

# A revision of the cicadas of the *Purana tigrina* group (Hemiptera, Cicadidae) in Sundaland

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The *Purana tigrina* group is proposed for a supposedly monophyletic group of six cicada species occurring in Sundaland: The Malayan Peninsula, Java, Sumatra and Borneo. One species, *P. tigrina* (Walker, 1850) from the Malayan Peninsula, Borneo, Sumatra, Bunguran and Nias Island, is redescribed. Five species are described here for the first time: *Purana karimunjawa*, *P. latifascia*, *P. metallica*, *P. mulu* and *P. usnani*. A key for the identification of the males and distribution maps of the species are provided.

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## Introduction

The genus *Purana* is currently placed in the tribe Dundubiini and the subtribe Leptopsaltriina (Duffels & Van der Laan 1985; Moulds 2005). In 1923, Moulton erected the new section Leptopsaltraria [sic] for the genera *Leptopsaltria* Stål, 1866, *Maua* Stål, 1866, *Nabalua* Moulton, 1923, *Purana* Stål, 1866 and *Tanna* Distant, 1905. The new section was characterized by the presence of one to three pairs of tubercles on the ventral side of the male abdomen. In 1963, Metcalf added several genera lacking the abdominal tubercles to the subtribe.

In recent years two, presumed monophyletic, groups of the genus *Purana* have been revised: the *P. nebulilinea* group (Kos & Gogala 2000) and the *P. carmentis* group (Schouten & Duffels 2002). The present paper proposes another, possibly monophyletic, group: the *Purana tigrina* group. The group consists of six species from Sundaland: *P. tigrina* (Walker, 1850), and five new species: *P. karimunjawa*, *P. latifascia*, *P. metallica*, *P. mulu* and *P. usnani*. Sundaland comprises: the Malayan peninsula, Java, Sumatra, Borneo, and numerous smaller islands.

Dr T. Trilar (Slovenian Museum of Natural History, Ljubljana) recorded the song of *P. latifascia* in Borneo, Sabah, and collected the only two specimens of this species known, while Dr M. Gogala (Slovenian Academy of Sciences and Art, Ljubljana) recorded the song of *P. metallica* in Tarutao National Park, Thailand, an island off the west coast of the Malayan Peninsula, and collected a part of the type series. The songs of those two species are described elsewhere in this issue (Gogala & Trilar 2007).

## Material and methods

The institutions listed below are the depositories of the material studied. The abbreviations given are used in the lists of material and throughout the text: BMNH The Natural History Museum (formerly British Museum (Natural History)), London  
BPBM Bernice P. Bishop Museum, Honolulu  
MNKM Muzium Negara Malaysia, Kuala Lumpur  
MNP Muséum National d'Histoire Naturelle, Paris

- PMSL Prirodoslovni Muzej Slovenije, Ljubljana  
 RMNH Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden  
 UKM Pusat Sistemik Serangga, Universiti Kebangsaan Malaysia, Bangi, Malaysia  
 UMS Universiti Malaysia Sabah, Kota Kinabalu  
 ZMAN Zoologisch Museum, Universiteit van Amsterdam, Amsterdam  
 MZB Museum Zoologicum Bogoriense, Cibinong  
 ZSM Zoologische Staatssammlung München

Data on the distribution of the species were derived from the 'Biodiversity Database of the Cicadas of South East Asia and the West Pacific' (J.P. Duffels, unpublished), and plotted on maps of ADC-Worldmap version 2.0 vol. 4 Southern Asia & Australia with the program MapInfo for Power Mac, version 4.03. The localities and other data from the specimen labels in the database are filed in the program File-Maker Pro 4.0. The information about geographical co-ordinates has been retrieved from the following sources: 'Atlas van Tropisch Nederland' (Anonymous 1938), 'The Times Comprehensive Atlas of the World' (Anonymous 1999), and the GEOnet Names Server of the U.S. Defense Mapping Agency (<http://www.nima.mil/gns/html/index.html>).

The terminology adopted in this paper for features of the body and the male genitalia follows that of Schouten & Duffels (2002) and Yaakop et al. (2005).

## Taxonomy

### Diagnosis *Purana tigrina* group

Body length male: 22.5–29 mm, female: 18–23 mm. Ground colour of body light to dark brown, sometimes with greenish tinge, central part of mesonotum and dorsal side of abdomen sometimes reddish brown. Markings on head and thorax black. Mandibular plate in lower two thirds black. Postclypeus (Figs 6, 8, 18) with brown to black fasciae in the 7–10 pairs of transverse grooves on its anterior and ventral parts; upper 3–4 pairs of these transverse fasciae usually reaching to lateral margins of postclypeus, other transverse fasciae variable in length among the species. Two longitudinal lines, connecting medial ends of transverse fasciae of each side, enclose an hourglass-shaped figure of the ground colour; each of these lines more or less strongly widened towards clypeal suture (Figs 6, 8, 18). Anteclypeus black, with exception of anterior margin and medial keel. Vertex with median black marking consisting of a pair of triangular spots enclosing lateral ocelli.

Pronotum with two black central fasciae and variable dark marks in the fissures. Mesonotum with a median, a pair of paramedian and a pair of lateral fasciae; a pair of dots in front of cruciform elevation (Figs 1, 9, 13, 18). Tegmina hyaline, with brown to black infuscations at basal veins of 2nd and 3rd apical areas; all species, except *P. langkawii*, with faint infuscations at apices of longitudinal veins of 1st to 3rd apical areas, and brownish suffusion towards tegmen apex. Males: Timbal coverings without marking. Sternites 3 and 4 with pair of tubercles (Figs 5, 7). Operculum (Figs 3, 11) with rounded medioproximal corner, oblique lateral margin, and a very broadly rounded or rounded triangular apical part, not, or just, reaching beyond posterior margin of sternite 2. Mediobasal part of operculum with brown to black patch. Genitalia with either a simple bilobate uncus and ridge-like basal pygofer lobes with a narrow, triangular apex (Figs 2, 10), or with a strongly sclerotized triangular uncus and spine-shaped basal pygofer lobes (Figs 14, 17, 23, 29).

### Relationships

The *Purana tigrina* group is probably the sister group of the *P. carmente* group (Schouten & Duffels 2002). For the study of the relationships among the species of these two groups we made comparisons with *Purana guttularis* (Walker, 1858), *P. tripunctata* Moulton, 1923, *P. ubina* Moulton, 1923, *Maua albigutta* (Walker, 1856), *M. affinis* Distant, 1905, *M. latilinea* (Walker, 1868) and *M. quadrituberculata* (Signoret, 1847).

This resulted in the following possible synamorphies for the species of the *P. tigrina* and *carmente* groups together: (1) two longitudinal lines connecting medial ends of transverse fasciae on postclypeus, more or less strongly, widen toward clypeal suture (Figs 6, 8, 18). Such a marking is found neither in the other species of *Purana* nor in *Maua albigutta* and *M. affinis*, but *M. latilinea* and *M. quadrituberculata* have a distinct, broad black marking at the clypeal suture. (2) first apical cell of tegmen shorter than third apical cell. In the species of the *tigrina* group, the first apical cell is distinctly shorter than the third apical cell; in the *carmente* group, the first apical cell is shorter than, or as long as, the third apical cell. In other species of *Purana* and in *Maua* the first apical cell is longer or as long as the third apical cell. (3) pronotum between central fasciae and lateral oblique fissures unmarked (Fig. 1); markings are present in the other species of *Purana* and *Maua* studied.

The *Purana tigrina* group can be distinguished from the *P. carmente* group by distinct spots at the basal veins of the 2nd and 3rd apical areas of the tegmina; the species of the *P. carmente* group have

unspotted tegmina. The other species of *Purana* and *Maua* studied (see above) all have distinct spots at the basal veins of the 2nd and 3rd apical areas.

The *tigrina* group can be subdivided into two subgroups: (1) *P. tigrina* and *P. metallica* having a simple, bilobate uncus and slightly converging, ridge-like basal pygofer lobes with a narrow, triangular apex (Figs 2, 10) and (2) *P. karimunjava*, *P. latifascia*, *P. mulu* and *P. usnani* which share a strongly sclerotized, triangular uncus and spine-shaped basal pygofer lobes (Figs 14, 17, 23, 29). The shape of uncus and basal pygofer lobes of *P. tigrina* and *P. metallica* is also found in *P. obducta* and *P. barbosae* of the *P. carmente* group and several genera of the Leptopsaltriaria. Spine-shaped basal pygofer lobes, as found in *P. karimunjava*, *P. latifascia*, *P. mulu* and *P. usnani*, are also found in *P. sagittata* of the *P. carmente* group. The sclerotized triangular uncus and the spine-shaped basal pygofer are supposed to be apomorphous characters.

Previous studies (Kos & Gogala 2000; Schouten & Duffels, 2002) of the genus *Purana* already noted that *Purana* in its present concept is probably not monophyletic. However, cladistic analysis of *Purana* and related genera must wait for a systematic study of some insufficiently known species of the genera *Purana* and *Maua*.

### Distribution

One species of the *Purana tigrina* group, *P. tigrina*, is widely distributed in Sundaland (Fig. 4): Nias Island (west of Sumatra), Sumatra proper, the Malayan Peninsula, Bunguran Island (= Greater Natuna) between the Malayan Peninsula and Borneo, and South Borneo (Kalimantan Timur). *P. metallica*, is known from Langkawi Island and Tarutao Island off the west coast of the Malayan Peninsula (Fig. 12). A second more widely distributed species, *P. usnani*, is recorded from Singapore, Lingga Island at the east coast of Sumatra, Bunguran, and North Borneo (Sarawak and Brunei) (Fig. 12). The remaining three species are probably restricted to very small areas (Fig. 25). *P. mulu* is known from the Gunung Mulu area in Sarawak and from Brunei, *P. latifascia* is known from one locality in Sabah, and *P. karimunjava* is only known from the Karimun Archipelago north of central Java.

### Key to the species of the *Purana tigrina* group

1. Male operculum with very broadly rounded apical part not reaching beyond anterior margin of sternite 3 (Figs 11, 19) ..... 2
- Male operculum with rounded triangular apical part reaching beyond anterior margin of sternite 3 to at most one fifth of sternite

- (Figs 3, 15, 24, 30) ..... 3
2. Tubercles on sternite 4 much smaller than those on sternite 3 and not reaching posterior margin of sternite (Fig. 20). Longitudinal lines connecting medial ends of transverse fasciae on postclypeus strongly widened at clypeal suture to a black mark reaching lateral margins of postclypeus. Basal pygofer lobes consisting of a pair of large, black-brown, spine-shaped projections (Fig. 21) ..... *P. mulu*
  - Tubercles on sternite 4 as large as those on sternite 3, and reaching or reaching beyond posterior margin of sternite (Fig. 7). Longitudinal lines connecting medial ends of transverse fasciae on postclypeus widened at clypeal suture to a black mark that does not reach lateral margins of postclypeus. Basal pygofer lobes consisting of slightly converging ridges (Fig. 10) ..... *P. metallica*
3. Medial margin of male operculum not black-brown. Lateral fasciae on mesonotum continuous, widest part of lateral fascia as wide as distance between paramedian and lateral fasciae (Fig. 22) ..... *P. latifascia*
  - Medial margin of male operculum black-brown. Lateral fasciae on mesonotum broken up or continuous, widest part of lateral fascia narrower than distance between paramedian and lateral fasciae (Figs 1, 13, 28) ..... 4
4. Lateral fasciae on mesonotum always broken up in a linear part and a black dot, linear part 2–3× as wide as anterior part of median fascia (Fig. 28) ..... *P. karimunjava*
  - Lateral fasciae on mesonotum usually continuous, rarely broken up in a linear part and a black dot, linear part as wide as or slightly broader than anterior part of median fascia (Figs 1, 13) ..... 5
5. Marking on anterior and ventral parts of postclypeus well developed (Fig. 18). Longitudinal lines connecting medial ends of transverse fasciae strongly widened at clypeal suture to a very broad black mark. Basal lobes of male pygofer consisting of large spine-shaped projections (Fig. 14) .... *P. usnani*
  - Marking on anterior and ventral parts of postclypeus more weakly developed (Fig. 6). Longitudinal lines connecting medial ends of transverse fasciae widened at clypeal suture to a black mark. Basal lobes of male pygofer consisting of slightly converging ridges (Fig. 2) ..... *P. tigrina*

*Purana tigrina* (Walker, 1850)

Figs 1–6

*Dundubia tigrina* Walker, 1850: 69. Holotype ♂: 'Malabar' [probably referring to the Malabar Coast of SW India]; on the rear side: '48/5', '31. *Dundubia tigrina*' (examined); 'Type' [print on round label with green margin] (BMNH) [examined].

