

urn:lsid:zoobank.org:pub:F5FB7824-F4E2-4E40-8D0D-D7D87851C59A

Belgian Journal of Entomology

***Polydictya* lanternflies of the Indochinese region: Six new species and identification key (Hemiptera: Fulgoromorpha: Fulgoridae)**

Jérôme CONSTANT¹ & Hong Thai PHAM²

¹ Royal Belgian Institute of Natural Sciences, O.D. Phylogeny and Taxonomy, Entomology, Vautier street 29,
B-1000 Brussels, Belgium. E-mail: jerome.constant@naturalsciences.be (corresponding author)

urn:lsid:zoobank.org:author:6E6072A1-9415-4C8D-8E60-2504444DB290

² Vietnam National Museum of Nature, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet
Street, Hanoi, Vietnam. Email: phamthai@vnmn.vast.vn

urn:lsid:zoobank.org:author:E34CB863-7E3B-4E8F-8738-B41C07D9F5F9



ISSN: 1374-5514 (Print Edition)

ISSN: 2295-0214 (Online Edition)



The Belgian Journal of Entomology is published by the Royal Belgian Society of Entomology, a non-profit association established on April 9, 1855.

Head office: Vautier street 29, B-1000 Brussels.



The publications of the Society are partly sponsored by the University Foundation of Belgium.

In compliance with Article 8.6 of the ICZN, printed versions of all papers are deposited in the following libraries:

- Royal Library of Belgium, Boulevard de l'Empereur 4, B-1000 Brussels.
- Library of the Royal Belgian Institute of Natural Sciences, Vautier street 29, B-1000 Brussels.
- American Museum of Natural History Library, Central Park West at 79th street, New York, NY 10024-5192, USA.
- Central library of the Museum national d'Histoire naturelle, rue Geoffroy Saint-Hilaire 38, F-75005 Paris, France.
- Library of the Muséum d'Histoire naturelle de Genève, route de Malagnou 1, CH-1208 Genève, Suisse.
- Zoological Record, Thomson Reuters, Publication Processing, 1500 Spring Garden Street, Fourth Floor, Philadelphia PA 19130, USA.

Front cover: New species of *Polydictya* Guérin-Méneville, 1844 from the Indochinese region, holotypes. Upper row, left to right: *P. draysapensis* sp. nov., *P. khmera* sp. nov., *P. laotiana* sp. nov. Bottom row, left to right: *P. nami* sp. nov., *P. nigrifrons* sp. nov., *P. thompsoni* sp. nov.

***Polydictya* lanternflies of the Indochinese region: Six new species and identification key (Hemiptera: Fulgoromorpha: Fulgoridae)**

Jérôme CONSTANT¹ & Hong Thai PHAM²

¹ Royal Belgian Institute of Natural Sciences, O.D. Phylogeny and Taxonomy, Entomology, Vautier street 29, B-1000 Brussels, Belgium. E-mail: jerome.constant@naturalsciences.be (corresponding author)
urn:lsid:zoobank.org:author:6E6072A1-9415-4C8D-8E60-2504444DB290

² Vietnam National Museum of Nature and Graduate School of Science and Technology, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet Street, Hanoi, Vietnam. E-mail: phamthai@vnmn.vast.vn
urn:lsid:zoobank.org:author:E34CB863-7E3B-4E8F-8738-B41C07D9F5F9

Abstract

Six new species of *Polydictya* Guérin-Méneville, 1844 are described from the Indochinese region: *P. draysapensis* sp. nov., *P. nami* sp. nov. and *P. nigrifrons* sp. nov. from Vietnam, *P. khmera* sp. nov. from Cambodia, *P. laotiana* sp. nov. from Laos and *P. thompsoni* sp. nov. from Thailand. The genitalia of the new species are described and illustrated as well as those of *P. chantrainei* Nagai & Porion, 2004 for comparison. Photographs of habitus and details, a distribution map and photographs of specimens in nature when available, are provided. A checklist and an identification key to the 13 species of *Polydictya* recorded from the Indochinese region, are given. The first record of trophobiosis of a species of *Polydictya* with Formicidae is given and illustrated for *P. thompsoni*. Seven additional species examined for comparison are illustrated: *P. affinis* Atkinson, 1889, *P. basalis* (Hope, 1843), *P. johanna*e Lallemand, 1956, *P. kuntzi* Nagai & Porion, 2004, *P. pantherina* Gerstaecker, 1895, *P. tricolor* (Westwood, 1845) and *P. uniformis* (Walker, 1857).

