Dtsch. Entomol. Z. 59 (2) 2012, 217–224 / DOI 10.1002/mmnd.201200017

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Revision of the Oriental genus *Leprota* Melichar (Hemiptera, Fulgoromorpha, Dictyopharidae), with description of a new species from northern Borneo, Malaysia

Zhi-Shun Song[1], Jürgen Deckert[2] and Ai-Ping Liang*, [1]

[1] Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, Beijing 100101, China
[2] Museum für Naturkunde, Leibniz Institute for Research on Evolution and Biodiversity, Invalidenstr. 43, Berlin 10115, Germany

Received 9 February 2012
Accepted 31 May 2012
Published 11 December 2012

Key Words

Taxonomy
Resurrection
Lectotype
Oriental region

Abstract

The Oriental genus *Leprota* Melichar, 1912, is formally resurrected from synonymy with *Saigona* Matsumura, 1910, and re-established here as a valid genus. Its type species *L. melichari* Fennah, 1963, is redescribed and illustrated based on the newly designated lectotype, including a first description of male genitalia. A new *Leprota* species is described from northern Borneo, Malaysia.

Introduction

In 1912, Melichar established a new dictyopharid genus *Leprota* to accommodate a species represented by the specimens from Sumatra, deposited in Berlin and Stettin. Melichar (1912) misidentified these specimens as *Dictyophara fulgoroides* Walker, 1858, and designated it as the type species of *Leprota*. Actually, *D. fulgoroides* (*s. str.*) (Fig. 5) only distributes in southern China, and as yet has never been found from Sumatra (Liang & Song 2006). It is neither conspecific nor congeneric with the samples described and illustrated by Melichar (1912), and was moved into the genus *Saigona* Matsumura, 1910, by Fennah (1963). However, the species described and wrongly attributed to *D. fulgoroides* Walker by Melichar (1912) does represent a good species for *Leprota*.

Fennah (1963) firstly pointed out Melichar's misidentification and redesignated a type species for *Leprota* based on the International Code of Zoological Nomenclature. He proposed a new name *Leprota melichari* Fennah, 1963, to replace *Leprota fulgoroides* Melichar (nec Walker), and requested that the International Commission "use its plenary powers to set aside all designations of type-species for the nominal genus *Leprota* Melichar, 1912, made prior to the Ruling now requested and, having done so, to designate the nominal species *Leprota melichari* Fennah, 1963, to be the type-species of that genus." (Fennah 1963: 304.).

Unfortunately, Fennah's work was omitted by the following researchers. Based on an examination of the type materials of *D. fulgoroides* deposited in the Natural History Museum, London, UK (BMNH) and *Saigona gibbosa* Matsumura, 1910, deposited in the Insect Collection of Hokkaido University, Sapporo, Japan (HU), Liang (2000) synonymized *S. gibbosa* with *D. fulgoroides*, but still regarded *D. fulgoroides* as the type species of *Leprota* (Liang & Suwa 1998; Liang 2000). Liang & Song (2006) in revision of the genus *Saigona* Matsumura from Oriental and eastern Palaearctic regions, placed *Leprota* as a synonymy of *Saigona* referring to Liang's (2000) research result.

Also, Fennah probably failed to report his work to the Museum für Naturkunde Berlin, Germany (MFNB) and the Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw, Poland (MIZPAS) (the latter which took over the partial zoological collection of the Stettin Museum), in which the collection described by

* Corresponding author, e-mail: liangap@ioz.ac.cn

Melichar were deposited. We have examined a male specimen in MFNB, which is labeled as "*Leprota fulgoroides* Walk." by Melichar. We herein designate it to be the lectotype of *Leprota melichari* Fennah, 1963, and add a new yellow label written as "Lectotype ♂ *Leprota melichari* Fennah, 1963, desig. Z. S. Song, J. Deckert & A. P. Liang, 2012". We also designate a female specimen in MIZPAS to be the paralectotype of *L. melichari* and add a new yellow label written as "Paralectotype ♀ *Leprota melichari* Fennah, 1963, desig. Z. S. Song, J. Deckert & A. P. Liang, 2012".

