

Revision of the Austro-Oriental Planthopper Genus *Dictyomorpha* With Description of a New Genus *Indodictyophara* gen. nov. From South India (Hemiptera: Fulgoroidea: Dictyopharidae)

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ABSTRACT The Austro-Oriental planthopper genus *Dictyomorpha* Melichar, 1912 (Hemiptera: Fulgoroidea: Dictyopharidae) is revised to contain three previously described and four undescribed species: *D. elongata* Melichar, 1912 (Papua New Guinea, Indonesia); *D. furca* sp. nov. (China); *D. hectica* Haupt, 1926 (Philippines); *D. laosensis* sp. nov. (Laos); *D. moluccana* (Kirkaldy, 1913) (from Amboina Kirkaldy, 1913) comb. nov. (Indonesia); *D. sulawesiensis* sp. nov. (Indonesia); and *D. unifasciata* Liang, sp. nov. (Vietnam). The monotypic genus *Amboina* Kirkaldy, 1913 is synonymized with *Dictyomorpha* Melichar, 1912. Descriptions or redescriptions of *Dictyomorpha* and its included species are provided together with the dorsal habitus of the adults and nymphs and the structural illustrations. Fifth-instar nymph and wax glands of *Dictyomorpha* species are described for the first time. A diagnostic key is provided for differentiation of the known species in the genus. New data on the ultrastructural morphology of the antennal sensilla, rostral apex, and hind pretarsus of *D. moluccana* and the wax glands of the nymph of *D. hectica* are provided for the first time from the scanning electron microscope observations. Autapomorphies are proposed to support the monophyly of *Dictyomorpha*. A new genus *Indodictyophara* gen. nov., which is closely related to *Dictyomorpha*, also is established for a single new species, *I. lobosa* sp. nov., from southern India.

KEY WORDS Auchenorrhyncha, planthopper, new species, new genus, scanning electron microscopy

The Dictyopharidae is a moderately large family of the Fulgoroidea (Hemiptera: Auchenorrhyncha), containing over 760 described species in ≈ 150 genera (Metcalf 1946, Song and Liang 2011). Members of the family often can be recognized by their variably anteriorly produced head. The group is cosmopolitan, but most species occur in temperate and tropical regions. Members of the group are predominantly monocot-feeders and a few are major agricultural pests on grasses, such as rice, maize (*Zea mays* L.), and sugarcane (Wilson and O'Brien 1987, Wilson et al. 1994). As in many other groups of Auchenorrhyncha, the world dictyopharid fauna remains inadequately studied. Many genera lack standard revisionary studies and monophyly of many genera and higher taxa never have been tested cladistically.

The dictyopharid planthopper genus *Dictyomorpha* was established by Melichar in 1912 to contain a single species *D. elongata* Melichar, 1912 from Astrolabe Bay, Papua New Guinea. Haupt (1926) added the second species of the genus *D. hectica* from Luzon, Philippines. Melichar (1912) placed *Dictyomorpha* in the tribe Dictyopharini of the subfamily Dictyopharinae.

Haupt (1926) placed *Dictyomorpha* in the tribe Dictyopharini of the subfamily Cixiinae of Fulgoridae. Since then, neither the genus nor its included species has been reported in the literature, except in the catalog of Metcalf (1946) of world Dictyopharidae and in the paper by Emeljanov (2008) dealing with the tribal placement of the genus.

After Melichar (1912), Metcalf (1946) placed the genus in the tribe Dictyopharini of the subfamily Dictyopharinae in his catalog of the world Dictyopharidae. Emeljanov (1979) established a new monotypic subfamily Aluntiinae for the dictyopharid genus *Aluntia* Stål, 1866 of the tribe Dictyopharini and placed the new subfamily under the lanternfly family Fulgoridae, which is widely accepted to be a sister group of Dictyopharidae. Emeljanov (2008) downgraded Aluntiinae into a tribe, viz. Aluntiini and moved Aluntiini back to the subfamily Dictyopharinae of Dictyopharidae. He redefined the Aluntiini and included in the tribe four genera, namely *Aluntia* Stål 1866, *Dictyomorpha*, *Arjuna* Muir 1934, and *Pippax* Emeljanov 2008.

While identifying Austro-Oriental Dictyopharidae material in the Insect Collection of the Institute of Zoology, Chinese Academy of Sciences, Beijing

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(IZCAS) and elsewhere, we found four new species of *Dictyomorpha* species from southwestern China (Yunnan Province), Vietnam, Laos, and Indonesia (Sulawesi), respectively. Based on examination of the type material deposited in the Hungarian Natural History Museum, Budapest, Hungary (HNHM) and Bernice Pauahi Bishop Museum, Honolulu, HI, United States (BPBM), we found that *Amboina* Kirkaldy, 1913 is clearly synonymous with *Dictyomorpha*. In addition, one new species, representing a new closely related genus of *Dictyomorpha*, *Indodictyophara lobosa* gen. et sp. nov., also is found from southern India. These discoveries greatly broaden the taxonomic, morphological, and biogeographic concepts of the genus *Dictyomorpha*, which now includes seven species and is distributed throughout the Austro-Oriental region (Fig. 13).

The purpose of the present paper is to redescribe the genus *Dictyomorpha* and its included species in addition to providing a key to the species and illustrations of the male genitalia. Photographs of the adults of all the known species and the scanning electron micrographs of the rostral apex, antennal sensilla, hind pretarsus of *D. moluccana*, and wax glands of the nymphs of *D. sulawesensis* sp. nov. are presented. New autapomorphies are proposed to support the monophyly of *Dictyomorpha*.

Materials and Methods

Specimens used for dissection were cleared in 10% KOH at room temperature for ≈ 6 –12 h, rinsed in distilled H₂O, then transferred to glycerol for examination.

Morphological characters were observed with a Zeiss (Stemi SV 11) optical stereomicroscope (Carl Zeiss, Göttingen, Germany) and were illustrated with the aid of a drawing tube attached to the microscope; measurements were made with the aid of an eyepiece micrometer.

For scanning electron microscopy study, the specimens or parts of the body (head together with antennae or legs of adult female; abdomen of nymph) were removed from the body and transferred to 10% KOH for 1–2 min, were cleared with 10% KOH, then washed in distilled water, mounted on aluminum stubs by double-sided sticky tape, air-dried at room temperature, and coated with gold-palladium by using a sputter coater. Observations were made with a JEOL 5200LV (Japanese Electronic and Optical Ltd., Tokyo, Japan) scanning electron microscope, operated at accelerating voltages of 20 or 25kV. Two dry, pinned female adult specimens and two dry nymphs were examined.

The specimens studied in the course of this work are deposited in the following institutions whose names are abbreviated in the text as follows: The Natural History Museum, London, United Kingdom (BMNH); Bernice P. Bishop Museum, Honolulu, HI, USA (BPBM); California Academy of Sciences, San Francisco, CA, United States (CAS); Hungarian Natural History Museum, Budapest, Hungary (HNHM); In-

stitute of Zoology, Chinese Academy of Sciences, Beijing, P.R. China (IZCAS); Natural History Museum of Denmark, University of Copenhagen, Copenhagen, Denmark (NHMD).

The morphological terminology and measurements used in this study follow Liang and Song (2006) and Song and Liang (2008).

The following abbreviations are used in the text: body length (BL) (from apex of cephalic process to tip of forewings); head length (HL) (from apex of cephalic process to posterior margin of vertex); head width (HW) (including eyes); forewing length (FWL).

Systematics

Genus *Dictyomorpha* Melichar

Dictyomorpha Melichar, 1912: 103; Metcalf, 1946: 81; Emeljanov, 2008: 372. Type species: *D. elongata* Melichar, 1912, by original designation and monotypy.

Amboina Kirkaldy, 1913: 16; Metcalf, 1946: 86. Type species: *A. moluccana* Kirkaldy, 1913, by original designation and monotypy. **New Synonymy**

Diagnosis. Elongate and slender dictyopharids (Figs. 1 and 2), length (from apex of cephalic process to tip of forewings) ♂ 16.4–19.1 mm; ♀ 17.3–18.1 mm; head (Figs. 1, 2; 9A–C) distinctly produced into a very long cephalic process, nearly twice as long as pronotum and mesonotum combined; cephalic process compressed dorsoventrally, flat and narrowing from base to apex, somewhat upturned at apex in lateral view (Fig. 9B); vertex (Figs. 1A, 9A) with median carina absent, medially sutured basally; frons (Fig. 9C) with lateral carinae strongly elevated and blade-like, areas between two lateral carinae deeply grooved; antennae with pedicel large and elongate; pronotum (Figs. 1A, 9A) with lateral and median carinae distinct and complete; mesonotum (Figs. 1A, 9A) tricarinate, lateral carinae nearly parallel; forewings (Figs. 1A; 5A–B) elongate, stigma absent, with six suboblique veins on apical subcostal area; clavus unclosed; legs very elongate and slender; hind tibiae with seven apical spines; aedeagus (Fig. 9E–H) with a pair of elongate, large, inflated and membranous phallical processes.

Description of Adults. Body (Figs. 1A; 2A–G, 2I) large, distinctly elongate and slender, length (from apex of cephalic process to tip of forewings) ♂ 16.4–19.1 mm; ♀ 17.3–18.1 mm.

General color ochraceous in dead, dried specimens (probably green or stramineous green in life).

Head (Figs. 1A; 2A–G, 2I; 9A–C) with cephalic process very elongate and slender, nearly twice as long as pronotum and mesonotum combined; cephalic process compressed dorsoventrally, flat and narrowing from base to apex, somewhat upturned at apex in lateral view; width of basal part including eyes broader than anterior part of pronotum and narrower than hind part of pronotum in dorsal view. Vertex (Figs. 1A; 2A–G, I) centrally carinate, with carina distinct only at extreme apical part and basal 1/4, other part of carina

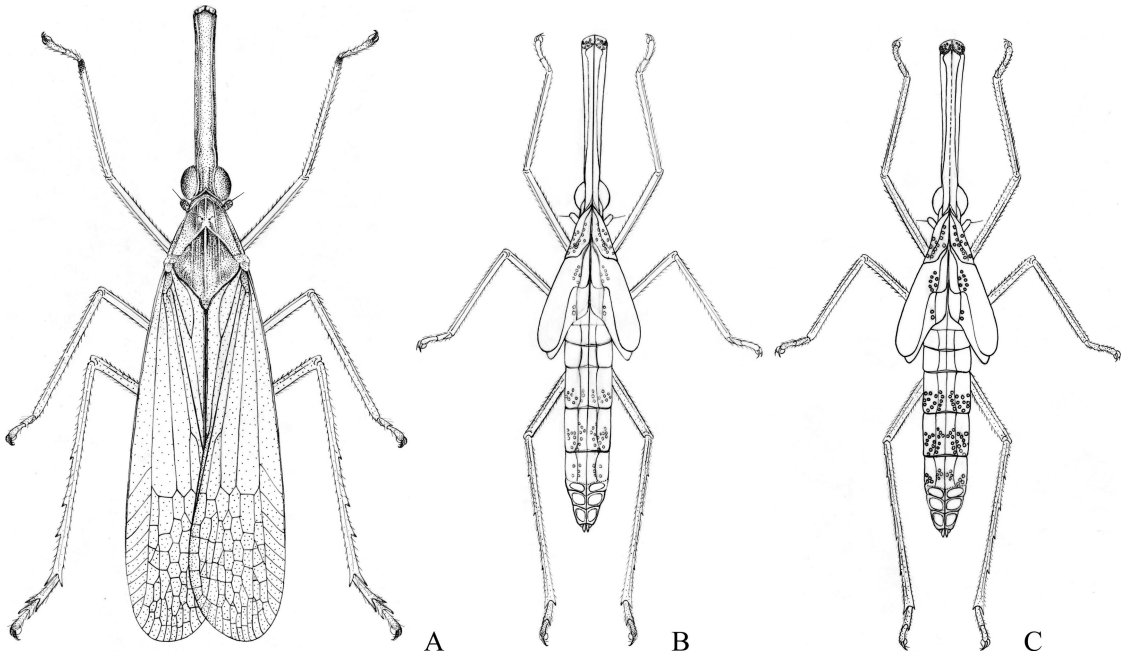


Fig. 1. Species of *Dictyomorpha*, dorsal habitus. (A) *D. unifasciata* Liang, sp. nov., male adult, holotype, Vietnam (Nha Trang; DaiLanh). (B) *D. unifasciata* Liang, sp. nov., nymph, Vietnam (Blao). (C) *D. sulawesiensis* sp. nov., nymph, Indonesia (Sulawesi).