*Dundubia tigrina*; Walker 1858: 5; Dohrn 1859: 73; Atkinson 1884: 224; Atkinson 1886: 161.

*Leptosaltria tigrina*; Distant 1889: 35; Distant 1892: pl. x Figs 6, 6a–n, 36.

*Purana tigrina*; Distant 1906a: 91, Fig. 43; Distant 1906b: 50; Distant 1912: 40; Moulton 1912: 130; Matsumura 1913: 77; Distant, 1916: 203; Moulton 1923: 120, 121, 168; Kato 1925: 16; Matsumura 1930: 4; Kato, 1932: 161; Mathur 1953: 142; Metcalf 1963: 469–470; Pringle 1955: 236; Livingstone 1977: 255–263 Figs 1–5, 7–9, 11–15; Duffels & van der Laan 1985: 107; Zaidi & Ruslan 1997: 223; Zaidi, Ruslan & Azman 2000: 203; Zaidi & Noramly & Ruslan 2000: 338; Schouten & Duffels 2002: 30–31.

*Purana tigrina mjobergi* Moulton, 1923: 69, 122 [not examined; the two male types from Sumatra could not be traced in BMNH].

**Misidentification of *P. tigrina***

*Purana tigrina*; Boulard 2006: 338, 339, Fig. 25.8 (acoustic ecological card).

Study of 2♂ and 1♀ of the recorded species, kindly provided by our esteemed colleague Dr Michel Boulard (MNP), revealed that the specimens do not belong to *P. tigrina* or to the *P. tigrina* group, but probably represent an undescribed species.

**Description**

Ground colour brownish, sometimes with greenish tinge; central part of mesonotum and dorsal side of male abdomen reddish brown.

**Head.** Vertex with median black marking consisting of a pair of distally broadening, proximally attenuating, more or less triangular, black spots enclosing lateral ocelli; triangular spots almost reaching frontoclypeal suture, sometimes reaching posterior margin of head, broadly connected at median ocellus and, entirely or partly, enclosing a pair of spots of ground colour laterally of median ocellus. A pair of curved Y-shaped figures runs from half-length of vertex to supra-antennal plates. Black band along posterior two thirds of inner margin of eye. Gena with black transverse fascia reaching from antenna (almost) to eye. Mandibular plate black in lower two thirds, and covered with silvery hirsute setae. Anterior and ventral parts of postclypeus (Fig. 6) with two series of 8–10 paramedian brown to black fasciae in transverse grooves: upper 3–4 pairs of transverse fasciae reaching lateral margins of postclypeus; next 1–2 pairs reaching to half-length of grooves, or beyond; lowest pairs of

fasciae shorter. Two longitudinal lines, connecting medial ends of transverse fasciae of each side, enclose an hourglass-shaped figure of the ground colour; each of these line widens towards the clypeal suture in a black mark. Anteclypeus black, except for anterior margin and medial keel and covered with densely set silvery setae and white waxy powder. Rostrum black-tipped, reaching anterior margin of sternite 3.

**Thorax.** Pronotum. Anterolateral corner of pronotal collar with short tooth. Central fasciae run from their somewhat dilated ends at anterior pronotum margin to crescent-shaped ends at pronotal collar. Posterior oblique fissures partly or entirely brown to black. Ambient fissure brown to black from proximal end of posterior oblique fissure to a dark spot in lateral bend of ambient fissure; often with another pair of brown to black lines or spots distally to spots in lateral bend. Posterior margin of pronotum collar with narrow black to black-brown line.

**Mesonotum.** Fasciae black. Median fascia fairly narrow anteriorly, 2–3 times as wide as anterior width at two fifths of its length from base, and more or less narrowing towards cruciform elevation. Paramedian fasciae as wide as, or slightly narrower than, anterior part of median fascia and slightly converging to half-length of mesonotum. Lateral fasciae either continuous or, more often, broken up in a linear part, which is as wide as anterior part of median fasciae, on anterior two thirds of mesonotum, and a distal black spot. A pair of black dots in front of cruciform elevation; posterior rim of cruciform elevation with narrow black band forming a median black triangle.

**Tegmina and wings.** Hyaline. Tegmina with brown infuscations at basal veins of 2nd and 3rd apical areas, small, faint infuscations at apices of longitudinal veins of 1st to 3rd apical areas, and brownish suffusion towards apex.

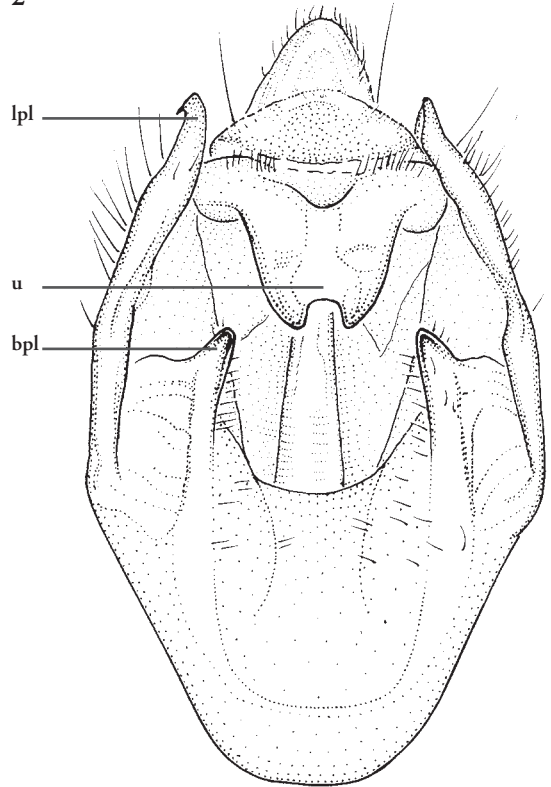
**Legs.** Ochraceous. Fore femora with three black to dark brown spines, a long and slender proximal spine at about one third of underridge, a stout, triangular spine at three fourths of underridge and a small distal spine adjacent to middle spine; underridge with black line; upperside with brown streak and distal parts of outer sides with brown marking. Fore tibiae brown, middle tibiae distally brown. Tarsi and claws of fore and middle legs dark brown to black.

**Male operculum** (Figs 3, 5). Apical part rounded triangular, reaching to one fifth or one fourth of sternite 3. Lateral margin oblique, sinuate at base and straight or slightly convex to rounded apex. Medial margin straight or very weakly concave, medioproximal corner rounded rectangular. Mediobasal part of operculum with relatively small brown to black patch, not extending to medial margin; medial margin and margin of rounded apex often black-brown.

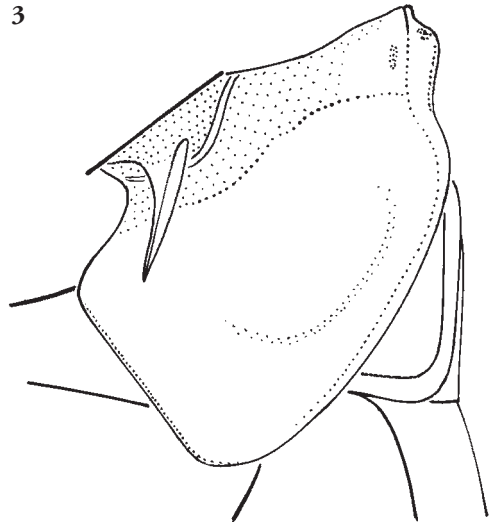
1



2



3



**Figs 1–3.** *Purana tigrina*, male, Malaysia, Negeri Sembilan, Pasoh Forest. – 1, Male body in dorsal view; 2, male pygofer in ventral view: bpl, basal pygofer lobe; lpl, lateral pygofer lobe; u, uncus; 3, male operculum in lateroventral view.



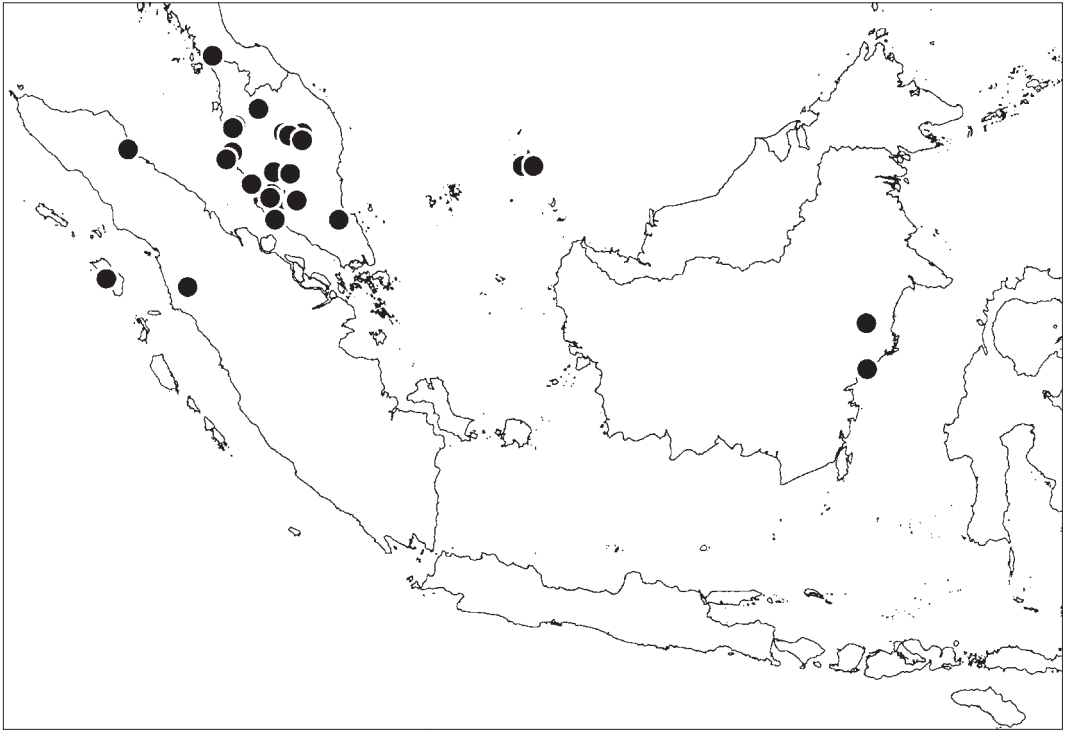


Fig. 4. Distribution of *Purana tigrina*.

