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Observations on the Adults of *Micraspis frenata* (Erichson, 1842) (Coleoptera: Coccinellidae) Feeding on the Pollen of Native and Non-native Grasses (Poaceae) in Eastern New South Wales, Australia

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ABSTRACT

Observations are provided on the feeding by adults on the pollen of six native and non-native grass species, *Chloris gayana* Kunth, *Chloris truncata* R.Br., *Paspalum urvillei* Steud., *Setaria gracilis* Kunth [= *Setaria geniculata* (Lam. Beauv.], *Sorghum bicolor* (L.) Moench ssp. *bicolor* and *Themeda australis* (R.Br.) Stapf (Poaceae) in the Sydney district, New South Wales., Australia. This species of ladybird beetle has also been recorded feeding on nectar of introduced weeds such as species of *Asclepias* and *Gomphocarpus* (Asclepiadaceae). These plants are not related to grasses. Clearly *M. frenata* is adapted to feeding on a number of food sources and possible preadaptations both to food items and changing environments have led to the evolutionary success of this species.

Key words: Coleoptera, Coccinellidae, *Micraspis frenata*, pollen feeding, native and non-native grasses, Poaceae

INTRODUCTION

The genus *Micraspis* Dejean, 1836 (Coleoptera: Coccinellidae) is distributed within the Palaearctic, Oriental and Australian Regions (i.e.from Japan and China, west to India and Africa and east to Melanesia and Australia)(Pope, 1988; Hawkeswood, 1994). The genus contains at least 30 species and is represented in the Australian region by at least 6 species (Pope, 1988). The most common and

best known species of the genus in Australia is *Micraspis frenata* Erichson, 1842, (previously known as *Verania frenata* Erichson, 1842), which is distributed from New Caledonia to Australia (i.e. Queensland, New South Wales, Victoria, Tasmania, South Australia and the Northern Territory (Pope, 1988). The adults of *M. frenata* are bright orange in colour and have distinctive black longitudinal markings on the elytra and measure 3.8-5.0 in total body length (Pope, 1988). The adult beetles are often found during summer days on a number of plant species where they are purported to feed on aphids (i.e. Thompson, 1893; Koebele, 1893; Froggatt, 1902, 1907; Swezey, 1905; Tillyard, 1926; Pope, 1988). Hawkeswood (1944) recently provided the very interesting observations of this species feeding on the nectar of *Gomphocarpus physocarpus* E. Mey and *Asclepias curassavica* L. (Asclepiadaceae) in south-eastern Queensland. Australia. Further interesting and previously unreported adult host (food) plants are recorded and discussed here.

OBSERVATIONS

On 23 February 2002, in a weed-infested paddock along an old watercourse, the authors observed numerous adults of *Micraspis frenata* (Erichson, 1842) (Coleoptera: Coccinellidae) feeding on the pollen and crawling over the inflorescences of peak-flowering non-native weedy grass species of *Setaria gracilis* (Lam.) Beauv. and *Paspalum urvillei* Steud. (Poaceae) at Grose Vale, New South Wales (see Fig. 1). A large number of other weed species were in flower in the immediate area at the time but no *Micraspis* beetles were observed on their flowers, although the introduced feral bee *Apis mellifera* L. (Hymenoptera: Apidae) was busily flower-frequenting many of these weed species, including some of the grass plants on which the coccinellids were occupied. No aphids were observed on any of the grass plants on which *M. frenata* were observed.

On 27 February 2002, further specimens of *M. frenata* were observed on the same property at Grose Vale feeding, mating and crawling on the flowers and rhachi of the native grass, *Themeda australis* (R.Br.) Stapf (Poaceae)(see Fig. 2). They were not observed feeding nor mating on any other plants.

A few weeks later during March and early April 2002, the species was observed again by the second author feeding on three introduced (non-native) grasses in the backyard of a house at Kurmond, New South Wales, about 5 km away from the Grose Vale site studied on 23 February. The beetles were feeding on the pollen

from grasses of *Chloris gayana* Kunth, *Chloris truncata* R.Br. (see Fig. 3), *Paspalum urvillei* Steud. and *Sorghum bicolor* (L.) Moench ssp. *bicolor* (Poaceae). Beetles were still present on the last named grass by the end of April when the seeds were well developed (see Fig. 4).

DISCUSSION

(a) *Micraspis frenata* biology

The larvae and adults of most Australian species of Coccinellidae are carnivorous, preying upon aphids, coccids or other small insects and mites (Britton, 1970; Hawkeswood, 1987). All of the earlier main references dealing with Australian insects, i.e. Froggatt (1907), Tillyard (1926), and McKeown (1942), mention that ladybird beetles usually feed on scale-insects, aphids and mites, while a few other species such as *Epilachna*, feed on vegetation, usually crop plants. None of these authors mentioned that Coccinellidae are known to feed on nectar or pollen in the adult stage.

