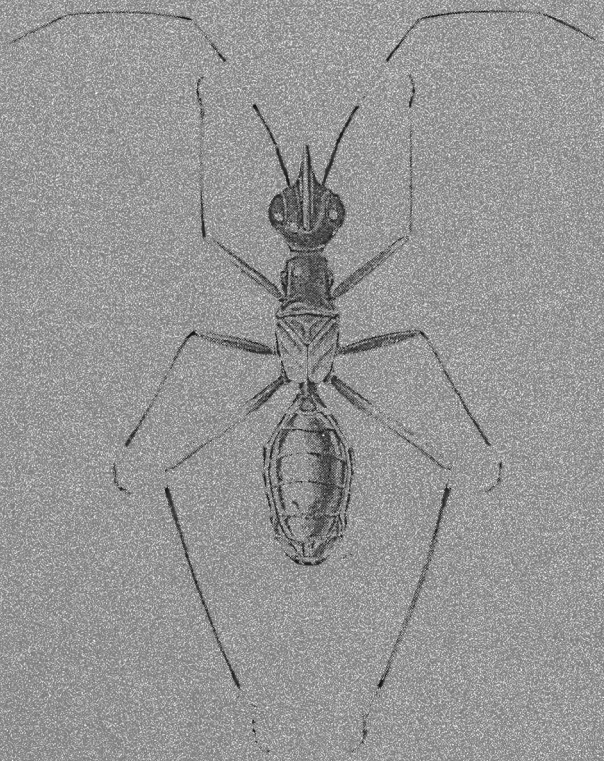
THE AUSTRALIAN Entomologist

published by
THE ENTOMOLOGICAL SOCIETY OF QUEENSLAND



Volume 37, Part 1, 26 March 2010
Price: $8.00 per part

ISSN 1320 6133

THE AUSTRALIAN ENTOMOLOGIST
ABN#: 15 875 103 670

The Australian Entomologist is a non-profit journal published in four parts annually by the Entomological Society of Queensland and is devoted to entomology of the Australian Region, including New Zealand, Papua New Guinea and islands of the south-western Pacific. Articles are accepted from amateur and professional entomologists. The journal is produced independently and subscription to the journal is not included with membership of the society.

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Cover: This undescribed species of *Myrmecoroides* (Heteroptera: Miridae) is about 5 mm in length and occurs along the Great Dividing Range from southeast Queensland to Victoria. It is found on native grasses. The species is sexually dimorphic, with fully-winged males and short-winged females (illustrated here). All species of *Myrmecoroides* are strongly ant-mimetic. This species is being described by Gerry Cassis of the University of New South Wales and Michael Wall of the San Diego Natural History Museum.
Illustration by Hannah Finlay.

A REVIEW OF THE FRUIT FLY TRIBE TEPHRELLINI (DIPTERA: TEPHRITIDAE: TEPHRITINAE) IN THE INDO-AUSTRALIAN REGION

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Abstract

Eight genera and 17 species of Indo-Australian Tephritidae are placed in the tribe Tephrellini. *Pristaciura* Hendel and *Indaciura* Hering are removed from synonymy with *Oxyaciura* Hendel and *Indaciura* is placed as a new synonym of *Pristaciura*, resulting in three new combinations: *P. formosae* (Hendel), *P. monochaeta* (Bezzi) and *P. xanthotricha* (Bezzi). *Pristaciura incisa* Hendel, stat. rev. is removed from synonymy with *P. xanthotricha*, with which it has been widely confused. A key to the genera is included.

Introduction

The fruit fly tribe Tephrellini is a primarily Afrotropical group of generally black flies with extensively black-patterned wings (Hancock 1990, 1991, Hancock *et al.* 2003). They are only moderately represented in the Palaearctic, Oriental and Indo-Australian regions. The six groups of genera recognised by Hancock (1990) were condensed to three groups by Hancock *et al.* (2003), reflecting their host plant preferences of Acanthaceae, Lamiaceae or Verbenaceae. Only the *Metasphenisca* and *Sphaeniscus* groups occur in the Indo-Australian region; the Verbenaceae-feeding *Munroella* group is entirely Afrotropical. Eight genera and 17 species (one undescribed) are known from the region.

Key to Indo-Australian genera

1 Wing with only one hyaline indentation from costa beyond stigma [cell sc]; two pairs each of frontal and scutellar setae ..... *Sphaeniscus* Becker

\- Wing with two hyaline indentations from costa beyond stigma; three (or more) pairs of frontal setae and one or two pairs of scutellar setae 2

2 Two pairs of scutellar setae (apicals and basals) 3

\- One pair of scutellar setae (basals only) 4

3 Wing base with a narrow, complete dark costal band connecting with the dark stigma; discal cell without isolated hyaline spots, at most with small posterior indentations ..... *Metasphenisca* Hendel

\- Wing base hyaline without a dark costal band; discal cell with two large, rounded hyaline spots ..... *Pediapelta* Munro

4 Wing with three narrow posterior hyaline indentations, the basal pair extending weakly into discal cell; cell r_{4+5} without a large isolated hyaline spot beyond apex of discal cell ..... *Tephraciura* Hering

\- Wing with posterior hyaline indentations not entering discal cell; cell r_{4+5} with a large isolated hyaline spot beyond apex of discal cell 5

5 Wing base largely dark, normally with a hyaline indentation across cell c and base of cell r_1; discal cell with one large isolated hyaline spot near apex; frons with thick, pale pubescence 6

- Wing base largely hyaline, at most with cell bc darkened or with a short, isolated costal band; discal cell normally with two isolated hyaline spots; frons without thick, pale pubescence 7

6 Two pairs of orbital setae ..... *Curticella* Hardy

- Only one pair of orbital setae ..... *Pristaciura* Hendel

7 Wing base with a dark costal spot at apex of cell bc; four posterior hyaline indentations ..... *Tephrella* Bezzi

- Wing base with cell bc darkened or with a short, isolated costal band; three posterior hyaline indentations 8

8 Wing base with cell bc darkened; two pairs of orbital setae; ocellar setae well developed ..... *Aciura* Robineau-Desvoidy

- Wing base with a narrow costal band over cell bc and basal half of cell c, separated from stigma by a hyaline gap; only one pair of orbital setae; ocellar setae vestigial ..... *Oxyaciura* Hendel*

* Not yet recorded but *Oxyaciura tibialis* (Robineau-Desvoidy) is known as far east as Afghanistan and NW China (Xinjiang) and might occur within the region.

The Indo-Australian fauna

Metasphenisca group of genera

Host plants are the flowerheads or seedpods of Acanthaceae.

Metasphenisca Hendel

Metasphenisca nigricans (Wiedemann) [= *bifaria* (Munro)] is known from southern India (Hancock 2007) and Sri Lanka (Hering 1956). It has only two hyaline indentations on the posterior margin of the wing, has been bred from the pods of *Barleria* sp. (Munro 1947) and was illustrated by Munro (1947).

Metasphenisca reinhardi (Wiedemann) [= *malayana* Hering] is known from Pakistan, India, Sri Lanka, Burma, Thailand and Cambodia. It has three hyaline indentations on the posterior margin of the wing and was illustrated by Munro (1947) and Hardy (1973).

Tephraciura Hering

Tephraciura basimacula (Bezzi) [= *basivitta* Hering] is known from southern India, including the Lakshadweep Islands, and Sri Lanka. The legs are mostly black. Illustrated by Hering (1951).

Tephraciura pachmarica Agarwal & Kapoor is known from central India. The legs are mostly yellow. Illustrated by Agarwal and Kapoor (1988).

Sphaeniscus group of genera

Host plants are the flowerheads of Lamiaceae.

Aciura Robineau-Desvoidy

Aciura afghana (Hering) [= *kashmirica* Zaka-ur-Rab] is known from NE Afghanistan and Kashmir, NW India (Hancock and McGuire 2002). It has pale postocular setae. Illustrated by Hering (1961) and Zaka-ur-Rab (1977).

Curticella Hardy

Curticella approximans (Walker) is known from Sulawesi and West Papua in Indonesia, mainland Papua New Guinea and Deslacs Island in the Bismarck Archipelago. All head setae are dark and the third antennal segment is comparatively elongate, four to five times longer than wide. Illustrated by Hardy (1959, 1987).

Hendel (1915: 460) noted only 1 pair of orbital setae for *C. approximans* and 2 pairs for '*Aciura*' *formosae* Hendel, presumably a *lapsus* as these species have 2 and 1 pair of orbital setae respectively. This species differs little from those placed in *Pristaciura* and the two genera are possibly synonymous.

