BIOLOGY OF MANUKA BEETLE IN TARANAKI

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Summary

Aspects of the biology of manuka beetle (*Pyronota* spp) including its distribution, life history, flight behaviour and dependence on manuka (*Leptospermum* spp) have been studied in Taranaki. Two species, *P. laeta* and *P. festiva*, are present in the area but differ little in their flight behaviour. Larvae of these two species are difficult to distinguish but both occur commonly in pasture on the lower slopes of Mt Egmont, and in the eastern hillcountry of Taranaki. A comparative study of the life history of manuka beetle with that of grass grub (*Costelytra zealandica*) has shown the larval stages of the former insect to overlap more and to be more variable in their occurrence. Weight gains of manuka beetle larvae also differ from grass grub, the major difference being the resumption of growth of the former in the spring.

INTRODUCTION

Manuka beetle is a common native scarabaeid in New Zealand and related to the major pasture pest, grass grub. Larvae of manuka beetle closely resemble those of grass grub and also inhabit soil of open pasture where they may cause similar damage (Miller 1971). Because of this, pasture damage in parts of Taranaki has often been mistakenly attributed to grass grub and the importance of manuka beetle as a pest largely ignored. For instance in the late winter and early spring of 1972 reports of late grass grub damage on farms bordering bushland at Okato in Taranaki were found to be caused by manuka beetle larvae.

Manuka beetle has been shown to be more tolerant of insecticides than grass grub (Thomson *et al* 1978) so it is important that these insects are not confused.

There is little published information on the biology of manuka beetle. Early records of the genus are mainly confined to single taxonomic observations but more recently the taxonomy of the insect has been extensively studied (Hoy and Given 1952; Given 1960; Brown 1965). Originally an inhabitant of native bush-grassland verges, the several species of manuka beetle are now widely distributed, mainly in lighter sandy and montane soils, throughout New Zealand (Miller 1971). The adults have been reported as defoliators of orchard trees, ash, rose and other garden plants (Miller 1971) but it is their close association with manuka bush, first recorded by Broun (1875) which is most well known. Although often found close to manuka bush there are reports of large populations of manuka beetle inhabiting pasture considerable distances from manuka bush (Cumber and Cowie 1954).

This paper reports on preliminary studies of the distribution, life history, flight behaviour and the importance of manuka to the manuka beetle.

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METHODS

Flight behaviour

The flight behaviour of manuka beetle was studied over two summers 1974/75 and 1975/76, at different manuka fringed pasture sites near Okato. Vane impaction traps consisting of four 40 x 20 cm glass sheets set upright at right angles to one another in water filled troughs were used. Traps were set at ground level and at heights of 1 m and 2 m. Sets of these were placed in pasture 10, 20 and 50 m from manuka scrub and 10 m into scrub. On chosen days traps were inspected hourly, weather conditions and catches recorded, and the beetles preserved for sexing and identification.

Distribution

A limited survey of Taranaki was undertaken by farm advisers who in the normal course of their duties made collections of scarabaeid larvae and submitted these for identification.

Comparative life-history of grass grub and manuka beetle

A study was carried out from May 1973 to May 1974 at Okato on two similar pasture sites; one with a predominantly manuka beetle population and another nearby with a predominantly grass grub population. Each month 45, 10 cm diameter soil cores were collected and sorted, the eggs, larvae, pupae and beetles counted and larval instar weight recorded.

Prior to the beginning of beetle emergence in October, ten 0.1 m² emergence traps similar to those used by Farrell (1972) and nine vane traps as described above were erected at each site.

Effect of manuka scrub on manuka beetle populations

In late November 1974 four plots of manuka beetle infested pasture 4 x 1.5 m were covered throughout the flight season with a 1 m high nylon mesh cage which confined beetles which emerged from the plots, but excluded beetles from outside the plots. Four control plots were left uncovered and four 10 cm diameter soil cores were taken from each plot at the beginning of the trial and again in May 1975.

RESULTS AND DISCUSSION

Two species of manuka beetle, *P. laeta*, the plain manuka beetle, and *P. festiva*, the kekerewai manuka beetle, were found in these studies. However due to the difficulties in distinguishing between the immature stages of the two species identification was made only in the flight study.

