

A new fungal host for *Episcaphula australis* (Boisduval), *E. pictipennis* Crotch and *Thallis compta* Erichson, with a review of the fungal host records for the Australian Erotylidae (Coleoptera)

With 1 Figure and 1 Table

TREVOR J. HAWKESWOOD, JAMES R. TURNER and RICHARD W. WELLS

Abstract: Brief field notes are provided on a recent collection of three species of Erotylidae from Australia, viz. *Episcaphula australis* (Boisduval), *E. pictipennis* Crotch and *Thallis compta* Erichson, which were collected on or near the white saprophytic fungus *Polyporus* sp. (probably *P. squamosus* Fries) (Polyporaceae) growing on dead, fallen logs and branches of *Eucalyptus crebra* F. Muell. (Myrtaceae) in central eastern New South Wales during May 1995. The host fungal records for the following species of Erotylidae are listed: *Cnecosa insueta* (Crotch), *Episcaphula australis* (Boisduval), *E. pictipennis* Crotch, *E. rufolineata* Wilson, *Thallis australasiae* Lea, *T. compta* Erichson, *T. erichsoni* Crotch, *T. janthina* Erichson and *T. vinula* Erichson. Most, if not all, of these taxa feed on the fruiting bodies and hyphae of Polyporaceae fungi.

Zusammenfassung: Über drei Arten der Erotylidae Australiens werden kurze Notizen mitgeteilt, so über *Episcaphula australis* (Boisduval), *E. pictipennis* Crotch und *Thallis compta* Erichson, die im Mai 1995 auf oder bei Fruchtkörpern des saprophytischen Pilzes *Polyporus* sp. (wahrscheinlich *P. squamosus* Fries) aufgenommen wurden, der auf Totholz von *Eucalyptus crebra* F. Muell. (Myrtaceae) im östlichen Neu-Südwesten wächst. Für folgende Arten der Erotylidae werden die festgestellten Wirtspilze aufgeführt: *Cnecosa insueta* (Crotch), *Episcaphula australis* (Boisduval), *E. pictipennis* Crotch, *E. rufolineata* Wilson, *Thallis australasiae* Lea, *T. compta* Erichson, *T. erichsoni* Crotch, *T. janthina* Erichson und *T. vinula* Erichson. Die meisten, wenn nicht alle dieser Arten, fressen an Fruchtkörpern und Hyphen der Porlinge (Polyporaceae ss. lato).

Introduction

The Erotylidae is mainly a tropical and subtropical family of Coleoptera with about 1500 described species. Australia has about 10% of the world's total of species, but little has been recorded on their biology and fungal hosts. The family is comprised of small to larger beetles, rounded to elongate in shape, 3–25 mm long, and usually brightly coloured with black stripes and/or spots over a yellow, orange, or red base colour. Their main body surfaces are usually glabrous, although a few species are variously covered in a fine layer of hairs. The larvae are almost cylindrical in shape, whitish, grey or pale brown in general colour, with well-developed legs and with segmentally arranged plates on the body which often possess spines. There are five or six pairs of simple eyes on the larval head and the abdomen usually bears hardened, pointed structures. Both larvae and adults feed on fleshy fungi or on fungal strands in decaying wood. Adults of some species are known to overwinter beneath the loose bark of trees (HAWKESWOOD 1987).

The early references on Australian fungus beetles, were mainly anecdotal (e.g. FROGGATT 1907; TILLYARD 1926; MCKEOWN 1942, 1949). Some details on the biology of one species, *Episcaphula australis* (Boisduval) have been provided by HAWKESWOOD (1986, 1987, 1991, 1992) and its fungal hosts are also reviewed again in the present paper. Adults of a related species of *Episcaphula*, *E. rufolineata* Wilson, have been recorded feeding and mating on bracket fungi in rainforest in south-eastern Queensland; adults have also been observed feeding on fungal hyphae on moss-covered trunks on other rainforest trees (HAWKESWOOD 1986, 1987). Further details on the biology and fungal hosts of Australian Erotylidae have been provided by HAWKESWOOD (1990), WEBB & SIMPSON (1991) and LE BRETON & VAARWERK (1993). All of these

references are reviewed in the following sections. A summary of the fungal hosts derived from available literature for Australian species of Erotylidae is provided in Table 1.