**Male abdomen** (Fig. 5). Dorsally with silvery pubescence. Posterior margins of tergites with narrow black bands. Timbal coverings without marking. Sternites 3 and 4 with a pair of tubercles. Tubercles on sternite 3 fairly large and glossy black, two thirds of tubercle reaching beyond posterior margin of sternite; tubercles on sternite 4 smaller and brown, one third of tubercle reaching beyond posterior margin of sternite. Sternite 7 for the greater part black-brown to black. Sternite 8 entirely black.

**Male genitalia** (Fig. 2). Pygofer oval-shaped, black to brown. Basal pygofer lobes consisting of slightly converging ridges that are broadly connected with lateroventral part of pygofer; apex of lobes triangular. Uncus broad at base, strongly narrowing to half its length, apical part slightly narrowing towards bicuspidate apex. Lateral process of pygofer very short, somewhat recurved with rounded apex.

**Female operculum**. Short, reaching to half or two thirds of abdominal segment 2. Lateral margin sinuate, laterodistal corner broadly rounded rectangular. Distal margin straight to undulate. Mediobasal part of operculum with dark patch.

**Female abdomen**. Dorsally with silvery pubescence. Posterior margins of tergites 2 to 4 or 5 with two paramedian rows of low black triangles, and with

very narrow black lines, laterally to triangles on tergite 2, and between triangles on segments 3–5. Anterior half or one third and lateral parts of sternites 3–6 black-brown; sternite 7 with lateral, black brown marking. Segment 9 with a pair of dorsal, paramedian, triangular spots at anterior margin, that continue ventrally along anterior margin; apical part of lower margin of segment 9 with a pair of black-brown patches. Ovipositor sheath black-brown, ovipositor dark brown.

**Measurements in mm** (10♂ 10♀). Body length ♂: 22.5–25.5, ♀: 18–21; tegmen length ♂: 29–32, ♀: (26.5)28–30.5; head width ♂: 7.3–7.7, ♀: (6.6)6.9–7.3; pronotum width ♂: 7.3–8.1, ♀: (6.4)6.8–7.4.

#### **Distribution** (Fig. 4)

*P. tigrina* was described from Malabar. This is probably the Malabar Coast of SW India. The collections studied by us revealed no further specimens of *P. tigrina* from India or adjacent areas. *P. tigrina* proved to be a common species in the Malayan Peninsula and Bunguran Island (= Greater Natuna) between the Malayan Peninsula and Borneo, while relatively few specimens are known from South Borneo (Kalimantan Timur), Sumatra and Nias

Island. The type specimen may be mislabeled. The species has been collected in lowland primary rainforest but is found mainly in logged forest, secondary vegetation, parks and gardens.

**Material examined.** 86♂ 45 ♀ **Malaysia: Peninsular Malaysia:** Perlis: Kaki Bukit, Wang Kelian, 7.xii.1992, Zaidi, Sham, Saiful & Kudin, 1♂ (UKM). **Kedah:** Province Wellesley, Distant coll. 1911–383, *tigrina* Walk., 1♂ (BMNH). **Pahang:** Bukit Fraser, 10.iii.1991, Kon, 1♂ (UKM); Jengka, Bandar Tin Razak, 10–14.iii.1993, Ruslan, 1♀ (UKM); Krau Wildlife Reserve, Kuala Lompat sector, 1.25 km NNW Rangers post, 8 km W Kuala Krau, 14.iii.1997, secondary forest riverbank, old Orang Asli settlement, at light, M.Y. Ruslan & S. Azman, 1♂ (ZMAN); Kuala Juram, 5–9.v.1997, Lan, Mail, Man, Bidi, 1♂ 2♀ (UKM); Merapoh, Kuala Juram, 5–9.v.1997, Lan, Mail, Man, Bidi, 1♂ (UKM); T. Negara, Kuala Juram, 28–29.vii.1995, 1♀ (UKM); Taman Negara, Kuala Kenyam, 29–31.viii.1995, Zaidi, Ruslan & M'dir, 2♀ (UKM); Taman Negara NP, Kuala Juram, E of Merapoh, 4°39'N 102°08'E, 14.iii.1999, edge primary rainforest near canteen, at light, J.P. & M.J. Duffels, M. Zaidi & M.Y. Ruslan, 2♂ (ZMAN); Rompin Endau, 23.viii.1992, Badrol & Haji, 1♀ (UKM). **Selangor:** UKM, Bangi, various dates between viii and iii, various collectors, 21♂ 4♀ (UKM); Tg. Karang, 24.i.1981, Latifah Mustakim, 1♂ (UKM); Kuala Lumpur, 17.i.1980, Fatimah Abang, 1♂ (UKM); Kuala Lumpur, 24–31.xii.1958, L.W. Quate, 1♂ (BPBM); Kuala Lumpur, nr. L. Gardens, coll. H.M. Pendlebury, 21.viii.1933, 1♂ (MNKM); Langat, Sg. Congkak, 27–29.xi.1992, Zabidi & Badrol, 1♀ (UKM); Petaling Jaya, 24.i.1980, Rashidi, 1♂ (UKM); Sabang, 31.i.1993, Hishamuddin, 1♂ (UKM); Ulu Langat, 21.ii.1981, Shabdin, 1♂ (UKM). **Perak:** Bukit Larut, 2.vi.1991, Ismail, Ysof, Zabidi, 1♂ (UKM); Sitiawan, Pg. Koh, ii.1985, Joan Yong, 1♂ (UKM); Taiping, Ex F.M.S. Museums, B.M. 1955–354, *Purana tigrina* (Wlk), 1♂ (MNKM); Temengor 29.xi–5.xii.1993, Ismail, Bidi, Saiful, 2♂ (UKM); Temengor, 29.xi–5.xii.1993, Ekspedisi MNS-Belum, Ismail, Ysof, Bidi, Saiful, 1♂ 7♀ (UKM). **Melaka:** Hutan Air, 9.xi.1990, Zaidi, Zabidi, Ruslan, 1♂ 3♀ (UKM). **Negeri Sembilan:** Pasoh, 28.x.1991, Zaidi, Ruslan, Abin, 2♂ 3♀ (UKM); Pasoh Forest Reserve, 10 km W Ayer Hitam, various localities, 300–350 m, xi–iii, various collectors, 11♂ 14♀ (ZMAN) 1♂ (MNP); Port Dickson, 30.i.1994, Yong Yin Yee, 1♂ (UKM); Port Dickson, 20.i.1990, 1♂ (UKM); W. Coast, Pulau Rumbia, iii.1926, Ex F.M.S. Museum B.M. 1955–354, 1♂ (MNKM). **Johor:** Endau Rompin N.P., Access road to nerc, 19.x.1999, M.A. Schouten & F. Cheong, 1♂ (ZMAN); Endau Rompin N.P., Access road to nerc, 22.iii.1999, logged forest, at light, J.P. & M.J. Duffels, M. Zaidi & M.Y. Ruslan, 1♂ (ZMAN); Endau Rompin N.P., Head quarters, 15.viii. 1999, disturbed forest, J.P. Duffels, M.A. Schouten, M.I. Zaidi & M.Y. Ruslan, 1♂ (ZMAN); Endau Rompin N.P., Janing Ridge, 5 min. 02°31'33"N 103°24'03", 21.v.2001, disturbed forest, transect primary 11, at light, M.A. Schouten & A.J. de Boer, 1♀ (ZMAN); Endau Rompin N.P., Janing Ridge, 20 min. 02°31'19"N 103°23'59", 19.v.2001, primary lowland forest, transect primary 12, at light,

M.A. Schouten & A.J. de Boer, 1♀ (ZMAN). **Indonesia: Bunguran** (= Greater Natuna Island): Sg Semala, 03°53'23"N 108°04'28"E, alt. 50 m a.s.l., 21.vi.2001, 20.00 hrs, lightly disturbed lowland forest, at light trap, M. Lammertink, 1♀ (MZB); Sg Semala, 03°53'48"N 108°04'07"E, 30 m, 28.vi.2001, clearing at edge of river, logged lowland forest, captured by loggers for M. Lammertink, 2♂ (ZMAN); Sg Semala, 03°53'48"N 108°04'17"E, 30 m, 1.vii.2001, clearing and logged lowland forest, Bpk Usnan and M. Lammertink, 3♂ (ZMAN) 1♂ (MZB); Sg Semala, 03°53'48"N 108°04'17"E, 30 m, 2.vii.2001, selectively logged lowland forest, captured by loggers for M. Lammertink, 1♂ (ZMAN) 1♂ (MZB); Sg Semala, 03°53'07"N 108°05'28"E, 30 m., 3.vii.2001, selectively logged lowland forest, Bpk Paizun and M. Lammertink, 1♂ (ZMAN) 1♂ (MZB); Sg Semala, 550 m WNW (heading 296°) of 03°53'07"N 108°05'28"E, 30 m, 2.vi.2001, ca. 15.00 hrs, selectively logged lowland forest, Bpk Paizun and M. Lammertink, 1♂ (ZMAN); Foothill of Gn. Ranai, 03°57'27"N 108°21'24"E, alt. 30 m a.s.l., 21.vii.2001, ca 8.30 hrs, forest gardens and secondary vegetation, captured by field assistants for M. Lammertink, 1♀ (ZMAN). **Kalimantan: Kalimantan Timur:** Sungai Wain, Camp Djam, 116°49'30"E 0°05'52", 20.xi.1997, G. Fredriksson, 1♂ (ZMAN); Sungai Wain Reserve, N of Balikpapan, 20.xi.1998, D.F.R. Cleary, 2♂ 1♀ (ZMAN). **Sumatra:** NE Sumatra, Kuala Simpang, lowland forest, v.1953, A. Sollaart, 1♂ (RMNH); Seleh, Kuala Simpang, ca 250 m, lowland forest, iii.1954, A. Sollaart, 1♂ (RMNH); West Sumatra: Panyabungan, 00°48'38"N 99°34'07"E, 18.ii.2002, T. Kothe, 2♂ (ZSM). **Nias:** Noord Nias, Hili Madjedja, Mitschke, 4de trim.[18]95, 1♂ (BMNH); Noord Nias, G. Madjedja, Mitschke, ix–xii.[18]93, 1♂ (BMNH).

### *Purana metallica* Duffels & Schouten sp. n.

Figs 7–12

*Purana* aff. *tigrina*; Gogala 1995: 101, 102, 111, 112, Figs 5–8.