In the present paper, we must formally resurrect *Leprota* Melichar from synonymy with *Saigona* Matsumura as a valid genus, based on Fennah's (1963) work as well as examining Melichar's *Leprota* material. In addition, a new *Leprota* species is described and illustrated from northern Borneo, Malaysia.

Material and methods

The specimens studied in the course of this work are deposited in Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA (BPBM), Museum für Naturkunde Berlin, Germany (MFNB), and Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw, Poland (MIZPAS).

The male genitalia were cleared in 10 % KOH at room temperature for ca. 12 hours, rinsed in distilled H_2O, then transferred to glycerol for examination. Morphological characters were observed with a Zeiss (Stemi SV II) optical stereomicroscope and illustrated with the aid of a drawing tube; measurements were made with the aid of an eyepiece micrometer.

The morphological terminology used in this study follows Emeljanov (1988) for external morphology and venation of the forewings, and Bourgoin & Huang (1990) for male genitalia.

Results

Dictyopharidae Spinola, 1839
Dictyopharinae Spinola, 1839
Orthopagini Emeljanov, 1983

Leprota Melichar, 1912

Leprota Melichar, 1912: 91. Type species: *Leprota melichari* Fennah, 1963, a replacement name for *Leprota fulgoroides* Melichar, 1912 (nec Walker, 1858); by subsequent designation.

Leprota Melichar, 1912: Schmidt, 1915: 353; Metcalf, 1946: 74; Fennah, 1963: 303; Liang, 2000: 235; Liang & Song, 2006: 28.

Orodictya Kirkaldy, 1913: 16. Type species: *Orodictya monticola* Kirkaldy, 1913; by original designation. Synonymized by Emeljanov, 2011: 1144.

Diagnosis. Head produced in a very robust cylindrical cephalic process, longer than pronotum and mesonotum combined; vertex and genae covered in numerous irregular transverse wrinkles; vertex distinctly broad, with median carina only distinct between eyes; frons with numerous fine irregular wrinkles between intermediate carinae; pronotum relatively narrow and elongate, with median carina distinct; mesonotum tricarinate, nearly parallel; forewings hyaline and very elongate, darkened apically, with numerous netted veins on apical 1/5 area; stigma elongate and distinct; legs moderately long, fore femora not flattened and dilated, hind tibiae with 8 apical spines; aedeagus with a pair of membranous endosomal processes, apically acute; base of phallobase sclerotized and pigmented, with inflated membranous paired lobes, without long spines.