Pediapelta Munro

Pediapelta ternaria (Loew) is an African species known in the Indo-Australian region from a single specimen from SE Queensland, Australia (Hancock and Drew 2003), where it appears to have been accidentally introduced. It has dark postocular setae and four posterior hyaline indentations on the wing. Collected on *Ocimum suave* in Africa (Munro 1947) and illustrated by Munro (1947) and Hancock and Drew (2003).

This and other African species currently included in *Pediapelta* Munro (see Munro 1947, Hancock *et al.* 2003) differ from the genotype (*P. spadicescens* Munro) in significant wing characters. In *P. spadicescens* the wing base is infuscated and cell c has a dark costal patch medially, while the large hyaline spot in cell r_{4+5} lies before, not beyond, the apex of the discal cell. These characters suggest that all other species are currently misplaced and, as Munro (1947) suggested, show a greater affinity with those placed in *Dicheniotes* Munro. However, pending further study the current arrangement is maintained.

Pristaciura Hendel, stat. rev.

Indaciura Hering is regarded here as a new synonym of *Pristaciura*; the relationship of its type species, *Aciura formosae* Hendel, with *Pristaciura incisa* Hendel and '*Oxyaciura*' *monochaeta* (Bezzi) was discussed by Hancock (1990), who placed all three species in *Oxyaciura* Hendel. However, the type species of *Oxyaciura*, *O. tibialis*, has a mostly hyaline wing base (with a short, isolated costal band) and a strongly angled apex to cell bcu; it appears to be more closely related to species placed in *Aciura*, differing in the single pair of orbital setae and vestigial ocellar setae.

In *Pristaciura* (and *Curticella*) the lateral vertical setae are weak or vestigial, the ocellar setae are weak but distinct, the frontal pubescence is thick and pale (thin and dark in *Oxyaciura* and its allies) and wing cell bcu is weakly angled apically. Accordingly, *Pristaciura* is reinstated as a valid genus to include five Indo-Australian species, with *Curticella* as its closest ally.

Pristaciura formosae (Hendel), **comb. n.** is known from Taiwan and the Ryukyu Islands, Japan. It has the postocellar, paravertical and uppermost occipital seta flattened and whitish, the postocular setae thin and black and four posterior hyaline indentations on the wing; the first, in the middle of cell cu_1, is short and almost at right angles to the cell; the third, basally in cell m, is relatively narrow and almost perpendicular. Illustrated by Shiraki (1968). Formerly placed in *Oxyaciura* and type species of *Indaciura*.

Pristaciura incisa Hendel, **stat. rev.** is known from Sri Lanka, southern India, southern Thailand, Vietnam, SE China (Hainan) and Java in Indonesia. It differs from *P. formosae* in having only three posterior hyaline indentations on the wing, that in the middle of cell cu_1 long and oblique. From both *P. formosae* and *P. xanthotricha* (see below) it differs in having the postocular setae also flattened and whitish and the posterior hyaline indentations broader, with that in cell m distinctly curved posteriorly. Originally described from Sri Lanka (Hendel 1928) and illustrated by Hardy (1973) and Wang (1998) [both as *P. xanthotricha*]. Formerly placed as a synonym of *P. xanthotricha* and type species of *Pristaciura*.

Pristaciura monochaeta (Bezzi), **comb. n.** is known from northern India and Nepal; a record from Sri Lanka (Hardy 1971) is based on a headless male and requires confirmation [*cf. P. incisa*, above]. A record from SW China (Wang 1998) belongs elsewhere (see below). All the head setae are black and narrow and there are three posterior hyaline indentations on the wing, that in the middle of cell cu_1 long and oblique and that in cell m distinctly curved. Illustrated by Bezzi (1913) and Hardy (1964). Formerly placed in *Oxyaciura*.

Pristaciura xanthotricha (Bezzi), **comb. n.** is known with certainty only from the types from northern India and southern Burma; other records appear to be misidentifications of *P. incisa*. It resembles *P. formosae* in having the postocellar, paravertical and uppermost occipital seta flattened and whitish and the postocular setae thin and black, and the posterior hyaline indentations on the wing relatively narrow, that in cell m almost perpendicular (see Bezzi 1913). It differs from *P. formosae* in having the basal hyaline indentation in cells c and r_1 narrow or absent and only three posterior hyaline indentations on the wing, that in the middle of cell cu_1 long and oblique. Illustrated by Bezzi (1913). Formerly placed in *Oxyaciura* or *Indaciura*.

An additional, undescribed species is known from southern China (Yunnan and Hong Kong), characterised by the following combination of characters: head setae as in *P. xanthotricha*; three posterior hyaline indentations on

the wing, that in cell m distinctly curved, that in the middle of cell cu_1 short and perpendicular; basal hyaline indentation in cells c and r_1 weak or absent; alula brown. Illustrated by Wang (1998, as '*Oxyaciura*' *monochaeta*).

Sphaeniscus Becker

Sphaeniscus atilius (Walker) is widespread in Southeast Asia from India to Japan and East Timor and in the Pacific, including New Guinea, Australia and New Caledonia. It has four posterior hyaline indentations on the wing and no isolated discal spots. It breeds in *Hyptis capitata* in Malaysia (Hardy 1955) and *Perilla frutescens* in eastern Asia (Wang 1998) and was illustrated by Hardy (1973, 1987) and Wang (1998).

Sphaeniscus binoculatus (Bezzi) is known only from Fiji, where it breeds in *Coleus blumei* (Hancock and Drew 1994). It resembles *S. atilius* but has the inner and outer of the four posterior hyaline indentations on the wing interrupted to produce a pair of large, isolated discal spots. Illustrated by Bezzi (1928) and Hardy (1955).

Sphaeniscus melanotrichotus Hering is known only from Sri Lanka. It resembles *S. atilius* but has the basal half of the hind tibiae black, not yellow and the basal dark transverse band on the wing is broader, occupying most of cell c rather than just the apical half. Illustrated by Hering (1956).

Sphaeniscus quadrincisus (Wiedemann) is known from Taiwan, India, Sri Lanka, Thailand, Vietnam and Java in Indonesia. It has only three posterior hyaline indentations on the wing. Collected on *Ocimum* sp. in Thailand (Hancock and McGuire 2002) and illustrated by Hardy (1973, 1987).

Tephrella Bezzi

Tephrella decipiens Bezzi is known only from NE India and Burma. It has pale postocular setae and was illustrated by Bezzi (1913) and Munro (1947). Only females have been recorded.

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RECORDS OF THE TRAMP ANT *PYRAMICA MEMBRANIFERA* (EMERY) (HYMENOPTERA: FORMICIDAE: MYRMICINAE) FROM AUSTRALIA

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Abstract

New Australian distribution records for the tramp dacetine ant, *Pyramica membranifera* (Emery) are provided. Previously recorded only from the Top End of the Northern Territory, the species is now known to be widely distributed in subtropical and tropical Queensland, with records from suburban Brisbane and the Blackall Range in SE Queensland, the Proserpine region in central Queensland, Cairns in northern Queensland and Heron Island in the southern Great Barrier Reef. The Queensland records are predominantly from relatively disturbed environments, including suburban and agricultural landscapes, suggesting that *P. membranifera* is introduced. Its wide distribution suggests that it has been present in Australia for a considerable length of time, but its cryptic nature and propensity to occur in disturbed habitats probably contributed to the delay in its detection.

Introduction

Bolton (2000) revised the world species of *Pyramica* Roger, recording six species from Australia. He provided a key to the Australian species in which he also included the widespread tropical and warm-temperate tramp species *Pyramica membranifera* (Emery), which was not known from Australia at the time but which he suspected would eventually be found there (Bolton 2000). Andersen *et al.* (2007) subsequently recorded *P. membranifera* from a patch of monsoonal rainforest near Darwin in the Northern Territory. They speculated that the species may be native to northern Australia, based on the distance of the rainforest patch from the nearest urban centre (located approximately 40 km south-east of Darwin) and its lack of human infrastructure. However, additional records of *P. membranifera* from Queensland and the Northern Territory suggest that the species is an introduced tramp favouring disturbed environments.

Baroni Urbani and de Andrade (2007) considered *Pyramica* to be a junior synonym of *Strumigenys* Smith and listed this species as *Strumigenys membranifera*. However, until this synonymy is supported by additional evidence, we follow Bolton (2000) and refer to the species as *Pyramica membranifera*.