Early observations on *M. frenata*, i.e.Thompson (1893), Koebele (1893), Froggatt (1902, 1970) and Swezey (1905), mentioned that the beetle was an aphid feeder, feeding on those species particularly frequenting grasses, including sugar cane (*Saccharum officinarum* L.)(Poaceae). Swezey (1905) also recorded *M. frenata* as feeding on young leaf-hoppers in a insectary and suggested that it might do so in the field, if aphids became scarce. None of these authors mentioned that *M. frenata* fed on nectar and/or[pollen from flowers. Pope (1988) briefly noted that the label data in museum collections indicated that the species was associated with many other plants, including citrus, cotton, sorghum, lucerne, peach trees, maize, potatoes and paw-paw. Unfortunately, the association of *M. frenata* with all of these plants is not clear, but the beetles at the time of their capture, were most probably feeding on aphids, etc, or they may have been simply resting or perching on the leaves of these plants (Hawkeswood, 1994), although in the case of *Sorghum* (as recorded in the present paper), the beetles may have been feeding on pollen. Pope (1988) also noted that *M. frenata* had been reared in captivity on *Heteromyzus* aphids on *Sonchus oleraceus* L (Asteraceae). Studies both in the field and the laboratory by Anderson & Hales (1983) have shown that multivoltine *M. frenata* [cited erroneously as *Micraspis lineata* (Thunberg, 1781)] is polyphagous, capable of completing larval development and reproducing in the field on either aphids or

pollen, and in the laboratory, additionally on powdered, freeze-dried, honey bee brood. Anderson & Hales (1983) made no observations on nectar utilization by adult beetles of *M. frenata*, but stated that it was this feeding versatility (i.e. polyphagy) which enabled the species to remain reproductively active from early spring to early autumn. Hawkeswood (1994) recorded the species feeding on the nectar of *Gomphocarpus physocarpus* E. Mey and *Asclepias curassavica* L. (Asclepiadaceae) in the Toowoomba district, south-eastern Queensland, Australia, and noted that there were very few native plants or other introduced weeds in flower offering nectar to animal visitors at the time when observations were undertaken. Hawkeswood (1994) noted that *M. frenata* is a small beetle capable of reaching the nectar at the base of the asclepiad flower but may play no role in pollination of these plants because they may not be capable of transporting the pollinaria to another flower for cross-pollination. In the case of the six grass species reported here, *M. frenata* is probably best regarded as a pollen robber and probably plays only a small role in pollination as these grass species are generally regarded as wind pollinated. Again, as with the case of *M. frenata* feeding on Asclepiadaceae flowers, these adults most probably utilize the pollens of these grasses when aphids are absent or are in short supply. During the summer season at Grose Vale and Kurmond, *M. frenata* was found to be rather common while aphids were conversely scarce. Additionally, since many specimens were observed mating (Figs 1 & 2), the pollens are probably also very important in egg production by providing essential proteins.

(b)Notes on the six host grass species

Chloris gayana Kunth

Chloris gayana, commonly known as Rhodes Grass, is a native of South Africa. It is an erect stoloniferous perennial growing to 1.3 metres high. The inflorescence spikes are in 1-2 whorls. usually 10-15 flowers per whorl. It is a weed of cultivation, pastures and disturbed areas.

Chloris truncata R.Br.

Commonly known as Windmill Grass, this is a native species which is widespread in eastern Australia. The inflorescences are spikes which are arranged 6-9 per stem. It is often a weed of waste places but in the native situation, it occurs in grassy woodlands and grasslands, often on heavy soils.

Paspalum urvillei Steud.

Paspalum urvillei, commonly known as Vasey Grass, is very similar to *P. dilatatum* Poiret. It is a tufted perennial grass growing to about 1.2 metres high with short rhizomes. The inflorescences are arranged into 12-20 racemes. The species is a weed of central and coastal New South Wales, Queensland and Western Australia. It is introduced from South America.

Setaria gracilis Kunth [= *Setaria geniculata* (Lam. Beauv.)]

Setaria gracilis, commonly known as the Slender Pigeon Grass, is a native of Central and South America. It is a tufted spreading perennial measuring up to 1.2 metres high with short knotty rhizomes. The inflorescence is a cylindrical, spike-like panicle measuring up to 10 cm long. The spikelets are solitary on each panicle branch and there are 4-8 yellow or purplish bristles below each spikelet. In Australia it is a widespread weed of roadsides, disturbed and cultivated land from the coast to the plains of New South Wales and other states.

