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The lanternfly genus *Penthicodes*: key to the species and review of the “*Ereosoma* group” with two new species and one new subspecies (Hemiptera: Fulgoromorpha: Fulgoridae)

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Abstract

Penthicodes celebica n. sp., is described from Sulawesi, *P. warleti* n. sp. from India (Assam) and *P. caja malayana* n. ssp. from peninsular Malaysia. They are compared with the allied species of the subgenus *Ereosoma* Kirkaldy, 1906, as treated by Nagai & Porion (1996): *P. astraea* (Stål, 1864), *P. atomaria* (Weber, 1801) *P. bimaculata* (Schmidt, 1905), *P. caja* (Walker, 1851), *P. pulchella* (Guérin-Méneville, 1838), *P. quadrimaculata* Lallemand, 1963, *P. rugulosa* (Stål, 1870) and *P. variegata* (Guérin-Méneville, 1829). *Penthicodes quadrimaculata* is removed from synonymy with *P. bimaculata*. Male genitalia of all treated species are illustrated and described. New geographical records, distribution maps, behaviour data and photographs of habitus are given. An illustrated identification key to all 12 species of the genus, including *P. farinosa* and *P. nicobarica*, is proposed. *Penthicodes basigera* (Walker, 1870) is transferred to the genus *Scamandra* Stål, 1863 and the new combination *Scamandra basigera* (Walker, 1870) n. comb. is proposed. The subgenus *Ereosoma* is regarded as heterogenous and the species are separated in 2 new species-groups on the base of the male genitalia and colour pattern: group *astraea*+ (*astraea*, *bimaculata*, *caja*, *celebica*, *quadrimaculata*, *rugulosa* and *variegata*) and group *atomaria*+ (*atomaria*, *pulchella*, *warleti*).

Key words: Lanternbug, Fulgoroidea, Aphaeninae, Oriental Region

Introduction

Blanchard (1845) described the genus *Penthicodes* widely distributed in South Eastern Asia (from India to Vietnam and Southern China, and southwards to Sulawesi and Taliabu) with the species *farinosa* Weber, 1801 and *variegata* Guérin-Méneville, 1829, partly including species from *Aphaena* Guérin-Méneville, 1834. Gradually species were added, until Metcalf's catalogue (1947) included two subgenera: *Penthicodes* with ten species, and *Ereosoma* Kirkaldy, 1906 with one species. Eight other species later attributed to *Penthicodes* were placed by Metcalf (1947) in his artificial, heterogenous genus *Aphaenina* Metcalf, 1947.

Lallemand (1963) in his revision of the Asian and Australian species, recorded three species in the subgenus *Penthicodes* (with seven subspecies and one variety in *P. farinosa*), nine in *Ereosoma* and put *atomaria* in a third group.

Ten species are presently recognized in the genus *Penthicodes* (Nagai & Porion, 1996): two in the subgenus *Penthicodes* (*farinosa* with five subspecies and *nicobarica*) and eight in the subgenus *Ereosoma* (*astraea*, *atomaria*, *basigera*, *bimaculata*, *caja*, *pulchella*, *rugulosa*, *variegata*).

During the identification of recent material of *Penthicodes* in the accessions of RBINS, ZMAN and CAS, two undescribed species and one subspecies have been found. The three new taxa are members of the subgenus *Ereosoma* Kirkaldy, 1906, as treated in Lallemand, 1963.

The present paper aims to describe the new taxa and compare them to the other species of the subgenus *Ereosoma*. An illustrated key to all species of *Penthicodes* is given, while the status of the numerous “forms” of *P. farinosa* (Weber, 1801) (see Lallemand, 1963 and Nagai & Porion, 1996) is currently being revised by our German colleagues Sophia Seidel and Andreas Wessel (Seidel & Wessel, *pers. comm.*).

Also, *P. quadrimaculata* Lallemand, 1963 is removed from synonymy with *P. bimaculata* (Schmidt, 1905).

The present study has also lead to reconsidering the generic attribution of *Penthicodes basigera* (Walker, 1870), which is transferred to the genus *Scamandra* Stål, 1963 and the new combination *Scamandra basigera* (Walker, 1870) is proposed. The precise status of *S. basigera* within the genus *Scamandra* is not discussed here as the genus requires revision.



FIGURES 1–6. 1, *Penthicodes astraea*. 2, *P. atomaria*, form with red hind wings. 3, *P. atomaria*, form with orange hind wings. 4, *P. bimaculata*. 5, *P. caja caja*. 6, *P. caja malayana*. A: habitus, dorsal view; B: vertex, pro and mesonotum, dorsal view; C: frons, normal view; D: habitus, lateral view; E: habitus, ventral view.



FIGURES 7–12. 7, *Penthicides celebica*. 8, *P. pulchella*. 9, *P. quadrimaculata*. 10, *P. rugulosa*. 11, *P. variegata*. 12, *P. warleti*. A: habitus, dorsal view; B: vertex, pro and mesonotum, dorsal view; C: frons, normal view; D: habitus, lateral view; E: habitus, ventral view.

Material and methods

Distribution maps produced by the software *CFF 2.0* (Barbier & Rasmont, 2000) and photos of habitus are provided. Male genitalia are illustrated from dry organs dissected with a needle blade from softened specimens.

The following acronyms are used for the measurements (taken as in Constant, 2004): BF—breadth of the frons, BT—breadth of the thorax, BTg—breadth of the tegmen, BV—breadth of the vertex, LF—length of the frons, LM—length of the mesonotum, LP—length of the pronotum, LT—total length, LTg—length of the tegmen, LV—length of the vertex.

Acronyms used for the collections (name of the curator in parentheses).

BMNH	The Natural History Museum, London, United Kingdom (M. Webb)
CAS	California Academy of Sciences, San Francisco, California, U.S.A. (N. D. Penny)
DEI	Deutsches Entomologisches Institut, Müncheberg, Germany (E. Groll)
FMNH	Field Museum of Natural History, Chicago, Illinois, U.S.A. (P.P. Parillo)
FSAG	Facultés des Sciences Agronomiques de Gembloux, Gembloux, Belgium (E. Haubruge)
GGC	Geert Goemans private collection, Belgium
IEBR	Institute of Ecology and Biological Resources, Hanoi, Vietnam (H.T. Pham)
MHNL	Muséum d'Histoire Naturelle de Lyon, France (H. Labrique, J. Clary)
MSNG	Museo Civico di Storia Naturale "Giacomo Doria", Genova, Italy (F. Penati)
NHRS	Naturhistoriska riksmuseet, Stockholm, Sweden (G. Lindberg)
NMW	Naturhistorisches Museum Wien, Wien, Austria (Herbert Zettel)
OUMNH	Oxford University Museum of Natural History, Oxford, United Kingdom (D. Mann, Z. Simons)
RBINS	Royal Belgian Institute of Natural Sciences, Brussels, Belgium (P. Grootaert)
RMNH	Nationaal Natuurhistorisch Museum (Naturalis), Leiden, The Netherlands (R. de Vries)
SMTD	Staatliches Museum für Tierkunde, Dresden, Germany (R. Emmrich)
ZMHB	Museum für Naturkunde der Humboldt- Universität, Berlin, Germany (J. Deckert)
ZMPA	Polish Academy of Sciences, Museum of the Institute of Zoology, Warsaw, Poland (J. Szwed, A. Stroinski)
ZMAN	Zoölogisch Museum Amsterdam, Amsterdam, The Netherlands (J.P. Duffels, W. Hogenes)
ZMUC	Zoological Museum of the University of Copenhagen, Denmark (N. P. Kristensen)

Taxonomy

Family Fulgoridae Duméril, 1820

Subfamily Aphaeninae Blanchard, 1847

Tribe Aphaenini Distant, 1906

Genus *Penthicodes* Blanchard, 1845

Identification key to the species

1. vertex with 2 patches of white waxy secretion (Figs. 13D, E) 2
- vertex without patches of white waxy secretion (e.g. Figs. 1B, 2B) 3
2. head broader than long in dorsal view (Fig. 13D) *Penthicodes farinosa* (Weber, 1801)
- head as long as broad between eyes in dorsal view (Fig. 13E) *Penthicodes nicobarica* (Stål, 1869)
3. apical black patch of hind wings rounded, distinct from paler marginal infuscate band (Figs. 2A, 3A, 8A, 12A) 4
- apical black patch of hind wings with internal margin concave, prolongating the broad concolorous marginal band

- (e.g. Figs. 1A, 4A, 6A) 6
4. head and pronotum pale yellow-brown, mesonotum black-brown (e.g. Fig. 2B) 5
- head and thorax uniformly coloured (Fig. 8B); tegmina with small dark brown spots on membrane and costal cell without 2 large black spots, showing only small dark brown spots (Fig. 8A); legs with pale rings (Fig. 8 E) *Penthicodes pulchella* (Guérin-Méneville, 1838)
5. tegmina with small spots on membrane, no large spots on costal cell but 2 larger spots on disc (Fig. 12A); legs with pale rings (Fig. 12E) *Penthicodes warleti* n. sp.
- tegmina with membrane unspotted and usually 2 large spots on costal cell (Figs 2A, 3A); legs uniformly dark brown to black (Fig. 2E, 3E) *Penthicodes atomaria* (Weber, 1801)
6. tegmina with complete transverse white band along nodal line of cross veins (Fig. 1A) *Penthicodes astraea* (Stål, 1864)
- tegmina without complete transverse white band on nodal line: only one or two white spots along margins (e.g. Figs. 4A, 5A, 9A) 7
7. tegmina with 2 white spots at nodal line of cross veins, along costal and along sutural margins (e.g. Figs. 5A, 6A, 9A) 8
- tegmina with only one white spot along sutural margin (e.g. Fig. 4A) 11
8. spots of tegmina large, dark brown; abdominal tergites black in middle (Figs. 5A, 6A) *Penthicodes caja* (Walker, 1851) ... 9
- spots of tegmina smaller, black-brown; abdominal tergites red, rarely basal tergites black-brown in middle (Figs 9A, 11A) 10
9. disc of hind wings orange (Fig. 5A) *Penthicodes caja caja* (Walker, 1851)
- disc of hind wings red (Fig. 6A) *Penthicodes caja malayana* n. sp.
10. disc of hind wings orange to orange-red with base red, or red, and with 3 (2–5) round, large black spots; usually at least one black spot with white center (Fig. 9A) (Sumatra, Borneo, Java, We, Nias and Madura) *Penthicodes quadrimaculata* Lallemand, 1963
- disc of hind wings always yellow-orange with base red, and with 5–10 black spots, 2–4 large and 3–6 small ones (Fig. 11A) (continental SE Asia) *Penthicodes variegata* (Guérin-Méneville, 1829)
11. legs I and II black-brown with pale yellow-brown rings (Fig. 4E) (Sumatra, Singapore and Borneo) *Penthicodes bimaculata* (Schmidt, 1905)
- legs I and II uniformly black-brown or with very slightly paler rings (Fig. 7E) 12
12. membrane of tegmina without black-brown markings, only some very small whitish spots (Fig. 10A) (Philippines) *Penthicodes rugulosa* (Stål, 1870)
- membrane of tegmina with black-brown markings (Fig. 7A) (Sulawesi) *Penthicodes celebica* n. sp.

Penthicodes astraea (Stål, 1864)

Figs. 1 A–E, 13 B, 14 A–D, 24.

Aphana astraea Stål, 1864: 61.

Penthicodes astraea (Stål, 1864): Metcalf, 1947: 133; Lallemand, 1963: 24.

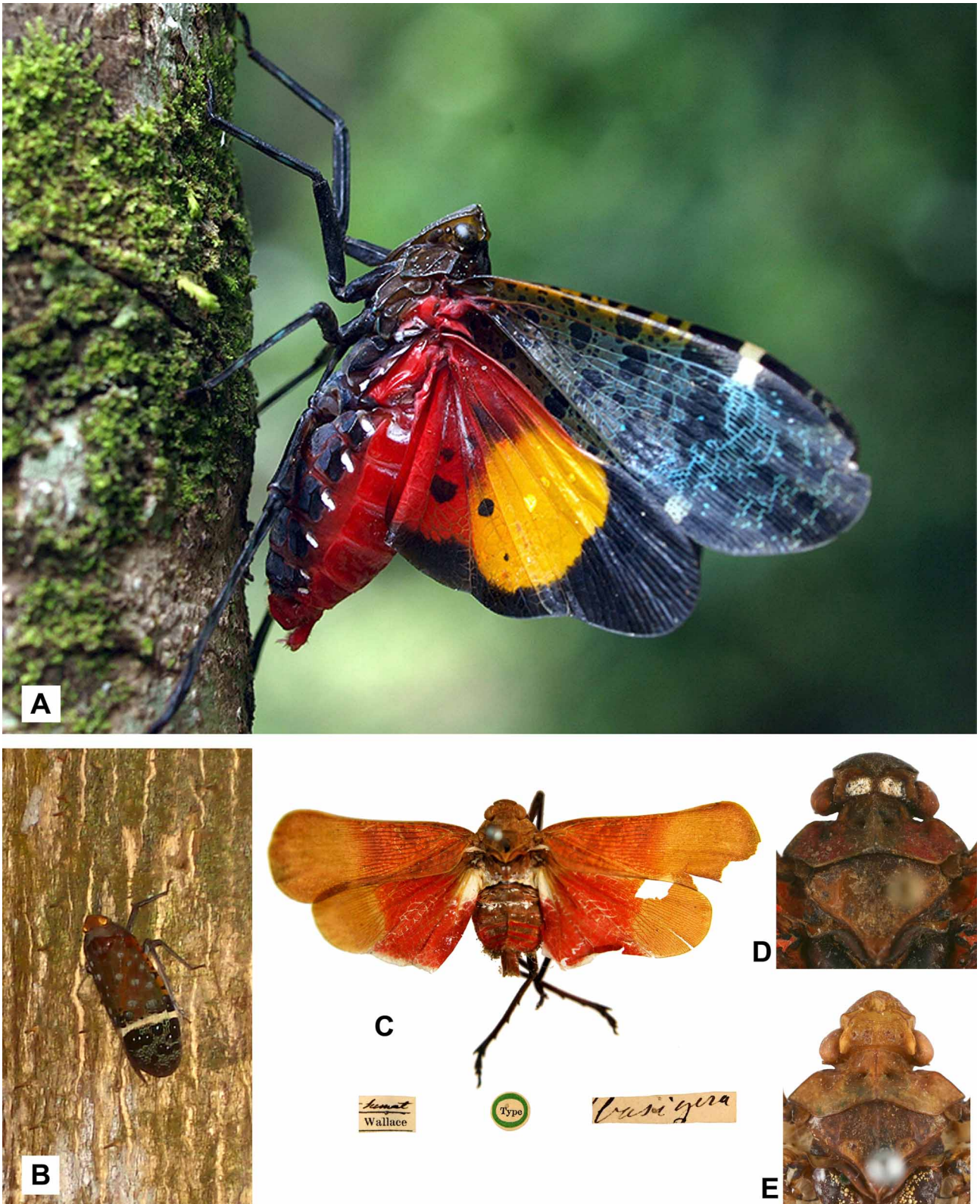
Diagnostic characters: (1) tegmina with complete white band on nodal line of cross-veins (Fig. 1A); (2) legs I and II dark brown without pale yellow rings (Fig. 1E); (3) black-brown markings of tegmina subcircular, also on membrane (Fig. 1A); (4) disc of hind wings red (rarely dark orange apically) with 2 (1–4) black spots (Fig. 1A); (5) abdominal tergites red (Fig. 1A).

