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Review of the filter-feeding caddisfly subfamily Macronematinae (Trichoptera: Hydropsychidae) in tropical Southeast Asia

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Abstract. A comprehensive taxonomic review of the tropical Southeast Asian Macronematinae (Trichoptera: Hydropsychidae), one of the major aquatic insect groups in the region, resulted in the recognition of 56 valid species belonging to seven genera. Species with observed materials were provided with diagnoses and additional descriptions, while 11 species with unavailable material were discussed in regard to their type information and taxonomic validity. Additional two species, *Trichomacronema vietnamensis*, new species, and an undetermined species, *Macrostemum* sp., were described. Genitalia illustrations and colour wing images were provided for each of the species examined, and figures of the heads and thoraces of selected species were also included. Figures of unavailable species were redrawn based on the original published figures. An identification key to the seven genera and all 56 valid species was provided.

Key words. Trichoptera, Hydropsychidae, Macronematinae, *Trichomacronema vietnamensis* new species, tropical Southeast Asia, taxonomy

INTRODUCTION

The order Trichoptera, which includes 49 extant families, is a group of holometabolous insects with terrestrial adults and larvae that inhabit a variety of freshwater environments. The Hydropsychidae is one of the largest Trichoptera families and includes 1,441 described species that are distributed among five subfamilies (Arctopsychinae, Diplectroninae, Hydropsychinae, Macronematinae, and Smicrideinae) (Morse, 2017). The larvae of hydropsychid species are filter-feeders, particularly inhabiting running waters, and spin labial silk into retreats and nets that are used for both protection and collecting fine particulate organic matter (FPOM) for consumption. The Hydropsychidae larvae can be distinguished from larvae of other Trichoptera families by the complete sclerotisation of thoracic nota, lateroventral rows of gills on abdomen, and terminal brush of long setae on each anal proleg (Dudgeon, 1999). The adults are characterised by 5-segmented maxillary palps, each with a longest terminal segment and with annulated sclerotisation, as well as by their lack of ocelli and mesoscutal warts (Nimmo, 1987).

The subfamily Macronematinae has a rather complex taxonomic history. Brauer (1868) initially subdivided the Hydropsychidae and established the family Oestropsidae (later treated as the subfamily Oestropsinae) for the hydropsychid genera lacking palps which included the genera *Oestropsis* Brauer, 1868 and *Polymorphanisus* Walker, 1852, while keeping the genus *Macronema* Pictet, 1836 within the Hydropsychidae, sensu stricto. Later, Brauer (1875) described the genera *Aethaloptera* Brauer, 1875 and *Phanostoma* Brauer, 1875, the latter of which was eventually synonymised with the genus *Amphipsyche* McLachlan, 1872, by Martynov (1935), and placed both genera in the Oestropsidae, even though *Phanostoma* species have normal mouthparts. Ulmer (1905b) established the subfamily Macronematinae, based on the argument that neither Oestropsidae nor Oestropsinae could be valid because the type genus *Oestropsis* was synonymised with *Polymorphanisus* (Ulmer, 1905b; Barnard, 1980). Considering the studies of Brauer (1868) and McLachlan (1878), Ulmer (1905b) treated *Polymorphanisus*, *Aethaloptera*, *Amphipsyche*, *Macronema*, and *Blepharopus* Kolenati, 1859 to be separated from other Hydropsychidae genera and be included under the subfamily Macronematinae. Ulmer's (1905b) establishment of the subfamily Macronematinae, rejecting the family level names Oestropsidae and Oestropsinae, has generally been accepted by most Trichoptera taxonomists and is retained under the Article 40.2 of the International Code of Zoological Nomenclature (ICZN, 1999), although some taxonomists have not accepted this change (Banks, 1913a, 1939; Navás, 1926; Denning, 1943).

Macronematinae sensu Ulmer was first divided by Lestage (1936), who placed species with evident palps in the tribe Macronematini and those with greatly reduced palps in the tribe Polymorphanisini. This division has been accepted by most authors, although Ulmer (1951) continued to use the

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subfamily Macronematinae without further subdivision. This study does not adopt the tribes proposed by Lestage (1936) because our initial findings using molecular phylogenetic analysis showed that both tribes are not monophyletic and further phylogenetic studies are needed (Uy et al., unpublished).

The Macronematinae comprise 383 species worldwide (Morse, 2017). Barnard published revisionary studies of the Old World Polymorphanisini (Barnard, 1980) and the genus *Amphipsyche* (Hydropsychidae) (Barnard, 1984). Malicky (1998a, 1998b) published taxonomic studies of Southeast Asian Macronematinae. However, species taxonomy of these previous studies needs a review since most of the original descriptions by Ulmer (1905a, b, 1906, 1930), Banks (1911, 1916, 1920, 1924, 1931a, b, c, 1934, 1939), Navás (1917, 1922, 1923, 1929, 1931), etc. were not informative enough. Therefore, the purpose of this study is to review the species taxonomy of Macronematinae in the region, providing updated diagnoses and distribution records. This paper also provides description of a new species, *Trichomacronema vietnamensis*. The terminologies used followed Nielsen (1957) for the description of male genitalia. Type and other material data as well as latest distributional records are provided. A complete identification key to the genera and all known species of Macronematinae (adult males) in tropical Southeast Asia is provided for the first time. We do not include larvae in this study because larvae of only a few species of Trichoptera are known in tropical Southeast Asia.

MATERIAL AND METHODS

Collections. The Macronematinae collections used in this study were established by the authors from various countries in Southeast Asia, including the Philippines, Thailand, Vietnam, Laos, and Cambodia. Most of the materials are housed in the Korea University Entomological Museum (KU) in Seoul, Korea and Hans Malicky's personal collection (HMPC) in Lunz am See, Austria. Additional Macronematinae collections are as follows; part of the Macronematinae type or non-type materials were examined by loans or visiting.

BMNH	British Museum (Natural History), London, UK
CNC	Canadian National Collection Museum Ottawa, Canada
IRSNB	Royal Belgian Institute of Natural Sciences, Brussels, Belgium
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA
MNHN	French National Museum of Natural History, Paris, France
MZPW	Polish Academy of Science, Museum of the Institute of Zoology, Warsaw, Poland
NHMUK	Natural History Museum, London, UK
NHMW	Natural History Museum Vienna, Austria
NMID	National Museum or Ireland, Dublin, Ireland
NZSI	Zoological Survey of India, National Zoological Collection, Calcutta, West Bengal, India
PSUNHM	Princess Maha Chakri Sirindhorn Natural History Museum, Thailand
RMNH	Naturalis Biodiversity Center, Leiden, Netherlands
ROM	Royal Ontario Museum Toronto, Canada
SM	National Museum Szczecin, Poland
SMKM	Selangor Museum, Kuala Lumpur, Malaysia
UPLBMNH	University of the Philippines Los Banos Museum of Natural History, Philippines
UMSP	University of Minnesota Insect Collection, USA
USNM	National Museum of Natural History, Washington D.C., USA
ZMHB	Museum of Natural History, Berlin, Germany
ZMUH	Zoologisches Museum, Hamburg, Germany

Sample preparation. The right forewing and hind wing of each examined specimen were dissected while submerged in alcohol. The wings were then arranged on glass slides so that they lay perfectly flat, and cover slips were pressed and secured over them. The mounted wings were usually dried overnight, and transparent tape was used to attach the cover slips to their respective slides in order to secure and protect the mounted wings. Genitalia were dissected and submerged in 10% KOH overnight, in order to clear the abdominal area and facilitate the observation of genitalia, and then submerged in glycerine for preservation and examination.

Morphological examination. The morphology of the wings and sclerotised genitalia of the examined species were illustrated. The wings were photographed using a Zeiss Stereo Discovery V12 microscope (Carl Zeiss Microscopy GmbH, Jena, Germany). In addition, the genitalia and wings of some species were drawn or sketched using a Leitz drawing tube on a microscope (Ernst Leitz Wetzlar Company, Wetzlar, Germany) and then digitised using Adobe Illustrator CS6 (Adobe Systems Inc., San Jose, California, USA). For the species with unavailable material, literature was consulted, and key characters were redrawn from the original published figures.

TAXONOMIC ACCOUNTS

Family Hydropsychidae Curtis, 1835
Subfamily Macronematinae Ulmer, 1905
Genus *Aethaloptera* Brauer, 1875

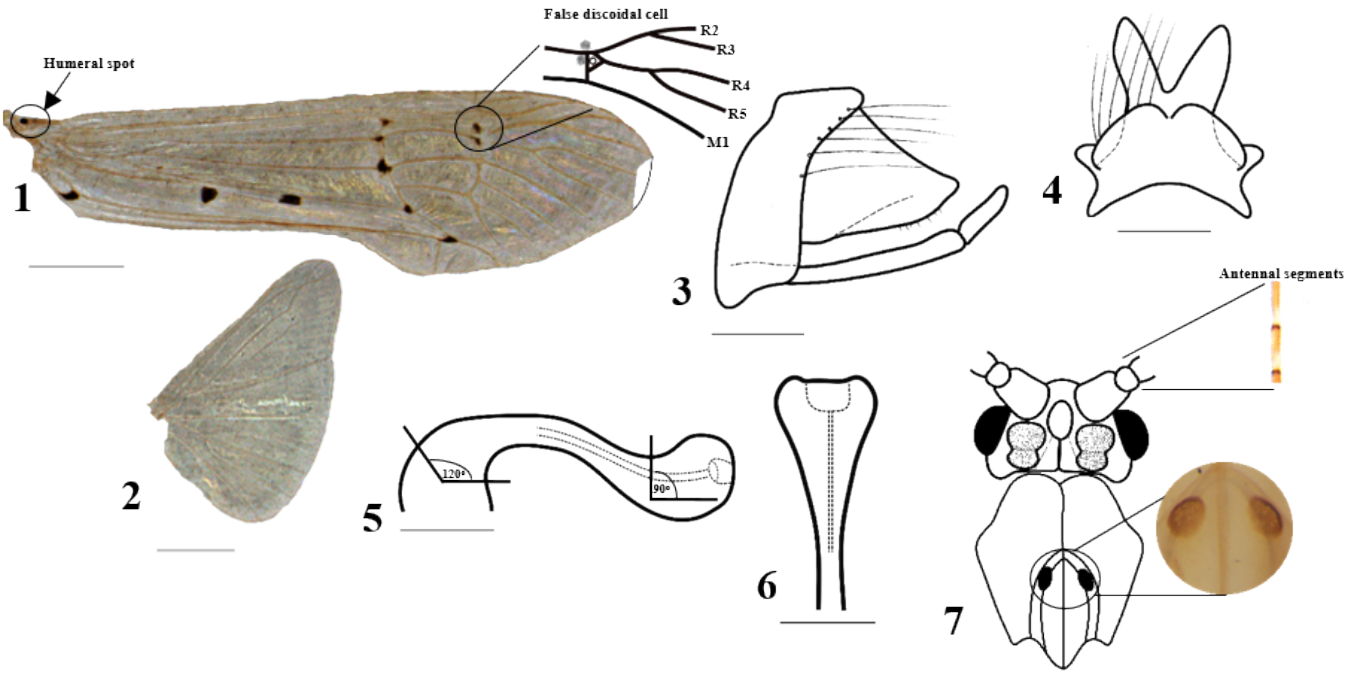
Aethaloptera Brauer, 1875: 71 [Type species: *Aethaloptera dispar* Brauer, 1875 (by monotypy)].

Chloropsyche McLachlan, 1880: 69 [Type species: *Chloropsyche evanescens* McLachlan, (by monotypy); synonymised by Kimmins, 1962: 96].

Primerenca Navás, 1915: 181 [Type species: *Primerenca maesi* Navás by original designation and monotypy; synonymised by Lestage, 1919: 293].

Paraethaloptera Martynov, 1935: 193 [Type species: *Paraethaloptera gracilis* Martynov, by original designation and monotypy; synonymised by Barnard, 1980: 66].

Diagnosis. This genus can be distinguished from other Macronematinae genera by having 'false' discoidal cell on



Figs. 1–7. *Aethaloptera sexpunctata*. 1, forewing; 2, hind wing; Male genitalia: 3, lateral; 4, segment X dorsal; 5, phallus lateral; 6, phallus tip; 7, Head dorsal. Scale bars: 1–2 = 2 mm, 3–6 = 0.25 mm, 7 = 1 mm.

the forewing surrounding nygma, formed by the rejoining of R4 and R5 right after their initial separation (Barnard, 1980) (Fig. 1). Wings very pale yellow (whitish in alcohol) and with brown spots. Head with two pairs of warts, appearing connected with each other (Fig. 7); posterior warts smaller.

Aethaloptera sexpunctata Kolenati, 1859
(Figs. 1–7)

Setodes sexpunctata Kolenati, 1859: 266 [Holotype male; India; NHMW].
Polymorphanisus sexpunctatus (Kolenati) Brauer, 1868: 263.
Aethaloptera sexpunctata (Kolenati) Ulmer, 1907: 19.
Aethaloptera dyakana Banks, 1920: 354 [Holotype female; Borneo; MCZ; synonymised by Ulmer, 1951: 194].
Paraethaloptera punctata Banks, 1938: 232 [Lectotype female; Peninsular Malaysia; NHMUK; synonymised by Barnard, 1980: 75].
Aethaloptera punctata (Banks) Kimmins, 1962: 96.

Diagnosis. *Male*. Antennae 26 mm in length with dark brown striations, colour of each antennal segment (from one striation to the next) half brown and half whitish (Fig. 7). Forewing 9 mm and hind wing 4 mm in length (Figs. 1, 2). Mesoscutum without evident markings. Mesoscutellum with pair of dark brown spots located anterolaterally (Fig. 7) Tibial spurs 0.3.2.

Male genitalia. Inferior appendages two-segmented (Fig. 3). Segment X in dorsal view bifid with each lobe connected half midway (Fig. 4). Phallus in lateral view bending almost 120° measured from central axis of the base of phallus to central axis of the shaft at 2/3 length recurving dorsally ca. 90° toward apex (Fig. 5). In lateral view, phallus apex forming knob-like structure, in dorsal view forming two rounded heart-shaped lobes (Fig. 6).

Female. Antennae 30 mm in length. Antennal flagellum brown with darker striations. Forewing 10 mm and hind wing 8 mm. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 0.3.2.

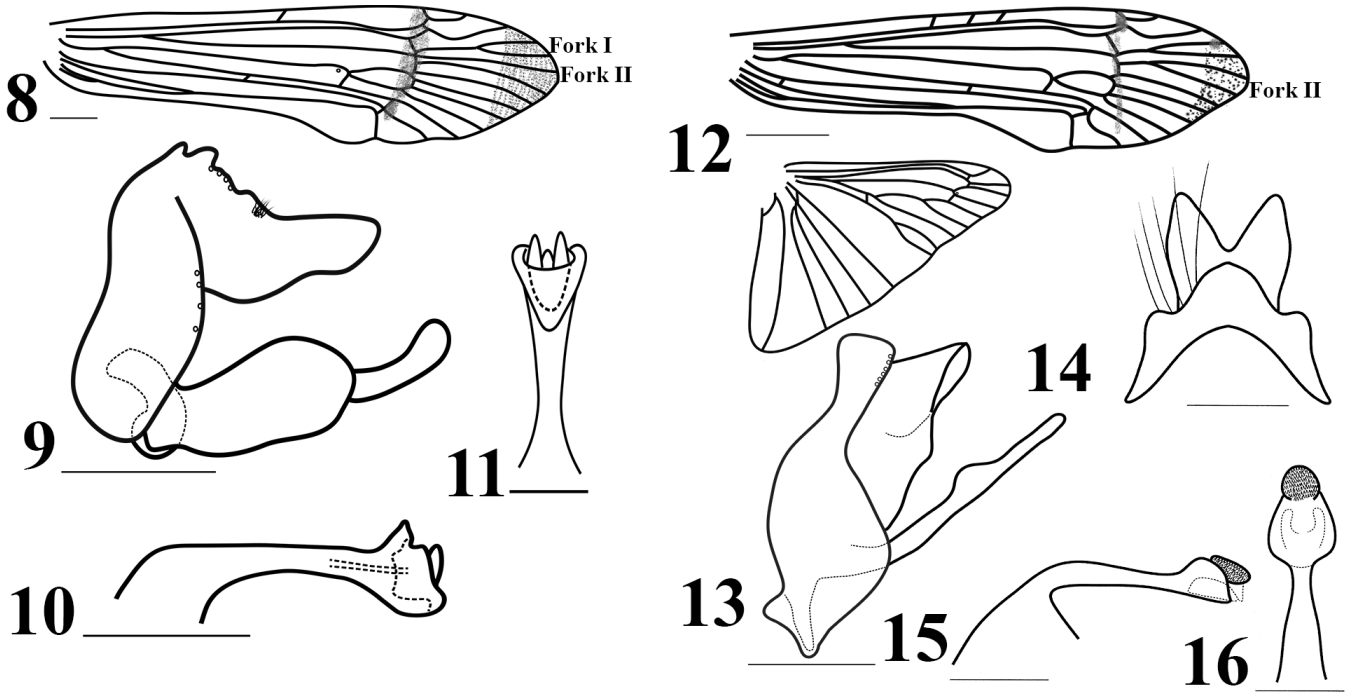
Material examined. *Thailand:* 3 males, Sakon Nakhon Province, Nam Phung, coll. C.J. Uy, 20 May 2015 (UPLBMNH); 1 female, Mae Hong Son, Ban Huai Hia, coll. H. Malicky, 15 April 2000 (HMPC); *Indonesia:* 2 females, Sumatra, Palembang, coll. H. Malicky, 13 May 1972 (HMPC); *India:* 4 males, Kherani Mokam, coll. F. Schmid, 3 May 1960 (CNC).

Distribution. India, Burma, Thailand, Laos, Vietnam, Cambodia, Malaysia (Johor), Sri Lanka, Sumatra, Borneo, New Guinea, Northern Australia.

Remarks. Kolenati (1859) originally said that brown spots were present on the posterior cubitus, arculus, and thyridium of each forewing, with a total of six spots on both forewings, thus inspiring the specific epithet *sexpunctata.* In the specimens examined here, the brown spots were more numerous and included a very evident humeral spot at the edge of the costa (Fig. 1).

Genus *Amphipsyche* McLachlan, 1872

Amphipsyche McLachlan, 1872: 68 [Type species: *Amphipsyche proluta* McLachlan, (by monotypy)].
Phanostoma Brauer, 1875: 69 [Type species: *Phanostoma senegalense* Brauer, 1875 (by monotypy); synonymised by Martynov, 1935: 201].
Amphipsychella Martynov, 1935: 201 [Type species: *Amphipsychella extrema* Martynov, 1935 (by monotypy); synonymised by Barnard, 1984: 76].



Figs. 8–16. *Amphipsyche bifasciata*. 8, right forewing; Male genitalia: 9, lateral; 10, phallus lateral; 11, phallus tip. *Amphipsyche exsiliens*. 12, right fore- and hind wing; Male genitalia: 13, lateral; 14, segment X dorsal; 15, phallus lateral; 16, phallus tip. Scale: 8, 12 = 2 mm; 9–11, 13–16 = 0.25 mm (8–16 redrawn from Barnard, 1984).

Diagnosis. This genus can be distinguished from other Macronematinae genera by the absence of forewing discoidal cell and having an anal area of forewing dilated in males. Species with medium sized, yellowish bodies. Protibial spur very minute and sometimes not obvious in other species.

Amphipsyche bifasciata Navás, 1931
(Figs. 8–11)

Amphipsyche bifasciata Navás, 1931: 7 [Holotype male; China (lost)]; Barnard, 1984: 89 (redescription).
Amphipsyche proluta McLachlan; Banks, 1940: 207; Mosely, 1942: 361 (misidentification).

Diagnosis. *Male.* Forewing with pale brown mark streak at apex, darker brown stripe across anastomosis; Fork II not stalked (Fig. 8).

Male genitalia. Inferior appendages with basal segment too broad (Fig. 8). Phallus apex with truncate with pair of pointed unsclerotised lobes (Fig. 11).

Distribution. Vietnam.

Remarks. Neither the holotype (lost) nor other specimens were available. The male wing (Fig. 8) and male genitalia (Figs. 9–11) were redrawn from Barnard (1984: Figs. 22–27) and diagnosis was described based on the redrawn figures.

Amphipsyche exsiliens Barnard, 1984
(Figs. 12–16)

Amphipsyche exsiliens Barnard, 1984: 97 [Holotype male; Burma; NHMUK].

Diagnosis. *Male.* Antennae 38 mm in length. Antennal flagellum light brown to yellowish with darker striations. Forewing 12 mm and hindwing 6 mm in length. Forewing with brown spot in fork I and in crossvein Sc-R1 (Fig. 12). Tibial spurs 1.4.4.

Male genitalia. Inferior appendages unsegmented. In lateral view, phallus has somewhat triangular apex with everted endotheca (Fig. 15). In dorsal view, segment IX is curved in the apex with one lobe on each side. Segment X divided medially.

Female. Antennae of all female specimens broken therefore length cannot be measured. Antennal flagellum colouration same as male. Forewing 9 mm and hindwing 5 mm in length. No evident markings found in forewings of old specimens. Tibial spurs 1.4.3.

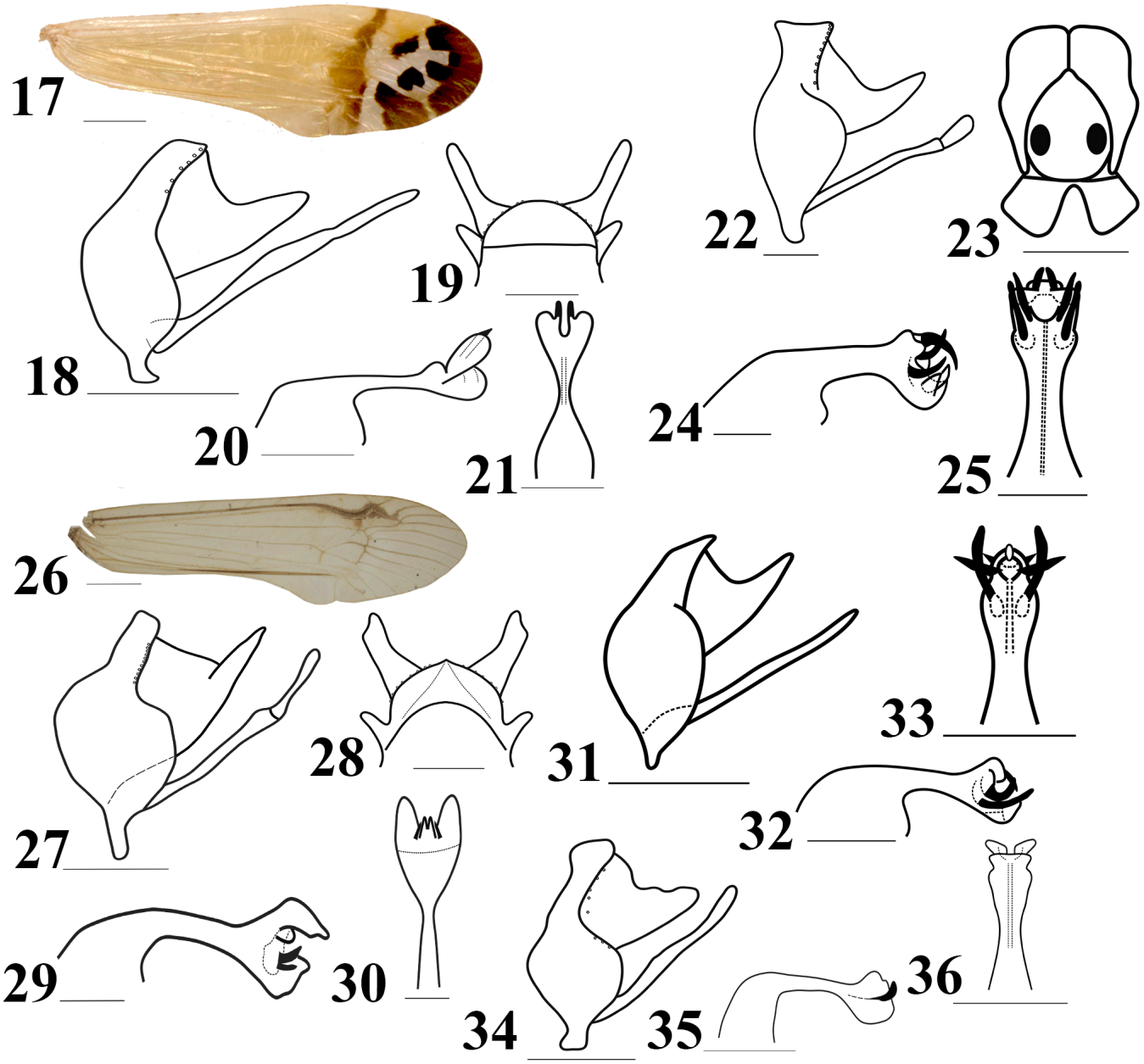
Material examined. *Indonesia:* 11 males, 10 females, Sumatra, Kebun, Sei Kopas, Mae Wang stream, coll. H. Malicky, 23 April 1997 (HMPC); *Nepal:* 1 male, Siwalik Range Bardia National Park, coll. H. Malicky, 18 March 2003 (HMPC).