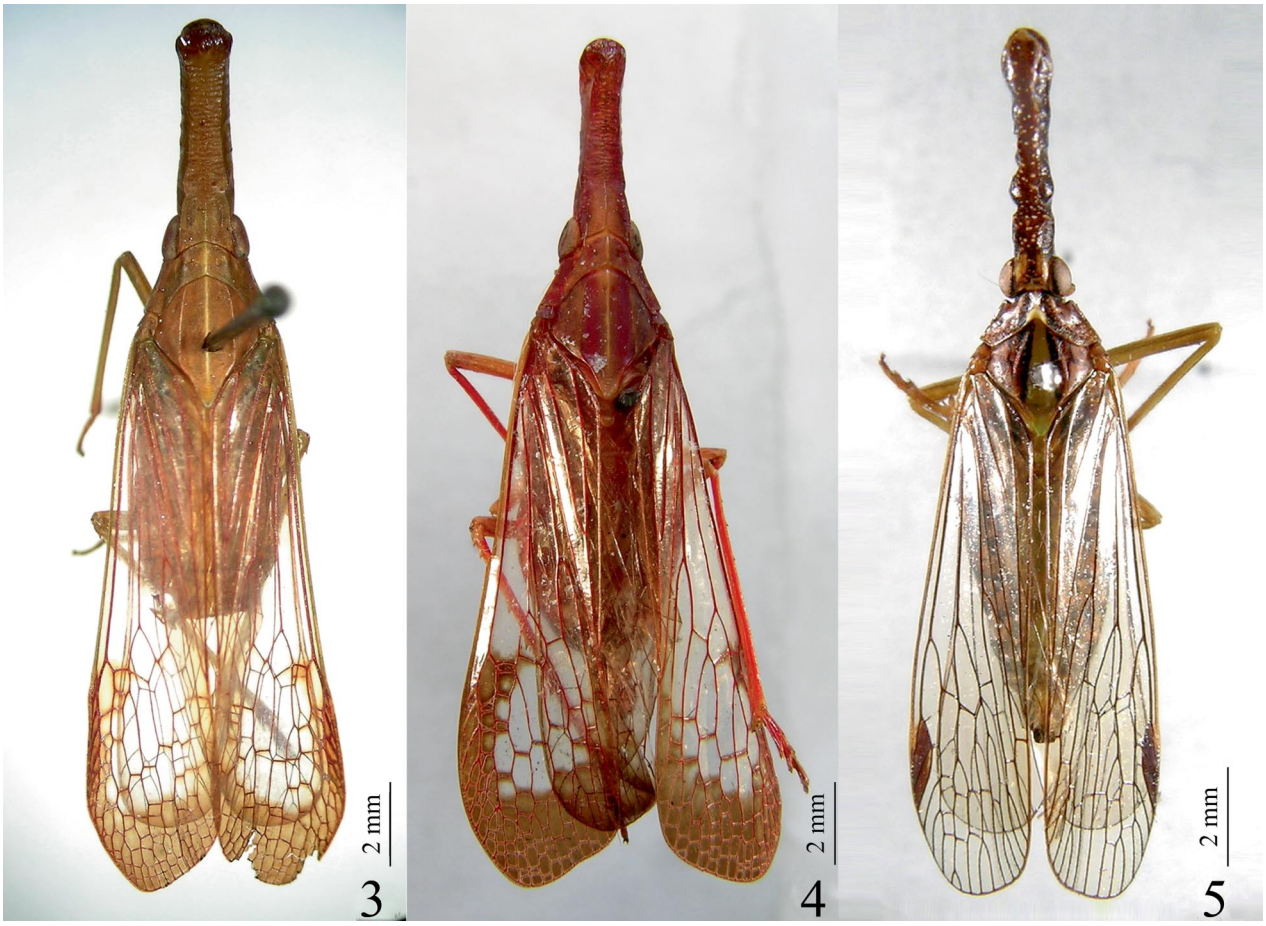
Description. General color rust-brown above, greenish yellow below. Head produced in a very robust cylindrical cephalic process, longer than pronotum and mesonotum combined (Figs 1–4, 6–8, 16–18). Vertex and genae covered in numerous irregular transverse wrinkles (Figs 6, 7, 16, 17). Vertex very broad, basal breadth nearly three times as wide as transverse diameter of eyes in dorsal view (Figs 6, 16); lateral margins only elevated between eyes, blunted in remainder, and they sub-parallel at base, more or less sinuate in front of eyes, slightly constricted and then expanded towards apex in dorsal view (Figs 6, 16); anterior margin broadly convex and rounded, posterior margin broadly concave; median carina only distinct between eyes, the remainder indistinct. Frons broad, lateral carinate margins nearly parallel; posterior margin somewhat concave; intermediate carinae not sharp, sub-parallel, nearly approaching frontoclypeal suture, with numerous fine irregular wrinkles between intermediate carinae; median carina complete but indistinct (Figs 8, 18). Postclypeus and anteclypeus convex medially, with distinct median carina. Rostrum long, reaching beyond abdominal segment VI. Eyes and ocelli relatively small. Antennae with scape very small; pedicel large and subglobose, with more than 50 distinct sensory plaque organs distributed over entire surface; flagellum long, setuliform.