LT: ♂ (n = 16): 27.3 mm (25.2–30.0); ♀ (n = 7): 31.0 mm (29.5–32.9). Wingspan: ♂ (n = 3): 53.3 mm (51.4–54.7); ♀ (n = 7): 58.6 mm (54.4–62.7).

Male genitalia: anal tube short (Figs. 14A, C) and strongly emarginate apically in dorsal view (Fig. 14C), showing strong ventral hump in middle and subbasal dorsal hump in lateral view (Figs. 14A, B); pygofer with hump at dorsal third in lateral view (Fig. 14A), broader in middle in postero-ventral view (Fig. 14D); gonostyli rounded apically in lateral view, dorsal margin with median hump and ventral margin sinuate (Fig. 14A); contiguous in postero-ventral view, joining at apex and with teeth projecting latero-ventrad in postero-ventral view (Fig. 14D).

Distribution (Fig. 24): Philippines (Luzon, Mindanao, Mindoro, Negros*, Marinduque*) (* = new data).

Typical material examined: Philippines: Holotype ♀: [Ins. Philipp.] [Semper] [*Aphaena astraea* Stål] [499 58] [387 61] [Riksmuseum Stockholm] [NHRS-HEMI 000000013] (NHRS).



FIGURES 13 A–E . A, *Penthicides variegata*, Cattien N.P., Vietnam (photo by Phung My Trung). B, *P. astraea*, Luzon, Mt Palakong, 8.vii.2009, Philippines (photo by Joachim Bresseel). C, *Scamandra basigera*, Holotype, dorsal view and labels. D, *Penthicides farinosa*, vertex, pro and mesonotum, dorsal view. E, *Penthicides nicobarica*, vertex, pro and mesonotum, dorsal view.

Notes: according to the original description, the holotype is from Manilla (Luzon). 2 ♀ labeled [Ins. Philipp.] [Semper] [Paratypus] [389 61] [Riksmuseum Stockholm] [NHRS-HEMI 000000015] (NHRS) and [Ins. Philipp.] [Semper] [Paratypus] [388 61] [Riksmuseum Stockholm] [NHRS-HEMI 000000016] (NHRS) have been examined but are not recognized as paratypes because the original description refers to one single specimen.

Material examined: Philippines: 1 ♀: (NHRS); 1 ♀: idem, Semper (NHRS). **Luzon:** 4 ♂, 3 ♀: E Luzon, N Ec. Bongabon Bgy Laby, Sierra Madre Mangan Mts, 700m, 15.viii.2005, J.H. Lourens (RBINS) coordinates: 15°38'N 121°15'E; 8 ♂, 2 ♀: E Luzon, Sierra Madre, Aurora, , ix.2007, I. & M. Lumawig (RBINS) coordinates: 16°20'N 122°00'E; 1 ♀: N Luzon, x.1993 (MHNL) coordinates: 17°30'N 121°E; 1 ♂: N Luzon, vi.1990 (MHNL); 1 ♂: N Luzon, viii.1995 (MHNL); 1 ♀: Luzon, Manilla, Thorey (RBINS) 14°35'N 121°00'E; 1 ♀: Luzon, Los Baños, , xii.2002, R. Curaran (RBINS) coordinates: 14°11'N 121°11'E; 1 ♂: Luzon, Mount Maquiling, 150m, 22.viii.1948, A. Dingayan (RBINS) coordinates: 14°08'N 121°12'E; 2 ♀: Luzon, Mt Banahaw, v.1994 (MHNL) coordinates: 14°54'N 121°05'E. **Negros:** 1 ♂: E Negros, vi.1989 (MHNL) coordinates: 10°N 123°E. **Marinduque:** 1 ♀: Marinduque, Sto Vincente, 29.vii.1989, J.H. Lourens (ZMAN) coordinates: 13°24'N 121°58'E. **Mindanao:** 1 ♀: Mindanao (NHRS). **Mindoro:** 1 ♀: Mindoro, Mount Halcon, vii.2000 (MHNL) coordinates: 13°16'N 121°00'E; 2 ♂, 1 ♀, idem, ix.2007, I. & M. Lumawig (RBINS). 1 ♀: no data (OUMNH).

Additional data (photograph by Joachim Bresseel): **Philippines: Luzon:** Quezon province, Mt Palakong, 650m, 8.vii.2009 coordinates: 14°39'N 121°33'E.

***Penthicodes atomaria* (Weber, 1801)**

Figs. 2 A–E, 3 A–E, 15 A–D, 24.

Cicada atomaria Weber, 1801: 113.

Lystra atomaria (Weber, 1801), Fabricius, 1803: 57.

Aphaena nigropunctata Guérin Méneville, 1838 in Duperrey, 1838: 185, synonymised by Stål 1863: 232

Penthicodes picta Blanchard, 1849: Pl. 3, Fig. 2., synonymised by Lallemand, 1963: 27.

Penthicodes atkinsoni Schmidt, 1923: 19, synonymised by Nagai & Porion, 1996: 20.

Penthicodes atomaria (Weber, 1801): Schmidt, 1923: 19.

Diagnostic characters: (1) tegmina with 2 large black spots in costal cell (rarely absent) and no spot on membrane, one white patch along sutural margin on nodal line (Figs. 2A, 3A); (2) legs I and II dark brown without pale yellow rings (Figs. 2E, 3E); (3) head and pronotum paler than mesonotum (Figs. 2B, 3B); (4) disc of hind wings red (Fig. 2A) or orange (Fig. 3A) with 6–15 black spots in 3 rows and 4 (3–5) small white spots (Figs. 2A, 3A); (5) abdominal tergites red, sometimes black medio-basally (Figs. 2A, 3A).

LT: ♂ (n = 24): 24.4 mm (21.8–26.8); ♀ (n = 23): 27.6 mm (24.9–29.5). Wingspan: ♂ (n = 12): 48.0 mm (40.7–61.8); ♀ (n = 12): 56.6 mm (49.5–63.0).

Male genitalia: anal tube about 1.20 longer than broad (Fig. 15 C), and with lateral margins sinuate in dorsal and in lateral views (Figs. 15 A, C); pygofer with hump at dorsal 4/5 in lateral view (Fig. 15 A), and with anterior margin emarginate (Fig. 15 A); gonostyli rounded apically in lateral view, dorsal margin with postero-dorsal angle rounded (Fig. 15 A); contiguous in postero-ventral view, joining at apex and with teeth projecting latero-ventrad in postero-ventral view (Fig. 15 D).

Distribution (Fig. 24): Bhutan*, Cambodia*, China **, India, Indonesia (Java, Sumatra, Borneo*, Lombok*), Laos*, Malaysia**, Thailand, Vietnam (* = new data; ** = no specimen examined in this study).

Material examined: 1 ♂, 3 ♀: no data (RBINS; 1 ♀: OUMNH). **Bhutan:** 5 ♂, 4 ♀: Bhutan (RBINS) coordinates: 27°30'N 90°30'E. **Cambodia:** 1 ♀: Angkor Thom, Siem Reap prov., xi.2005, D. Jump (RBINS) coordinates: 13°27'N 103°52'E; 1 ♂: idem, viii.2003 (RBINS); 1 ♂: Kompong Speu, Aural Mountains (Cardamom), day collecting, 29.i.2006, Oul Yothin (RBINS) coordinates: 11°27'N 104°32'E; 1 ♂: Kbal Spean, 18.xii.2004, day collecting, I. Var (RBINS) coordinates: 13°41'N 104°00'E; 1 ♂: idem, 19.xii.2004, Daniel R. Jump. **India:** 1 ♀ Bengale (RBINS); 1 ♀: 7 mi S of Pynursla, 1010m, 30.ix.1961, E.S. Ross & D.Q.

Cavagnaro (CAS) coordinates: 25°19'N 91°54'E; 1 ♂: Assam, 5 mi W of Digboi, 110m, 15.x.1961, E.S. Ross & D.Q. Cavagnaro (CAS) coordinates: 27°23'N 95°38'E; 1 ♀: Assam, Abhoypur (=Abhaipur) For., Naphuk (=Namphuk), 360m, 12.x.1961, E.S. Ross & D.Q. Cavagnaro (CAS) coordinates: 27°02'N 94°20'E; 1 ♂: Assam, Kohara, Kaziranga, 110m, 7.x.1961, E.S. Ross & D.Q. Cavagnaro (CAS) coordinates: 26°35'N 93°25'E; 1 ♂: Darjeeling, 1–9.vi.1919, Lepcha (OUMNH) coordinates: 27°02'N 88°16'E; 1 ♂: idem, 8.viii.1919 (OUMNH); 1 ♂: idem, 7–15.vii.1919, Lepcha (OUMNH); 1 ♀: Darjeeling (RBINS); 1 ♂: idem, A. Möller (ZMUC); 1 ♀: India Orient, Wroblewsky (ZMUC). **Indonesia:** 1 ♂, 4 ♀: Indonesia (FASG); 1 ♂: idem (MNHN); 1 ♂: idem, 1891, H. Fruhstorfer (MNHN). **Java:** 1 ♀: Java, 12.ix.1914, Mus. Hauschild (ZMUC); 1 ♂: E Java, Boworante, forest, 0–100m, iv.1955, A. Sollaart (RMNH); 3 ♂, 1 ♀: Java (RBINS); 3 ♂: Java, Fruhstorfer (RBINS); 1 ♂: Java, Malang, Wiederhold (RBINS) coordinates: 7°59'S 112°37'E; 1 ♂: Java, Pambang, Bodjonegoro (=Bojonegoro), Mixed Forest, Teak Forest, 19.x.1923, L.G.E. Kalshoven (RMNH) coordinates: 7°09'S 111°52'E; 1 ♀: Java, Semarang, Teak forest, 29.viii.1924, L.G.E. Kalshoven (RMNH) coordinates: 6°58'S 110°25'E; 1 ♂: idem, 9.x.1930 (RMNH); 1 ♂, 1 ♀: Batavia (=Jakarta), iv.1813 (ZMUC) coordinates: 6°10'S 106°48'E. **Lombok:** 1 ♂, 1 ♀: Lombok (RBINS) 8°24'S 116°28'E. **Sumatra:** 1 ♂: Sumatra (FSAG); 1 ♀: idem, 25.v.1950 (FSAG); 1 ♀: Laut Tador, 25.v.1950 (FSAG) coordinates: 3°18'N 99°15'E; 2 ♀: idem, 20.viii.1950 (FSAG); 1 ♂: idem, 23.viii.1950 (FSAG); 1 ♀: idem, 4.viii.1950 (FSAG); 1 ♂: idem, 5.viii.1950 (FSAG); 1 ♂: idem, 14.viii.1950 (FSAG); 1 ♀: idem, 23.v.1950 (FSAG); 1 ♂: idem, 21.v.1950 (FSAG); 1 ♂: Sumatra (RBINS); 1 ♂: idem, Wallace (RBINS); 1 ♀: idem, Van Lansberg (RBINS); 1 ♀: Padang (RBINS) coordinates: 0°57'S 100°21'E; 1 ♂, 1 ♀: Sumatra: Lampung Krui, Pahlungan (Puan), hill rice-damar garden, in hollow *Pterospermum* sp (Sterculiaceae), 6.xi.2001, K. Smets (RBINS) coordinates: 5°11'S 103°58'E; 2 ♀: Sumatra: Lampung Krui, Pahlungan (Puan), edge damar garden, in hollow *Parkia speciosa* (Mimosaceae), 6.xi.2001, K. Smets (RBINS); 3 ♂, 1 ♀: Sumatra: Tamiang, V. Nill (RBINS) coordinates: 2°28'S 103°55'E. **Laos:** 1 ♂, 2 ♀: 4km S Champasaak, Vat Phu Phou Pasak (Mt Khao), 100–150m, 25.v.2006, Schillhammer (NMW) coordinates: 15°59'N 106°25'E. **Thailand:** 1 ♂: Nakhon Nayok prov., Khao Yai Nat. Park, 700m, 29.ix–6.x.1984, Karsholt, Lomholdt & Nielsen (ZMUC) coordinates: 14°19'N 101°15'E; 1 ♀: Loei prov., Phu Luang Wildlife Sanctuary, 700–900m, 8–14.x.1984, Karsholt, Lomholdt & Nielsen (ZMUC) coordinates: 17°10'N 101°46'E; 1 ♂, 1 ♀: Chiang Mai prov., Doi Inthanon, summit, 2500m, 6.x.1981 (ZMUC) coordinates: 18°32'N 98°25'E; 1 ♀: Chiang Mai prov., Doi Suthep, summit, 1600m, light catch, 30.ix.1981 (ZMUC) coordinates: 18°48'N 98°55'E; 1 ♀: Chiang Mai prov., Doi Suthep N.P., Konthathan, 6–700m, 26.ix.1981 (ZMUC); 1 ♀: Chiang Mai, Samoeng, vi.1988, H. Probst (RBINS) coordinates: 18°51'N 98°43'E; 1 ♀: Trang, Lower Siam, Dr. W.L. Abbott (RBINS) coordinates: 7°33'N 99°36'E; 1 ♀: Payap Doi Pai, W of Chiangmai, xi.1965 (RMNH) coordinates: 18°47'N 98°59'E; 1 ♂, 1 ♀: Thailand, x.1989 (MNHN); 1 ♂: Chiang Mai, xii.1992, M. Donskoff (MNHN) coordinates: 18°47'N 98°59'E; 1 ♀: idem, x.1990 (MNHN). **Vietnam:** 1 ♀: Cochinchine, Phuquoc, 29.viii.1924, R. Vitalis de Salvaza (RBINS) coordinates: 10°13'N 103°58'E; 1 ♀: Tonkin Central: Chien Hoa, H. Fruhstorfer (RBINS) coordinates: 22°10'N 105°20'E.

Additional data: MHNL [specimens examined on photographs transmitted by H. Labrique, data compiled by C. Audibert]: **Indonesia:** **Lombok:** 4 ex.: Mt Lombok, vi.1990, coll. T. Porion; 1 ex.: Lombok, xii.1993, T. Porion;. **Sumatra:** 1 ex.: W Sumatra, ii.1991; 1 ex.: Aceh, v.1991, coll. T. Porion coordinates: 5°30'N 95°25'E; 1 ex.: Aceh, iv.1991, leg. & coll. T. Porion; 1 ex.: W Sumatra, Payakumbuh, i.1996, coll. T. Porion coordinates: 0°14'S 100°38'E; 1 ex.: idem, xii.1996, leg. & coll. T. Porion; 2 ex.: Berastagi, vi.1992, leg. & coll. T. Porion coordinates: 3°11'N 98°31'E; 1 ex.: W Sumatra, Pangkalan, ii.1991 coordinates: 2°40'S 102°39'E. **Laos:** 1 ex.: Xiengkouang (=Xiangkhoang), vi.2001, coll. T. Porion coordinates: 19°12'N 102°43'E. **Malaysia:** **Borneo:** 2 exs: Sabah, Crocker Range, i.2000, coll. T. Porion coordinates: 5°40'N 116°20'E. **Thailand:** 2 exs: Chiang Mai, Wiangpapao, v.1989, coll. T. Porion coordinates: 19°22'N 99°30'E; 1 ex: idem, v. 1990; 1 ex: Chiang Mai, Samoeng, v.1989, coll. T. Porion; 1 ex: Chiang Mai, vii.1987, coll. P. Bleuzen; 1 ex: Thailand, 2001, coll. P. Bleuzen; 3 ex: Thailand, coll. P. Bleuzen.

IEBR [data sent by H.T. Pham]: **Vietnam:** Ha Thay (Ba Vi) coordinates: 19°53'N 105°54'E; Thura Thien Hue (Bach Ma) coordinates: 16°12'N 107°52'E.