Keywords: Indochina, Lanternbug, Fulgoroidea, Planthopper, Global Taxonomy Initiative, trophobiosis, Formicidae.

Introduction

The family Fulgoridae contains the largest and most spectacular planthoppers, the lanternflies, and are among the most famous of all insects. It groups 142 genera and 767 species worldwide (BOURGOIN, 2019), distributed mostly in the wet tropics but with some genera extending to the temperate regions. The Oriental Region contains about 300 species, representing about 40% of the diversity of the family.

The genus *Polydictya* was erected by GUÉRIN-MÉNEVILLE (1844) to accommodate one species, *Eurybrachys basalis* Hope, 1843, described from Sylhet in Bangladesh (HOPE, 1843). Species were progressively added to the genus (BOURGOIN, 2019). The genus *Thaumastodictya*, described by KIRKALDY (1902) based on one species, *Polydictya krisna* Kirkaldy, 1902 from Sri Lanka, was synonymized under *Polydictya* by DISTANT (1906). LALLEMAND (1963), NAGAI & PORION (1996, 2004), CONSTANT & PHAM (2008, 2017), CONSTANT (2009, 2010, 2015a, 2016), CHEW KEA FOO *et al.* (2010) and BOSUANG *et al.* (2015) more recently added new species and proposed nomenclatural changes within the genus. The genus presently contains 30 species (BOURGOIN, 2019). It is widely distributed in the Oriental region: from Sri Lanka it extends over northern India, Thailand, Laos, Vietnam,

southwards to Sulawesi and its adjacent islands through Malaysia and Indonesia, but it is interestingly not recorded from the Philippines.

Seven species are currently recorded from the Indochinese Peninsula: *P. basalis* (Hope, 1843), *P. chantrainei* Nagai & Porion, 2004, *P. drumonti* Constant & Pham, 2017, *P. grootaerti* Constant & Pham, 2017, *P. johannae* Lallemand, 1956, *P. tricolor* (Westwood, 1845) and *P. vietnamica* Constant & Pham, 2008 (DISTANT, 1918; NAGAI & PORION 1996; CONSTANT & PHAM 2008, 2017).

The study of recent material in the collections of MNHN, RBINS and VNMN led to the discovery of six new species from Vietnam, Laos, Cambodia and Thailand which are here described, illustrated and keyed with the other Indochinese species.

Material and methods

The male genitalia were dissected as follows: the pygofer was cut from the abdomen of the softened specimen with a needle blade, then boiled for about one hour in a 10% solution of potassium hydroxide (KOH). The aedeagus was dissected with a needle blade and all pieces examined in ethanol, the whole placed in glycerine for preservation. Observations were done with a Leica MZ8 stereomicroscope. Pictures were taken with a Canon EOS 700D camera with Sigma DG Macro lens, stacked with the software CombineZ and optimized with Adobe Photoshop CS3. For the transcription of the labels of the types, the wording on each single label is given *verbatim* limited by square brackets. The distribution map was produced with SimpleMappr (SHORTHOUSE, 2010).

Morphological terminology follows O'BRIEN & WILSON (1985), except forewing venation following BOURGOIN *et al.* (2015) and with male terminalia nomenclature modified after BOURGOIN (1988) and BOURGOIN & HUANG (1990). The metatibiotarsal formula gives the number of spines on: (side of metatibia) apex of metatibia/apex of first metatarsomere/apex of second metatarsomere. Literature citations of the original authorities for species and higher taxa are found in FLOW (BOURGOIN, 2019) and are not included in the references for this work unless otherwise cited.

The measurements were taken as in CONSTANT (2004) with the following acronyms used:

BF	=	maximum breadth of the frons
BTg	=	maximum breadth of the tegmen
BV	=	maximum breadth of the vertex
LF	=	length of the frons in median line
LT	=	total length (apex of head to apex of tegmina)
LTg	=	maximum length of the tegmen
LV	=	length of the vertex in median line

Acronyms used for the collections

BMNH = Natural History Museum, London, United Kingdom.

FSAG = University of Liège, Gembloux Agro-Bio Technologies, Gembloux, Belgium.

MHNL = Centre de conservation et d'étude des collections, Musée des Confluences, Lyon, France.

MNHN = Muséum National d'Histoire Naturelle, Paris, France.

OUMNH = Oxford University Museum of Natural History, Oxford, United Kingdom.

RBINS = Royal Belgian Institute of Natural Sciences, Brussels, Belgium.

VNMN = Vietnam National Museum of Nature, Hanoi, Vietnam.

ZIMG = Universität Greifswald, Zoologisches Institut und Museum, Greifswald, Germany.