Table 1
Summary of the fungal hosts and references for some Australian species of Erotylidae. (NB. All identified fungi belong to the family Polyporaceae)

Erotylid species	Fungal host species	References
<i>Cnecosa insueta</i> (Crotch)	<i>Haplophilus</i> sp.	WEBB & SIMPSON (1991)
	<i>Piptoporus portentosus</i> (Berk.) G. H. Cunn.	WEBB & SIMPSON (1991)
<i>Episcaphula australis</i> (Boisduval)	<i>Polyporus</i> fungus?	WILSON (1921)
	<i>Pycnoporus coccineus</i> (Fries) Bond. & Sing. (= <i>Polystictus cinnabarinus</i> (Jacq. ex Fries) Cooke)	HAWKESWOOD (1986, 1987, 1991, 1992)
	<i>Poria</i> sp.	HAWKESWOOD (1986, 1991, 1992)
	<i>Pycnoporus coccineus</i> (Fries) Bond. & Sing.	LE BRETON & VAARWERK (1993)
	<i>Trametes lactinea</i> (Berk.) Patouillard	LE BRETON & VAARWERK (1993)
	<i>Polyporus</i> sp. (<i>P. squamosus</i> Fries) (?)	HAWKESWOOD, TURNER & WELLS (this paper)
<i>Episcaphula pictipennis</i> Crotch	<i>Pycnoporus coccineus</i> (Fries) Bond. & Sing.	WEBB & SIMPSON (1991)
	<i>Polyporus</i> sp. (<i>P. squamosus</i> Fries) (?)	HAWKESWOOD, TURNER & WELLS (this paper)
<i>Episcaphula rufolineata</i> Wilson	<i>Ganoderma applanatum</i> (Fries) Karsten	HAWKESWOOD (1986)
	<i>Poria</i> sp.	HAWKESWOOD (1986)
<i>Thallis australasiae</i> Lea	<i>Polyporus mylittae</i> Cooke & Masee	WEBB & SIMPSON (1991)
<i>Thallis compta</i> Erichson	<i>Polyporus</i> sp. (<i>P. squamosus</i> Fries) (?)	HAWKESWOOD, TURNER & WELLS (this paper)
<i>Thallis erichsoni</i> Crotch	<i>Pseudotrampetes gibbosus</i> (Pers.) Fries	HAWKESWOOD (1990)
<i>Thallis janthina</i> Erichson	<i>Piptoporus portentosus</i> (Berk.) G. H. Cunn.	WEBB & SIMPSON (1991)
	<i>Piptoporus portentosus</i> (Berk.) G. H. Cunn.	WEBB & SIMPSON (1991)
<i>Thallis vinula</i> Erichson	<i>Polyporus squamosus</i> Fries	WEBB & SIMPSON (1991)

New observations

During 8 May 1995, the first two authors were assisting R. W. Wells and A. Antenor on a Roads and Traffic Authority of New South Wales Survey of an area located 1.5 km north of Sawyers Gully on the Cessnock 1 : 25,000 - 9132-N Map with the grid reference for the centre of the region as 543733. The area, which is 40-50 m above sea level, was visited between 1230-1330 hrs on a mild, overcast day with c. 65% cloud cover, with sunny breaks and with a slight breeze blowing. The Kurri Kurri Open Woodland Association found at this site consists of *Eucalyptus crebra* F. Muell., *E. fibrosa* F. Muell., *E. maculata* Hook., *E. moluccana* Roxb. and *E. tereticornis* Smith, while the understorey includes such shrubs as *Acacia falcata* Willd., *A. elongata* Sieb. ex DC. (Mimosaceae) and *Melaleuca styphelioides* Sm. and *M. thymifolia* Sm. (Myrtaceae). While JRT was examining a rotting ironbark log of *E. crebra* F. Muell. measuring about 20 cm in diameter, one specimen of *Thallis compta* Erichson (Fig. 1b) was found under the semi-rotten bark amongst fungal hyphae. An apparently dead basidiocarp of *Polyporus* sp. (possibly *P. squamosus* Fries, Polyporaceae) was noticed on the side of the same log about 30 cm away, and after careful examination, TJH collected one specimen each of *Episcaphula australis* (Boisduval) (Fig. 1a) and *E. pictipennis* Crotch (Fig. 1c) from the fungus. There was some evidence of the fungus beetles feeding on the basidiocarp. Extensive examination of other logs and branches in the near vicinity failed to locate any further specimens of Erotylidae.