Data compiled by A. Wessel and S. Seidel: **India:** 1 ex.: Assam, Shillong (SMTD) coordinates: 25°34'N

91°53'E; 1 ♂: Darjeeling (D.E.I.); 1 ex.: Sikkim (SMTD) 27°45'N 88°30'E. **Indonesia: Java:** 1 ♂, 1 ♂?: Java (ZMHB); 1 ex.: idem (SMTD); 1 ex.: Java, Malang (SMTD); 1 ex.: Java (East), Fruhstorfer (ZMHB); 1 ♂: Java (South), coll. Breddin, det. E. Schmidt 1911 (DEI) ; 1 ♂: Java (South-West), Palabuan, coll. Breddin, det. E. Schmidt 1911 (DEI) coordinates: 6°59'S 106°33'E; 1 ♂: idem, det. E. Schmidt, 1910 (DEI); 1 ex.: Java (West) Pengalengan, 1893, H.Fruhstorfer (ZMHB) coordinates: 7°10'S 107°34'E; 1 ex.: Java (West) Sisoeroele Gbg., 800m, Zobrys u. Wolter (ZMHB); 1 ex.: Java (West) Sukabumi, 1893, H. Fruhstorfer (ZMHB) coordinates: 6°55'S 106°56'E; 1 ♂, 1 ♀: idem, coll. Breddin, det. E. Schmidt 1911 (DEI); **Sumatra:** 1 ♀: Sumatra, coll. Breddin, det. E. Schmidt, 1911 (DEI) ; 1 ♂: Sumatra (ZMHB) ; 3 ex.: Sumatra, Excell. von Studt B. (ZMHB); 1 ♂: Sumatra (North), Sialang, Grubauer S.V. (ZMHB) coordinates: 1°31'N 99°27'E; 3 ex.: Moeara (=Muara), Grubauer S.V. (ZMHB) coordinates: 2°20'N 98°55'E; 1 ♀: Sumatra, Deli (= Labuhandeli), coll. Breddin, det. E. Schmidt 1911 (DEI) coordinates: 3°45'N 98°41'E; 1 ex.: Sumatra, Deli (= Labuhandeli), Martin G. (ZMHB); 1 ex.: Sumatra, Deli (= Labuhandeli) (near Medan), Hartert (ZMHB); 1 ♂?: Sumatra, Deli (= Labuhandeli) (near Medan), Hartert? (ZMHB); 1 ex.: Sumatra, Alahan (= Alahanpanjang), Micholitz c., coll. A.Jacobi (SMTD) coordinates: 1°05'S 100°47'E; 1 ♂, 2 ♀: Sumatra (North East), Tebing Tinggi, Dr. Schultheiss, coll. Breddin, det. E. Schmidt 1911 (DEI) coordinates: 3°20'N 99°09'E; 1 ex.: Sumatra, Ober-Langkat, 1894, M. Ude (ZMHB); 1 ex.: Sumatra, Ober-Langkat, Deli (= Labuhandeli) (near Medan), 1894, M. Ude (ZMHB); 1 ex.: Sumatra (West), Bungus Bucht, Padang, xii, Schoede S.G. (ZMHB); 2 ♂, 1 ex.: Sumatra, Westcoast, von Faber (ZMHB). **Thailand:** 2 ♂: Thailand (North), Cordillère du Doi Mon Kia (near Chiang Mai), iii.2002, Michel Boulard, det. A. Soulier-Perkins 2007 (MNHN) coordinates: 19°13'N 99°26'E.

Penthicodes bimaculata (Schmidt, 1905)

Figs. 4 A–E, 16 A–D, 25.

Aphaena bimaculata Schmidt, 1905: 376.

Aphaenina bimaculata (Schmidt, 1905): Metcalf, 1947: 150.

Penthicodes bimaculata (Schmidt, 1905): Lallemand, 1963: 26.

Penthicodes quadrimaculata Lallemand, 1963: erroneously synonymised by Nagai & Porion, 1996: 20.

Diagnostic characters: (1) tegmina with white patch only along sutural margin on nodal line of cross-veins (Fig. 4A); (2) legs I and II dark brown with pale yellow rings (Fig. 4E); (3) black-brown markings of tegmina irregular, also on membrane (Fig. 4A); (4) disc of hind wings red, dark orange apically and with 4 black spots and 1–3 small white spots (Fig. 4A); (5) abdominal tergites red (Fig. 4A).

LT: ♂ (n = 1): 27.0 mm; ♀ (n = 2): 26.0 mm (25.7 – 26.3). Wingspan: ♀ (n = 3): 49.2 mm (47.0 – 50.6).

Note: the species is easy to separate from *P. quadrimaculata*, which has similar geographical distribution, by a white spot only on the sutural margin of the tegmina (one spot also along costal margin in *P. quadrimaculata*).

Male genitalia: anal tube short with elongate, curved lateral expansion directed ventrad and small ventral process directed postero-ventrad (Figs. 16A–C); pygofer broader at dorsal third (Fig. 16A); ovoid in postero-ventral view (Fig. 16D); gonostyli rounded at apex in lateral view (Fig. 16A), contiguous in postero-ventral view (Fig. 16D).

Distribution (Fig. 25): Sumatra, Singapore*, Borneo* (* = new data).

Note: the mention from Java by Nagai & Porion (1996) was based on the erroneous synonymy with *P. quadrimaculata* Lallemand, 1963.

Typical material examined: Indonesia: Sumatra: 1 ♂ lectotype (**present designation**) labeled: [Dohrn, Sumatra, Soekaranda] [*bimaculata Schmidt, 1905] [*Penthicodes bimaculata* ♂ Edm. Schmidt determ. 1910] [Type] [Mus. Zoologicum Polonicum, Warszawa, typus n.1169, *Aphaena bimaculata* Schmidt, 1905, Syntypus] [Mus. Zool. polonicum Warszawa, 12/45] [MIZ 187245] (ZMPA) coordinates: 3°30'N 98°13'E; 3 ♀ paralectotype: Dohrn, Sumatra, Soekaranda (2: ZMPA, 1: MSNG).

Note: the paralectotype in MSNG was given by Dohrn in 1906 (F. Penati *pers. comm.* 2009).

Material examined: *Borneo*: 1 ♂: Borneo (NHRS). *Indonesia, Sumatra*: 1 ♂: SE Sumatra, Laut Tador, 3.viii.1955 (FSAG) coordinates: 3°18'N 99°15'E; 1 ♀: W Sumatra, Padang, vii.1994 (MHNL) coordinates: 0°57'S 100°21'E; 1 ♀: Padang Bedagai, A. v.d. Groot (ZMAN) coordinates: 3°30'N 99°13'E; 1 ♀: Dolok Merawan, A. v.d. Groot (ZMAN) coordinates: 3°10'N 99°08'E. *Singapore*: 1 ♀: Seletar Reservoir, 1°24'N 103°48'E, 7.xi.1991, O. Martin (ZMUC).

Additional data: compiled by A. Wessel and S. Seidel: *Indonesia: Sumatra*: 1 ♀: Sumatra (North East), Tebing Tinggi, Dr. Schultheiss, xii.1884, coll. Breddin, det. E. Schmidt (DEI) coordinates: 3°20'N 99°09'E.

***Penthicodes caja* (Walker, 1851)**

Figs. 17 A–D.

Aphaena caja Walker, 1851: 278.

Penthicodes caja (Walker, 1851): Distant, 1918: 198.

Male genitalia: anal tube short and broad with postero-lateral margins strongly emarginate (Figs. 17A–C); pygofer with strong hump at dorsal third (Fig. 17A); broadly ovoid in postero-ventral view (Fig. 17D); gonostyli rounded postero-dorsally in lateral view (Fig. 17A), well separated basally in postero-ventral view (Fig. 17D).

***Penthicodes caja caja* (Walker, 1851)**

Figs. 5 A–E, 25.

Diagnostic characters: (1) tegmina with white patch along sutural margin and along costal margin on nodal line of cross-veins (Fig. 5A); (2) legs I and II dark brown with pale yellow rings (Fig. 5E); (3) dark-brown to black-brown markings of tegmina large and irregular, also on membrane, ground colour of membrane paler (Fig. 5A); (4) disc of hind wings orange with base red, and with 4 (3–6) black spots, one elongate black line near base and 1–4 small white spots (Fig. 5A); (5) abdominal tergites black medially (Fig. 5A).

LT: ♂ (n = 1): 28.0 mm; ♀ (n = 3): 30.9 mm (30.1 – 32.0). Wingspan: ♀ (n = 3): 56.7 mm (55.4 – 57.5).

Note: the species is easy to recognize by the large, irregular, dark brown markings of the tegmina, and the subspecies is easily recognized by the disc of hind wings orange with base red.

Distribution (Fig. 25): Bangladesh, India (N), Laos*, Myanmar*, Thailand, Vietnam (* = new data).

Typical material examined: Bangladesh: photo of the holotype ♀ labeled: [Silhet – on the reverse – 46 48] [Type] [Holo-type] (BMNH) coordinates of Silhet (= Sylhet): 24°53'N 91°52'E.

Notes: the original description refers to a male specimen but Walker and other authors very often confused males and females in Fulgoridae and other Fulgoromorphs, e.g. Eurybrachidae.

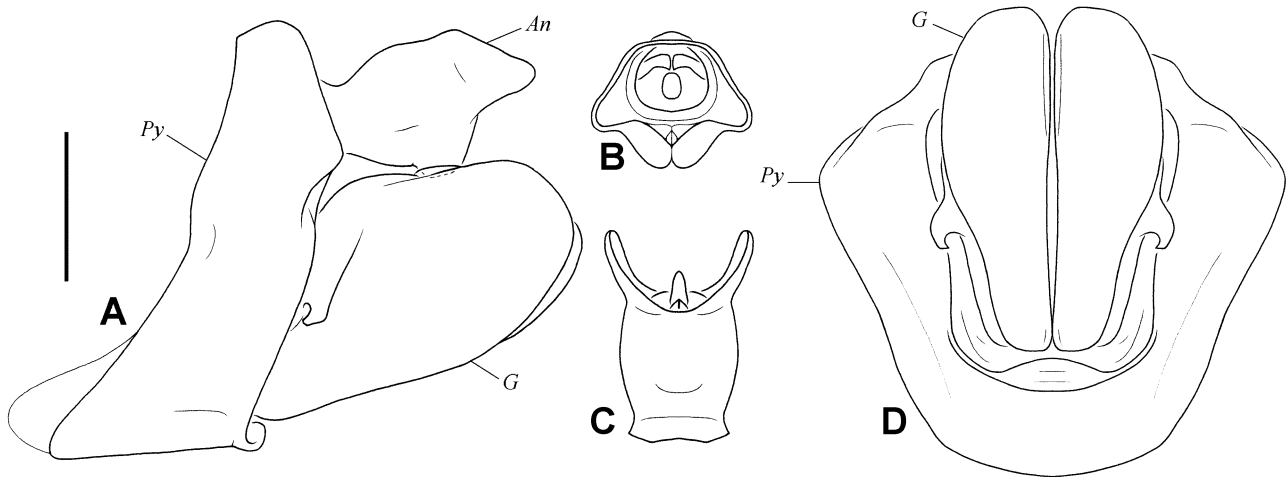
1 ♀ labeled [Silhet] [Stevens] [*caja* W. (B.M.)] [Typus] [497 58] [383 61] [Riksmuseum Stockholm] [NHRS-HEMI 000000032] (NHRS) has also been examined. This specimen is not regarded as typical because the original description refers to one specimen from Mr. Stainforth collection while this specimen is from Mr. Stevens' collection.

Material examined: 2 ♀: no data (MHNL). *Myanmar*: 2 ♀: Dawna, vi.1992 (MHNL) coordinates: 16°50'N 98°15'E; *Laos*: 1 ♀: Phong Saly (= Phôngsali), viii.1920, R. Vitalis de Salvaza (RBINS) coordinates: 21°41'N 102°06'E; 1 ♂: idem, v.1920 (FSAG). *Thailand*: 2 ♀: Thailand (GGC); 2 ♀: Chiang Mai, iv.1992, M. Donskoff (MNHN) coordinates: 18°47'N 98°59'E. *India*: 1 ♂, 1 ♀: Sikkim, Elwes (FSAG) coordinates: 27°45'N 88°30'E; 1 ♂, 2 ♀: Sikkim (NHRS).

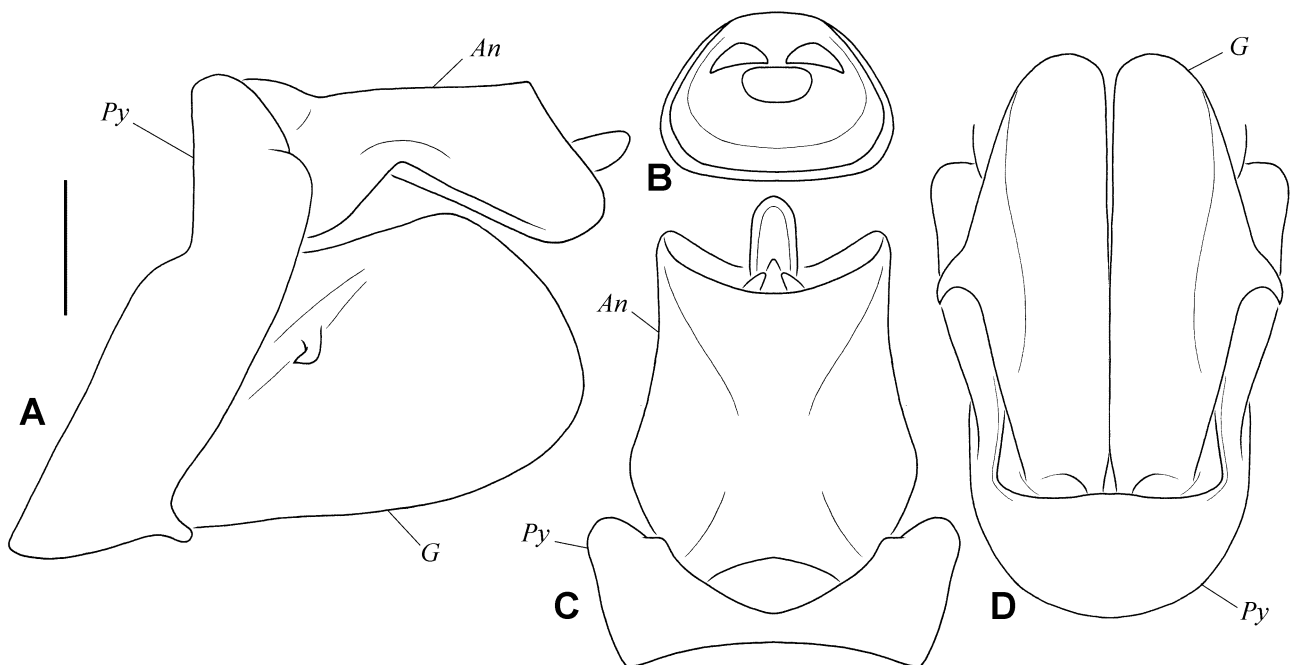
Note: 1 ♀ erroneously labeled from N Celebes, ex coll. E.P. VanDuzee (CAS) has also been examined.

Additional data: Vietnam: 1 ♂: Vinh Phuc province, Tam Dao National Park, vi.2000, alt 1000m, H.T. Pham (IEBR) coordinates: 21°29'N 105°38'E.

Data compiled by A. Wessel and S. Seidel: *India*: 1 ♂: Darjeeling, det. V. Lallemand (ZMHB) 2 ex.: Sikkim (SMTD).



