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The first larval host plant record for *Curis caloptera* (Boisduval, 1835) (Coleoptera: Buprestidae) with notes on the biology and larval host plants of other species of *Curis* Laporte & Gory from Australia

With 3 figures

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Abstract: The first larval host plant, *Casuarina littoralis* Salisb. (Casuarinaceae) is recorded here for the Australian buprestid beetle, *Curis caloptera* (Boisduval, 1835) (Coleoptera: Buprestidae) from South Maroota, Sydney district, New South Wales. The larval host plants recorded for two other species of Australian *Curis* are reviewed and discussed. The association with *Casuarina* is probably an ancient and co-evolutionary relationship dating back to the Tertiary.

Zusammenfassung: Erstmals wurde die Wirtspflanze *Casuarina littoralis* Salisb. (Casuarinaceae) der Larve des seltenen australischen Prachtkäfers *Curis caloptera* (Boisduval, 1835) (Coleoptera: Buprestidae) in South Maroota, Distrikt Sydney, Neusüdwales, gefunden. Die Wirtspflanzen der Larven zweier anderer Käferarten der australischen Gattung *Curis* werden vorgestellt und diskutiert. Die Bindung an *Casuarina* ist wahrscheinlich eine alte und koevolutionäre Beziehung, die bis ins Tertiär zurückreicht.

Introduction

The authors have spent many years determining the larval hosts of Australian Buprestidae (see e.g. HAWKESWOOD 1983, 1985a, b, 1986a, b, 1987, 1988, 1990, 1992a, b, 1993; HAWKESWOOD & TURNER 1992, 1994, 1997a, b; TURNER 2001a–d; TURNER & HAWKESWOOD 1994a, b, 1995a–f, 1996a–c, 1997). Such studies are important in determining the feeding relationships of the larvae and co-evolutionary considerations. These data are often difficult to obtain and we have found that searching for larval, pupal and/or adult material in timber can be a long process often without success, although it is highly rewarding when new discoveries are forthcoming. Most of our observations and records have been made fortuitously. Recent field collection of infested wood in the Sydney district, New South Wales has resulted in the discovery of the first larval host record for the rare *Curls caloptera* (Boisduval). The field observations are recorded and discussed below.

Observations

During the afternoon of 20 May 2002, the authors examined a fallen tree of *Casuarina littoralis* Salisb. (Casuarinaceae), which had been about 10 metres tall when living. As TJH removed sections of bark from a large branch, he noted a headless dead buprestid wedged tightly in an exit hole. This section of the tree was partially dissected by JRT on site and a thin grass stem used to push the dead beetle out through the exit hole. From the markings on the elytra the specimen was identified as *Curis caloptera* (Boisduval, 1835) (Coleoptera: Buprestidae). Further examination revealed two additional fresh exit holes higher up the trunk (Figs. 1, 2, 3a–c). This wood was later cut into billets by JRT and transported to the laboratory for detailed examination. Initial examination of the billets by JRT revealed a number of details regarding this species. The larval galleries were found to be approximately the same length in each case and given that the exit holes were

Fig. 1. The lowermost fresh exit hole in dead branch of *Casuarina littoralis* (Casuarinaceae) (bark stripped away) at South Maroota, New South Wales. (Photo: J. R. Turner)

Fig. 2. The uppermost fresh exit hole in dead branch of *Casuarina littoralis* (Casuarinaceae) (bark stripped away). (Photo: J. R. Turner)

21 cm apart, it would appear that the eggs are laid by the female on a branch 1.5–2.0 cm in diameter approx. 50–60 cm above the exit holes. About 20 cm above one exit hole, the branch joined another branch about 2.5 cm in diameter at which point the larval gallery to the first (uppermost) exit hole (Fig. 2) was 5 mm wide and 1 mm in depth (Fig. 3 a, c). On reaching the exit hole, it was evident the larva then reversed direction up the trunk and enlarged its initial gallery to be 12 mm wide and 2 mm deep. The fact that the larva enlarged the larval gallery was clearly visible in the wood where it overlapped the initial larval gallery (Fig. 3 a). The larvae them moved downwards within the stem to a spot 7 cm past the exit hole before preparing its pupal chamber and the exit hole. At this point the two galleries were separated by only 1 mm of wood but they never joined (Fig. 3 c). The 7 cm section below the exit hole was found to be free of frass for 2–3 cm below the exit hole.