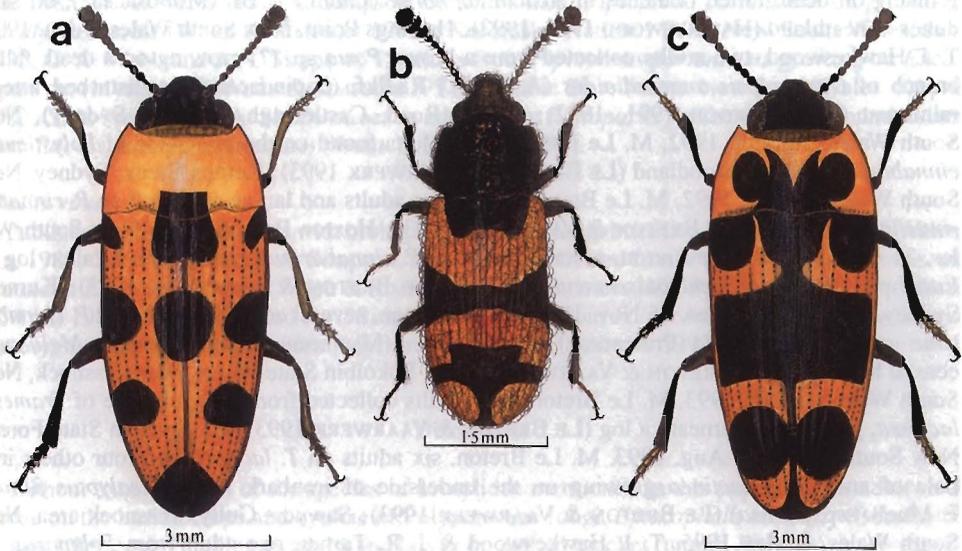


Fig. 1. Dorsal habitus of three species of Australian Erotylidae. a: *Episcaphula australis* (Boisduval), b: *Thalitis compta* Erichson, c: *Episcaphula pictipennis* Crotch. (Paintings: J. R. Turner)

Summary of the published biological data on Australian Erotylidae

Cnecosa insueta (Crotch)

Published collection records with biological data: Ourimbah State Forest, New South Wales, 1 Feb. 1985, G. A. Webb and J. A. Simpson, 20 adults from *Haplophilus* sp., growing on *Eucalyptus paniculata* Sm. (Myrtaceae) (WEBB & SIMPSON 1991); Coolangubra State Forest, New South Wales, Jan. 1985, G. A. Webb and J. A. Simpson, one adult from *Piptoporus portentosus*, on ground in *Eucalyptus* forest (WEBB & SIMPSON 1991).

Episcaphula australis (Boisduval)

Published collection records with biological data: Blackall Ranges, Queensland, 1921, F. E. Wilson, on polyporous fungus (WILSON 1921); Beerwah, Queensland, 12 Sept. 1992, T. J. Hawkeswood and M. Peterson, adults on *Pycnoporus coccineus* (= *Polystictus cinnabarinus*), growing on a fallen *Eucalyptus* log, in heathland (HAWKESWOOD 1986, 1991, 1992); Glenbrook, New South Wales, 8 Oct. 1982, T. J. Hawkeswood, adults on *Pycnoporus coccineus* (as *Polystictus cinnabarinus*), growing on fallen logs of *Eucalyptus crebra* F. Muell. (Myrtaceae) in dry sclerophyll forest (HAWKESWOOD 1986, 1991, 1992); Mt. Nebo, 20 km NW of Brisbane, Queensland, 11 April 1983, T. J. Hawkeswood, adults feeding on white hyphae growing on leaves and sticks under a large piece of fallen *Eucalyptus* bark, at the margin of rain forest and wet sclerophyll forest (HAWKESWOOD 1986, 1991, 1992); Griffith University campus, Brisbane, Queensland, 22 Sept. 1983, T. J. Hawkeswood, adults and larvae in several *P. coccineus* (as *P. cinnabarinus*) growing on a moist, decaying stump of *Xanthorrhoea johnsonii* A. Lee (Xanthorrhoeaceae) (HAWKESWOOD 1986, 1991, 1992); Griffith University campus, Brisbane, Queensland, 12 July 1984, T. J. Hawkeswood, numerous larvae (all stages) feeding on *P. cinnabarinus* (= *P. coccineus*) on a dead, fallen *Eucalyptus umbra* R. T. Baker (Myrtaceae) in closed woodland (HAWKESWOOD 1986, 1991, 1992); Near Toowoomba, Queensland, 15 March 1986, T. J. Hawkeswood, adults feeding and mating on the underside of two large *P. coccineus* (as *P. cinnabarinus*), growing on a dead, fallen log of *Eucalyptus propinqua* Deane et Maiden