Pronotum (Figs 6, 16) relatively narrow and elongate, anterior margin slightly centrally arched, lateral marginal areas straight and sloping with two longitudinal carinae on each side between eyes and tegulae, posterior margin deeply concave; median carina distinct, with a big lateral pit at side of carina, respectively. Mesonotum (Figs 6, 16) tricarinate on disc, nearly parallel. Forewings (Figs 9, 19) hyaline, venation fuscous, stigma and apical maculate markings rust-brown; forewings elongate, with ratio of length to width about 3.5:1; Sc + R, M and CuA all branched apically, with numerous netted veins on apical 1/5 area, apical margin with about 16–18 cells; stigma elongate and distinct, with 3–5 veins, apical part with netted veins. Legs moderately long; fore femora not flattened and dilated, hind tibiae with 7–9 lateral and 8 apical spines; hind tarsomeres I with 8–9 and tarsomeres II with 7–8 apical spines, respectively.

Male genitalia. Pygofer relatively small, ventrally distinctly wider than dorsally in lateral view (Figs 11, 21), dorso-posterior margin excavated to accommodate anal tube in dorsal view (Figs 10, 20). Segment X (anal tube) large and stout, apical dorsal margin deeply exca-

Figures 1–2. Dorsal habitus of *Leprota melichari* Fennah. **1.** Lectotype, male; **2.** Paralectotype, female.

vated to accommodate anal style in dorsal view (Figs 10, 20); anal style relatively large. Gonostyles moderately large, apex strongly expanded, posterior margin nearly straight; upper margin with dorsally directed, black-tipped long process at apex; outer upper edge with a ventrally directed, hook-like process near middle in lat-



Figures 3–5. Dorsal habitus of dictyopharid species. **3.** *Leprota melichari* Fennah, male; **4.** *Leprota robusta* sp. n., holotype, male; **5.** *Dictyophara fulgoroides* Walker, male.

eral view (Figs 11, 21). Aedeagus moderate and stout, with a pair of membranous endosomal processes, apically acute; base of phallobase sclerotized and pigmented, with inflated membranous paired lobes which possessing some small short spines (Figs 13–15, 23–25).

Distribution. Indonesia (Sumatra); Malaysia (northern Borneo).

Remarks. Melichar (1912) stated that *Leprota* can be distinguished from its closely related genus *Lappida* Amyot & Serville, 1843 by the head produced in an elongate, distinctly robust cylindrical cephalic process, more or less bulbous apically and frons covered in numerous irregular transverse wrinkles. Actually, *Lappida* belongs to the tribe Lappidini Emeljanov for its Sc + R and M veins with a long common stem in the forewings (Emeljanov 2008, 2011). The genus only distributes in the New World and maybe has been far related to *Leprota*.

The genus *Leprota* can be separated from *Saigona* by the body color (generally rust-brown or rust-red above, without pale speckles in *Leprota*, ochraceous or fuscous, with pale speckles on the vertex and most part of genae in *Saigona*); the head covered in numerous irregular transverse wrinkles; the forewings elongate, with numerous netted veins on apical 1/5 area (relatively short, with sparse netted veins on apical area in *Saigona*); and the fore femora normal (the fore femora flattened and dilated, with short and blunt spine near apex in *Saigona*).

Recently, Emeljanov (2011) synonymized the monotypic *Orodictya* Kirkaldy, 1913 with *Leprota* Melichar. We studied the Kirkaldy' s (1913) original description and think that *Orodictya monticola* Kirkaldy may be conspecific with *Leprota melichari* Fennah for their paler body color and the cephalic process with bulbous tip. This needs to be confirmed in near future based on examination of the Kirkaldy's type specimen.