Distribution. Sumatra, Nepal.

Remarks. The male wing (Fig. 12) and male genitalia (Figs. 13–16) were redrawn from Barnard (1984: Figs. 54–60).

Amphipsyche gratiosa Navás, 1922
(Figs. 17–21)

Amphipsyche gratiosa Navás, 1922: 62 [Holotype male; Vietnam (lost)]; Barnard, 1984: 98 (redescription).



Figs. 17–36. *Amphipsyche gratiosa*. 17, right forewing; Male genitalia: 18, lateral; 19, segment X dorsal; 20, phallus lateral; 21, phallus tip. *Amphipsyche magna*. Male genitalia: 22, lateral; 24, phallus lateral; 25, phallus tip; 23, thorax. *Amphipsyche meridiana*. 26, right forewing; Male genitalia: 27, lateral; 28, segment X dorsal; 29, phallus lateral; 30, phallus tip. *Amphipsyche parva*. Male genitalia: 31, lateral; 32, phallus lateral; 33, phallus tip. *Amphipsyche petiolata*. 34, lateral; 35, phallus lateral; 36, phallus tip. Scale: 17, 26 = 2 mm, 18–25, 27–36 = 0.25 mm (22–25, 27–36 redrawn from Barnard, 1984).

Diagnosis. *Male.* Antennae 35 mm in length. Antennal flagellum light brown to yellowish with darker striations. Forewing 12 mm and hind wing 6 mm in length. Forewing with very evident markings as shown in Fig. 17. Tibial spurs 1.4.4.

Male genitalia. Inferior appendages slender and unsegmented. Phallus apex with leaf-like lobes, each bearing single spine (Fig. 21). In lateral view, Segment IX narrow.

Female. Antennae 11 mm in length. Antennal flagellum same colouration as male except less dark and less obvious striations. Forewings 8 mm and hind wing 6 mm in length. Forewings without evident markings. Tibial spurs 0.4.4.

Material examined. *Thailand:*1 male, 15 females, Chiang Dao district, Ping river, coll. H. Malicky, 10 June 2003 (UPLBMNH); 44 males, 54 females, Mae Wang district, Mae Wang stream, coll. C.J. Uy, 12 May 2015 (UPLBMNH).

Distribution. Burma, Cambodia, Laos, Thailand, Vietnam.

Remarks. The males of this species possess very distinguished markings in forewings as shown in Fig. 17, whereas females lack forewing markings. The examined female specimens lack both crossvein sc-c and dilation of the anal forewing area.

Amphipsyche magna Banks, 1939
(Figs. 22–25)

Amphipsyche magna Banks, 1939: 58 [Holotype male; Philippines; MCZ]; Barnard, 1984: 102 (description of female).

Diagnosis. Male. Forewing with no markings; median cell very obvious formed by M2–M3+4. Mesoscutellum with pair of dark circular markings (Fig. 23).

Male genitalia. Inferior appendages slender and segmented; harpago blunt and shorter than coxopodite (Fig. 22). Phallus apex with three pairs of endothecal spines (Fig. 25), dorsal pair directed ventrally, mid and ventral pairs directed dorsally.

Distribution. Philippines (Luzon).

Remarks. The species has never been collected in our fieldwork in the Philippines therefore, no other individual was examined. However, Barnard (1984) provided a clear description of the species that was used as a reference for the diagnosis of this species. The genitalia (Figs. 22, 24, 25) and thorax (Fig. 23) were also redrawn from Barnard's revision of the genus *Amphipsyche* (1984: Figs. 78–83, 87).

Amphipsyche meridiana Ulmer, 1909
(Figs. 26–30)

Amphipsyche meridiana Ulmer, 1909: 134 [Lectotype female; Java; RMNH].
Amphipsyche nirvana Banks, 1913b: 236 [Holotype male; India; MCZ; synonymised by Barnard, 1984: 106].
Amphipsyche vedana Banks, 1913b: 235 [Holotype female; India; MCZ; synonymised by Barnard, 1984: 106].
Amphipsyche propinqua Ulmer, 1927: 177 [Lectotype male; Cambodia; ZMHB; synonymised and designated by Barnard, 1984: 106].
Amphipsyche indica Martynov, 1935: 199 [8 syntypes; 4 males, 4 females, India; 2 syntypes NZSI, 6 syntypes lost].
Amphipsyche tricalcarata Martynov, 1935: 197 [Holotype female; India; NZSI (lost); synonymised with *indica* by Schmid, 1958: 107].
Amphipsyche sigmosa Navás, 1935: 105 [Lectotype male; India; MNHN; synonymised and designated by Barnard, 1984: 107].

Diagnosis. Male. Antennae 40 mm in length. Antennal flagellum light brown to yellowish with darker striations. Forewing 14 mm and hind wing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 0.4.4.

Male genitalia. Inferior appendages unsegmented. In lateral view, phallus with mouth-like apex with pair of semi-membranous lobes (Fig. 29). Mid endothecal spines short.

Female. Antennae 40 mm in length. Antennal flagellum same colouration as male. Forewing 14 mm and hind wing 8 mm in length. Mesoscutum and mesoscutellum same as male. Tibial spurs 0.4.4.

Material examined. *Indonesia:* 6 males, 49 females, Java, Tengah, coll. H. Malicky, 11 January 1996 (HMPC); *Thailand:* 20 males, 25 females, Chiang Mai, Mae Ping, coll. P. Chaibu, 25 November 1997 (HMPC).

Distribution. Burma, Cambodia, India, Laos, Malaysia (Perak), Nepal, Pakistan, Sri Lanka, Sumatra, Java, Thailand, Vietnam.

Remarks. The male wing (Fig. 26) was photographed and male genitalia (Figs. 27–30) was redrawn.

Amphipsyche parva Banks, 1920
(Figs. 31–33)

Amphipsyche parva Banks, 1920: 354 [Holotype male; Borneo; MCZ]; Barnard, 1984: 105 (redescription).

Diagnosis. *Male genitalia.* Inferior appendages unsegmented (Fig. 31). Phallus with three pairs of endothecal spines, dorsal pair short, mid pair curved dorsally, ventral pair longest and almost straight (Fig. 33).

Distribution. Borneo.

Remarks. The species has never been collected from Borneo again. Therefore, no other individual was examined. However, Barnard (1984) provided a clear description of the species. The male genitalia (Figs. 31–33) were redrawn from Barnard (1984: Figs. 90–93). Diagnosis was also based on the description by Barnard (1984).

Amphipsyche petiolata Ulmer, 1930
(Figs. 34–36)

Amphipsyche petiolata Ulmer, 1930: 434 [Lectotype female; Java; ZMUH; designated by Ulmer, 1951: 197].
Amphipsyche minima Banks, 1931: 395 [Lectotype female; West Malaysia, BMNH; synonymised by Barnard, 1984: 99].
Amphipsyche pubescens Kimmins, 1955: 387 [Holotype male; Borneo; NHMUK; synonymised by Barnard, 1984: 99].

Diagnosis. *Male genitalia.* Inferior appendages unsegmented (Fig. 34). Phallus apex, globose with bifurcate membranous process directing towards apex laterally (Fig. 35).

Distribution. Borneo, Malaysia.

Remarks. Barnard (1984) clearly described the species. The male genitalia (Figs. 34–36) were redrawn from Barnard (1984: Figs. 69–73). Diagnosis was also based on the description by Barnard (1984).

Genus *Macrostemum* Kolenati, 1859

Macrostemum Kolenati, 1859: 239 [Type species: not designated]; *Hydropsyche hyalina* Pictet (selected by Ulmer, 1957: 339).
Macronemum Burmeister, 1839: 915 [unjustified emendation of *Macronema* Pictet, 1836 which was a *nomen nudum* for *Macronema*]; Ross, 1944: 114 [characterisation of *M. carolina, M. transversum, M. zebratum*].
Monopseudopsis Walker, 1852: 105 [Type species: *Monopseudopsis inscriptus* Walker, (by monotypy); synonymised by McLachlan, 1862: 308].

Diagnosis. This genus can be distinguished from other Macronematinae genera by having medium or large discoidal cell, small median cell, and no costal crossveins and subcostal vein joining with R1. Tropical Southeast Asian species vary in wing colour pattern and these patterns are important in designating the species.

Remarks. This genus was erected by Kolenati (1859) based on the absence of apical spurs on the foretibia, but the type species was not designated. Ulmer (1907) synonymised *Macrostemum* with *Macronema* (Pictet, 1836) and transferred all the *Macrostemum* species to the genus *Macronema.* Ulmer also recognised two species groups, based on wing venation, with one group distributed in South America and the other with a cosmopolitan distribution. Ulmer (1957) designated *Hydropsyche hyalina* [= *Macrostemum hyalinum*] as the type species of the cosmopolitan *Macronema* group. Flint & Bueno-Soria (1979) divided the neotropical species of *Macronema* into the *hyalinum* group (with a cosmopolitan distribution) and the *percitans* group (exclusively neotropical). All the species of the *hyalinum* group are currently placed in *Macrostemum,* making the genus *Macronema* endemic to the neotropical region.

Macrostemum albardanum Banks, 1931
(Figs. 37–41)

Macrostemum albardanum Banks, 1931a: 396 [Holotype male; Malaysia; MCZ].

Diagnosis. *Male.* Antennae 22 mm in length. Antennal flagellum light brown with darker striations. Forewing 10 mm and hind wing 7 mm in length. Forewing pattern very much obvious with dark colour in almost half of wing and light brown colour in another half (Fig. 37). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 1.4.4.

Male genitalia. Inferior appendages two-segmented. In lateral view, phallus with protrusion at apex. In lateral view, segment X elongated, narrowing toward apex.

Material examined. *Thailand:* 3 males, Ranong Province, Namtok Ngao, coll. T. Prommi, 8 August 2004 (HMPC).

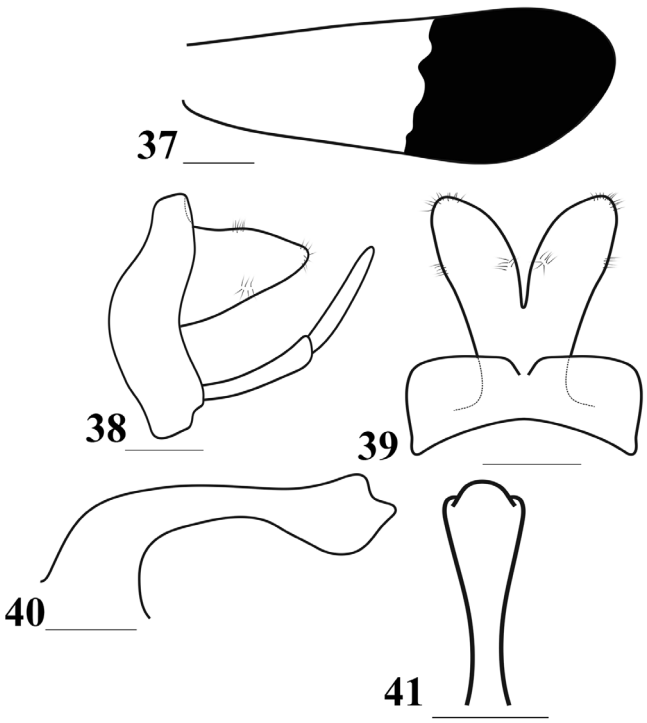
Distribution. Malaysia, Thailand, Vietnam.

Remarks. No female specimens were available for examination. The male wing (Fig. 37) and male genitalia (Figs. 38–41) were redrawn.

Macrostemum bacham Hoang, Tanida & Bae, 2005
(Figs. 42–46)

Macrostemum bacham Hoang et al., 2005: 163 [Holotype male; Vietnam; KU].

Diagnosis. *Male.* Antennae 40 mm in length. Antennal flagellum dark brown in first few segments then lighter throughout with darker striations. Forewing 17 mm and hind wing 13 mm in length. Forewing with three dark brown



Figs. 37–41. *Macrostemum albardanum*. 37, right forewing; Male genitalia: 38, lateral; 39, segment X dorsal; 40, phallus lateral; 41, phallus tip. Scale: 37 = 2 mm; 38–41 = 0.02 mm.

spots (Fig. 42). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented, harpago long and slender. In lateral view, phallus with protrusion at apex (Fig. 45) and in dorsal view, protrusion tongue-shaped (Fig. 46).

Female. Antennae broken. Antennal flagellum same as male. Forewing 11 mm and hind wing 9 mm in length. Forewing pattern same as male (Fig. 42). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

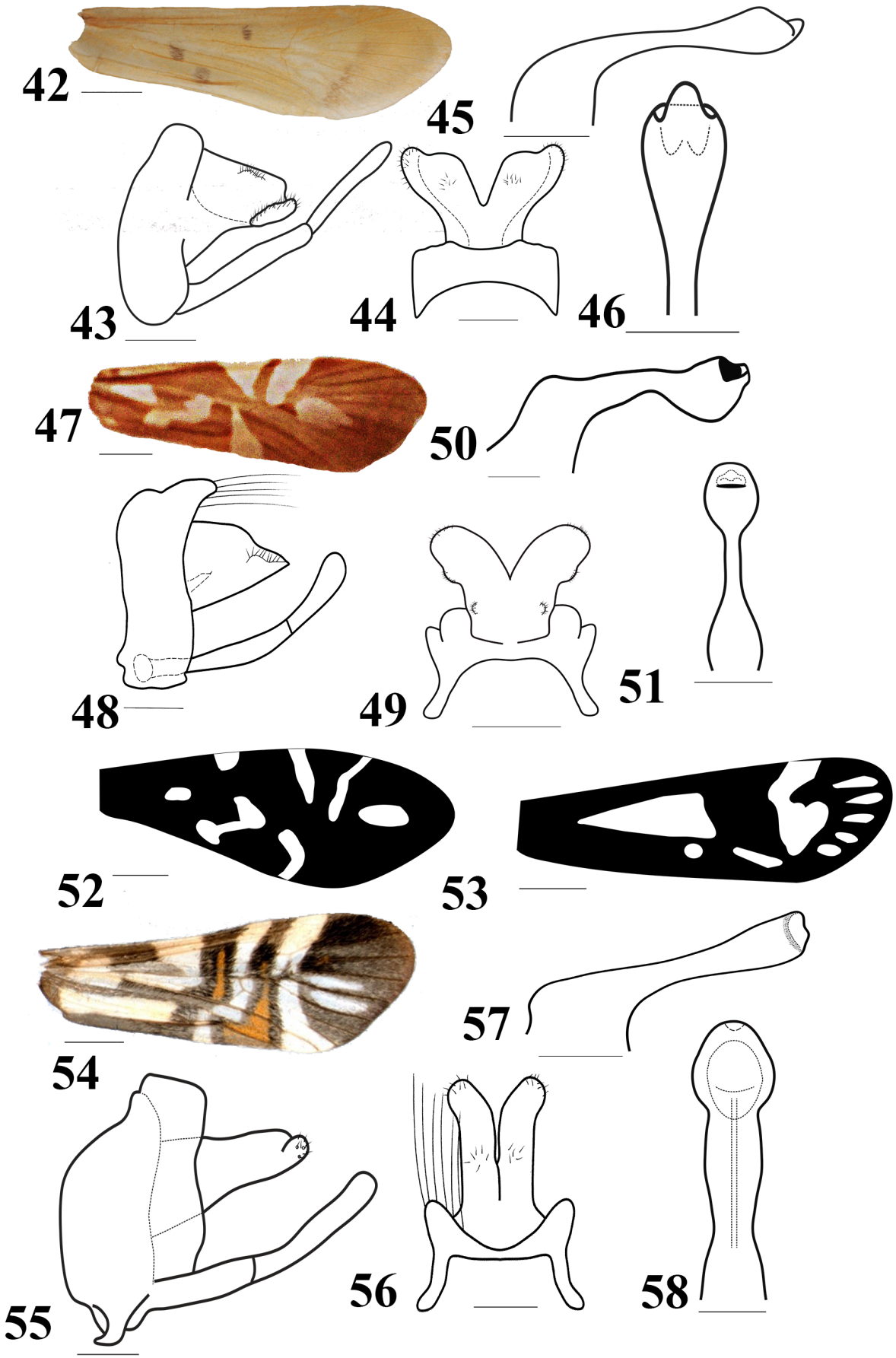
Material examined. *Laos:* 1 male, 2 females, Champasak Province, Bolavens Plateau, coll. J. Hajek, 9 May 2010 (HMPC); 1 male, Kham Mouan Province, Ban Khoun Ngeun, coll. P. Pacholatko, 24–29 April 2001 (HMPC); *Vietnam:* 1 male, 1 female, Dak Lak, Dak Pri, coll. D.H. Hoang, 11 April 2003 (KU).

Distribution. Laos, Vietnam.

Remarks. The male wing (Fig. 42) was photographed and male genitalia (Figs. 43–46) were redrawn from Malicky (2010).

Macrostemum bellerophon Malicky & Chantaramongkol, 1998
(Figs. 47–51)

Macrostemum bellerophon Malicky & Chantaramongkol (in Malicky, 1998b): 774 [Holotype male; Thailand; HMPC].



Figs. 42–58. *Macrostemum bacham*. 42, right forewing; Male genitalia: 43, lateral; 44, segment X dorsal; 45, phallus lateral; 46, phallus tip. *Macrostemum bellerophon*. 47, right forewing; Male genitalia: 48, lateral; 49, segment X dorsal; 50, phallus lateral; 51, phallus tip. *Macrostemum bellum*. 52, right forewing. *Macrostemum bifenestratum*. 53, right forewing. *Macrostemum boettcheri*. 54, right forewing; Male genitalia: 55, lateral; 56, segment X dorsal; 57, phallus lateral; 58, phallus tip. Scale: 42, 47, 52–53 = 2 mm; 43–46, 48–51, 55–58 = 0.02 mm (43–46 redrawn from Malicky, 2010; 52 redrawn from Banks, 1916; 56 redrawn from Navás, 1929).

Diagnosis. *Male.* Antennae broken. Antennal flagellum dark brown in first few segments then lighter throughout with darker striations. Forewing 13 mm and hind wing 10 mm in length. Forewing markings as shown (Fig. 47). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented, harpago blunt (Fig. 48). In dorsal view, phallus with oval apex (Fig. 51). In lateral view, phallus with an opening in center making posterior area of apex longer than anterior area (Fig. 50). Segment X divided medially, each lobe larger than segment X of other *Macrostemum* species (Fig. 49).

Type material examined. Holotype. *Thailand:* male, Doi Inthanon, Bang Khun Klang, coll. P. Chantaramongkol & H. Malicky, 29 August–5 September 1989 (HMPC).

Paratypes. *Thailand:* 3 males, Doi Inthanon, Bang Khun Klang, coll. P. Chantaramongkol & H. Malicky, 7–14 November 1989 (HMPC).

Distribution: Thailand.

Remarks. No female specimens were available for examination.

Macrostemum bellum Banks, 1916
(Fig. 52)

Macrostemum bellum Banks, 1916: 214 [Holotype male; Philippines (Luzon); MCZ].

Distribution: Philippines.

Remarks. This rare species has never been collected in the Philippines again, therefore, no other individual was examined. The male wing (Fig. 52) was redrawn from Banks (1916: pl. II, Fig. 19).

Macrostemum bifenestratum Navás, 1929
(Fig. 53)

Macrostemum bifenestratum Navás, 1929: 41 [Holotype male; Malaysia (Pahang); MNHN].

Distribution. Malaysia (Pahang).

Remarks. This species has never been collected in Malaysia again. Therefore, no other individual was examined. The male wing (Fig. 53) was redrawn from Navás (1929: Fig. 20).

Macrostemum boettcheri Ulmer, 1930
(Figs. 54–58)

Macrostemum boettcheri Ulmer, 1930: 389[Holotype male; Philippines; ZMHB]; Malicky, 1998b: 777 (redescription).

Diagnosis. *Male.* Antennae 18 mm in length. Antennal flagellum same colouration as male. Forewing 9 mm and hind wing 6 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented, harpago almost same length as coxopodite (Fig. 55). In dorsal view, phallus with oval apex (Fig. 58). In lateral view, phallus with more elongated anterior part of apex (Fig. 57). Segment X divided medially with elongated lobes longer than other *Macrostemum* species, with elongated blunt apex in lateral view (Fig. 55).

Female. Antennae 18 mm in length. Antennal flagellum same colouration as male. Forewing 9 mm and hind wing 6 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Material examined. *Philippines:* 2 males, Romblon Province, Sibuyan, Lambingan falls, coll. H. Zettel, 21 November 1994 (UPLBMNH); 3 males, 2 females, Los Banos, Laguna, Province, Molawin creek, coll. C.J. Uy, 18 April 2014 (UPLBMNH).

Distribution. Philippines (Luzon).

Remarks. Male of this species can be distinguished from other congeners by the wing colour pattern as shown in Fig. 54. Forewings possess orange markings at the middle part in fresh specimens.

Macrostemum caliptera Banks, 1931
(Fig. 59)

Macrostemum caliptera Banks, 1931c: 68 [Holotype male; Philippines; MCZ].

Distribution. Philippines (Luzon).

Remarks. This is very rare species and was never seen in many sampling done in Luzon Island. The male wing was redrawn from Banks (1931c: pl. V, Fig. 9).

