Non-native birches and species hybrids as hosts for a dipteran stem miner

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Introduction

When non-native trees are imported to a new area they often form a new resource for the local herbivores. This is expected especially among congeneric trees.

Larva of *Phytobia betulae* Kangas (Diptera: Agromyzidae) leaves a permanent record of its presence into the annual ring. It tunnels from the crown to the base of the stem through the layer of newly formed xylem. The tunnel becomes filled with brown parenchyma cells (Fig. 1).

Phytobia spp. are recorded in birches (*Betula* spp.) in Asia and in North America. European *P. betulae* infests two congeneric native birches, *B. pendula* and downy birch, *B. pubescens* Ehrh. Therefore, *P. betulae* was predicted to infest successfully also non-native birches.

Figure 1. Left: Female *Phytobia betulea* ovipositing into a shoot of *Betula pendula* (photo by J. Lehto). Right: Brown larval tunnels within the annual rings of *Betula* sp. at the stem base (photo by M. Rousi).

Results & Discussion

All the trees were mined by *P. betulae:* European, Asian and also North-American x European hybrid. The pure *B. platyphylla*, the hybrids *B. pendula* x *B. platyphylla* and *B. pendula* x *B. resinifera* were as suitable hosts for *P. betulae* as native *Betula pendula* was.

Tree size alone explained the *Phytobia* occurrence in the trees irrespective of the birch species or hybrid (Table 1). As expected *Phytobia* larvae were more abundant in the trees that had grown the fastest (Fig. 2 and 3).

The relationship of the insect with its host tree is relatively intimate and specialized. However, our result is a new example of the successful host shift from a native tree to a congeneric non-native tree.

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Material and Methods

The presence of *Phytobia* larval tunnels was investigated in two field trials with randomized blocks design. Material was collected in 2002 and 2005 when the trees were12 and 11 years old in Trials A and B, respectively. Trees were measured and discs were taken at 1.3 m height. The discs were sanded and investigated with the stereomicroscope to see even the smallest larval tunnels.

Table 1. ANOVA tables for Trial A and Trial B. In both Trials the tree diameter as covariate was more important explanatory variable than the birch type: native *B. pendula*, non-native *B. platyphylla (*Trial A*)* or the hybrids (Trial B).

Trial	Source of variaton	df	Mean sq	F	p
A	Tree diameter	1	247500	160.7	<0.0001
	Block	4	3726	2.4	0.05
	Birch type	3	1077	0.7	0.55
	Residual	130	1529		
B	Tree diameter	1	15371	95.7	<0.0001
	Block	3	461	2.9	0.04
	Birch type	2	424	2.6	0.08
	Residual	76	161		