FIGURES 14 A–D. *Penthicides astraea*, genitalia ♂. A, pygofer, anal tube and gonostyli, left lateral view. B, anal tube, posterior view. C, anal tube, dorsal view. D, pygofer and gonostyli, postero-ventral view. An: anal tube; G: gonostyli; Py: pygofer. Scale 2 mm.



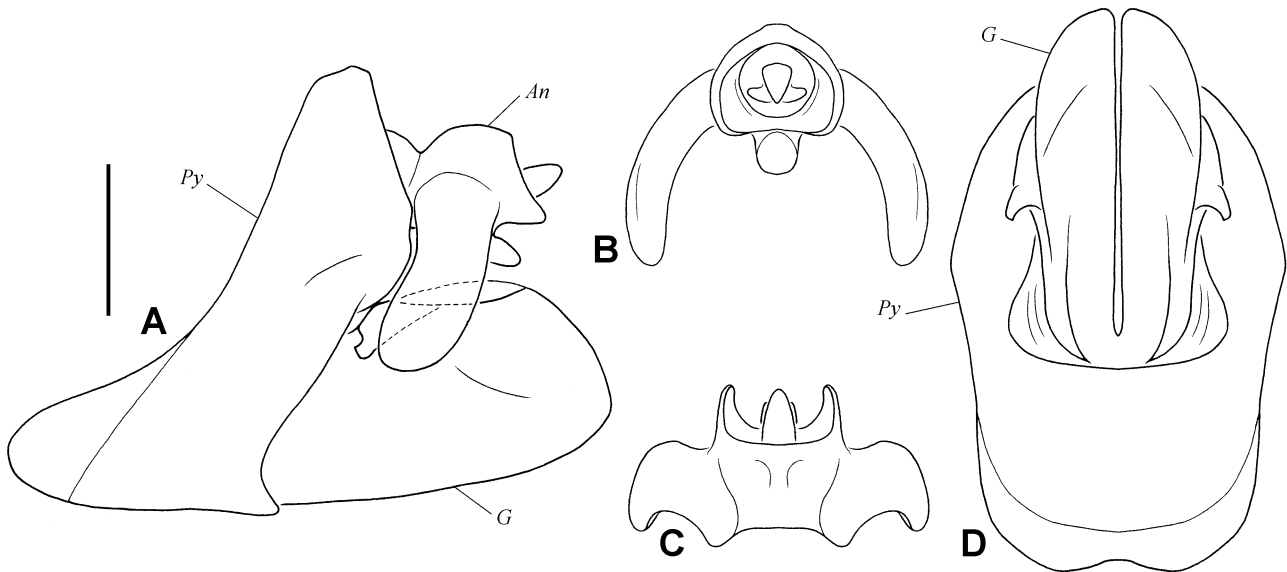
FIGURES 15 A–D. *Penthicides atomaria*, genitalia ♂. A, pygofer, anal tube and gonostyli, left lateral view. B, anal tube, posterior view. C, anal tube, dorsal view. D, pygofer and gonostyli, postero-ventral view. An: anal tube; G: gonostyli; Py: pygofer. Scale 2 mm.

***Penthicides caja malayana* n. ssp.**

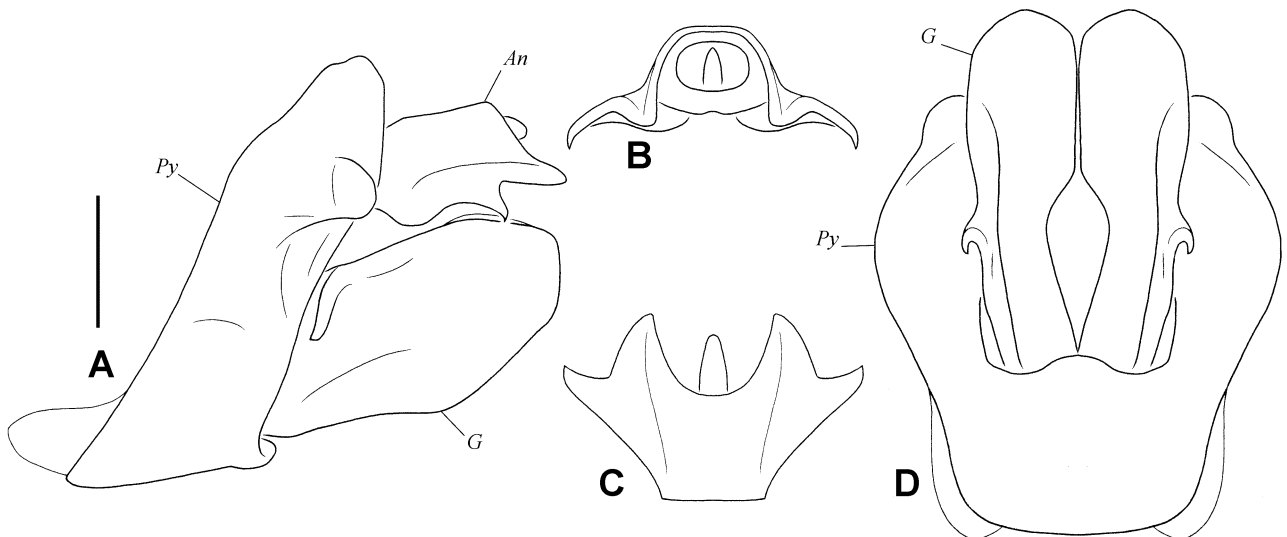
Figs. 6 A–E, 25.

Diagnostic characters: (1) tegmina with white patch along sutural margin and along costal margin on nodal line of cross-veins (Fig. 6A); (2) legs I and II dark brown with pale yellow rings (Fig. 6E); (3) dark-brown to black-brown markings of tegmina large and irregular, also on membrane, ground colour of membrane paler (Fig. 6A); (4) disc of hind wings red, and with 4 (3–6) black spots, one elongate black line near base and 1–4 small white spots (Fig. 6A); (5) abdominal tergites black medially (Fig. 6A).

LT: ♂ (n = 2): 27.8 mm (27.3 – 28.3); ♀ (n = 2): 29.6 mm (29.3–29.9). Wingspan: ♂ (n = 2): 50.6 mm (49.5–51.6); ♀ (n = 4): 54.3 mm (50.8–56.2).



FIGURES 16 A–D. *Penthicodes bimaculata*, genitalia ♂. A, pygofer, anal tube and gonostyli, left lateral view. B, anal tube, posterior view. C, anal tube, dorsal view. D, pygofer and gonostyli, postero-ventral view. An: anal tube; G: gonostyli; Py: pygofer. Scale 2 mm.



FIGURES 17 A–D. *Penthicodes caja*, genitalia ♂. A, pygofer, anal tube and gonostyli, left lateral view. B, anal tube, posterior view. C, anal tube, dorsal view. D, pygofer and gonostyli, postero-ventral view. An: anal tube; G: gonostyli; Py: pygofer. Scale 2 mm.

Note: the subspecies is easy to recognize by the disc of hind wings red.

Distribution (Fig. 25): W Malaysia.

Material examined: Malaysia: Holotype ♂: [Coll. I.R.Sc.N.B., Malaysia W., Cameron Highlands, iv. 2007, purchased from A. Chaminade, I.G.: 31.467] (RBINS) coordinates: 4°29'N 101°23'E. Paratypes: 1 ♂, 2 ♀: idem (RBINS); 1 ♂, 1 ♀: [Cameron Highlands, vi.1992] (MHNL); 1 ♂: [Cameron Highlands, ii.1989] (MHNL); 1 ♀: [Pahang, Cameron Highlands, v.1990] (MHNL) coordinates: 4°30'N 103°23'E.

Additional data compiled by A. Wessel and S. Seidel: **Malaysia:** 2 ♂: Cameron Highlands, from Tapah to Tana Rata (= Tanah Rata), v.1981, J. and P.O. Bourgeat, det. J. Constant 2003 (MNHN) coordinates: 4°20'N 101°20'E; 3 ♂, 3 ♀: Cameron highlands (near Ipoh), A.E. Selner, Augsburg, det. A. Krohner 1998 (ZSMC) coordinates: 4°35'N 101°05'E.

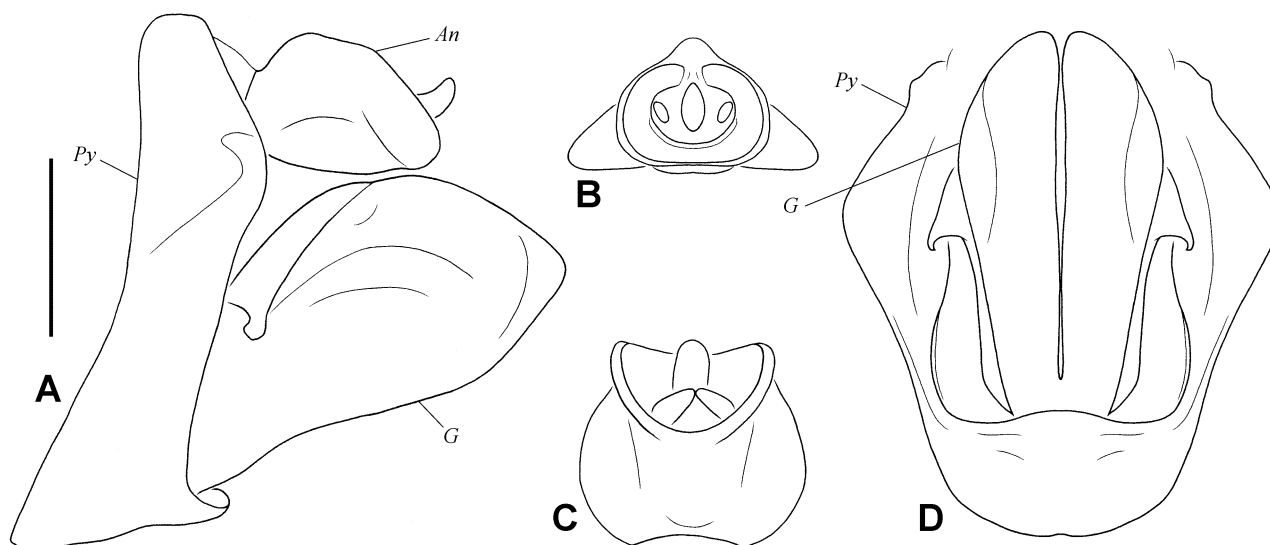
***Penthicodes celebica* n. sp.**

Figs. 7 A–E, 18 A–D, 24.

Etymology. The species is named after its *patria typica*, Celebes (Sulawesi, Indonesia).**Material examined: Indonesia, Sulawesi:** holotype ♂: [Coll. I.R.Sc.N.B., Indonesia, S. Sulawesi, Puncak Palopo, 2008, achat Syamsul Alam, I.G.: 31.172] (RBINS) coordinates: 3°00'S 120°12'E Paratypes: 2 ♂, 7 ♀: same data as holotype (RBINS); 9 ♂, 11 ♀: [Coll. I.R.Sc.N.B., Indonesia, S Sulawesi, Puncak Palopo, iv.2008, I.G.: 31.318] (RBINS, 1 ♂: BMNH); 1 ♂: [Indonesia, S.W. Sulawesi, Puncak Palopo, X–XI.1996, Tajuddin] [Coll. Zoologisch Museum Amsterdam] [*Penthicodes* spec. det. C.A. Schulz, 2007] (ZMAN); 1 ♀: [Ned. Indië, W. Celebes, 1500m, Sidaonta Paloe, vi.1937, J.M.A. v. Groenendael] [*Penthicodes* spec. det. C.A. Schulz, 2007] (ZMAN) coordinates: 1°18'S 119°57'E; [Indonesia, Sulawesi Selatan, Rd Rantepao-Palopo, 9.v.2004, 500m, G. Withaar] [*Penthicodes* spec. det. C.A. Schulz, 2007] (ZMAN) coordinates: 2°59'S 119°54'E; 1 ♀: [Indonesia: Sulawesi, Soroako, 9.x.1993, disturbed rain forest] [2°35'30"S 121°22'30"E, M.J. & J.P. Duffels, at light] [*Penthicodes* spec. det. C.A. Schulz, 2007] (ZMAN).**Diagnostic characters:** (1) tegmina with white patch only along sutural margin on nodal line of cross-veins (Fig. 7A); (2) legs I and II dark brown, rarely with slightly paler rings (Fig. 7E); (3) black-brown markings of tegmina irregular, also on membrane (Fig. 7A); (4) disc of hind wings red and with 3–5 round black spots, at least 2 with central white spot, and 0–2 small white spots (Fig. 7A); (5) abdominal tergites red, rarely dark brown in middle (Fig. 7A).**Description.** LT: ♂ (n = 12): 26.3 mm (24.8–27.7); ♀ (n = 19): 27.9 mm (26.2–29.4). Wingspan: ♂ (n = 2): 47.7 mm (46.4–49.1); ♀ (n = 8): 52.8 mm (50.3–57.0).**Head:** eyes included, slightly more than half as broad as thorax (Fig. 7B); dark olivaceous-brown with antennae and apex of clypeus black (Figs. 7B, C); vertex much broader posteriorly than anteriorly, with anterior margin strongly emarginate and lateral margins carinate; posterior half with 2 strong impressions separated by median carina, anterior half with 2 semicircular humps (Fig. 7B); frons longer than broad, punctured and wrinkled, with strong peridiscal carina and slightly marked median carina on superior half (Fig. 7C); obsolete cephalic process hooked and flattened on dorsal part of head (Fig. 7B); clypeus longer than frons, medially carinate (Fig. 7C); labium reaching apex of abdomen, black-brown with yellow ring on penultimate segment (Fig. 7E); ratio BV/LV = 5; BF/LF = 1.**Thorax:** (Fig. 7B) dark olivaceous-brown, sometimes mesonotum slightly tinged with red; pronotum wrinkled with anterior margin carinate and strongly bisinuate, and posterior margin strongly and angulously emarginate medially; strong median carina with deeply impressed point on each side; mesonotum with median carina not reaching apex posteriorly and curved peridiscal carinae; disc wrinkled and with slightly impressed point at postero-lateral angle; ratio BT/LP+LM = 1.14; LP/LM = 0.52.**Tegmina:** (Fig. 7A) olivaceous-brown with irregular black-brown markings; usually 3–4 larger spots along costal margin and 1 at apico-sutural angle; white spot along sutural margin at nodal line of cross-veins; costal margin slightly curved; apical margin obliquely rounded; sutural margin sinuate; maximal breadth near nodal line; ratio LTg/BTg = 2.5.**Hind wings:** (Fig. 7A) slightly broader than tegmina; bright red with band along sutural margin and apical 1/3 black; red area rarely turning to bright orange-red apically; 3–4 large and 1–2 small black spots on baso-sutural half of disc, usually 2–3 larger ones with small white spot in middle; 0–2 small white spots on apico-costal half of disc; irregular grey-white markings on apical 1/3, often confluent.**Legs:** (Figs 7A, E) black-brown; rarely femora and tibiae I and II with slightly marked paler, brown rings; tibiae III with 5–6 lateral and 7 apical spines.**Abdomen:** red dorsally, sometimes tinged with brown in middle (Fig. 7A); black ventrally (Fig. 7E).**Male genitalia:** anal tube short, thick and broad, with subbasal hump dorsally in lateral view and lateral margins strongly rounded in dorsal view (Figs. 18A–C); subtriangular in posterior view (Fig. 18B); pygofer with hind margin bisinuate in lateral view (Fig. 18A), broader slightly above middle in postero-ventral view (Fig. 18D); gonostyli roundly pointed apically in lateral view, with dorsal margin broadly rounded and ventral margin bisinuate (Fig. 18A), contiguous in postero-ventral view, and with teeth projecting latero-ventrally in

postero-ventral view (Fig. 18D).