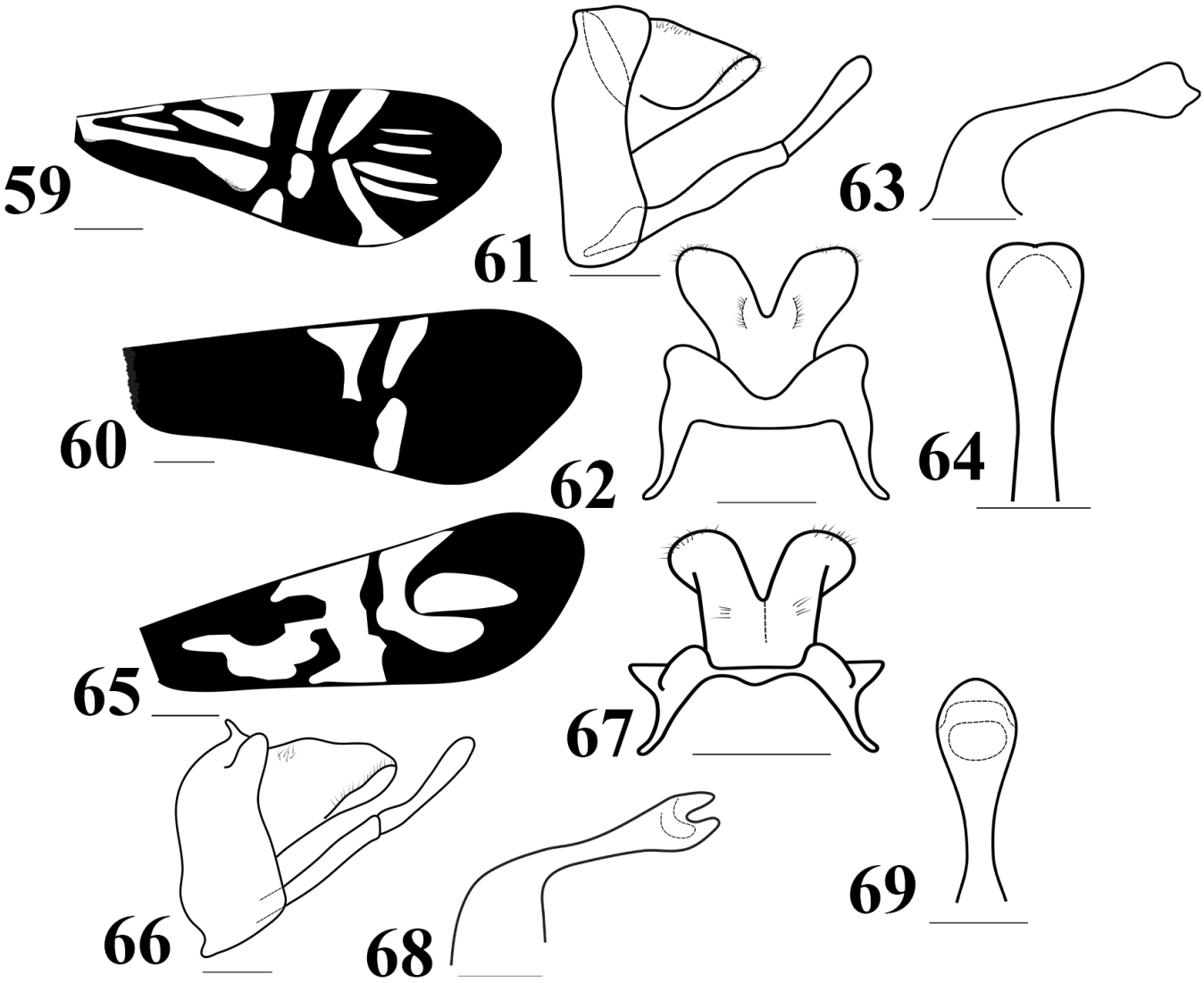
Macrostemum centrotum Navás, 1917
(Figs. 60–64)

Macrostemum centrotum Navás, 1917: 403 [Holotype male; Vietnam (Sapa)].

Diagnosis. *Male.* Antennae 30 mm in length. Antennal flagellum first few segments darker brown then lighter throughout with darker striations. Forewing 13 mm and hindwing 9 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented (Fig. 61). In lateral view, with protrusion in phallus apex (Fig. 63). In lateral view, segment X broad narrowing towards the apex (Fig. 61), in dorsal view bifid and each lobe blunt (Fig. 62).

Female. Antennae broken. Antennal flagellum same colouration as male. Forewing 10 mm and hindwing 7 mm



Figs. 59–69. *Macrostemum caliptera*. 59, right forewing. *Macrostemum centrotum*. 60, right forewing; Male genitalia: 61, lateral; 62, segment X dorsal; 63, phallus lateral; 64, phallus tip. *Macrostemum dairiana*. 65, right forewing; Male genitalia: 66, lateral; 67, segment X dorsal; 68, phallus lateral; 69, phallus tip. Scale: 59, 60, 65 = 2 mm; 61–64, 66–69 = 0.02 mm (59 redrawn from Banks, 1931c).

in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Material examined. *Vietnam:* 3 males, 4 females, Tam Dao, coll. H. Malicky, 19 May–13 June 1995 (HMPC).

Distribution. China, Vietnam.

Remarks. The original description of Navás (1917) (in Latin) did not provide illustration, as well as information on the deposition of the specimen. The assumption is that the type specimen might be deposited in the Natural History Museum in Barcelona, Spain where his personal collections were transferred from the Catholic boy's school (John Morse, personal communication). However, the museum curator confirmed that there are no species from the genus *Macrostemum* in their list of available type specimen collection by Navás (Glòria Masó Ros, personal communication). The curator also stated that there is a necessity to review the general collection and not types by Navás but the person handling the collection is now on leave. Therefore, the actual status of the type material cannot be confirmed and the possibility that it is also lost can be considered. Malicky (1998b) redescribed the male of this species including the illustrations of genitalia and forewing. The wing patterns of all the examined specimens were consistent (Fig. 60).

Macrostemum dairiana Malicky, 1998
(Figs. 65–69)

Macrostemum dairiana Malicky, 1998b: 775 [Holotype male; Indonesia; HMPC].

Diagnosis. *Male.* Antennae 23 mm in length. Antennal flagellum brown with darker striations. Forewing 12 mm and hind wing 5 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented (Fig. 66). In lateral view, phallus apex divided into two lobes making it with U-shape opening at center (Fig. 68). In lateral view,

segment X broad and width toward apex not as narrow as other species such as *M. dione* and *M. fenestratum* (Fig. 66). In dorsal view, segment X long and divided medially wherein apex of each side lobular (Fig. 67).

Type material examined. Holotype. *Indonesia:* male, North Sumatra, Dairi, coll. E.W. Diehl, 20 September 1970 (HMPC).

Paratypes. *Indonesia:* 2 males, North Sumatra, Dairi, coll. E.W. Diehl, 20 September 1970 (HMPC).

Distribution. Sumatra.

Remarks. No female specimens were available for examination.

Macrostemum dione Malicky & Chantaramongkol, 1998

(Figs. 70–74)

Macrostemum dione Malicky & Chantaramongkol, 1998 (in Malicky, 1998b): 776 [Holotype male; Sumatra; HMPC].

Diagnosis. *Male.* Antennae 23 mm in length. Antennal flagellum first few segments darker brown then lighter throughout with darker striations. Forewing 10 mm and hind wing 5 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented (Fig. 71). In lateral view, phallus with spine-like structure at anterior portion of apex (Fig. 73). In dorsal view, phallus with lobular tongue at apex, and spine-like structure appears broader in dorsal view (Fig. 74). In lateral view, segment X elongated narrowing toward apex (Fig. 71).

Female. Antennae 20 mm in length. Antennal flagellum same colouration as male. Forewing 10 mm and hind wing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Type material examined. Paratypes. *Vietnam:* 2 males, 2 females, Nam Cat Tien, coll. H. Malicky, 17–25 June 1995 (UM: UMSP000208571).

Distribution. Laos, Malaysia (Perak, Pahang), Sumatra, Thailand, Vietnam.

Remarks. We provide a photograph of the actual wing of the species (Fig. 70).

Macrostemum distinguendum Ulmer, 1905

(Figs. 75–79)

Macrostemum distinguendum Ulmer, 1905b: 71 [Holotype male; Sumatra; SM].

Diagnosis. *Male.* Antennae 25 mm in length. Antennal flagellum first few segments darker brown then lighter throughout with darker striations. Forewing 10 mm and hindwing 5 mm in length with three V-shape white markings and one small white elongated pattern runs parallel to the wing length (Fig. 75). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented (Fig. 76). Phallus when viewed laterally has pointed structure in apex directed apically (Fig. 78). In dorsal view, phallus has protrusion like apical tongue (Fig. 79). In dorsal view, segment X divided medially throughout the center (Fig. 77).

Female. Antennae 25 mm in length. Antennal flagellum same colouration as male. Forewing 12 mm and hindwing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Material examined. *Indonesia:* 1 male, Sumatra, Padang, coll. E.W. Diehl, 24 October 1990 (HMPC); 2 females, Sumatra, Kebun Sei Kopas, coll. H. Malicky, 29 April 1997 (HMPC); *Malaysia:* 4 males, 2 females, Hulu, Perak, coll. I. Sivec, 1–3 April 1994 (HMPC); 1 female, Sarawak, Bako National Park, coll. I. Sivec, 10 May 1999 (HMPC).

Distribution. Borneo, Sumatra.

Macrostemum dohrni Ulmer, 1905

(Figs. 80–84)

Macrostemum dohrni Ulmer, 1905b: 69 [Holotype male, Sumatra; SM]; Malicky, 1998b: 18 (female).

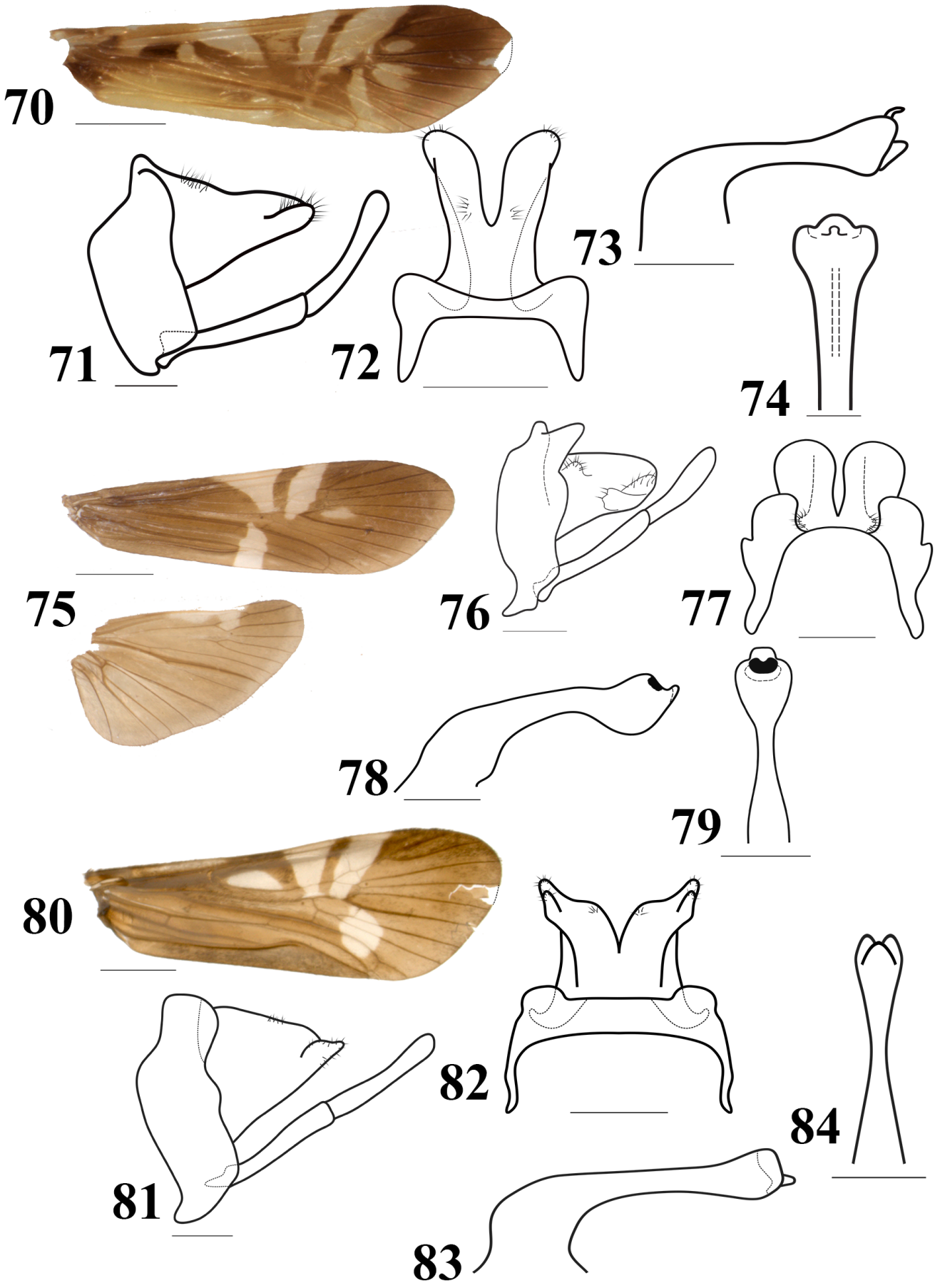
Diagnosis. *Male.* Antennae 25 mm in length. Antennal flagellum first few segments darker brown then lighter throughout with darker striations. Forewing 15 mm and hindwing 10 mm in length. Forewing pattern as shown (Fig. 80). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented harpago long and slender (Fig. 81). In lateral view, phallus with small pointed structure in posterior part of apex (Fig. 83) but not evident in dorsal view (Fig. 84). Pointed structure at apex of phallus somewhat similar to *M. centrotum* but smaller. In dorsal view, segment IX subrectangular (Fig. 82). Segment X divided medially with evident warts near apex (Fig. 82).

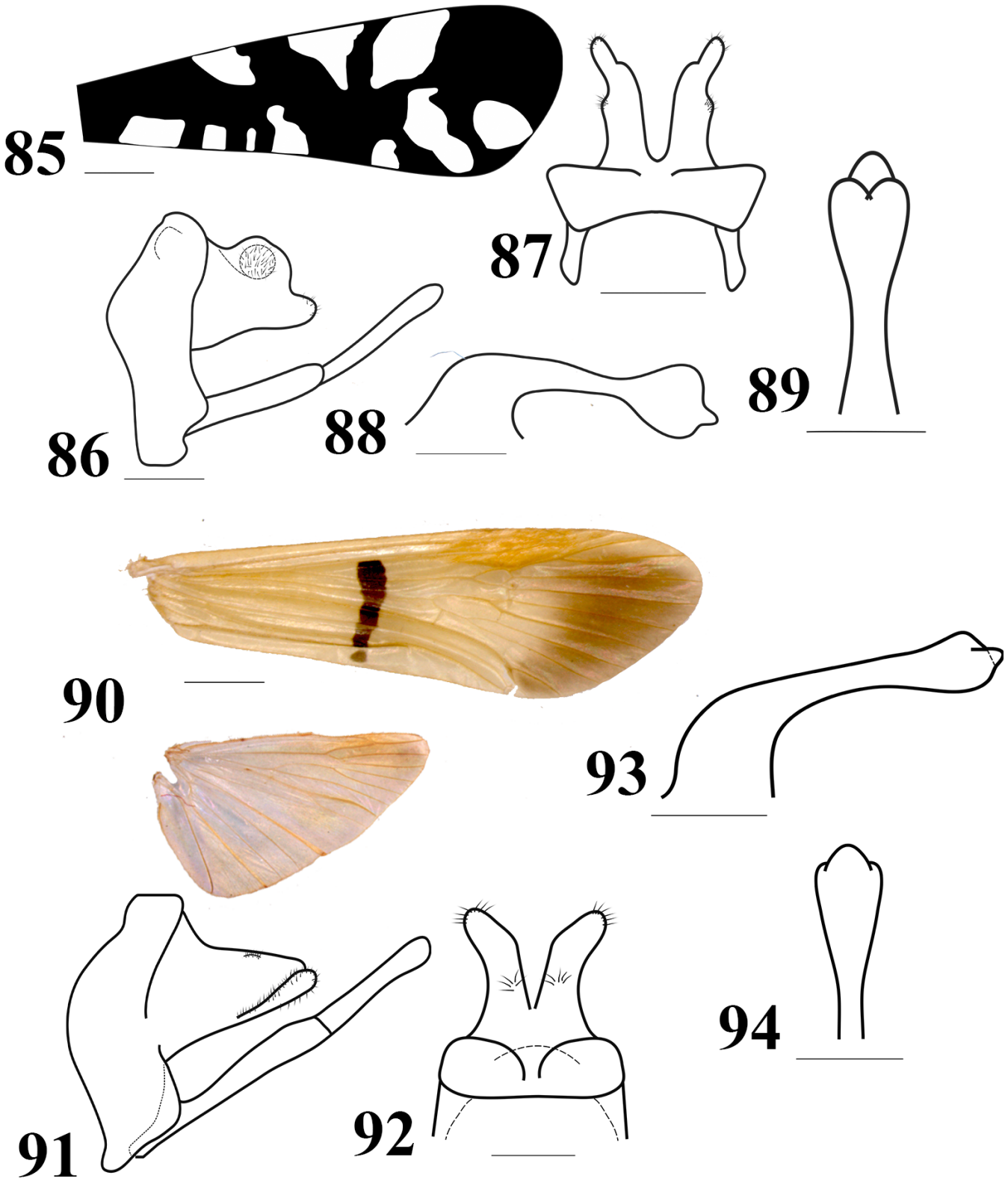
Female. Antennae 25 mm in length. Antennal flagellum same colouration as male. Forewing 13 mm and hindwing 10 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Material examined. *Thailand:* 1 male, 1 female, Kao Soi Dao, coll. N. Waldbach, 23 April 1996 (HMPC); *Cambodia:* 12 males, 5 females, Mondolkiri Province, coll. G. Ronkay & G. Csorba, 30 January 2006 (HMPC).

Distribution. Cambodia, Malaysia, (Pahang), Sumatra, Thailand.



Figs. 70–84. *Macrostemum dione*. 70, right forewing; Male genitalia: 71, lateral; 72, segment X dorsal; 73, phallus lateral; 74, phallus tip. *Macrostemum distinguendum*. 75, right fore- and hind wing; Male genitalia: 76, lateral; 77, segment X dorsal; 78, phallus lateral; 79, phallus tip. *Macrostemum dohrni*. 80, right forewing; Male genitalia: 81, lateral; 82, segment X dorsal; 83, phallus lateral; 84, phallus tip. Scale: 70, 75, 80 = 2 mm; 71–74, 76–79, 81–84 = 0.02 mm.



Figs. 85–94. *Macrostemum eleanora*. 85, right forewing; Male genitalia: 86, lateral; 87, segment X dorsal; 88, phallus lateral; 89, phallus tip. *Macrostemum fastosum*. 90, right fore- and hind wing; Male genitalia: 91, lateral; 92, segment X dorsal; 93, phallus lateral; 94, phallus tip. Scale: 85, 90 = 2 mm; 86–89, 91–94 = 0.02 mm.

Macrostemum eleanora Banks, 1938
(Figs. 85–89)

Macrostemum eleanora Banks, 1938: 232 [Holotype male; Malaysia; SMKM].

Diagnosis. *Male.* Antennae broken. Antennal flagellum dark brown in first few segments, and lighter throughout. Forewing 10 mm and hind wing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented, harpago long and narrow. In lateral view, phallus with pointed structure at apex (Fig. 88). In dorsal view, phallus with lobular tongue at apex (Fig. 89). In lateral view, segment X broad and with longer posterior part at apex (Fig. 86). Segment X with large wart (Fig. 86).

Material examined. *Malaysia:* 1 male, Cameron Highlands, coll. F. Koch, 27 July 1996 (HMPC).

Distribution. Malaysia.

Remarks. No female specimens were available for examination. Male wing (Fig. 85) and male genitalia (Figs. 86–89) were redrawn from Malicky (2010).

Macrostemum fastosum Walker, 1852
(Figs. 90–94)

Macrostemum fastosum Walker, 1852: 76 [Holotype male; Hong Kong; BMNH]; Malicky, 1998b: 769 (redescription).
Macronema tripunctatum Banks, 1924: 451 [Holotype male; Philippines; MCZ; synonymised by Fischer, 1963: 186].

Diagnosis. *Male.* Antennae 35 mm in length. Antennal flagellum brown; darker colour of striations not obvious. Forewing 14 mm and hind wing 7 mm in length with dark brown stripe along middle of forewing; apex with evident dark brown markings (Fig. 90). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented, harpago long. In lateral view, phallus with longer posterior area of apex (Fig. 93). In dorsal view, segment X divided at middle and pointed toward apex laterally (Fig. 92).

Female. Antennae 30 mm in length. Antennal flagellum dark brown in first few segments, and lighter throughout. Forewing 14 mm and hind wing 9 mm in length, same pattern as male. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Material examined. *Thailand:* 20 males, 15 females, Mae Kampong, Mae La stream, coll. C.J. Uy, 14 May 2015 (UPLBMNH); *Vietnam:* 7 males, 13 females, Tam Dao, coll. H. Malicky, 19 May–13 June 1995 (HMPC); *Indonesia:* 7 males, 13 females, Sumatra, Simarito, coll. H. Malicky, 14 February 1994 (HMPC); *Laos:* 1 female, Luang Prabang Province, coll. C. Holzschuh, 24 April–16 May 1999 (HMPC).

Distribution. Burma, China, India, Java, Bali, Laos, Malaysia (Perak), Nepal, Philippines, Thailand, Vietnam.

Remarks. This species can be easily distinguished from other congeners from its distinct wing pattern (Fig. 90). However, we observed that specimens from Vietnam have thicker brown stripes on forewings. Other diagnostic characters are illustrated in Figs. 91–94.

Macrostemum fenestratum Albarda, 1887
(Figs. 95–106)

Macrostemum fenestratum Albarda, 1887: 18 [Holotype female; Indonesia; RMNH].
Macronema similior Banks, 1931a: 396 [Holotype male; Malaysia; MCZ; synonymised by Malicky, 2009: 47].
Macronema spectabilis Banks, 1931a: 395 [Holotype male; Malaysia; MCZ; synonymised by Malicky, 2013: 47].
Macronema splendens Banks, 1931b: 421 [Holotype male; Malaysia; MCZ; synonymised by Malicky, 2009: 47; Malicky, 2013: 47].

Diagnosis. *Male.* Antennae 23 mm in length. Head with dark brown stripe running from ventral part of head beside eye up to dorsal part except middle part in dorsal view. Antennal flagellum dark brown in first few segments, and lighter throughout. Forewing 8 mm and hind wing 6 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented. Phallus with spine-like structure at anterior portion of apex (Fig. 105). In dorsal view, spine-like structure very evident and sharply pointed (Fig. 106). Segment X divided medially with wide separation and with broad apex (Figs. 103, 104).

Female. Antennae 23 mm in length. Antennal flagellum dark brown in first few segments, and lighter throughout with head markings same as males. Forewing 8 mm and hind wing 6 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

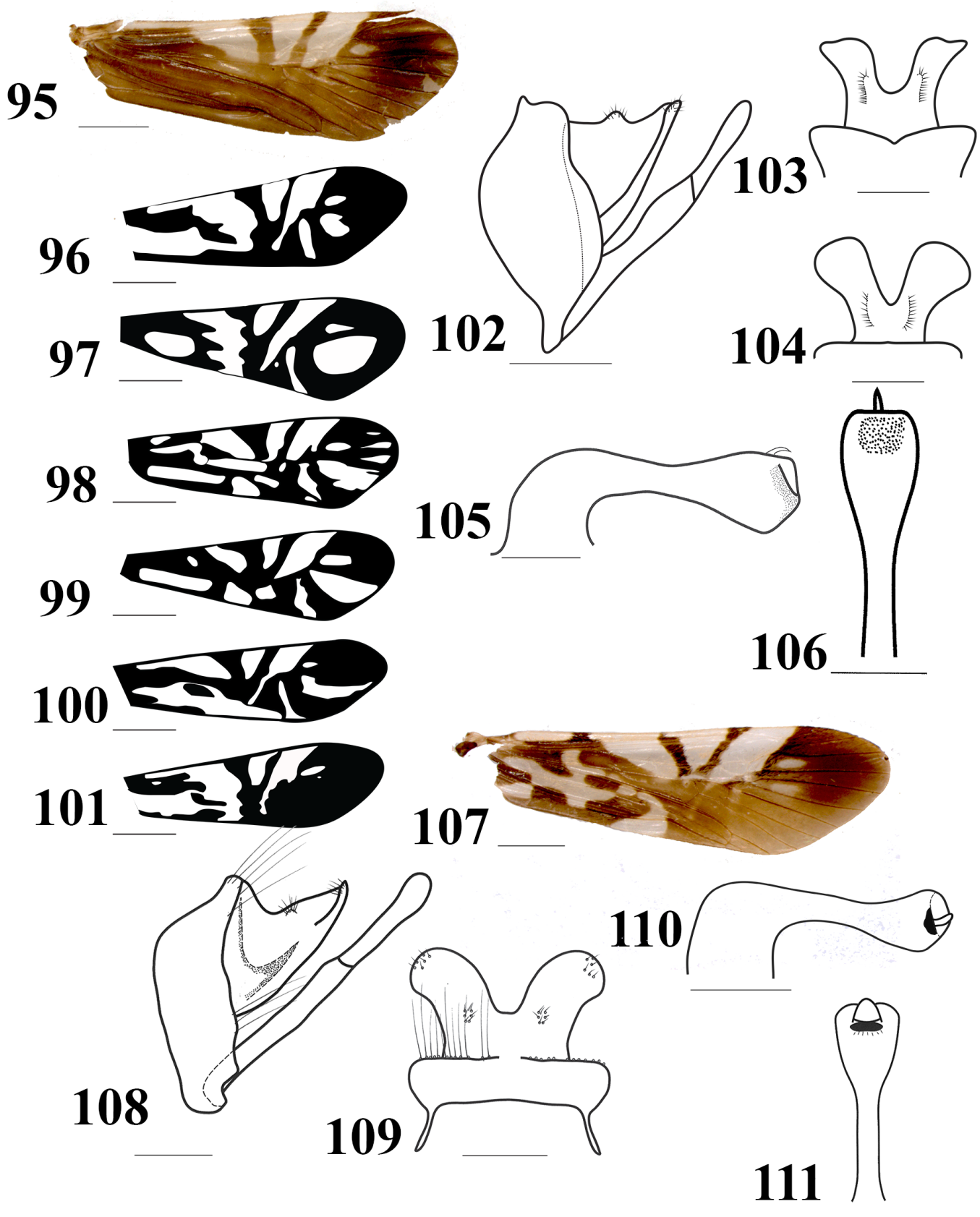
Material examined. *Thailand:* 19 males, 11 females, Phuket, Tonesai waterfall, coll. P. Chantaramongkol, 1 March 1990 (HMPC); *Indonesia:* 16 males, 12 females, North Sumatra, Huta Padang, coll. H. Malicky, 8 February 1991 (HMPC); 1 male, East Kalimantan, Seturan River, coll. P. Derleth, 10 August 2000 (HMPC).