Results

Taxonomy

Class Hexapoda Blainville, 1816
Order Hemiptera Linnaeus, 1758
Suborder Auchenorrhyncha Duméril, 1806
 Infra-order Fulgoromorpha Evans, 1946
 Superfamily Fulgoroidea Latreille, 1807
 Family Fulgoridae Latreille, 1807

Genus *Polydictya* Guérin-Ménéville, 1844

Polydictya GUÉRIN-MÉNEVILLE, 1844: 358

Type species: *Polydictya basalis* (Hope, 1843) by monotypy.

Thaumastodictya KIRKALDY, 1902: 307

Type species: *Polydictya krisna* Kirkaldy, 1902 by original designation (junior synonym of *Polydictya pantherina* Gerstaecker, 1895)

Polydictya – WALKER, 1851: 289 [list of species]. — STÅL, 1866: 135 [key]. — ATKINSON, 1885: 155 [described]. — DISTANT, 1888: 487 [compared with *Myrilla* Distant, 1888]. — KARSCH, 1890: 63 [compared to *Anecphora* Karsch, 1890]. — GERSTAECKER, 1895: 10 [compared to *Holodictya* Gerstaecker, 1895]. — KIRKALDY, 1902: 307 [compared to *Thaumastodictya* Kirkaldy, 1902]. — MELICHAR, 1903: 71 [erroneous synonymy with *Chalia* Walker, 1858]. — DISTANT, 1906: 199 [key to Oriental genera], 215 [described, senior synonym of *Thaumastodictya*]. — KIRKALDY, 1907: 59 [note on publication date]. — SCHMIDT, 1907: 113 [compared to *Myrilla*, copied from DISTANT, 1888]. — JACOBI, 1910: 101 [compared to *Coelodictya* Jacobi, 1910]. — SCHMIDT, 1912: 71 [compared to *Coelodictya* and *Holodictya*, comments on species]. — METCALF, 1947: 84 [catalogued]. — LALLEMAND, 1963: 7 [key to genera], 14 [key to species]. — NAGAI & PORION, 1996: 13 [list of species, synonymies]. — CONSTANT & PHAM, 2008 [notes]. — CONSTANT, 2009 [notes, key to species with posterior wings red basally]. — CONSTANT, 2010 [notes]. — CONSTANT & PHAM, 2017 [new species from Vietnam; key to Indochinese species].

Thaumastodictya – MELICHAR, 1903: 71 [description]. — DISTANT, 1906: 215 [junior synonym of *Polydictya*].

The characters defining the genus were given by LALLEMAND (1963), i.e., head broad, slightly narrower than the pronotum; frons as long as broad, not carinate, largely rounded dorsally, broadened above clypeus and strongly broader than the latter; vertex at least 4 times broader than long, excavate; tegmina at least 2.5 times longer than broad, densely reticulate; clavus closed with vein Pcu+A1 extending up to sutural margin; posterior wings almost entirely reticulate; protibiae as long as femora, sometimes slightly foliaceous; posterior tibiae with 4–6 lateral spines.

Species included from Indochinese region

Polydictya basalis (Hope, 1843)

Polydictya chantrainei Nagai & Porion, 2004

Polydictya draysapensis sp. nov.

Polydictya drumonti Constant & Pham, 2017

Polydictya grootaerti Constant & Pham, 2017

*Polydictya johanna*e Lallemand, 1956

Polydictya khmera sp. nov.

Polydictya laotiana sp. nov.

Polydictya nami sp. nov.

Polydictya nigrifrons sp. nov.

Polydictya thompsoni sp. nov.

Polydictya tricolor (Westwood, 1845)

Polydictya vietnamica Constant & Pham, 2008

Note

Polydictya uniformis Walker, 1957 is removed from the list of species from the Indochinese region. It was described from Borneo (WALKER, 1857) and recorded from Thailand by NAGAI & PORION (1996) and BOSUANG *et al.* (2017) based on misidentified specimens showing a red basal area on the posterior wings, which is absent in *P. uniformis*.