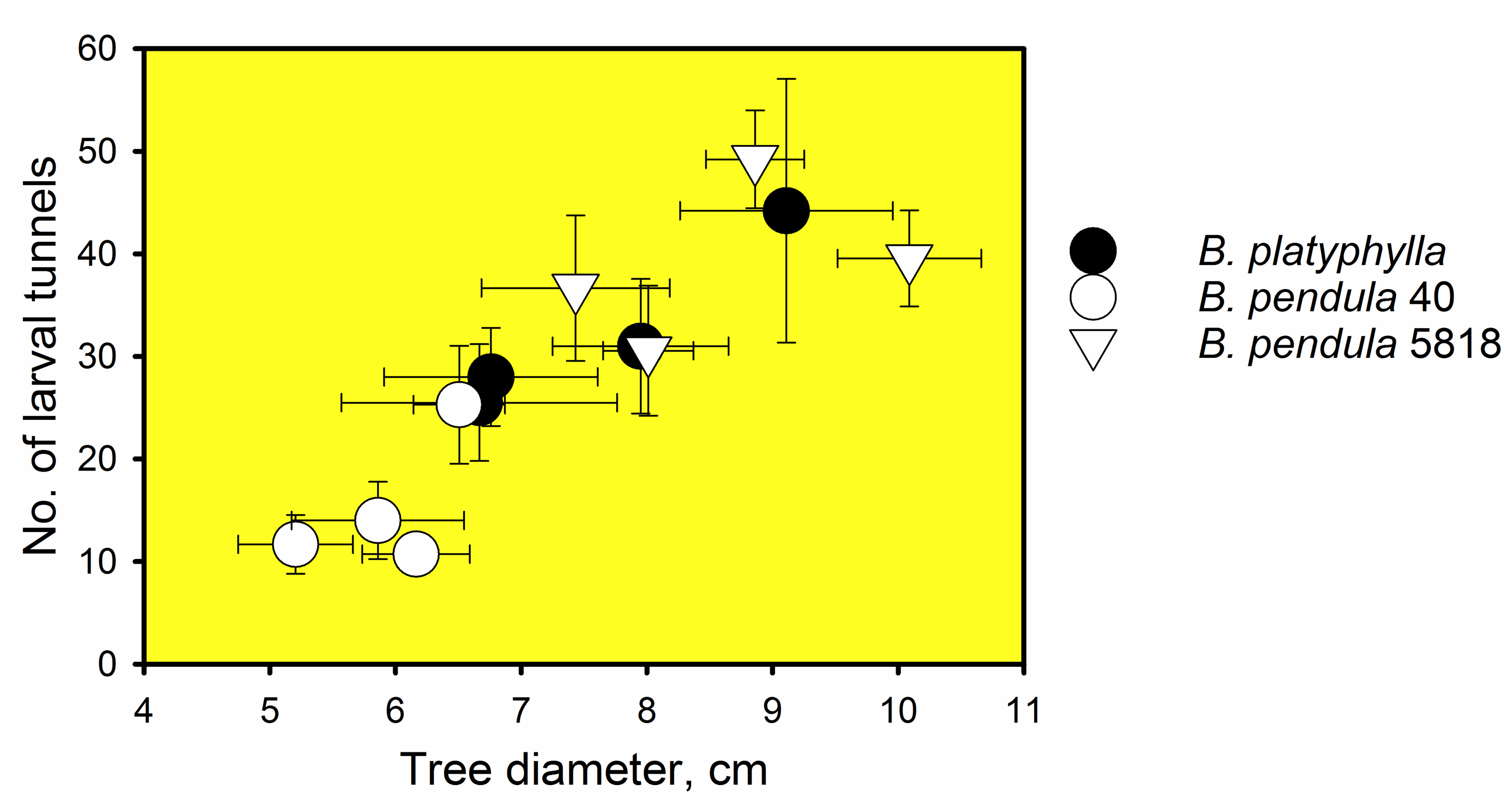

Figure 2. Trial A. The positive relationship of tree size and the number of larval tunnels in Japanese birch *B. platyphylla* var. *japonica* and in two native micropropagated *B. pendula* clones 5818 and 40. Plot means ± SE.

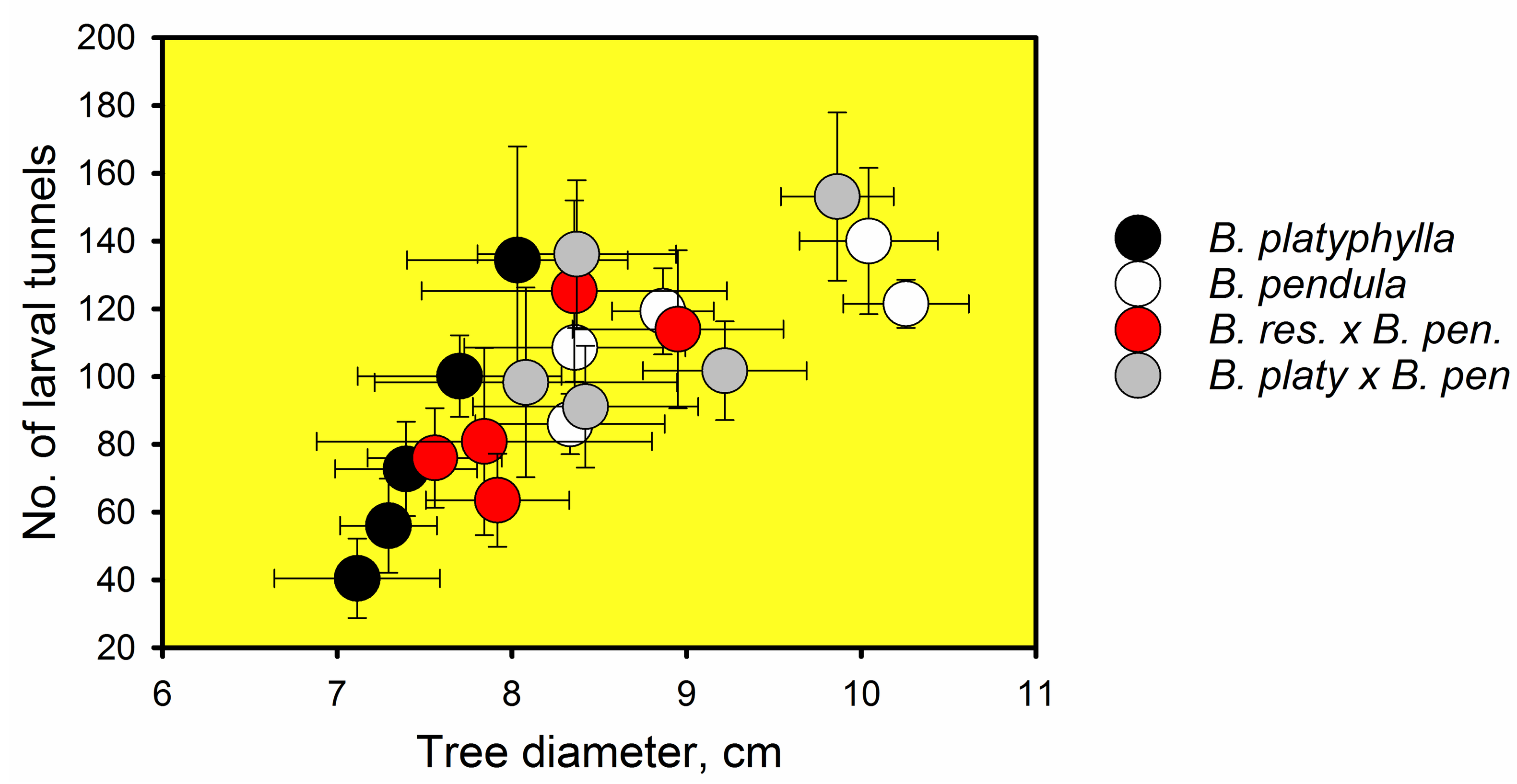

Figure 3. Trial B. The positive relationship of tree size and the number of larval tunnels in Japanese *B. platyphylla* var. *japonica* and hybrids among *B. platyphylla*, native *B. pendula* and North American *B. resinifera*. Plot means ± SE.