Distribution. Borneo, Cambodia, Java, Laos, Malaysia (Perak, Pahan, Johor), Sumatra, Thailand, Vietnam.

Remarks. This species exhibited many variations in wing pattern (Figs. 95–101). The segment X of some specimens also varied, when viewed dorsally (Figs. 103, 104) but consistently with narrowing apex in lateral view (Fig. 102).

Macrostemum floridum Navás, 1929
(Figs. 107–111)

Macrostemum floridum Navás, 1929: 41 [Holotype male; China; MNHN]; Malicky, 1998b: 777 (redescription); Hoang et al., 2005: 167 (female description).



Figs. 95–111. *Macrostemum fenestratum*. 95–101, right forewing variants; Male genitalia: 102, lateral; 103–104, segment X variants dorsal; 105, phallus lateral; 106, phallus tip. *Macrostemum floridum*. 107, right forewing; Male genitalia: 108, lateral; 109, segment X dorsal; 110, phallus lateral; 111, phallus tip. Scale: 95–101, 107 = 2 mm; 102–106, 108–111 = 0.02 mm.

Diagnosis. *Male.* Antennae 25 mm in length. Antennal flagellum dark brown in first few segments, lighter throughout. Forewing 10 mm and hindwing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented, harpago long (Fig. 108). In lateral view, phallus with pointed structure originating from posterior pointing apically but very minute not like other species (Fig. 110). In dorsal view, phallus with lobular tongue in apex (Fig. 111). In lateral view, segment X broad tapering to apex, directed dorsad in some specimens (Fig. 108), each lobes widely separated in dorsal view (Fig. 109).

Female. Antennae broken. Antennal flagellum dark brown in first few segments, and lighter throughout. Forewing 11 mm and hindwing 9 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Material examined. *Thailand:* 1 male, Chiang Mai, Chiang Mai Zoo, coll. P. Chantaramongkol & H. Malicky, 28 August–4 September 1989 (HMPC); *Vietnam:* 5 males, 16 females, Nam Cat Tien, coll. H. Malicky, 17–25 June 1995 (HMPC); *India:* 1 male, Kerala, Kallar, coll. Dembicky & Pacholatko, 1–9 May 1997 (HMPC); *Laos:* 3 males, 2 females, Luang Prabang Province, Khan River, coll. C. Holzschuh, 21 April 1999 (HMPC); 2 females, Attapeu Province, Annam Highlands Mountains, coll. J. Hajek, 30 April–6 May 2010 (HMPC).

Distribution. China, India, Cambodia, Laos, Thailand, Vietnam.

Remarks. The original description of this species in Navás (1917) (in Latin) provided only forewing illustration lacking male genitalia illustration. Malicky (1998b) redescribed the male of this species. The wing colour pattern (Fig. 107) and the phallus structure in lateral view (Fig. 110) are consistent among the specimens examined in this study. Segment X has variations in the described species. Some specimens described from Vietnam have pointed apex of segment X in lateral view (Fig. 108) while broad in specimens from other area. We provide redescription of this species based on our recent materials.

Macrostemum hestia Malicky & Chantaramongkol, 1998
(Figs. 112–118)

Macrostemum hestia Malicky & Chantaramongkol (in Malicky, 1998b): 774 [Holotype male; Thailand; HMPC].

Diagnosis. *Male.* Antennae broken. Antennal flagellum first few segments darker brown and lighter throughout the segments. Head with dark brown stripe running traverse the head. Forewing 14 mm and hindwing length 7 mm. Forewing pattern as shown (Fig. 112). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented. In lateral view, phallus with opening in posterior part of the apex (Fig. 117). In ventral view, phallus apex somewhat heart-shaped (Fig. 118). In lateral view, segment X with large wart on apex (Figs. 113, 115). In dorsal view, segment X with longer apex on each side directing sideways (Figs. 114, 116).

Female. Antennae broken. Antennal flagellum and head markings same as male. Forewing 12 mm and hindwing length 8 mm. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Type material examined. Paratypes. *Thailand:* 7 males, 1 female, Doi Inthanon, Siriphum waterfall, coll. H. Malicky, 20 March 1989 (UPLBMNH); 1 male, Pu Kradung Northern Province, Namtok Penpob, coll. N. Saengpradab, 25 May 1996 (HMPC); *Malaysia:* 1 male, Hulu, Perak, coll. I. Sivec, 3–13 April 1994.

Distribution. China (Jiangxi), Laos, Malaysia (Perak), Thailand, Vietnam.

Remarks. Genitalia variations were observed among the specimens examined in this study. However, only segment X varied in some specimens (Figs. 114, 116), although the phallus structure was consistent among the examined specimens (Figs. 117, 118).

Macrostemum indistinctum Banks, 1911
(Figs. 119–122)

Macrostemum indistinctum Banks, 1911: 106 [Holotype male; India; MCZ]; Malicky, 1998b: 777 (redescription).

Macronema brisi Navás, 1930: 5 [Holotype male; China; synonymised by Malicky, 1998b: 777].

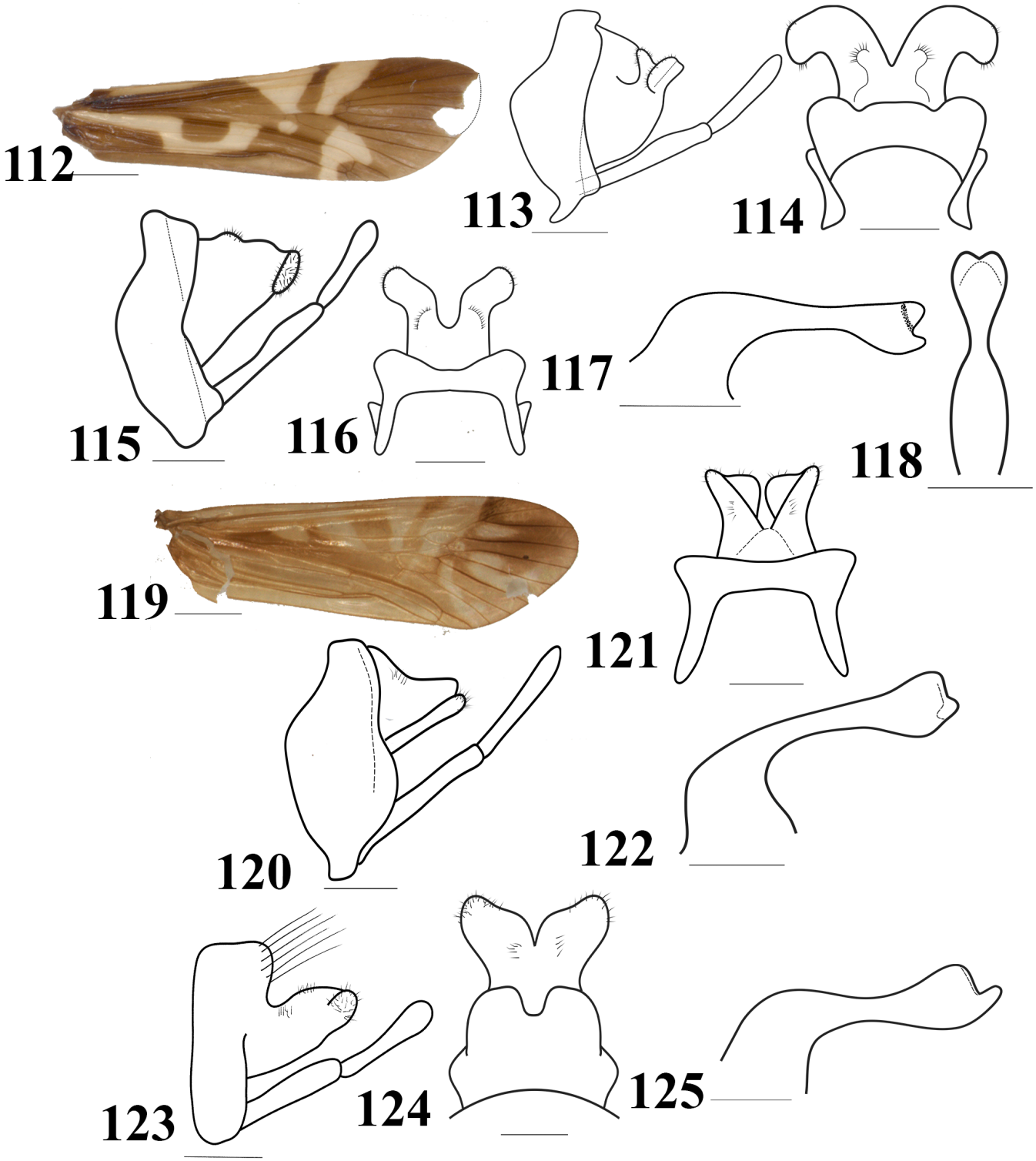
Macrostemum saowapa Chantaramongkol & Malicky, 1986: 528 [Holotype male; Sri Lanka; HMPC; synonymised by Flint, 2003: 819].

Diagnosis. *Male.* Antennae 25 mm in length. Antennal flagellum dark brown with darker striations. Forewing 13 mm and hind wing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented, harpago long and slender (Fig. 120). In lateral view, phallus with pointed structure, posterior of apex pointing apically but very minute not like other species (Fig. 122). In dorsal view, segment X divided medially with inner portion consisting of evident folds running diagonally (Fig. 121).

Female. Antennae broken. Antennal flagellum same as males. Forewing 11 mm and hind wing 8 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Material examined. *Indonesia:* 1 male, 1 female, Sumatra, Prapat, coll. H. Malicky, 17 April 1997 (UPLBMNH); *Vietnam:* 5 males, 2 females, Dak Lak Province, Yok Don, coll. D.H. Hoang , 26 March 2001 (KU).



Figs. 112–125. *Macrostemum hestia*. 112, right forewing; Male genitalia: 113, 115, lateral; 114, 116, segment X dorsal; 117, phallus lateral; 118, phallus tip. *Macrostemum indistinctum*. 119, right forewing; Male genitalia: 120, lateral; 121, segment X dorsal; 122. phallus lateral. *Macrostemum luteipes*. Male genitalia: 123, lateral; 124, segment X dorsal; 125, phallus lateral. Scale: 112, 119 = 2 mm; 113–118, 120–125 = 0.02 mm (123–125 redrawn from Kimmins, 1955).

Distribution. India, Sri Lanka, Cambodia, Laos, Malaysia (Perak), Sumatra, Thailand, Vietnam.

Remarks. The deposition of the type specimen of *Macrostemum brisi* Navás, 1930 was not indicated (see Remarks under *Macrostemum centrotum* Navás, above). The original description of Banks (1911) includes only the illustration of forewing lacking description and illustration of male genitalia. Malicky (1998b) redescribed the species. The eyes of males are larger than those of females, whereas wing pattern is consistent (Fig. 119).

Macrostemum luteipes Kimmins, 1955
(Figs. 123–125)

Macrostemum luteipes Kimmins, 1955: 388 [Holotype male; Malaysia; BMNH].

Distribution. Borneo.

Remarks. A specimen had been borrowed from UM; however, the specimen labeled under the name of *M. luteipes* was found to be misidentified and was in fact *M. distinguendum.* Therefore, specimens of *M. luteipes* were not observed and genitalia (Figs. 123–125) were redrawn from Kimmins (1955: Figs. 54–56).

Macrostemum midas Malicky & Chantaramongkol, 1998
(Figs. 126–130)

Macrostemum midas Malicky & Chantaramongkol (in Malicky, 1998b): 770 [Holotype male; Thailand; HMPC].

Diagnosis. *Male.* Antennae 30 mm in length. Antennal flagellum darker brown in first few segments and brown throughout. Forewing 12 mm and hind wing 8 mm in length with dark brown stripe along middle of forewing curving anteriorly (Fig. 126). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented (Fig. 127). In lateral view, phallus with flat apex (Fig. 129), with protrusion at ventral view (Fig. 129). In dorsal view, segment IX apex concave with long setae (Fig. 128). Segment X divided medially, with each lobe blunt, with subapical wart with cluster of small setae (Fig. 128).

Female. Antennae 30 mm in length. Antennal flagellum same as males. Forewing 9 mm and hind wing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Type material examined. Holotype. *Thailand:* male, Ranong Province, Klong Nakha Wildlife Sanctuary, coll. Schwendinger, 29 January 1991 (HMPC).

Paratypes. *Thailand:* 2 males, Ban Tramot, Southern Thailand, coll. H. Malicky, 29 April 2003 (HMPC).

Additional material examined. *Thailand:* 3 males, 13 females, Khao Kitchakut, coll. H. Malicky, 24 April 1996 (HMPC); 24 females, Putoei, Ban Huai Hindam, coll. H. Malicky, 26 April 2001 (HMPC).

Distribution. Cambodia, Laos, Malaysia (Perak, Pahang, Johor), Thailand, Vietnam.

Remarks. Examined specimens of *M. midas* possess a dark brown stripe in the middle of each forewing, as in *M. fastosum.* However, in *M. midas,* the stripes arch anteriorly (Fig. 126), whereas, in *M. fastosum*, the stripe is straight. The hind wing venation of *M.* midas is the same as that of *M. fastosum* (Fig. 90).

Macrostemum opulentum Ulmer, 1905
(Figs. 131–136)

Macrostemum opulentum Ulmer, 1905a: 84 [Holotype male; Borneo; MNHN].

Diagnosis. *Male.* Antennae broken. Antennal flagellum darker brown in first few segments and brown throughout. Forewing 9 mm and hindwing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented, separation of harpago and coxopodite almost in the middle (Fig. 133). In lateral view, phallus with flat apex (Fig. 135), spatulate in dorsal view (Fig. 136). In dorsal view, segment IX squarish (Fig. 134). Segment X divided medially with long lobes, widely separated towards the apex in dorsal view (Fig. 134).

Female. Antennae broken. Antennal flagellum same as males. Forewing 9 mm and hindwing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Material examined. *Malaysia:* 3 males, 12 females, Sabah, Kinabalu National Park, Poring hot spring, coll. I. Sivec, 21 April 1999 (HMPC).

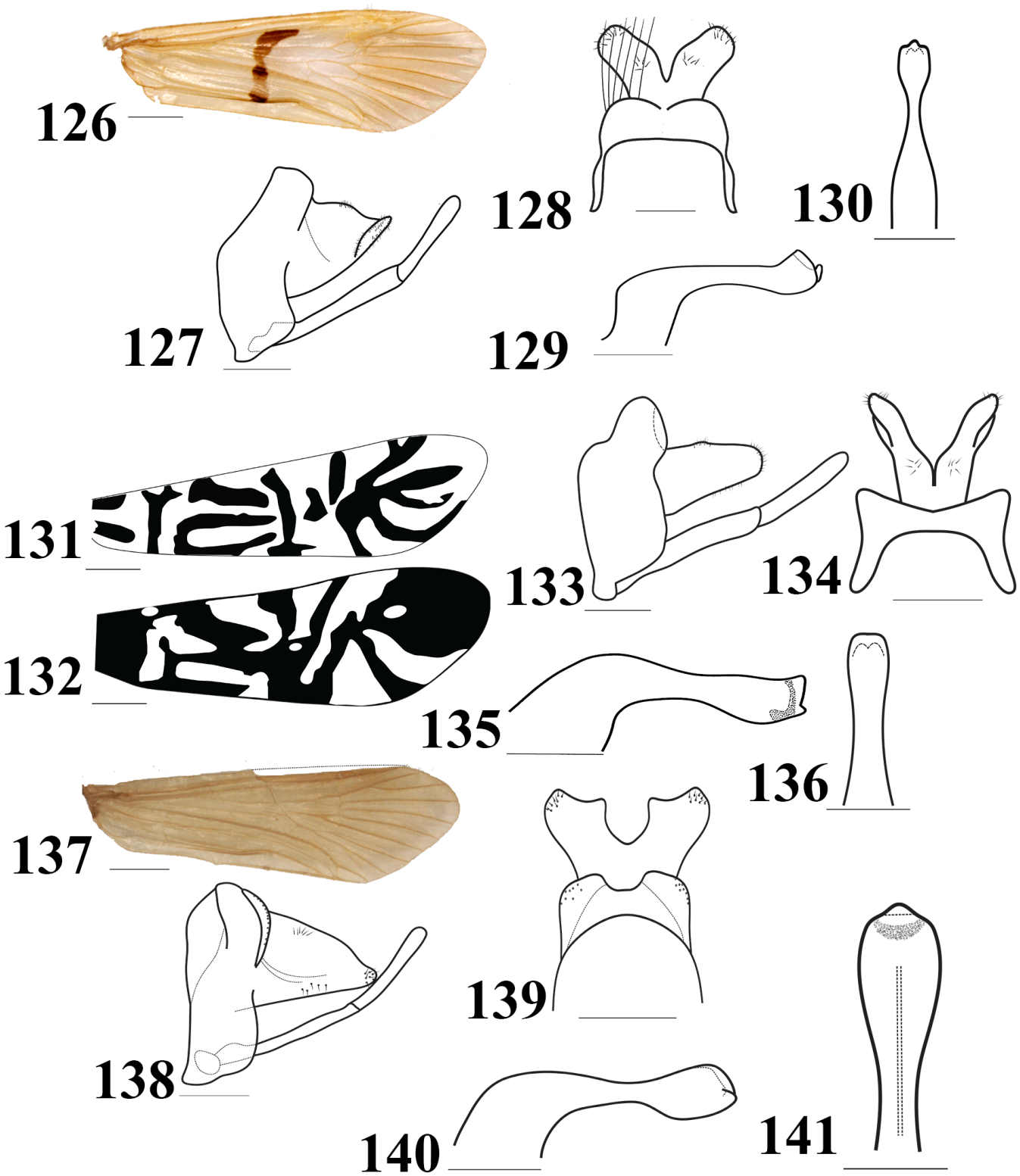
Distribution. Borneo, Indonesia.

Remarks. Based on the original description by Ulmer (1905), only the forewing pattern was illustrated. Two forewing colour patterns were observed (Figs. 131, 132).

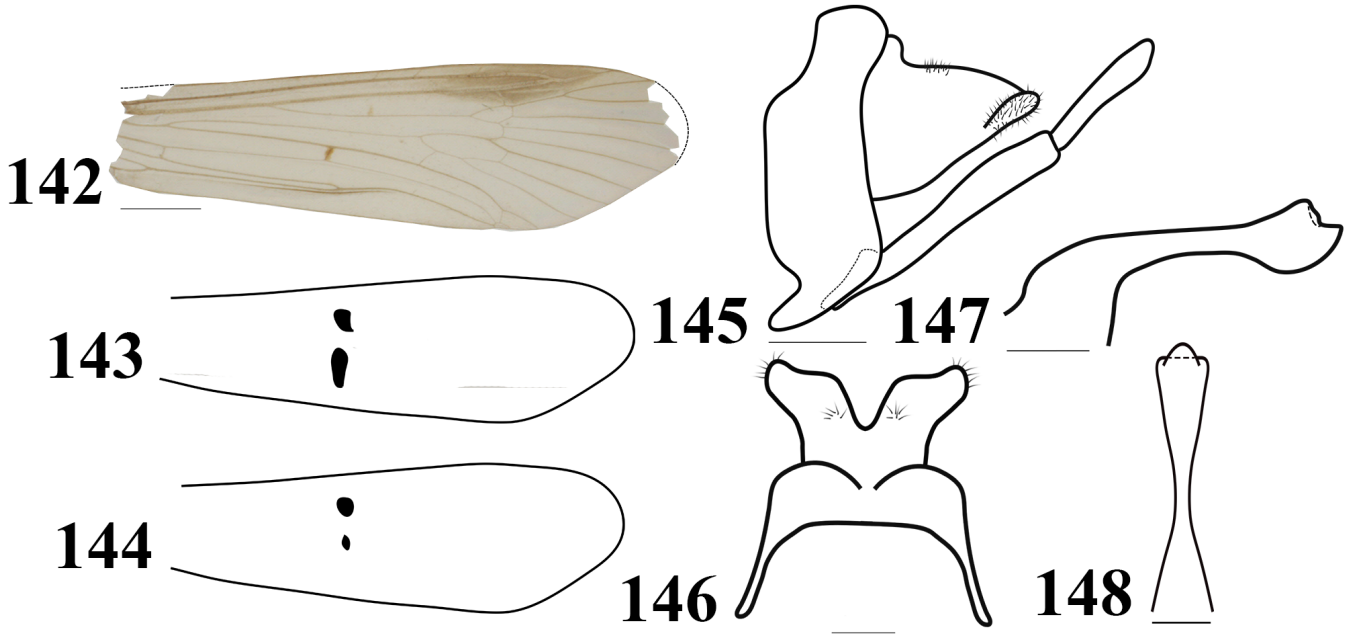
Macrostemum pallipes Banks, 1931
(Figs. 137–141)

Macrostemum pallipes Banks, 1931a: 422 [Holotype male, Malaysia; MCZ].

Diagnosis. *Male.* Antennae 35 mm in length. Antennal flagellum brown with darker striations. Forewing 13 mm and hindwing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.



Figs. 126–141. *Macrostemum midas*. 126, right forewing; Male genitalia: 127, lateral; 128, segment X dorsal; 129, phallus lateral; 130, phallus tip. *Macrostemum opulentum*. 131–132, right forewing; Male genitalia: 133, lateral; 134, segment X dorsal; 135, phallus lateral; 136, phallus tip. *Macrostemum pallipes*. 137, right forewing; Male genitalia: 138, lateral; 139, segment X dorsal; 140, phallus lateral; 141, phallus tip. Scale: 126, 131–132, 137 = 2 mm; 127–130, 133–136, 138–141 = 0.02 mm.



Figs. 142–148. *Macrostemum punctatum*. 142–144, right forewing variants; Male genitalia: 145, lateral; 146, segment X dorsal; 147, phallus lateral; 148, phallus tip. Scale: 142 = 2 mm; 145–148 = 0.02 mm.

Male genitalia. Inferior appendages two-segmented, very slender especially harpago (Fig. 138). In lateral view, phallus with squarish apex (Fig. 140), with protrusion in ventral view (Fig. 141). In dorsal view, segment X divided medially with shorter lobes as compared to other *Macrostemum* species (Fig. 139).