The larval gallery associated with the lower exit hole (Fig. 1, 3 b, c) varied from the other described above in that from the exit hole, the larva chewed a new gallery measuring 7 cm long, upwards and towards the centre of the branch. This gallery then traversed outwards towards the bark and then reversed downwards in a loop (Fig. 3 b, c), crossing the upward gallery just above the exit hole, then continuing for about 7 cm before reversing to the exit hole of the pupal chamber.

The pupal chamber and exit hole of *C. caloptera* are excavated to fit the shape of the adult which emerges sideways from the exit hole. The exit hole is almost igloo-shaped in elevation and measures 4 mm deep and 6 mm wide. All exit holes were found to be facing the same direction on the tree, i.e. they were all on the same side of the trunk.

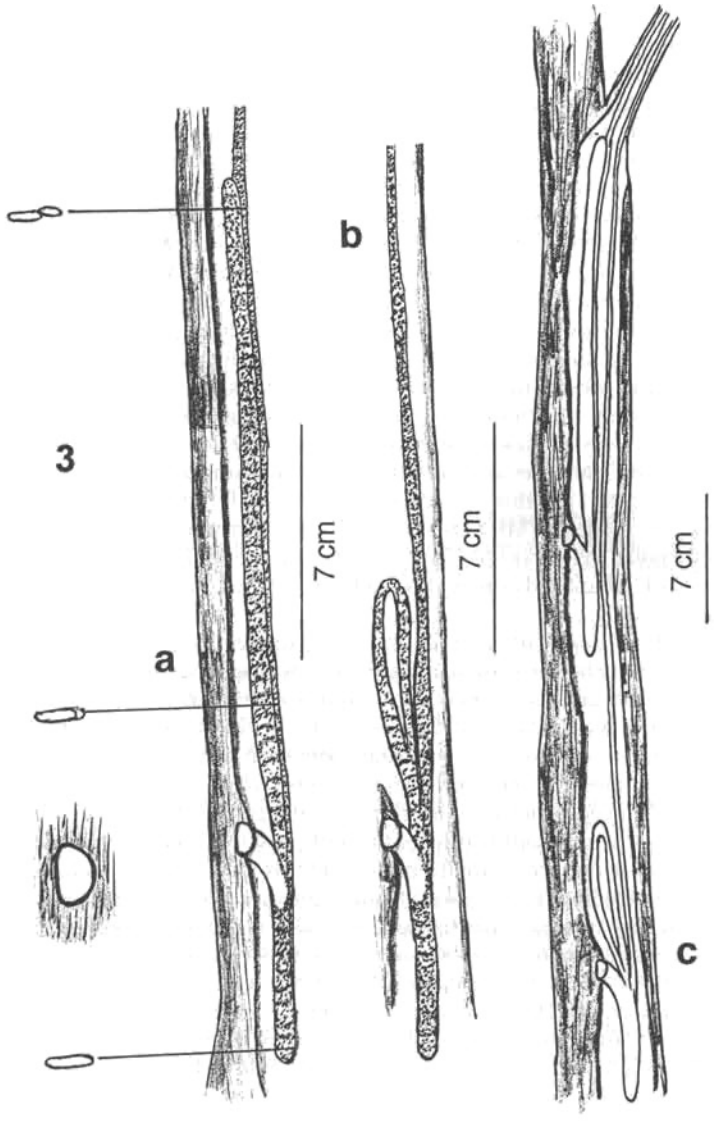

Fig. 3. Larval galleries of *Curis caloptera* in dead branch of *Casuarina littoralis* (Casuarinaceae). (a) Uppermost larval gallery and pupal chamber (below exit hole): various transverse sections through differing areas of the larval gallery show the shapes and relative size of the gallery as viewed in cross section; (b) Lowermost larval gallery and pupal chamber (below exit hole); (c) Both larval galleries and their relative positions shown in the dead branch of *Casuarina*. (Illustration: J. R. Turner).

