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Further notes on the biology and food plants of the Australian belid weevil, *Rhinotia haemoptera* Kirby

(Insecta, Coleoptera, Belidae)

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New observations are provided on the adult food plants of the Australian belid weevil, *Rhinotia haemoptera* Kirby. Adults were observed during late September 1994 in the lower Blue Mountains, New South Wales, Australia, on the following plants, i.e. *Acacia linifolia* (Vent.) Willd., *A. obtusifolia* A. Cunn., *A. suaveolens* (Sm.) Willd. and *A. ulicifolia* (Salisb.) Court (Mimosaceae) and *Hakea dactyloides* (Gaertn.) Cav. (Proteaceae), either feeding on the leaves, seed pods or flowers. The new data are discussed with previously recorded data for the beetle.

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Introduction

The Australian belid weevil, *Rhinotia haemoptera* Kirby (Fig. 1), was first described by Kirby (1818: 426-427, plate XXII, fig. 7) from "Australasia". Since then, modern reviews on the biology and host plants (both adult and larval) of the species have been provided by Hawkeswood (1990) and by Hawkeswood, Turner & LeBreton (1994). Since these papers have been published, the present authors have made further observations and collections of the species from its natural habitat and these data are provided below for the first time.

Observations

a. Study area.

During 24 September 1994, the authors surveyed vegetation growing on both sides of a fire trail in the lower Blue Mountains, about 6 km SW of Glenbrook, New South Wales (33°48'S, 150°36'E). The fire trail was surveyed for about 4 km during the morning and a return journey was undertaken during the afternoon. The vegetation of the area is dry sclerophyll forest and woodland, dominated by various species of *Eucalyptus* (Myrtaceae), with a relatively thick understorey of species of *Hakea*, *Persoonia*, *Lambertia* and *Lomatia* (Proteaceae), *Acacia* (Mimosaceae), *Daviesia*, *Pultenaea*, *Dillwynia* and *Phyllota* (Fabaceae) and with many other small shrubs, sedges and grasses. The soil is skeletal to deeper and the parent material is quartz sandstone. The elevation along the fire trail changed from approx. 250 to 500 m above sea level. The temperature varied from 22-25 °C and at times a strong southerly breeze blew. The area had received very little rain during the previous six months and there was a thick

covering of dry leaves, sticks, branches and twigs on the ground and amongst the shrubs. Fire danger warnings had been issued during the week.

b. Food plants.

1. *Acacia linifolia* (Vent.) Willd. (Mimosaceae). This plant species is a graceful shrub growing to about 2 m tall with very slender branches; the phyllodes are linear-lanceolate in shape, 2-4 cm long and 1-3 mm wide and are glabrous; the species is widespread in heathlands and dry sclerophyll forests; the flowers are pale yellow and flowering occurs during January to August (Beadle 1975). At least 15 specimens of *R. haemoptera* were observed on the foliage of non-flowering plants and others were observed to alight on the foliage from the nearby bushland. At least one *R. haemoptera* was observed feeding on young leaves in a cluster at the end of a branchlet (Tab. 1).

2. *Acacia obtusifolia* A. Cunn. (Mimosaceae). This plant is a shrub to small tree growing to 5 m tall, with dark green foliage measuring 9-20 cm in length and 7-25 mm in diameter and flowers from December to February (Beadle 1975, Costermans 1981). At least two beetles were collected from this species, one of which was feeding on a young phyllode. Plants were non-flowering at this time. In captivity, beetles fed extensively on both young and old mature phyllodes of this wattle.

3. *Acacia suaveolens* (Sm.) Willd. (Mimosaceae). This plant species is a slender shrub growing to about 1-2 m high with angular branches; the phyllodes are narrow-oblong to linear-lanceolate in shape measuring up to 12 cm long and 4-10 mm wide, and are glabrous and glaucous; the species is widespread in heathlands and dry sclerophyll forests and flowering occurs during March to August (Beadle 1975, Costermans 1981, Simmons 1987). Most of the young plants along the fire trail carried seed pods (legumes); in this species, the legumes are oblong in shape, flat, glaucous, and measure 2-4 cm long and 12-20 mm wide (Beadle 1975). A number of *R. haemoptera* adults were observed feeding on the legumes at the tops of plants (Fig. 1); feeding resulted in about 20-30 % of the legume nearest the pedicel being chewed; the proboscis of the adults are probed into the cuticle and epidermis and into the seed cavity of the pod. Another beetle was observed to chew on a pedicel and young phyllode of a small *A. suaveolens* plant. Upon the legumes, *R. haemoptera* chewed holes 0.8-2.0 mm in diameter, many of them coalescing (Fig. 1).

