Notes of the ecology of *Ectopsis ferrugalis* (Curculionidae)

JOHN HUTCHESON
Forest Research Institute, Private Bag 3020, Rotorua, New Zealand

ABSTRACT

Ectopsis ferrugalis Broun congregating behaviour on damaged lancewood (*Pseudopanax crassifolius* (A. Cunn.) C. Koch) together with life cycle information is recorded. The attacked tree produced a flow of gum which appeared dependant on available water. The tree, and a nearby damaged fivefinger (*P. arboreus* (Murr.) Philipson) which was also attacked, subsequently died.

Keywords: *Ectopsis ferrugalis* biology, Curculionidae, *Pseudopanax crassifolius*, lancewood decline.

INTRODUCTION

Large numbers of the cryptorhynchine weevil *Ectopsis ferrugalis* Broun 1881 were observed mating and ovipositing on a damaged, overmature lancewood (*Pseudopanax crassifolius* (A. Cunn.) C. Koch) in the Waipapa Ecological Area, northwest of Lake Taupo. Hudson (1934) noted that this weevil is associated with *Nothopanax arboreus* (= *Pseudopanax arboreus*). The New Zealand Arthropod Collection has specimens reared from *P. chatamicum* Kirk collected in the Chatham Islands in February 1967, and from *Weinmannia silvicola* Sol. ex A. Cunn. branches collected in Waipoua State forest in October 1967 (Dr Robin Craw pers. comm.) As there appears to be little published information on the ecology of this large flightless NZ weevil, the present note seems justified.

The vegetation of the Waipapa Ecological Area has been described in detail by Leathwick (1987). It ranges from almost pure monoao (*Dracophyllum subulatum* Hook. f.) on the bottom of the open basin where the most intense cold air ponding occurs, to monoao plus small-leaved *Coprosma* spp. sheltering young lancewood and *Pittosporum* spp. on the basin edges. The lancewood have matured and shelter a mixture of species including the future podocarp canopy at the outer edge of the high forest. As old lancewood and other tall shrub species such as fivefinger (*P. arboreus* (Murr.) Philipson) and kamahi (*W. racemosa* Linn. f.) die, the young podocarps assume the canopy.

OBSERVATIONS

Summary of life cycle

In early summer, adults were found aggregating on a damaged overmature *P. crassifolius* tree. Intensity of attack was up to 40 holes/900cm^2, and extended up to 4m from the ground. The strong aggregating behaviour of these flightless weevils indicates a powerful insect or host attractant. Pairing occurs and continues during drilling of oviposition holes, which is accompanied by mating. Females dissected in the laboratory in mid December showed various degrees of egg development, with over 30 eggs present in a female that was paired with a male. Eggs are approximately 0.75mm, spherical and white.

Oviposition holes extend to various depths apparently dependant upon the length of the female rostrum, but most penetrate into the inner cambium. First instar larvae are present in early January, tunnelling transversely with one larva per drill. By early June, larval tunnelling was approximately 2mm wide. Bark removed in late December from dead material, possibly infested the previous summer, showed large weevil larvae in varying stages of development but no pupae. *Ectopsis ferrugalis*-sized exit holes were present in this material in early June, suggesting that development takes a minimum of 1 year with emergence occurring in late summer/autumn, and the adults overwintering before mating and oviposition in spring.

In mid December, many elytra were found under the tree but there were no clues as to the identity of their predators. Possum (*Trichosurus vulpecula*) droppings nearby did not contain any chitinous remains.

Adult weevil behaviour

Weevil activity was high on fine warm days, and very low on cold wet days. Females drilled into the bark until the rostrum was buried and the head was pressed firmly onto the bark. Mating, lasting for up to a minute in the couplings that were observed, often took place at this stage. Oviposition did not occur automatically after each drilling session. Rather, it appeared to occur when the tree's gum response was diminished and this appeared dependant upon water balance of the tree, and hence rainfall (see below). After mating the pair remained together and active, with the female leading and the male resting foretarsi, and often antennae on the female elytra. Pairs at rest were often head to head, with the male foretarsi resting on the female's pronotum, especially when she was drilling. Weevils not occupied with drilling that were disturbed by the observer dropped off the tree, though males seemed much less inclined to do so if their mate was drilling, a process that took about 30 minutes. Single male intruders were sometimes successful in splitting established pairs, but were also seen to be deterred by the incumbent male assuming the mating posture.