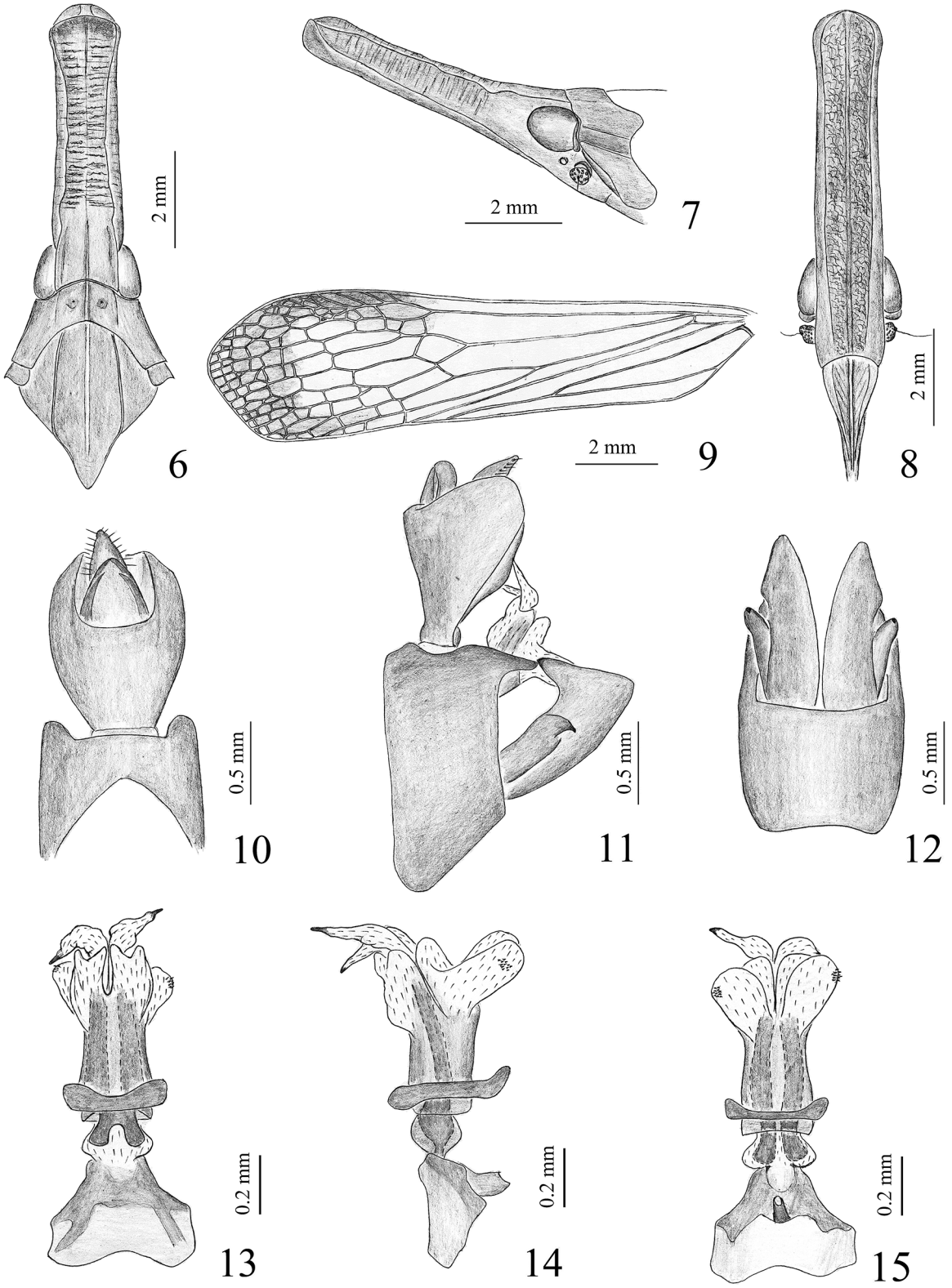
Leprota melichari Fennah, 1963

Figures 1–3, 6–15

Leprota fulgoroides (Walker, 1858): Melichar, 1912: 91, pl. 3, figs. 14, 15; Schmidt, 1915: 353; Metcalf, 1946: 75. Misidentification of *Dictyophora* [*sic*] *fulgoroides* Walker, 1858: 67.