4. *Acacia ulicifolia* (Salisb.) Court. (Mimosaceae). This plant is scattered but widespread throughout dry sclerophyll forests and heathlands in the Blue Mountains where it is a variable, rigid, much-branched, prickly shrub, often with drooping branches; the phyllodes are prickly, green, scattered or crowded, measure 7-14 mm long and 0.6-1.5 mm wide, with a prominent nerve on each side, tapering into a very long, sharp point; the species flowers from July to September (Beadle 1975, Costermans 1981, Simmons 1987). Five specimens of *R. haemoptera* were collected from the flowers where they appeared to be feeding on pollen; although beetles often crawled over foliage, no feeding on the phyllodes were observed (Tab. 1).

5. *Hakea dactyloides* (Gaertn.) Cav. (Proteaceae). This plant is a straggly shrub growing to 1-3 m high, with flat leaves, measuring 5-10 cm long and 5-25 mm wide; the species is widespread in gullies on sandstone in open forests and heathlands (Beadle 1975, Costermans 1981). Two specimens of *R. haemoptera* were collected from foliage of two flowering plants but it was not clear whether they were feeding before capture (Tab. 1). Beetles placed in plastic bags with this plant did not appear to feed on the leaves over a two-week period.

Table 1. Feeding data for *Rhinotia haemoptera* Kirby adults observed/collected in the lower Blue Mountains, New South Wales on 24 Sept. 1994 by the authors

Plant species	Family	Food		
		Flowers	Seeds	Leaves
Acacia linifolia (Vent.) Willd.	Mimosaceae	–	–	+
Acacia obtusifolia A. Cunn	Mimosaceae	–	–	+
Acacia suaveolens (Sm.) Willd.	Mimosaceae	–	+	+
Acacia ulicifolia (Salisb.) Court	Mimosaceae	+	–	–
Hakea dactyloides (Gaertn.) Cav.	Proteaceae	–	–	?

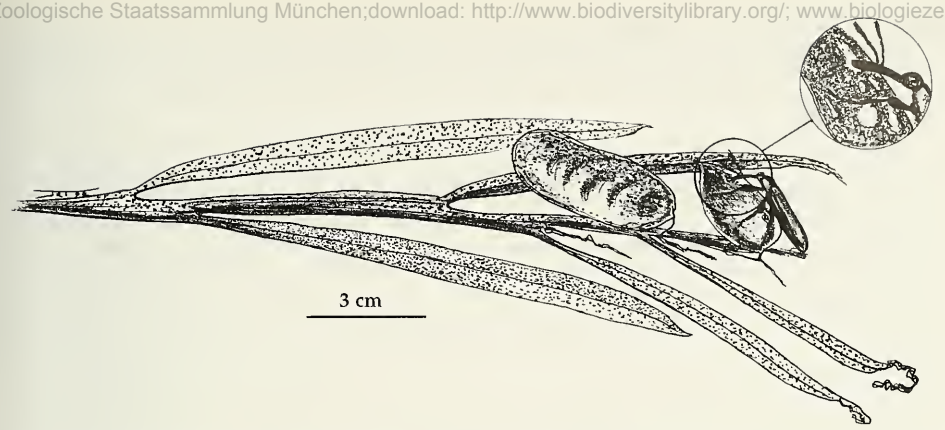

Fig. 1. Adult of *Rhinotia haemoptera* Kirby feeding on the developing legume at the top of a branch of *Acacia suaveolens* (Sm.) Willd. (Mimosaceae) from south of Glenbrook, New South Wales. (Drawing: J. R. Turner).

Discussion

Rhinotia haemoptera Kirby was common along the fire trail and this abundance was probably due to two factors, i.e. 1. sudden warm weather following a long cold winter which had induced a mass emergence of adults, and 2. abundance of vigorous flowering and non-flowering *Acacia* host plants growing in exposed situations enabling easy access and food for the beetles.

Acacia linifolia has been recorded by Hawkeswood, Turner & LeBreton (1994) as a plant associate of *R. haemoptera*, but feeding on this species had not been previously observed. Near Glenbrook, the beetles were commonly attracted to *A. linifolia*, where adults mostly rested on the foliage or occasionally nibbled the young terminal leaflets. This new data therefore verifies *A. linifolia* as an adult food plant.