Female. Antennae broken. Antennal flagellum same as males. Forewing 11 mm and hindwing 6 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Material examined. *Malaysia:* 3 males, 2 females, Sabah, Kinabalu National Park, Poring hot spring, coll. I. Sivec, 22 April 1999 (HMPC).

Distribution. Borneo.

Remarks. Original description by Banks (1911) did not include illustrations. Unlike most *Macrostemum* species, no wing markings were observed (Fig. 137).

***Macrostemum punctatum* Betten, 1909**
(Figs. 142–148)

Macrostemum punctatum Betten, 1909: 232 [Holotype male; India; NZSI].

Macrostemum mithras Malicky & Chantaramongkol, 2003: 917 [Holotype male; Thailand; HMPC; synonymised by Malicky, 2013: 47].

Diagnosis. *Male.* Antennae 40 mm in length. Antennal flagellum first few segments darker brown then lighter throughout with darker striations. Forewing 13 mm and hind wing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented (Fig. 145). In lateral view, phallus apex circular, with longer posterior area (Fig. 147). In ventral view, phallus with lobular tongue at apex (Fig. 148). In lateral view, segment X broad and narrowing through apex (Fig. 145) and divided at middle with wide separation in dorsal view (Fig. 146).

Female. Antennae broken. Antennal flagellum first few segments darker brown then lighter throughout with darker striations. Forewing 13 mm and hind wing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

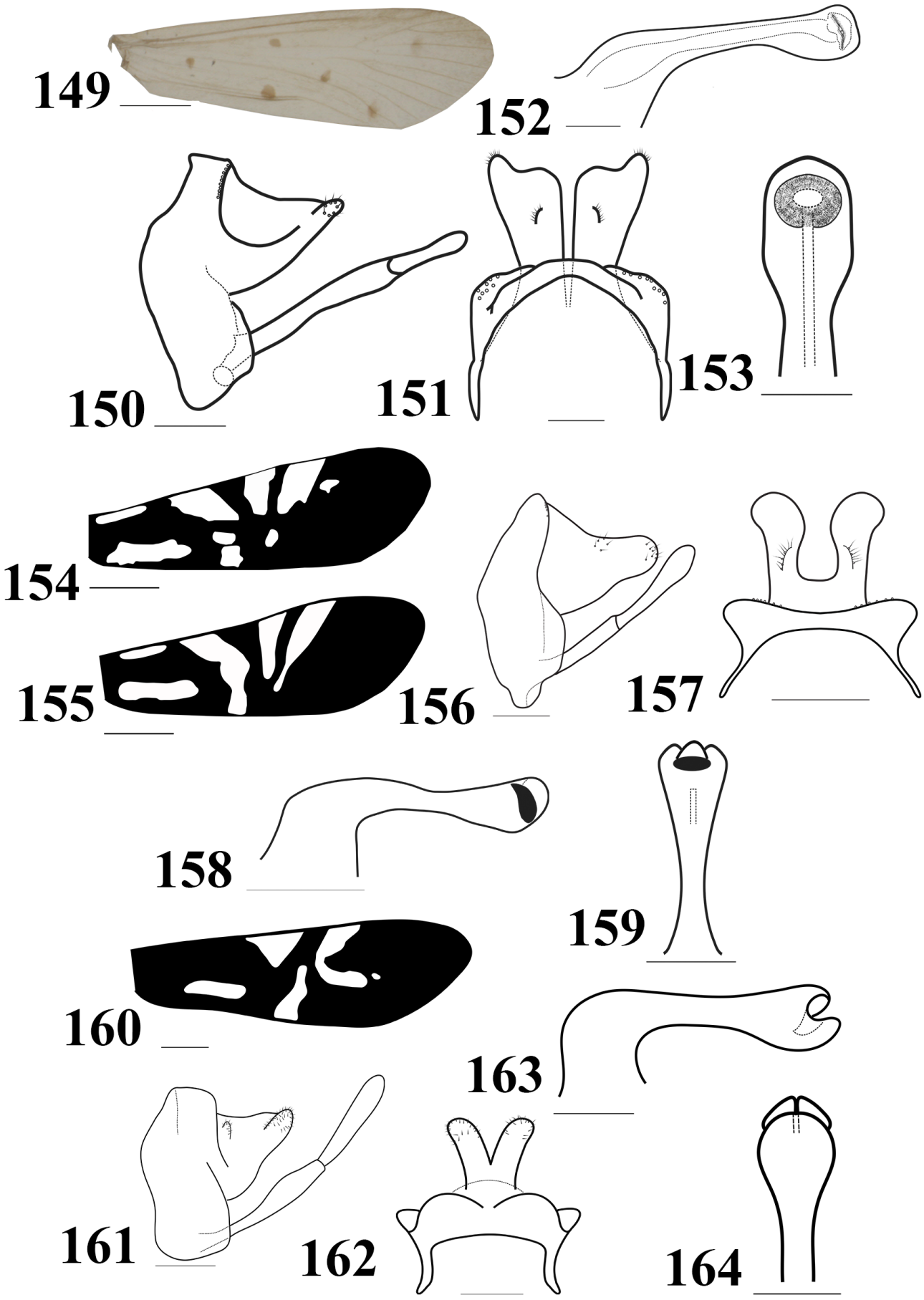
Type material examined. Holotype. *Thailand:* male, Khampaeng Phet Province, Klong Lan National Park, coll. CMU, 7 March 2002 (HMPC).

Paratypes. *Thailand:* 7 males, Khampaeng Phet Province, Klong Lan National Park, coll. CMU, 7 March 2002 (HMPC).

Additional material examined. *Nepal:* 4 males, 5 females, Harare Province, coll. Jiri, Allen, 25 May 1991(HMPC); 10 males, 2 females, Mahadev Khola, coll. H. Malicky, 12–13 April 1995 (HMPC); 20 males, 5 females, Ganesh, Himal, coll. G. Karki, 15 May 1999 (HMPC).

Distribution. India, Nepal, Thailand.

Remarks. Three types of wing patterns were observed (Fig. 142–144). The species was initially described as possessing two thick rectangular dark-brown spots running across the width of its forewing (Fig. 143). However, some specimens lacked wing markings (Fig. 142). The three types of wing patterns were even observed among the specimens from same locality.



Figs. 149–164. *Macrostemum quinquepunctatum*. 149, right forewing; Male genitalia: 150, lateral; 151, segment X dorsal; 152, phallus lateral; 153, phallus tip. *Macrostemum seba*. 154–155, right forewing; Male genitalia: 156, lateral; 157, segment X dorsal; 158, phallus lateral; 159, phallus tip. *Macrostemum tonkinensis*. 160, right forewing; Male genitalia: 161, lateral; 162, segment X dorsal; 163, phallus lateral; 164, phallus tip. Scale: 149, 154–155, 160 = 2 mm; 150–153, 156–159, 161–164 = 0.02 mm.

Macrostemum quinquepunctatum Banks, 1920
(Figs. 149–153)

Macronema quinquepunctatum Banks, 1920: 354 [Holotype male; Philippines; MCZ].

Diagnosis. *Male.* Antennae 25 mm in length. Antennal flagellum yellowish with brown striations. Forewing 10 mm and hind wing 7 mm in length with five dark spots (Fig. 149). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented, harpago short and blunt (Fig. 150). In lateral view, phallus with squarish apex (Fig. 152). In ventral view, phallus with evident endothecal sclerite (Fig. 153). In lateral view, segment X narrowing toward apex with setal wart at tip (Fig. 150). Segment IX squarish. Segment X divided medially as shown in Fig. 151.

Female. Antennae 25 mm in length. Antennal flagellum same as males. Forewing 10 mm and hind wing 7 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Material examined. *Philippines:* 33 males, 38 females, Sibuyan, Romblon Magdiwang, Pawala River, coll. R. Muller, 23–30 July 1986 (HMPC).

Distribution. Philippines.

Remarks. The species was initially described as *Macronema quinquepunctatum* by Banks (1920) without the drawings of the genitalia. However, he noted that the species closely resembles *M. fasciatum* [= *M. fastosum*], even though the harpago of the latter species is longer and the phalli and wing patterns of the species differ greatly.

Macrostemum seba Malicky & Prommi, 2009
(Figs. 154–159)

Macrostemum seba Malicky & Prommi (in Malicky, 2009): 47 [Holotype male; Thailand; HMPC.]

Diagnosis. *Male.* Antennae 20 mm in length. Antennal flagellum first few segments darker brown then lighter throughout with darker striations. Forewing 10 mm and hind wing 6 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented, harpago blunt towards the apex (Fig. 156). In lateral view, phallus with spine-like structure at anterior portion of apex (Fig. 158). In dorsal view, phallus with lobular tongue in anterior part of apex (Fig. 159). In lateral view, segment X with broad apex (Fig. 156), forming U-shape at middle of two lobes in dorsal view (Fig. 157).

Type material examined. Holotype. *Thailand:* male, Phangnga Province, Sriphanga National Park, coll. T. Prommi, 7 August 2004 (HMPC).

Paratypes. *Thailand:* 4 males, Phangnga Province, Sriphanga National Park, coll. T. Prommi, 7 August 2004 (HMPC); 6 males, Ranong Province, Klongbangmun stream, coll. T. Prommi, 8 October 20014 (HMPC).

Additional material examined. *Laos:* 1 male, Boli, Kham Xai Province, coll. V. Kuban, 1–18 May 2001 (HMPC).

Distribution. Thailand, Laos.

Remarks. The phallus resembles that of *M. dione* dorsally. However, the phallus of *M. seba* possesses both dorsal and ventral tongues, whereas that of *M. dione* has only one (Fig. 159). The original description of the species included drawings of two types of genitalia and wing patterns. The genitalia drawings included here are based on both the holotype and paratype specimens, and both wing pattern variations were drawn as well (Figs. 154–159). No female specimens were available for examination.

Macrostemum tonkinensis Mosely, 1934
(Figs. 160–164)

Macrostemum tonkinensis Mosely, 1934: 140 [Holotype male; Vietnam; BMNH].

Diagnosis. *Male.* Antennae about 35 mm long. Antennal flagellum dark brown in first few segments, and lighter throughout. Forewing 12 mm and hind wing length 10 mm. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented, harpago broad. Phallus when viewed laterally has circular apex with very obvious opening in the middle (Fig. 163), when viewed dorsally has a curved apex (Fig. 164).

Female. Antennae about 20 mm long. Antennal flagellum dark brown in first few segments, and lighter throughout. Forewing 13 mm and hind wing length 8 mm. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

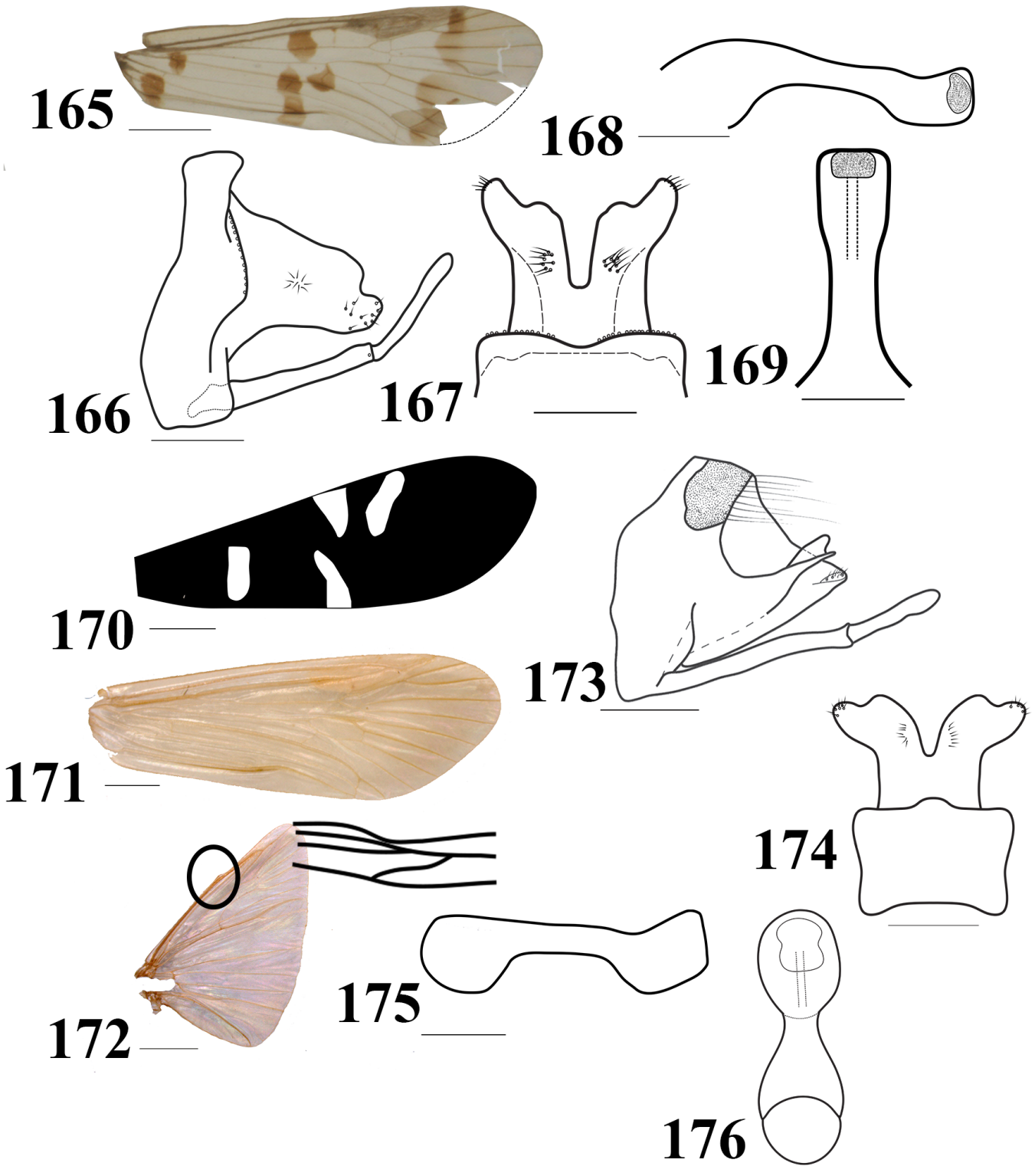
Material examined. *Vietnam:* 13 males, 21 females, Tam Dao, coll. H. Malicky, 19 May–13 June 1995 (HMPC); *Laos:* 1 female, Hua Phan Province, Phou Pan, coll. C. Holzschuh, 1–10 May 2011 (HMPC).

Distribution. Vietnam, Laos.

Remarks. The forewing pattern was consistent among the examined specimens; a white C-shaped marking occupied almost half of the forewing from the anterior area (Fig. 160). Male genitalia were redrawn (Figs. 161–164).

Macrostemum trifasciatum Banks, 1934
(Figs. 165–169)

Macrostemum trifasciatum Banks, 1934: 575 [Holotype male; Malaysia; SMKM].



Figs. 165–176. *Macrostemum trifasciatum*. 165, right forewing; Male genitalia: 166, lateral; 167, segment X dorsal; 168, phallus lateral; 169, phallus tip. *Macrostemum zenon*. 170, right forewing. *Macrostemum* sp. 171, right forewing; 172, right hind wing; Male genitalia: 173, lateral; 174, segment X dorsal; 175, phallus lateral; 176, phallus tip. Scale: 165, 170–172 = 2 mm; 166–169, 173–176 = 0.02 mm (170 redrawn from Malicky, O'Connor & Ashe, 2010).

Diagnosis. *Male.* Antennae 33 mm in length. Antennal flagellum brown with darker striations. Forewing 15 mm and hindwing 10 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Male genitalia. Inferior appendages two-segmented, harpago long and narrow (Fig. 166). In lateral view, phallus apex flat without any protrusion (Fig. 168), in dorsal view subrectangular (Fig. 169). Segment IX in dorsal view subrectangular, without dorsal keel in posterior margin (Fig. 167). Segment X in lateral view subtriangular with subbasal wart (Fig. 166).

Female. Antennae 25 mm in length. Antennal flagellum brown with darker striations. Forewing 10 mm and hindwing 5 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 2.4.4.

Material examined. *Malaysia:* 9 males, 9 females, Sabah, Kinabalu National Park, coll. I. Sivec, 22 April 1999 (HMPC).

Distribution. Borneo.

Remarks. Original description by Banks (1934) did not include illustrations. Malicky (1998b) redescribed this species. This species can be easily distinguished from other congeners by the distinct wing pattern as shown in Fig. 165.

Macrostemum tripunctatum Banks, 1924

Macrostemum tripunctatum Banks, 1924: 451. [Holotype male; Philippines (Mindanao); MCZ].

Distribution. Philippines.

Remarks. Banks (1924) reported that the species only differs from *M. quinquepunctatus* (*quinquepunctatum*) in the number of forewing brown spots, three instead of five. No wing or genitalia drawings were provided in the original description. Neither the holotype nor other specimens of this rare species were examined.

Macrostemum zenon Malicky, O'Connor & Ashe, 2010
(Fig. 170)

Macrostemum zenon Malicky, O'Connor & Ashe (in Malicky et al., 2010): 161. [Holotype male; Indonesia (Sulawesi); NMID].

Distribution. Indonesia.

Remarks. The wings were redrawn from Malicky et al. (2010: Figs. 28–33). Wing pattern is somewhat similar with *M. bellerophon* (Fig.47) and *M. distinguendum* (Fig. 75).

Macrostemum sp.
(Figs. 171–176)

Material examined. *Philippines:* 1 male, Mindanao, Compostella Valley, New Leyte, coll. C.J. Uy, 22 January 2014 (UPLBMNH).

Distribution. Philippines.

Remarks. This species is similar to *M. quinquepunctatum*, which is found on the island of Sibuyan in the Philippines, but exhibits a different wing pattern. In addition, the wings of *Macrostemum* sp. are colourless (Figs. 171, 172), whereas its phallus apex is more elongated than that of *M. quinquepunctatum*. This species possesses a more complicated segment X especially in the presence of bifid protrusion in the apex when viewed laterally. It is possible that the species is either new to science or a variation of *M. quinquepunctatum.* However, it currently remains unclear because this species is only known from a single specimen. Female of this species is so far unknown.

Genus *Oestropsyche* Brauer, 1868

Oestropsyche Brauer, 1868: 265 [Type species: *Oestropsyche palingenia* Brauer, 1868: 266 [= *Oestropsyche vitrina* Hagen, 1859] (by monotypy)]; Ulmer, 1907 (redescription).

Diagnosis. This genus can be distinguished from other Macronematinae genera by having two head setal warts raised anteriorly on vertex (Fig. 182). Forewing discoidal cell absent. Median cell longer and broader in males than in females. Thorax without markings. Tibia and tarsal segments of legs, dilated.

Remarks. Fischer (1963) initially placed this genus in the tribe Macronematini, despite the absence of mouthparts, whereas Barnard (1980) placed it in the tribe Polymorphanisini based on both larval characters and the absence of adult mouthparts (Ulmer, 1951).

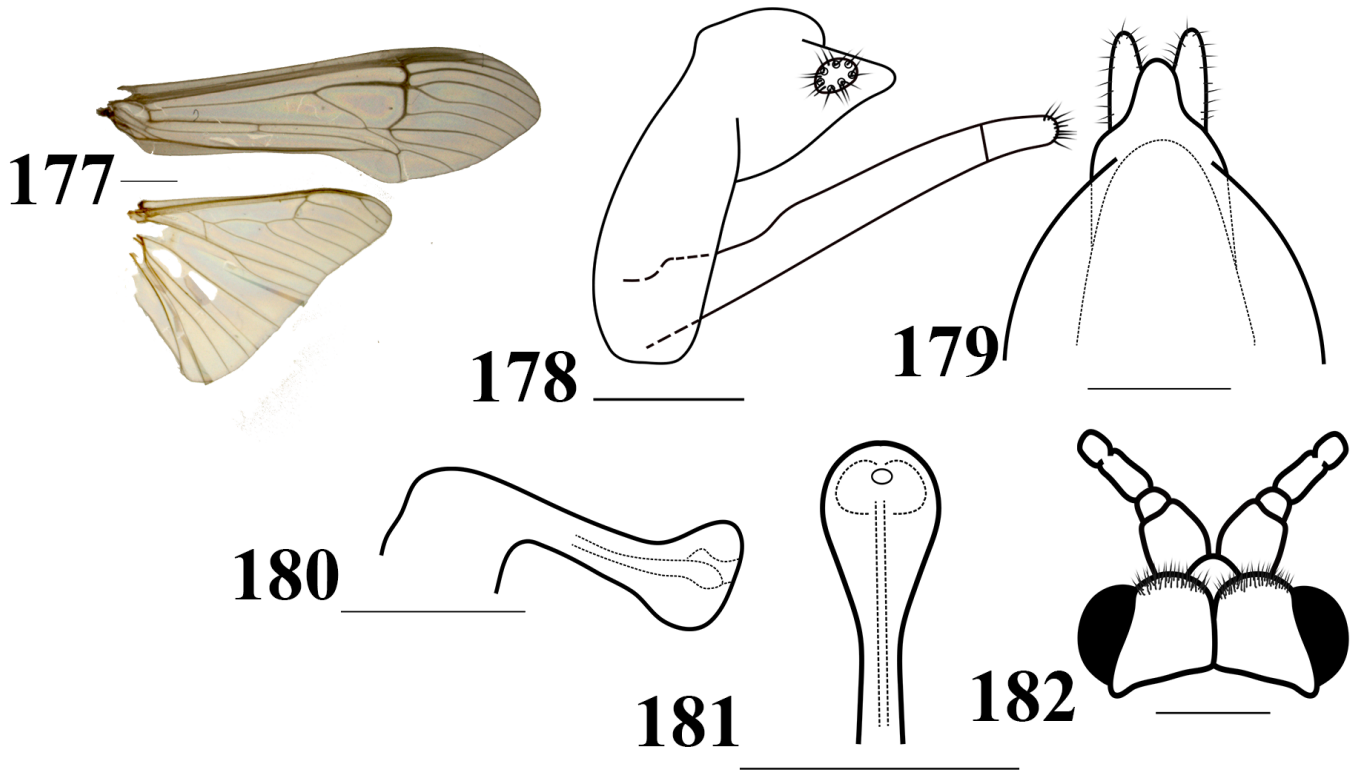
Oestropsyche vitrina Hagen, 1859
(Figs. 177–182)

Macronema vitrinum Hagen, 1859: 209 [Holotype male; Sri Lanka; MCZ (Ross, 1952: 35)].
Polymorphanisus vitrinus (Hagen) Hagen, 1864: 875.
Oestropsyche palingenia Brauer, 1868: 266 [Lectotype male; Philippines; IRSNB; synonymised by Ulmer, 1907: 29].
Oestropsyche vitrina (Hagen) Ulmer, 1907: 29.
Oestropsyche hageni Banks, 1939: 56 [Holotype male; India; MCZ; synonymised by Barnard, 1980: 66].

Diagnosis. *Male.* Antennae 30 mm in length, light brown with dark brown striations. Forewing 17 mm and hind wing 8 mm. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 1.3.2.

Male genitalia. Inferior appendages two-segmented and apex forming somewhat lobular structure, potentially mistaken as separate segment. Phallus in lateral view with same orientation as that of *A. sexpunctata* (Fig. 180). Lateral tubercles in segment X well-developed.

Female. Antennae 13 mm in length, light brown with dark brown striations. Forewing 20 mm and hind wing 12 mm. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 1.2.2.



Figs. 177–182. *Oestropsyche vitrina*. 177, fore- and hind wing; Male genitalia: 178, lateral; 179, segment X dorsal; 180, phallus lateral; 181, phallus tip; 182, Head dorsal. Scale bars: 177 = 2 mm; 178–181 = 0.5 mm; 182 = 1 mm.

Material examined. *Philippines:* 1 male, 5 females, Nueva Vizcaya, Imugan, coll. C.J. Uy, 13 January 2014 (UPLBMNH); 1 male, Nueva Ecija, Pantabangan, coll. C.J. Uy, 1 May 2013 (UPLBMNH).