indistinct and sometimes being slightly sutured; anterior, lateral and posterior margins carinate, leaving disc concave; lateral carinate margins somewhat constricted between eyes, somewhat expanded before eyes, and widening a little at apex; anterior margin angulately convex and posterior margin angulately concave at $\approx 90^\circ$, slightly growing beyond posterior margin of eyes. Frons (Fig. 9C) with lateral carinate margins narrow and elongate; lateral carinae strongly elevated and blade-like, converging posteriorly and reaching to eyes, not to frontoclypeal suture, areas between two lateral carinae deeply grooved; median carina complete, strongly elevated and blade-like at apex and slightly keeled in middle. Postclypeus and anteclypeus (Fig. 9C) convex medially, with distinct median carina. Rostrum long, reaching hind coxae, basal segment longer than apical segment; rostral apex consisting of two lateral lobes separated by dorsal stylet groove, each lateral lobe bearing ≈ 10 basiconic sensilla near stylet groove, nearly 10 sensory setae and numerous fine sensilla on disc (Fig. 3A). Eyes comparatively large, prominent and oval exteriorly. Ocelli prominent and reddish. Antennae with scape very small and short; pedicel (Fig. 3B–D) cylindrical and elongate, with ≈ 40 distinct sensory plaque organs distributed over all the surface; each plaque with three to six central cuticular folds and 13–16 folds around its edge and bordered by seven to 11 strongly developed protective denticles; flagellum (Fig. 3E) with swollen amphora-like base cavate apically, with three to 4 basiconic sensilla in cavity.

Pronotum (Figs. 1A; 2A–G, I; 9A) narrow and elongate, discal longitudinal length (from anterior

margin of pronotum to base of tegulae, excluding tegulae) nearly as long as length of mesonotum; anterior margin slightly centrally arched, lateral marginal areas straight and sloping, posterior margin angulately concave at $\approx 90^\circ$; disc tricarinate, median and lateral longitudinal carinae distinct and complete; lower lateral carinae between eyes and tegulae conspicuous and visible in dorsal view. Mesonotum (Figs. 1A; 2A–G, 2I; 9A) tricarinate on disc, median carina inconspicuous, lateral carinae nearly parallel. Wings hyaline; forewings (Figs. 1A; 5A, B) elongate and slender, nearly four times as long as the broadest; apical third reticulate, broadened inward and more or less overlapped distally when the forewings unexpanded; vein Cu branching before veins Sc + R and M; stigma absent, with six oblique veins on subapical costal area; clavus unclosed, claval suture not reaching to posterior margin of forewings. Legs very elongate and slender, fore and middle femora distinctly elongate, hind tibiae more than twice as long as hind femora; fore femora spineless, not flattened and dilated; hind femora with a cluster of long setae on inner side of base; hind tibiae with one plus (three or four) lateral black-tipped spines (extreme basal spine very small and obscure) and seven apical black-tipped spines; hind tarsomeres I with ≈ 6 black-tipped apical spines (nine to 10 in *D. furca* sp. nov.) and tarsomeres II with seven black-tipped apical spines (11–12 in *D. furca* sp. nov.), respectively; hind pretarsus with four long setae on each outer-lateral base of unguis and numerous short and small setae on dorsal base of unguis (Fig. 3 F).

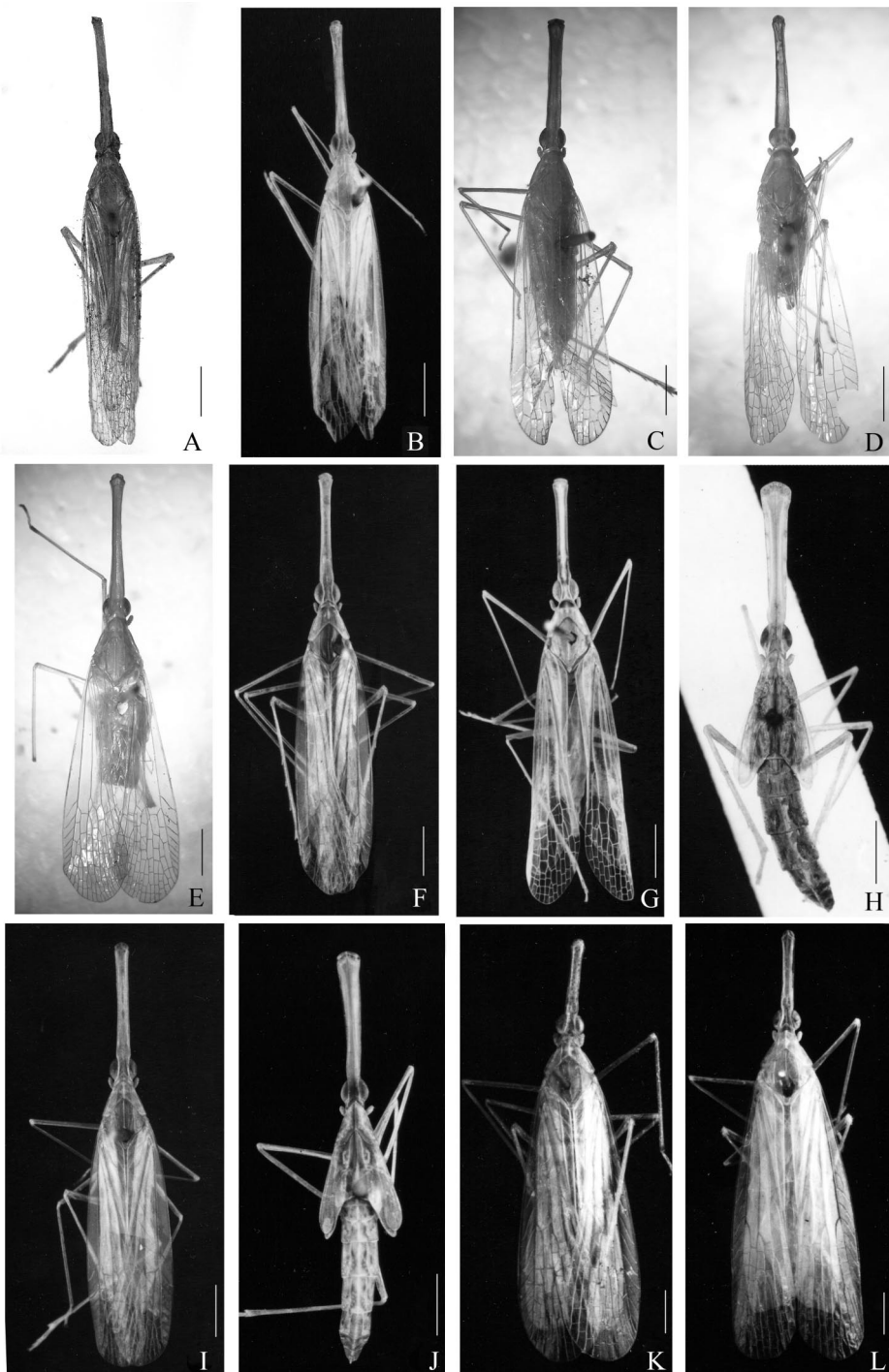


Fig. 2. Species of *Dictyomorpha* and *Indodictyophara* gen. nov., dorsal habitus. (A) *D. elongata* Melichar, female, holotype, Papua New Guinea (Erima). (B) *D. elongata* Melichar, male, Papua New Guinea (Madang). (C) *D. elongata* Melichar, female, Papua New Guinea (NE. Bainyik). (D) *D. furca* sp. nov., male, holotype, China (Yunnan). (E) *D. laosensis* sp. nov., male, holotype, Laos (Vientiane). (F) *D. moluccana* (Kirkaldy), male, paratype, Indonesia (Amboina). (G) *D. sulawesiensis* sp. nov., male, holotype, Indonesia (Sulawesi). (H) *D. sulawesiensis* sp. nov., nymph, Indonesia (Sulawesi). (I) *D. unifasciata* Liang, sp. nov., male, holotype, Vietnam (DaiLanh). (J) *D. unifasciata* Liang, sp. nov., nymph, Vietnam (Blao [Balao]). (K) *I. lobosa* sp. nov., male, holotype, southern India (Travancore). (L) *I. lobosa* sp. nov., female, paratype, southern India (Coimbatore). Scale bar = 2 mm.

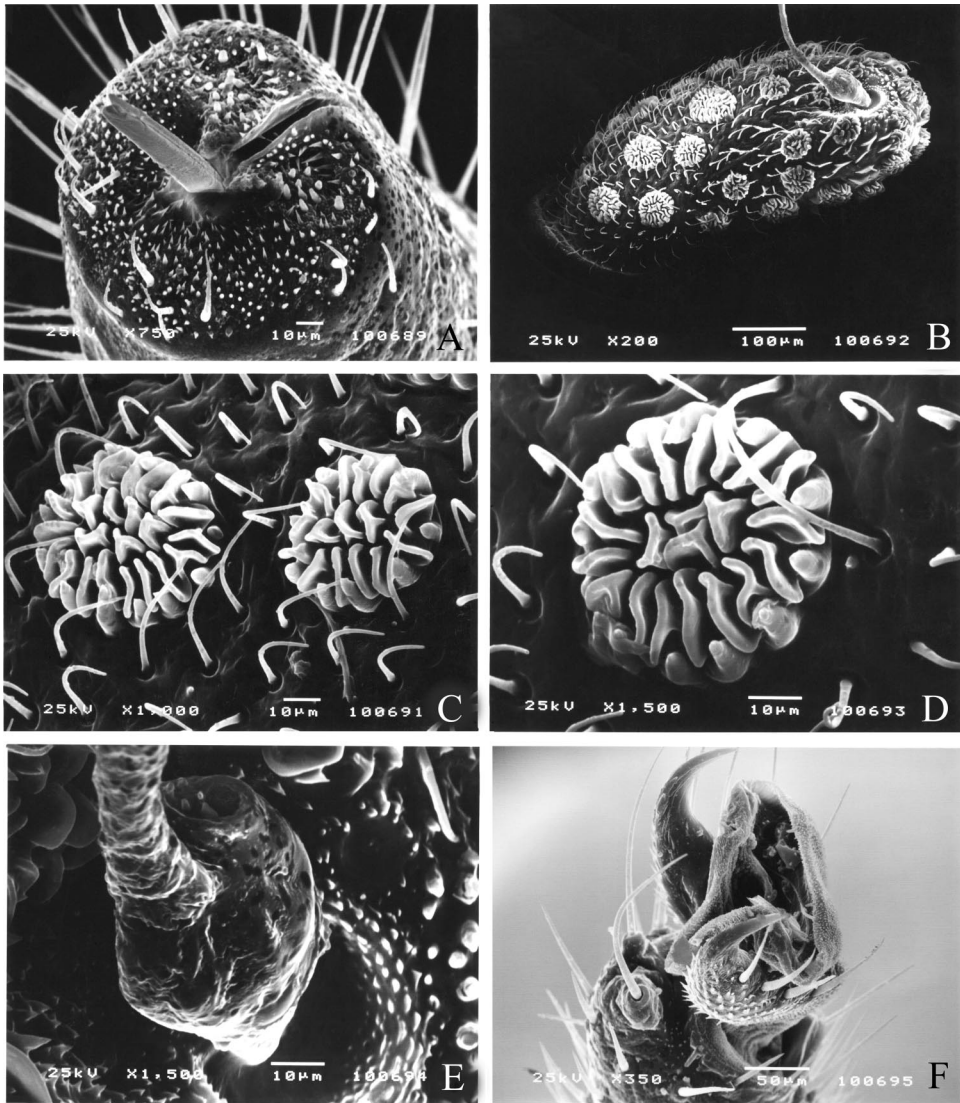


Fig. 3. Scanning electron micrographs of *Dictyomorpha moluccana* (Kirkaldy). (A) Apex of rostrum. (B) Pedicel of antenna, showing sensory plaque organs and microtrichia. (C) Two sensory plaque organs on pedicel surface. (D) One sensory plaque organ on pedicel surface. (E) Expanded flagellar base. (F) Hind pretarsus.

