A new species of *Psilogramma* Rothschild & Jordan, 1903 from northern Australia (Lepidoptera: Sphingidae)

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Abstract: *Psilogramma* ***penumbra*** **sp. n.** is recorded from north-eastern Western Australia, and coastal areas of the Northern Territory. It is here described, figured, and compared with the closely related species *Psilogramma menephron* (Cramer, 1780) from eastern Queensland. The life history of *P. penumbra* is currently unknown. The description of *P. penumbra* brings the total number of *Psilogramma* species recorded from Australia to seven.

Key words: Monsoon forest, DNA sequence, Northern Territory, "top end".

Eine neue Art der Gattung *Psilogramma* Rothschild & Jordan, 1903 vom nördlichen Australien (Lepidoptera: Sphingidae)

Zusammenfassung: Die neue Art *Psilogramma* ***penumbra*** **sp. n.** aus dem nordöstlichen Westaustralien und von den Küsten des Northern Territory wird beschrieben. Sie wird beschrieben, abgebildet und mit der nah verwandten *Psilogramma menephron* (Cramer, 1780) vom östlichen Queensland verglichen. Die Biologie von *P. penumbra* ist noch unbekannt. Nach der Beschreibung von *P. penumbra* sind 7 Arten der Gattung *Psilogramma* von Australien bekannt.

Introduction

Recent light trapping activities by the authors in the "top end" of the Northern Territory and Western Australia has produced two species of *Psilogramma* that significantly differed morphologically from all the other known Australian species. DNA sequencing of these species by the Canadian BOLD project (Barcode of Life, 2010) showed that both these separate species remained undescribed. Of these two species, *Psilogramma exigua* Brechlin, Lane & Kitching, 2010 was recently described. The second species is herein figured and described as *P. penumbra* sp. n.

Placement of this new species in *Psilogramma* complies with generic diagnoses given by Rothschild & Jordan (1903), D'Abrera (1987) and Holloway (1987).

Abbreviations used in the text:

ANIC	Australian National Insect Collection, Canberra.
CDAL	coll. D. A. Lane, Atherton.
CMSM	coll. M. S. Moulds, Kuranda.
NTM	Northern Territory Museum, Darwin.

Psilogramma penumbra sp. n. (Figs. 1–4, 7–9)

Holotype ♂ (Fig. 1): Smith Point, Cobourg Peninsula, Northern Territory, 19. ii. 2007, [leg.] D. A. Lane, molecular voucher & genitalia prep. BC-LTM-147 (MSM, in NTM).

Paratypes (in total 8 ♂♂, 7 ♀♀): **Northern Territory:** 1 ♂, same data as holotype, NTM. 1 ♂, same data, but 22. ii. 2007. 1 ♂, 1 ♀, Black Point, Cobourg Peninsula, 17. & 19. ii. 2007, leg. D. A. Lane; 1 ♀ (Fig. 4), same data, but 18. ii. 2007, molecular voucher BC-LTM-146 (MSM). 1 ♂ (Fig. 2), 1 ♀ (Fig. 3), Milikapiti, Snake Bay, Melville Island, 16. iii. 2010, leg. D. A. Lane; 2 ♂♂, 1 ♀, same data, but 16. iii. 2010. All these in CDAL. 1 ♂, Black Point, Cobourg Peninsula, Northern Territory, 18. ii. 2007, leg. D. A. Lane, molecular voucher BC-LTM-145, CMSM. 1 ♂, 16.03° S, 130.24° E, 8 km N Bullita, Gregory Nat. Pk., 21. v. 2001, leg. E. D. Edwards, ANIC DNA 003239; 1 ♀, 12.52° S, 132.50° E, Koongarra, 15 km E Mt. Cahill, 8. iii. 1973, leg. M. S. Upton (AN 31001716); 1 ♀, 11.09° S, 132.50° E, Black Point, Cobourg Pen., 27. i. 2007, leg. E. D. Edwards (AN 31001715). All these in ANIC. — **Western Australia:** 1 ♀, 15.07° S, 125.45° E, Mitchell River, 27. v. 2001, leg. E. D. Edwards; ANIC.

Etymology. *Penumbra* is derived from *paene*, meaning "almost, nearly" and *umbra* meaning "shadow". It equates to the sharp contrast of dark and light markings, as if looking at a solar or lunar eclipse, and as if observing the penumbra.