(Myrtaceae) (HAWKESWOOD 1991, 1992); Hastings Point, New South Wales, 22 April 1990, T. J. Hawkeswood, several adults feeding on undersurface of *P. cinnabarinus* (= *P. coccineus*), growing on dead, fallen branches of *Acacia sophorae* (Labill.) R. Br. (Mimosaceae), on sand dunes in heathland (HAWKESWOOD 1991, 1992); Hastings Point, New South Wales, 5 Jan. 1991, T. J. Hawkeswood, two adults collected from a brown *Poria* sp. (?) growing on a dead, fallen branch of *Cupaniopsis anacardioides* (A. Cunn.) Radlkf. (Sapindaceae), in disturbed littoral rainforest (HAWKESWOOD 1991, 1992); Devlin Road, Castlereagh, (western Sydney), New South Wales, 16 Sept. 1992, M. Le Breton, two adults found on the underside of *Polysticulus cinnabarinus* in open woodland (LE BRETON & VAARWERK 1993); Kemps Creek, Sydney, New South Wales, 31 Oct. 1992, M. Le Breton, numerous adults and larvae observed on *P. cinnabarinus* in open forest (LE BRETON & VAARWERK 1993); Hoxton Park, Sydney, New South Wales, 31 Oct. 1992, M. Le Breton, several adults on *P. cinnabarinus* growing on a fallen log of *Eucalyptus* sp. in a *Eucalyptus maculata* forest (LE BRETON & VAARWERK 1993); Kummell, Sydney, New South Wales, 25 Nov. 1993, M. Le Breton, several adults on and near *P. cinnabarinus* growing on *Banksia* (Proteaceae) and *Melaleuca* (Myrtaceae) in burnt *Banksia-Melaleuca* coastal heathland (LE BRETON & VAARWERK 1993); Pokolbin State Forest, near Cessnock, New South Wales, 16 Jan. 1993, M. Le Breton, four adults collected from the underside of *Trametes lactinea*, growing underneath a log (LE BRETON & VAARWERK 1993); Castlereagh State Forest, New South Wales, 28 Aug. 1993, M. Le Breton, six adults on *T. lactinea* and four others in a hole of another *T. lactinea* growing on the underside of ironbark logs (*Eucalyptus fibrosa* F. Muell. ssp. *fibrosa*) (LE BRETON & VAARWERK 1993); Sawyers Gully, Cessnock area, New South Wales, 8 May 1995, T. J. Hawkeswood & J. R. Turner, one adult from *Polyporus* sp. (*P. squamosus*?) growing on dead log of *Eucalyptus crebra* F. Muell. (Myrtaceae) (HAWKESWOOD, TURNER & WELLS, this paper).

Episcaphula pictipennis Crotch

Published collection records with biological data: North Head, Sydney, New South Wales, 3 Dec. 1985, G. A. Webb and J. A. Simpson, two adults from *Pycnoporus coccineus* growing on *Leptospermum laevigatum* (Sol. ex Gaertn.) F. Muell. (Myrtaceae) (WEBB & SIMPSON 1991); Sawyers Gully, Cessnock area, New South Wales, 8 May 1995, T. J. Hawkeswood & J. R. Turner, one adult from *Polyporus* sp. (*P. squamosus*?) growing on dead log of *Eucalyptus crebra* F. Muell. (Myrtaceae) (HAWKESWOOD, TURNER & WELLS, this paper).