Abdomen elongate, pregenital segment (the segment before pygofer) short.

Male Genitalia. Pygofer (Fig. 9D, E, F) relatively small and narrow, ventrally distinctly wider than dorsally, posterior margin strongly produced posteriorly in lateral aspect (Fig. 9E), dorsal margin deeply excavated to accommodate anal tube and dorsolateral margins angularly produced posteriorly in dorsal view (Fig. 9F), ventrolateral margins angularly produced posteriorly in ventral view (Fig. 9D). Anal tube narrow and elongate in dorsal and lateral views (Fig. 9E, F). Anal styles very short and small (Fig. 9E, F). Parameres (Fig. 9G) symmetrical; base narrow, expanded toward apex, broadest subapically; apex bluntly rounded and protruded backward; upper margin with directed dorsally process near middle, outer

upper edge with a very small ventrally directed, hook-like process near submiddle in lateral aspect. Aedeagus (Fig. 9E, H) with a pair of large and elongate phallic processes, basal half sclerotized and pigmented, apical half membranous and inflated, directed posteriorly or dorsoposteriorly; phallobase sclerotized and pigmented at base, with or without membranous lobes ventrally.

Description of Fifth-Instar Nymphs. The general habitus of the fifth-instar nymph (Figs. 1B, C; 2H, J) very similar to adults, but wings undeveloped and body covered with numerous sensory pits. General color also similar to adults.

Head (Figs. 1B, C; 2H, J) very elongate, distinctly broad and robust apically; cephalic process compressed dorsoventrally, distinctly upturned at apex;

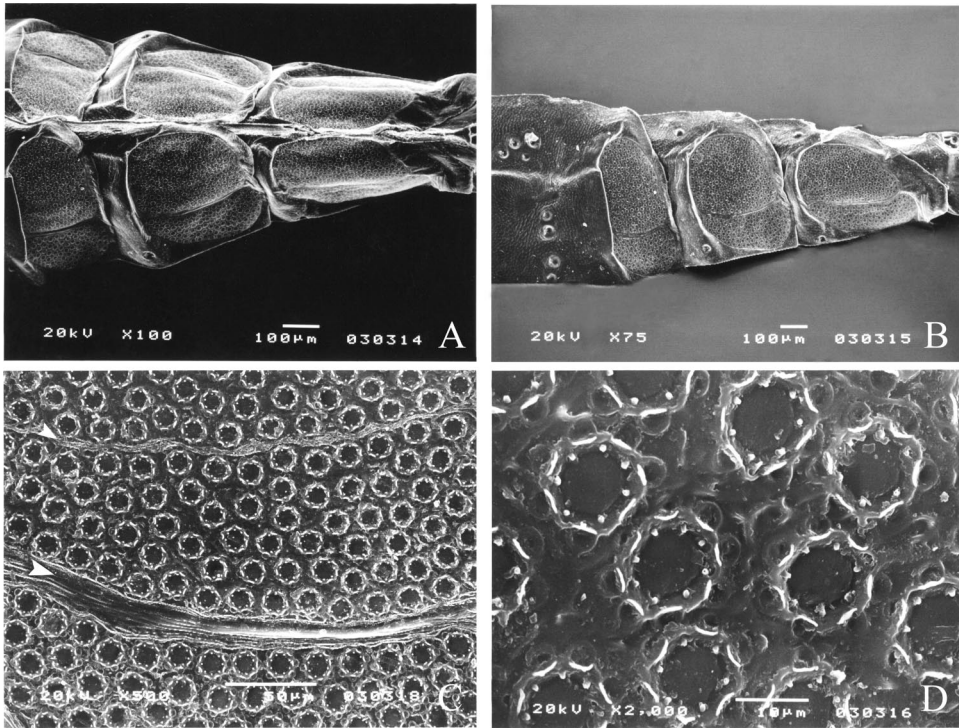


Fig. 4. Scanning electron micrographs of *Dictyomorpha sulawesiensis* sp. nov. (A) Abdominal tergites VI–VIII, dorsal view, showing large wax plates. (B) Abdominal tergites VI–VIII, lateral view, showing very large wax-secreting plates. (C) Wax gland pores and two longitudinal linear areas (arrowhead) on wax-secreting plate. (D) Wax gland pores.

apical part with ≈ 26 sensory pits. Vertex (Figs. 1B, C; 2H, J) with lateral margins strongly carinate, median longitudinal carina distinct from base to apex. Frons with lateral margins carinate, each side with ≈ 45 –50 sensory pits; lateral carinae prominent, reaching to frontoclypeal suture, but areas between two lateral carinae deeply grooved, and median carina absent. Postclypeus and anteclypeus convex medially, with median carina indistinct. Rostrum long, reaching hind coxae. Eyes prominent, but ocelli absent. Antennae with pedicel cylindrical, possessing ≈ 40 distinct sensory plaque organs distributed over entire surface.

Pronotum (Figs. 1B, C; 2H, J) distinctly narrow, produced anteriorly, posterior margin angulately concave; disc with 14–16 sensory pits between median longitudinal carina and lateral carinae, with five sensory pits between lateral carinae and upper lateral carinae, respectively. Mesonotum (Figs. 1B, C; 2H, J) with 5–6 sensory pits outside lateral carinae. Metanotum (Fig. 2B, C) with 6–7 sensory pits outside lateral carinae. Forewing pads (Figs. 1B, C; 2H, J) each with four sensory pits arranged in a longitudinal line in middle. Legs similar to adults, very elongate and slender.

Abdomen (Figs. 1B, C; 2H, J) 9-segmented, elongate, and slightly flattened dorsoventrally. Tergites II–VI with distinct median carina and lateral carinae that are nearer to median carina; tergites IV–VI with 4, 7, and 4 sensory pits between lateral carinae and median carina, 10–11, 9–10, and 4–6 sensory pits between lateral margin and lateral carinae, respectively; sensory pits on tergite VI

smaller than those on tergites IV–V; tergites VI–VIII each with a pair of very large wax-secreting plates that occupy almost whole tergite (Figs. 1B, C; 4A, B); wax plates (Fig. 4A, B) on tergite VI transversely elongate and narrower than those on tergites VII and VIII, those on tergite VII very broad and transversely elongate and those on tergite VIII largest and longitudinally elongate; surface of wax plates covered with numerous fine cuticular structures for wax molding—the wax gland pores (Fig. 4A–D) and longitudinal linear areas separating wax gland pores (Fig. 4C). Wax gland pores (Fig. 4A–D) flower-shaped and ≈ 11.8 – $13.1 \mu\text{m}$ in diameter (Fig. 4C, D), each glandular pore unit including a main, central disc surrounded by eight or seven microtubules, which are bordered by eight or seven small, shallow, rounded cavities in each of which a central dome is located; central disc nearly rounded, slightly concave; microtubules being hollow centrally, with apex slightly expanded, equidistantly arranged and inward sloped (Fig. 4C, D); number of cavities located beyond two adjacent microtubules surrounding central disc usually equal to that of microtubules surrounding central disc; rim of each cavity smooth, but inner rim adjacent to central disc strongly ridged (ridge length 3.3 – $3.9 \mu\text{m}$). The function of the microtubules surrounding the central disc of the wax gland pore is unknown at present, but they may secrete the fluid material to strengthen or solidify the wax threads coming from the central raised circle of the disc (Liang and O'Brien 2002, Liang and Wilson 2002). The function of the central

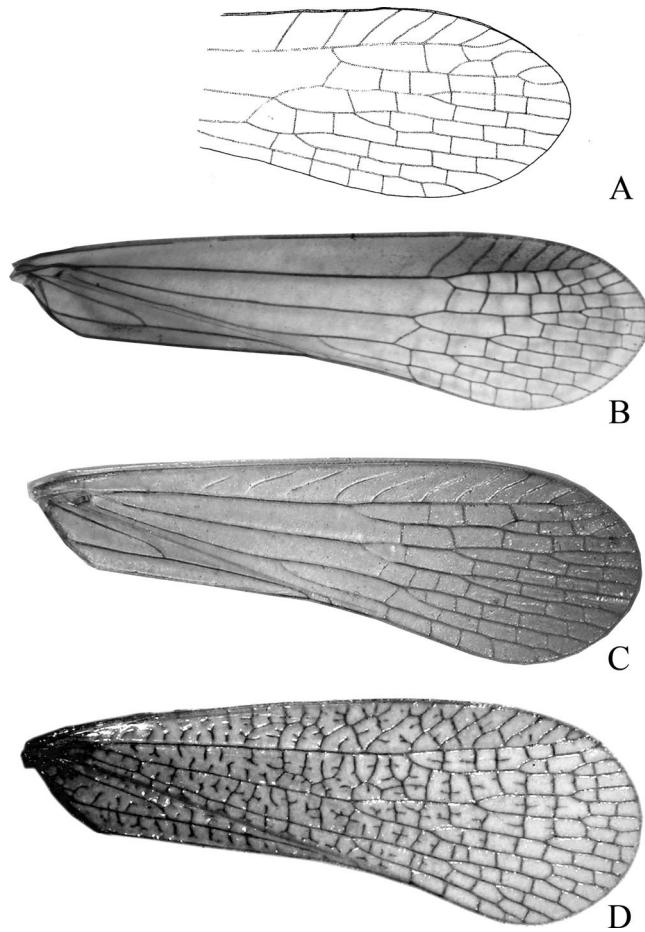


Fig. 5. Forewing. (A) *Dictyomorpha elongata* Melichar. (B) *D. moluccana* (Kirkaldy). (C) *Indodictyophara lobosa* sp. nov. (D) *Aluntia schimperii* (Guérin-Méneville).

dome in each cavity surrounding the central disc needs to be investigated.

Monophyly of *Dictyomorpha*. Currently there are ≈ 150 described genera of Dictyopharidae, however, the monophyly of most genera have not been examined cladistically. The wax-secreting plates on the abdominal tergites VI–VIII in the nymphs of most dictyopharid species usually are caudal, elongate, vertical, and oval and are relatively small in size and occupy $< 1/2$ of the entire tergite (Wilson and McPherson 1981; Emeljanov 1993, 1994; Liang and Wilson 2002). However, the nymphs of the *Dictyomorpha* species have the largest, three pairs of wax-secreting plates on abdominal VI–VIII tergites that occupies nearly the entire tergites (Fig. 4A, B) (Wilson and McPherson 1981; Emeljanov 1993, 1994; Yang and Yeh 1994; McPherson and Wilson 1995; Liang and Wilson 2002; A.-P. L., unpublished data). In addition, the longitudinal linear areas between the flower-shaped wax gland pores only are found in *Dictyomorpha* species (Fig. 4C). In the wax-secreting plates of all other nymphs of dictyopharid species, the wax gland pores are evenly and continuously distributed and no longitudinal linear areas separating wax

gland pores are present on the wax-secreting plates. These two distinct characters (the largest wax-secreting plates and the presence of the longitudinal linear areas separating wax gland pores on the wax-secreting plates) appear to be two autapomorphies of *Dictyomorpha* that support monophyly of the genus *Dictyomorpha*.

Remarks. In the tribe Aluntiini, *Dictyomorpha* is similar externally to *Aluntia* Stål in having the slender and elongate body, very long and slender legs, and very long cephalic process, but can be separated from the latter by the forewings without dendroid nodose secondary veins (with numerous dendroid nodose secondary veins in *Aluntia* [Fig. 5D]), the frons with strongly ridged and complete median carina (median carina absent in middle in *Aluntia*), and the aedeagus with large, membranous, and inflated phallical processes (the aedeagus with phallical processes distinctly slender, sclerotized, and not inflated in *Aluntia*) (see Emeljanov 2008).