♂ (Figs. 1–2). Ground colour of fresh specimens dark brown, tending black. Highlighted markings whitish with dark brownish-black overlay. Small (1 mm diameter) forewing cell spot cream, ringed by heavy black concentric circle.

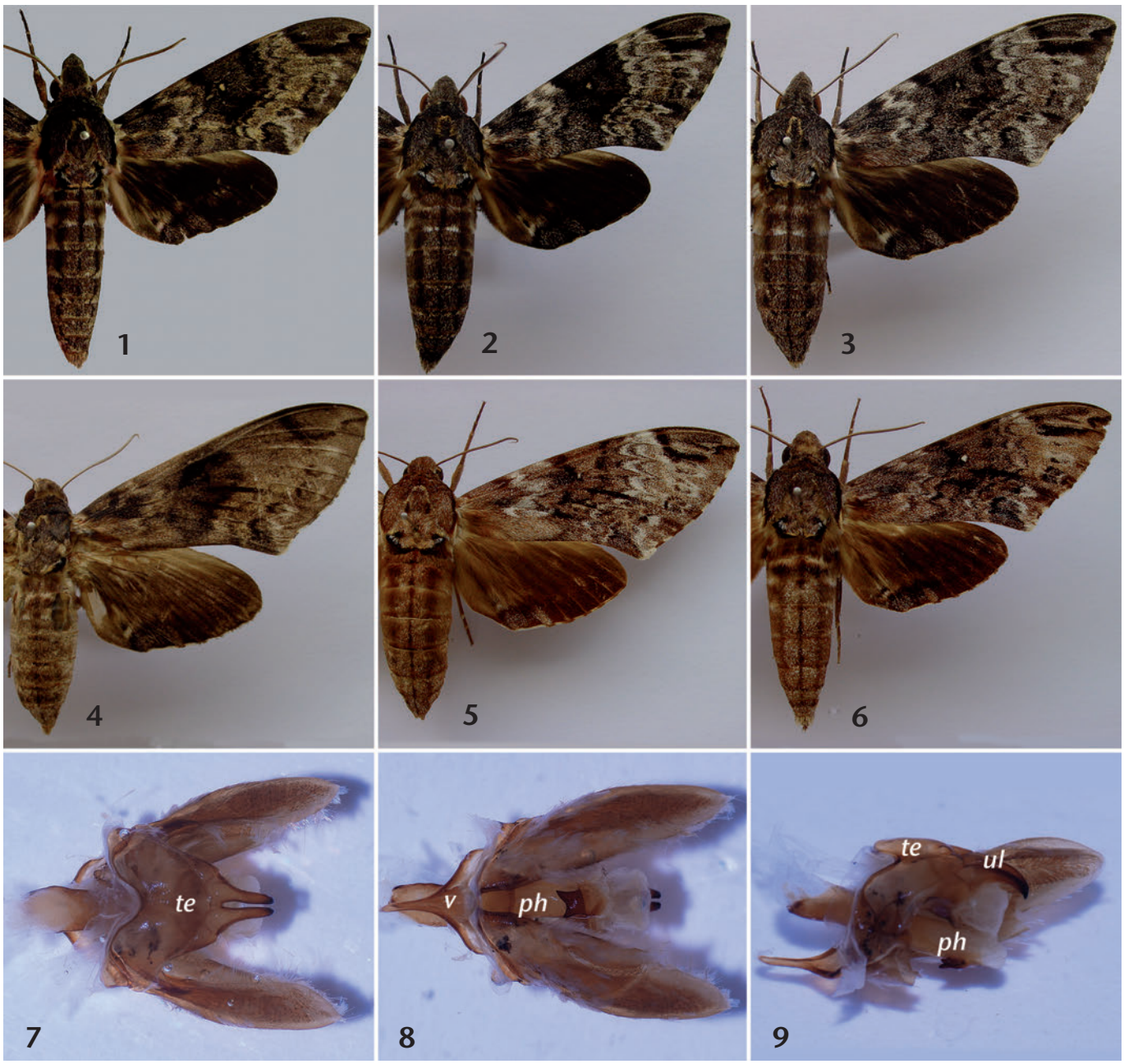
Forewing base dark brownish-black; a series of outer irregular whitish and black wavy bands run from costa across lower cell to inner margin; a broad black irregular band runs from costa across cell to inner margin, with an outer series of wavy whitish and black bands running from outer costa to outer inner margin; apex broadly dark brown with a central overlying "S"-shaped (or lightning-bolt shaped) line coloured black; termen black with alternate whitish markings; tornus dark brown.

