Comparison of levels of herbivory by different guilds of insects in young versus established deciduous woodland in Northwest England

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INTRODUCTION - More than 50% of UK stocked broadleaved woodland are less than 40 years old[(1)], partly driven by extensive planting of woodlands by the Community Forests in the North of England. Whilst further tree planting is a policy priority in the UK[(2)], there is a dearth of information regarding how ecological networks of interacting species assemble in new woodland over time[(3)].

METHODS - This project is sampling the phytophagous insects living on and in on the leaves of trees in 7 matched pairs of young (20-30 years) and established semi-natural woodlands (>150 years), in the Northwest of England. This will allow comparison of the biodiversity and pattern of interactions between trees and insects using ecological networks. Insects on lower branches are being sampled by beating into bags. It has also collected data on the relative effects of leaf chewing and leaf mining insects in the two different ages of woodland to establish the levels of ecosystem disservice in each. Tree species present vary between woodlands but all contain oak and birch. Number of leaves sampled varied between tree species.

Leaf Chewers

Figure 1: LeafByte App was used to measure the percentage of leaf area consumed by leaf chewers. 10 leaves on 10 branches of each tree species in each woodland measured where available.

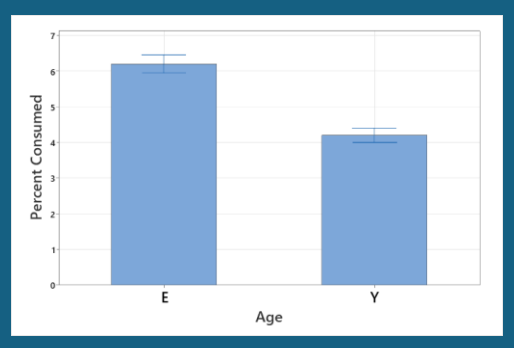


Figure 2: Percentage of leaf area consumed by invertebrate chewers in established (E) (>150 years) and young (Y) (20-30 years) woodlands sampled in August/September. Leaves from all tree species. Bars show +/- 1 SE. (H=46.87, p<0.001)

Less in younger woodlands

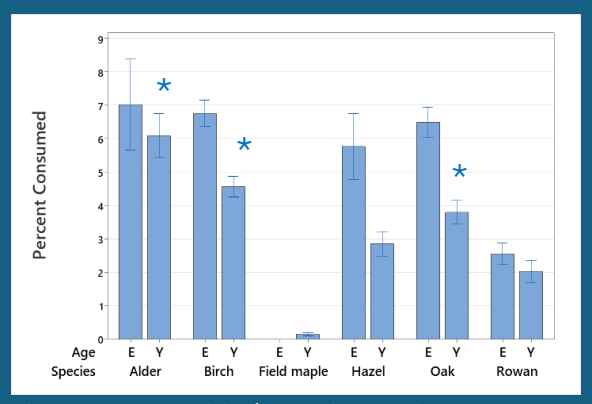
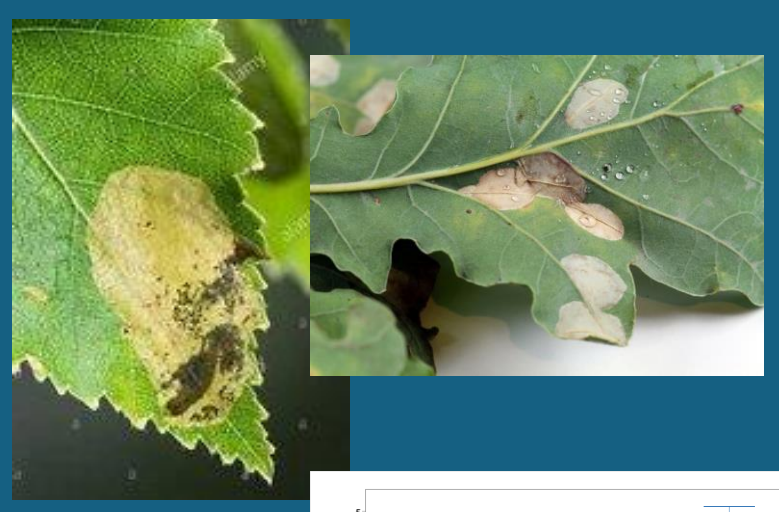


Figure 3: Percentage of leaf area consumed by invertebrate chewers in established (E) (>150 years) and young (Y) (20-30 years) woodlands by tree species. * show where there is a significant difference between young and established woodlands (p<0.05). Bars show +/- 1 SE. (N>300 for birch and oak in both E and Y woodlands, N<150 for hazel & rowan in both E and Y woodlands)

Leaf Miners



More in younger woodlands

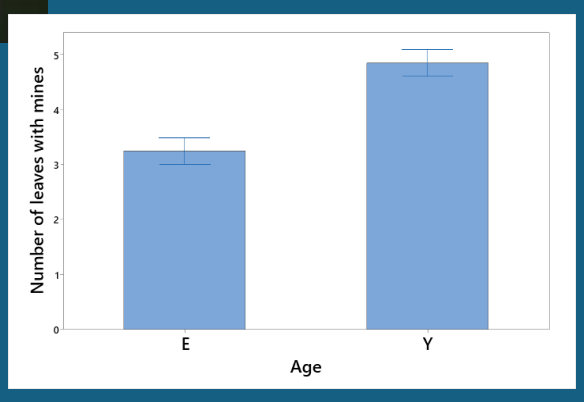


Figure 4: Number of leaves with leaf miners in established (E) (>150 years) and young (Y) (20-30 years) woodlands. Counted in 10 leaves per branch from oak and 15 leaves per branch from birch (to allow for different area per leaf). Sampled in August/September. Bars show +/- 1 SE. (H = 18.55, p<0.001)

INITIAL RESULTS - These suggest a difference in levels of insect herbivory between different woodland ages and different guilds of insects. Percentage of leaf area consumed by leaf chewers was **significantly lower in young woodlands** overall (Figure 2) and for oak, birch and alder individually (Figure 3) (p<0.05).

Whereas the percent of leaves with mines was **significantly higher in young woodlands** for oak and birch combined and individually (Figure 4) (p<0.05).

DISCUSSION – Those species where there was no significant difference were those where fewer leaves were measured. Interpretation of these results will require a better understanding of both the insect species present, particularly the leaf chewers, and the chemical composition of the leaves.

REFERENCES: (1) Forest Research (2021). Forestry Statistics 2021. Forestry Commission. (2) DEFRA (2018). A Green Future: Our 25 Year Plan to Improve the Environment. DEFRA. (3) Burton, V., D. Moseley, C. Brown, M. J. Metzger and P. Bellamy (2018). Reviewing the evidence base for the effects of woodland expansion on biodiversity and ecosystem services in the United Kingdom. Forest Ecology and Management **430**: 366-379.

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