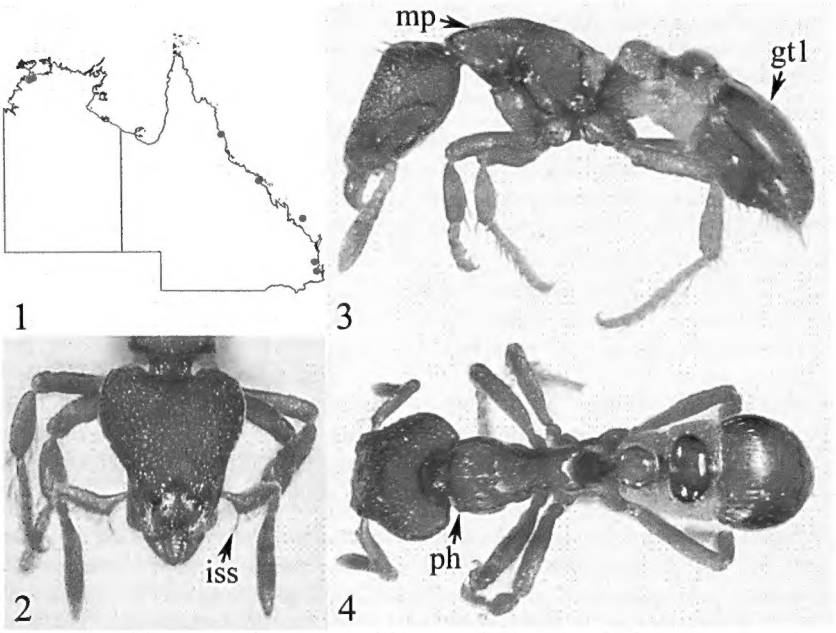
Pyramica membranifera (Emery)

(Figs 2-4)

Material examined. NORTHERN TERRITORY: 40 workers, Territory Wildlife Park, 40 km south-east of Darwin, 12°42′S, 130°59′E, ii-iv.2007, monsoonal rainforest,

Winkler sacks; 2 workers, Fogg Dam, 50 km SE Darwin, monsoonal rainforest, extracted from litter taken from nest mounds of Orange-footed scrub fowl. QUEENSLAND: 2 workers, 16°51'38.3"S, 145°41'13"E, Caravonica, Cairns, 19.v.2009, E. Moreau, R. Coleman, sample no. SSEA 433144; 1 queen, 20.519°S, 148.557°E, Proserpine, Thompson Creek, site XY15, closed forest, 6.xi.2007-13.ii.2008, 30 m, pitfall, [R] Raven, 15270; 12 workers, 23°26'34.6"S, 151°55'02.1"E, Heron Island site 4, *Pisonia grandis* forest; day hand collect., nest in soil beneath log, C.J. Burwell; 1 worker, Wootha, Maleny District, Blackall Range, 26°47'10"S, 152°48'30"E, iv.2004, litter extract, shaded experimental plot within pasture matrix, A. Nakamura; 1 worker, [Brisbane], Chapel Hill, Cassandra St, 27°30'S, 152°57'E, 22-23.iii.2003, 150 m, C.J. Burwell, 51131 (QMT114635).

NT specimens in CSIRO Tropical Ecosystems Research Centre, Darwin; Qld specimens in Queensland Museum, Brisbane; except 2 workers from Territory Wildlife Park and 3 workers from Heron Island in Australian National Insect Collection, Canberra and 1 worker from Caravonica in Plant Biosecurity Science Collection, Queensland Primary Industries and Fisheries, Cairns.



Figs 1-4. *Pyramica membranifera* (Emery). (1) known distribution in Australia; (2) frontal view of head; (3) lateral habitus; (4) dorsal habitus. gt1 = first gastral tergite; iss = incurved spatulate seta projecting towards base of scape; mp = marginate pronotum; ph = pronotal humerus. (Figs 2-4 of worker from Heron Island).

Comments. Pyramica membranifera is widespread in Queensland, occurring from northern (Cairns) and central (Proserpine) areas to southeastern Queensland (Brisbane and the Blackall Range) (Fig. 1). It also occurs at Heron Island, a coral cay in the southern Great Barrier Reef about 80 km off the coast of Gladstone (Fig. 1).

In Australia, *Pyramica membranifera* can be easily identified using the key to *Pyramica* species in Bolton (2000). It can be distinguished from other known Australian *Pyramica* species by a combination of the following: leading edge of scape with conspicuous row of projecting spatulate hairs, one or more of which curves towards the base of the scape (Fig. 2, iss); pronotum laterally margined (Fig. 3, mp), dorsum mostly smooth; pronotal humeri without projecting hairs (Fig. 4, ph); first gastral tergite without standing hairs (Fig. 3, gt1).

Discussion

Pyramica membranifera is a very widely distributed, tropical and warm-temperate tramp species (see Bolton 1983, 2000 for a summary of its distribution). Brown and Wilson (1959) suggested it was native to Africa, but Bolton (1983) considered its origin uncertain. Based on the relative isolation and undisturbed nature of the patch of monsoonal rainforest in the Territory Wildlife Park where *P. membranifera* was first recorded in Australia, Andersen *et al.* (2007) suggested the species may be native to northern Australia, like other tropical tramp ants in the Indo-Pacific region such as *Tetramorium lanuginosum* Mayr, *Cardiocondyla wroughtoni* (Forel) and *Strumigenys emmae* (Emery) (Andersen *et al.* 2007). The second known Northern Territory locality (Fogg Dam) is also relatively undisturbed and remote from an urban centre. However, other introduced species such as *Tetramorium simillimum* (Smith) (Bolton 1977) and *Monomorium floricola* (Jerdon) (Heterick 2001), were recorded from the Territory Wildlife Park site (Andersen *et al.* 2007) and introduced species such as *Paratrechina longicornis* (Latreille) also occur at Fogg Dam (A. Andersen unpublished data).

In contrast to the Northern Territory records, the Queensland collections of *P. membranifera* are mostly from disturbed habitats and there seems little doubt that the species is introduced there. The Queensland localities include suburban backyards, cattle pasture and degraded riparian vegetation within areas grazed by cattle. On Heron Island, a single nest was located beneath a log in relatively undisturbed *Pisonia grandis* R.Br. forest. However, Heron Island has an ant fauna that is dominated by introduced tramp species, several of which have invaded the closed *Pisonia* forest that dominates the vegetation of the island (CJB unpublished data). This record suggests that the Northern Territory populations may also be introduced.

The broad range of the species within tropical and subtropical Queensland (Fig. 1) suggests that it has been in Australia for a considerable length of

time. The fact that it has not been detected until recently probably stems from two factors: firstly, *P. membranifera* is a small, cryptic, soil and litter-inhabiting species that is difficult to collect as it rarely falls into pitfall traps and is not easily collected by hand, due to its habit of remaining motionless when disturbed and, secondly, the species appears to favour disturbed sites such as suburban gardens and pastures, habitats that are rarely targeted for survey by myrmecologists.

Acknowledgements

We thank Geoff Thompson and Karin Koch (Queensland Museum) for their skilful preparation of the figures of the worker specimen and the distribution map respectively. Thanks also to Andrew McDougall (Queensland Parks and Wildlife Service) for the opportunity for Queensland Museum staff to conduct fieldwork on Heron Island, and the Electric Ant Control Centre (EACC – Queensland Primary Industries and Fisheries) team for sending the specimens from Cairns.

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PLATYPLEURA TEPPERI GODING & FROGGATT, 1904 (CICADOIDEA: CICADIDAE), A MADAGASCAN CICADA ERRONEOUSLY RECORDED FROM AUSTRALIA

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Abstract

The identity of the cicada *Platypleura tepperi* Goding & Froggatt, 1904 is resolved. It is not an Australian species, but a junior synonym of the Madagascan *Yanga guttulata* (Signoret, 1860).

Introduction

Platypleura tepperi was described by Goding and Froggatt (1904) from 'Northern Territory, Australia' from three specimens supposedly collected by J.G. Tepper, then entomologist at the South Australian Museum (SAM). Only a single specimen could be traced, a syntype male in the SAM (Figs 1-7). Although this specimen has long been considered of doubtful Australian origin (Burns 1957), its true origins have never been clarified. I have recently re-examined the SAM specimen and it has become clear that it is in fact a synonym of the Madagascan species *Yanga guttulata* (Signoret, 1860).