Leprota melichari Fennah, 1963: 303. Replacement name for *Leprota fulgoroides* Melichar, 1912 (nec Walker, 1858).

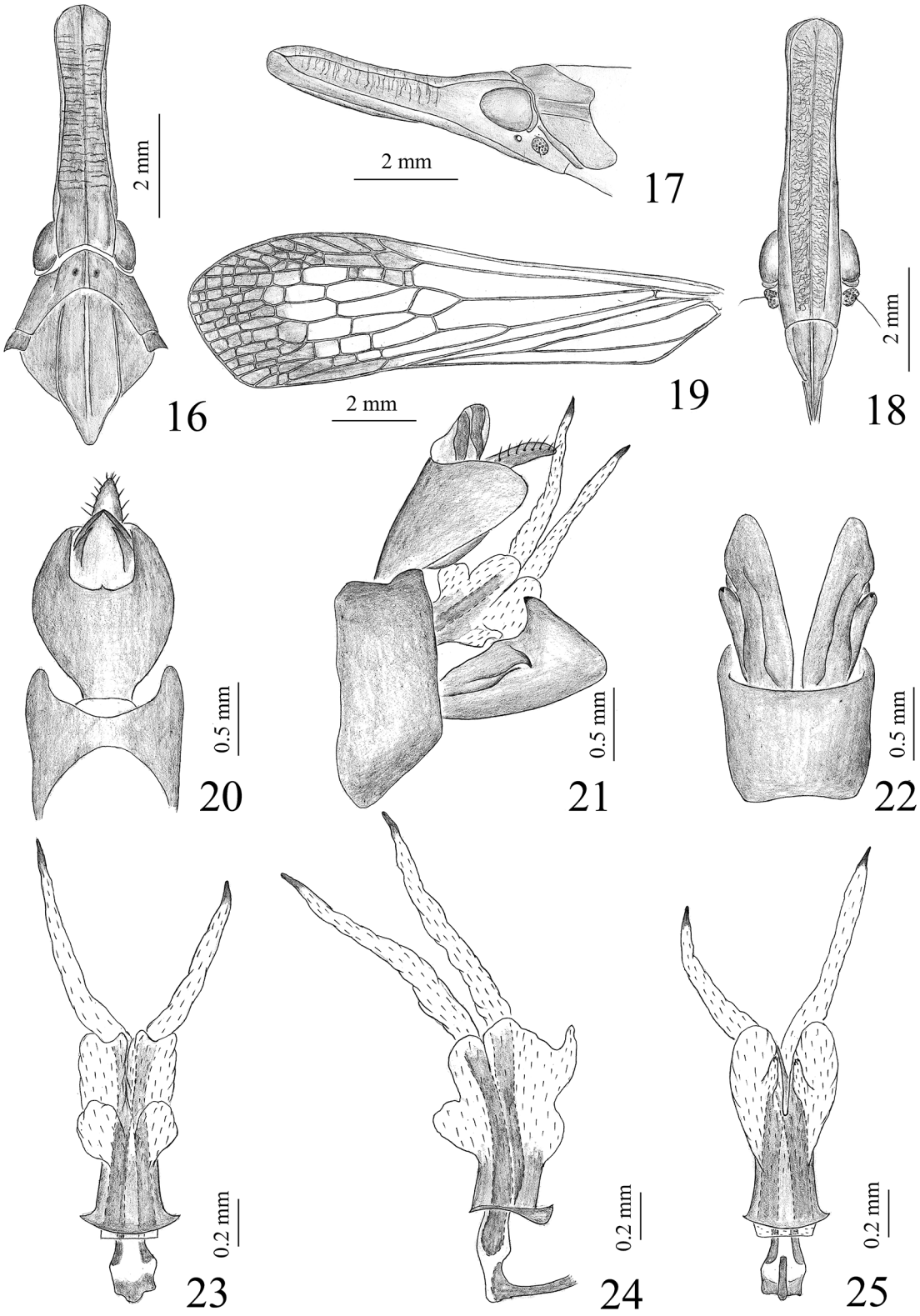
Redescription. Body length (from apex of cephalic process to tip of forewings): ♂ 20.5–20.8 mm, ♀ mm 24.0 mm; head length (from apex of cephalic process to base of eyes): ♂ 6.1–6.8 mm, ♀ 6.6 mm; head width (including eyes): ♂ 2.2–2.3 mm, ♀ 2.2 mm; forewing length: ♂ 13.2–13.3 mm, ♀ 16.0 mm.



