A note on the feeding of *Pringleophaga marioni* Vietti larvae at Marion Island

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Larvae of the Lepidopteran Pringleophaga marioni *Viette form an important component of the soil macrofauna at sub-Antarctic Marion Island. They were previously considered as herbivores, feeding on plant roots and rhizomes. Captive larvae are omnivorous and will aggressively attack and devour earthworms. The significance of this carnivory in the field is unknown but the larvae and earthworms occur together in the upper peat layers of many of the island plant communities.*

Larwes van Pringleophaga marioni *(Lepidoptera) vorm 'n belangrike komponent van die grond-makrofauna van die sub-Antarktiese Marion-eiland. Die larwes is vantevore as herbivore wat plantwortels en wortelstokke vreet, beskou. Larwes wat eksperimenteel afgesonder word, is egter omnivore en sal selfs erdwurms aanval en verorber. Die is nie bekend of erdwurms in die natuur deur die larwes benut word nie, maar larwes en erdwurms kom saam in die boonste veenlae van baie van die eiland se plantgemeenskappe voor.*

Introduction

Larvae of the flightless Lepidopteran *Pringleophaga marioni* Viette are an important element in the macroinvertebrate fauna of Marion Island, being one of the most abundant groups after earthworms. They are a significant item in the diets of sheathbills (Burger 1978) and house mice (Gleeson 1981) at the island. The life history and feeding ecology of *P. marioni* are largely unknown. Van Zinderen Bakker (1966) observed the larvae among grass roots and on moss cushions but provided no details of what they were eating. Viette (1948) suggested that the main foods of larvae of *P. kerguelensis*, with which *P. marioni* may be conspecific, are the roots and rhizomes of *Pringlea antiscorbutica* and *Acaena magellanica*. According to Huntley (1971) *Pringleophaga marioni* adults may be pollinators of *Pringlea;* thus the association of the larvae with this plant species may be coincidental.

While dissecting tussocks of *Poa cookii* on Marion Island in May 1982, a *Pringleophaga* larva was observed amongst the roots, apparently feeding on an earthworm. This larva plus several others were placed in a plastic container together with a living earthworm. Three of the larvae promptly converged upon the worm and devoured it.

Experimentation

"Cafetaria" type experiments were initiated. Three *P. marioni* larvae (one from a *Poa cookii* tussock and two from an *Azorella selago* cushion) were placed in an opaque plastic container (100 ml), together with living and dead *P. cookii* roots, green and dead *P. cookii* leaf bases, some peat and one earthworm. After one night (in the laboratory at *ca* 16 °C), the worm was almost completely (*ca* 80%) consumed and all the other foodstuffs uneaten. After the second night the worm had disappeared, the roots had been eaten, the dead leaves had only been nibbled and the green leaves were completely untouched. All remaining items were then completely ignored by the larvae until they died on the fourth day.

A further trial, in which the larvae were subjected to temperature and humidities closer to those experienced in the field, was also performed. One larva was placed in each of three separate containers, each with:

2 cm green *Poa* leaf base
2 cm dead *Poa* leaf base
ca 1 cm^3 *Clasmatocolea humilis* (common bryophyte in mire areas)
ca 1 cm^3 peat
2 small earthworms (*ca* 4 cm, probably *Microscolex kerguelarum* Grube).

The containers were placed in an incubator at 10 °C and 75-85 per cent relative humidity. The initial 15 hours of this trial were conducted in the dark and the remainder in subdued light. At irregular intervals throughout the trial the behaviour of the animals was noted.

Results and discussion

The results are presented in Table 1. They show that *Pringleophaga* larvae will eat earthworms if available. Two larvae preferred worms over all the other foods presented while the third gave worms high priority as second choice after roots. Feeding only commenced 4-15 hours after the start of the trial. Since caterpillars generally feed continuously they may have been driven through starvation to consume some of the food items presented, an acknowledged criticism of "cafetaria"-type feeding experiments. Although two larvae started feeding on live roots, in only one case did this result in a large proportion of the root material being consumed. Average times to first noticeable consumption were: earthworms 17 hours, live roots 30 hours, dead roots 47 hours, leaves not consumed. Using this measure, earthworms are approximately twice as attractive as food as are roots. The liverwort was not consumed but no conclusions regarding the peat can be made. Certainly the larvae were never actually seen to eat peat during the observation periods in the feeding trial, but they may have done so at other times.

The feeding behaviour of the larvae is interesting. They foraged actively during the feeding trials and, on encountering

Table 1

Behaviour of *P. marioni* larvae and consumption of food items during a 60 hour feeding trial.

Time	Larva 1	Larva 2	Larva 3
Start	Exploratory movements, showed interest in worms, roots and *Clasmatocolea*.	As 1	As 1
4 hours	No change.	No change.	No change.
15 hours	No change.	Live root mostly eaten.	Live root slightly nibbled.
	Both 2 + 3 making sporadic bites at the earthworms which quickly withdraw. *Clasmatocolea* and peat removed since the larvae were apparently showing no interest in them and the peat was being spread around the container.		
16 hours	"Hunting" movements initiated, then reared up and pounced on a worm, almost cutting it in two.	Aggressively biting at worm, much more frequently than before.	As 2
24 hours	One worm ⅔ eaten.	One worm visibly bitten in several places.	One worm in two mangled pieces.
40 hours	One worm disappeared, the other bisected. Roots and leaves not recognisably touched.	Both roots gone. Both worms still present.	Only small fragments remaining of both worms.
60 hours	Second worm approximately ½ eaten. No other change except living and dead roots nibbled.	One worm in pieces, second has the tail end missing.	Remains of worms liquified. No other change.

a worm, would bite at it. The violent reaction of the worm would cause the larvae to retreat. This continued until the larvae happened to bite deeply into the worm, when they would immediately become aggressive and, despite the worm's struggles, tear at it in a truly ferocious manner. Before this stage, however, any resistance on the part of the worm was sufficient to discourage the larvae. The worm will, therefore, more easily escape attack by *Pringleophaga* larvae in the field; hence they may not form as important a component in the larval diet as suggested from the feeding trials.

Pringleophaga larvae and earthworms are very common in the upper peat layers of many vegetation types at Marion Island, and both come to the surface amongst the bases of *Poa cookii* tussocks. The larvae have generally been thought to be herbivorous on a limited number of sub-Antarctic plant species, but, because of their widespread occurrence over a range of vegetation types, they may be catholic detritivores rather than strict herbivores. If so, then the step to facultative predation on the abundant earthworms might not be a large one. One observation and two "cafetaria" trials with limited replication are obviously inadequate upon which to base any conclusion. However, the consistency of the results suggests that *Pringleophaga marioni* may be an important carnivore in the trophic structure of the Marion Island terrestrial ecosystem. To the authors' knowledge this is the first observation of carnivory in *Pringleophaga,* and they are also not aware of any record of Tineidae preying upon other insects, although larvae of some case-bearing moths feed on animal fibres. Since some Lepidopterans are cannibalistic under stress, this unexpected carnivory could have been aberrant behaviour following the disturbance of their removal from the grass tussock. It is strongly urged that the "cafetaria" trials reported on here be extended, as part of the recently initiated Marion Island entomological programme, to incorporate a wider range of food items (particularly bryophytes) and single-item survival tests, as well as microscopic examination of the gut contents of *P. marioni* larvae collected from a range of habitats.

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