Discussion

The adult *Curis caloptera* is mostly a brilliant green insect with maroon and gold patterns on the elytra and pronotum. It has been recorded from New South Wales, Victoria and South Australia (Carter 1929). The species has been recorded during summer on flowers of Myrtaceae such as *Leptospermum* and *Angophora* (Hawkeswood 1978; Williams & Williams 1983) and are pre-

sumably nectar feeders. *Casuarina littoralis* is the first published larval host plant for the species. It is amazing to think that despite all of the insect collecting that has been undertaken within the Sydney district and elsewhere within the known range of *C. caloptera* that virtually no ecological data have been published on this species in the 167 years since this insect was first collected and described! Our record of the larval host is in keeping with the record of the related species from Western Australia, *Curis intercribrata* Fairmaire. McMillan (1951) recorded this *Curis* species as breeding in the dead trunks and branches of the „giant she-oak", *Casuarina glauca* Otto (Casuarinaceae) from the Toodyay district, north-east of Perth, Western Australia (Hawkeswood & Peterson 1982). However, Hawkeswood (1988) later realised that *C. glauca* is an eastern Australian species (Johnson 1982). Examination of the data and checklist provided by Bennett (1982) shows that at least six *Casuarina* species have a known distribution which encompasses the Toodyay district, viz. *C. fraseriana* Miq., *C. obesa* Miq. in Lehm., *C. microstachya* Miq. in Lehm., *C. lehmanniana* Miq., *C. campestris* Diels and *C. humilis* Otto (Hawkeswood 1988). (For purposes of this paper and other future works of ours, the genus *Allocasuarina*, which remains controversial amongst botanical authorities as to its taxonomic status, will be disregarded). Of these six *Casuarina* species, only *C. fraseriana* and *C. obesa* are tall trees over 5 m high (Bennett 1982) suitable for the title of „giant she-oak", so that it would appear that either species is the one referred to by McMillan (1951) by this vernacular. However, until further observations on the biology of *C. intercribrata* are made, McMillan's record must be disregarded (Hawkeswood 1988). Tepper (1887) briefly noted that larvae of *Curis aurifera* Laporte & Gory species lived in the stems of *Eucalyptus gracilis* F. Muell. (Myrtaceae), a mallee eucalypt of the arid and semi-arid heathlands of South Australia.

The new research on *Curis caloptera* indicates that the female beetle lays her eggs in the thin bark of the smaller branches of *Casuarina* and when hatched the larvae bore downwards into a larger main stem. The reversal up the main stem from below the future pupal chamber is of interest. Why this behaviour occurs is not clear at the present time but in the case at South Maroota it appears that two sympatric larvae did not come in contact with each other. It would appear that the larvae are able to detect the presence and movements of other larvae close by and take action which prevents their tunnelling activities from interfering with each other.

Despite McMillan's misidentification of the host plant of *C. intercribrata* discussed above, it does appear that *Casuarina* species are the preferred hosts for *Curis*. The record of Tepper (1887) of *C. aurifera* larvae feeding in the stems of *Eucalyptus gracilis* has not been confirmed by any later authors and it may transpire that *C. aurifera* is also a *Casuarina* breeder. Hawkeswood & Peterson (1982) noted that the genus *Casuarina* contains about 70 species, distributed in Malaysia, Madagascar, Polynesia and Australia (which has at least 30 described species, often placed in the genus *Allocasuarina*). Hawkeswood & Peterson (1982) also noted that the present disjunct distribution of *Casuarina* can be partly explained by the break-up of Gondwanaland where the genus probably originated about 100 million years B. P. In addition, Raven & Axelrod (1974) stated that it was likely that the ancestors of the ancient and archaic Casuarinales reached Australia during mid-Cretaceous geological time, c. 100 million years B. P. In Australia, *Casuarina* species are present in the fossil pollen records of rocks of the Palaeocene epoch (66–24 million years B. P.) (White 1990). The Tertiary is usually regarded as a most significant period of geological time when aridity became the main factor affecting the Australian environment, which resulted in the establishment of an arid interior to the continent, the spread of scrublands and grasslands and the contraction of rainforest and the evolution of sclerophyllous vegetation (White 1990). *Casuarina* is well represented in the fossil flora of this period of geological time. It is probable that much speciation of *Curis* in the arid and semi-arid areas of Australia occurred at this time when *Casuarina* was also evolving and speciating. Further larval host records will be of great importance for a better understanding of the evolution and taxonomic relationships of these interesting buprestids.

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