Distribution (Fig. 24): Sulawesi.



FIGURES 18 A–D. *Penthicodes celebica*, genitalia ♂. A, pygofer, anal tube and gonostyli, left lateral view. B, anal tube, posterior view. C, anal tube, dorsal view. D, pygofer and gonostyli, postero-ventral view. An: anal tube; G: gonostyli; Py: pygofer. Scale 2 mm.

***Penthicodes pulchella* (Guérin-Méneville, 1838)**

Figs. 8 A–E, 19 A–D, 26.

Aphaena pulchella Guérin-Méneville, 1838: 186.

Aphaena confuscus White, 1846: 24; synonymised by Stål, 1862: 485.

Aphaena io Walker, 1851: 279; synonymised by Stål, 1862: 485.

Aphaena nigroirrorata Stål, 1854: 244; synonymised by Stål, 1862: 485.

Penthicodes pulchella (Guérin-Méneville, 1838): Distant, 1918: 198.

Penthicodes wachsi Schmidt, 1930: 115; synonymised by Nagai & Porion, 1996: 21.

Diagnostic characters: (1) tegmina with white patch along sutural margin on nodal line of cross-veins (Fig. 8A); (2) legs I and II dark brown with pale yellow rings (Fig. 8E); (3) tegmina marked with numerous small black-brown spots, some of them v-shaped on veins (Fig. 8A); (4) disc of hind wings orange with base red, rarely completely orange-red, with 6–15 black spots in 3 rows and 4 (3–5) small white spots (Fig. 8A); (5) abdominal tergites red (Fig. 8A).

LT ♂ (n = 8): 20.2 mm (19.4 – 20.8); ♀ (n = 3): 21.4 mm (20.3 – 22.3). Wingspan ♀ (n = 4): 44.1 mm (42.1 – 46.3).

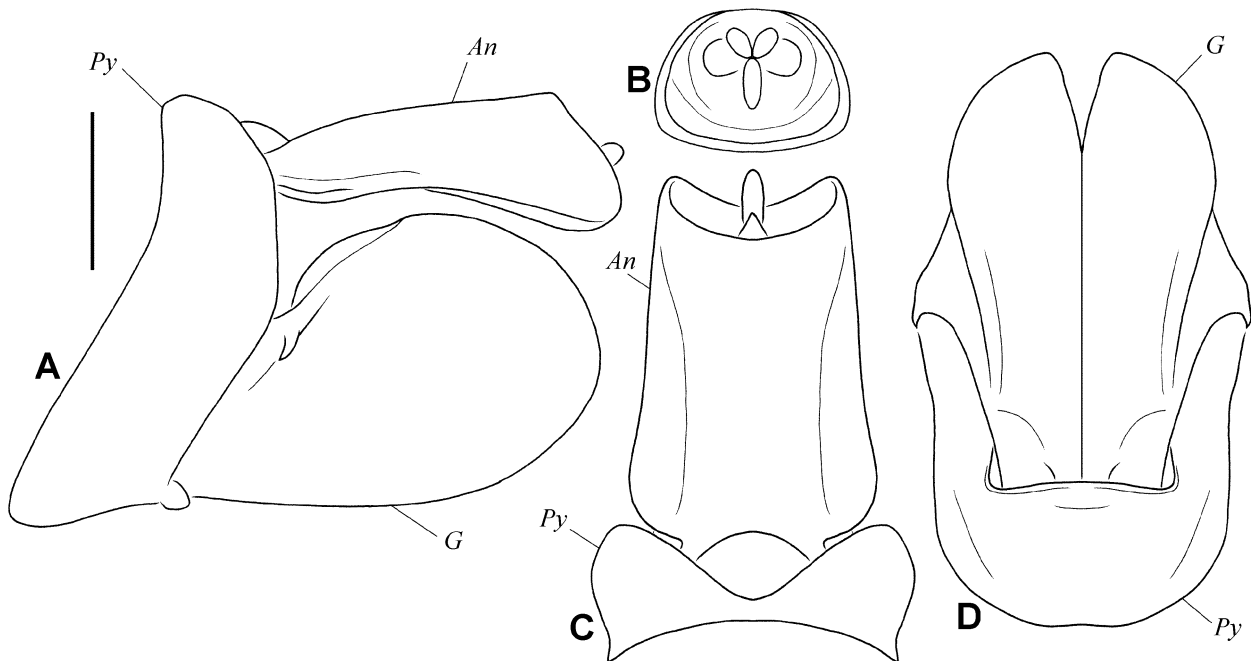
Male genitalia: anal tube elongate, about 1.5 time longer than broad, broader basally in dorsal view (Figs. 19 A), and slightly sinuate in dorsal and lateral views (Figs. 19 A, C); pygofer not showing hump, with hind margin subregularly rounded in lateral view (Fig. 1 A); gonostyli rounded posteriorly in lateral view (Fig. 1 A); contiguous in postero-ventral view, splitting near apex and with teeth projecting latero-ventrad in postero-ventral view (Fig. 1 D).

Distribution (Fig. 26): Andaman Islands**, Cambodia*, China, India, Indonesia: Java, Sumatra*, Myanmar*, Taiwan*, Thailand, Vietnam (* = new data; ** = no specimen examined in this study).

Typical material examined: Holotype of *Aphaena nigroirrorata* labeled: [China] [nigroirrorata Stål] [Typus] [Io Walk. = confuscus White (B.M.)] [1 58] [NHRS-HEMI 000000049].

Type ♀ of *Penthicodes wachsi* (examined on photo) labeled: [Fr. A. Th. H. Verbeek, Aglebock, No.] [Java, 24.3.1927, Res. Rembang, 40M] [* wachsi Schmidt, 1930] [Penthicodes wachsi Schmidt ♀, Edm. Schmidt determ. 1930] [Typus] [Mus. Zool. Polonicum Warszawa, 12/45] [Mus. Zool. Polonicum Warszawa

Typus n. 1218, *Penthicodes wachsi* Schmidt, 1930, Syntypus] (ZMPA) coordinates of Rembang: 6°42'S 111°20'E.



FIGURES 19 A–D. *Penthicodes pulchella*, genitalia ♂. A, pygofer, anal tube and gonostyli, left lateral view. B, anal tube, posterior view. C, anal tube, dorsal view. D, pygofer and gonostyli, postero-ventral view. An: anal tube; G: gonostyli; Py: pygofer. Scale 2 mm.

Material examined: 1 ♀: Himalaya (ZMUC). **Cambodia:** 1 ♀: Angkor Thom, Siem Reap prov., 25–27.ii.2005, D. Jump (RBINS) coordinates: 13°27'N 103°52'E; 1 ♂: Phnom Kulen N.P., Kbal Spean, 24.vii.2004, P. Grootaert (RBINS) coordinates: 13°41'N 104°00'E. **India:** 2 ♀: Assam (ZMUC) coordinates: 25°34'N 91°53'E. **Indonesia:** **Java:** 1 ♂: Semarang, Teak forest, 1.iii.1931, L.G.E. Kalshoven (RMNH) coordinates: 6°58'S 110°25'E; 1 ♀: idem, 27.ii.1931 (RMNH); 1 ♂: W Java, Toegoe (= Tugu), ex coll. Oberthur, 1902 (RBINS) 6°07'S 106°55'E; 1 ♂, 2 ♀ (FSAG); 1 ♂, 1 ♀: xii.1935, Preariger, Regenschofren (FSAG); 1 ♂: Soekaboemi (= Sukabumi) (FSAG) coordinates: 6°55'S 106°56'E; 1 ♀: Java, West, Palabohan Ratoe (= Pelabuhanratu), vi.1908, E. Cordier, coll. C, Tessé de Béarn Croisière du "Nirvana" (MNHN) coordinates: 6°59'S 106°33'E. **Sumatra:** 4 ♂: W Sumatra, Moeara Tenam Benkoelen (= Bengkulu), 1200m, Le Moults (FSAG) coordinates: 3°48'S 102°16'E. **Myanmar:** 1 ♂: Rangoon, Churchill Road, F.J. Meggitt (RBINS) coordinates: 16°47'N 96°10'E. **Thailand:** 1 ♀: 14 mi S of Ban Muang Pon, 23.xi.1978, E.S. Ross (CAS) coordinates: 18°47'N 97°54'E; 2 ♂, 1 ♀: 7km NW of Fang, Horticultural Experimental Station, 30.x–2.xi.1979, Zool mus Copenhagen Exp (ZMUC) coordinates: 19°55'N 99°13'E; 2 ♂: Doi Suthep-Pui NP, Konthathan waterfall area, 600m, 20–27.x.1979, Zool mus Copenhagen Exp (ZMUC) coordinates: 18°48'N 98°55'E. **Vietnam:** 1 ♀: Cochinchina, Tayninh, 1923 (FSAG) coordinates: 11°18'N 106°06'E; 1 ♀: Tonkin: Bavi, 16.iv.1936, Le Moults (FSAG) coordinates: 21°05'N 105°23'E; 1 ♂: Tonkin, region Hoa Binh, 1934, A. De Cooman (MNHN) coordinates: 20°50'N 105°20'E.

Additional data: MHNL [specimens examined on photographs transmitted by H. Labrique, data compiled by C. Audibert]: **India:** 1 ex: Kotarigi, TN, 27–29.x.1997, leg. Werner, coll. T. Porion coordinates: 11°26'N 76°53'E. **Thailand:** 3 ex.: Chiang Mai, v.1990, coll. T. Porion coordinates: 18°47'N 98°59'E; 1 ex: Wang Chin Pae, x.1991, coll T. Porion coordinates: 17°53'N 99°37'E.

IEBR [data sent by H.T. Pham]: **Vietnam:**Thái Nguyên (Đồng Hi) coordinates: 21°40'N 105°55'E.

Data compiled by A. Wessel and S. Seidel: **Taiwan:**1 ex: Formosa, Alikang, 1909, H.Sauter (SMTD) coordinates not found. **Indonesia:** **Java:** 1 ♂: Java, det.V. Lallemand (DEI). **Vietnam:** 1 ex.: Tonkin, Lang Nac, viii.1917, Jeanvoine (SMTD) coordinates: 21°13'N 106°50'E; 1 ex.: Tonkin, Tien Yen, ix.1917, Jeanvoine (SMTD) coordinates: 21°19'N 106°55'E.

***Penthicodes quadrimaculata* Lallemand, 1963 revised status**

Figs. 9 A–E, 20 A–D, 27.

Penthicodes quadrimaculata Lallemand, 1963: 26.*Penthicodes bimaculata* (Schmidt, 1905); erroneously synonymised by Nagai & Porion, 1996: 20.

Diagnostic characters: (1) tegmina with white patch along sutural margin and along costal margin on nodal line of cross-veins (Fig. 9A); (2) legs I and II dark brown with pale yellow rings (Fig. 9E); (3) black-brown markings of tegmina irregular, also on membrane (Fig. 9A); (4) disc of hind wings with base red, rest orange to orange-red, or red, and with 3 (2–5) round, large black spots (usually at least one black spot with white center) and 1–3 small white spots (Fig. 9A); (5) abdominal tergites red, rarely basal tergites black-brown in middle (Fig. 9A).

LT ♂ (n = 5): 25.0 mm (23.0–27.3); ♀ (n = 3): 29.6 mm (28.8–30.5). Wingspan ♂ (n = 6): 46.3 mm (44.1–48.6); ♀ (n = 21): 53.4 mm (49.4–61.0).

Notes: (1) the species is easy to separate from *P. bimaculata*, by the 2 white spots of nodal line along the sutural and costal margins of the tegmina (only one spot also along sutural margin in *P. bimaculata*). The very similar *P. variegata* is known only from continental Asia, shows smaller spots on hind wings, and hind wings always orange with base red. (2) the erroneous synonymy with *P. bimaculata* proposed by Nagai and Porion (1996) was obviously based on superficial observation of the two species and did not take in account the male genitalic characters.

Male genitalia: anal tube short and narrow, broader apically in dorsal view, much broader in lateral view with strong subbasal hump dorsally and median ventral carina (Figs. 20A–C); pygofer with posterior margin emarginate at dorsal third in lateral view (Fig. 20A), broader at dorsal third in postero-ventral view (Fig. 20D); gonostyli rounded apically in lateral view (Fig. 20A), slightly separated basally in postero-ventral view and with teeth subparallel in postero-ventral view, not or slightly projecting laterally (Fig. 20D).

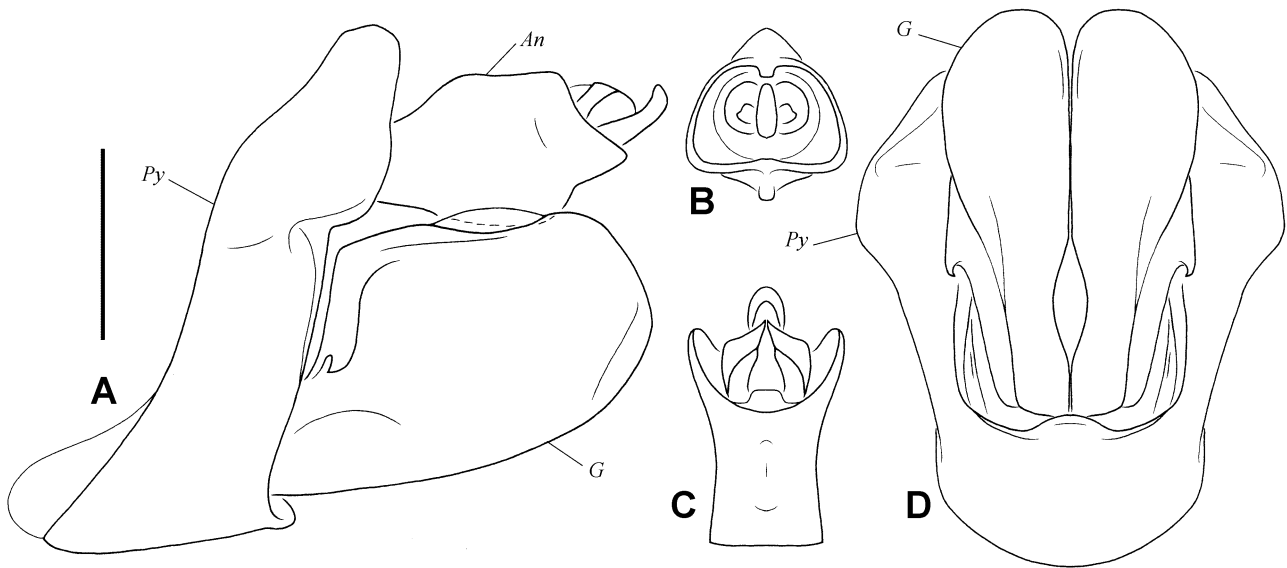
Distribution (Fig. 27): Java, Sumatra*, Borneo*, Nias Island*, We Island* (* = new data).

Typical material examined: Holotype ♂: [Java, Fruhstorfer] [Type] [*Penthicodes quadrimaculata* Lall. V. Lallemand det., 1961](FSAG).