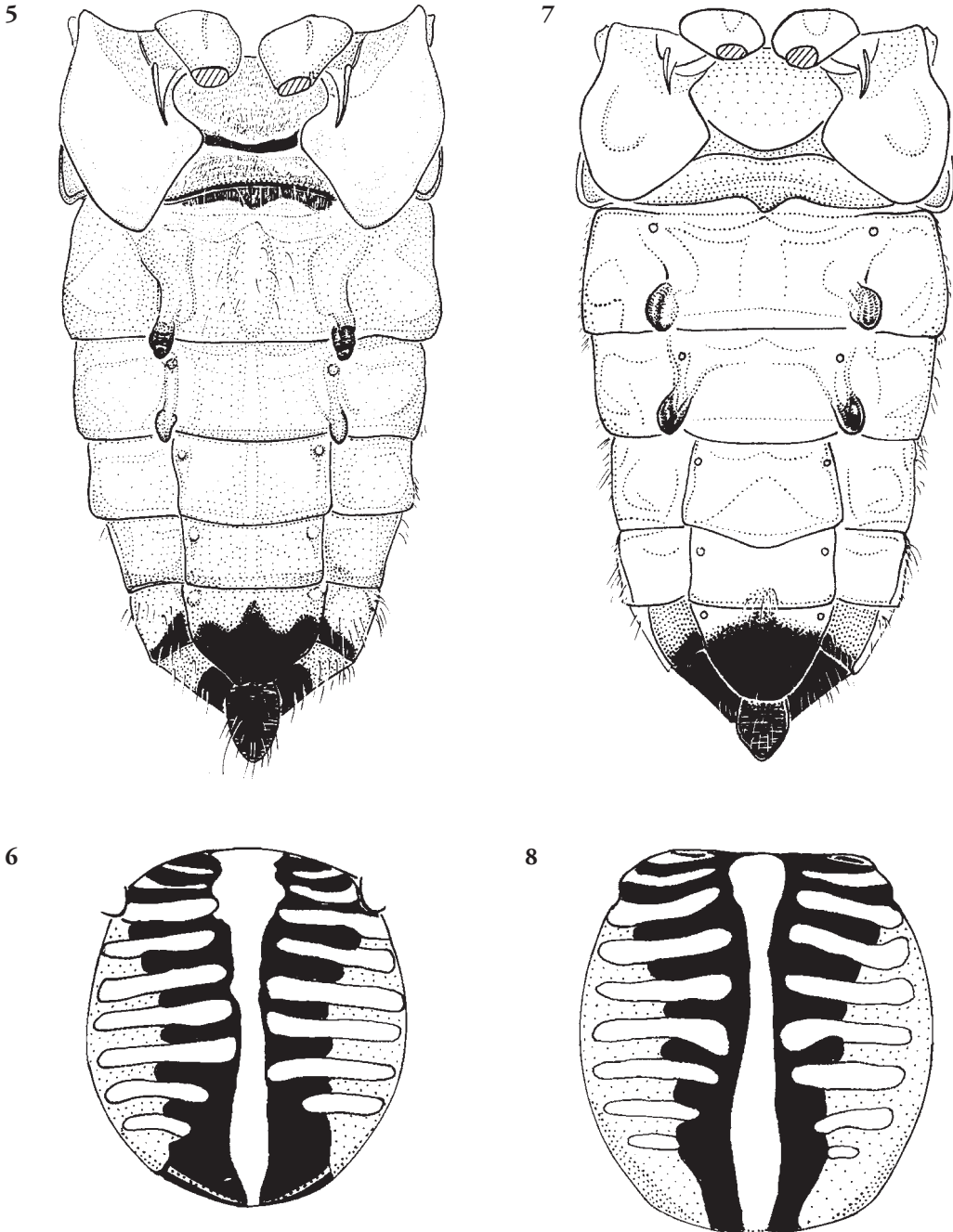
*Purana metallica*; Gogala & Trilar 2007: 390, Figs 1–4.

**Type material.** Holotype ♂: **Malaysia:** 'Malay Penin. / West Coast / Langkawi Is / April 15th 1928 / H.M. Pendlebury / Coll. F.M.S. Museums'. 'Ex. F.M.S. / Museum. / B.M. 1955–354' (MNKM). **Paratypes:** 10♂ 5♀. **Malaysia:** same data as holotype, 4♂ 3♀ (MNKM), 1♂ 1♀ (ZMAN), same data as holotype but 16.iv.1928, 2♂ (MNKM), 17.iv.1928, 1♂ (MNKM), 2.v.1928, 1♀ (MNKM). **Thailand:** Tarutao Nat. Park, 14.iv.1993, M. Gogala, 3♂ 1♀ (PMSL) 1♂ (ZMAN).

### Description

Ground colour brownish, mesonotum dark brown.

**Head.** Marking on vertex as in *P. tigrina* but triangular spots on vertex always reaching posterior margin of head. Gena with black transverse fascia reaching from antenna almost to eye in the specimens



**Figs 5–8.** *Purana* spp., males. – 5–6. *Purana tigrina*. – 5, Male abdomen in ventral view; Malaysia, Negeri Sembilan, Pasoh Forest; 6, postclypeus in ventral view, Malaysia, Johor, Endau Rompin. 7–8. *Purana metallica*. – 7, Male abdomen in ventral view, holotype; 8, postclypeus in ventral view, paratype Langkawi.



from Langkawi or to the eye in the specimens from Tarutao. Transverse grooves on anterior and ventral parts of postclypeus (Fig. 8) with two series of 7–9 paramedian brown to black fasciae: upper 3–4 pairs of transverse fasciae (almost) reach to lateral margins of postclypeus, the other fasciae reach to at most half the length of grooves. Two longitudinal lines, connecting medial ends of transverse fasciae of each side, enclose an hourglass-shaped figure of the ground colour; each of these lines widens at clypeal suture to a black mark that does not reach lateral margins of postclypeus. Marking on anteclypeus and rostrum as in *P. tigrina*.

**Thorax.** Marking on pronotum and mesonotum as in *P. tigrina*.

**Tegmina and wings.** Hyaline. Tegmina with light brown infuscations at basal veins of 2nd and 3rd apical areas.

**Legs.** Marking as in *P. tigrina*.

**Male operculum** (Figs 7, 11). Short, apical part very broadly rounded, not reaching beyond anterior margin of segment 3. Lateral margin sinuate at base and convex to rounded apex. Medial margin weakly convex, medioproximal corner rounded. Medio-basal part of operculum with relatively small brown to black patch not extending to medial margin; medial and apical margins not marked.

**Male abdomen** (Fig. 7). Dorsally with silvery pubescence. Posterior margins of tergites with narrow black bands. Tibial coverings without marking. Sternites 3 and 4 with a pair of glossy black to brown tubercles reaching, or reaching beyond, posterior margins of sternites. Sternite 7 and 8, paratergites of segment 7 and greater part of segment 8 black-brown to black.

**Male genitalia** (Fig. 10). Similar to those of *P. tigrina*, but uncus distinctly broader and gradually narrowing from base towards bicuspidate apex; lateral sides of uncus weakly convex.

**Female operculum.** Short, reaching to two thirds of abdominal segment 2 or to posterior margin of this segment. Lateral margin sinuate, laterodistal corner broadly rounded rectangular. Distal margin undulate or weakly convex. Mediobasal part of operculum with dark patch.

**Female abdomen.** As in *P. tigrina*.

**Measurements in mm** (11♂ 5♀). Body length ♂: 25–29, ♀: 20.5–22; tegmen length ♂: 28.5–32.5, ♀: 27.5–29.5; head width ♂: 7.5–8.2, ♀: 7.3–7.8; pronotum width ♂: 7.6–8.9, ♀: 7.5–8.4.

## Biology

*P. metallica* was observed in the lower stratum of the rainforest and also in forest clearings and on trees at the seashore (Gogala & Trilar 2007).

## Distribution

 (Fig. 12)

*P. metallica* is recorded from Langkawi Island, Malaysia off the west coast of the Malayan Peninsula and from Ko Tarutao island, Thailand, just north of Langkawi. The sound of *P. metallica* was also recorded in Taleban National Park on the mainland of Thailand near the Malaysian border on the 18th of April 1993 (Gogala & Trilar 2007).

## Derivation of name

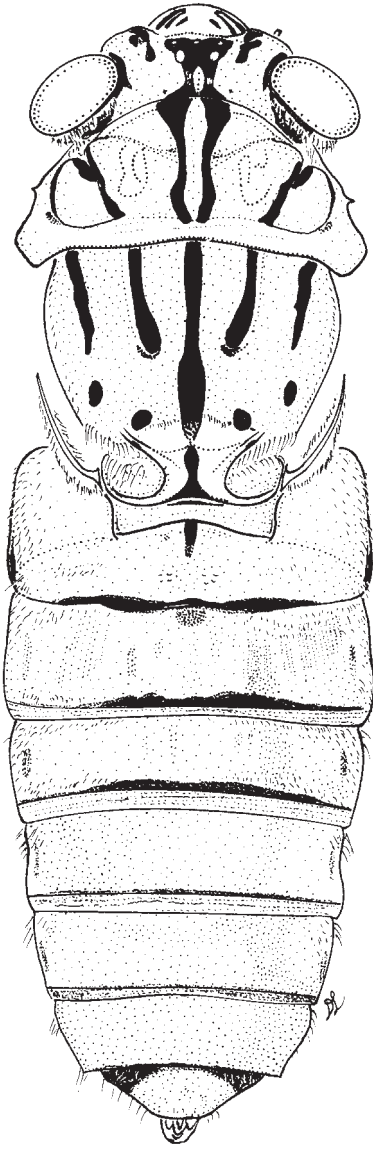
This species is named after its very high-pitched metallic sound (Gogala 1995; Gogala & Trilar 2007).

## *Purana usnani* Duffels & Schouten sp. n.

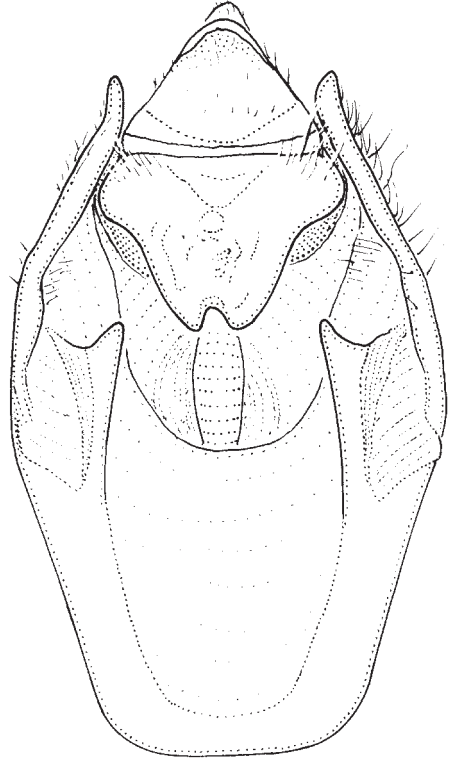
Figs 12–18

**Type material.** Holotype ♂: **Indonesia: Lingga Island:** ‘Indonesia, Lingga Isl. / Sg. Sereng, within 100 m of / 00°03’37”S 104°30’47”E / alt. 5 m a.s.l. / 02.x.2001, 8.00–17.00 hrs; Edge of burnt clearing / (80 m wide) and handlogged / swamp forest’ ‘Captured with stick & glue / by Bpk Usnan for M. Lammertink’, (ZMAN). **Paratypes:** 26♂ 6♀. **Indonesia: Lingga Island:** same data as holotype, 2♂ 1♀ (ZMAN) 2♂ 1♀ (MZB); Sg. Neneng, 00°03’37”S 104°30’47”E, alt. 5 m a.s.l., 30.ix.2001, 16.00–17.15 hrs, edge of burnt clearing (80 m wide) and handlogged swamp forest, captured with stick & glue by Bpk Masir & Bpk Edi for M. Lammertink, 5♂ 1♀ (ZMAN) 4♂ 1♀ (MZB), same data but 1.x.2001, 15.00–17.30 hrs, captured with stick & glue by Bpk Edi for M. Lammertink, 2♂ (ZMAN) 1♂ (MZB), 2.x.2001, 7.00–17.00 hrs, 3♂ 1♀ (ZMAN) 2♂ (MZB), same data but 30.ix.2001, 15.35 hrs, captured with stick & glue by Bpk Masir for M. Lammertink while these cicadas were mating 5m high in vegetation, 1♂ 1♀ (ZMAN); Mentuda, 00°09’47”S 104°28’51”E, alt. 1 m a.s.l., 28.viii.2001, 14.15 hrs, disturbed mangrove forest at village edge, height 2.5 m in vegetation, handcaptured while struggling in large spider web by Bpk Usnan for M. Lammertink, 1♂ (ZMAN). **Indonesia: Bunguran** (= Greater Natuna Island): 1.7 km SW of Gn. Lintang, 150m NE (heading 48°) of 03°41’10”N 108°14’09”E, alt. 40 m a.s.l., 13.vii.2001, cicada ca. 5 m high in vegetation, “Heath forest” i.e. forest on poor soil, low canopy at 20–25 m, much moss on forest floor and trees, many pitcher plants, lightly disturbed by handlogging, handcaptured with stick & glue by Bpk Paizun for M. Lammertink, 1♂ (ZMAN). **Singapore:** Singapore, 10.ii.1983, E. Sismondo, this specimens was thought by E. Sismondo to be conspecific with the specimen from which Recording 675/1 was made, CH, 1♂ (BMNH). **Malaysia: Borneo: Sarawak:** Bintulu,