Distribution

The survey found that manuka beetle occurred in pastures close to native bush or manuka. Severe pasture damage appeared to be confined to a 5 km wide belt of land around the Egmont National Park whereas pasture damage at lower altitudes on the more intensive dairy farms was found to be caused by grass grub. Mixed populations of manuka beetle and grass grub were commonly found in the eastern Taranaki hillcountry and in these situations it was difficult to apportion pasture damage between pests.

Flight behaviour

P. festiva comprising 63% of the population at the 1974/75 site and 83% of the population at the 1975/76 site, was more common than *P. laeta*. The two species differed little in flight behaviour. Both flew

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concurrently between mid November and late January, a later and more prolonged flight season than in grass grub. *P. laeta* commenced flying earlier than *P. festiva* and was the predominant species found in November, but the main flight period for both species occurred from mid to late December (Fig. 1).

Fig 1: Flight and emergence patterns of the manuka beetle.

Unlike grass grub, manuka beetle are diurnal and flew at any time between 8 am and 6 pm though peak flight activity usually occurred near midday. This often corresponded with a peak in air temperature which appeared to be an important factor influencing flight. Though beetles were usually more active in sunlight, flights were recorded in cloudy conditions and even in light drizzle. During the day manuka beetle were observed in large numbers on manuka bush at the edge of open pasture where they mated and fed on the bushes often completely defoliating them.

Throughout the season the most flight activity in both species was recorded in traps placed 50 m and 20 m away from manuka bush; considerably fewer beetles were trapped closer to the bush line and only the occasional one appeared in traps set 10 m into bush. Differences were found between the species in the height that they were trapped above ground. For *P. festiva* ground flight was common in both males and females early in the season but overall 67% of *P. festiva* males were caught in the ground traps compared to only 11% of the females. No behavioural differences in height of flight were found between male and female *P. laeta*. Both sexes were more frequently trapped in the 1 m and 2 m high traps than *P. festiva*.

Comparative life histories

Comparative life histories of manuka beetle and grass grub are shown in Fig. 2. Grass grub beetles emerged and flew about 4-6 weeks earlier than manuka beetle and hence development of early larval instars was similarly more advanced. Unlike grass grub, the length of time that each larval instar of manuka beetle was present in the soil varied markedly from year to year. In 1973 first instar larvae were present until June whereas in the following year this stage was absent after March. Occurrence of instars was also more overlapping in manuka beetle as shown particularly for second and third instars in 1973 (Fig. 2). It is possible that differences between the development of the immature stages of the two manuka beetle species present may account for the variation and overlapping of stages which appeared to be a feature of its life history.

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Fig 2: Comparative development of grass grub and manuka beetle.

Fig 3: Larval growth curves of grass grub and manuka beetle.

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Larvae of manuka beetle are much smaller than grass grub, and in this study reached an average liveweight of 56 mg compared to 160 mg for the latter. Growth curves for larvae of both insects were similar in the summer and autumn (Fig. 3) although by early winter grass grub had gained 93% of its maximum weight and manuka beetle only 57%. Little growth occurred in either insect during winter although, unlike grass grub, manuka beetle were observed to remain high in the soil profile. In early spring manuka beetle resumed its growth and reached its maximum larval weight in late October and November. As a result of its increased feeding activity at this time, spring damage to pasture is more evident in pasture heavily infested with manuka beetle than with grass grub.

Importance of manuka bush

Population densities found in the enclosed and open plots demonstrated the marked effect access of beetles to manuka had on subsequent population levels (Table 1).

Table 1: Population densities of Manuka beetle in plots left open and plots enclosed over the entire flight season.

	Populations 27/11/74* No/m ²	Populations 29/5/75 No/m ²
Open pasture	123	476
Enclosed pasture	132	172

* In this sample, 2nd stage larvae, pupae and beetles were all present. The data presented are the total numbers found at the time of sampling.

It is likely that manuka acts as a food source and a mating site for the beetle thereby improving its mating success and fecundity. Manuka beetles are also known to feed on a number of other plants (Miller 1971) but the effect of these plants, compared to that of manuka, on the reproductive performance of the beetle is not known. However these studies do explain why manuka beetle, though occurring in open pasture appear to reach damaging levels usually only in areas close to manuka bush.

The pest status of manuka beetle is largely unknown. Its potential importance in hillcountry pasture of the North Island, much of which is fringed by manuka, deserves closer examination particularly in view of the spring damage the larvae cause and the difficulties in chemically controlling the insect (Thomson *et al* 1978). The biology and ecology of manuka beetle also require further investigation.

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