Material examined: **Indonesia, Java:** 1 ♀: E Java, Mount Gunitir, ii.1999 (MHNL) coordinates: 8°13'S 114°00'E. **Borneo:** 1 ♀: Tandjoengredeb (= Tanjungredep), E. Mjöberg (ZMAN) coordinates: 2°09'N 117°29'E; 1 ♂: Sambas, 1891, Dr. J. Bossha (RMNH) coordinates: 1°20'N 109°15'E. **Nias Island:** 1 ♀: Nias Isl. (RBINS) coordinates: 1°05'N 97°35'E. **Sumatra:** 1 ♂: Sumatra NO, between Serdang and Toba Lake, Dr. B. Hagen (RMNH) coordinates: 2°35'N 98°50'E; 3 ♂: Aceh, v.1993 (MHNL) coordinates: 5°30'N 95°25'E; 2 ♂, 1 ♀: idem, iv.1993 (MHNL); 1 ♂: idem, no date (MHNL); 1 ♀: W Sumatra, Bukittinggi, v.1994 (MHNL) coordinates: 0°19'S 100°22'E; 1 ♀: W Sumatra, Padang, , iv.1994 (MHNL) coordinates: 0°57'S 100°21'E; 1 ♀: idem, xii.1994 (MHNL); 1 ♀: idem, vi.1994 (MHNL); 1 ♀: idem, v.1994, (MHNL); 1 ♀: idem, vii.1994 (MHNL); 1 ex, sex unknown: Sumatra, Muller (RMNH); 1 ♀: Tamiang, V. Nill (RMNH) coordinates: 2°28'S 103°55'E; 1 ♀: Laut Tador, alt. 90m, i.viii.1950, R. Straatman (RMNH) coordinates: 3°18'N 99°15'E. **We Island:** 1 ♂, 2 ♀ We Island, W off Sumatra, i.1993 (MHNL) coordinates: 5°49'29"N 95°18'29"E. **Malaysia, Borneo:** 1 ♀: Sarawak: Saribas, x.1923 (OUMNH) coordinates: 1°30'N 111°20'E; 1 ♀: Sabah, Crocker Range, vi.1982 (MHNL) coordinates: 5°40'N 116°20'E; 1 ♀: idem, v.1992 (MHNL); 1 ♀: idem, vii.1990 (MHNL); 1 ♀: idem, viii.2001 (MHNL); 1 ♀: idem, i.2000 (MHNL); 1 ♀: idem, 12–26.vi.2006 (RBINS); 1 ♀: idem, 10–15.vi.2008 (RBINS); 2 ♀: Sabah, near Keningau, iv.1991 (MHNL) coordinates: 5°20'N 116°10'E; 1 ♀: “Borneo” (MHNL).

Data compiled by A. Wessel and S. Seidel (those data were under the very similar *P. variegata* but here attributed to *P. quadrimaculata* regarding the allopatric known distribution of the 2 species): **Borneo:** 1 ♀: Malaysia, North, Sabah, District Ranau, Poring Hot Spring, light trap, Poring Lodge, v.2002, 650m, T. Kothe (ZSMC) coordinates: 6°02'35"N 116°42'19"E; 1 ex.: Indonesia, West-Kalimantan, Pontianak, R. Oberthur (MNHN) coordinates: 0°02'S 109°20'E; 1 ex.: Borneo (ZMHB); 3 ex.: idem, R. Oberthur (MNHN); 1 ♀: Borneo, *P. variegata* det. J. Constant 2003 (MNHN). **Indonesia: Sumatra:** 1 ex: Ober-Langkat, Deli (= Labuhandeli) (near Medan), M. Ude S., *P. variegata* det. H. Synave 1967 (ZMHB) coordinates: 3°45'N

98°41'E; 1 ♀: West, Rimbo Panti Natural Reserve, 5.vi.2002, 250m, T. Kothe, det. T. Kothe (ZSMC) coordinates: 0°20'50"N, 100°04'07"E.



FIGURES 20 A–D. *Penthicides quadrimaculata*, genitalia ♂. A, pygofer, anal tube and gonostyli, left lateral view. B, anal tube, posterior view. C, anal tube, dorsal view. D, pygofer and gonostyli, postero-ventral view. An: anal tube; G: gonostyli; Py: pygofer. Scale 2 mm.

Penthicides rugulosa (Stål, 1870)

Figs. 10 A–E, 21 A–D, 25.

Aphana rugulosa Stål, 1870: 742.

Aphaenina rugulosa (Stål, 1870): Metcalf, 1947: 152.

Penthicides rugulosa (Stål, 1870): Lallemand, 1963: 26.

Diagnostic characters: (1) tegmina with white patch only along sutural margin on nodal line of cross-veins (Fig. 10A); (2) legs I and II uniformly dark brown (Fig. 10E); (3) black-brown markings of tegmina irregular, larger ones subcircular with central white spot, membrane unspotted (Fig. 10A); (4) disc of hind wings red, with 1 (2) round black spots with central white spot, 1-3 small white spots (Fig. 10A); (5) abdominal tergites red (Fig. 10A).

LT ♂ (n = 3): 24.3 mm (23.6–24.9); ♀ (n = 6): 26.0 mm (24.4–27.7). Wingspan ♂ (n = 2): 49.3 mm (48.5–50.1).

Male genitalia: anal tube short, crescent-shaped in dorsal view and with 2 short processes postero-ventrally (Figs. 21A–C); pygofer with strong hump at dorsal third (Fig. 21A); broader at ventral third in postero-ventral view (Fig. 21D); gonostyli rounded apically in lateral view (Fig. 21A), contiguous in postero-ventral view (Fig. 21D) and with pilose hump dorsally at level of lateral teeth (Fig. 21A); lateral teeth spinose posteriorly (Figs. 21A, D).

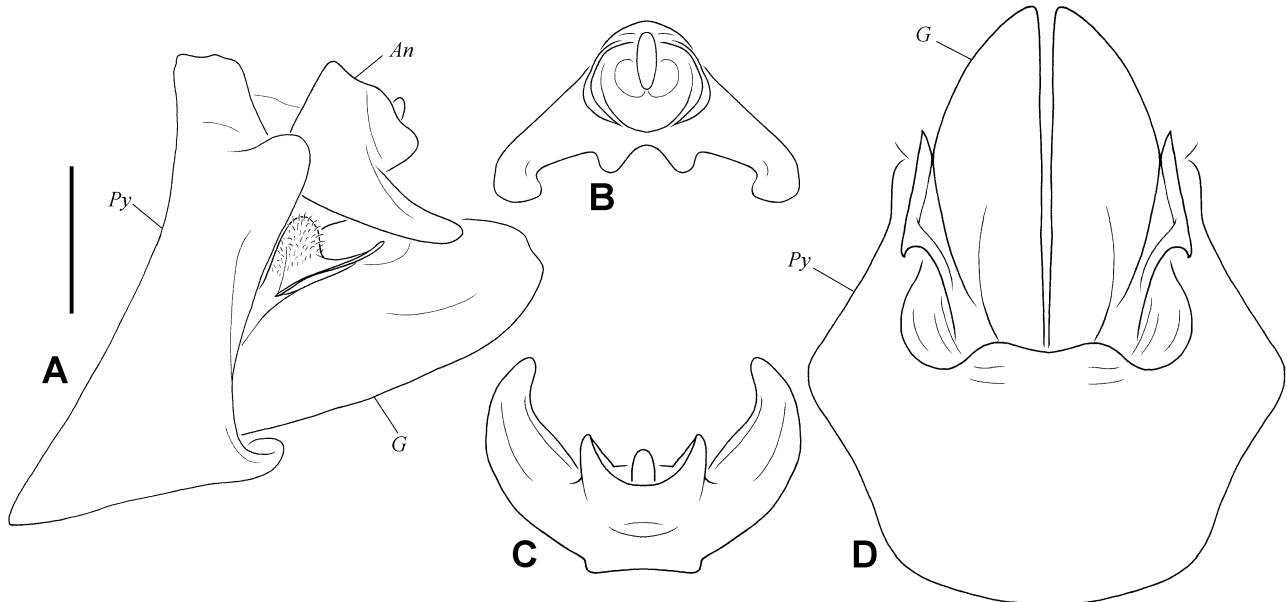
Distribution (Fig. 25): Philippines: Luzon, Mindanao, Leyte*, Biliran* (* = new data).

Typical material examined: Philippines: Holotype ♀: [Ins. Philipp.] [Semper] [*rugulosa* Stål] [Typus] [384 61] [Riksmuseum Stockholm] [NHRS-HEMI 000000078] (NHRS).

Material examined: Philippines: Biliran: 1 ♂: Isl. Biliran, Baker (FASG) coordinates: 11°29'N 124°29'E. **Leyte:** 1 ♂: Leyte: Mount Panasugan, 400m, 6.v.1952, C.R. Baltazar (RBINS) 10°44'N 124°54'E. **Luzon:** 1 ♀: E Luzon, N. Ec. Bongabon Bgy Laby, Sierra Madre Mingan Mts, 700m, 15.viii.2005, J.H. Lourens (RBINS) coordinates: 15°38'N 121°15'E; 2 ♀: E Luzon, Sierra Madre, Aurora, , ix.2007, I. & M. Lumawig (RBINS) coordinates: 16°59'N 121°38'E. **Mindanao:** 1 ♂, 1 ♀: Mindanao, Butuan, Baker (RBINS)

8°57'N 125°32'E; 1 ♂: Mindanao, Zamboanga, i.1993 (MHNL) coordinates: 6°54'N 122°04'E; 2 ♀: Mindanao, Davao, Baker (FSAG) coordinates: 7°04'N 125°36'E; 1 ♂: Sitio Taglawig, Maco, Tagum, Davao prov., X.1946, at sea level, original dipterocarp forest, CNHM-Philippine Zool. Exped. 1946-47, leg. H. Hoogstraal (FMNH) coordinates: 7°22'N 125°51'E.

Additional data compiled by A. Wessel and S. Seidel: **Philippines: Mindanao: Davao, Baker (SMTD).**



FIGURES 21 A–D. *Penthicides rugulosa*, genitalia ♂. A, pygofer, anal tube and gonostyli, left lateral view. B, anal tube, posterior view. C, anal tube, dorsal view. D, pygofer and gonostyli, postero-ventral view. An: anal tube; G: gonostyli; Py: pygofer. Scale 2 mm.

***Penthicides variegata* (Guérin-Méneville, 1829)**

Figs. 11 A–E, 13 A, 22 A–D, 27.

Aphaena variegata Guérin-Méneville, 1829: Pl. 58, fig. 3.

Aphaena basirufa Walker, 1851: 278; synonymised by Lallemand, 1963: 25.

Penthicides variegata (Guérin-Méneville, 1829): Distant, 1918: 198.

Diagnostic characters: (1) tegmina with white patch along sutural margin and along costal margin on nodal line of cross-veins (Fig. 11A); (2) legs I and II dark brown with pale yellow rings (Fig. 11E); (3) black-brown markings of tegmina irregular, also on membrane (Fig. 11A); (4) disc of hind wings yellow-orange with base red, 5-10 black spots (2-4 large and 3-6 small ones) and 2-4 small white spots (Fig. 11A); (5) abdominal tergites red, rarely basal tergites black-brown in middle (Fig. 11A).

LT ♂ (n = 4): 27.4 mm (26.2–28.2); ♀ (n = 7): 29.7 mm (28.5– 31.8). Wingspan ♂ (n = 4): 51.8 mm (48.0–57.6); ♀ (n = 24): 56.4 mm (51.0– 60.8).

Male genitalia: anal tube short and narrow, broader apically in dorsal view, about as broad in lateral view, with slight subbasal hump dorsally (Figs. 22A–C); pygofer with strong hump at dorsal third in lateral view (Fig. 22A), broader in middle in postero-ventral view (Fig. 22D); gonostyli cut straight apically in lateral view, with dorsal margin emarginate near apex (Fig. 22A), broadly separated in postero-ventral view, joining at apex and with teeth projecting laterally in postero-ventral view (Fig. 22D).

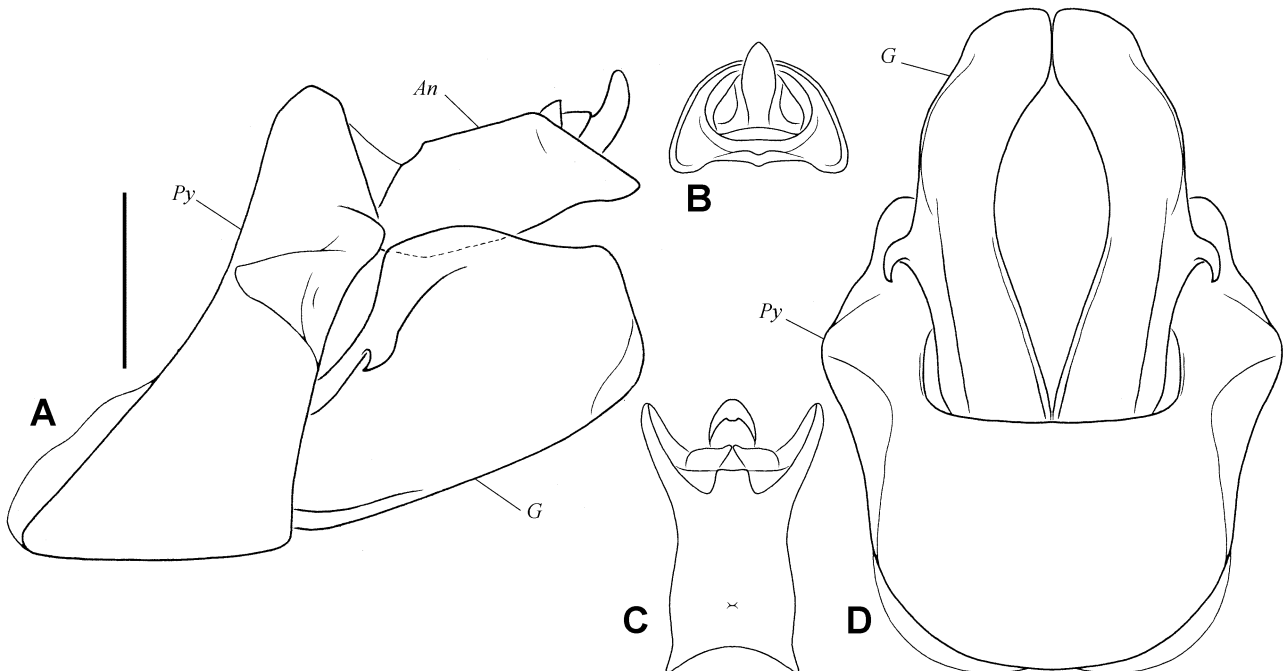
Distribution (Fig. 27): Bhutan*, N India, Malaysia, Myanmar, Thailand*, Vietnam (* = new data).

Note: the species was erroneously mentioned from Indonesia (Java, Sumatra, Borneo) and the Philippines (see Metcalf, 1947).

Material examined (on photo): holotype ♂ of *Aphaena basirufa* Walker, 1851, labeled [Type] [23].

Aphaena basirufa] [Silhet] (BMNH).