Identification key to the species of *Polydictya* from the Indochinese region

1. Posterior wings with a rectangular basicostal bluish-white marking (Figs 5 A, 16A)..... **2**
– Posterior wings without rectangular basicostal bluish-white marking (Figs 1 A, 6 A)..... **4**
2. Posterior wings red basally (Figs 5 A, 16 A)..... **3**
– Posterior wings brown basally (Fig. 17 A)..... ***P. johanna*e** Lallemand, 1956
3. Tegmina bicolorous, brown with basal 1/3 pale yellowish; basal red marking of posterior wings rather well delimited (Fig. 5 A)..... ***P. draysapensis*** sp. nov.
– Tegmina brown, progressively slightly paler towards base; basal red marking of posterior wings progressively turning to brown after basal 1/4 (Fig. 16 A).....
..... ***P. basalis*** (Hope, 1843)
4. Anterior and median legs uniformly red, sometimes dark red (Fig. 20 A, C; CONSTANT & PHAM, 2017: fig. 6 A, C) **5**
– Anterior and median legs brown to black, often with a paler ring on tibiae (Figs 1 A, C, 10 A, C, 12 A, C)..... **6**
5. Basal half of tegmina with black markings, distal half mostly black; tegmina narrow, about three times as long as broad (Fig. 20 A) ***P. tricolor*** (Westwood, 1845)
– Basal 2/3 of tegmina without black markings, distal 1/3 brown; tegmina rather broad, less than 2.5 times as long as broad (CONSTANT & PHAM, 2017: fig. 6 A)
..... ***P. vietnamica*** Constant & Pham, 2008
6. All legs brown (Fig. 10 A, C); tegmina uniformly coloured, black-brown with pale yellowish veins; posterior wings with short basal bright red marking extending to basal 1/4 and followed by black area along costal margin (Fig. 10 A) ***P. nami*** sp. nov.
– Pro- and mesotibiae black or brown with more or less developed paler ring in middle (Figs 1 A, C, 12 A, C); tegmina with paler and darker areas forming cloudy effect; posterior wings with brightly coloured basal area red or orange, extending at least to basal 1/3 and not followed by black area (Figs 1 A, 12 A,) **7**

7. Posterior wings largely bright red basally with some small black spots in the red area; abdomen mostly black dorsally (CONSTANT & PHAM, 2017: fig. 1 A) *P. drumonti* Constant & Pham, 2017
 – Posterior wings largely bright red or orange basally without small black spots; abdomen red or red with middle black dorsally (Figs 1 A, 12 A,)..... **8**
8. Posterior wings with brightly coloured basal area mostly bright orange (Figs 1 A, 6 A).. **9**
 – Posterior wings with brightly coloured basal area mostly bright red (Fig. 8 A, 12 A) **11**
9. Anterior margin of head strongly rounded in dorsal view (CONSTANT & PHAM, 2017: fig. 3 B); pro- and mesonotum contrasting, with mesonotum blackish brown (CONSTANT & PHAM, 2017: fig. 3 B); pro- and mesofemora blackish brown (CONSTANT & PHAM, 2017: fig. 3 C); posterior margin of anal tube abruptly perpendicular in lateral view with central portion strongly reflexed towards the anterior (CONSTANT & PHAM, 2017: fig. 4 A); endosomal processes with 6 strong lateral teeth and one strong, pointed dorsal process (CONSTANT & PHAM, 2017: fig. 4 D–E) *P. grootaerti* Constant & Pham, 2017
 – Anterior margin of head smoothly rounded in dorsal view (Figs 1 B, 6 B); mesonotum darker than pronotum but not strongly contrasting (Figs 1 B, 6 B); pro- and mesofemora brown (Figs 1 C, 6 C); posterior margin of anal tube forming slightly obtuse angle with central portion reflexed towards the anterior (Figs 2 A, 7 A); endosomal processes with 5–6 weak lateral teeth and one rather weak, pointed dorsal process (Figs 2 D–E, 7 D–E)..
 **10**
10. Posterior wings with brightly coloured basal area extending to 2/3 of length and remaining part opaque brown (Fig. 6 A); anal tube more elongate, 1.66 times longer than broad (Fig. 7 B); distal portion of endosomal process incurved and rather broad in dorsal view (Fig. 7 E) *P. khmera* sp. nov.
 – Posterior wings with brightly coloured basal area extending to half-length and remaining part translucent brown with very narrow opaque band along sutural margin (Fig. 1 A); anal tube less elongate, 1.42 times longer than broad (Fig. 2 C); distal portion of endosomal process rather straight and narrow in dorsal view (Fig. 2 E)
 *P. chantrainei* Nagai & Porion, 2004
11. Frons black-brown with contrasting narrow yellowish band along dorsal margin (Fig. 12 D); anterior and median legs black-brown with obsolete paler rings on tibiae (Fig. 12 A, C); bright red area of posterior wings turning to bright orange along costal margin (Fig. 12 A); brown portion of posterior wings opaque (Fig. 12 A)..... *P. nigrifrons* sp. nov.
 – Frons brown without contrasting band along dorsal margin (Figs 8 D, 13 D); anterior and median legs dark brown with well-marked pale yellowish rings on tibiae (Figs 8 A, C, 13 A, C); bright red area of posterior wings not turning to bright orange along costal margin (Figs 8 A, 13 A); brown portion of posterior wings opaque (Fig. 13 A) or translucent (Fig. 8 A) **12**
12. Frons with dorsal margin slightly projecting anterodorsally (Fig. 8 B, D); posterior wings translucent pale brown on distal portion and along anal margin (Fig. 8 A) *P. laotiana* sp. nov.
 – Frons with dorsal margin broadly rounded (Fig. 13 B, D); posterior wings opaque brown on distal portion and along anal margin (Fig. 13 A)..... *P. thompsoni* sp. nov.