Episcaphula rufolineata Wilson

Published collection records with biological data: Mt. Glorious, c. 25 km NW of Brisbane, Queensland, 11 Sept. 1982, T. J. Hawkeswood, several adults feeding on the underside of *Ganoderma applanatum* growing on a fallen log in rainforest (HAWKESWOOD 1986); Mt. Glorious, Queensland, 15 Oct. 1983, T. J. Hawkeswood, several adults and larvae feeding on a white *Poria* sp. growing on a small log in rainforest (HAWKESWOOD 1986).

Thallis australasiae Lea

Published collection records with biological data: Pilliga East State Forest, New South Wales, 20 Jan. 1983, G. A. Webb and J. A. Simpson, one adult on *Polyporus myliitae* on ground (WEBB & SIMPSON 1991).

Thallis compta Erichson

Published collection records with biological data: Sawyers Gully, Cessnock area, New South Wales, 8 May 1995, J. R. Turner, one adult associated with hyphae of *Polyporus* sp. (*P. squamosus*?) (HAWKESWOOD, TURNER & WELLS, this paper).

Thallis erichsoni Crotch

Published collection records with biological data: Rungli Downs, via Helidon, Queensland, 13 Oct. 1985, T. J. Hawkeswood, one adult on *Pseudotrametes gibbosus* on fallen log of *Eucalyptus propinqua* Deane et Maiden (Myrtaceae) (HAWKESWOOD 1990).

Thallis janthina Erichson

Published collection records with biological data: Coolangubra State Forest, New South Wales, Jan. 1985, G. A. Webb and J. A. Simpson, 68 adults from *Piptoporus portentosus* on ground in *Eucalyptus* forest (WEBB & SIMPSON 1991); Kosciusko National Park, New South Wales, Jan. 1985, G. A. Webb and J. A. Simpson, 15 adults from *Piptoporus portentosus* growing on *Eucalyptus* sp. (Myrtaceae) (WEBB & SIMPSON 1991); Nundle State Forest, New South Wales, 6 April 1982, G. A. Webb and J. A. Simpson, seven adults from *Piptoporus portentosus* on ground, fallen from *Eucalyptus* sp. (Myrtaceae) (WEBB & SIMPSON 1991).

Thallis vinula Erichson

Published collection records with biological data: Coolangubra State Forest, New South Wales, Jan. 1985, G. A. Webb and J. A. Simpson, three adults collected from *Piptoporus portentosus*, on ground in *Eucalyptus* forest (WEBB & SIMPSON 1991); Shooters Hill, Sydney, New South Wales, 12 April 1986, G. A. Webb and J. A. Simpson, 11 adults from *Polyporus squamosus*, growing on *Eucalyptus dalrympleana* Maiden (Myrtaceae) (WEBB & SIMPSON 1991).

Discussion

Without exception, all of the species of Erotylidae mentioned in this paper feed as adults and larvae on the basidiocarps and hyphae of Polyporaceae fungi. *Episcaphula australis* (Boisduval) is most often found feeding as adults and larvae on the red bracket fungus, *Pycnoporus coccineus* (= *Polystictus cinnabarinus*) (see illustrations in HAWKESWOOD 1987, 1991, 1992). The orange-red colour pattern with black blotches provide camouflage for the adults against the red fungal fruiting bodies of *P. coccineus*. However, other fungal hosts for *E. australis* are known, including non-red Polyporaceae e.g. *Poria* sp. and *Trametes lactinea*. The large species of Erotylidae such as *Episcaphula australis* and *E. rufolineata*, seem to prefer fungal bodies which are larger than 5 cm in diameter, and basidiocarps which are fresh, are not usually colonized by these erotylids until the spores have been released from the basidiopores and the basidiocarps become somewhat worn and decayed. Large populations of some Erotylidae, e.g. *Cnecosa insueta* and *Thallis* spp., may be bred from field-collected bracket fungi, but in the field, usually only a few adults are found associated with any particular host fungus basidiocarp (HAWKESWOOD 1986, 1991, 1992, WEBB & SIMPSON 1991; LE BRETON & VAARWERK 1993). It is possible that predation and parasitism are important in the life-cycles of these Erotylidae, although there may in fact be a high success rate for some species in developing from pupae to adults and that the adults disperse to other fungi in the general area soon after emergence so that the ratio of number of adults to number of basidiocarps becomes small.