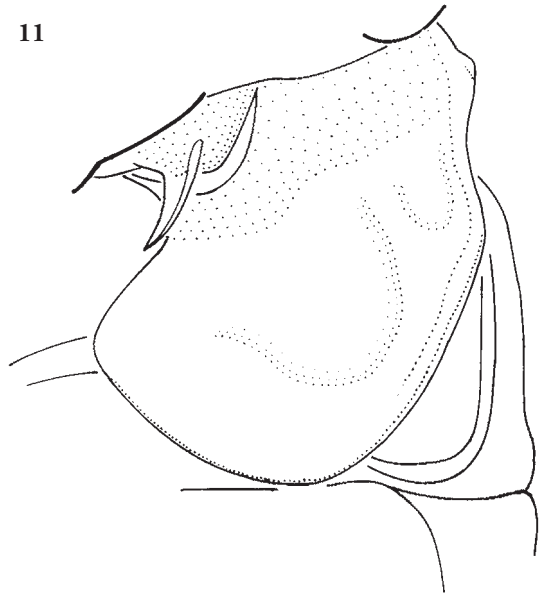
9



10



11



**Figs 9–11.** *Purana metallica*. – 9, Male body in dorsal view, holotype; 10, male pygofer in ventral view, paratype Langkawi; 11, male operculum in lateroventral view, holotype.

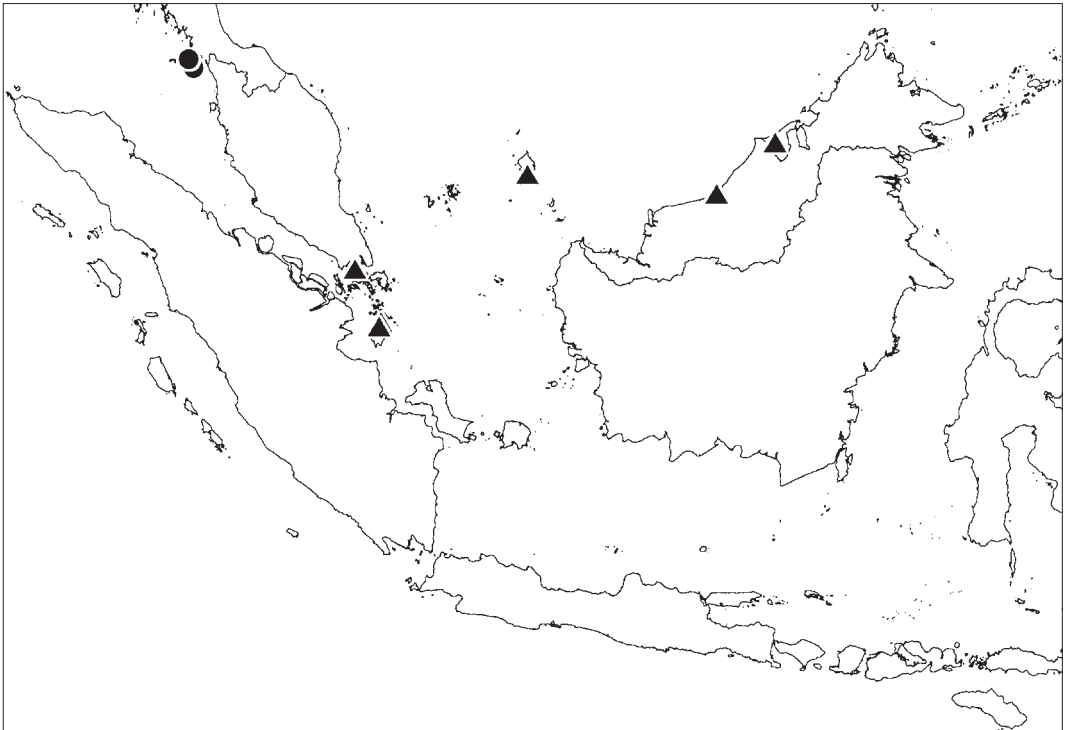


Fig. 12. Distribution of *Purana metallica* (rounds) and *P. usnani* (triangles).

14.viii.1994, Zaidi & Talib, 1♂ (UKM); Samantan, Samusan, 23–27.v.1998, Zaidi, Ismail, Ruslan, 1♂ (UKM). **Brunei:** N. Borneo, Waterstradt, 1♂ (BMNH).

### Description

All specimens from Lingga are well preserved. Ground colour of head and pronotum greenish, central part of mesonotum and dorsal side of male abdomen reddish brown.

**Head.** Vertex with median black marking as in *P. tigrina* but triangular black spots somewhat larger and not enclosing any spots of the ground colour. A pair of Y-shaped figures runs from half-length of vertex to supra-antennal plates; proximal end forming a hook; distal arms often fused in large black dot. Black band along inner margin of eye and black transverse fascia on gena broader than in *P. tigrina*. Mandibular plate in lower two thirds black, covered with silvery hirsute setae. Marking on anterior and ventral parts of postclypeus (Fig. 18) more strongly developed than in *P. tigrina*. Transverse grooves with two series of 9–10 paramedian brown to black fasciae: upper 4 pairs of these fasciae reach to lateral margins of postclypeus, next 3–4 pairs very variable

in length and reaching to half-length the grooves, or almost to, lateral margins of postclypeus, lowest 1–2 pairs of fasciae always reaching lateral margins of postclypeus. Longitudinal lines connecting medial ends of transverse fasciae strongly widened at clypeal suture to a very broad black mark. Anteclypeus and rostrum as in *P. tigrina*.

**Thorax.** Pronotum. Marking as in *P. tigrina*, but colouration in posterior oblique and ambient fissures more distinct.

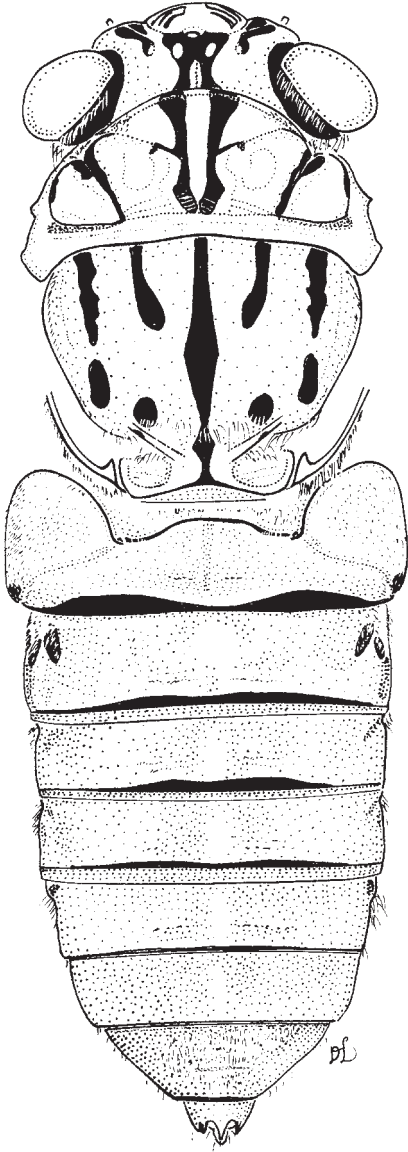
**Mesonotum.** Marking as in *P. tigrina*, but median fascia, at two fifths of its length from base, 2–4 times as wide as its anterior width and continuing as a narrow line on cruciform elevation; all fasciae generally somewhat broader than in *P. tigrina*.

**Tegmina and wings.** As in *P. tigrina*, but black-brown at basal veins of 2nd and 3rd apical areas.

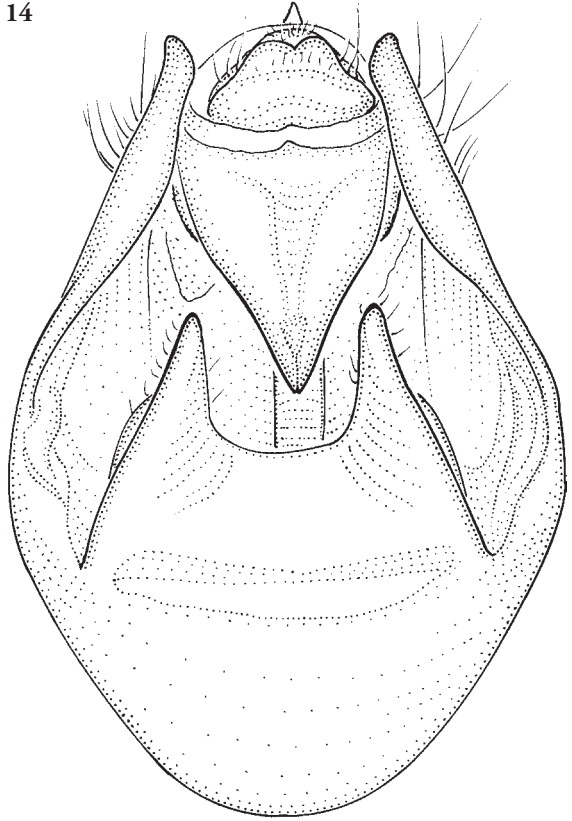
**Legs.** As in *P. tigrina*.