***Polydictya chantrainei* Nagai & Porion, 2004**

Figs 1–4

Polydictya chantrainei NAGAI & PORION, 2004: 5 [described], pl. 2 fig. 9 [habitus in dorsal view].

Polydictya chantrainei – CONSTANT, 2009: 294 [key], 296 [distribution, compared with *P. duffelsi* Constant, 2009, intraspecific variation], figs 1 [distribution map], 9 [habitus, from Myanmar]. — CONSTANT & PHAM, 2017: 279 [listed], 280 [compared with *P. drumonti* Constant & Pham, 2017], 285 [compared with *P. grootaerti* Constant & Pham, 2017], 289 [keyed].

DIAGNOSIS. The species can be separated from all other *Polydictya* species by the following combination of characters: (1) tegmina with paler and darker areas forming cloudy effect (Fig. 1 A); (2) posterior wings with bright orange basal area extending to half-length and remaining part translucent brown with very narrow opaque band along sutural margin (Fig. 1 A); (3) frons with dorsal margin slightly projecting anterodorsally (Fig. 1 B, D), yellow-brown (Fig. 1 D); (4) protibiae slightly laminate, brown basally and black distally with pale yellowish ring in middle (Fig. 1 A, C); (5) abdomen red dorsally (Fig. 1 A); (6) genital segments orange.

The closest species are *P. grootaerti* Constant & Pham, 2017 from Vietnam (CONSTANT & PHAM, 2017: fig. 3), *P. khmera* sp. nov. from Cambodia (Fig. 6) and *P. kuntzi* Nagai & Porion, 2004 from Borneo (Fig. 18), from which *P. chantrainei* can be separated by character (2): the three other species show the brown coloured part of the posterior wings entirely opaque.

TYPE MATERIAL EXAMINED. THAILAND: Holotype ♂: [Chiang Mai, Thailand, VI.2002] (MHNL).

MALAYSIA: Paratype ♂: [Coll. P. Bleuzen, Cameroon Highlands, Malaisie, XI 1993] (MHNL).

NOTES.

On the label of the paratype, “Cameroon Highlands” is a misspelling of “Cameron Highlands”.

From the type series, only the paratype from Malaysia was examined in CONSTANT (2009). The present study allowed the examination of the male genitalia of a specimen from the type locality, Chiang Mai and revealed that the specimen from Laos attributed to *P. chantrainei* by CONSTANT (2009) actually belongs to a separate species, *P. laotiana* sp. nov. For this reason, the distribution map only shows the type location and the identity of the specimens from Malaysia and Myanmar as listed in CONSTANT (2009) require verification based on male genitalia.

ADDITIONAL MATERIAL. THAILAND: 1 ♂ (Fig. 1 – dissected): Thailand, Chiang Mai, Sept. 2000 (MNHN).

SUPPLEMENTARY DESCRIPTION.

Measurements and ratios: LT: ♂ (n = 1): 21.6 mm; LTg/BTg = 3.0; BV/LV = 4.1; LF/BF = 0.87.



Fig. 1. *Polydictya chantrainei* Nagai & Porion, 2004, ♂ from Chiang Mai, Thailand (MNHN). A, habitus, dorsal view; B, head, pro- and mesonotum, dorsal view. C, habitus, ventral view. D, frons, normal view. E, habitus, lateral view. F, head and prothorax, lateral view.