Distribution. Southwest China (Yunnan Province), Vietnam (Nha Trang, Dalat, Blao), Laos (Vientiane Province), Philippines (Luzon, Los Banos), Indonesia

(Sulawesi, Amboina, Vogelkop, Pukusam), and Papua New Guinea (Madang Province, Bainyik).

Key to the Species of Genus *Dictyomorpha*²

- 1. Aedeagus with phallical processes forked apically (Fig. 7E, H, I); antenna with pedicel relatively small and short (Fig. 7A-C); mesonotum with median carina very obscure and nearly invisible (Fig. 7A); hind tarsomeres I and II with 9-10 and 11-12 apical spines, respectively; southwestern China (Yunnan Province) *D. furca* sp. nov.
 - Aedeagus with phallical processes not forked apically; antenna with pedicel distinctly large and elongate (Fig. 8A-C); hind tarsomeres I and II with six and seven apical spines, respectively 2
- 2. Aedeagus with phallical processes with a narrow pigmented fascia on posterior edge in lateral view (Fig. 11E, H); Vietnam (Nha Trang, Dalat, Blao) *D. unifasciata* Liang, sp. nov.
 - Aedeagus with phallical processes without a narrow pigmented fascia on posterior edge in lateral view 3
- 3. Male pygofer with posterior margin strongly angularly produced posteriorly and forming a relatively long, robust, conical process in middle in lateral view (Figs. 6E, 9E); hind tibiae with 1 + 4 lateral spines 4
 - Male pygofer with posterior margin produced posteriorly, obtuse apically in lateral aspect (Figs. 7E, 8E, 10E, 11E); hind tibiae with 1 + 3 lateral spines 5
- 4. Aedeagus with phallical processes relatively shorter and smaller (Figs. 6E, H, I); vertex uniformly ochraceous; frons and genae with several reddish speckles; Papua New Guinea (Madang Province, Bainyik), Indonesia (Pukusam) *D. elongata* Melichar
 - Aedeagus with phallical processes relatively larger, longer, more expanded, and stout (Fig. 9E, H); vertex with lateral margins very narrowly sanguineous; frons and genae without reddish speckles; Indonesia (Amboina, Vogelkop) *D. moluccana* (Kirkaldy), comb. nov.
- 5. Cephalic process relatively elongate and slender (Figs. 2E, 8A-C); parameres with upper process on upper margin relatively smaller, directed anterodorsally in lateral view (Fig. 8E, G); aedeagus with phallical processes elongate and large, with basal 2/3 directed posterodorsally and the apical 1/3 directed anterodorsally in lateral view (Fig. 8E, H); Laos (Vientiane Province) *D. laosensis* sp. nov.
 - Cephalic process relatively short and broad (Figs. 2G, H; 10A-C); parameres with upper process on upper margin relatively large, directed posteriorly in lateral view (Fig. 10E, G); aedeagus with

phallical processes shorter, smaller and narrower, broadly directed anterodorsally in lateral view (Fig. 10E, H); Indonesia (Sulawesi) *D. sulawesensis* sp. nov.

Dictyomorpha elongata Melichar (Figs. 2A, B, C; 5A; 6; 13)

Dictyomorpha elongata Melichar, 1912: 104, Pl. II, fig. 17; Metcalf, 1946: 81. Holotype ♀, PAPUA NEW GUINEA (HNHM) [examined on behalf of authors by Andras Orosz].

Description. ♂, BL: 17.4 mm; HL: 5.6 mm; HW: 1.2 mm; FWL: 10.0 mm. ♀, BL: 17.9 mm; HL: 5.6 mm; HW: 1.2 mm; FWL: 10.5 mm.

General color as in generic description, but vertex with lateral margins very narrowly pale sanguineous, pronotum with two pairs of reddish markings on disc, genae, and frons with several sanguineous speckles.

External characters as in generic description. Head (Fig. 6A-C) with length ratio of cephalic process to pronotum and mesonotum combined ≈1.9:1. Hind tibiae with 1 + 4 lateral spines.

Male Genitalia. Pygofer (Fig. 6D-F) with posterior margin strongly produced posteriorly and forming a relatively long, robust, conical process in middle in lateral view (Fig. 6E). Anal tube (Fig. 6E, F) with ratio of length to width at middle ≈2.2:1 in dorsal view (Fig. 6F). Parameres (Fig. 6D, E, G) with upper process on upper margin relatively broad and large in lateral view. Aedeagus (Fig. 6E, H, I) with phallical processes relatively elongate and slender, somewhat shorter and smaller, apical half turned dorsolaterally, with a tiny black spine at apex; phallobase stout and inflated, with a pair of membranous lobes ventrally.

Type Material Examined. Holotype ♀, [PAPUA NEW GUINEA]: Erima, Astrolabe B.; N. Guignea, Biró 1899; elongata M. [Melichar's handwriting], det. Melichar (HNHM) [examined on behalf of authors by Andras Orosz].

Other Material Examined. PAPUA NEW GUINEA: 1♂, Madang Province, Nobonob Hill (7 km NW Madang) (5° 10' S, 145° 45' E), 2.iii.1987 (Norman D. Penny) (CAS); 1♀, NEW GUINEA: NE. Bainyik, 150 m, S. of Maprik, 12.i.1960 (T. C. Maa) (BPBM). [INDONESIA:] 1♀, Dutch New Guinea: Humboldt Bay Dist., Pukusam Dist., West of Tami River., vi.1937, W. Stüber, B. M. 1938-177 (BMNH).

Remarks. This species is similar to *D. moluccana* (Kirkaldy) in the male genitalic structure, especially the pygofer with posterior margin strongly produced posteriorly and forming a relatively long, robust, conical process in middle in lateral view (Figs. 6E, 9E), but can be distinguished from the latter by its frons and genae with several reddish speckles and the aedeagus with the phallical processes relatively shorter and smaller (Fig. 6E, H, I).

Distribution. Papua New Guinea (Madang Province, Bainyik), Indonesia (Pukusam) (Fig. 13). This species represents the eastern distribution limit of *Dictyomorpha*.

² *Dictyomorpha hectica* Haupt is not included in the key because specimens of this species were not available for inclusion in this study.

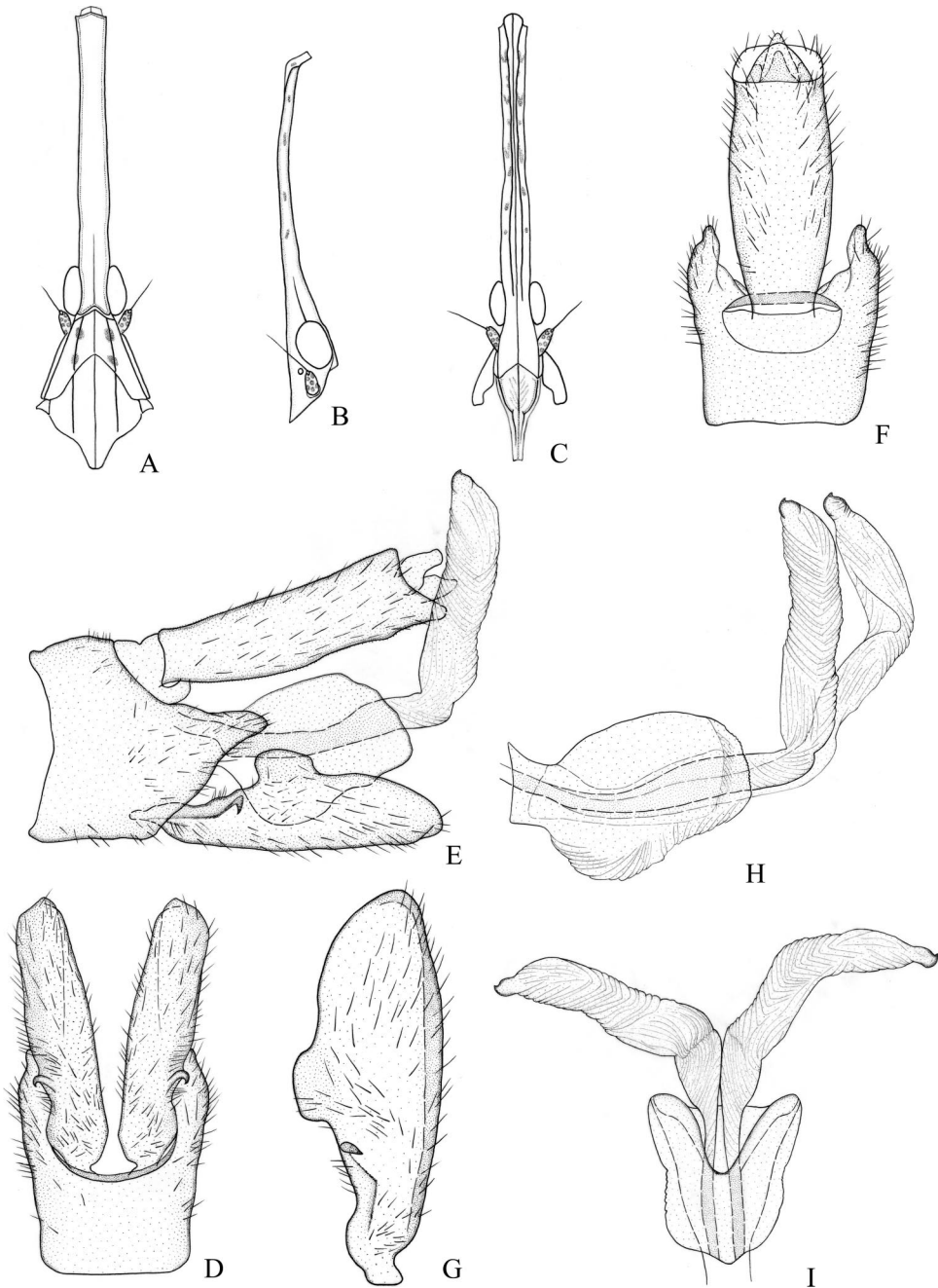


Fig. 6. *Dictyomorpha elongata* Melichar. (A) Head, pronotum and mesonotum, dorsal view. (B) Head, lateral view. (C) Head, ventral view. (D) Pygofer and parameres, ventral view. (E) Male genitalia, lateral view. (F) Pygofer and anal tube, dorsal view. (G) Paramere, lateral view. (H) Aedeagus, lateral view. (I) Aedeagus, ventral view.

Dictyomorpha furca sp. nov
(Figs. 2D, 7, 13)

Description. Relatively smaller species, ♂, BL: 16.4 mm; HL: 5.2 mm; HW: 1.1 mm; FWL: 9.8 mm. Female unknown.

General color as in generic description; vertex, frons, and genae with lateral margins very narrowly

sanguineous; vertex with two pairs of symmetrical sanguineous speckles at base; pronotum with reddish markings at apex.