Figures 6–15. *Leprota melichari* Fennah. **6.** Head, pronotum and mesonotum, dorsal view; **7.** Head and pronotum, lateral view; **8.** Head, ventral view; **9.** Forewing; **10.** Anal tube and pygofer, dorsal view; **11.** Pygofer, gonostyles and anal tube, lateral view; **12.** Pygofer and gonostyles, ventral view; **13.** Aedeagus, dorsal view; **14.** Same, lateral view; **15.** Same, ventral view.

Head much longer than pronotum and mesonotum combined (about 1.4–1.5:1), moderately bulbous at the tip. Forewings as Figure 9. Hind tibiae with 7–9 lateral spines; hind tarsomeres I with 7–9 and tarsomeres II with 7–8 apical spines, respectively.

Male genitalia. Pygofer distinctly wider ventrally than dorsally (about 3.0:1), posterior margin with a large and elongate process, apically acute, directed posteriorly near dorsal margin in lateral view (Fig. 11). Anal tube large and stout, with ratio of length to width



Figures 16–25. *Leprota robusta* sp. n. **16.** Head, pronotum and mesonotum, dorsal view; **17.** Head and pronotum, lateral view; **18.** Head, ventral view; **19.** Forewing; **20.** Anal tube and pygofer, dorsal view; **21.** Pygofer, gonostyles and anal tube, lateral view; **22.** Pygofer and gonostyles, ventral view; **23.** Aedeagus, dorsal view; **24.** Same, lateral view; **25.** Same, ventral view.

near middle about 1.3:1 in dorsal view (Fig. 10). Gonostyles expanded apically, posterior margin straight with upper process large and elongate. Aedeagus with endosomal processes relatively short, expanded medially and directed dorsally; phallobase with dorsal part with a pair of elongate lobes depressed apically in dorsal view (Fig. 13); ventral part with two pairs of apical lobes: inner paired lobes small, directed posteriorly;

outer paired lobes large and elongate, directed ventrally, which possessing 11–13 small short spines near outer subapex in ventral view (Fig. 15).

Type material examined. Lectotype ♂, *Leprota melichari* Fennah, 1963, here designated. [INDONESIA]: Ober Langkat, Deli, Sumatra, 1894, M. Ude S.; *Leprota fulgoroides* Wlk [Melichar's handwriting]; *Leprota fulgoroides* (Walker, 1858) [orange label]; *Leprota* Melichar, 1912 [white label]; Lectotype ♂ *Leprota melichari* Fennah, 1963, desig. Z.S. Song, J. Deckert & A.P. Liang, 2012 [new added yellow label] (MFNB).

Paralectotype ♀, *Leprota melichari* Fennah, 1963, here designated. Sumatra: Soekaranda Januar 1894 Dohrn [white label]; Mus. Zool. Polonicum Warszawa 12/45 [white label]; *Leprota fulgoroides* Wlk [Melichar's handwriting, light blue label]; MIZ 310132 [white label]; Paralectotype ♀ *Leprota melichari* Fennah, 1963, desig. Z. S. Song, J. Deckert & A. P. Liang, 2012 [new added yellow label] (MIZPAS).