Hawkeswood, Turner & LeBreton (1994) first recorded *Acacia obtusifolia* as a larval host plant for the belid but adult feeding on foliage or flowers had not been observed. Near Glenbrook, although *A. obtusifolia* is common in patches, it does not appear to be a preferred adult host, although a limited number of adults may feed on the young foliage only.

Froggatt (1893) recorded *Acacia suaveolens* as a larval host plant for *R. haemoptera*, but the utilization of this plant by adults had not been previously recorded (Hawkeswood, Turner & LeBreton 1994). Our recent observations show that adults prefer chewing on the tissues of developing legumes of *A. suaveolens* and less commonly on leaves. We did not observe any evidence of larval feeding, probably because the plants along the fire trail were mostly very thin-stemmed young plants, not suitable for larval development.

The prickly *Acacia ulicifolia* has not been recorded previously as an adult food plant of *R. haemoptera* (Hawkeswood, Turner & LeBreton 1994). Our observations indicated that leaves of *A. ulicifolia* were not attacked by *R. haemoptera*, probably because of the small, prickly and tough fibrous nature of the leaves which make them unpalateable. The beetles appeared to be mostly attracted to the flowers where pollen from the anthers was consumed (Tab. 1).

Hakea dactyloides is probably not an adult host plant for *R. haemoptera* and adults were not observed on the flowers; adults apparently failed to feed on leaves in captivity and avoided the flowers and fruits when offered. Tepper (1887) briefly noted that adults of *R. haemoptera* visited flowers of *Hakea* sp. in South Australia, but Hawkeswood, Turner & LeBreton (1994) questioned this old record. Our recent observations near Glenbrook did not support Tepper's statements and suggest strongly that *Acacia* flowers, leaves and/or seed pods (legumes) are the preferred food of *R. haemoptera* adults.

The known adult food plants of *R. haemoptera* with reliable feeding observations are as follows: *Acacia decurrens* (Wendl.) Willd. (leaves), *A. floribunda* (Vent.) Willd. (branches), *A. linifolia* (Vent.) Willd.

(leaves), *A. longifolia* (Andr.) Willd. (leaves), *A. obtusifolia* A. Cunn. (leaves), *A. paradoxa* DC. (leaves), *A. penninervis* Sieb. ex DC. var. *longiracemosa* (leaves), *A. suaveolens* (Sm.) Willd. (leaves, seeds-legumes), *A. terminalis* (Salisb.) MacBride (leaves) and *A. ulicifolia* (Salisb.) Court (flowers). All other purported adult host records in the literature are erroneous or require verification (Hawkeswood, Turner & LeBreton 1994).

Arnol'di et al. (1991) have studied the Mesozoic Coleoptera of Russia and neighbouring areas and have described a number of fossil weevils belonging to the families Eobelidae, Attelabidae and Curculionidae and noted that during the late Jurassic, the Rhynchophora (weevils) turned out to be the most diverse and most abundant group in terms of species of all the Polyphaga. Arnol'di et al. (1991) further noted that the recent finds of Triassic beetles show clearly that these Coleoptera differ very little from the earlier Jurassic Eobelidae, such that this fact compelled them to regard the Rhynchophora as the most ancient of the Polyphaga. These authors move on to state that the present day Belidae, which inhabit Australia, South America and southern North America (and hence display a Gondwanian distribution) possess many indisputably archaic morphological features (in the adults) in addition to a few specialized characteristics. These authors regard the Australian genus *Rhinotia* as the most primitive representative of the recent species of the family Belidae, since its general appearance is very similar to that of the late Jurassic "belidoid" Rhynchophora. However, these authors also state that the Jurassic weevils that they described differed from modern-day Belidae in the form of the pronotum and antennae and in other important morphological characters of the adults, such that they could not possibly be included within the family Belidae. Thus it would appear that *Rhinotia* is a somewhat more advanced genus which probably first appeared in Australia during the Tertiary Period when flowering plants rapidly evolved and speciated to dominate the ecosystems of the continent and when interrelationships between these flowering plants and insects were beginning to co-evolve (White 1990). *Acacia* does not appear in the fossil pollen record until the Miocene Epoch of the Tertiary Period (23.7-5.3 million years BP), when the arid areas of Australia were well developed with their sclerophyllous vegetation (White 1990). So, assuming that *Rhinotia* did not shift food plant preferences during the early stages of its evolution, *R. haemoptera* has probably co-evolved with *Acacia* for at least 5.5 million years, although fossil evidence is badly needed to shed more light on the probabilities of this suggestion.

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