External characters as in generic description. Head (Fig. 7A–C) with length ratio of cephalic process to pronotum and mesonotum combined $\approx 2.1:1$. Antenna (Fig. 7A–C) with pedicel relatively shorter and

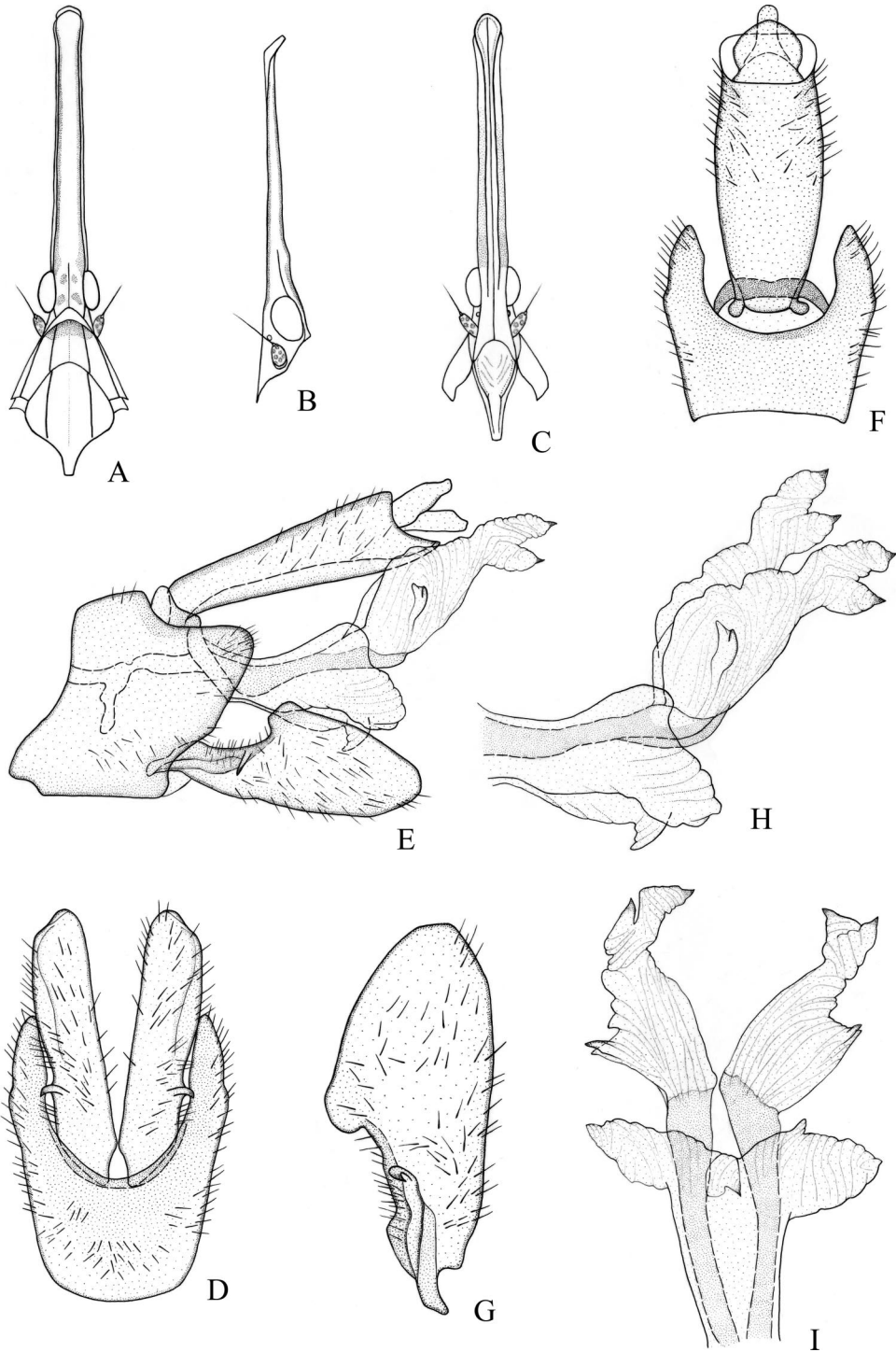


Fig. 7. *Dictyomorpha furca* sp. nov. (A) Head, pronotum and mesonotum, dorsal view. (B) Head, lateral view. (C) Head, ventral view. (D) Pygofer and parameres, ventral view. (E) Male genitalia, lateral view. (F) Pygofer and anal tube, dorsal view. (G) Paramere, lateral view. (H) Aedeagus, lateral view. (I) Aedeagus, ventral view.

smaller than that of other *Dictyomorpha* species. Pronotum (Fig. 7A) with disc relatively convex, median, and lateral longitudinal carinae inconspicuous. Me-

sonotum (Fig. 7A) with median carina very obscure and nearly invisible, lateral carinae distinct and complete. Hind tibiae with 1 + 4 lateral spines.

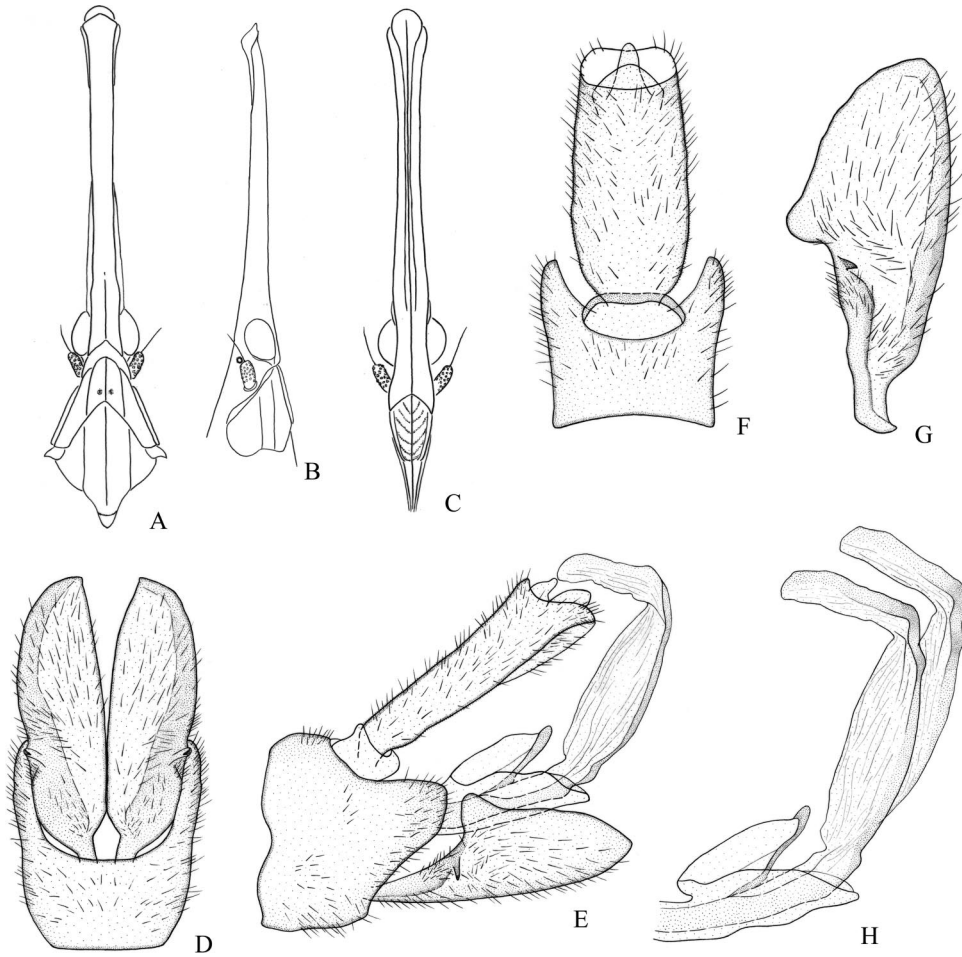


Fig. 8. *Dictyomorpha laosensis* sp. nov. (A) Head, pronotum and mesonotum, dorsal view. (B) Head, lateral view. (C) Head, ventral view. (D) Pygofer and parameres, ventral view. (E) Male genitalia, lateral view. (F) Pygofer and anal tube, dorsal view. (G) Paramere, lateral view. (H) Aedeagus, lateral view.

Male Genitalia. Pygofer (Fig. 7D–F) with posterior margin broadly produced posteriorly with apex of posteriorly produced part stout and obtuse in lateral view (Fig. 7E). Anal tube (Fig. 7E, F) with ratio of length to width at middle $\approx 2.0:1$ in dorsal view (Fig. 7F). Parameres (Fig. 7D, E, G) with upper process short and obtuse in lateral view. Aedeagus (Fig. 7E, H, I) with phallical processes in lateral view relatively short, somewhat large and robust, directed dorsoposteriorly, middle part strongly inflated, with two small, acute processes on lateral edge, subapically distinctly constricted, and apical part distinctly forked with two branches ended with a tiny black spine at apex; phallobase with a pair of membranous lobes directed lateroventrally and a middle small lobe directed ventrally, acute apically.

Etymology. This species is named for its aedeagus with the phallical processes forked apically (Fig. 7E, H).

Type Material Examined. Holotype δ , CHINA: Yunnan Province, Ruili (24° 0' N, 97° 8' E), Mengxiu, 2 May 1981 (F.S. Li) (IZCAS).

Remarks. This species can be distinguished easily from all other known species in the genus by its relatively smaller size; the relatively short and small antennal pedicel; the hind tarsomeres I and II with 9–10 and 11–12 apical spines, respectively; and the shape of the male genitalia, especially the phallical processes distinctly forked apically (Fig. 7E, H, I).

Distribution. Southwestern China (Yunnan Province) (Fig. 13). This species represents the most northwestern distribution limit of the *Dictyomorpha* species and the first authentic record of the genus *Dictyomorpha* in China.

Dictyomorpha hectica Haupt

(Figs. 4 and 13)

Dictyomorpha hectica Haupt, 1926: 431; Metcalf, 1946: 81. Type [incomplete data], PHILIPPINES (Luzon) (depository unknown) [not examined].

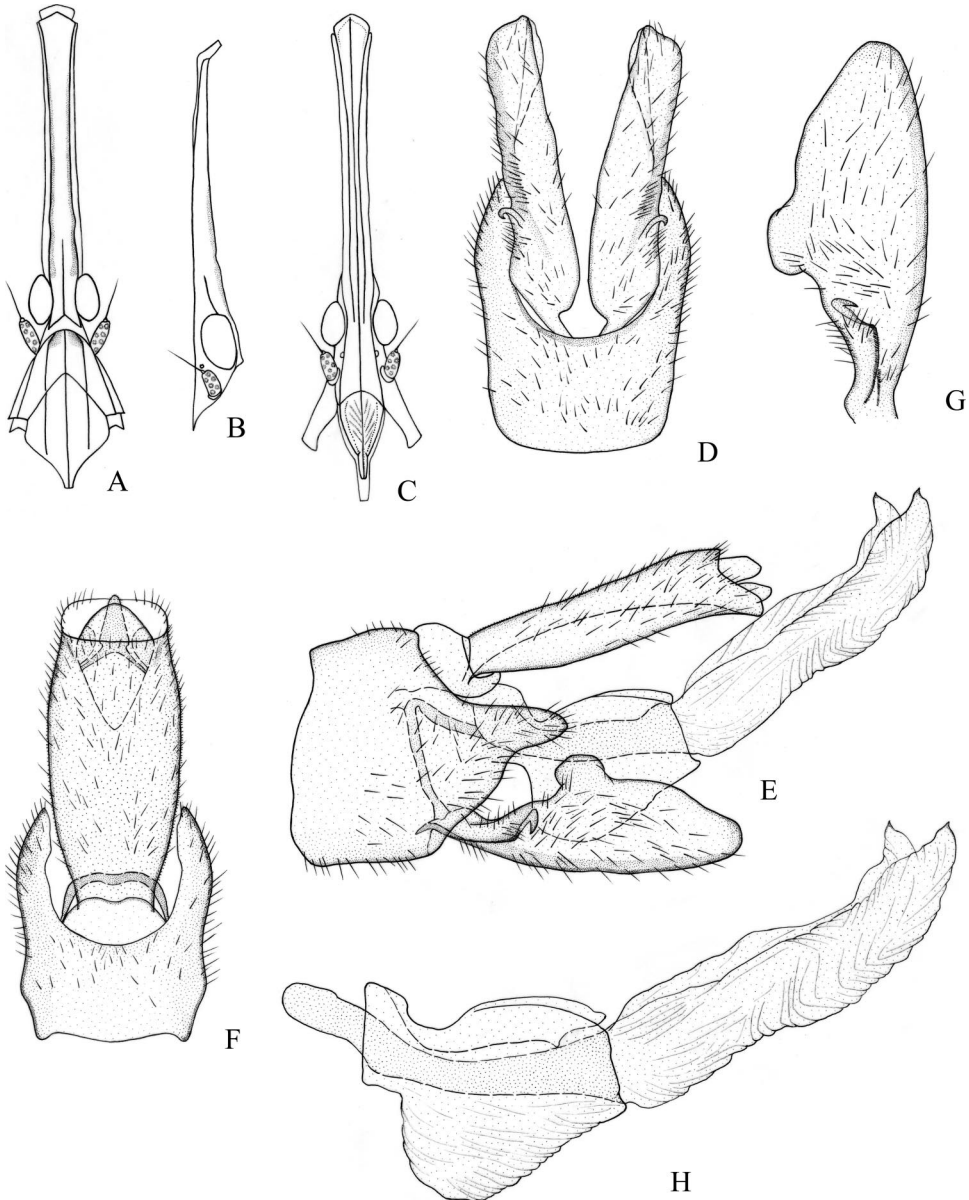


Fig. 9. *Dictyomorpha moluccana* (Kirkaldy). (A) Head, pronotum and mesonotum, dorsal view. (B) Head, lateral view. (C) Head, ventral view. (D) Pygofer and parameres, ventral view. (E) Male genitalia, lateral view. (F) Pygofer and anal tube, dorsal view. (G) Paramere, lateral view. (H) Aedeagus, lateral view.