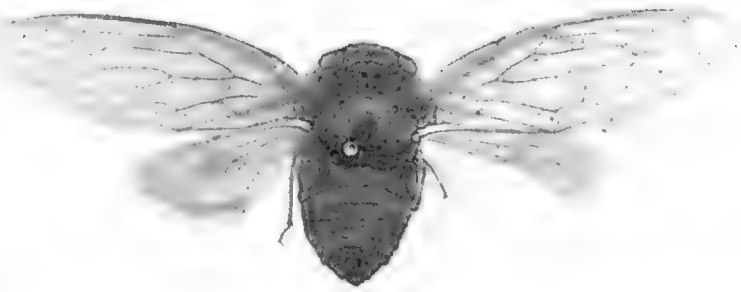


Fig. 1. Male syntype of *Platypleura tepperi*, SAM. Approximately 1.2 x natural size.

Yanga guttulata (Signoret)

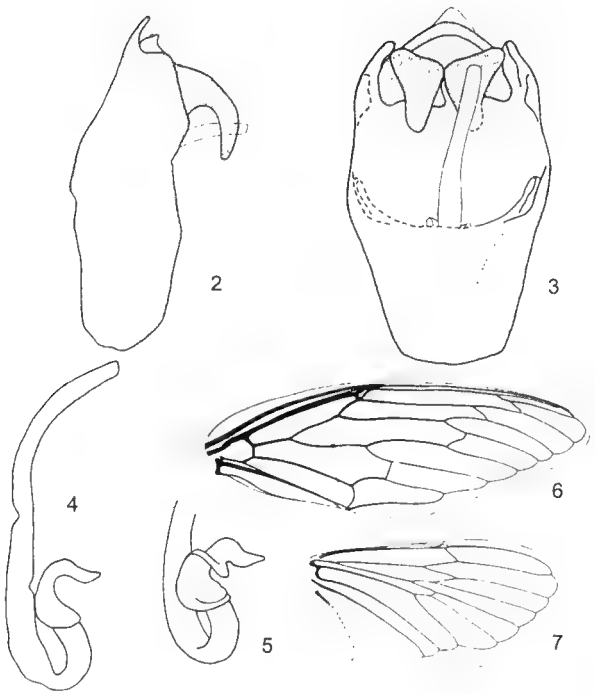
Platypleura guttulata Signoret, 1860: 178, pl. 4.

Yanga guttularis [*sic*]: Distant, 1905: 196.

Yanga guttulata: Distant, 1906: 17.

Platypleura tepperi Goding & Froggatt, 1904: 568-69. Male syntype in SAM, labelled 'N.Territory', '[?]:8', 'Platypleura Tepperi/ God.&Fr/ NorthernTerritory'; examined. **Syn. n.**

The SAM syntype of *P. tepperi* is unfortunately in poor condition, with faded colour, damaged hind wings and damaged genitalia. However, there is no doubt that the wing and body markings, colour and morphology match perfectly those of *Y. guttulata*, as do the male genitalia (Figs 2-5), although the latter do not always clearly delineate *Yanga* Distant spp. in Madagascar.



Figs 2-7. Male syntype of *Platypleura tepperi*. (2-3) genitalia in lateral and ventral views; (4-5) aedeagus in lateral view and basal plate in lateroventral view; (6-7) fore and hind wings showing venation.

Acknowledgements

Michel Boulard (MNHN, Paris), Martin Villet (Rhodes University, Grahamstown) and Mick Webb (NHM, London) helped in determining the identity of *P. tepperi*. Peter Hudson kindly lent the syntype and Ivan Nozaic did the drawings.

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THE LIFE HISTORY OF THE HAWK MOTH *LANGIA TROPICUS* MOULDS (LEPIDOPTERA: SPHINGIDAE) TOGETHER WITH NEW DISTRIBUTION RECORDS FOR THE SPECIES

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Abstract

The early stages of the hawk moth *Langia tropicus* Moulds are described from northern Queensland and aspects of the species' biology are discussed. All known larval food plants are members of the coarse-leaved Flame Trees that occur throughout the dry monsoonal tropics of northern Australia, namely *Brachychiton chillagoensis* Guymer, *B. albidus* Guymer and *B. paradoxus* Schott & Endl. (Sterculiaceae). New distribution records from Western Australia and northern Queensland are included.

Introduction

Langia tropicus Moulds, 1983 has been recorded from a wide area across northern Australia, from Kununurra in northeastern Western Australia, across the northern third of the Northern Territory, and in northern Queensland from near Georgetown, Chillagoe and the Coen district (Moulds 1983). From a period commencing in the early 1990s, larvae of *Langia tropicus* have been collected regularly by one of us (DAL) from the Chillagoe district, where they were found feeding on the coarse-leaved Flame Tree *Brachychiton chillagoensis* Guymer and reared through to adults. Subsequently, larvae were also found feeding on the closely allied *Brachychiton albidus* Guymer at the Newcastle Range, 60 km east of Georgetown, from near Mt Surprise, and from Undara National Park, south-west of Mount Garnet, and on *Brachychiton paradoxus* Schott & Endl. from near Coen, also in northern Queensland. However, it was only recently that we were able to observe and photograph all larval instars, again from the Chillagoe district, allowing the complete life history to be documented.

New distribution records

WESTERN AUSTRALIA: 1 ♂, Great Western Hwy, 100 km SE of Derby, 31.xii.1985, M.S. & B.J. Moulds; 1 ♀, Wyndham, 5.i.1966, M.S. & B.J. Moulds. QUEENSLAND: 1 ♀, York Downs, 50 km E of Weipa, 28.xii.1983, M.S. & B.J. Moulds; 3 ♂♂, 2 ♀♀, Archer River xing, 60 km N of Coen, 29.xii.1983 and 9.i.1988, M.S. & B.J. Moulds; 1 ♀, 50 km S of 40 Mile Scrub, 29.xii.2007, Dennis Kitchin; 1 ♂, 4 km N of Mt Surprise, bred/larva, 15.ii.2005, D.A. Lane; 2 final instar larvae observed (both parasitised by tachinid flies), Undara National Park, 12.ix.1999, D.A. Lane.

The above records extend the previously recorded distribution from the eastern Kimberley to the western Kimberley in Western Australia and in Queensland north from Coen to the Archer River and York Downs (some 50 km E of Weipa) on Cape York Peninsula and south-east to the Mt Surprise district (Mt Surprise, Undara and 50 km south of 40 Mile Scrub).

Food plants and habitat

All known larval food plants are members of the coarse-leaved Flame Trees (Sterculiaceae) that occur throughout the dry monsoonal tropics of northern Australia, namely *Brachychiton chillagoensis*, *B. albidus* and *B. paradoxus*.

In the Chillagoe district, *Langia tropicus* favours the extensive limestone outcrop areas where its food plant *B. chillagoensis* grows as a small to medium-sized tree in and on the verges of vine scrub thicket areas that predominately straddle the limestone outcrops. These trees defoliate during the dry season, but following the first wet season storms they respond with a fairly rapid flush of fresh leaf growth.

In the Newcastle Range area, approximately 55-60 km east of Georgetown, and at Mt Surprise, the habitat is more open compared with that of the Chillagoe district, but contains an equally widespread occurrence of coarse-leaved *Brachychiton* food plants, often growing in steep and rocky gullies or escarpment areas where fires rarely reach, allowing the plants to maintain a stronghold. In the Undara district the food plants predominately grow along the collapsed lava tubes in vine scrub habitat.

The group of coarse-leaved Flame Trees includes many other species found across the range of *L. tropicus* and it is likely that several of these also will be found to be host plants. Such species include *B. vitifolius* (Bailey) Guymer and *B. muellerianus* Guymer from the Laura and Coen districts respectively in northern Queensland, *B. megaphyllus* Guymer from the Northern Territory, and *B. incanus* R.Br. and *B. fitzgeraldianus* Guymer, both from the Wyndham and Kununurra districts of northern Western Australia.

Description of early stages

Egg (Fig. 1). Pale yellow in colour, smooth and glossy to the naked eye; subspherical, being slightly elongate and slightly flattened top and bottom; approximately 1.9 mm long, 1.7 mm wide and 1.5 mm high.