Other material examined. [MALAYSIA]: 1♂, W. Borneo, Manorg, no collecting time, F. Muir (BPBM); 1♀, Busau, Juni 1909; *Leprota fulgoroides* Walk., ♀, Edm Schmidt detern, 1911 [Schmidt's handwriting] (MIZPAS).

Distribution. Indonesia (Sumatra); Malaysia (northern Borneo).

Remarks. The male genitalia of L. melichari have never been described or illustrated in detail, and we have done so here.

Leprota robusta **sp. n.**

Figures 4, 16–25

Description. Body length (from apex of cephalic process to tip of forewings): ♂ 19.3 mm; head length (from apex of cephalic process to base of eyes): ♂ 5.5 mm; head width (including eyes): ♂ 2.0 mm; forewing length: ♂ 12.6 mm.

General color distinctly darker than *L. melichari*. Head much longer than pronotum and mesonotum combined (about 1.4:1), slightly bulbous at the tip. Forewings as Figure 19. Hind tibiae with 7 lateral spines; hind tarsomeres I with 8 and tarsomeres II with 7 apical spines, respectively.

Male genitalia. Pygofer distinctly wider ventrally than dorsally (about 3.4:1), posterior margin with a broad short process, directed dorsally near dorsal margin in lateral view (Fig. 21). Anal tube large and stout, with ratio of length to width near middle about 1.2:1 in dorsal view (Fig. 20). Gonostyles expanded apically, posterior margin straight with upper process relatively short. Aedeagus large and stout, with endosomal processes distinctly elongate, directed dorso-posteriorly; phallobase with dorsal part with a pair of small rounded lobes near middle and a pair of elongate apical lobes depressed apically in dorsal view (Fig. 23); ventral part with a pair of large rounded apical lobes and a pair of small angular lobes near middle which possessing 3–4 small spines at apex in ventral view (Fig. 25).

Material examined. Holotype: ♂, [MALAYSIA]: Borneo, Sarawak, Nanga Pelagus, nr. Kapit, 108–585 m, Secondary forest, 1958.VIII.7–14, T. C. Maa (BPBM).

Etymology. This new species name is derived from the Latin "*robustus*", meaning sturdy. It refers to its robust cylindrical cephalic process.

Distribution. Malaysia (northern Borneo).

Remarks. The new species is externally similar to *L. melichari* Fennah, but can be distinguished from the latter by its darker body color; the slightly bulbous tip of cephalic process; the pygofer with a broad short process near dorsal margin, directed dorsally; and the aedeagus with a pair of distinctly elongate endosomal processes, directed dorso-posteriorly.

Acknowledgments

We are grateful to Mr. Tomasz Huflejt, Museum & Institute of Zoology, Polish Academy of Sciences, Warszawa, Poland, Mr. Davis J. Preston and Dr. Scott E. Miller, Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, for loan of specimens. We also wish to thank Dr. Manfred Asche, Museum für Naturkunde, Leibniz Institute for Research on Evolution and Biodiversity at the Humboldt University Berlin, Germany, for his very kind editorial help with this paper. Two anonymous reviewers are greatly appreciated for their efforts in improving this paper.

The work on which this paper is based was supported by the following sources: National Natural Science Foundation of China (No. 31101657, 30970400, 31172128), Scientific Survey on the Middle- and Lower-reaches of Lancang (Mekong) River and Grand Shangri-La Area (No. 2008FY110300), National Science Fund for Fostering Talents in Basic Research (Special subjects in animal taxonomy, NSFC-J0630964/J0109) and a grant (No. O529YX5105) from the Key Laboratory of Zoological Systematics and Evolution of Chinese Academy of Sciences.

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