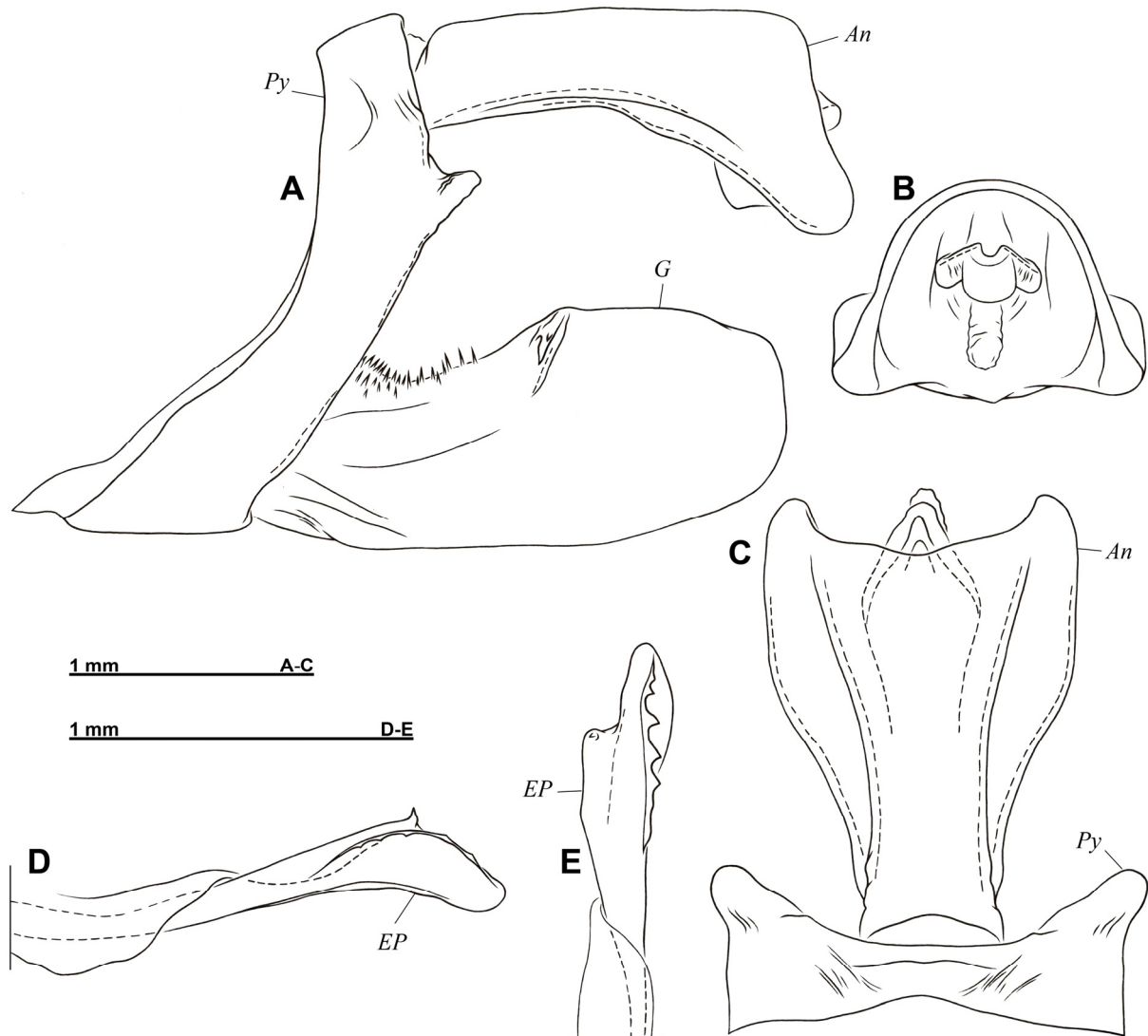


Fig. 2. *Polydictya chantrainei* Nagai & Porion, 2004, ♂ from Chiang Mai, Thailand (MNHN), genitalia. A, pygofer, anal tube and gonostylus, left lateral view. B, apex of anal tube, postero-dorsal view. C, anal tube and pygofer, dorsal view. D, endosomal process of aedeagus, lateral view. E, endosomal process of aedeagus, dorsal view. An, anal tube – EP, endosomal process of aedeagus – G, gonostylus – Py, pygofer.

Male genitalia: (Figs 2–3) pygofer, anal tube and gonostyli orange; pygofer higher than long, with posterior margin slightly curved in lateral view and with blunt dorsolateral process directed posterodorsally and laterally. Anal tube elongate, 1.42 times longer than broad in dorsal view, broader near apex; dorsal margin nearly straight in lateral view and abruptly curved ventrally near apex; apicoventral angle rounded in lateral view; lateral margins strongly sinuate in dorsal view, subparallel on distal half; apical margin excavate in dorsal view, apicolateral angles blunt in dorsal view; in posterior view, dorsal and lateral margins strongly rounded, ventral margin bisinuate and lateral lamina visible on a distance. Gonostyli elongate, subrectangular with posterior half wider and dorsal margin excavate on basal half in lateral view; strong lateral bifid tooth directed antero-ventrally at about half length; apical margin nearly straight medially. Aedeagus with endosomal process rather straight in dorsal view, curved ventrally on distal portion in lateral view; in dorsal view, widening from base towards apex and abruptly narrowing after mediodorsal small hook, laterodorsal margin

