

Are novel congeneric hosts facilitating the invasion of exotic wood-boring insects?

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INTRODUCTION

The presence and abundance of ancestral hosts or closely related species are thought to be among the main factors that facilitate successful invasions of herbivorous insects to novel environment (e.g. Niemelä & Mattson 1996). Invasive species have been hypothesized to follow their native host plant. We tested the host preference of *Hylastes ater* and *Hylurgus ligniperda* by using different ancestral and novel, more or less closely related coniferous hosts of Eurasian and North American origin. Both these bark beetles are of European origin that have become established and invasive in New Zealand (Brockerhoff *et al.* 2002). These species are highly successful invaders that are now also found in several other countries, e.g. South Africa, Chile, and Uruguay. Although these are secondary bark beetles, *H. ater* can cause mortality of seedlings and both species contribute to sapstain of logs. In New Zealand, the main host for both species is Monterey pine (*Pinus radiata*), but it has not been examined whether there is in fact a preference for this species relative to other novel or ancestral hosts species.

AIM OF THE STUDY

The main objective of this study was to test the preference of *H. ater* or *H. ligniperda* to various ancestral and novel hosts under natural conditions in the field (in situ). In addition, we wanted to verify the host range of these bark beetles which are typically associated with pine (*Pinus* spp.) but have also been reported from several other conifers.

MATERIAL & METHODS

Ten logs, 50cm in length and 20cm in diameter, were cut of each of the following eight conifer species: *Pinus radiata*, *P. contorta*, *P. ponderosa*, *P. nigra*, *P. sylvestris*, *Pseudotsuga menziesii*, *Larix decidua* and *Cupressus macrocarpa*.

The logs were placed at a field site, a recent clearcut, in Chaney's Forest in Christchurch, New Zealand, in groups containing one log of each tree species (Picture 1). There were 10 replicates and the trial was run from 21 September to 27 October 2009 (during the peak flight of *H. ligniperda*) and again, with fresh logs, from 3 to 24 February 2010, during peak flight of *H. ater*.



Picture 1. A group of logs of eight species of conifers, set up as part of a multiple-choice test at a field site near Christchurch, New Zealand

After exposure in the field, the logs were taken to the laboratory where the bark was removed and all adult beetles that were found from the logs were identified and counted.

Data was analyzed using ANOVA with multiple comparisons performed using the Tukey's adjustment.

RESULTS

Over the experiment period total of 2 329 *H. ater*, 5 970 *H. ligniperda* were found on the logs. The mean number of beetles differed significantly ($p < 0.01$) among the conifer species we tested (Table 1).

Table 1. Mean number of beetles found on logs of different tree species. (Native ancestral host plant of ¹*H. ater* and ²*H. ligniperda*)

	<i>H. ligniperda</i>	<i>H. ater</i>
<i>P. ponderosa</i>	13.09 A	4.68 AB
<i>P. contorta</i>	10.70 B	5.13 A
<i>P. radiata</i>	10.58 B	6.46 A
<i>P. sylvestris</i> ^{1,2}	9.90 B	6.33 A
<i>P. nigra</i> ^{1,2}	7.44 C	5.57 A
<i>L. decidua</i> ¹	4.24 D	2.49 BC
<i>P. menziesii</i>	0.77 E	1.70 C
<i>C. macrocarpa</i>	0.42 E	0.79 C

Both bark beetles clearly preferred pine species over non-pine species. In the case of *H. ligniperda* there was a significant preference for *P. ponderosa*, a novel host, whereas *H. ater* did not show a preference for ancestral or novel hosts. *P. radiata*, the most widely planted conifer in New Zealand (and several other countries) is among the most suitable host trees, which may partly explain the success and remarkable abundance of these beetles.

CONCLUSIONS

Although *H. ligniperda* was most abundant on a novel host, our analysis did not reveal a strong preference towards novel hosts. There was no obvious preference in *H. ater* because ancient hosts and novel, closely related congenics of *Pinus* spp. were equally suitable. Our findings agree with those of an extensive review by Bertheau *et al.* (2010) which found that insect fitness may vary between specialist and generalist polyphagous insects, relative to the genetic distance between ancestral and novel hosts. Though the studied species did not clearly prefer novel hosts but it indicated clear colonization ability of the species on novel host thus can promote their invasiveness.

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