**Male operculum** (Figs 15, 16). Apical part rounded triangular, reaching to one fifth or one sixth of sternite 3. Lateral margin oblique, sinuate at base and convex to broadly rounded triangular apex. Medial margin weakly convex to weakly concave, medioproximal corner rounded rectangular. Basal half of male operculum black-brown extending from

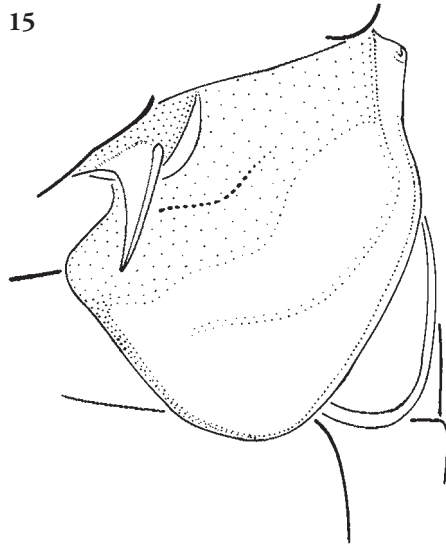
13



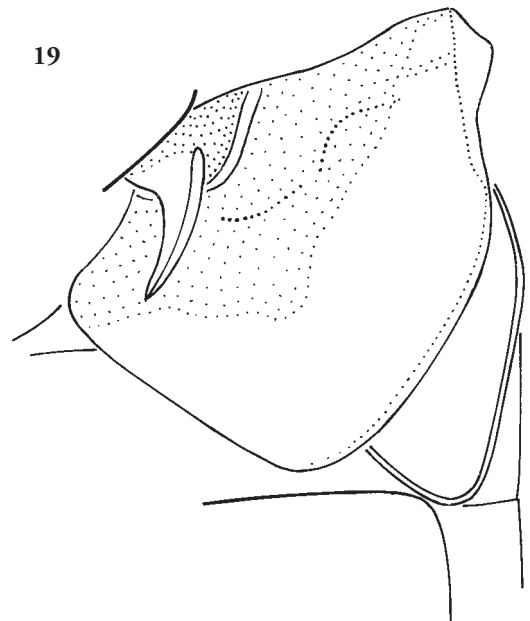
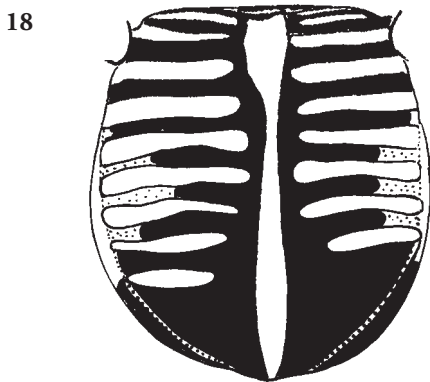
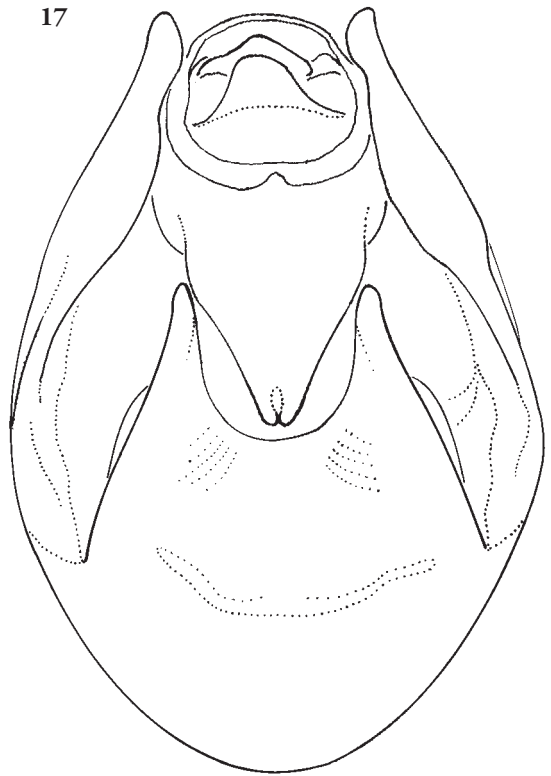
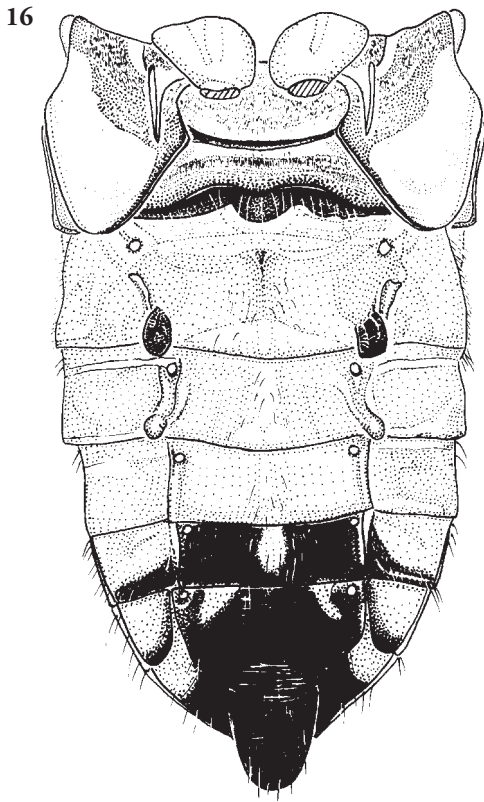
14



15



**Figs 13–15.** *Purana usnani*. – 13, Male body in dorsal view, holotype; 14, male pygofer in ventral view, holotype; 15, male operculum in lateroventral view, paratype Lingga Island.



**Figs 16–19.** *Purana* spp. – 16–18. *Purana usnani*, paratypes Lingga Island; 16, male abdomen in ventral view; 17, male pygofer in ventral view; 18, postclypeus in ventral view. – 19, *Purana mulu*, male operculum in lateroventral view, holotype.



laterobasal corner to medial margin, medial margin and margin of rounded triangular apex black-brown.

**Male abdomen** (Fig. 16). As in *P. tigrina*, but with dark median line or spot on tergite 3 and with different tubercles. Though the tubercles on sternite 3 are fairly large and glossy black as in *P. tigrina*, only one third of tubercle reaches beyond posterior margin of sternite; tubercles on sternite 4 small and light brown and just reaching beyond posterior margin of sternite.

**Male genitalia** (Figs 14, 17). Pygofer oval-shaped, black to brown. Basal pygofer lobes consisting of a pair of very large, black-brown, spine-shaped projections reaching from two fifths to two thirds of pygofer length. Margin between basal pygofer lobes U-shaped. Uncus triangular, broad at base, slightly narrowing to half its length and from there strongly narrowing to narrow apex; uncus variable in length and size. Lateral process of pygofer very short, somewhat recurved with rounded apex.

**Female operculum**. Fairly short, almost, or just, reaching posterior margin of abdominal segment 2. Lateral margin sinuate, laterodistal corner broadly rounded rectangular. Distal margin undulate. Medial half of operculum black-brown.

**Female abdomen**. As in *P. tigrina*.

**Measurements in mm** (10♂ 6♀). Body length ♂: 23.5–26, ♀: 20–22; tegmen length ♂: 30.5–32.5, ♀: 29–32.5; head width ♂: 7.2–8.0, ♀: 7.3–7.8; pronotum width ♂: 7.6–8.5, ♀: 7.5–8.4.

### Distribution (Fig. 12)

A long series of this species was collected on Lingga Island off the east coast of Sumatra. Furthermore, small numbers of specimens are recorded from Singapore, Borneo (Sarawak and Brunei), and Bunguran (= Greater Natuna Island) between Sumatra and Borneo. On Lingga Island, most of the material was collected in swamp forest.

### Derivation of name

This species is named in memory of Bapak Usnan from Sukadana, Kalimantan Barat, who was invaluable as an assistant to Martjan Lammertink during his fieldwork in Kalimantan, and on Lingga and Bunguran Islands in 1998–2001. Bapak Usnan passed away in May 2005 at the early age of 50.

### *Purana mulu* Duffels & Schouten sp. n.

Figs 19–21, 25

**Type material**. Holotype ♂: **Malaysia: Borneo: Sarawak**: 'Sarawak / Gunong Mulu / Nat. Park', 'Site 20. Mar.–Apr. / W. Melinau Gorge / 150 m.

422577 / FEG 3. Kerangas. / MV-understorey' 'J.D. Holloway / RGS Mulu exped. / B.M. 1978–2006', (BMNH). **Paratypes**: 4♂ 2♀. **Malaysia: Borneo: Sarawak**: same data as holotype, 2♂ 1♀ (BMNH), 1♂ 1♀ (ZMAN). **Brunei**: North Borneo, 1♂ (BMNH).

### Description

Ground colour brownish, central part of mesonotum and dorsal side of male abdomen somewhat reddish brown.

**Head**. Vertex with median black marking as in *P. usnani*, triangular black spots sometimes enclosing a pair of spots of ground colour. Y-shaped figures, black band along inner margin of eye and black transverse fascia on gena as in *P. usnani*. Transverse grooves on postclypeus with two series of 9–10 paramedian brown to black fasciae; upper 4 pairs of transverse fasciae reach to lateral margins of postclypeus, other fasciae variable in length. Longitudinal lines connecting medial ends of transverse fasciae on postclypeus strongly widened at clypeal suture to a black mark reaching lateral margins of postclypeus. Marking on mandibular plate, post- and anteclypeus, and rostrum as in *P. usnani*.

**Thorax**. Pronotum. Marking as in *P. usnani*.

**Mesonotum**. Marking as in *P. usnani*, but median fascia, at two fifths of its length from base, 3–4 times as wide as its anterior width and continuing on cruciform elevation. Lateral fasciae continuous or broken up (in two paratypes).

**Tegmina and wings**. As in *P. usnani*, but infuscations at basal veins of 2nd and 3rd apical areas light brown.

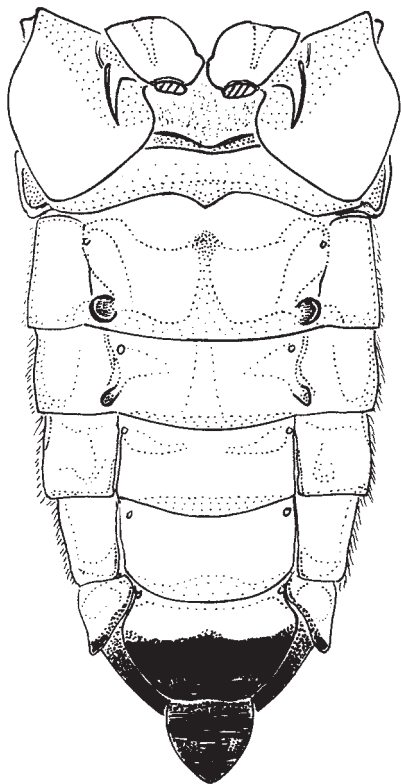
**Legs**. As in *P. usnani*.

**Male operculum** (Figs 19, 20). Short, apically broadly rounded, more or less triangular, not reaching beyond anterior margin of segment 3. Lateral margin oblique, but sinuate at base, and convex to very broadly rounded apex. Medial margin straight or convex, medioproximal corner rounded. Basal one third of male operculum black-brown, medial and apical margins not blackened.

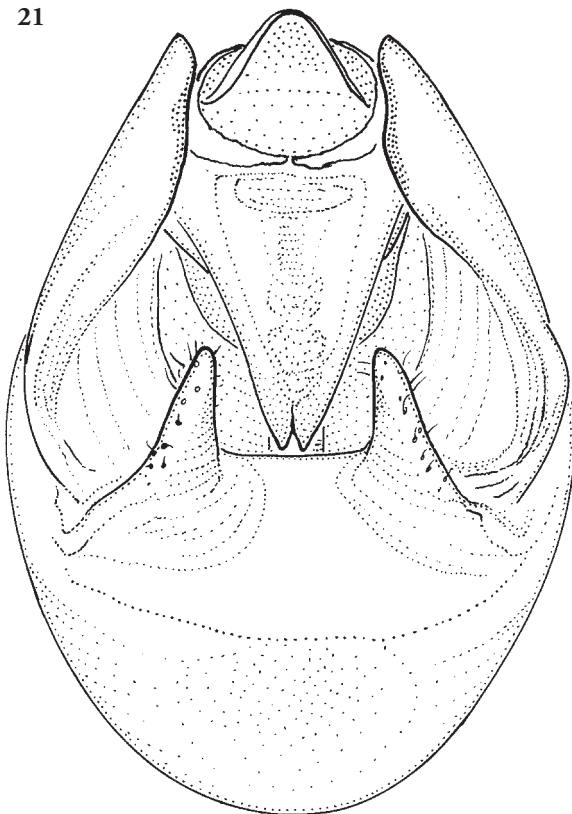
**Male abdomen** (Fig. 20). As in *P. usnani*. Posterior margins of tergites often with narrow black bands. Tergite 3 without dark median line or spot. Tubercles on sternites 3 and 4 much smaller than in *P. usnani* and *P. tigrina*. Tubercles on sternite 3 about one fourth as long as sternite and not reaching beyond posterior margin of sternite; tubercles on sternite 4 much smaller, light brown, and not reaching beyond posterior margin of sternite. Posterior half of sternite 7 and entire sternite 8 black-brown to black.