First instar larva (Fig. 2). Pale green with pale dull yellow head. Meso- and metathoracic segments wrinkled with transverse rings of folded flesh of similar size, the meso- and metathorax each comprising six such folds, abdominal segment 1 seven folds and abdominal segments 2-7 each with eight; each fold with many small protuberances arranged along its width and each terminating with a minute, fine seta microscopically bifurcate at apex; a row of tubercles along the length of larva either side of dorsal surface largest; these tubercles each carrying a primary seta and arranged as a fused pair mid length on meso- and metathorax, two each evenly spaced on abdominal segments 2-7. Prothoracic shield pale green, indistinct, with 10 primary tubercles spaced more or less evenly around perimeter, each terminating in a fine seta microscopically bifurcate at apex. Head rounded, with many small white tubercles barely discernable; vertex smooth and rounded; ocelli black; antennae muddy pale yellow; mouthparts muddy pale yellow with apices of

mandibles black. Thoracic legs, prolegs and anal prolegs (claspers) pale green. Claspers and anal plate with scattered small tubercles as on body, a submedian pair of these on anal plate much larger than any other, elongate, formed from a fusion of three tubercles, each with a long seta. Spiracles pale green, similarly coloured to thorax and abdomen.

Caudal horn dull pale yellow; slender, approximately 1.5-1.6 mm long; barely curved forwards or straight; throughout its length densely covered in numerous microscopic spine-like tubercles that are similarly coloured to shaft of horn; apex of horn minutely bifurcate, the branches sometimes tending brown, wide apart, very short, conical, aligned in the transverse plane and terminating in a fine almost colourless seta; a few (about 3-5) tubercles that are a little smaller than terminal bifurcation on distal quarter or so of shaft.

Length on hatching approximately 6 mm; length at maturity approximately 9 mm. Width of head capsule approximately 1.2 mm. Duration approximately 3-4 days.

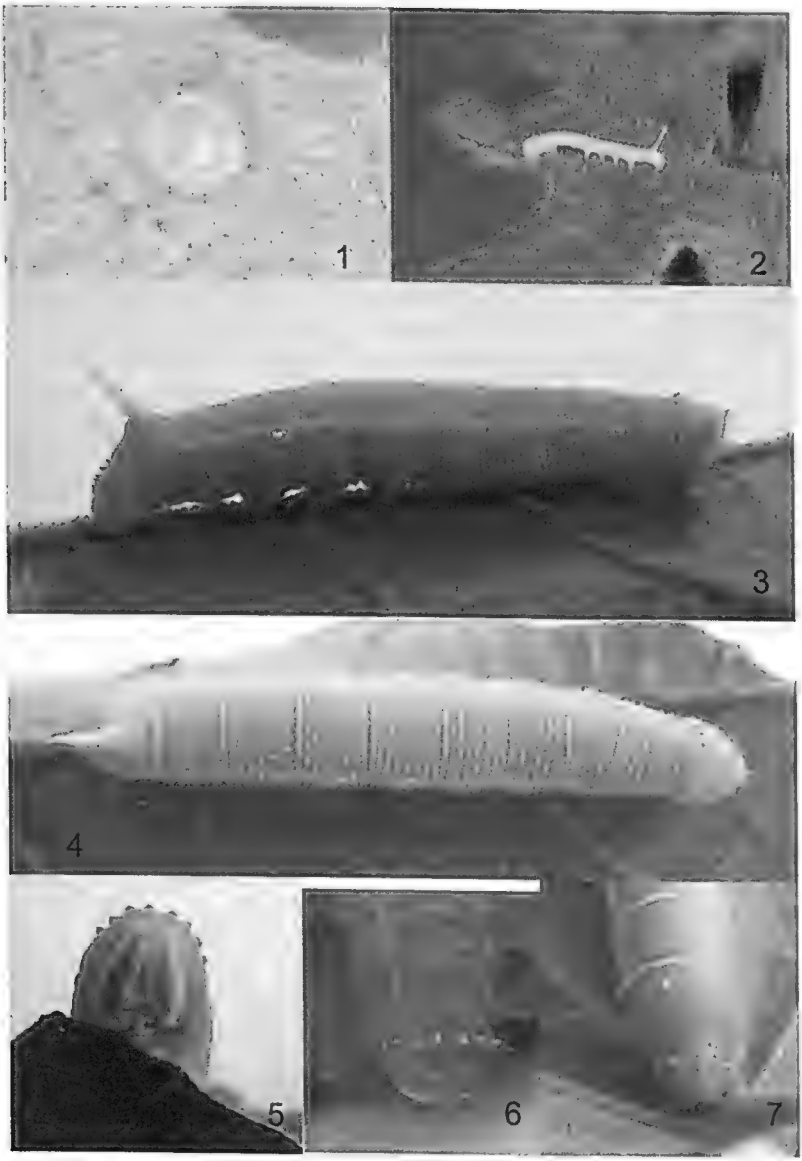
Second instar larva. Pale green with pale muddy green head. Thoracic and abdominal segments folded into multiple transverse fleshy rows with small protuberances, setae as in first instar. Head with many small, pointed, white tubercles (similar to those on body) scattered over surface; vertex bearing a pair of pale yellow conical tubercles either side of coronal suture, larger than any other tubercles on head; ocelli black, antennae muddy pale green; mouthparts muddy pale green with apices of mandibles jet black. Prothoracic shield similar to that of first instar. Thoracic legs, prolegs and anal claspers pale muddy green. Anal plate with scattered small white tubercles as on body, a pair of these at base either side of midline much larger than any other. Spiracles pale green, similarly coloured to thorax and abdomen.

Caudal horn pale brown; approximately 2.4 mm long; bearing many very small sharply-pointed tubercles mostly similarly coloured to shaft but a few black or nearly so; apically bifurcate, the branches much longer than any tubercle, directed outwards at 45° or slightly less.

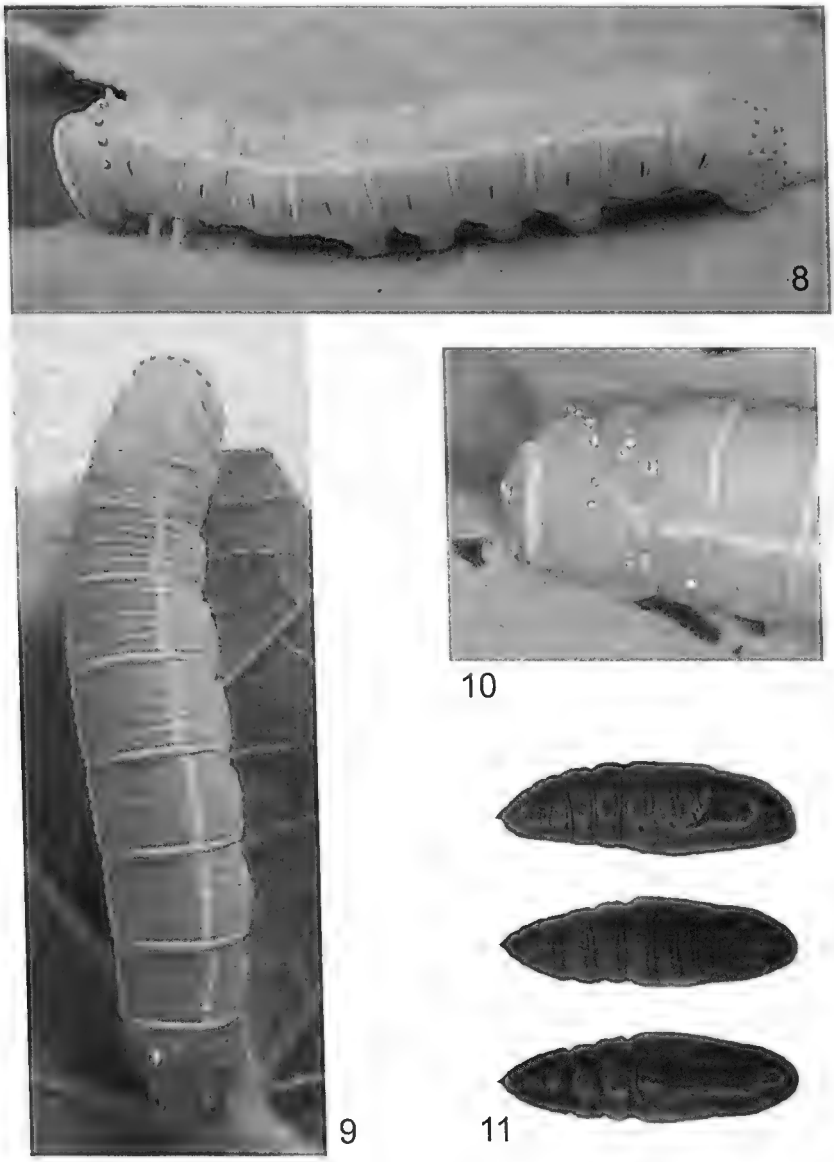
Length at maturity at rest approximately 12 mm. Width of head capsule approximately 1.8 mm. Duration approximately 4 days.

