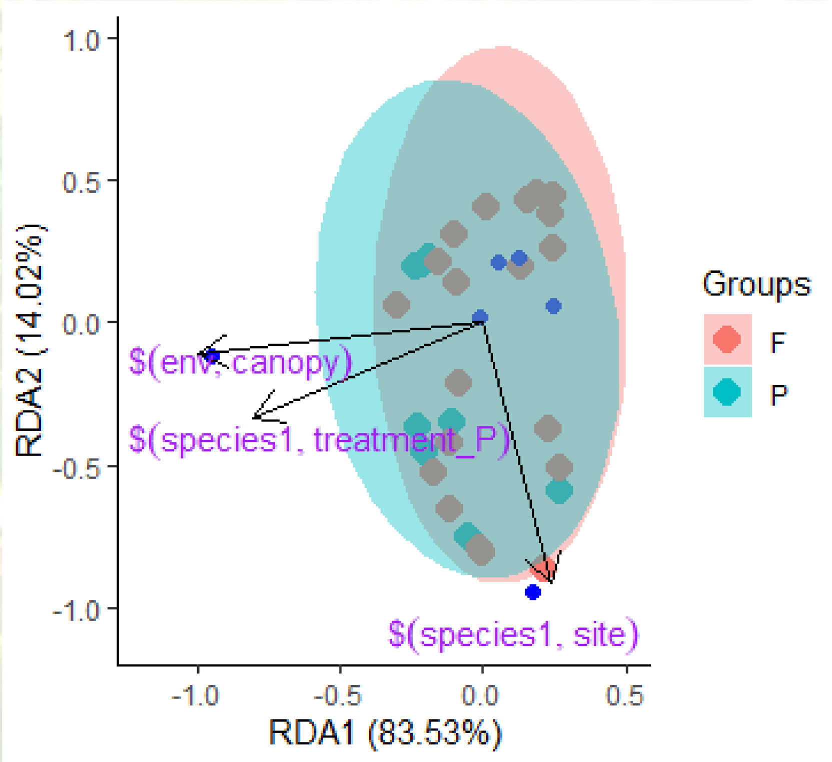
Figure 4: Defoliation types. Bud damage (midge) (left), Easter pale spruce adelgid gall (B).

Results (part 2)

Defoliation types:

- Treatment had a significant effect on the Shannon index diversity of defoliation types (0.52151).
- Site was non-significant (P = 0.08801)
- PCoA showed that spruce gall adelgid and sawfly damage were highly present in plantations.
- Defoliation is different in plantations and mixed wood locations in the first axis of RDA (P = 0.002).

Figure 3: RDA of defoliation type diversity, factors: treatment, site, canopy. Forest sites (F) are I red, plantation sites (P) are in blue.



Discussion

1)Lower overall herbivore diversity in forest may be driven by predator control (11). All arthropods will be identified to species level.

2)Aphids were present in higher abundance in plantations. Higher adelgid populations cause the formation of galls.

3) Another sampling session will be done in spring 2021, were we will identify early herbivory and further sample predatory insects

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