Description. BL: 18.0 mm; HL: 5.5 mm; length of pronotum and mesonotum combined: 3 mm; FWL: 11 mm.

Body including wings and legs green; spines on legs fully green; only eyes and claws brown. Vertex with median carina somewhat distinct between eyes and the remainder nearly invisible; all other carinae on head, pronotum and mesonotum as in *D. elongata*; wing venation identical to that of *D. elongata* (from Haupt, 1926: 431–432).

Fifth-Instar Nymph. Pronotum with nine larger sensory pits and six smaller sensory pits between median

longitudinal carina and lateral carinae and five larger sensory pits between lateral carinae and upper lateral carinae, respectively. Mesonotum with five sensory pits outside lateral carinae. Metanotum with six sensory pits outside lateral carinae. Forewing pads each with four sensory pits arranged in a longitudinal line in middle. Legs very elongate and slender.

Abdominal tergites IV–VI each side with 3, 6, 4 sensory pits between lateral carinae and median carina, with 11, 10, 4 sensory pits between lateral margin and lateral carinae, respectively; sensory pits on tergite VI smaller than those on tergites IV–V (Fig.

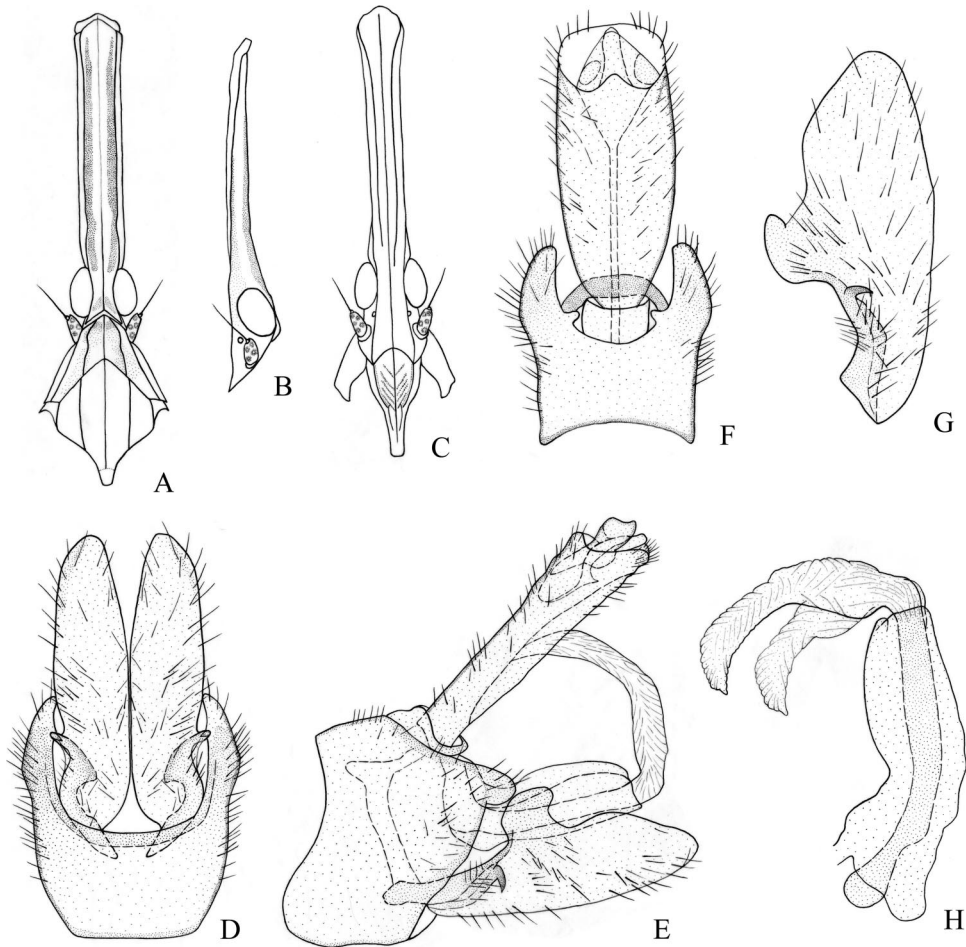


Fig. 10. *Dictyomorpha sulawesiensis* sp. nov. (A) Head, pronotum and mesonotum, dorsal view. (B) Head, lateral view. (C) Head, ventral view. (D) Pygofer and parameres, ventral view. (E) Male genitalia, lateral view. (F) Pygofer and anal tube, dorsal view. (G) Paramere, lateral view. (H) Aedeagus, lateral view.

4). Structure of wax-secreting plates and wax glands as shown in Fig. 4 (also see the generic description).

The apical part of the cephalic process of this nymph specimen is missing, so the number of sensory pits on cephalic process cannot be calculated in this study.

Material Examined. PHILIPPINES: one nymph, Los Banos, P. I., September 1915 (BPBM).

Remarks. *Dictyomorpha hectica* was described by Haupt (1926) from Mt. Banahao, Laguna, Luzon, Philippines, based on an unspecified number and sex of the specimens. We were unable to examine the type specimens of this species. We tentatively identified the nymph specimen collected from Los Banos in Philippines as this species.

Haupt (1926) stated that *D. hectica* is very similar to *D. elongata* Melichar and that *D. hectica* differs from *D. elongata* in the cephalic process somewhat expanded subapically and then angulately convex into a right angle at apex.

Distribution. Philippines (Luzon, Los Banos) (Fig. 13).

***Dictyomorpha laosensis* sp. nov**

(Figs. 2E, 8, 13)

Description. ♂, BL: 19.1 mm; HL: 6.5 mm; HW: 1.3 mm; FWL: 10.7 mm. Female unknown.

General color as in generic description.

External characters as in generic description (Fig. 2E). Head (Figs. 2E, 8A–C) with length ratio of cephalic process to pronotum and mesonotum combined $\approx 2.0:1$. Pronotum and mesonotum with median and lateral carinae conspicuous. Hind tibiae with 1 + 3 lateral spines.

Male Genitalia. Pygofer (Fig. 8D–F) with posterior margin broadly produced posteriorly and forming a broad, stout, and obtuse process in lateral view (Fig. 8E). Anal tube (Fig. 8E, F) relatively short and stout, with ratio of length to width at middle $\approx 1.9:1$ in dorsal view (Fig. 8F). Parameres (Fig. 8D, E, G) with upper process on upper margin relatively small and obtuse, directed anterodorsally in lateral aspect. Aedeagus (Fig. 8E, H) with phallic processes with basal 2/3 broad in antero-posterior view and directed dorso-

posteriorly, strongly constricted at apical 1/3 and then directed dorsoanteriorly, apical 1/3 narrow with an obtuse apex; phallobase with a pair of membranous lobes ventrally and three membranous lobes dorsally in lateral view (Fig. 8H), with middle lobe small and directed dorsoposteriorly.

Material Examined. Holotype ♂, LAOS: Vientiane Prov., Phou Kou Khouei, Ban Van Eue, 15 April 1965 (J.L. Gressitt) (BPBM).

Etymology. This species is named for its occurrence in Laos.

Remarks. This new species is similar to *D. unifasciata* Liang, sp. nov. from Vietnam, but can be distinguished from the latter by the body relatively larger (body length 19.1 mm); the anal tube relatively short with ratio of length to width $\approx 1.9:1$ in dorsal view (Fig. 8F); phallical processes without a narrow, pigmented fascia on posterior edge in lateral view (Fig. 8E, H).

Distribution. Laos (Vientiane Province) (Fig. 13).

Dictyomorpha moluccana (Kirkaldy), comb. nov

(Figs. 2F, 3, 5B, 9, 13)

Amboina moluccana Kirkaldy, 1913: 16; Metcalf, 1946: 86. Holotype ♂, Indonesia (Amboina Island) (BPBM) [examined].

Redescription. ♂, BL: 17.4 mm; HL: 5.6 mm; HW: 1.2 mm; FWL: 10.0 mm. Female unknown.

General color as in generic description, but vertex with lateral margins very narrowly sanguineous and pronotum with pair of blackish markings at apex.

External characters as in generic description (Fig. 2F). Head (Figs. 2F, 9A) with length ratio of cephalic process to pronotum and mesonotum combined $\approx 2.1:1$. Hind tibiae with 1 + 4 lateral spines.

Male Genitalia. Pygofer (Fig. 9D–F) with posterior margin strongly produced posteriorly and forming a relatively long, robust, conical process in middle in lateral view (Fig. 9E). Anal tube (Fig. 9E, F) with ratio of length to width at middle $\approx 2.3:1$ in dorsal view (Fig. 9F). Parameres (Fig. 9D, E, G) with upper process on upper margin relatively broad and large in lateral view. Aedeagus (Fig. 9E, H) with phallical processes elongate, much expanded, and stout, directed dorsoposteriorly, acute apically in lateral view; phallobase with a pair of membranous lobes ventrally.

Type Material Examined. Holotype ♂, [INDONESIA]: Amboina, no date, F. Muir (BPBM). Paratype: 1♂, Amboina, no date, F. Muir, [yellow label] Paratype (BPBM).

Other Material Examined. 1♂, [INDONESIA]: NEW GUINEA: NETH. Vogelkop: Fak Fak, S. coast of Bomberai, 10–100 m, 11 June 1959 (T. C. Maa) (BPBM).

Remarks. This species is similar to *D. elongata* Melichar in the pygofer with the posterior margin strongly produced posteriorly and forming a relatively long, robust, conical process in middle in lateral view (Figs. 8E, 9E), but can be distinguished from the latter by its frons and genae without reddish speckles and

the aedeagus with the phallical processes relatively larger, longer, more expanded, and stout (Fig. 9E, H).

Distribution. Indonesia (Amboina, Vogelkop).

Dictyomorpha sulawesiensis sp. nov

(Figs. 1C, 2G, H, 4, 10, 13)

Description. *Adult.* ♂, BL: 17.8–17.9 mm; HL: 4.7–5.2 mm; HW: 1.1–1.2 mm; FWL: 10.4–11.4 mm. ♀, BL: 17.3 mm; HL: 5.0 mm; HW: 1.2 mm; FWL: 10.8 mm.

General color as in generic description; both vertex and genae with lateral margins very narrowly sanguineous.

External characters as in generic description (Fig. 2G). Head (Figs. 2G, 10A–C) with vertex relatively broad, with length ratio of cephalic process to pronotum and mesonotum combined $\approx 2.1:1$. Hind tibiae with 1 + 4 lateral spines.

Male Genitalia. Pygofer (Fig. 10D–F) with posterior margin moderately produced posteriorly with posteriorly produced part obtuse apically in lateral view (Fig. 10E). Anal tube (Fig. 10E, F) with ratio of length to width at middle $\approx 2.0:1$ in dorsal view (Fig. 10F). Parameres (Fig. 10D, E, G) with upper process on upper margin relatively long and large, apex directed posteriorly in lateral view. Aedeagus (Fig. 10E, H) with phallical processes relatively short, small, elongate, and slender, turned dorsoposteriorly in lateral view, with apical half distinctly slender, directed anterodorsally, and ended with fine acute apex, and basal half slightly dilated and directed dorsally in lateral view; phallobase relatively narrow and elongate, without membranous lobes dorsally and ventrally (Fig. 10H).