Sorghum bicolor (L.) Moench ssp. *bicolor*

Sorghum bicolor is commonly known as Red or Forage Sorghum, and is perhaps the best known member of the genus. It occurs in many areas of the world and is a native of Africa and the Americas. It is a commonly cultivated crop plant and often occurs as a weed along roadsides.

Themeda australis (R.Br.) Stapf

This is only the second native species of grass listed here as a food plant for *M. frenata*. It is commonly known as the Kangaroo Grass and is widely distributed in eastern and southern Australia, where it occurs in open forests, grasslands, sand dunes, dry sclerophyll forests and woodlands. The stems, leaves and glumes are tinged with purple.

(c) Conclusions

Micraspis frenata appears to have preadaptations for feeding on a wide variety of food resources. The pollens of the grasses mentioned here and the nectar of unrelated plants such as Asclepiadaceae (Hawkeswood, 1994) obviously contain vastly different nutrients and other chemicals (i.e. the first group are monocots while

the second group are dicots). The apparent ability of *M. frenata* to feed on a wide variety of nectars and pollens as well as invertebrates (i.e. aphids, leaf-hoppers) probably was an important factor in the evolutionary success of this beetle. The fact that within Australia it has adapted to both tropical and cool temperate climates and climes within, indicates high plasticity to temperature extremes. No doubt further field research throughout its enormous range (not only in Australia), will reveal a multitude of information regarding its general biology, food and behaviour.

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Fig. 1. One mating pair (top) and one single specimen (bottom) of *Micraspis frenata* (Erichson, 1842) on the inflorescences of *Paspalum urvillei* (Poaceae) at Grose Vale, western Sydney, New South Wales. Large numbers of *M. frenata* were observed during cloudy but warm conditions during February 2002 on this weedy non-native grass species as well as others in the area (viz. Themeda australis). (Photo: J. R. Turner).

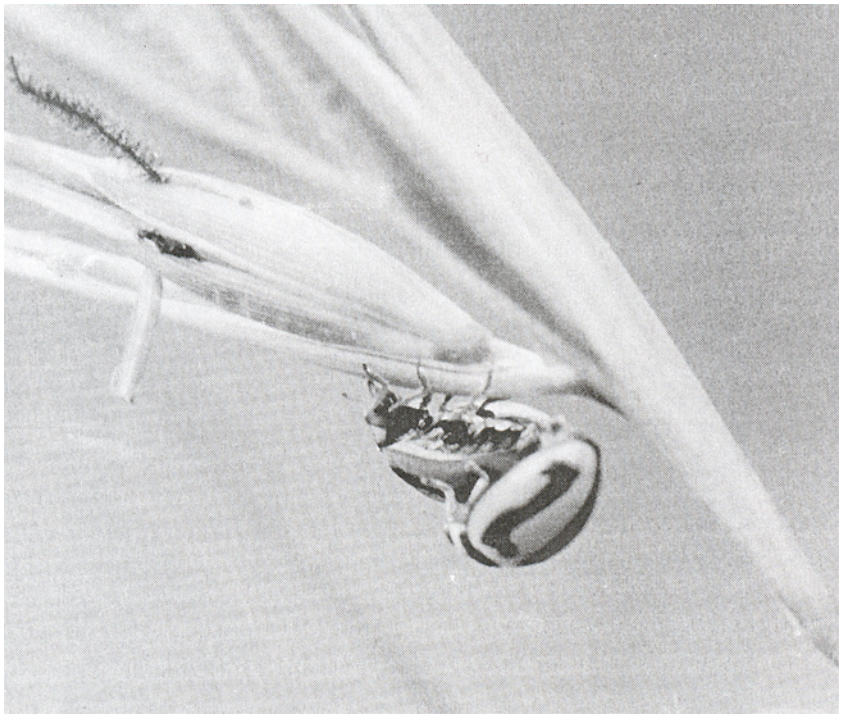

Fig. 2. A mating pair of *Micraspis frenata* (Erichson, 1842) upside down on a flower of *Themeda australis* (Poaceae) at Grose Vale, western Sydney, New South Wales. A few adults were observed feeding on the prominently exposed anthers of this plant species, which has large flowers. (Photo: J. R. Turner).

Fig. 3. One specimen of *Micraspis frenata* (Erichson, 1842) on an inflorescence spike of the native grass *Chloris truncata* (Poaceae) at Kurmond, New South Wales. (Photo: J. R. Turner).

Fig. 4. One specimen of *Micraspis frenata* (Erichson, 1842) amongst a seeding inflorescence of *Sorghum bicolor* (Poaceae) at Kurmond, New South Wales. Arrow points to the adult beetle which is facing head downwards amongst the seeds. (Photo: J. R. Turner).