Material examined: India: 1 ♀: Darjeeling, 1891, Mowis (RMHN) coordinates: 27°02'N 88°16'E; 1 ♀: idem, A. Desgodins (RMHN); 1 ♀: idem, ex coll. C. van Volxem, [18]64, Higgins (RBINS); 1 ♀: idem, Wroblewsky (ZMUC); 1 ♀: idem, F.A Möller (ZMUC); 1 ♂: Sikkim (RBINS) coordinates: 27°45'N 88°30'E; 1 ♀: Sikkim (ZMAN). **Malaysia:** 1 ♀: Cameron Highlands, iv.1990 (MHNL) coordinates: 4°29'N 101°23'E; 1 ♂, 7 ♀: idem, vi.1992, T. Porion (MHNL); 1 ♀: idem, v.1996, T. Porion (MHNL); 1 ♀: idem, 8.vi.1989 (MHNL); 1 ♀: idem, iv.1990 (MHNL). **Myanmar:** 2 ♀: Dawna, vi.1992 (MHNL) coordinates: 16°50'N 98°15'E; 2 ♀: Momeik (= Möng Mit), 600m (RBINS) coordinates: 23°07'N 96°41'E. **Thailand:** 1 ♀: Thailand (CAS); 1 ♂: idem, iv.1975 (RBINS); 1 ♀: idem (MHNL); 1 ♀: E Siam, Pak Johng (= Pak Chong), 14.vi.1925, H.M. Smith (RBINS) coordinates: 14°42'N 101°25'E; 1 ♂: Loei prov., Na Haeo, secondary forest, 5–12.v.2001, Constant & Grootaert (RBINS) coordinates: 17°29'N 101°04'E; 3 ♀: Phrae, Wang Chin, vii.2001 (RBINS) coordinates: 17°53'N 99°37'E; 1 ♀: Wiang Pa Pao, v.1989 (MHNL) coordinates: 19°22'N 99°30'E. **Vietnam:** 1 ♀: 120km NNE Ho Chi Minh, Cat Tien Nat. Park, 7–21.vi.1995, A. Napolov (MHNL) coordinates: 11°32'N 107°26'E; 1 ♂: Annam, CuaTung (RBINS) coordinates: 21°02'N 106°29'E; 2 ♂, 2 ♀: idem (FSAG); 1 ♀: idem (RMHN); 1 ♂, 1 ♀: Cochinchina, Tan Lo, , 20.v.1923, R. Vitalis de Salvaza (RBINS) coordinates: 19°20'N 105°31'E.



FIGURES 22 A–D. *Penthicodes variegata*, genitalia ♂. A, pygofer, anal tube and gonostyli, left lateral view. B, anal tube, posterior view. C, anal tube, dorsal view. D, pygofer and gonostyli, postero-ventral view. An: anal tube; G: gonostyli; Py: pygofer. Scale 2 mm.

No country data: 2 ♀ (MHNL); 3 ♀ (RBINS); 1 ♂: 1823, Diard (RMHN); 1 ♂, 1 ♀: Himalaya, 1861, Dr. C. Falder (RMHN).

Additional data: IEBR [data sent by H.T. Pham]: **Vietnam:** 1 ♂: Vinh Phuc province, Tam Dao National Park, vi.2000, alt 1000m, H.T. Pham coordinates: 21°29'N 105°38'E; Vinh Phuc province, Ngoc Thanh coordinates: 18°55'0"N 105°31'0"E; Ninh Binh province, Cuc Phuong N.P. coordinates: 20°19'N 105°38'E.

- Data compiled by A. Wessel and S. Seidel: **Bhutan:** 1 ♂, 1 ♀: Bhutan, Maria Basti, R. Oberthur (MNHN). **Vietnam:** 3 ♂: Tonkin, Cho-Ganh, L. Duport (MNHN) coordinates: 13°17'N, 109°15'E; 1 ♀: Tonkin, Nang Tri (MNHN) coordinates not found; 1 ♂: Hue, coll. E. Fleutiaux 1919 (MNHN) coordinates: 16°28'N 107°36'E; 1 ♂, 1 ex.: Annam, Quantri, Haupt 1926 (SMTD coordinates: 20°03'N 105°32'E; 1 ♂: Tonkin, Than Moi (= Thanh Moi), H.Rolle (SMTD) coordinates: 21°38'N 106°33'E. **India:** 1 ex.: Darjeeling, Linnaea T., det. V. Lallemand (ZMHB); 1 ♂, 1 ex.: Assam (ZMHB) coordinates: 26°00'N 93°00'E. **Myanmar:** 4 ♀:

Burma, Tenasserim, det. A. Krohner 1998 (ZSMC) coordinates: 13°00'N 99°00'E. **Malaysia:** 2 ♂, 25 ♀: Cameron highlands (near Ipoh), A.E. Selner, det. A. Krohner 1998 (ZSMC). **Thailand:** 1 ♂: Chiang Mai, Exp. Lehmann, det. A. Krohner 1998 (ZSMC) coordinates: 18°47'N 98°59'E.

***Penthicodes warleti* n. sp.**

Figs. 12 A–E, 23 A–D, 26.

Etymology. The species is named after the Belgian entomologist Jean-Marie Warlet (1931–2008) in memory of all he taught to me.

Material examined: India: holotype ♂: [Assam, Abhoypur For., Naphuk 360m, x-12-1961] [Collectors: E.S. Ross, D.G. Cavagnaro] (CAS).

Note: Abhoypur = Abhaipur; Naphuk = Namphuk. Coordinates: 27°02'N 94°20'E.

Diagnostic characters: (1) tegmina with white patch only along sutural margin on nodal line of cross-veins (Fig. 12A); (2) legs I and II dark brown with pale yellow rings (Fig. 12E); (3) tegmina marked with numerous small black-brown spots, some of them v-shaped on veins; a series of black spots along costal margin; spots on membrane and 2 bigger spots between veins Sc and R1-R2 (Fig. 12A); (4) disc of hind wings red and with 11 round black spots in 3 rows and 4 small white spots (Fig. 12A); (5) abdominal tergites red (Fig. 12A).

Description. LT: ♂ (n = 1): 22.9 mm.

Head: eyes included, about 0.6 times as broad as thorax; yellow-brown with labium and apex of clypeus dark brown; vertex broader posteriorly, sides and posterior margin carinate; anterior margin emarginate; disc longitudinally slightly sulcate, with median carina and slight, irregular, transverse carina subparallel to anterior margin; frons longer than broad, longitudinally wrinkled and with 2 slight, longitudinal carinae; obsolete cephalic process flattened on dorsal part of head; clypeus longer than frons, medially slightly carinate on apical half; labium reaching apex of abdomen; ratio BV/LV = 4.4; BF/LF = 0.95.

Thorax: yellow-brown with mesonotum brown; pronotum wrinkled with anterior margin carinate and strongly bisinuate, and posterior margin roundly emarginate medially; strong median carina with deeply impressed point on each side; mesonotum with median carina not reaching apex posteriorly and curved peridiscal carinae; disc wrinkled and with slightly impressed point at postero-lateral angle; ratio BT/LP+LM = 1.22; LP/LM = 0.5.

Tegmina: yellow-brown, slightly tinged with reddish, with small black-brown spots on disc and membrane; series of small spots along costal margin; some spots on disc, on veins, v-shaped; 2 bigger black spots on disc, between veins Sc and R; white spot along sutural margin at nodal line of cross-veins, followed by black-brown marking; costal margin slightly curved; apical margin obliquely rounded; sutural margin sinuate; maximal breadth near nodal line; ratio LTg/BTg = 2.5.

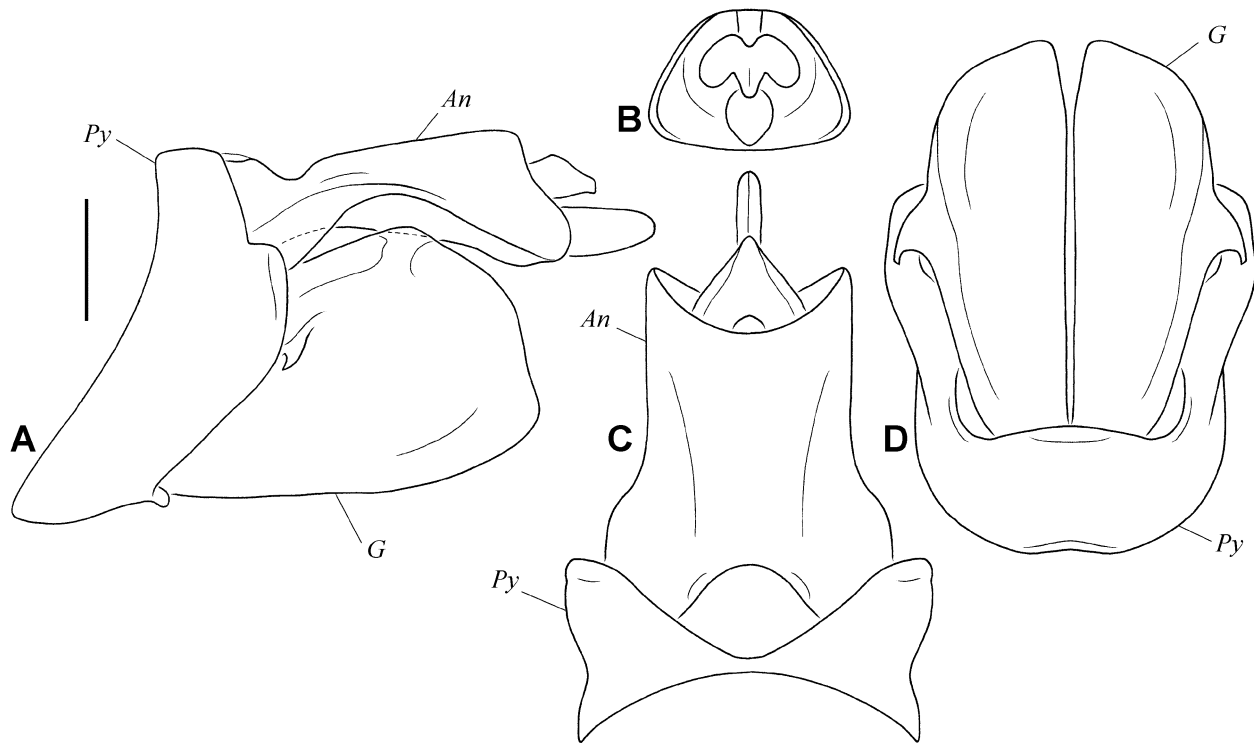
Hind wings: broader than tegmina; bright red with band along sutural margin brown and apical 1/3 black; 11 black spots on disc, organised in 3 vague rows; one short black line at basal angle; 4 small white spots on apico-costal half of disc.

Legs: black-brown; all femora and tibiae I and II with slightly pale yellow-brown rings; tibiae III brown and with 5 lateral and 7 apical spines.

Abdomen: red dorsally; black ventrally.

Male genitalia: anal tube elongate, laminate on sides, and with lateral margins emarginate after first third; lateral margin strongly concave in lateral view; dorsal margin strongly excavate subbasally (Figs. 23A–C); subtrapezoidal in posterior view (Fig. 23B); pygofer with hind margin strongly and abruptly emarginate at dorsal first third; dorsal third narrower (Fig. 23A), broader slightly above middle in postero-ventral view (Fig. 23D); gonostyli with posterior margin bisinuate in lateral view, with dorsal margin broadly rather straight and dorso-apical angle marked, ventral margin slightly bisinuate (Fig. 23A), contiguous in postero-ventral view, spreading slightly near apex, and with teeth projecting latero-ventrally in postero-ventral view (Fig. 23D).

Distribution (Fig. 26): N India.



FIGURES 23 A–D. *Penthicides warleti*, genitalia ♂. A, pygofer, anal tube and gonostyli, left lateral view. B, anal tube, posterior view. C, anal tube, dorsal view. D, pygofer and gonostyli, postero-ventral view. An: anal tube; G: gonostyli; Py: pygofer. Scale 2 mm.

Genus *Scamandra* Stål, 1863

Scamandra basigera (Walker, 1870) n. comb.

Fig. 13 C.

Aphaena basigera Walker, 1870: 97.

Aphaenina basigera (Walker, 1870): Metcalf, 1947: 150.

Penthicides basigera (Walker, 1870): Lallemand, 1963: 24, Nagai & Porion, 1996: 20, 30.

After examination of photographs of the type specimen of *Penthicides basigera* (Walker, 1870), the species is transferred to the genus *Scamandra* Stål, 1863 and the new combination *Scamandra basigera* (Walker, 1870) is proposed. The precise status of *S. basigera* within the genus *Scamandra* is not discussed here as the genus requires revision but it seems very close to *Scamandra rosea* (Guérin-Méneville, 1834) described from Java and Sumatra.

Material examined (on photo): holotype ♂ labeled [Type] [*basigera*] [Sumat Wallace] (BMNH).

The species is transferred to *Scamandra* after the following characters (Fig. 13C): (1) pronotum smooth, without strong median carina; (2) number of longitudinal veins in middle of tegmina exceeding 12 while it is less than 10 (usually 6–8) in *Penthicides*; (3) absence of an elongate cephalic process; (4) presence of a basal tubercle on hind tibiae (Lallemand, 1963).

Distribution: Sumatra.

Note: Nagai & Porion (1996) erroneously stated that the type specimen of *P. basigera* was missing in the collections of the BMNH.

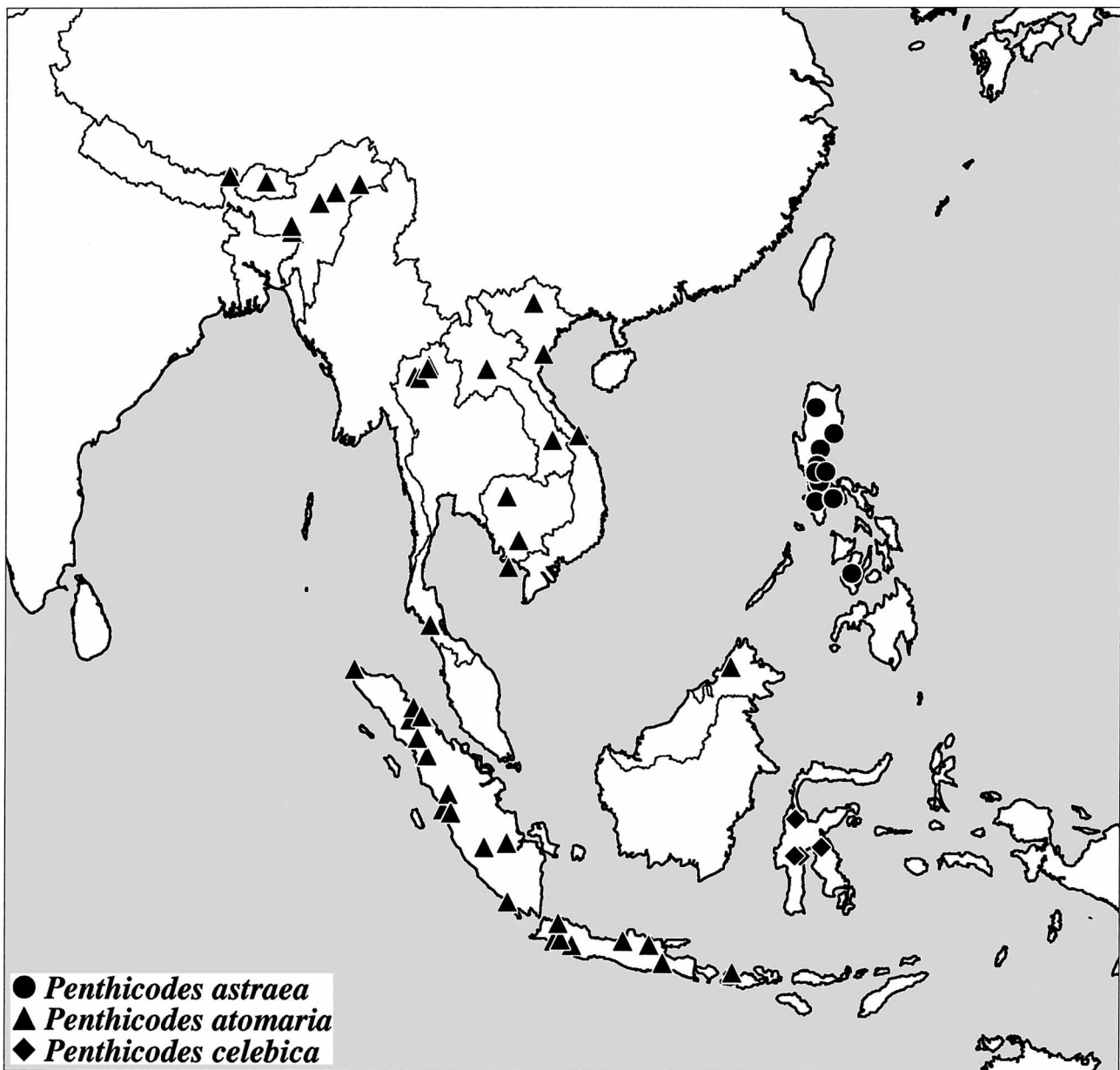


FIGURE 24. Distribution of *Penthicides astraea*, *P. bimaculata*, *P. caja* and *P. celebica* in SE Asia.

