Burnt Pine Longhorn – can chemical ecology yield new control tactics?

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The burnt pine longhorn was accidentally introduced to New Zealand around the 1950s, and it has since spread throughout the country. It has been caught most abundantly in Nelson (see Fig. 1). It attacks logs, stumps and standing, dead or damaged trees of several pine species. However, it is well known for its spectacular attacks of scorched trees, usually soon after a forest fire. Knowledge of the life cycle and damage of burnt pine longhorn was updated recently (Brockerhoff & Hosking 2001). It does not appear to have a long range sex pheromone, and mating typically occurs after adult emergence, followed by dispersal to new habitat.

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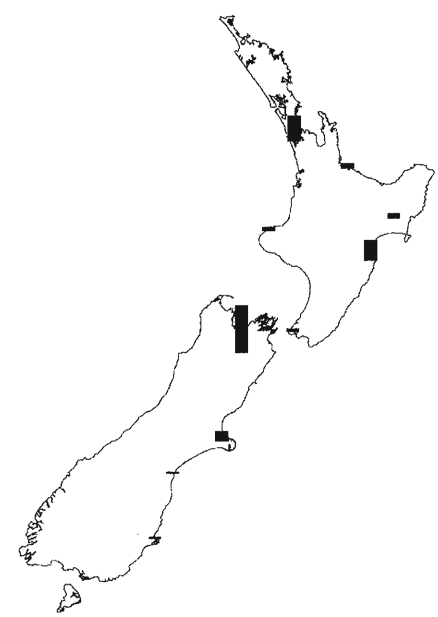
Fig. 1. Map of relative catch per trap per day of burnt pine longhorn at major ports in 2002-2003.



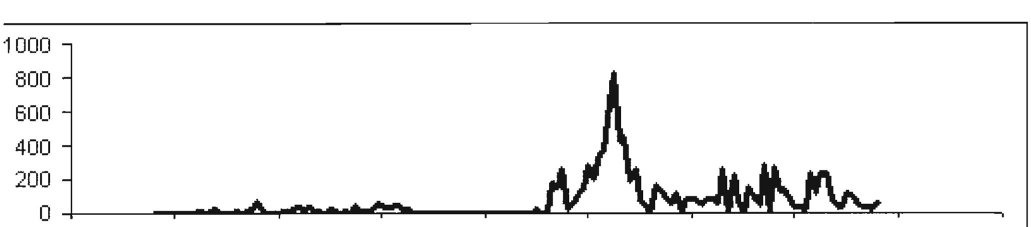
Eggs are usually laid in bark crevices and the larvae feed in the phloem area and then tunnel up to 10 cm deep into the wood. Because of the risk of such damage, it greatly reduces the salvage time for fire-damaged trees. In addition, this beetle is a vector of sapstain fungi, which further reduce the value of salvaged wood (Bradbury 1998; Suckling *et al.* 1999).

Burnt pine longhorn is also a problem on wood and log exports and is frequently reported by industry workers as sheltering in sawn timber at sawmills and in ports. Sawn timber destined for export is often fumigated to meet quarantine regulations, at times of year when the insect is prevalent, and trapping can be used to indicate the relative abundance of the insect during the season (Fig. 2).

Alternative treatments or other pest management methods are urgently needed to support timber exports because the fumigant currently in use (methyl bromide), is being phased out. A recent response by the Australian authorities to exported wood reportedly containing the insect meant costly delays while the ship sat off Sydney Harbour.

One possible approach to managing this insect may come from the field of chemical ecology, as in the case of many other insects where pheromones and other compounds such as attractants and repellents have been identified and used (see www.pherobase.com, developed by Ashraf El-Sayed). We have already shown that this beetle can be attracted to odours from burnt pine bark in laboratory and semi-field tests (Suckling *et al.* 2001), and this may explain the strong attraction of the insect to paper mills, and kiln areas at sawmills. We suspect that the beetle benefits by colonising an area after a fire, because there are likely to be few predators, lots of food, and little competition.

Fig. 2. Seasonal catch from regular monitoring of burnt pine longhorn using an electronic bug killer with catch tray at Brightwater, Nelson in 2001/02. Data kindly supplied by AgriQuality. Beetles are active into April at some locations in some seasons.

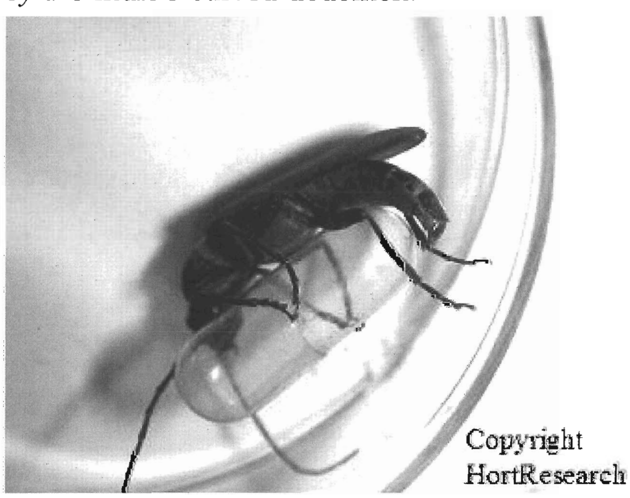


Our experiments also showed that burnt pine longhorn was repelled from laying eggs or being attracted to scorched logs if they were treated with certain other odours, called "green leaf volatiles". These odours are associated with angiosperms, including grasses, rather than conifers. In this insect, we can propose that green leaf volatiles may signal the lost opportunity of the fire-damaged habitat. This would occur when a flush of grass growth was released by the nutrients some time after the fire. Alternatively, a different hypothesis for the same phenomenon is that these compounds could indicate a non-host, i.e. a non-coniferous tree (Huber & Borden 2001). The repellents may also offer new options for commercial management of the pest, either in the field (after a fire), or at the point of export.

Overseas, the management of other forest and timber pests, for example bark and ambrosia beetles, often involves the use of attractants such as pheromones and host plant volatiles (e.g. Borden 1995), and there are an increasing number of examples where repellents are being trialled to drive insects away from forest resources.

More recently, we have been examining the very powerful contact sex pheromone of the burnt pine longhorn (see Fig. 3). The contact sex pheromone is not very volatile, and works only at very close range. However, a gelatine capsule treated with this material is irresistible for male beetles which will readily attempt to copulate with it even though the gelatine capsule obviously lack the looks of a pretty female beetle.

Fig. 3. Male burnt pine longhorn attempting to mate with a gelatine capsule loaded with a hexane extract of the contact sex pheromone from female beetles. Note the typical mating position indicated by the male's curved abdomen.



So far, none of these approaches has been field tested or developed to a commercial stage, although there has been some interest. Insect pest management solutions from chemical ecology are increasingly being used in many productive sectors, and this type of enabling research is creating opportunities for the forestry sector to use new approaches to a persistent problem.

Acknowledgements

Thanks to MAF Forest Biosecurity for data on burnt pine longhorn counts from AgriQuality trapping programme, conducted as part of the National Wood and Bark Beetle Survey, especially Alan Flynn and Davor Bejakovich. This article was funded from the FRST programme subcontract to HortResearch from Forest Research (CO4X0302).

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