Distribution. India, Iria Jaya, Laos, Malaysia (Perak), Philippines (Luzon), Sri Lanka, Sumatra, Thailand, Java, Borneo, Bali, Sulawesi.

Remarks. Based on original description by Hagen (1859), the inferior appendages were not stated whether it is segmented or not. Barnard (1980) provided a detailed description of this species during his revision study however, illustrated that inferior appendages are unsegmented. The samples that we examined showed that inferior appendages of *O. vitrina* are two-segmented (Fig. 178). The male wings (Fig. 177) and male genitalia (Figs. 178–181) were redrawn. Head in dorsal view was also figured to show the structure of setal warts (Fig. 182). The tibial spurs of *O. vitrina* are extremely variable, with male specimens possessing tibial formulas of 0.2.2, 1.2.2, 1.3.2, 2.2.2, 2.3.2, or 2.3.3 and female specimens possessing tibial formulas of 0.2.2, 1.2.2, 2.2.2, 2.3.2, or 2.3.3.

Genus *Polymorphanisus* Walker, 1852

Polymorphanisus Walker, 1852: 78 [Type species: *Polymorphanisus nigricornis* Walker, by monotypy].
Oestropsis Brauer, 1868: 263 [Type species: *Oestropsis semperi* Brauer, by monotypy; synonymised by Ulmer, 1907: 19].

Diagnosis. Head with one pair of warts on vertex. Antennae usually twice as long as forewings. Sc and R1 in forewings separately terminating on wing margin. Specimen whitish to greenish when fresh and usually brownish if stored in alcohol for long periods of time. Mesothoracic legs with tibia and tarsus broadened.

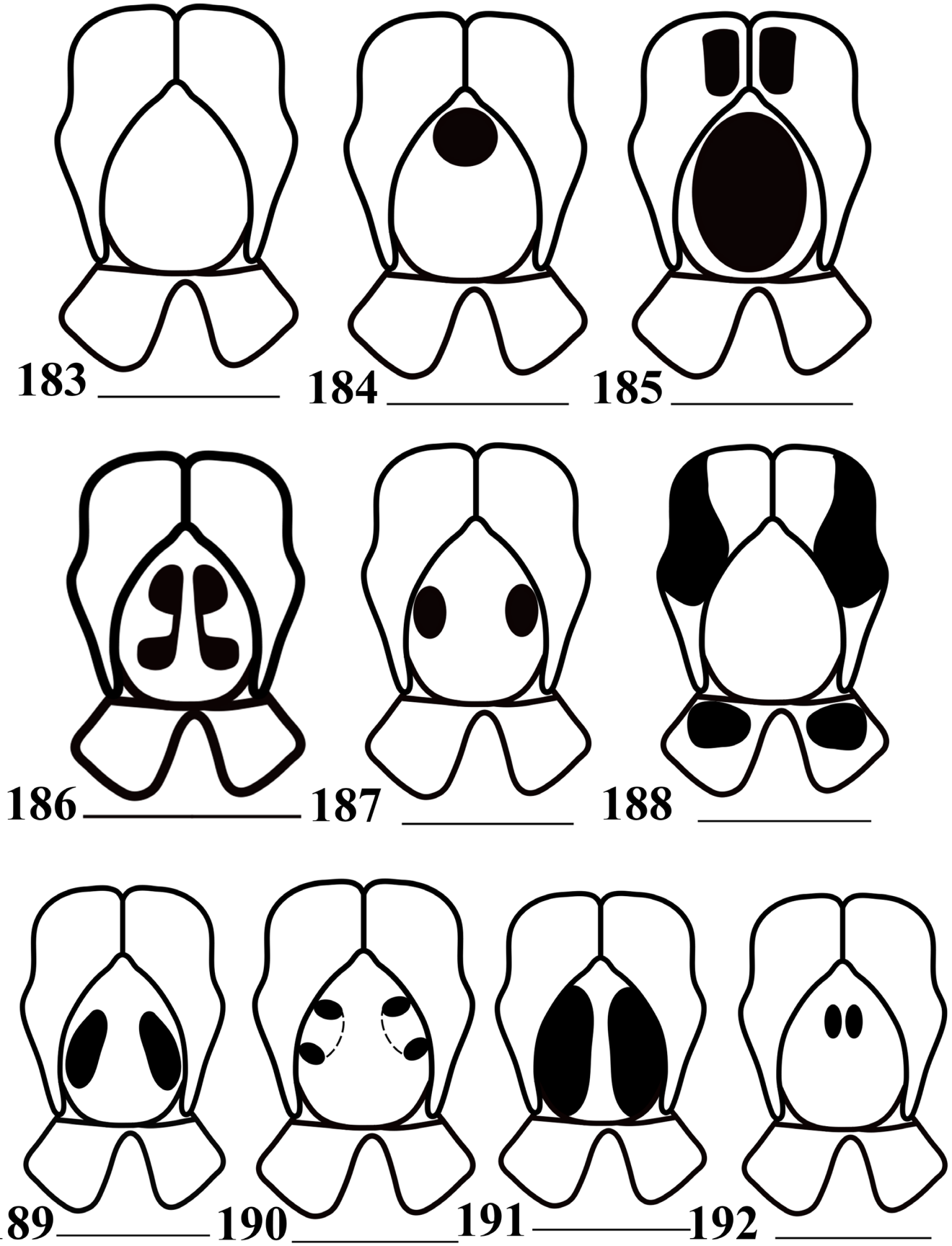
Remarks. Barnard (1980) subdivided this genus into an '*ocularis*-group' and '*nigricornis*-group' and mentioned that additional work could determine whether the groups deserved generic status. However, because it is difficult to find male specimens and because the larvae of most species are unknown, the present study did not attempt to resolve the monophyly of the two species groups. *Polymorphanisus* species can be easily distinguished from one another by clearly distinct mesonotum, mesoscutellum, and metascutum markings.

Polymorphanisus astictus Navás, 1923
(Figs. 183, 193, 202–204, 226)

Polymorphanisus astictus Navás, 1923: 47 [Lectotype male; China; MNHN (Barnard, 1980: 79)].
Polymorphanisus hainanensis Martynov, 1930: 82 [Holotype male; China; NHMUK; synonymised by Barnard, 1980: 79].
Polymorphanisus flavipes Banks, 1939: 53 [Holotype female; India; MCZ; synonymised by Barnard, 1980: 79].

Diagnosis. *Male.* Antennae 50 mm in length. Antennal flagellum brown with darker striations. Forewing 23 mm and hind wing 15 mm in length. Mesoscutum and mesoscutellum without evident markings (Fig. 183). Tibial spurs 1.3.3.

Male genitalia. Inferior appendages two-segmented. In dorsal view, phallus with rounded apex (Fig. 204). Segment IX produced into rounded lobe. In dorsal view, segment



Figs. 183–192. *Polymorphanisus* thorax. 183, *astictus, ocularis* male and female thorax; 16, *fuscus* male thorax; 184–185, *fuscus* female thorax; 186, *muluensis* male and female thorax; 187, *nigricornis* male and female thorax; 188, *quadripunctatus* male and female thorax; 189, *semperi* male and female thorax; 190, *scutellatus* male thorax; 191, *scutellatus* female thorax; 192, *unipunctus* male and female thorax. Scale = 2 mm (189 redrawn from Barnard, 1980).

X with reduced lobes with almost not obvious separation medially (Fig. 226).

Female. Antennae 30 mm in length. Antennal flagellum brown with darker striations. Forewing 25 mm and hind wing 15 mm in length. Mesoscutum and mesoscutellum without evident markings (Fig. 183). Tibial spurs 1.3.3.

Material examined. *Thailand:* 1 male, 1 female, Kuiburi National Park, Prajuab, Kirikhan Province, coll. P. Laudee, 15 February 2015 (UPLBMNH).

Distribution. China, India, Thailand, Malaysia (Johor, Pahang), Sumatra.

Remarks. Barnard (1980) provided a detailed redescription of this species. Other diagnostic characters are illustrated in Figs. 183, 193, 202–204, and 226.

Polymorphanisus fuscus Ulmer, 1905
(Figs. 184–185, 194, 205–207, 227)

Oestropsis fusca Ulmer, 1905b: 42 [Holotype female; Sumatra; *MZPW* (Tomaszewski, 1961: 4)].

Diagnosis. *Male.* Antennae 30 mm in length. Antennal flagellum brown with darker striations. Forewing 20 mm and hind wing 15 mm in length. Mesoscutum without evident markings. Mesoscutellum with dark brown spot covering anterior third (Fig. 184). Tibial spurs 1.3.3.

Male genitalia. Inferior appendages two-segmented. In dorsal view, phallus produced into two apical lobes (Fig. 207). In lateral view, segment X with blunt triangular projection pointing caudad (Fig. 206).

Female. Antennae and wing lengths same as for male. Mesoscutum with two squarish dark brown markings occupying almost half of total area. Mesoscutellum with large oval dark brown spot covering nearly whole area (Fig. 185). Tibial spurs 1.3.3.

Material examined. *Indonesia:* 2 males, 3 females, Sumatra, Aek Tarum, coll. E.W. Diehl, 6 January 1978 (HMPC); 3 males, 2 females, Sumatra, Aek Tarum, coll. E.W. Diehl, 7 August 1994 (HMPC).

Distribution. Sumatra, Borneo, Malaysia (Johor).

Remarks. Barnard (1980) provided a detailed redescription of this species. However, we examined individuals with different tibial spur formula of 2.3.3. Other diagnostic characters are illustrated in Figs. 184, 185, 194, 205–207, and 227.

Polymorphanisus muluensis Barnard, 1980
(Figs. 186, 195, 208–210, 228)

Polymorphanisus muluensis Barnard, 1980: 87 [Holotype male; Borneo; NHMUK].

Diagnosis. *Male.* Antennae 50 mm in length. Antennal flagellum brown with darker striations. Forewing 15 mm and hind wing 10 mm in length. Mesoscutum without evident markings. Mesoscutellum with paired dark brown markings as shown (Fig. 186). Tibial spurs 2.3.3.

Male genitalia. Inferior appendages two-segmented, harpago blunt and shorter than in other species. In dorsal view, phallus with distinctive wide opening because of phallotremal sclerite (Fig. 210). Segment X divided medially, each half with double lobular structure (Fig. 228).

Female. Antennae 45 mm in length. Antennal flagellum brown with darker striations. Forewing 20 mm and hind wing 15 mm in length. Mesoscutum and mesoscutellum same as male (Fig. 186). Tibial spurs 2.3.3.

Material examined. *Vietnam:* 2 males, Nam Cat Tien, coll. H. Malicky, 17–25 June 1995 (HMPC); *Laos:* 2 females, Central Province, Viangchan, coll. Holzschuh, 1–8 June 1996 (HMPC); *Thailand:* 1 male, Sakon Nakhon Province, Nam Phung, coll. C. J. Uy, 20 May 2015 (UPLBMNH).

Distribution. Borneo, Laos, Thailand, Vietnam.

Remarks. Barnard (1980) provided a detailed redescription of this species. However, we examined individuals with different tibial spur formula of 1.3.2 or 1.3.3. Other diagnostic characters are illustrated in Figs. 186, 195, 208–210, and 228.

Polymorphanisus nigricornis Walker, 1852
(Figs. 187, 196, 211–213, 229)

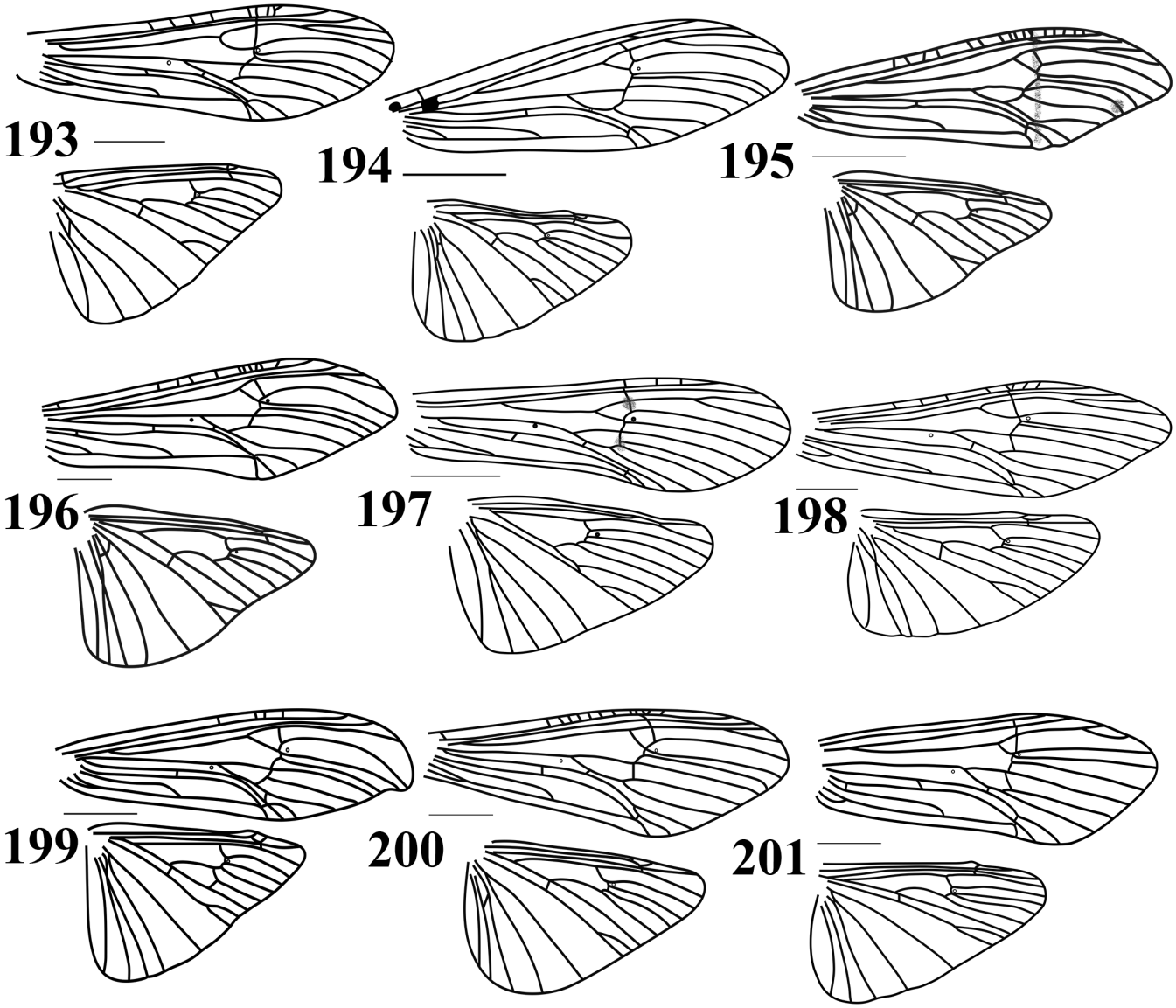
Polymorphanisus nigricornis Walker, 1852: 79 [Holotype male; India; NHMUK]; Betten & Mosely, 1940: 212–214, Figs. 106a–106d (redescription).

Diagnosis. *Male.* Antennae 40 mm in length. Antennal flagellum light brown with darker striations. Forewing 20 mm and hind wing 15 mm in length. Mesoscutum without evident markings. Mesoscutellum with paired dark brown spots located on each side (Fig 187). Tibial spurs 1.3.3.

Male genitalia. Inferior appendages two-segmented, harpago short and blunt. In lateral view, phallus with broad and somewhat flat apex (Fig. 212). In dorsal view, segment IX curved and segment X divided medially with two lobes each side (Fig. 229).

Female. Antennae 50 mm in length. Antennal flagellum basal half darker brown and getting lighter throughout apical half. Forewing 25 mm and hind wing 12 mm in length. Mesoscutum without evident markings. Mesoscutellum same as male (Fig 187). Tibial spurs 1.3.3.

Material examined. *Vietnam:* 12 females, Nam Cat Tien, coll. H. Malicky, 17–25 June 1995 (HMPC); *Laos:* 1 male, Vientiane Province, Lao Pako, coll. J. Bezdek, 1–4 May 2004 (HMPC).



Figs. 193–201. *Polymorphanisus* male right fore- and hind wings. 193, *astictus*; 194, *fuscus*; 195, *muluensis*; 196, *nigricornis*; 197, *ocularis*; 198, *quadripunctatus*; 199, *semperi*; 200, *scutellatus*; 201, *unipunctus.* Scale = 5 mm (199 redrawn from Barnard, 1980).

Distribution. India, Laos, Thailand, Vietnam, Sumatra, Java.

Remarks. Barnard (1980) provided a clear redescription and remarks of this species. However, we examined individuals with different tibial spur formula of 2.3.3. Other diagnostic characters are illustrated in Figs. 187, 196, 211–213, and 229.

Polymorphanisus ocularis Ulmer, 1906
(Figs. 197, 214–216, 230)

Polymorphanisus ocularis Ulmer, 1906: 60 [Lectotype female; Java; RMNH]; Barnard, 1980: 100 (redescription).
Polymorphanisus indicus Banks, 1911: 105 [Holotype female; India; MCZ; synonymised by Barnard, 1980: 100].

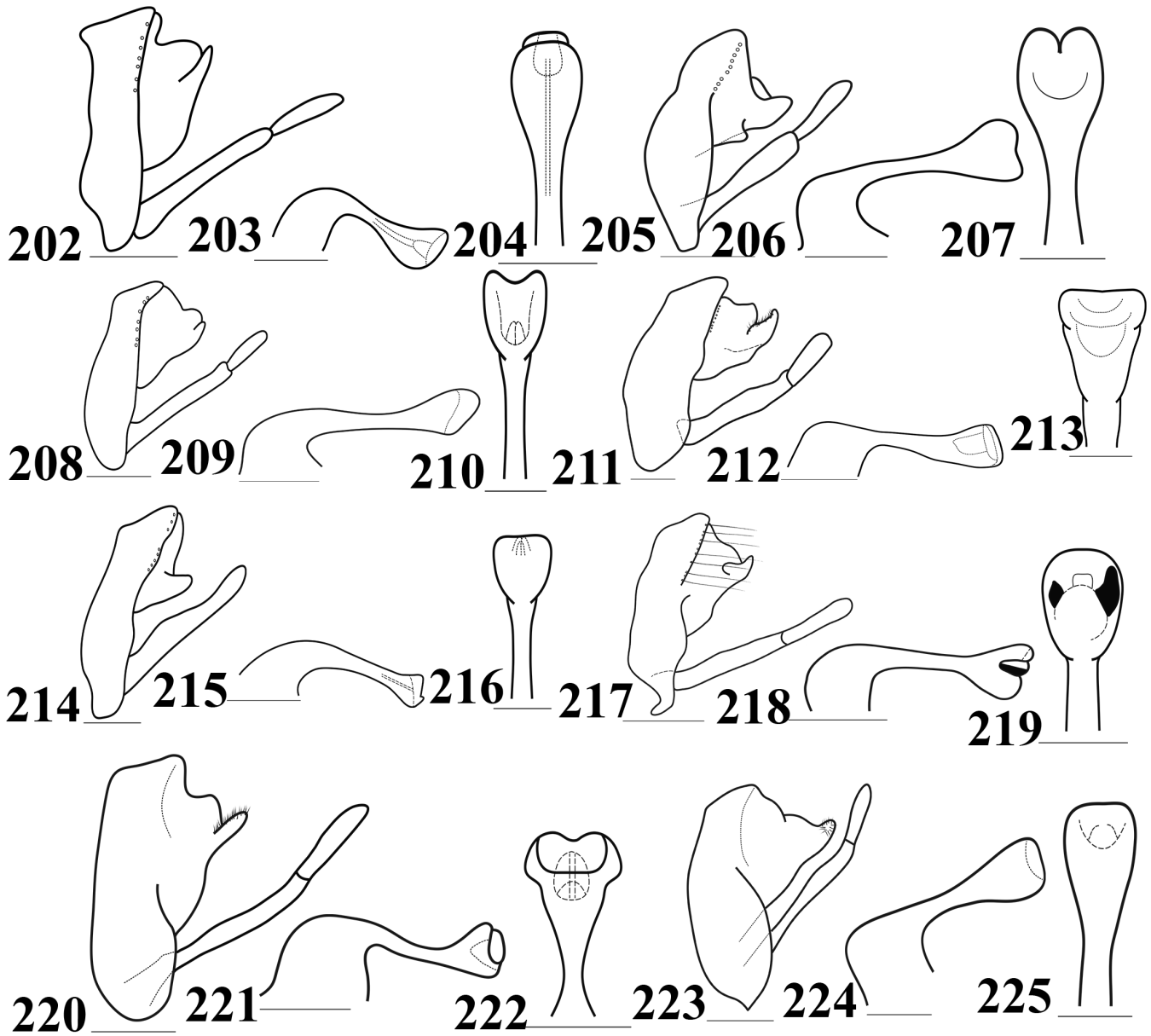
Diagnosis. *Male.* Antennae 23 mm in length. Antennal flagellum light brown with darker striations. Forewing 17 mm with two brown spots and hind wing 8 mm in length (Fig. 197). Mesoscutum and mesoscutellum without evident markings like *P. astictus* (Fig. 183). Tibial spurs 1.3.2.

Male genitalia. Inferior appendages unsegmented, broad at middle and narrow at apex (Fig. 214). In dorsal view, segment IX square-shaped almost covering segment X; segment X bifid (Fig. 230).

Female. Antennae 20 mm in length. Antennal flagellum same colouration as male. Forewing and hind wing length same as male. Mesoscutum and mesoscutellum same as male, without evident markings (Fig. 183). Tibial spurs 1.3.2.

Material examined. *Indonesia:* 1 female, Sumatra, Dolok Merangir, coll. E.W. Diehl, 1–5 May 1972 (HMPC); *Laos:* 1 female, Central Ban Phabat, coll. C. Holzschuh, 27 April–1 May 1997 (HMPC); *Thailand:* 1 male, Ton Nga Chang, coll. H. Malicky, 4–5 May 1993 (HMPC); 1 male, Sakon Nakhon Province, Nam Phung, coll. C.J. Uy, 20 May 2015 (UPLBMNH).

Distribution. Borneo, Burma, Java, Sumatra, Laos, Malaysia (Johor), Sri Lanka, Thailand, Vietnam.



Figs. 202–225. *Polymorphanisus* male genitalia. 202–204, *astictus*; 205–207, *fuscus*; 208–210, *muluensis*; 211–213, *nigricornis*; 214–216, *ocularis*; 217–219, *quadripunctatus*; 220–222, *scutellatus*; 223–225, *unipunctus.* Lateral view, 202, 205, 208, 211, 214, 217, 220, 223; Phallus, 203, 206, 209, 212, 215, 218, 221, 224; Phallus tip, 204, 207, 210, 213, 216, 219, 222, 225. Scale = 0.5 mm.

Remarks. This is the only *Polymorphanisus* species in Southeast Asia belonging to *ocularis*-group of Barnard (1980). This species can be distinguished by big eyes, brown forewing spots, and a tibial spur formula of 1.3.2. We provide redescription of this species based on our recent materials as the original description and redescriptions are less informative.

***Polymorphanisus quadripunctatus* Ulmer, 1951**
(Figs. 188, 198, 217–219, 231)

Polymorphanisus quadripunctatus Ulmer, 1951: 186 [Holotype female; Borneo; ZMUH]; Weidner, 1964: 91 (Holotype depository).