Third instar larva. Similar to second instar. Vertex of head bearing a pair of bright orange conical tubercles clearly larger than all others on the head, one either side of coronal suture, these directed straight up and parallel to each other and each terminating in a microscopic seta.

Caudal horn very pale brown; 3.5 mm long; shaft bearing many short, sharply pointed, conical tubercles of slightly different lengths, most very pale brown but some black; apically bifurcate, the branches no longer than the largest tubercles on shaft, black on their apical half or so, otherwise brown to very pale brown.



Figs 1-7. Early stages of *Langia tropicus*. (1) egg; (2) first instar larva; (3-4) fourth instar larva: (3) lateral view; (4) dorsal view; (5-7) fifth instar larva: (5) head frontal view; (6) head and prothoracic shield dorsal view; (7) eighth abdominal segment, anal plate and caudal horn, oblique view



Figs 8-11. Early stages of *Langia tropicus* (continued). (8-10) fifth instar larva: (8) lateral view; (9) dorsal view; (10) close up of head and thoracic segments, showing strategically placed tachinid fly eggs; (11) pupa: lateral, dorsal and ventral views.

Length at maturity at rest approximately 20 mm. Width of head capsule 2.6 mm. Duration approximately 5 days.

Fourth instar larva (Figs 3-4). Pale green with head a slightly darker green. Thoracic and abdominal segments folded into multiple transverse fleshy rows, each with many small protuberances along its length, these tubercles dull white in colour, all of similar size, conical, and all terminating in a minute simple seta. Prothoracic shield pale bluish green, not sclerotized, bearing eight prominent, bright pink, short, conical tubercles of similar size, each capped white, and more or less evenly spaced across the width of the shield. Head with many small white tubercles (similar to those on body) scattered over surface; vertex of head bearing a pair of conical tubercles, pale pink but tending white apically, clearly larger than any other on the head; ocelli inconspicuous, black or brown; antennae pale green; mouthparts pale green with apices of mandibles jet black. Thoracic legs, prolegs and anal prolegs (claspers) pale muddy green. Anal plate muddy pale green, with pink conical tubercles similar to those on prothoracic shield but not quite as large and not quite as brightly coloured, these more or less evenly spaced mostly around perimeter but 3 interior. Spiracles turquoise, those on abdominal segments a little darker.

Caudal horn pale pink; straight, long (approximately 7.5 mm), slender and gradually tapering to a point; shaft bearing many short, sharply pointed, conical tubercles of slightly different lengths, most similarly coloured to shaft, pale pink but a few black; apically bifurcate, the branches a little longer than the largest tubercles on shaft, pale pink, V-shaped.

Length at maturity at rest approximately 35-45 mm. Width of head capsule 4.9 mm. Duration approximately 6 days.

Fifth instar larva (Figs 5-10). Head, thorax and abdomen pale green over a little more than dorsal half, ventral remainder pale greyish green; non glossy; mesothorax, metathorax and abdominal segments 1-7 divided into transverse fleshy rings. Mesothorax, metathorax and abdomen bearing a pale yellow subdorsal stripe from about anterior of mesothorax to anterior of abdominal segment 8 at which point it abruptly terminates; sometimes a spot of similar colour on abdominal segment 8 near distal end of pale yellow abdominal stripe; yellow pigmentation also narrowly encircling abdominal spiracles somewhat irregular in outline; the distal fleshy fold of mesothorax, metathorax and abdominal segments 1-7 dull pink, most obvious on abdominal segments. Head in frontal view rounded, slightly broader towards base, apical protuberances present in earlier instars absent, pale green with a broad white stripe down the length of each cheek continuing to antennae; median region with a narrower white stripe of slightly less intensity either side of coronal suture and along frontal sutures, frontoclypeal triangle white or greenish white; ocelli mostly translucent white or pale green but usually three distinctly brown; antennae whitish; mouthparts tending white with

apices of mandibles jet black. Prothoracic shield pale bluish green, not markedly sclerotized, bearing eight prominent (collar like), bright pink, short, conical tubercles of similar size, each capped white, and more or less evenly spaced across the width of the shield along its posterior margin; anterior margin with very small white tubercles and some even smaller tubercles scattered elsewhere. Anal plate light bluish green with bright pink conical tubercles similar to those on prothoracic shield, these more or less evenly spaced, most around perimeter but three interior. Prothoracic spiracles turquoise, abdominal spiracles deep bluish green, all with a narrow black vertical midline reaching almost full length. Thoracic legs and ventral prolegs entirely pale greyish green; anal prolegs (claspers) light bluish green with bright pink conical tubercles scattered over surface similar to those on anal plate; crotchets brown.

Caudal horn straight, conical, very short, approximately 1.5-1.7 mm long; salmon pink in colour, tending glossy; surface smooth, lacking noticeable tubercles and setae even at magnification (x50) except at apex; apex smooth and rounded with two very fine short setae spaced apart and angled at about 30° to midline.

Length of mature larva at rest approximately 65 mm (male), 75 mm (female). Width of head capsule approximately 6.5 mm (male), 7.5 mm (female). Duration approximately 8-9 days.

Pupa (Fig. 11). Length 42-50 mm. Dark brown, smooth and glossy; head bluntly rounded and lacking protruding features; abdominal segment 1 totally lacking pits; abdominal segments 2-8 each with a single row of deep pits near anterior margin; abdominal segments 8-10 with many very small pits scattered across surface, most dense on segment 10. Cremaster black; glossy; gnarled; terminating in a linear projection about 0.5 mm long, the apex of which carries a small cluster of gnarled rounded protuberances.

Biology

At Chillagoe, the first adults of *Langia tropicus* emerge following the flush of fresh growth induced by the onset of wet season rains, usually in mid to late December. Adults are nocturnal and remain active throughout the wet season, usually until late March.

Eggs are deposited singly, usually on the underside and rarely on the upperside, of fresh but well developed leaves usually a short distance from the leaf margin. Oviposition occurs only on coarse-leaved *Brachychiton* species, never on the smooth-leaved *Brachychiton diversifolius* R.Br., which also grows in the Chillagoe limestone outcrops along with the host tree *B. chillagoensis*. Extensive searching of *B. diversifolius* has never revealed signs of *Langia tropicus* larvae, or any sign of eggs.

During all instars, larvae rest and feed on the underside of leaves, usually resting along the midrib vein. In this position they are remarkably well

camouflaged, with their colouration closely matching and blending with the pale colouration of the underside leaf pattern.

Larval parasitism by tachinid flies was observed. The flies oviposited on late or final instar larvae, their eggs being placed on the head or thoracic segments so that the larvae could not reach them with their mouthparts. In some other species of Sphingidae, such as *Daphnis placida* (Walker) (DAL pers. obs.), final instar larvae have been observed to forcibly remove tachinid eggs with their mouthparts. The observed parasitised *Langia tropicus* larvae reached pupation, but the fly larvae exited through the pupal walls and pupated in the surrounding soil. Further, several *L. tropicus* eggs were observed that appeared to have been parasitised by a small wasp species, as the eggs had died and darkened in colour and, being darker, were quite visible on the pale green leaf undersides.

Final instar larvae leave the food plant trees to pupate. They first turn a dull purplish colour, then wander off in search of a suitable pupation site. In captivity, such purplish larvae were placed in plastic containers with a sand base 150 mm deep. Some larvae began to burrow fairly quickly after being placed while others continued to roam over the surface for up to two hours. All eventually burrowed up to 100 mm deep in the sand, where they formed a cell lined with silk and sand particles in which they pupated. It is not known exactly where larvae pupate in the wild, but it is assumed that wild larvae would behave similarly to captive larvae and pupate below ground. The limestone outcrops around Chillagoe contain many suitable pupation sites, both with deep soil deposits or rock crevices filled with soil and leaf litter, but searches of such places have failed to produce any pupae. It is believed that *Langia tropicus* are able to diapause over the dry season as pupae, as several pupae in captivity have undergone a seasonal diapause of up to 14 months, with emergence following local hot, wet conditions after a long dry winter.

Acknowledgements

Garry Sankowsky of Tolga is sincerely thanked for his plant identifications and knowledge of the numerous coarse-leaved *Brachychiton* species of northern Australia. The company of Graham Wood in the field during the mid 1990s is also acknowledged.