Fifth-Instar Nymph. ♀, BL: 14.8 mm; HL: 5.4 mm; HW: 1.1 mm. General color similar to adults; basal vertex and pronotum with four symmetrical reddish speckles; frons with areas between lateral margins and lateral carinae marked with several symmetrical reddish stripes (Figs. 1C, 2H).

Cephalic process with ≈ 26 sensory pits on apical part; frons with ≈ 45 sensory pits on each lateral side (Figs. 1C, 2H).

Pronotum with eight larger sensory pits and eight smaller sensory pits between lateral carinae and upper lateral carinae and six larger sensory pits between upper lateral carinae and lower lateral carinae, respectively. Forewing pads each with six sensory pits near mesonotum; hindwing pads each with six sensory pits near metanotum (Figs. 1C, 2H).

Abdominal tergites IV–VI each side with 4, 6, and 4 sensory pits between lateral carinae and median carina and 10, 9, and 6 sensory pits between lateral margin and lateral carinae, respectively; sensory pits on tergite VI smaller than those on tergites IV–V (Figs. 1C, 2H); tergites VI–VIII covered with very large wax-secreting plates and numerous very fine, flower-shaped wax gland pores (Figs. 1C, 2H, 4A–D; see also the description of the fifth-instar nymph under the generic description above).

Type Material Examined. Holotype ♂, INDONESIA: Sulawesi Utara, Dumoga-Bone N. P., May and

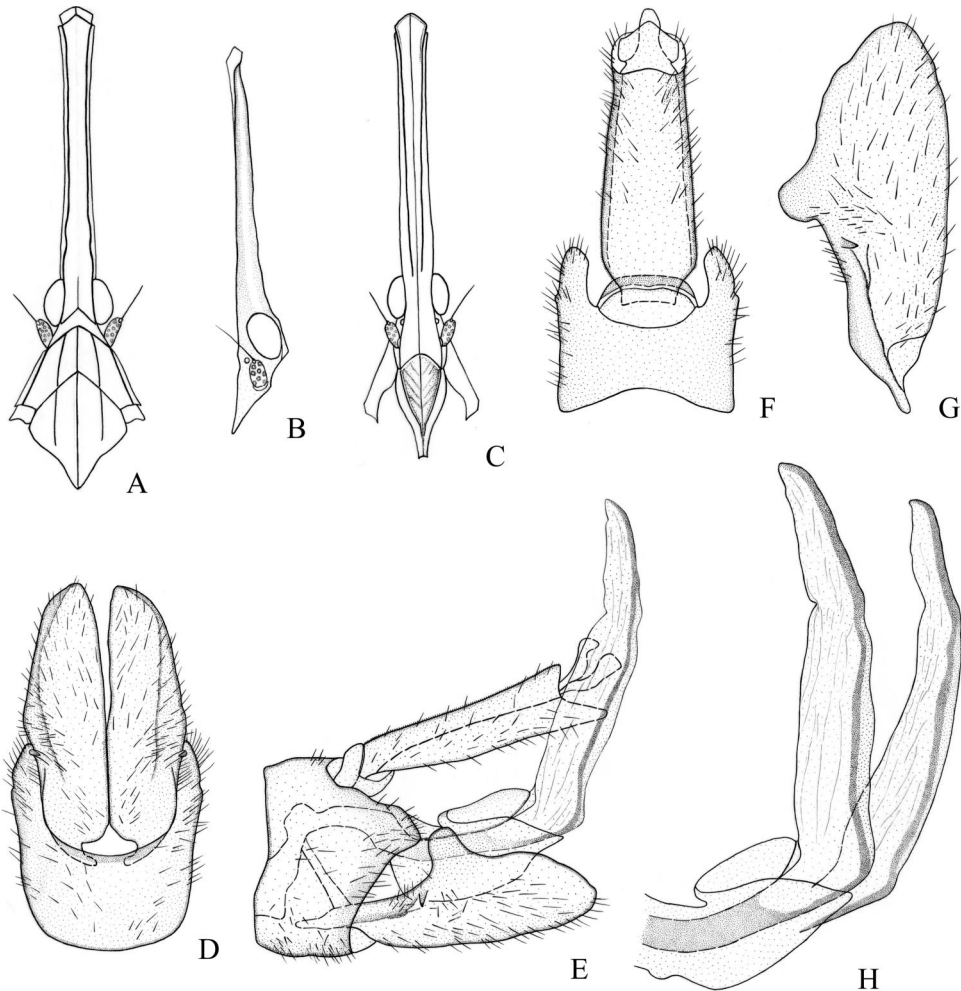


Fig. 11. *Dictyomorpha unifasciata* Liang, sp. nov. (A) Head, pronotum and mesonotum, dorsal view. (B) Head, lateral view. (C) Head, ventral view. (D) Pygofer and parameres, ventral view. (E) Male genitalia, lateral view. (F) Pygofer and anal tube, dorsal view. (G) Paramere, lateral view. (H) Aedeagus, lateral view.

June 1985; Malaise trap, up tree; 1,440 feet Camp, 15 May–29 June [19]85 (BMNH). Paratypes: 1♂, INDONESIA: Sulawesi Utara, Dumoga-Bone N. P., 6–13 July 1985; Flight interception trap, Plot A (BMNH); 1♀, Sulawesi, N. Coast, 24 February 1985, R. Ent. Soc. Lond. Project Wallace B. M. 1985–10 (BMNH); 1♂, Celebes: Bantimurung, 40 km N.E. Makassar, el. 200, 3 August 1966 (L. & P. Swan) (CAS).

Other Material Examined. INDONESIA: one nymph, Makassar, 4–1903 (F. Muir) (BPBM).

Etymology. This species is named for its occurrence in Sulawesi, Indonesia.

Remarks. This new species is similar to *D. elongata* Melichar and *D. moluccana* (Kirkaldy), but can be distinguished from the latter two species by the male pygofer with posterior margin moderately produced posteriorly with the apex of the posteriorly produced part obtuse in lateral view (Fig. 10E) and by the difference in the shape of the aedeagus and parameres (Fig. 10E, G, H).

Distribution. Indonesia (Sulawesi) (Fig. 13).

Dictyomorpha unifasciata Liang, sp. nov.
(Figs. 1A, B; 2I, J; 11; 13)

Description. *Adult* (Figs. 1A, 2I). ♂, BL: 17.0 mm; HL: 5.5 mm; HW: 1.2 mm; FWL: 9.6 mm. ♀, BL: 18.1 mm; HL: 5.0 mm; HW: 1.1 mm; FWL: 10.2 mm.

General color as in generic description.

External characters as in generic description (Fig. 2I). Head (Figs. 2I, 11A–C) with length ratio of cephalic process to pronotum and mesonotum combined $\approx 2.0:1$. Pronotum and mesonotum with median and lateral longitudinal carinae distinct and complete. Hind tibiae with 1 + 3 lateral spines.

Male Genitalia. Pygofer (Fig. 11D, F) similar to *D. laosensis* sp. nov., with posterior margin moderately produced posteriorly with posteriorly produced part somewhat stout and obtuse in lateral view (Fig. 11E). Anal tube (Fig. 11E, F) elongate and slender, with

ratio of length to width at base $\approx 2.3:1$ in dorsal view (Fig. 11F). Parameres (Fig. 11D, E, G) with upper process on upper margin relatively long and obtuse in lateral aspect. Aedeagus (Fig. 11E, H) somewhat similar to *D. laosensis* sp. nov.; phallical processes somewhat elongate and robust, base broad, gradually narrowing to apex, directed dorsoposteriorly, weakly excavated on anterior edge at apical one-thirds and then slightly turned dorsally or somewhat anterodorsally in lateral view, with a narrow pigmented fascia running from base to apex on posterior edge in lateral view; phallobase with a pair of membranous lobes ventrally and three membranous lobes dorsally in lateral view (Fig. 11H) with middle lobe above phallobase small and directed dorsoposteriorly.

Fifth-Instar Nymph. ♀, BL: 14.2 mm; HL: 5.1 mm; HW: 0.9 mm. General color similar to adults; frons with areas between lateral carinae reddish; abdominal segments with several symmetrical reddish speckles or stripes (Figs. 1B, 2J).

Cephalic process with ≈ 26 sensory pits on apical part, frons with ≈ 45 sensory pits on each lateral side (Figs. 1B, 2J).

Pronotum with nine larger sensory pits and seven smaller sensory pits between upper lateral carinae and lateral carinae, with five larger sensory pits between lower lateral carinae and upper lateral carinae, respectively. Forewing pads each with six sensory pits near mesonotum; hindwing pads each with seven sensory pits near metanotum. Legs similar to adults, very elongate, and slender (Figs. 1B, 2J).

Abdominal tergites IV–VI each side with 4, 7, 4 sensory pits between lateral carinae and median carina and 11, 10, 4 sensory pits between lateral margin and lateral carinae, respectively; sensory pits on tergite VI smaller than those on tergites IV–V (Figs. 1B, 2J); tergites VI–VIII covered with very large wax-secreting plates and numerous very fine, flower-shaped wax gland pores (Fig. 1B; see also the description of the fifth-instar nymph under the generic description above).

Type Material Examined. Holotype ♂, VIETNAM: DaiLanh, N. of Nha Trang, 30 November–5 December 1960 (C. M. Yoshimoto) (BPBM). Paratype. VIETNAM: 1 ♀, Dalat, 6 km S., 1,400–1,500 m, 9 June–7 July 1961 (N. R. Spencer) (BPBM).

Other Material Examined. VIETNAM: one female nymph, Blao (Balao), 500 m, 14–21 October 1960 (C. M. Yoshimoto) (BPBM).

Etymology. This species is named for the presence of a narrow, pigmented fascia on posterior edge of the phallical processes in lateral view (Fig. 11E, H).

Remarks. This new species is similar to *D. laosensis* sp. nov. from Laos in having the aedeagus with the phallobase with three membranous lobes dorsally in lateral view (Figs. 8H; 11E, H) with the middle lobe small and directed dorsoposteriorly. This new species can be distinguished from *D. laosensis* sp. nov. by its relatively smaller body (length 17.0 mm); anal tube relatively longer with ratio of length to width $\approx 2.3:1$ in dorsal view (Fig. 11F); and the aedeagus with phallical processes with a narrow, pigmented fascia run-

ning from base to apex on the posterior edge in lateral view (Fig. 11E, H).

Distribution. Vietnam (Nha Trang, Dalat, Blao) (Fig. 13).

Genus *Indodictyophara* gen. nov

Type Species. *Indodictyophara lobosa* sp. nov., by present designation.

Description. Relatively elongate dictyopharid species, length (from apex of cephalic process to tip of forewings) ♂ 19.3 mm, ♀ 20.4 mm (Fig. 2K, L). General color ochraceous in dead, dried specimens (probably green or stramineous green in life). External appearance (Fig. 2K, L) similar to *Dictyomorpha*, but cephalic process relatively short, forewings with subcostal area with more oblique transverse veins (Fig. 5C), and male genitalic structure distinct.

Head (Figs. 2K, L; 12A–C) elongate and slender, nearly 1.3 times as long as pronotum and mesonotum combined. Cephalic process somewhat compressed dorsoventrally, flat and narrowing from base to apex in lateral view (Fig. 12B). Vertex (Fig. 12A) with lateral margins carinate, median carina only visible basally; posterior margin angulately concave at $\approx 90^\circ$, slightly dilated beyond posterior margin of eyes; lateral margins distinctly narrowed and constricted between eyes, a little expanded before eyes, and slightly widening at apex. Frons (Fig. 12C) with lateral margins carinate; lateral and median carinae strongly ridged and blade-like, areas between lateral carinae and median carina deeply grooved; lateral carinae converging posteriorly and reaching to eyes. Postclypeus and anteclypeus (Fig. 12C) convex medially, with median carina.