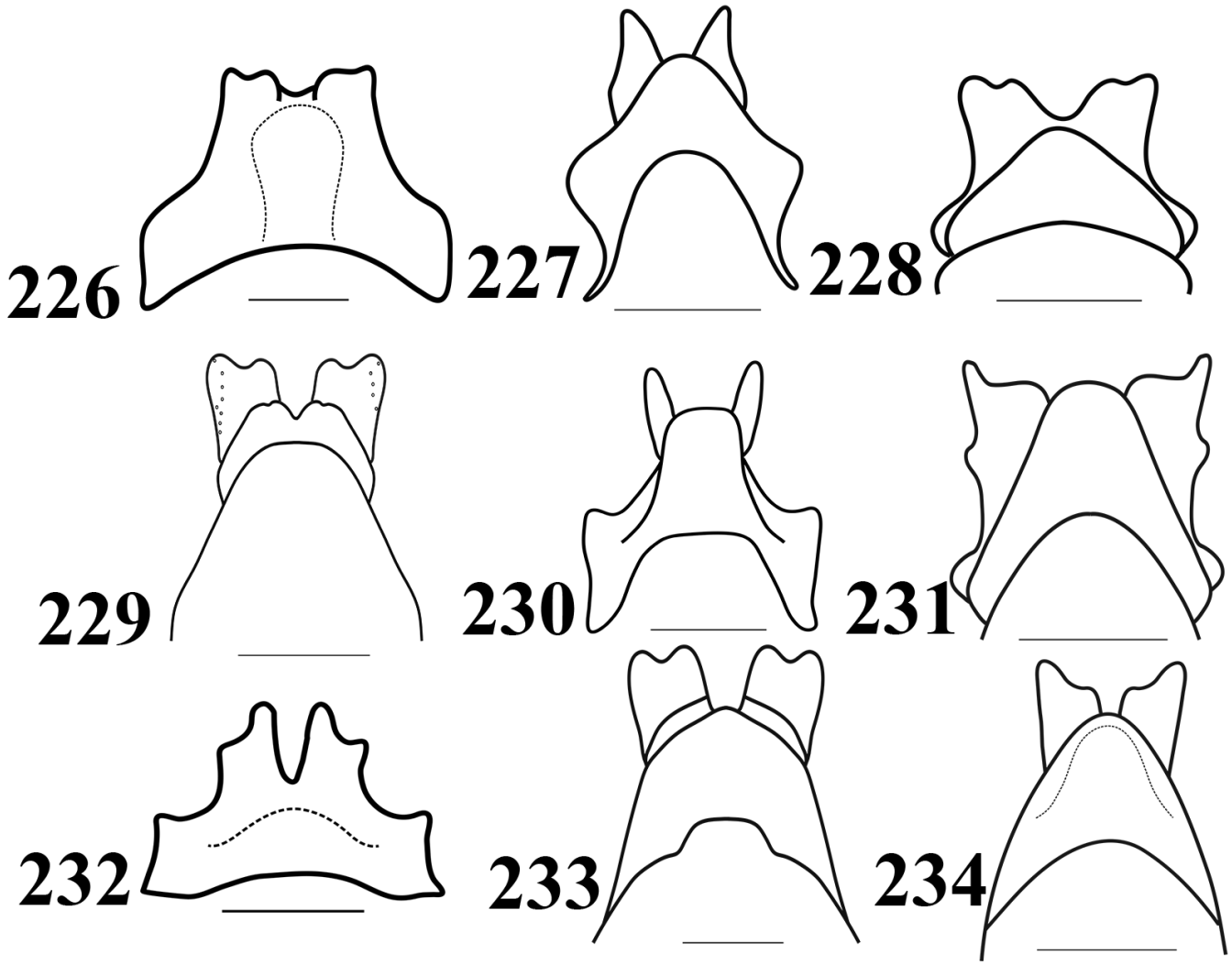
Diagnosis. *Male.* Antennae 40 mm in length. Antennal flagellum brown with darker striations. Forewing 22 mm and hind wing 12 mm in length. Mesoscutum and metascutum with evident markings as shown in Fig. 188. Mesoscutellum without evident markings (Fig. 188). Tibial spurs 1.3.3.

Male genitalia. Inferior appendages two-segmented. In dorsal view, phallus with circular apex with endothecal lining very obvious (Fig. 219). In dorsal view, segment IX curved apically (Fig. 231).

Female. Antennae 30 mm in length. Antennal flagellum same colouration as male. Forewing and hind wing length same as male. Mesoscutum and metascutum with evident markings same as male (Fig. 188). Mesoscutellum without evident markings (Fig. 188). Tibial spurs 1.3.3.

Material examined. *Malaysia:* 2 males, 9 females, Sabah, Kinabalu National Park, coll. I. Sivec, 22 April 1999 (HMPC).

Distribution. Borneo, Philippines.



Figs. 226–234. *Polymorphanisus* segment X of male genitalia. 226, *astictus*; 227, *fuscus*; 228, *muluensis*; 229, *nigricornis*; 230, *ocularis*; 231, *quadripunctatus*; 232, *semperi*; 233, *scutellatus*; 234, *unipunctus.* Scale = 0.5 mm (232 redrawn from Barnard, 1980).

Remarks. Barnard (1980) provided a detailed redescription and remarks of this species.

***Polymorphanisus scutellatus* Banks, 1939**
(Figs. 190, 191, 200, 220–222, 233)

Polymorphanisus scutellatus Banks, 1939: 55 [Holotype female; Borneo; MCZ].
Polymorphanisus scutellaris Banks; Kimmins, 1955: 399 (incorrect spelling of *scutellatus* Banks).

Diagnosis. *Male.* Antennae 50 mm in length. Antennal flagellum brown with darker striations. Forewing 20 mm and hind wing 14 mm in length (Fig. 200). Mesoscutum without evident markings. Mesoscutellum with two oval markings as in Fig. 190. Tibial spurs 1.3.2.

Male genitalia. Inferior appendages two-segmented, harpago as thick as coxopodite (Fig. 220). Phallus with wide opening in apex (Figs. 221, 222). Segment IX squarish, curving apicodorsad (Fig, 220). In dorsal view, segment X bifid with each half consisting of two lobes (Fig. 233).

Female. Antennae 35 mm in length. Antennal flagellum same colouration as male. Forewing and hind wing length same as male. Mesoscutum without evident markings. Mesoscutellum with two larger dark spots covering almost whole area and in some individuals looking like lung shape (Fig. 191). Tibial spurs 1.3.2.

Material examined. *Indonesia:* 2 males, 2 females, Aek Tarum, coll. H. Malicky, 6 March 1994 (HMPC).

Distribution. Borneo, Sumatra, Java, Sulawesi.

Remarks. Barnard (1980) only observed one type of thoracic markings for this species (Fig. 190), whereas Ulmer (1951) reported two variations. The specimens examined here exhibited two types of thoracic markings, and the males were different from the females (Figs. 190, 191). The examined specimens possessed tibial spur formulas of 2.3.2, 1.3.3, or 1.3.3.

Polymorphanisus semperi Brauer, 1868
(Figs. 189, 199, 232)

Oestropsis semperi Brauer, 1868: 264 [Lectotype male; Philippines (Mindanao), IRSNB].
Polymorphanisus semperi Brauer; Ulmer, 1907: 23.

Distribution. Philippines (Mindanao).

Remarks. The male wings (Fig. 199), thorax (Fig. 189) and male genitalia (Fig. 232) were redrawn from Barnard (1980; figs. 104–109).

Polymorphanisus unipunctus Banks, 1939
(Figs. 192, 201, 223–225, 234)

Polymorphanisus unipunctus Banks, 1939: 53 [Holotype female; China; USNM]; Banks, 1940: 206 (redescription of holotype female); Fischer, 1963: 209 (catalogue); Barnard, 1980 (redescription of holotype female); Malicky, 1998a: 402 (description of male).

Diagnosis. *Male.* Antennae 60 mm in length. Antennal flagellum brown with darker striations. Forewing 22 mm and hind wing 15 mm in length. Mesoscutum without evident markings. Mesoscutellum with two dark brown spots smaller than found in other species (Fig. 192). Tibial spurs 1.3.2.

Male genitalia. Inferior appendages two-segmented. In lateral view, phallus with squarish apex (Fig. 225). In dorsal view, segment IX with curved apex (Fig. 234). Segment X divided medially (Fig. 234).

Female. Antennae 40 mm in length. Antennal flagellum same colouration as male. Forewing and hind wing length same as male. Mesoscutum and mesoscutellum same as male (Fig. 192). Tibial spurs 1.3.2.

Material examined. *Vietnam:* 1 male, Nam Cat Tien, coll. H. Malicky, 17–25 June 1995 (HMPC); *Thailand:* 1 female, Umgebung Pai Huai Mae Ya, coll. H. Malicky, 20 April 2000 (HMPC); 1 female, Mae Hong Son, Muang Pai Resort, coll. H. Malicky, 3–16 May 2005 (HMPC).

Distribution. China, Laos, Thailand, Vietnam.

Remarks. Banks (1939) briefly described this species for the first time using a female specimen from China, which was designated as holotype. A redescription was made by Banks (1940) with a remark "new species" using the designated holotype and additional one female which was designated as paratype (in MCZ). Fischer (1963) regarded the first description of this species (Banks, 1939) as "nomenclaturially invalid" and the authorship of this species to be Banks (1940) probably because of the remark "new species" in the second paper. Barnard (1980), with his redescription of holotype of this species, disagreed on Fischer's (1963) opinion and corrected the authorship of this species to be Banks (1939). Malicky (1998a) provided a male description of this species. We follow Barnard (1980) that Banks (1939) officially described this species for the first time with valid holotype designation and description.

Genus *Pseudoleptonema* Mosely, 1933

Pseudoleptonema Mosely, 1933: 8 [Type species: *Macronema ceylanicum* Hagen, 1858, by original designation].

Diagnosis. This genus can be distinguished from other Macronematinae genera by forewing Rs base entire. Head with five setal warts; two anterior, two posterior and one anteromesal setal wart (Fig. 256). Wing pattern dark brown in alcohol with white patterns varying in every species.

Remarks. Mosely (1933) established the genus *Pseudoleptonema* based on the type species *Leptonema ceylanicum* Hagen, 1858. It was originally described as *Macronema ceylanicum* Hagen, 1858 but Ulmer transferred it in *Leptonema* (1907). Mosely (1933) established the genus *Pseudoleptonema* based on the type species *Leptonema ceylanicum* Hagen, 1858 because the generic characters of *L. ceylanicum* such as number of spurs, venation, genitalia, and maxillary palps do not fit those of the genus *Leptonema*. Mosely (1933) initially characterised the genus *Pseudoleptonema* as possessing 1.4.4 spurs, maxillary palpi with second segments slightly longer than the third, forewings with upper R branch running into the first apical sector, and forked Sc. However, *P. quinquefasciatum* Martynov, 1935 has 0.4.4 tibial spurs, and the forewing Sc of *P. supalak* Malicky & Chantaramongkol, 1998 is not forked.

Pseudoleptonema erawan Malicky & Chantaramongkol, 2001
(Figs. 235–239)

Pseudoleptonema erawan Malicky & Chantaramongkol (in Malicky et al., 2001): 12 [Holotype male; Thailand; HMPC]; Hoang et al., 2005: 172 (redescription).

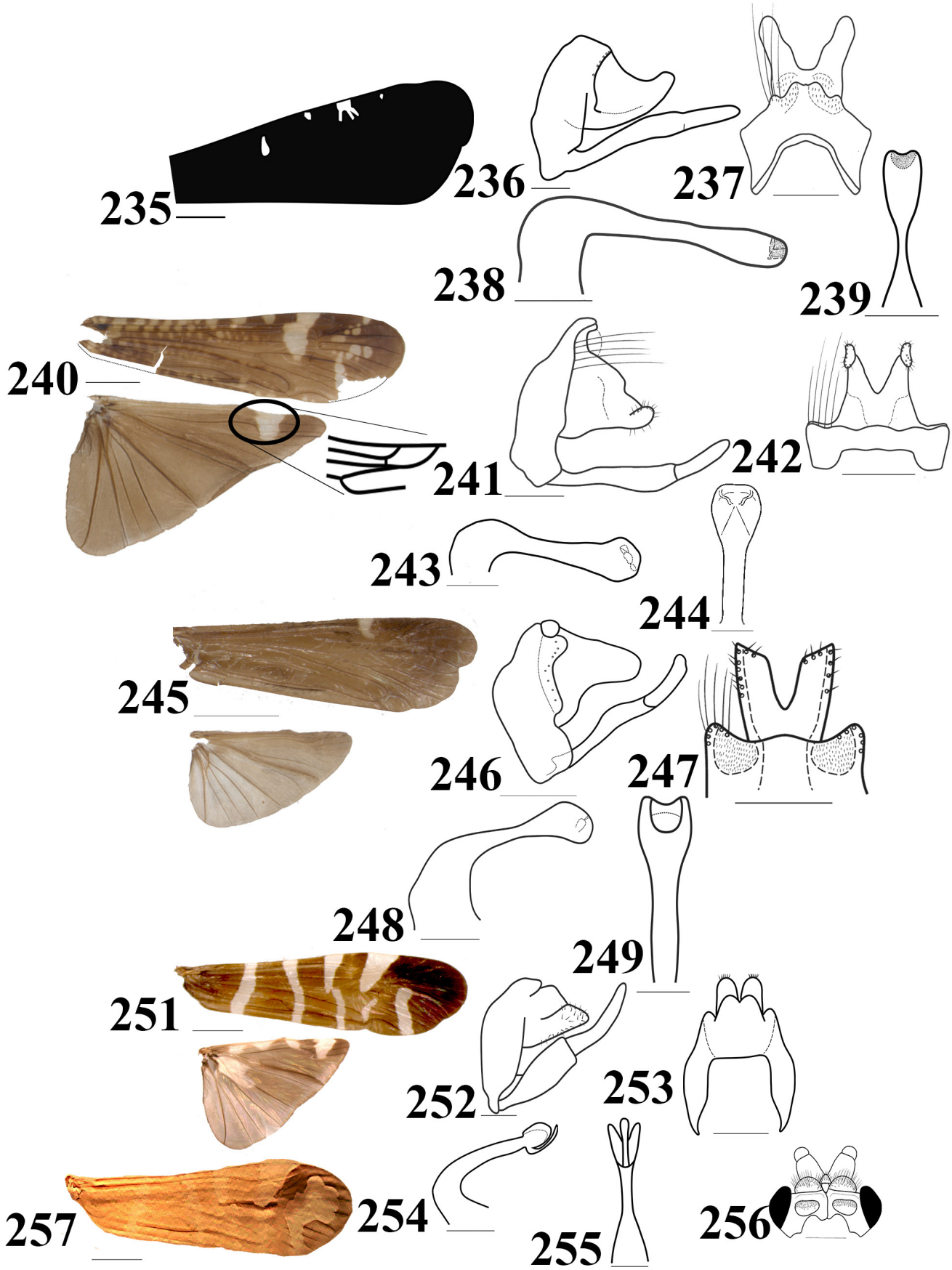
Diagnosis. *Male.* Antennae 22 mm in length. Antennal flagellum uniformly dark brown with striations not much darker than colour of segments. Forewing 10 mm and hind wing 5 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 1.4.4.

Male genitalia. Inferior appendages two-segmented (Fig. 236). In lateral view, phallus bent, with curved elongated apex (Fig. 238), with broad opening in dorsal view (Fig. 239). In dorsal view, segment X widely separated medially (Fig. 237).

Material examined. *Thailand:* 3 males, Lamphun Province, Mae Ping, coll. A. Nuntakwang, 22 April 2003 (HMPC).

Distribution. India, Laos, Thailand, Vietnam.

Remarks. Fore- and hind wing images were not provided because the observed specimens were old, and the wing pattern was no longer clear. Therefore, forewing drawing (Fig. 235) is provided to show the difference of the wing pattern



Figs. 235–257. *Pseudoleptonema erawan*. 235, right forewing; Male genitalia: 236, lateral; 237, segment X dorsal; 238, phallus lateral; 239, phallus tip. *Pseudoleptonema sinuatum*. 240, right fore- and hind wing; Male genitalia: 241, lateral; 242, segment X dorsal; 243, Phallus lateral; 244, Phallus tip. *Pseudoleptonema supalak*. 245, right fore- and hind wing; Male genitalia: 246, lateral; 247, segment X dorsal; 248, phallus lateral; 249, phallus tip. *Pseudoleptonema quinquefasciatum*. 251, right fore- and hind wing; Male genitalia: 252, lateral; 253, segment X dorsal; 254, phallus lateral; 255, phallus tip; 256, Head dorsal. *Pseudoleptonema tansoongnerni*. 257, right forewing. Scale: 235, 240, 245, 251, 257 = 2 mm; 236–239, 241–244, 246–249, 252–255 = 0.02 mm; 256 = 0.5 mm.

to other *Pseudoleptonema* species. No female specimens were available for examination.

Pseudoleptonema quinquefasciatum Martynov, 1935
(Figs. 251–256)

Macronema quinquefasciatum Martynov, 1935: 190 [Holotype male; India; NZSI]; Malicky, 1998b: 779 (redescription, transferred from genus *Macronema*): Hoang et al., 2005: 171 (redescription).

Diagnosis. *Male.* Antennae 20 mm in length. Antennal flagellum dark brown. Forewing 10 mm and hind wing 5 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 0.4.4.

Male genitalia. Inferior appendages two-segmented, harpago long, about as long as coxopodite (Fig. 252). In dorsal view, phallus with two lobular structures widely separated making middle tongue like structure very evident (Fig. 255). Length of tongue like structure longer than phallus apex. In lateral view, phallus with circular apex making tongue like segment appear originating from base pointing apically (Fig. 254). Segment X bifid with curved apex (Fig. 253).

Female. Antennae 12 mm in length. Antennal flagellum same colouration as male. Forewing 8 mm and hind wing 6 mm in length. Mesoscutum and mesoscutellum same as male. Tibial spurs 0.4.4.

Material examined. *Thailand:* 40 males, 47 females, Mae Wang Province, Mae Wang stream, coll. C.J. Uy, 13 May 2015 (UPLBMNH).

Distribution. India, Nepal, Laos, Thailand, Vietnam.

Remarks. This species was well redescribed and illustrated by Malicky (1998b) and Hoang et al. (2005). The wings (Fig. 251) were photographed, genitalia (Figs. 252–255) and dorsal head (Fig. 256) were redrawn.

Pseudoleptonema sinuatum Ulmer, 1906
(Figs. 240–244)

Macronema sinuatum Ulmer, 1906: 71 [Holotype male; Borneo; LMNH].
Pseudoleptonema sinuatum Ulmer; Malicky, 1998b: 780 (redescription, transferred from genus *Macronema*).

Diagnosis. *Male.* Antennae 23 mm in length. Antennal flagellum light brown with darker striations. Forewing 11 mm and hind wing 8 mm in length with light brown markings (Fig. 240). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 1.4.4.

Male genitalia. Inferior appendages two-segmented. In lateral and dorsal view, phallus with more rounded apex than *P. supalak* (Fig. 243, 244). Segment X with prominent rounded tip with setal warts (Fig 241). In dorsal view, setal area in tip of segment X like oval area only attached at surface of segment X (Fig. 242).

Female. Antennae 20 mm in length. Antennal flagellum same colouration as male. Forewing 10 mm and hind wing 8 mm in length. Mesoscutum and mesoscutellum same as male. Tibial spurs 1.4.4.

Materials examined. *Indonesia:* 1 male, 8 females, East Kalimantan, Pujungan, Kayan-Mentarang Natural reserve, coll. D.C. Darling, 1–2 March 1993 (ROM: 112643); 1 female, East Kalimantan, Seturan River, coll. P. Derleth and M. Sartori, 20 April 2001 (HMPC); *Malaysia:* 3 males, Sabah, Kinabalu National Park, Poring hot spring, coll. I. Sivec, 22 April 1999 (HMPC).

Distribution. Borneo, Indonesia.

Pseudoleptonema supalak Malicky & Chantaramongkol, 1998
(Figs. 245–249)

Pseudoleptonema supalak Malicky & Chantaramongkol (in Malicky, 1998b): 780 [Holotype male; Thailand; HMPC]; Hoang et al., 2005: 172 (redescription).

Diagnosis. *Male.* Antennae 23 mm in length. Antennal flagellum light brown with darker striations. Forewing 11 mm and hind wing 8 mm in length. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 1.4.4.

Male genitalia. Inferior appendages two-segmented. In lateral view, phallus with round apex (Fig. 248) and with large opening in ventral view (Fig. 249). Segment X with broad apex in lateral view (Fig. 246) and medially separated in dorsal view (Fig. 247).

Female. Antennae 15 mm in length. Antennal flagellum same colouration as male. Forewing 7 mm and hind wing 6 mm in length. Mesoscutum and mesoscutellum same as male. Tibial spurs 1.4.4.

Type material examined. Holotype. *Thailand:* 1 male, Pranlaeng, coll. H. Malicky, 22 September 1996 (HMPC).

Paratypes. *Thailand:* 6 males, 1 female, Pranlaeng, coll. H. Malicky, 22 September 1996 (HMPC).

Additional material examined. *Thailand:* 10 males, 10 females, Lampang Province Chaeson National Park, coll. H. Malicky, 25–26 May 2005 (HMPC).

Distribution. Thailand, Vietnam.

Remarks. The wing patterns of the *P. supalak* specimens were consistent, with a white V-shaped mark on the forewing (Fig. 245). However, this pattern is also observed in some *P. erawan* specimens. In such cases, specimens can be identified based on the structure of the phallus and segment X. The body of *P. supalak* is also narrower than that of *P. erawan,* and *P. supalak* possesses an obvious flap on the edge of its forewing.

Pseudoleptonema tansoongnerni Laudee & Malicky, 2017
(Fig. 257)

Pseudoleptonema tansoongnerni Laudee & Malicky, 2017: 384 [Holotype male; Laos; PSUNHM].

Remarks. According to the figures in the original description (Laudee & Malicky, 2017), the genitalia are quite similar to those of *P. quinquefasciatum*. The wing pattern of *P. tansoongerni* can be distinguished from that of *P. quiquefasciatum* by having a large transparent region subapically (Laudee & Malicky, 2017) (Fig. 257).

Genus *Trichomacronema* Schmid, 1964

Trichomacronema Schmid, 1964: 840 [Type species: *Trichomacronema shanorum* Schmid, 1964, designation].

Diagnosis. This genus can be distinguished from other Macronematinae genera by having forewing venation of Rs base obsolete, joined to R1 by cross-vein. Body black when fresh and brown in alcohol. Head with five setal warts with two anterior setal warts larger then posterior. Anteromesal setal wart large and obvious. Discoidal cell present and minute.

Remarks. Only two *Trichomacronema* species (*T. tamdao* and *T. paniae*) have been reported in Southeast Asia, and both are distributed in Thailand and Vietnam. The new *Trichomacronema vietnamemsis* Uy, Malicky & Bae, new species that is described here represents the third species from Southeast Asia.

Trichomacronema paniae Malicky & Chantaramongkol, 1991
(Figs. 258–262)

Trichomacronema paniae Malicky & Chantaramongkol, 1991: 114 [Holotype male; Thailand; HMPC].

Diagnosis. *Male.* Antennae 35 mm in length. Antennal flagellum brown with darker striations. Forewing about 15 mm and hind wing about 7 mm. Wing pattern as shown (Fig. 258). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 1.4.4.

Male genitalia. Inferior appendages two-segmented, harpago short and blunt (Fig. 259). In lateral view and dorsal view, phallus with round apex (Fig. 261–262). Segment X bifid and short (Fig. 260).

Female. Antennae 25 mm in length. Antennal flagellum brown with darker striations. Forewing about 15 mm and hind wing 7 mm in length. Wing pattern same as male. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 1.4.4.

Material examined. *Thailand:* 2 males, Lampang Province, Chaeson National Park, coll. H. Malicky, 25–26 May 2005 (CNC 279896), 30 females, Lampang Province, Chaeson National Park, coll. H. Malicky, 25–26 May 2005 (HMPC); *Myanmar:* 1 male, Pin Tao waterfall, Keng Tung, Shan state, coll. P. Laudee, 20 October 2014.

Distribution. Thailand, Vietnam, Myanmar.

Trichomacronema tamdao Malicky, 1998
(Figs. 263–267)

Trichomacronema tamdao Malicky, 1998b: 779 [Holotype male; Vietnam; HMPC].

Diagnosis. *Male.* Antennae 30 mm in length. Antennal flagellum brown with darker striations. Forewing about 18 mm and hind wing 9 mm in length. Wing pattern as shown (Fig. 263). Mesoscutum and mesoscutellum without evident markings. Tibial spurs 1.4.4.