**Male genitalia** (Fig. 21). As in *P. usnani*, but differing in shape of basal pygofer lobes and uncus.

20



21



**Figs 20–21.** *Purana mulu*, holotype. – 20, Male abdomen in ventral view; 21, male pygofer in ventral view.

Spine-shaped projections of basal pygofer lobes somewhat shorter and more robust. Uncus with very weakly convex lateral margins and gradually narrowing from base to apex.

**Female operculum.** As in *P. usnani*.

**Female abdomen.** As in *P. usnani*, but only tergites 2 to 3 or 2 to 4 have a pair of paramedian low black triangles.

**Measurements in mm** (Mulu specimens: 4♂ 2♀). Body length ♂: 22.5–26, ♀: 21.5–23; tegmen length ♂: 28.5–31, ♀: 29–30; head width ♂: 7.2–7.8, ♀: 7.7–7.9; pronotum width ♂: 7.4–8.2, ♀: 7.5–8.0.

**Distribution** (Fig. 25)

This species is known from Northern Borneo: Gunung Mulu N. P., Sarawak, and Brunei.

*Purana latifascia* Duffels & Schouten sp. n.

Figs 22–26

*Purana latifascia*; Gogala & Trilar 2007: 390–396, Figs 5–10.

**Type material.** Holotype ♂: **Malaysia: Sabah:** 'Malaysia, Sabah / Klagan, / Kampong Lubu / 2.5.1999, Trilar leg.' (PMSL). Paratype: **Malaysia: Sabah:** same data as holotype, 1♂ (PMSL).

### Description

Ground colour light brown.

**Head.** Marking as in *P. usnani*.

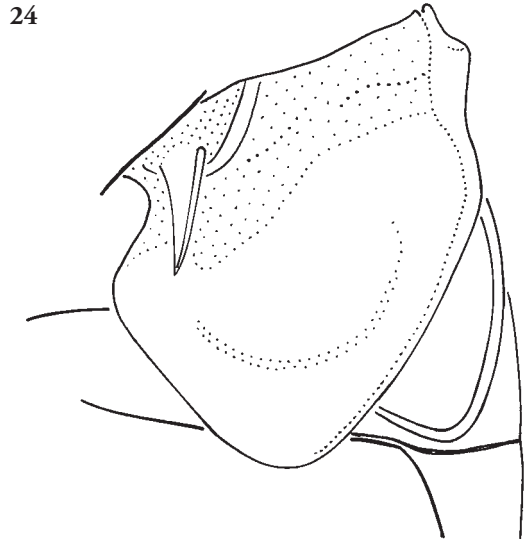
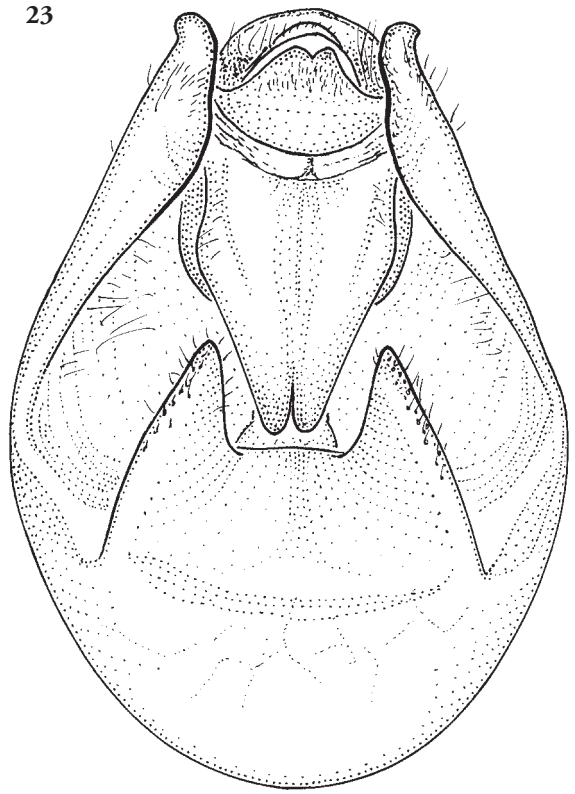
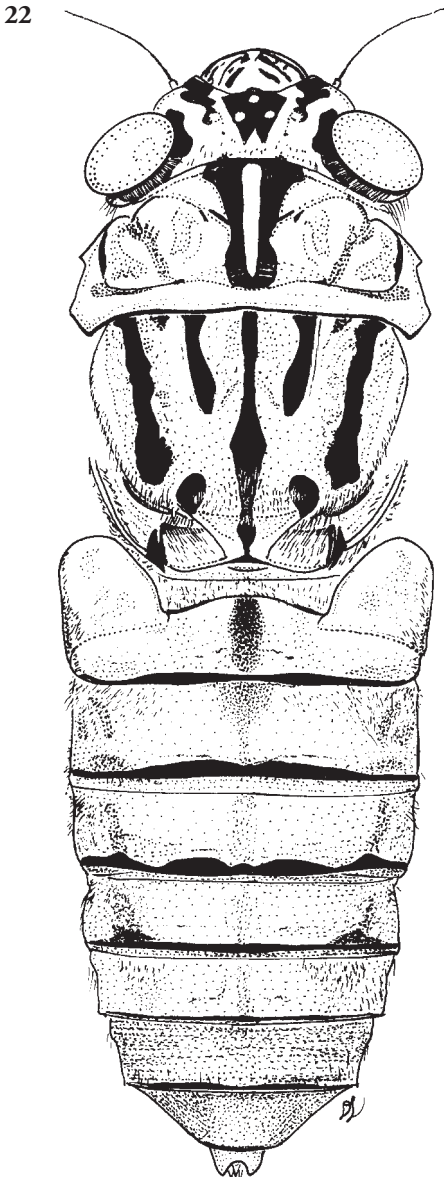
**Thorax.** Pronotum. Marking as in *P. usnani*.

**Mesonotum.** Marking as in *P. usnani*, but median fasciae at two fifths of its length from base 2–3 times as wide as its anterior width and continuing on cruciform elevation (Fig. 22). Lateral fasciae continuous, widest part of lateral fascia as wide as distance between paramedian and lateral fasciae.

**Tegmina and wings.** As in *P. usnani*.

**Legs.** As in *P. usnani*.

**Male operculum** (Figs 24, 26). Apical part rounded triangular, reaching just beyond anterior margin of sternite 3. Lateral margin oblique, sinuate at base and very weakly convex to fairly broadly rounded, triangular apex. Medial margin very weakly concave,



**Figs 22–24.** *Purana latifascia*, holotype. – 22, Male body in dorsal view; 23, male pygofer in ventral view; 24, male operculum in lateroventral view.

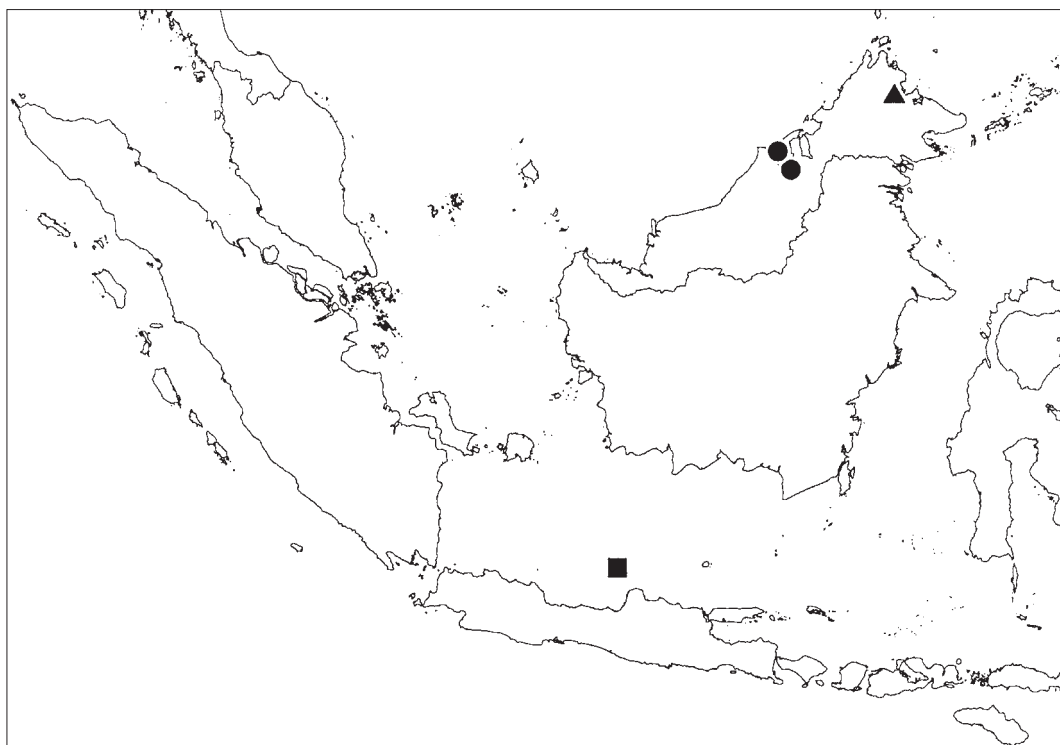


Fig. 25. Distribution of *Purana karimunjava* (squares), *P. latifascia* (triangles) and *P. mulu* (rounds).

medioproximal corner rounded rectangular. Basal one third of male operculum black-brown; medial margin and margin of rounded triangular apex not blackened.

**Male abdomen** (Fig. 26). As in *P. usnani*, but tubercles smaller, those on segment 3 fairly large, light brown to black brown, and reaching just beyond segment margin, those on segment 4 small, light brown and just reaching posterior segment margin. Tergite 3 with dark median, brown spot. Posterior margins of tergites with narrow black bands.

**Male genitalia** (Fig. 23). As in *P. usnani*, but differing in shape of basal pygofer lobes and uncus. Basal pygofer lobes short and stout, more similar to those of *P. mulu*. Uncus very large, with fairly concave lateral margins, and gradually narrowing from base to apex.

**Measurements in mm** (2♂). Body length ♂: 27.5; tegmen length ♂: 32.5; head width ♂: 8.0; pronotum width ♂: 8.3–8.6.

### Biology

This species was collected in Kampong Lubu, a village of long houses at the border of mangroves along

the river Sungai Klangen, from 3–7 km away from the sea (Gogala & Trilar 2007). The sound of this species was recorded at the same locality.

### Distribution

(Fig. 25) This species is described after two specimens from Sabah, which were collected in trees near a long-house in Kampong Lubu.

### Derivation of name

The relatively broad lateral mesonotal fasciae characterize this species. The name 'latifascia' is composed of two parts 'lati' (Latin for broad) and 'fascia' (Latin for band).