Reference

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A NEW SPECIES OF *STENUS* LATREILLE (COLEOPTERA: STAPHYLINIDAE) FROM AUSTRALIA

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Abstract

Stenus necopinus sp. n. is described from northern Queensland, Australia, bringing to 30 the number of *Stenus* Latreille species in Australia.

Introduction

The *Stenus* Latreille fauna of Australia was revised nearly 40 years ago (Puthz 1970); additional information has been published by Puthz (1972, 1975, 1977), Hawkeswood (1987), Reid (1997) and Porch (2008). A recent revision of the collection of the Australian National Insect Collection (ANIC, Canberra) brought one male of a new species to light, increasing the total number of Australian *Stenus* to 30.

Stenus necopinus sp. n.

(Figs 1-2)

Type material. Holotype ♂, QUEENSLAND [Cape York Peninsula]: 5 km S Batavia Downs, Malaise trap, 11.xii.1992-15.i.1993, P. Zborowski (in Australian National Insect Collection, Canberra).

Description. Length: 6.6 mm (forebody: 2.8 mm). Measurements (in mm): head width: 0.99; average distance between eyes: 0.58; pronotal width: 0.71; pronotal length: 0.93; greatest width of elytra: 1.13; greatest length of elytra: 1.30; sutural length: 1.08. Blue-metallic, elytra with violet tint, strongly shiny, forebody coarsely and moderately densely punctate, abdominal punctation coarse and moderately dense anteriorly, becoming much finer and much sparser posteriorly; pubescence long, semi-erect. Antennae, maxillary palpi and legs yellowish, apices of tarsal segments slightly infuscate. Clypeus metallic, labrum dark brown to light brown, pubescence long, divergent.

Male. Anterior sternites simple. Sternite 8 with a deep apical excision to almost half length (Fig. 2). Sternite 9 finely serrate apically. Tergite 10 rounded, apical margin nearly smooth. Aedeagus (Fig. 1), median lobe narrowly triangular with a small apicodorsal tooth; internal sac strongly sclerotized, broadly tubular; parameres much longer than the median lobe, widened in anterior third, with 3 groups of setae: about 11 fine setae apically, 7-9 fine setae internally and 11 strong and very long densely set setae medially.

Head distinctly narrower than elytra, frons broad, shallowly concave, lateral furrows very shallow, indistinct, median portion less broad than each of the lateral portions, nearly flat; punctation coarse and moderately dense, diameter of punctures as large as apical cross section of antennal segment 3, interstices

mostly smaller than diameter of punctures, as large or slightly larger on posterior median portion and on a small area near posterior eye margins. Antennae long and slender, when reflexed nearly the last two segments extending beyond the posterior margin of pronotum; penultimate segments twice as long as broad.

Pronotum much longer than broad, broadest in posterior third, sides from there very slightly convex anteriorly, shallowly concave posteriorly; punctation slightly coarser than on frons amd moderately dense, diameter of punctures slightly larger than apical cross section of antennal segment 3, interstices mostly distinctly smaller than diameter of punctures; no delimited unpunctured areas present.

Elytra broader than head, somewhat longer than broad, subquadrate, shoulders rectangular, sides slightly widened, narrowed in posterior fifth, posterior margin deeply emarginate; sutural impression short and shallow, humeral impression indistinct; punctation as coarse as on frons but on average sparser, interstices mostly larger than diameter of punctures, becoming smaller laterally. Fully winged.

Abdomen cylindrical, immarginate, basal constrictions of first segments deep, tergite 7 with a broad membranous fringe apically; punctation of tergite 3 coarse and dense anteriorly, becoming less coarse and less dense posteriorly, on the following tergites strongly decreasing in coarseness and density, punctures on tergite 7 finer than one eye facet near dorsal eye margin, interstices four times and more as large as punctures; tergite 10 only with few scattered punctures.

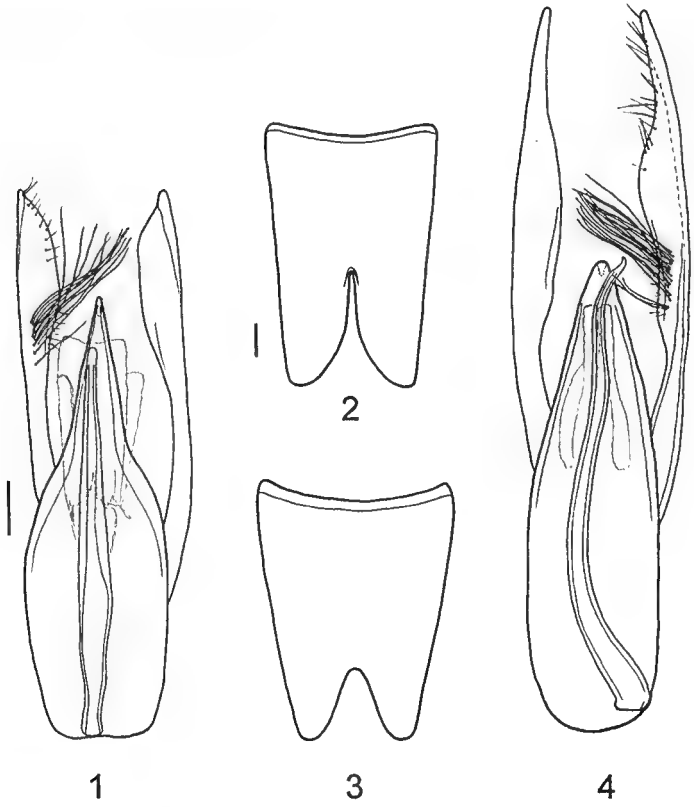
Legs long and slender, metatarsi more than half as long as the metatibiae (ratio 26:48), first segment slightly longer than the two following segments combined, distinctly longer than the last segment; segment 3 and 4 deeply bilobed.

The whole insect is shining without any microsculpture.

Discussion. This new species belongs to the *coeruleus*-group (Puthz 1970: 56) and may be the sister species of *S. coeruleus* Waterhouse, which it strongly resembles. It may be distinguished by the semi-erect pubescence (in *S. coeruleus* it is much more erect), finer and sparser abdominal punctation, less densely punctate elytra and by the male sexual characters (*cf.* Figs 3 and 4).

Stenus necopinus differs from all other Australian *Stenus* with immarginate abdomen, bilobed tarsi and bluish-metallic lustre (*S. platythrix* Puthz, *S. pseudocoeruleus* Puthz, *S. improbus* Puthz) by the complete lack of microsculpture and the male's sexual characters.

Etymology. Since the *Stenus* fauna of Australia is fairly well known, the new species was unexpected = (Lat.) *necopinus*.



Figs 1-4. *Stenus* spp. (1-2) *S. necopinus* sp. n., holotype male: (1) aedeagus, ventral; (2) sternite 8, ventral. (3-4) *S. coeruleus*, male from Dorrigo, NSW: (3) sternite 8, ventral; (4) aedeagus, ventral. Scale bars = 0.1 mm (1=4; 2=3).

Acknowledgement

My thanks are due to Tom Weir (ANIC, Canberra) for the loan of the material.

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RANGE EXTENSION AND BEHAVIOURAL OBSERVATIONS FOR *DOLESCHALLIA BISALTIDE* (CRAMER) (LEPIDOPTERA: NYMPHALIDAE: NYMPHALINAE)

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Abstract

Records of a southern extension of range are provided for *Doleschallia bisaltide* (Cramer) collected in and around Coffs Harbour, New South Wales. Previously unreported behaviour is also noted.

Introduction

Between December 2007 and May 2009, multiple specimens of *Doleschallia bisaltide* (Cramer) (Fig. 1) were captured in and around Coffs Harbour, northeastern New South Wales. Specimens were also observed frequenting a garden in Sapphire Beach, Coffs Harbour on a daily basis during February and April 2008 and again between February and April 2009. A number of specimens were captured at this location, which borders the Orara East State Forest, at an altitude of 100 m and 2 km west of the coastline. Previously unreported behaviour was also observed at this location.

Fig. 1. *Doleschallia bisaltide* at rest on 6 m high canopy of *Eucalyptus* sp

Fig. 2. Locale at Sapphire Beach and net extension used to capture specimens in canopy.