Hindwing almost wholly dark brownish-black; tornus with a white spot with underlying light grey patches. In some dark specimens wing markings are less distinct.

Forewing length 48–53 mm, wingspan 104–118 mm.

Head dark brownish-black. Thorax dark brown with overlying light greyish scaling; an outer broad black band terminating cream abuts wing bases; two adjacent black spots on central thorax, with light brown spots above; two adjacent patches coloured light greyish-blue on lower thorax near abdomen.

Abdomen mostly dark brownish-black; a black median line longitudinally reaching tip of abdomen, and two parallel but wider black bands laterally (in dark specimens these abdominal markings are indistinct). Underside of head, thorax and abdomen whitish; underside of wings broadly brown with irregular black transverse bands.



Figs. 1–6: *Psilogramma* species, adults, dorsal view. — **Figs. 1–4:** *P. penumbra* sp. n. **Fig. 1:** holotype ♂, molecular and genitalia voucher BC-LTM-147 (MSM). **Fig. 2:** PT ♂. **Fig. 3:** PT ♀. **Fig. 4:** PT ♀, molecular voucher BC-LTM-146 (MSM). — **Figs. 5–6:** *P. menephron*. **Fig. 5:** ♀, Kuranda, Queensland. **Fig. 6:** ♂, Silver Plains, Queensland. — **Figs. 7–9:** *Psilogramma penumbra*, ♂ genitalia, dissection no. BC-LTM-147 (MSM). **Fig. 7:** dorsal view. **Fig. 8:** ventral view. **Fig. 9:** lateral view. — Abbreviations: *ph* phallus, *te* tegumen, *ul* uncal lobe, *v* vinculum.

♀ (Figs. 3–4). Similar in overall appearance to ♂, but wings broader. From collected material at hand, ♀♀ occur in two forms — one very similar to the ♂ (Fig. 3), and one with variable wing marking combination of dark brownish-black base colour, with a prominent large black spot straddling the outer cell, and extending from costa to inner margin (Fig. 4). Some intermediate forms of the ♀ have also been collected.

Forewing length 55–61 mm, wingspan 120–138 mm.

♂ genitalia (Figs. 7–9). Tegumen in dorsal view with distal shoulders very broadly curved and ill-defined. Uncal lobes in dorsal view nearly parallel-sided throughout their length, barely tapering; in lateral view claw-like, curved evenly on ventral margin, gently so on dorsal margin with abrupt down-curve towards a pointed apex, tapering throughout length but with apical region tapering to a point from a broad base; apex black or nearly so. Gnathos very short and broad, distal margin almost straight. Valvae nearly parallel-sided, distally rounded; sacculus ill-defined, harpe absent. Phallus with sclerotized, subapical "fish tail" process with branches nearly equal, almost symmetrical. Vinculum in ventral view with anterior, rod-like extension clearly longer than length of the midline of basal triangle.

The ♂ genitalia differ from those of *P. menephron* (Cramer, 1780) in the shape of the tegumen in dorsal view (the distal shoulders are weakly developed and very broadly rounded in *penumbra*, strongly developed in *menephron*), in the shape of the "fish tail" process to the phallus (the

branches nearly equal in *penumbra*, one much longer than the other in *menephron*), in the length of the anterior process to the vinculum (clearly longer than the length of the midline of the basal triangle in *penumbra* but about equal in *menephron*), and in the shape of the uncal lobes (nearly parallel-sided in *penumbra*, abruptly narrowed on distal half in *menephron*).

Discussion

Psilogramma penumbra is sympatric with both *P. exigua* and *P. argos* Moulds & Lane, 1999 in coastal areas of the Northern Territory and north-eastern Western Australia. *P. penumbra* is noticeably larger than *exigua,* and is consistently much darker coloured with highlighted contrasting alternate banding of whitish and black when compared to *exigua* or *argos*.