Pronotum (Fig. 12C) narrow and elongate; anterior margin slightly centrally arched, lateral marginal areas straight and sloping, posterior margin strongly angulately concave at $\approx 90^\circ$; disc tricarinate, median and lateral longitudinal carinae distinct and complete; lower lateral carinae between eyes and tegulae conspicuous and visible in dorsal view. Mesonotum (Fig. 12C) tricarinate on disc, lateral carinae nearly parallel. Forewings (Figs. 2K, L; 5C) similar to *Dictyomorpha*, hyaline, nearly three times as long as the broadest; apical third reticulate, broadened inward and more or less overlapped distally when forewings are in repose; vein Cu branching before veins Sc + R and M; stigma absent, with ≈ 10 oblique veins on subcostal area (Fig. 5C); clavus unclosed, claval suture not reaching to posterior margin of forewings. Legs very elongate and slender; fore femora distinctly elongate and spineless; hind tibiae with 1 + 3 lateral black-tipped spines and seven apical black-tipped spines; hind tarsomeres I and II with six and seven black-tipped apical spines, respectively.

Abdomen elongate, pregenital segment (the segment before pygofer) short.

Male genitalia see *Indodictyophara lobosa* sp. nov. below.

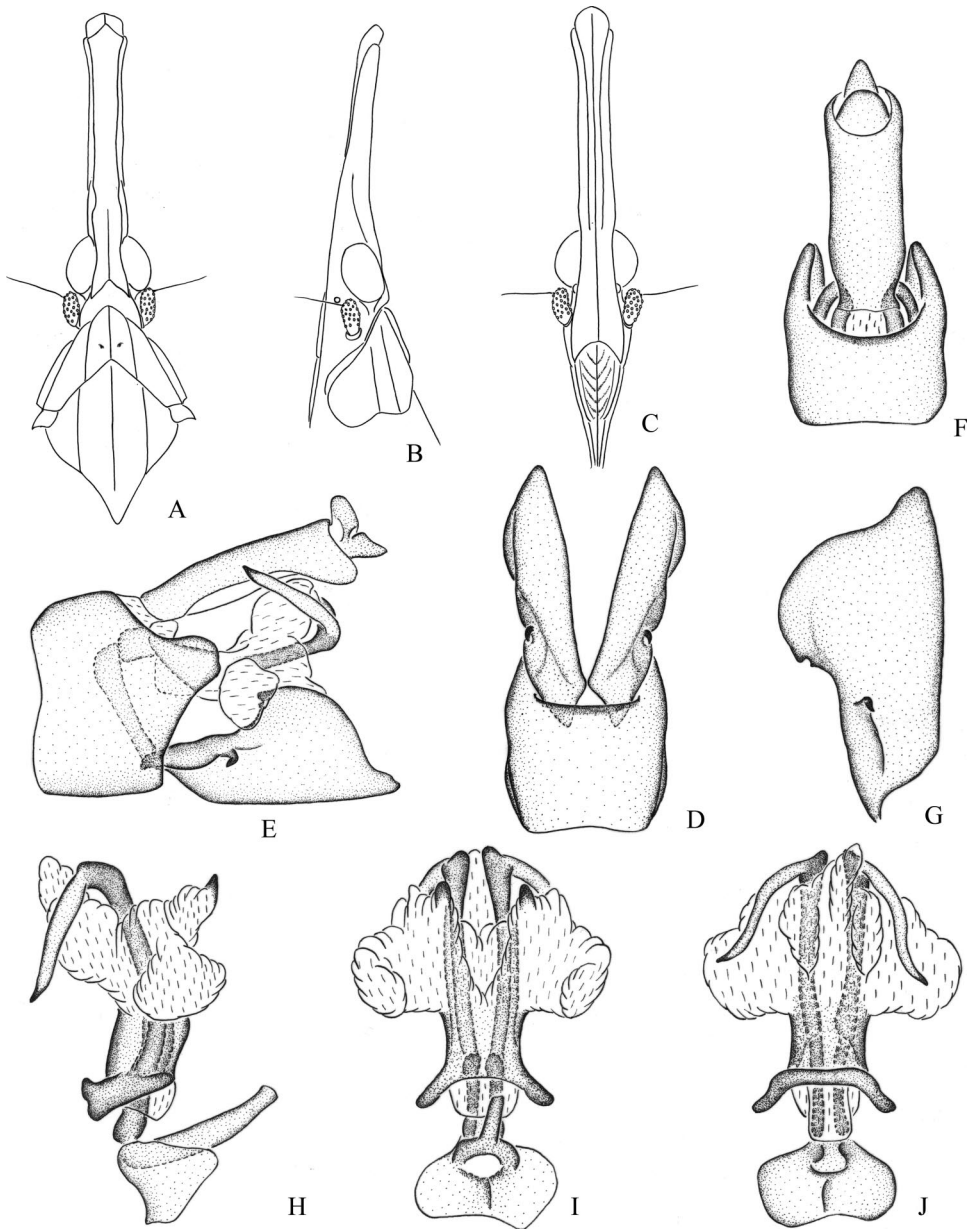


Fig. 12. *Indodictyophara lobosa* sp. nov. (A) Head, pronotum and mesonotum, dorsal view. (B) Head, lateral view. (C) Head, ventral view. (D) Pygofer and parameres, ventral view. (E) Male genitalia, lateral view. (F) Pygofer and anal tube, dorsal view. (G) Paramere, lateral view. (H) Aedeagus, lateral view. (I) Aedeagus, ventral view. (J) Aedeagus, dorsal view.

Etymology. The new generic name is a combination of the prefix “Indo-” (India) plus the well known generic name “*Dictyophara*”, gender: feminine.

Remarks. In general external appearance the new genus is very similar to *Dictyomorpha* and phylogenetically they may be two very closely related genera. The new genus can be distinguished from *Dictyomorpha* by the cephalic process shorter (Figs. 2K, L; 12A–C), the forewings with ≈ 10 oblique veins on subcostal area (Fig. 5C) (with six oblique veins on subapical, subcostal area in *Dictyomorpha* (Fig. 5A, B), and the

aedeagal structure, especially the phallical processes distinctly short, slender, sclerotized and not inflated (Fig. 12H–J) (phallical processes elongate, large, membranous, and inflated in *Dictyomorpha*).

The new genus and *Dictyomorpha* are very similar to *Aluntia* Stål in having the following characters: the body elongate and slender with very elongate and dorsoventrally compressed cephalic process; pronotum with distinct and complete median and lateral carinae; forewings with open clavus and stigma absent; and the legs elongate and slender with hind tibiae with

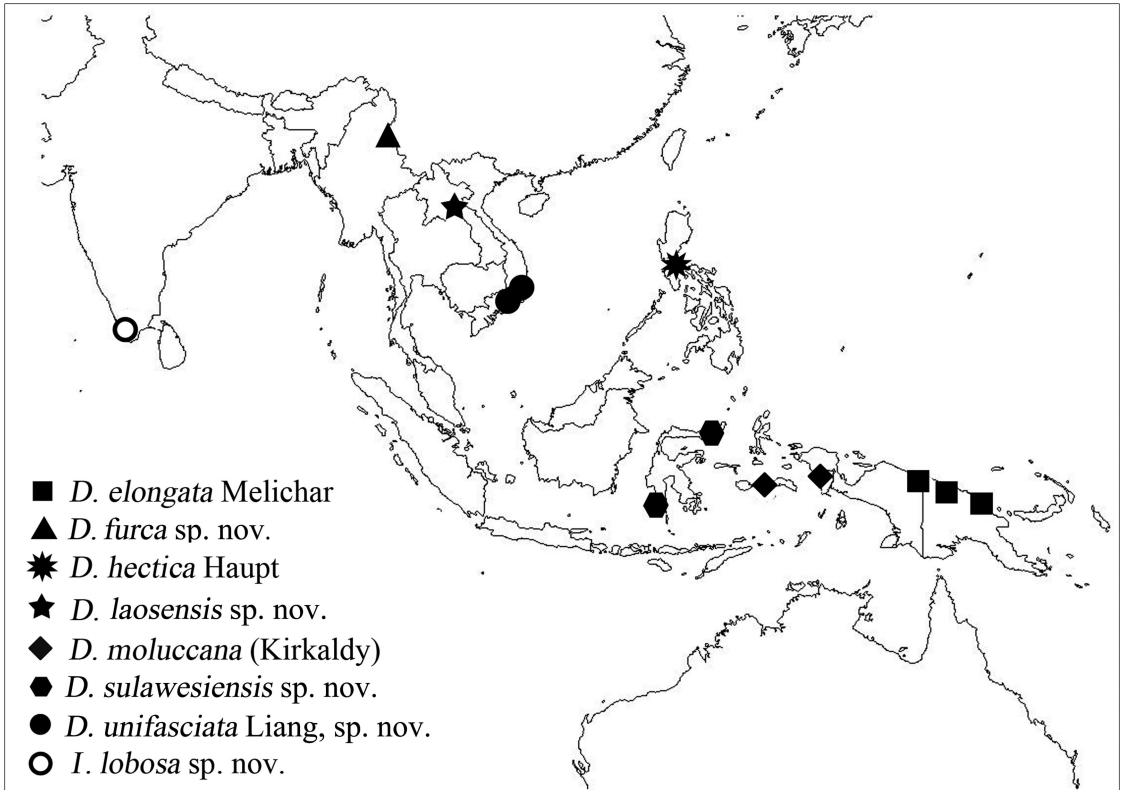


Fig. 13. Geographic distribution of the species of *Dictyomorpha* and *Indodictyophara* gen. nov.

seven apical spines. We here tentatively place the new genus *Indodictyophara* in the tribe Aluntiini.

Distribution. Southern India (Fig. 13).

Indodictyophara lobosa sp. nov.

(Figs. 2K, L; 5C; 12; 13)

Description. ♂, BL: 19.3 mm; HL: 4.0 mm; HW: 1.3 mm; FWL: 12.9 mm. ♀, BL: 20.4 mm; HL: 4.5 mm; HW: 1.3 mm; FWL: 13.7 mm.

General color and external characters as in generic description (Fig. 2K, L).

Male Genitalia. Pygofer (Fig. 12D–F) relatively small, ventrally distinctly longer than dorsally, posterior margin produced posteriorly with apex stout, and obtuse in lateral view (Fig. 12E); dorsal margin deeply excavated to accommodate anal tube, dorsolateral margins angularly produced posteriorly in dorsal view (Fig. 12F); ventrolateral margins angularly produced posteriorly in ventral view (Fig. 12D). Anal tube (Fig. 12E, F) narrow and elongate, with ratio of length to width at middle \approx 2.3:1 in dorsal view (Fig. 12F). Anal styles very short and small. Parameres (Fig. 12G) symmetrical; apex distinctly expanded and broad, produced into a large process in lateral view; upper margin with a small, inward directed process and a minute, nearby spinous process in lateral view (Fig. 12G); outer upper edge with a very small ventrally directed, hook-like process near middle. Aedeagus (Fig. 12E,

H–J) distinctly shorter and smaller than that of *Dictyomorpha* species, with a pair of distinctly spinous, sclerotized, tip-blackened, anterodorsally directed phallic processes in lateral view; phallobase short and stout, with two pairs of membranous lobes ventrally (in lateral and ventral views, outer pair of lobes large, directed laterally, with apical part turned ventrally and inner pair of lobes directed posteriorly, with apex acute and pigmented) and three membranous lobes dorsally (in lateral and dorsal views, two lateral lobes small and oval and middle lobe slender, acute, and directed dorsoposteriorly).

Material Examined. Holotype ♀, [INDIA]: Travancore, Pirmed, 3,400 feet, 4–6 April 1937 (B. M.–C. M. Expdn. to South India, April–May 1937) (NHMD). Paratype: [INDIA]: 1 ♀, S. India, Coimbatore Dist., Bolampatti Valley, 20 April 1937 (B. M.–C. M. Expdn. to South India, April–May 1937) (NHMD).

Etymology. This species is named for its aedeagus with phallobase having relatively numerous membranous lobes (Fig. 12H–J).

Distribution. Southern India (Travancore, Coimbatore) (Fig. 13).

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