The specialization of these Australian Erotylidae on Polyporaceae fungi suggests a close co-evolutionary relationship, which probably originated, in some cases, during Cretaceous times when rainforest communities dominated the Australian and other landmasses. At least one of the above-mentioned species, *Episcaphula rufolineata*, is still predominantly found in rainforests (in subtropical rainforests of south-eastern Queensland and north-eastern New South Wales) (HAWKESWOOD 1986, 1987). As the Australian continent became drier during the Tertiary and later, Erotylidae radiated to feed on bracket fungi growing on more mesic hosts such as the dominant plant genera *Eucalyptus* (Myrtaceae) and *Acacia* (Mimosaceae).

Evolutionary success of such species as *Episcaphula australis* may be attributed to maintenance of moderately large, localized populations, protective coloration, escape mechanisms (free-fall and thanatosis), dispersability of adults by active crawling (since flight seems rare) and adaptive tolerance as a species to differing climatic conditions. Overwintering may also be an important factor in the survival of *E. australis* (HAWKESWOOD 1986, 1987, 1991, 1992).

The study of the biology and fungal hosts of Erotylidae is still in its infancy in Australia and many more host records and biological observations are sure to be produced with further field research and laboratory work.

Acknowledgements

TJH and JRT would like to thank R. W. WELLS for transport to the Sawyers Gully site. JRT would also like to thank M. S. MOULDS for permission to examine specimens in the collection of the Entomology Department of the Australian Museum in Sydney, New South Wales. This research was undertaken on private funds of the authors.

References

- FROGGATT, W. W. (1907): Australian Insects. – W. Brooks & Co., Sydney: 1–449
- HAWKESWOOD, T. J. (1986): Notes on two species of Australian fungus beetles (Coleoptera: Erotylidae). – *Coleopterists Bulletin*, **40**: 27–28
- HAWKESWOOD, T. J. (1987): Beetles of Australia. – Angus & Robertson Publishers, Sydney: VIII + 248
- HAWKESWOOD, T. J. (1990): Neue Wirtsangaben für Imagines einiger pilzfressender Käfer (Coleoptera) von New South Wales und Queensland, Australien. – *Entomologische Zeitschrift*, **100**: 93–98
- HAWKESWOOD, T. J. (1991): Zu Biologie und Wirtspilzen des australischen Pilzkäfers *Episcaphula australis* (Boisduval) (Coleoptera: Erotylidae). – *Entomologische Zeitschrift*, **101**: 263–268
- HAWKESWOOD, T. J. (1992): Review of the biology and host fungi of the Australian fungus beetle, *Episcaphula australis* (Boisduval) (Coleoptera: Erotylidae). – *Sydney Basin Naturalist*, **1**: 94–96
- LE BRETON, M. & VAARWERK, M. (1993): An additional adult host and some localities for the Australian fungus beetle, *Episcaphula australis* (Boisduval) (Coleoptera: Erotylidae). – *Sydney Basin Naturalist*, **2**: 30
- MCKEOWN, K. C. (1942): Australian Insects – Royal Zoological Society of New South Wales, Sydney: 1–442
- MCKEOWN, K. C. (1949): Australian Insects. XXXV. Coleoptera 12 – the Fungus Beetles. – *Australian Museum Magazine*, **9**: 348–349
- TILLYARD, R. J. (1926): Insects of Australia and New Zealand. – Angus & Robertson Ltd., Sydney: 1–560
- WEBB, G. A. & SIMPSON, J. A. (1991): Notes on some Australian fungus beetles and their hosts and parasites (Coleoptera). – *Coleopterists Bulletin*, **45**: 42–44
- WILSON, F. E. (1921): An entomologist in southern Queensland. – *Victorian Naturalist*, **38**: 54–56

Received on 16 August, 1996

TREVOR J. HAWKESWOOD, PO Box 39, Hastings Point, New South Wales, 2489, Australia
JAMES R. TURNER, PO Box 371, Penrith, New South Wales, 2750, Australia
RICHARD W. WELLS, PO Box 409, Katoomba, New South Wales, 2780, Australia