In Australia *P. penumbra* appears closest to *Psilogramma menephron* (Fig. 5 ♀, Kuranda, Qld; Fig. 6 ♂, Silver Plains, Qld) which is currently known only from eastern Queensland. Overall markings of *menephron* are fairly similar in general placement and pattern to *penumbra*; however the ground colour and markings of *menephron* are distinctly a brown to dark brown, and do not approach the clearly black contrasting markings of *penumbra*. The distinctly brown overall appearance of *menephron* is one of the principal characters distinguishing it from all other Australian *Psilogramma* species. Results obtained from DNA sequencing by the Canadian BOLD Project provided clear separation of both *menephron* and *penumbra* (see voucher codes above), as well as the five other known and described Australian species of *Psilogramma* (Moulds, Tuttle & Lane, in prep.).

Distribution

P. penumbra is currently known from a single record from the Mitchell River in north-eastern Western Australia, and from northern areas of the Northern Territory, including Cobourg Peninsula (Garig Gunag Barlu National Park), Melville Island, from near Mt. Cahill, and Gregory National Park. In coastal areas its habitat appears to be monsoon forest areas.

The Australian species of *Psilogramma*

Seven species of *Psilogramma* are now recognised as occurring in Australia as documented below. However, a matter concerning dates of priority for the name of one of these species (*P. mastrigti* Eitschberger, 2001 equals *P. papuensis* Brechlin, 2001) requires discussion. Both these names (along with the names of several other new species synonymous between the two papers, but not found in Australia) were published in May 2001 (Brechlin 2001, Eitschberger 2001). Brechlin & Kitching (2010) claim that Brechlin's paper has date priority over Eitschberger's, while Eitschberger (2010) claims that his 2001 paper has date priority over Brechlin's. The date of publication printed on the journal issue containing Brechlin's paper, that is Arthropoda **9** (2), is "May 2001". The date printed on the journal issue containing Eitschberger's paper, Neue Entomologische Nachrichten **Supplement 1,** is "14 May 2001". But at least some, if not all, issues of Arthropoda **9** (2) have been rubber stamped "11 May 2001" (by persons unknown but presumably by the publisher) and it is on this basis that Brechlin & Kitching (2010) claim that the new names in Brechlin (2001) have priority over those in Eitschberger (2001). However, Eitschberger (2010) states that he has seen issues of Arthropoda **9** (2) bearing different rubber stamped dates and dismisses the rubber stamping as proof of date of publication, thus claiming the new names in his 2001 paper have priority following Article 21.3.1 of the Code (ICZN 1999). The rubber stamping of the date of publication on a journal by the publisher does seem unusual and in view of doubts raised by Eitschberger on this matter it would seem that additional confirmation of the dates of publication of both journal issues should be sought. Brechlin & Kitching (2010) say that they intend to provide a detailed discussion on this matter in a forthcoming work. It is currently beyond the scope of this paper to provide here a full analysis of this problem. We therefore leave the situation unresolved and provide in the list below both names for the single Australian species involved.

The life histories of 5 Australian species, viz. *P. menephron, P. casuarinae* (Walker, 1856), *P. argos, P. mastrigti/papuensis* and *P. maxmouldsi* Eitschberger, 2001 have been documented by the authors, and these individual life histories provide clear recognition of species separation by distinctive individual larval characters; these life histories will be a component of a future work, a planned book on the Australian hawk moths (Moulds, Tuttle & Lane, in preparation). The life histories of *P. exigua* and *P. penumbra* are presently unknown. A broad summary of the Australian *Psilogramma* species is as follows:

- *Psilogramma argos* Moulds & Lane, 1999. Known from north-eastern Western Australia, coastal Northern Territory, and north eastern Queensland, from the McIlwraith Range to Chillagoe and Forty Mile Scrub National Park.
- *Psilogramma casuarinae* (Walker, 1856). Known from eastern Australia, from northern and central Queensland, through eastern New South Wales to the Victorian border area, as far inland as Swan Hill. Also known from New Guinea.
- *Psilogramma exigua* Brechlin, Lane & Kitching, 2010. Known from north-eastern Western Australia, and northern parts of Northern Territory.
- *Psilogramma menephron* (Cramer, 1780). Currently known from eastern Queensland, from Iron Range to Toowoomba and Brisbane. Populations are also known from New Guinea and eastern Indonesia.
- *Psilogramma mastrigti* Eitschberger, 2001/*Psilogramma papuensis* Brechlin, 2001. Known from eastern Queensland, and also from New Guinea.

- *Psilogramma maxmouldsi* Eitschberger, 2001. Known from south-eastern Queensland.
- *Psilogramma penumbra* sp. n. Distribution as above.

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