Male genitalia. Inferior appendages two-segmented, harpago longer than *T. paniae*, as long as almost half of coxopodite length (Fig. 264). In lateral view, phallus with oval and broad apex (Fig. 266) and narrow dorsally (Fig. 267). Segment X bifid and short (Fig. 265).

Female. Antennae 33 mm in length. Antennal flagellum brown with darker striations. Forewing 18 mm and hind wing 9 mm in length. Wing pattern same as male. Mesoscutum and mesoscutellum without evident markings. Tibial spurs 1.4.4.

Type material examined. Holotype. *Vietnam:* 1 male, Tam Dao, coll. H. Malicky, 19 May–13 June 1995 (HMPC).

Paratypes. *Vietnam:* 2 males, Tam Dao, coll. H. Malicky, 19 May –13 June 1995 (HMPC).

Additional material examined. *Laos:* 3 females, Hua Phan Province, Phou Pan, coll. C. Holzschuh, 19–21 June 2014 (HMPC).

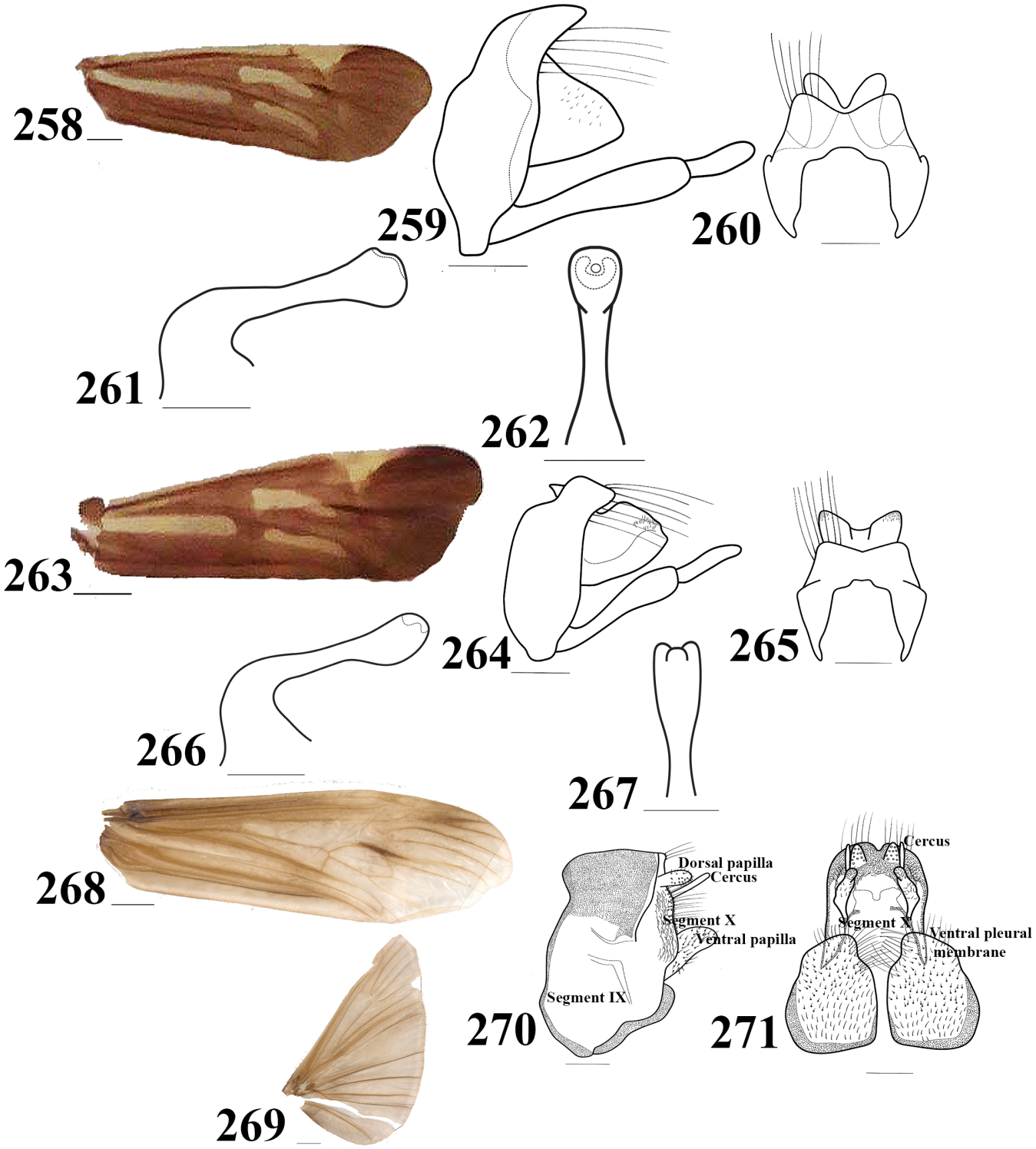
Distribution. Thailand, Vietnam, Laos.

Remarks. *Trichomacronema tamdao* and *T. paniae* can be easily distinguished by their phalli (Figs. 261, 266). Furthermore, the body of *T. tamdao* is slenderer than that of *T. paniae*. However, female specimens may be difficult to identify.

Trichomacronema vietnamensis, new species
(Figs. 268–271)

Description. *Male.* Unknown.

Female. Antennae 26 mm in length. Antennal flagellum brown with darker striations. Head dark brown with five lighter setal warts; pair of large anterior setal warts occupying almost anterior half of head, very close to anteromesal setal wart; pair of posterior setal warts smaller. Forewing 23 mm in length (Fig. 268); veins Sc and R1 not joined; Sc vein ending in costa; R1 not ending in costa, obsolete; base of Rs obsolete, joined to R1 by crossvein; discoidal cell present;



Figs. 258–271. *Trichomacronema paniae*. 258, right forewing; Male genitalia: 259, lateral; 260, segment X dorsal; 261, Phallus lateral; 262, Phallus tip. *Trichomacronema tamdao*. 263, right forewing; Male genitalia: 264, lateral; 265, segment X dorsal; 266, Phallus lateral; 267, Phallus tip. *Trichomacronema vietnamensis,* new species. 268, right forewing; 269, right hind wing; Female genitalia: 270, lateral; 271, ventral. Scale: 258, 263, 268–269 = 2 mm; 259–262, 264–267, 270–271 = 0.02 mm.

medial cell obvious; thyridial cell long; nygmas present in middle of thyridial cell and fork II; Cu1 and Cu 2 not joined; crossvein cu-a present. Hind wing 9 mm in length; vein Sc joining R1, ending in costa; nygma present in fork II; median and thyridial cell absent. Wing pattern with alternating dark and brown longitudinal streak marks as shown in Figs. 268, 269, more evident in forewing; presence of dark brown marking concentrated on half of anterior margin of median cell running towards base of M1 vein of forewing (Fig. 268). Body large (about 12 mm in length) and dark brown in alcohol. Mesoscutum and mesoscutellum without evident markings. Legs brown, with dark brown mark at basal end of tibia; Tibial spurs 1.4.4.

Female genitalia. Segment IX heavily sclerotised with row of long setae (Fig. 270). Ventral membrane with thick walls especially at posterior portion, with shorter setation posteriorly and longer setae anteriorly (Fig. 271). Dorsal papillary lobe close to cerci; ventral papillary lobe shorter and larger with heavy setation, situated distantly from cercus (Fig. 270).

Type material examined. Holotype. *Vietnam:* female (KUEM0000002403), Lao Cai Province, Sa Pa County Muong Hoa, coll. D.H. Hoang & Y.J. Bae, 23 April 2002 (KU).

Paratypes. *Vietnam:* 3 females (KUEM0000002404–KUEM0000002406), Lao Cai Province, Sa Pa County Muong Hoa, coll. D.H. Hoang & Y.J. Bae, 23 April 2002 (KU).

Distribution. Vietnam.

Etymology. The species epithet refers to Vietnam from which the species was collected.

Remarks. This species is obviously distinct from other congeners. Its wing structure is similar to that of *T. shanorum* Schmid, 1964, but its wing pattern is different. The radius and median forewing cells of *T. shanorum* possess white spots, whereas those of *T. vietnamensis* do not. The body of *T. shanorum* also possesses brown and dark-brown stripes, whereas that of *T. vietnamensis* is uniformly brown. As compared to the two species described from Southeast Asia, *T. tamdao* and *T. paniae,* this new species is much larger (whole body size was measured longitudinally from the head to the end of the forewing). Body size of *T. tamdao* and *T. paniae* are just half the size of *T. vietnamensis.* At a first glance, *T. vietnamensis* can be mistaken of a *Macrostemum* species because of the structure of head and thorax.

Key to the Genera and Species of the Tropical Southeast Asian Macronematinae (adult males)

1. Without mouthparts 2
– With mouthparts 12
2. Forewing with 'false' discoidal cell formed by fusion of R4 and R5 after basal furcation (Fig. 1) ..... ***Aethaloptera*** (*Aethaloptera sexpunctata*)
– Forewing without 'false' discoidal cell 3
3. Forewing without discoidal cell; Sc and R1 fused (Fig. 177); thorax without any brown spot markings ..... ***Oestropsyche*** (*Oestropsyche vitrina*)
– Forewing with discoidal cell; Sc and R1 not fused (Figs. 193–210); thorax with or without markings, either on mesoscutum or mesoscutellum ..... ***Polymorphanisus*** 4
4. Without markings on mesoscutum and mesoscutellum (Fig. 183) 5
– With markings on either mesoscutum or mesoscutellum (Figs. 184–192) 6
5. With two brown spots on forewing, one on median cell and one on discoidal cell (Fig. 194); male eyes large almost meeting ventrally; segment IX of male genitalia squarish apex dorsally (Fig. 230) ..... *Polymorphanisus ocularis*
– Without markings on forewing; eyes small, not meeting ventrally; segment IX of male genitalia produced into a spatulate lobe dorsally (Fig. 226 ..... *Polymorphanisus astictus*
6. Without markings on mesoscutellum; with large dark markings on each side of mesoscutum and metascutum (Fig. 188) ..... *Polymorphanisus quadripunctatus*
– With markings on mesoscutellum; mesoscutum with or without markings, metascutum without markings 7
7. With only one oval spot at center of mesoscutellum (occupying whole mesoscutellum for female (Fig. 185) and covering only anterior third for male (Fig. 184); forewing with two brown spots at the basal portion (Fig. 194) *Polymorphanisus fuscus*
– With paired spots or markings on mesoscutellum; forewing without brown spots 8
8. Paired spots or markings of mesoscutellum situated near center 9
– Paired spots or markings each situated near edge of mesoscutellum 10
9. Each of paired markings with darker area concentrated at anterior and posterior portion as shown (Fig. 186); segment X of male genitalia divided medially, each half with double lobe (Fig. 228) ..... *olymorphanisus muluensis*
– Paired spots small (Fig. 192); segment X of male genitalia divided medially with each lobe outer portion longer than the inner side (Fig. 234) ..... *Polymorphanisus unipunctus*
10. With two large oval spots on mesoscutellum located on each side covering most of the area for female (Fig. 191) and smaller oval markings with darker areas concentrated on anterior and posterior ends for male (Fig. 190) ..... *Polymorphanisus scutellatus*
– With smaller oval spots on mesoscutellum for both male and female 11
11. Mesoscutellum spots at each side elongated (Fig. 189); segment X in dorsal view crown like in shape, divided medially with each half having longer inner lobe than the outer (Fig. 232) . ..... *Polymorphanisus semperi*
– Mesoscutellum spots located at each side circular (Fig. 187); segment X in dorsal view divided medially with each half bilobed (Fig. 229) ..... *Polymorphanisus nigricornis*
12. Forewing without discoidal cell, anal area dilated in males (Figs. 8, 12, 17, 26) ..... ***Amphipsyche*** 13
– Forewing with discoidal cell, sometimes very small 19
13. Foretibia without spur 14
– Foretibia with spur 16
14. Male phallotheca with three pairs of endothecal spines (Figs. 25, 33) 15
– Male phallotheca with only 2 pairs of endothecal spines, mid and ventral spines short, dorsal endothecal spine absent (Figs. 29, 30) ..... *Amphipsyche meridiana*
15. Very large species 22–25 mm; with pair of round markings on mesoscutellum (Fig. 23) ..... *Amphipsyche magna*
– Small species 10–22 mm; without markings on mesoscutellum ..... *Amphipsyche parva*

16. Fork II on forewing stalked (Fig. 12); inferior appendages slender 17
– Fork II on forewing not stalked (Fig. 8); coxopodite very much broader than harpago (Fig. 9) ..... *Amphipsyche bifasciata*
17. Male phallus with everted endotheca, connective membrane bearing many small spines (Figs. 15, 16) ..... *Amphipsyche exsiliens*
– Male phallus without everted endotheca 18
18. Forewing pattern with five dark brown spots and other paler brown markings (Fig. 17); male phallotheca with large dorsal leaf-like lobes (Figs. 20, 21) ..... *Amphipsyche gratiosa*
– Forewing with only one dark brown spot in fork I; male phallotheca without dorsal leaf-like lobes (Figs. 35, 36) ..... *Amphipsyche petiolata*
19. R1 on hind wing fused with Sc (Fig. 172); segment X of male genitalia bilobed with warts and clusters of setae, each lobe elongated (Figs. 49, 92, 128, 77) ..... ***Macrostemum*** 27
– R1 on hind wing ending on R2+3, joined to Sc with a short cross-vein (Fig. 240); segment X bilobed, lobes not as longer as *Macrostemum* sp. (Figs. 237, 260, 265) 20
20. Species size ranging from 15–24 mm; forewing with base of Rs obsolete, joined to R1 by cross-vein; phallus apex without complicated structures ..... ***Trichomacronema*** 21
– Smaller species 10–12 mm; forewing base of Rs entire; phallus with more complicated structures in apex than ..... ***Pseudoleptonema*** 23
21. Species 15–22 mm; forewing black with white marking rectangular and V-shape markings (Figs. 258, 263) 22
– Species very large 22–24 mm; forewing lighter with white markings different with previous (Fig. 268) (only female known) ..... *Trichomacronema vietnamensis* new species
22. Phallus apex rounded in lateral view (Fig. 261) ..... *Trichomacronema paniae*
– Phallus apex oval and broad in lateral view (Fig. 266) ..... *Trichomacronema tamdao*
23. Phallus having circular apex with tongue-like projection from base pointing apically (Fig. 254) 24
– Phallus having circular apex without tongue-like projection 25
24. Body black and may appear dark brown in alcohol; forewing with black and white bands (Fig. 251) ..... *Pseudoleptonema quinquefasciatum*
– Body yellowish brown; forewing yellowish brown and black with white bands similar to *P. quinquefasciatum* but with large transparent region subapically (Fig. 257) ..... *Pseudoleptonema tansoongnerni*
25. Phallus with curved elongated apex (Fig. 238); segment X widely separated medially in dorsal view forming a U-shaped opening at the middle (Fig. 237) .... *Pseudoleptonema erawan*
– Phallus with rounded apex (Figs. 243, 248); segment X not as widely separated medially as above (Figs. 242, 247) 26
26. Segment X with rounded setal area at tip in dorsal view (Fig. 241); forewing with white circular and long V-shape white markings, apex evenly curved (Fig. 240) ..... *Pseudoleptonema sinuatum*
– Segment X without setal area at tip (Fig. 246); forewing with a small V-shape marking, apex with anterior half longer than posterior half (Fig. 245) ..... *Pseudoleptonema supalak*
27. Forewing half dark brown, half pale (Fig. 37); head is yellow, unmarked except the silvery mark near eyes ..... *Macrostemum albardanum*
– Forewing marking not as above; head usually dark brown to yellowish with dark brown bands 28
28. Forewing without markings; phallus apex squaris 9
– Forewing with evident dark brown and light markings; phallus not squarish 30
29. Segment X without bifid protrusion at apex (Fig. 138); phallus with tongue-like protrusion in dorsal view (Fig. 141); distributed in Sabah, Borneo ..... *Macrostemum pallipes*
– Segment X with bifid protrusion at apex in lateral view (Fig. 173); phallus without protrusion in dorsal view (Fig 176); distributed in the Philippines ..... *Macrostemum* sp.
30. Species yellowish; with dark brown band markings in the middle of the forewing running through the entire width (Figs. 90, 126) 31
– Species either dark brown or light brown, or if species is yellowish, without forewing markings as above 32
31. Dark brown stripe along middle of the width of forewing somewhat straight, anterior band thicker and narrowing posteriorly until the arculus and continuing with a dot like dark brown spot (Fig. 90) ..... *Macrostemum fastosum*
– Dark brown stripe along middle of the width of forewing curving anteriorly (Fig. 126) ..... *Macrostemum midas*
32. Forewing with orange, white and black markings (Fig. 54); segment X with each lobes longer as compared to the male genitalia of other *Macrostemum* species (Fig. 56); species endemic in the Philippines ..... *Macrostemum boettcheri*
– Forewing not as above; segment X not as long as above; species can also be found in other geographic area 33
33. Species pale yellowish; forewing with dark brown spots ... 34
– Species dark brown 38
34. Forewing with three dark brown bands: one near base not reaching costa, one at middle formed by four connected spots, and one broad band almost covering apex (Fig. 165) ..... *Macrostemum trifasciatum*
– Forewing with dark brown spots instead of bands (Figs. 42, 149, 142–144) 35
35. Forewing with three dark brown spots or less; segment IX of male genitalia usually broad 36
– Forewing with five dark brown spots or more (Fig. 149); segment IX of male genitalia thin and annular (Fig. 151) ..... *Macrostemum quinquepunctatum*
36. Forewing with two or no dark brown spot (Figs. 142–144); phallus in lateral view with longer posterior portion of the apex (Fig. 147) making it having an opening anteriorly ..... *Macrostemum punctatum*
– Forewing with three dark brown spots; phallus in lateral view if with posterior portion, making it just like a protrusion and not an opening 37
37. Forewing with three dark brown spots located on the radial sector, cubital area near base, and anal area almost near the posterior edge of forewing (Fig. 42) ... *Macrostemum bacham*
– Forewing with three dark brown spots located on crossvein behind median cell, in front of anal vein, and on vein from median to cubitus near base ..... *Macrostemum tripunctatum*
38. Endemic to the Philippines 39
– Distributed in other area 40
39. Forewing darker apically and lighter basally, with two curved light bands divided in the middle, with lighter bands running toward the length of forewing occupying three-fourths of the length, and four lighter streak bands near the apex (Fig. 59) ..... *Macrostemum caliptera*
– Forewing dark brown, with several silvery white marks as a subapical streak, two coastal spots tending to form V-shape, two spots near the base, and two streaks located toward the posterior portion of the forewing (Fig. 52) ..... *Macrostemum bellum*
40. Phallus apex divided into two lobes (Figs. 68, 117, 163) ... 41
– Phallus not divided into two lobes 43
41. Phallus apex in lateral view opening widely forming a U-shape (Figs. 68, 163), in ventral view, apex round; segment X medially separated and joined at the center forming a V-shape area in dorsal view (Figs. 67, 162) 42

– Phallus opening V-shaped and not as deep as wide (Fig. 117), in ventral view, apex heart-shaped (Fig. 118); segment X medially separated with lobes directed downwards (Figs. 114, 116) ..... *Macrostemum hestia*

42. Phallus opening broad with each lobe thick (Fig. 163); forewing with white markings where one is C-shape occupying almost half of anterior area (Fig. 160) ..... *Macrostemum tonkinensis*
– Phallus opening narrow, twice as deep as wide (Fig. 68); forewing with white markings as shown (Fig. 65) ..... *Macrostemum dairiana*
43. Phallus with spine-like structure at the tip of apex (Figs. 73, 105) 44
– Phallus without spine-like structure at the tip of apex 45
44. Segment X with apical lobes separated by parallel-sided gap narrower than width of either lobe (Fig. 72); spine-like structure at the tip of phallus seems not pointed in dorsal view (Fig. 74), but obviously pointed in lateral view (Fig. 73) ..... *Macrostemum dione*
– Segment X with apical lobes separated by U-shaped gap (Figs. 103, 104); spine-like structure at the tip of the phallus pointed in dorsal view (Fig. 106) ..... *Macrostemum fenestratum*
45. Phallus with protrusion almost in the middle of the apex in lateral view (Figs. 63, 86) 46
– Phallus without protrusion, or if with protrusion at apex, concentrated on posterior area 47
46. Phallus with curved protrusion very obvious in ventral view (Fig. 89); forewing black in fresh specimens with white markings, three large across costa, other marking originating from arculus running upwards across the width of forewing (Fig. 85) ..... *Macrostemum eleanora*
– Phallus without protrusion in dorsal view; forewing with three white markings, two across costa and one originating from arculus (Fig. 60) ..... *Macrostemum centrotum*
47. Phallus strongly convex subapicoventrally with apicoventral protrusion 90° from ventral margin basal of convexity in lateral view (Figs. 78, 50) 48
– Phallus rounded to an angle less than 90° in lateral view ..50
48. Phallus in dorsal view with apex oval narrowing in the body and with broad base (Fig. 51); segment X in lateral view narrowing toward apex (Fig. 48); forewing pattern dark brown in alcohol with white bands as shown in Fig. 47 ..... *Macrostemum bellerophon*
– Phallus in dorsal view with rounded apex; segment X in lateral view narrowing toward the apex but with broader tips with presence of warts (Fig. 76); forewing pattern with three white bands running across the length of the forewing as *M. bellerophon,* but no white markings running towards the length of the forewing length, or if there is very tiny white streak (Figs. 75, 170) 49
49. Phallus in dorsal view with raised curve protrusion at apex (Fig. 79); forewing pattern with two white bands in anterior and one white band in posterior and one small streak band running toward forewing length (Fig. 75), but in some individuals, the small white streak is not evident ..... *Macrostemum distinguendum*
– Phallus in dorsal view rounded; forewing pattern with four white bands running across the length of the forewing, two anterior and two posterior (Fig. 170) .... *Macrostemum zenon*
50. Phallus apex with ventral area much more protruded than anterior (Fig. 125); segment X lobes separated only half of length of segment X by narrow V-shaped notch (Fig. 124) ... *Macrostemum luteipes*
– Phallus apex not as above, if with protrusion, not as much protruded as above; segment X usually widely separated or if not, the lobes are not as attached as above 51
51. Phallus with truncate apex, in dorsal view as broad basally as apically, slightly narrower in middle (Fig. 165); forewing with variation (Figs. 131, 132) ..... *Macrostemum opulentum*
– Phallus rounded; forewing pattern mostly black or brown with fewer pale areas that are not interconnected 52
52. Forewing with white markings as shown in Fig. 53, most prominent large triangular marking at the middle part ..... *Macrostemum bifenestratum*
– Forewing pattern with various white markings, but none dominating middle of wing 53
53. Phallus apex with small tongue like projection in lateral view (Figs. 83, 110) 54
– Phallus without small projection at apex 55
54. Phallus in dorsal view with apex as wide as base and twice as wide as middle (Fig. 84); forewing with four white markings, two triangular across costa, one linear running parallel to the length of forewing, and one circular near basal area (Fig. 80); segment X divided mesally by narrow V-shaped pad, with each side consisting of two lobes, one is smaller and located at anterior of major lobe (Fig. 82) ..... *Macrostemum dohrni*
– Phallus in dorsal view with apical portion twice as wide as basal portion (Fig. 111); forewing with more than four white markings (Fig. 107); segment X bilobed and each lobe widely separated in dorsal view (Fig. 109 ..... *Macrostemum floridum*
55. Phallus with dorsal part of apex more protruded (Fig. 158) in lateral view, protrusion very much obvious in dorsal view (Fig. 159); segment X with each lobes widely separated forming a U-shape space (Fig. 157); forewing with variation (Fig. 154, 155) ..... *Macrostemum seba*
– Phallus with dorsal part of apex flat, ventral part a little longer in lateral view (Fig. 122); segment X with each lobe flat at apex (Fig. 121); forewing pattern as shown in Fig. 119 ..... *Macrostemum indistinctum*

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