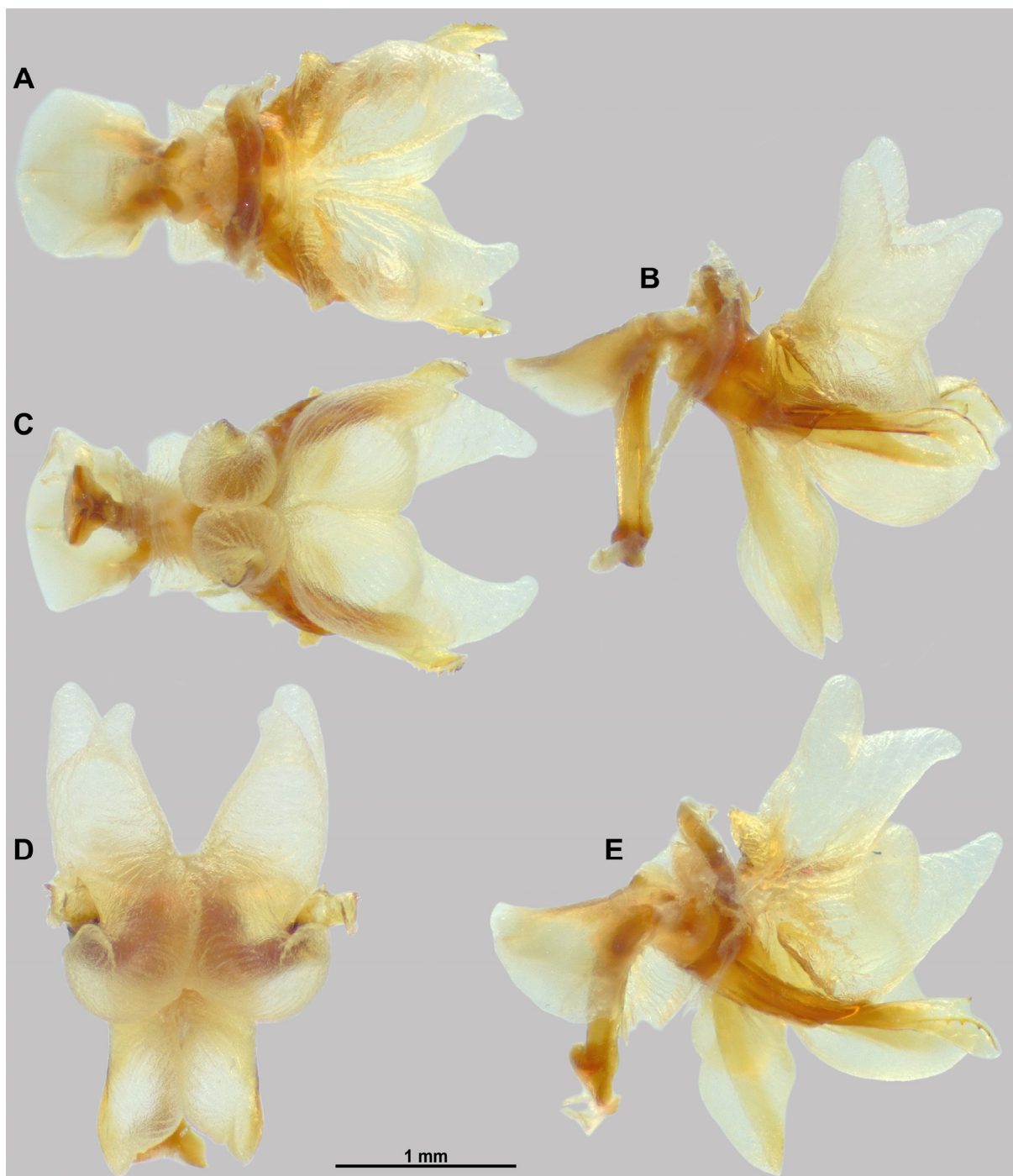


Fig. 3. *Polydictya chantrainei* Nagai & Porion, 2004, ♂ from Chiang Mai, Thailand (MNHN), aedeagus. A, dorsal view. B, lateral view. C, ventral view. D, posterior view. E, laterodorsal view.

lamine on distal portion and with 5–6 irregular teeth directed laterally; in lateral view, laterodorsal lamina incurved and apex rounded; inflated phallus rather complex, symmetrical, with 3 pairs of membranous processes; dorsal pair projecting dorsally, large, broad and furcate on distal portion; median pair projecting posteriorly, with weakly sclerotized shaft more or less following endosomal process, hemi crescent-shaped and basally inflated ventrally; ventral pair with spirulate external structure and with internal weakly sclerotized shaft, inflated in median portion in lateral view.