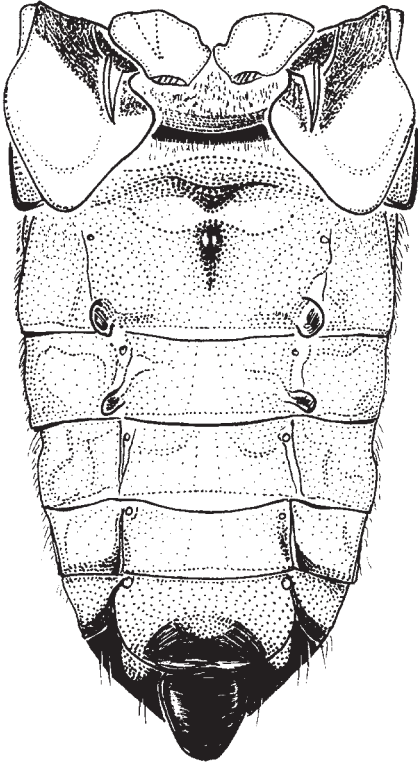
### *Purana karimunjava* Duffels & Schouten

#### sp. n.

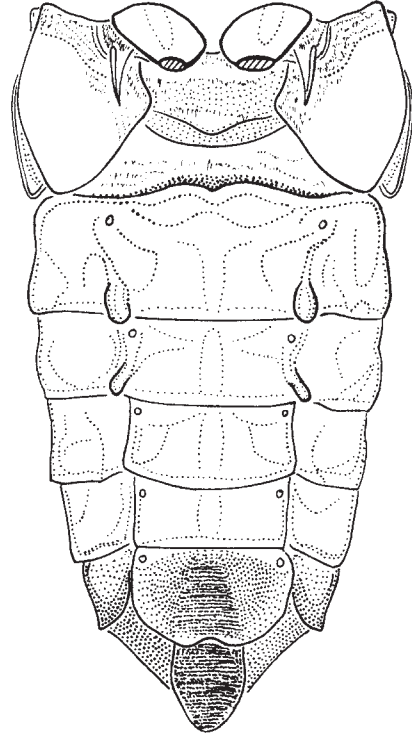
Figs 25, 27–30

**Type material.** Holotype ♂: Indonesia: Java: Karimunjava Island: 'Karimon Djawa / 22–30.xi.1980 / M.A. Liefstinck', 'mzb hemi. 17621' (MZB). Paratypes: 5♂. Indonesia: Java: Karimunjava Island: C. Java, P. Karimundjava,

26



27



**Figs 26–27.** *Purana* spp. – 26, *Purana latifascia*, male abdomen in ventral view, holotype. – 27, *Purana karimunjava*, male abdomen in ventral view, holotype.

9.xi.1955, leg. A. Hoogerwerf, mzb hemi. 16879, 1♂ (MZB), same but 5.xi.1955, mzb hemi. 16874, 1♂ mzb, mzb hemi. 18136, 1♂ (MZB); C. Java, P. Kemudjan, 15.xi.1955, leg. A. Hoogerwerf, mzb hemi. 18161, 1♂ (MZB), same data but mzb hemi. 18146, 1♂ (MZB).

### Description

Ground colour brownish.

**Head.** Marking as in *P. usnani*.

**Thorax.** Pronotum. Marking as in *P. usnani*, but dark marking of posterior oblique and ambient fissures often less distinct.

**Mesonotum.** Median fascia fairly narrow anteriorly, at two fifths of its length from base, 2–3 times as wide as its anterior width, and often continuing on cruciform elevation. Anterior half of paramedian fasciae as wide as anterior part of median fascia, distal half slightly broader; fasciae slightly converging to half-length of mesonotum. Lateral fasciae always broken-up in a linear part, which is 2–3 times as wide as anterior part of median fascia and reaches to two thirds of mesonotum length, and a distal black

spot. A pair of black spots in front of cruciform elevation; posterior rim of cruciform elevation with a low median black triangle.

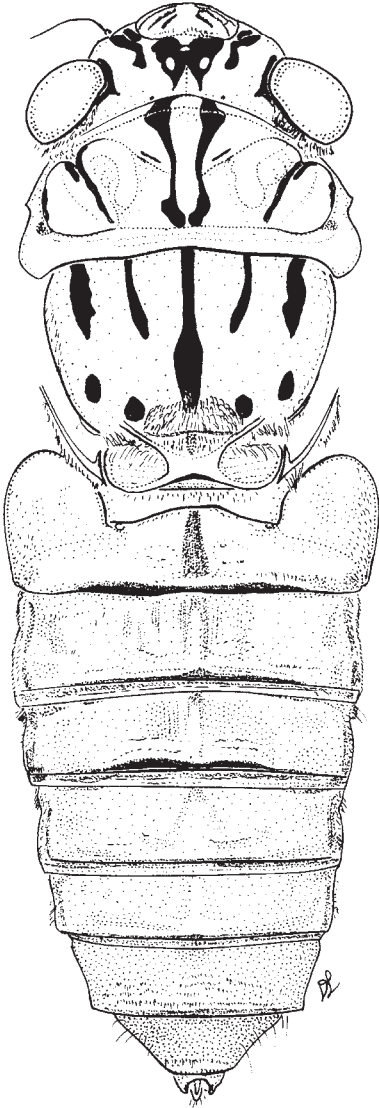
**Tegmina and wings.** As in *P. usnani*, but infuscations at basal veins of 2nd and 3rd apical areas light brown.

**Male operculum** (Figs 27, 30). Apical part rounded triangular, reaching distinctly beyond anterior margin of segment 3 to at most one sixth of segment length. Lateral margin oblique, sinuate at base and weakly convex or weakly concave to broadly rounded triangular apex. Medial margin weakly convex to weakly concave, medioproximal corner rounded rectangular. Basal one fourth of operculum black-brown, medial margin more or less black-brown.

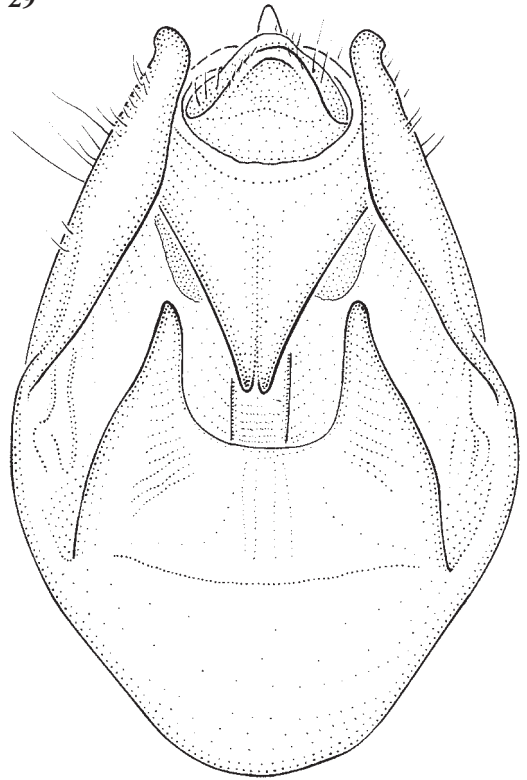
**Male abdomen** (Fig. 27). Dorsally with silvery pubescence. Tergite 3 with dark median line or spot. Posterior margins of tergites often with narrow, brown to black band. Timbal coverings without marking. Tubercles on sternite 3 black to brown, reaching beyond posterior margin of sternite; at most one third of tubercle extending beyond margin of sternite. Tubercles on segment 4 much smaller, brown and at most reaching to just beyond sternite margin.



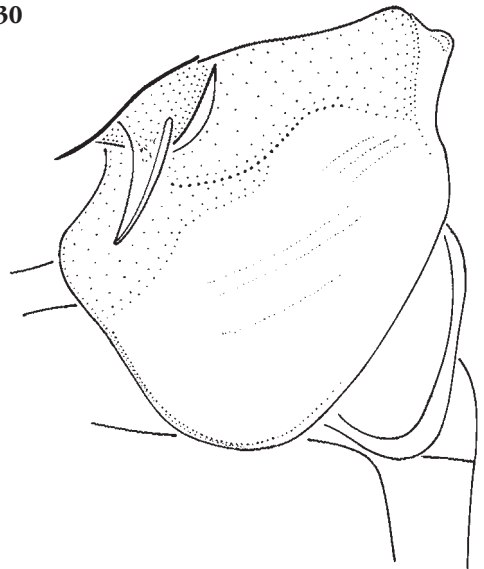
28



29



30



**Figs 28–30.** *Purana karimunjava*, holotype. – 28, Male body in dorsal view; 29, male pygofer in ventral view; 30, male operculum in lateroventral view.

**Male genitalia** (Fig. 29). As in *P. usnani*, but with the strongly chitinized parts of pygofer brown instead of black.

**Measurements in mm** (6♂). Body length ♂: 25–28; tegmen length ♂: 29.5–33.5; head width ♂: 7.7–8.0; pronotum width ♂: 7.9–8.6.

### Distribution (Fig. 25)

This species is known from Karimunjawa Island and Kemujan Island in the Karimun Archipelago north of central Java. This species has not been recorded from Java proper.

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## Book review

P. Oosterbroek, 2007. **The European families of the Diptera – Identification, diagnosis, biology.** 204 pp., over 600 figures. KNNV Publishing, Utrecht, Netherlands. Hardback ISBN 978-90-5011-245-1. Price € 59.95 excl. p&p. [www.knnvpublishing.nl](http://www.knnvpublishing.nl)

Finally there is a compact English handbook for the identification of the Diptera families of Europe. The Dutch version was published a year earlier and it has been translated, even more thoroughly tested and revised where necessary. Several parts of the key and family discussions have been updated to deal with a number of aberrant or variable groups and additional figures have been added. Species numbers for the Netherlands and Belgium have been replaced by the number of European genera and an estimate of the number of species.

The Introduction clearly states the book's history, geographical scope and systematic context and gives a broader view of "the Diptera". The Classification chapter itself is rather general in content and it mostly is a table with the actual classification of the 132 families in the key. Terminology used in the book is covered by more than ten pages and covers every term used in the keys, giving references to figures illustrating the feature or cross referring to a larger feature that is more thoroughly discussed.

Next follows the Identification key, which is extensively illustrated, usually with the text on the right page and the figures on the left. This allows the use of the key with very little need to turn pages to see relevant illustrations. Some pages with figures look a little crowded which is the result of the addition of figures after the revision. Since the figures are not all from the same source the styles vary but this is an aesthetic objection only.

At several instances in the key remarks have been added to assist in the use of the key or to indicate one or more groups that appear elsewhere in the key but that have a similar combination of characters. The choice was made to precede these remarks with ">>>" rather than use a smaller or different font for the remark which would have more clearly indicated their status as remark.

The use of the keys is straightforward, though some may have to get used to the characters used for some of the main divisions. Characters like the number and position of the costal breaks or the presence or absence of vibrissae, that were frequently used in older keys, are avoided for major divisions in the key,



either because families are not constant in that respect or because the features are not always easily interpreted. A number of specialists have tested the key using both "everyday" taxa but also some aberrant or rather outlandish taxa from the edges of the area covered. This should ensure that all European flies can be identified to the family level. And sure enough, the chloropid *Dicraeus raptus* (Haliday, 1838) keys out without any problem, even though the cross vein DM-Cu is absent (rather uncharacteristic in the family) and wingless Sciaridae run to the correct couplet every time.

After the keys all families are discussed in brief chapters with sections dealing with systematics (classification in general terms, number of European genera, estimate of number of species in Europe), diagnosis and biology and references to important literature. These chapters have also been updated in the translation and even more care has been taken to mention important aberrations. Still, so many families have one or more aberrant taxa making it impossible to include them all (for example the aberrant wing venation of *D. raptus* mentioned above is not given). Using the name *Icherya* rather than *Icerya* for a coccoid (in Cryptochaetidae biology) is one of the very few minor errors that could be found.

*continued on page 480*