Tree response

The lancewood on which most of the weevil activity occurred had a broken limb (30 cm dia.) which was still attached, and 2 live limbs (40 cm and 25 cm) which held a full canopy of green foliage. The broken limb had lost all its foliage and was colonised with *Armillaria* sp. decay fungus. Rhizomorphs of the fungus were also present at the base of the live limbs. There were subcortical workings in the broken limb but no exit holes. Other beetles associated with the tree (Table 1) included *Platypus apicalis* White which were initiating nests on the broken limb and at the base of the major live limb.

Table 1: Other beetles associated with dying lancewood

Healthy limbs		Broken limb	
Platypus apicalis White	Dr	*Tetrorea cilipes* White	Ov
Stephanoryhnchus curvipes White	Ov	*Platypus apicalis* White	Dr
Scolopterus penicilatus White	Ov	*Dendrotrupes vestitus* Broun	Em
		Psepholax crassicornis Broun	Dr
		Eiratus costatus Broun	Em
		Stephanorhynchus curvipes White	Em
		Bitoma insularis White	Em
		Corylophidae (2 species)	Em

Dr = drilling into
Ov = ovipositing
Em = emerged from

The live limbs responded to the large numbers of *E. ferrugalis* drills by exuding a droplet of gum from each wound. Observations were made weekly between 19 December and 16 January with follow-up visits 6 and 12 months later. The gum response of the tree was related to the previous week's rainfall with production of small highly viscous droplets after weeks with less than 50 mm rainfall, and copious quantities of jelly-like exudate after a week where 164 mm of rain fell. Weevil activity also appeared related to this gum response, with little occurring during the high gum output period. Dissection showed the outer bark held copious quantities of gum and most of the exudate was probably produced from this region.

By June, the cambium of the least attacked part of the main limb was still green but had a much lower gum content. The crown of the tree retained a thinned canopy and there were several small branches that had lost all their foliage. Massive *Platypus* attack was occurring on the inner junction of the main limb, the underside of the minor limb and the broken limb. Bark was beginning to lift from areas of the broken limb (in part due to the production of *Platypus* frass) and *E. ferrugalis* size exit holes were present.

An 8 cm (dbh) partly suppressed fivefinger, 8 m from the lancewood, received a 5 cm diameter bark slash (possibly as a track marker) during December and was subsequently attacked by the weevil. This sapling was dead within 6 months.

By the following January the attacked lancewood was completely dead and the broken limb had separated from the rest of the tree. *Platypus apicalis* and *Psepholax* sp. workings extended approximately 5 m up the upright limbs from which bark was beginning to lift in the areas of heaviest attack. There were no *E. ferrugalis* exit holes and larvae were about 7 mm long.

DISCUSSION AND CONCLUSIONS

These observations support phytophagous insects being seen as contributing agents of change in ecosystems (Hosking & Hutcheson 1986). Attack was concentrated on individual trees that were predisposed to death. In the case of the lancewood, predisposing factors were old age, *Armillaria* infection and windbreak, and in that of the sapling fivefinger, suppression and wounding. Attack was apparently influenced by the weather, both directly on beetle activity and indirectly through strength of the host's gum response.

The concentration of the attack by the large aggregation of these flightless weevils on the 2 weakened hosts is an indication of the efficiency of their communications and/or strength of a host attractant. Death of the trees within a year indicates the efficacy of colonising insects in thinning out habitat vegetation which is not in peak physiological condition.

The observations illustrate the 3 components of tree death discussed by Manion (1981) viz. predisposing, inciting and contributing factors, and a good example of how these components, when working in unison, influence vegetation succession.

REFERENCES

Hudson, G. V., 1934: *New Zealand Beetles*, Wellington, Ferguson and Osborn Ltd.

Hosking, G. P., Hutcheson, J. A., 1986: Hard beech (*Nothofagus truncata*) decline on the Mamaku plateau North Island, New Zealand. *New Zealand journal of botany, 24:* 263-269.

Leathwick, J. L., 1987: Waipapa Ecological Area: a study of vegetation pattern in a scientific reserve. *Forest Research Institute bulletin No. 130.* Ministry of Forestry. New Zealand.

Manion, P. D., 1981: *Tree Disease Concepts* Eaglewood Cliffs, New Jersey, Prentice & Hall.