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**Systematics of *Eucolaspis* (Coleoptera: Chrysomelidae) in
New Zealand and ecology of Hawke's Bay lineage**

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Abstract

Eucolaspis Sharp 1886 includes a group of native leaf beetle species, one or more of which infest exotic fruit crops. Economic losses suffered by organic apple orchards in Hawke's Bay prompt a revisit to ecological basics of the beetle. Taxonomic, behavioural and ecological knowledge gaps are addressed in the current research project. Phylogenetic analysis, based on cytochrome oxidase subunit 1 region of mitochondrial DNA, revealed that only one genetic lineage infests apples in Hawke's Bay and that there are only three putative species in mainland New Zealand with another separate species on Three Kings Islands. These findings are well supported by differences in male genitalia shape. Morphometric analyses also supported the phylogeny to some extent.

The current findings on host location show that *Eucolaspis* sp. "Hawke's Bay" beetles use plant odours to detect and discriminate host and non-host plants. The beetles were attracted to fresh leaf / fruit odour of apple and blackberry, but not to either clover or broad-leaved dock. The beetles were not able to distinguish between damaged and undamaged host plants and between closely related species of host plants just by olfaction. Irrespective of the geographical origin and ancestral host plant, beetles preferred to feed on blackberry over apple.

Emergence sex ratio in *Eucolaspis* sp. "Hawke's Bay" is found to be female-biased (0.35), whereas adult sex ratio in the active population on foliage was slightly male-biased (0.55) in organic apple orchards in Hawke's Bay. No evidence for a short-range sex pheromone was found through olfactometer bioassays. All the mating attempts in mating bioassays proceeded only after either antennal contact or licking of female's elytra by the male. Ablating antennae didn't impair mating, but significant delay was observed in locating the female. Males attempted to mate with intact and washed female cadavers, 45% and 35% respectively of the tested males, whereas no mating attempts were initiated towards male cadavers. Males of *Eucolaspis* sp. "Hawke's Bay" appear to utilize both contact sex pheromones and vision in locating potential female mates.

It was found in the current study that endogeic macro-invertebrates were more abundant in orchards that historically had high bronze beetle incidence, whereas epigeic macro-invertebrates were more abundant in orchards that had historically low bronze

beetle incidence. It may be that abundant surface-dwelling generalist predators in low bronze beetle orchards control bronze beetle from establishing in these orchards. However, this could only be confirmed by further research on specific predation of spiders and other generalist predators on bronze beetle.

A phenology model for adult emergence is proposed based on threshold temperature (4.69 ± 0.89 °C), degree-days (237 ± 22 °C days) and biofix date of September 11th. The model predicted adult emergence with a precision of ± 4 days when tested with field data.

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