Observations

NYMPHALIDAE

Doleschallia bisaltide (Cramer)

Specimens were observed at numerous locations around Coffs Harbour, New South Wales. These locations include the coastal Moonee Beach Nature Reserve, Sapphire Beach bordering the Orara East State Forest, at various locations in Bonville, and bordering the Bongil Bongil National Park south of Coffs Harbour. These records extend the known range of the species approximately 90 km further south than the previously reported locality of Grafton (Braby 2000, Common and Waterhouse 1981). Specimens were observed most commonly between February and April in both 2008 and 2009.

At Sapphire Beach, the species' status, using the system suggested by Braby (2004), was local but common. At the other locations the status was local and rare. Specimens at Sapphire Beach could be observed daily between 1400 and 1630h perched at a height of 6 m on the west-facing canopy of several *Eucalyptus* spp, or occasionally on power lines. Specimens were always observed in the same part of the canopy, at the same time each day and in full sun. At other times or when cloudy, specimens were rarely observed. Specimens were almost always perched on the upper side of the leaf, head down, with wings at 45° (Fig. 1). The exception was that specimens observed on power lines always rested with their wings fully open at 180°. When disturbed by passing Lepidoptera, specimens frequently followed the passing species, then flew rapidly over the canopy to eventually alight on the same or nearby leaf. In the same garden, one specimen was observed at 0800h flying rapidly to alight briefly on flowers of various species, in full sun. On occasion, at dusk (around 1800h), specimens could also be observed rapidly circling a large *Eucalyptus* sp. at heights between 6 and 12 m. All specimens captured and observed appeared to be in perfect condition. Specimens resting on the canopy were easily caught with an insect net attached to a pool cleaning pole (Fig. 2), carefully approaching the adult from behind. Adults were rarely disturbed before being netted using this technique.

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A SOUTHERN RANGE EXTENSION FOR *NACADUBA KURAVA PARMA* WATERHOUSE & LYELL (LEPIDOPTERA: LYCAENIDAE)

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Abstract

A southern range extension is provided for *Nacaduba kurava parma* Waterhouse & Lyell to Port Macquarie, New South Wales.

Introduction

Braby (2000) recorded the distribution of the White-banded line-blue, *Nacaduba kurava parma* Waterhouse & Lyell, 1914, to Grafton in northeastern New South Wales. This range was recently extended south to Coffs Harbour by Shakespeare *et al.* (2009).

New record

LYCAENIDAE

Nacaduba kurava parma Waterhouse & Lyell

A fresh adult male was collected in regenerating littoral rainforest near Lighthouse Beach, Port Macquarie, New South Wales on 12 May, 2009. This record extends the southern range limit by 140 km.

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THE FIRST RECORD OF *CEPHONODES PICUS* (CRAMER) (LEPIDOPTERA SPHINGIDAE) FROM SOUTHERN QUEENSLAND

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Abstract

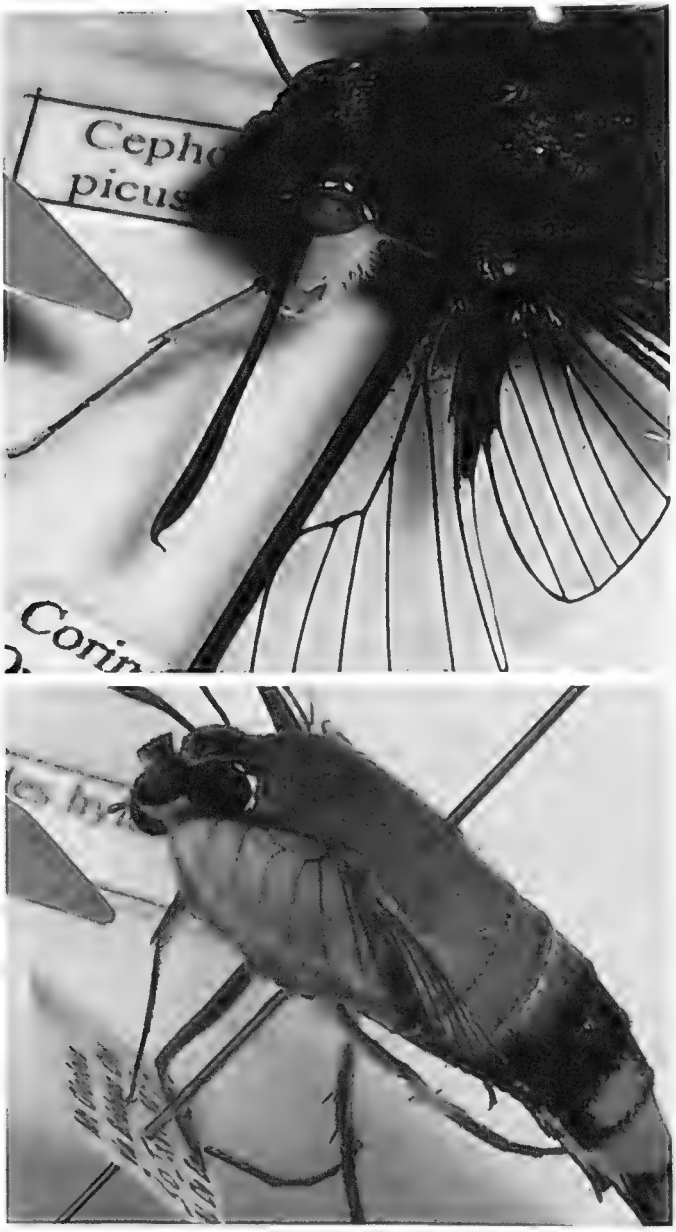
A southern distribution extension to Brisbane, SE Queensland, is presented for *Cephonodes picus* (Cramer), previously known from northern Australia and the Indo-Australian region.

Introduction

Cephonodes picus (Cramer) has a wide distribution across the Oriental and Australian regions, but in Australia it was considered to be confined to the extreme north of Australia (I.F.B. Common pers. comm.) and in the northern tropics of Queensland (E.D. Edwards pers. comm.). *C. picus* has since been recorded in Australia as far south as Rockhampton, central Queensland (Moulds 1998). This paper further extends the distribution for *C. picus* to Brisbane, southern Queensland.

While bee hawk moths, *Cephonodes* Hübner spp. and humming-bird hawk moths, *Macroglossum* Scopoli spp. were being studied in a suburban garden at Corinda, Brisbane (see De Baar 2007), a larva (Fig. 1), which differed from those of *C. hylas australis* Kitching & Cadiou and *C. kingii* (W.S. Macleay), was noted feeding on leaves of a Gardenia (*Gardenia augusta,* Rubiaceae). This larva was bred through to an adult *C. picus.*

Fig. 1. *Cephonodes picus* larva from Corinda, Brisbane.



Figs 2-3. *Cephonodes* spp. (2) *C. picus* from Corinda, showing apical spine on tibia of foreleg; (3) *C. hylas* showing reduced apical spine on tibia of foreleg.

New record

Cephonodes picus (Cramer)

(Figs 1-2)

Material examined. QUEENSLAND: 1 specimen, Corinda, Brisbane, collected larva 15.iii.2008, feeding on leaves of Gardenia (*Gardenia augusta,* Rubiaceae), pupated 19.iii.2008, emerged 6.iv.2008, M. De Baar (in De Baar collection, Brisbane).

Comments. Several larvae, representing three sphingid species, were collected on 15.iii.2008, feeding on a Gardenia (*Gardenia augusta,* Rubiaceae) in my garden. Two of these larvae proved to be *Cephonodes hylas australis* and *C. kingii*; the third was bred through to *C. picus*. The larva (Fig. 1) differs from that of *C. hylas* by having a broad, whitish dorsal band (this being more greenish in *C. hylas*) and lacking a thin, darkish lateral line (sometimes present on the *C. hylas* larva). The *C. picus* larva was collected from an established garden plant present in our yard since 1984, with no likelihood of introduction from the north via, for example, a potted plant.

The adult of *C. picus* is extremely similar to that of *C. hylas* but differs in having a strong projecting spine on the apex of the fore tibia (Fig. 2), whereas the fore tibial spine of *C. hylas* is poorly developed (Fig. 3) (I.F.B. Common, pers. comm.).

I had previously suggested the possible presence of this species in Brisbane, because of its similarity to *C. hylas* and thus being potentially overlooked (De Baar 2007).

Acknowledgements

I wish to thank Ted Edwards and Max Moulds for their discussions on *C. picus*, and the late Ian Common for personal communications during the 1970s.

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THE AUSTRALIAN
Entomologist
Volume 37, Part 1, 26 March 2010

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ISSN 1320 6133