Discussion

The present discovery of two new species and one new subspecies, and rejection of a synonymy in a spectacular genus of lanternflies once more emphasizes the need of further study on the group, based on male genitalia whenever possible. *Alpha* taxonomy as well as higher classification in the family are far from being resolved (Urban and Cryan, 2009), and nearly nothing is known of the biology of those insects.

Specimens of *Penthicides* have been observed during the day on tree trunks, hiding in bark crevices in small groups (*P. variegata* in Thailand, *pers. obs.*, and *P. farinosa* and *P. atomaria* in Sumatra, Koen Smets *pers. com.* 2003), and it is possible that they are nocturnal, like other species of the family (Naskrecki & Nishida, 2007).

It also seems that when they are disturbed (*P. variegata* in Vietnam, Phung My Trung, *pers. com.*, 2010), they spread their wings, showing their brightly coloured hind wings (Fig. 13 A). This behaviour could be a defence against predators.

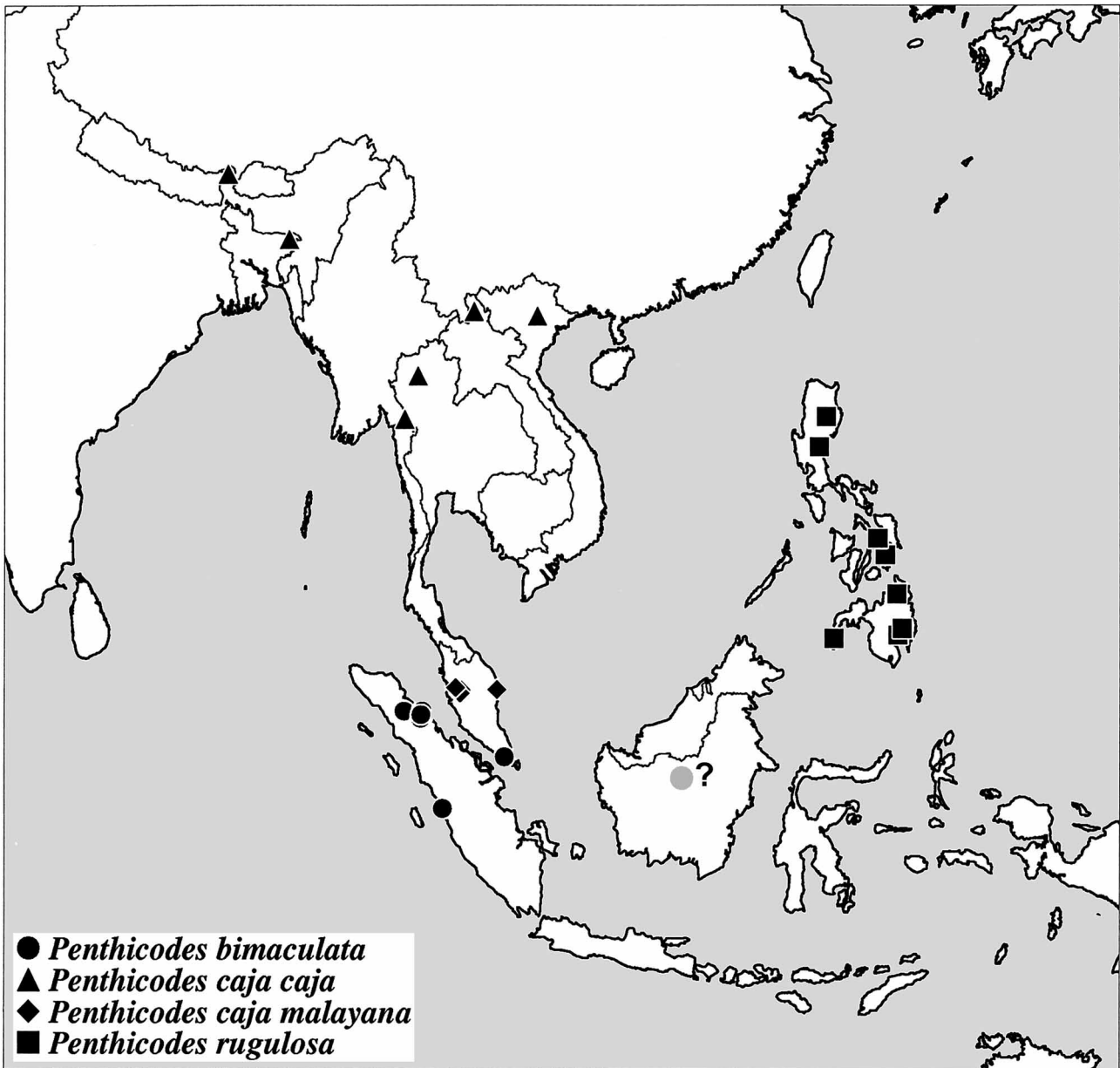


FIGURE 25. Distribution of *Penthicides bimaculata*, *P. caja caja*, *P. caja malayana* and *P. rugulosa* in SE Asia (no precise data for *P. bimaculata* in Borneo).

According to the shape of the male genitalia and the colour pattern, the subgenus *Ereosoma* is not homogenous and can be divided into 2 groups of species: *astraea*+ (*astraea*, *bimaculata*, *caja*, *celebica*, *quadrimalaculata*, *rugulosa*, *variegata*) and *atomaria*+ (*atomaria*, *pulchella*, *warleti*). The two groups can be separated according to the following characters:

- black spots on hind wings small, on 3 rows; apical black spot of hind wings rounded, distinct from the grey-black margin; tegmina without numerous large black-brown markings; male with anal tube dorso-ventrally flattened, laterally laminate and longer than broad.....group *atomaria*+
- black spots of hind wings not organized in 3 rows; apical black spot of hind wings with internal margin concave and continuing as a concolorous band along sutural margin; male with anal tube cylindrical or with lateral projections, but then not laminate and shorter than broad..... group *astraea*+

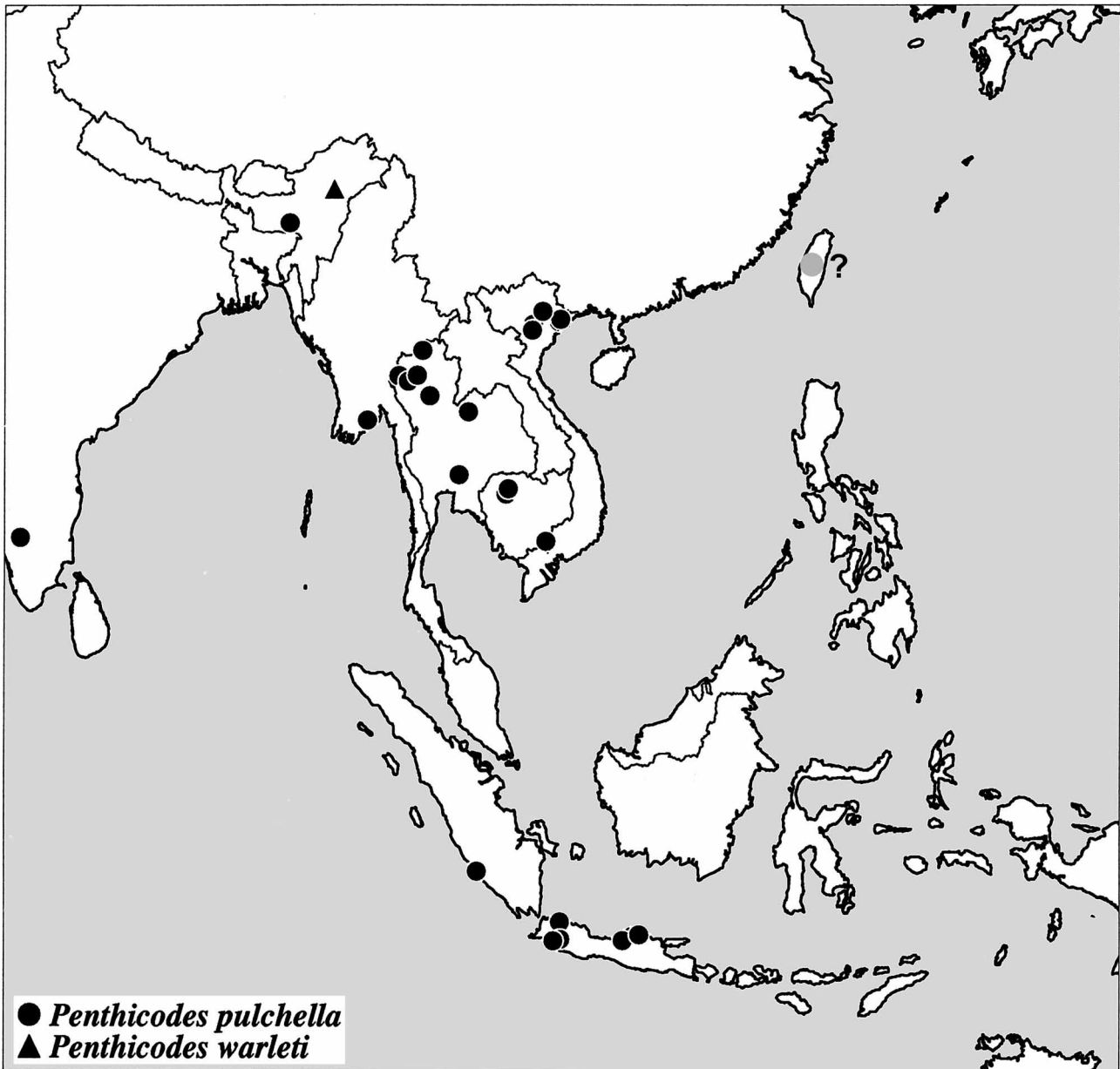


FIGURE 26. Distribution of *Penthicides pulchella* and *P. warleti* in SE Asia.(no precise data for *P. pulchella* in Taiwan).

Acknowledgements

I thank here all the curators listed above, Dr Lois B. O'Brien (University of Arizona, USA), Dr Hans Duffels (ZMAN), Dr Murray J. Fletcher (Orange Agricultural Institute, Orange, New South Wales, Australia), Dr Patrick Grootaert (RBINS) and Mr Pol Limbourg (RBINS) for their comments and permanent support, Mrs Sophia Seidel and Mr Andreas Wessel (Humboldt University, Berlin, Germany) for kindly sharing their data, Mr Hong Thai Pham for the data of IEBR and Mr Harold Labrique and Mr Cédric Audibert for the data of MHNL, Mrs Gunvi Lindberg (NHRS) for sending pictures of the specimens of the collections of NHRS, Mr Joachim Bresseel (Meise, Belgium) and Mr Phung My Trung (Vietnam) for allowing the use of their photos. The present study also benefited from funds from the European Union for visits to the museum of Copenhagen (COBICE), Paris (COLPARSYST) and Stockholm (SYNTHESESYS).

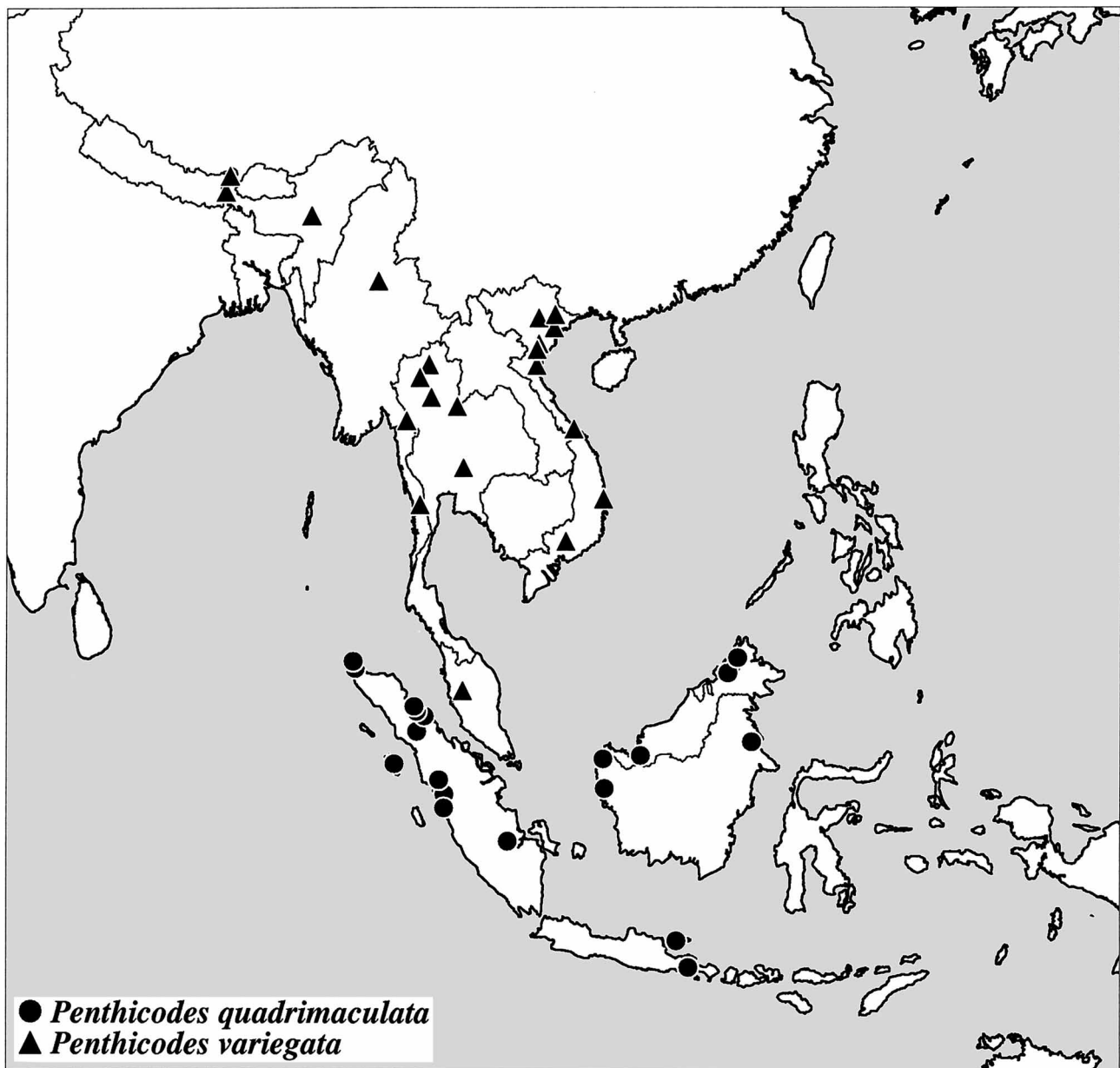


FIGURE 27. Distribution of *Penthicides quadrimaculata* and *P. variegata* in SE Asia.

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