DISTRIBUTION. Thailand (Chiang Mai Province) (Fig. 4).

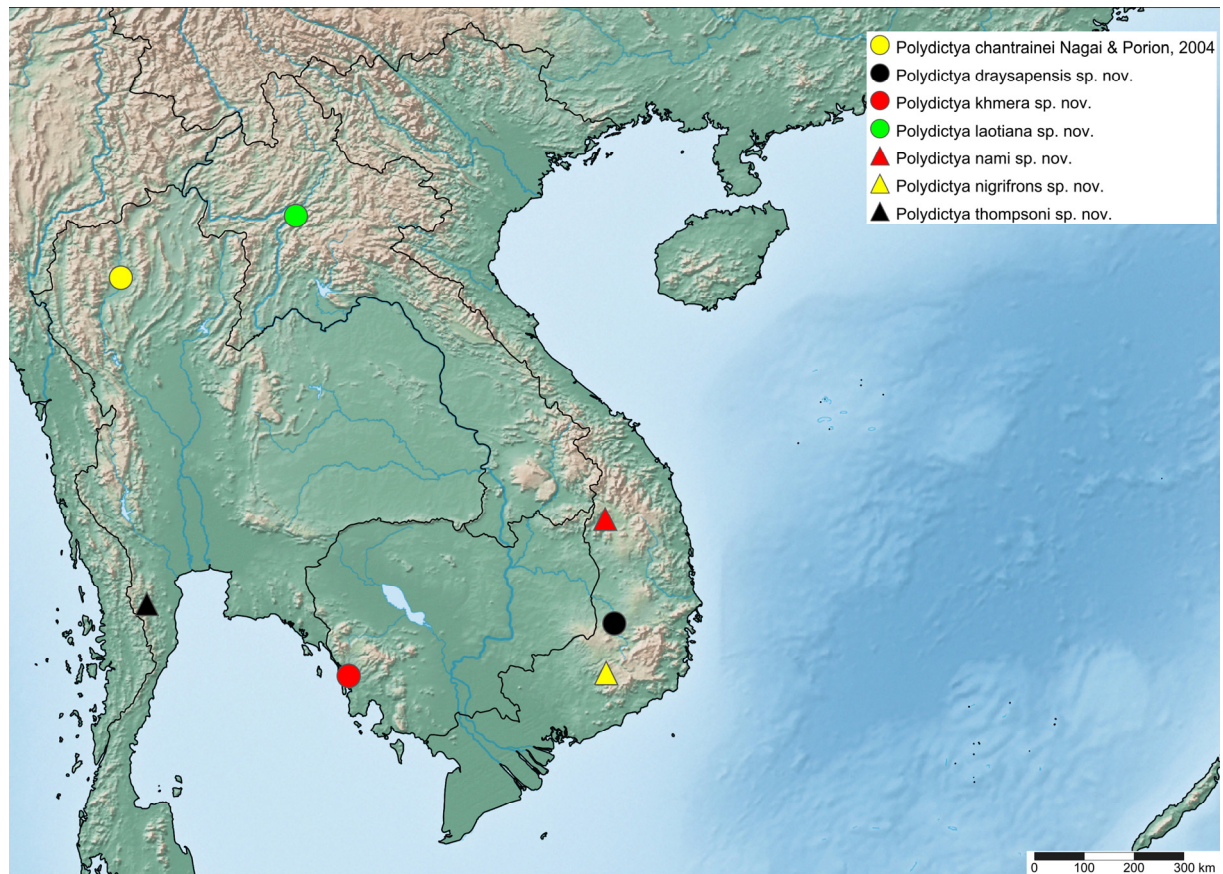


Fig. 4. *Polydictya* spp. nov. and *P. chantrainei* Nagai & Porion, 2004, distribution map.

***Polydictya draysapensis* sp. nov.**

urn:lsid:zoobank.org:act:8FD2A01B-6EFA-403A-BB30-2B180B54C917

Figs 4–5

DIAGNOSIS. The species can be separated from all other *Polydictya* species by the following combination of characters: (1) tegmina bicolourous, brown with basal 1/3 pale yellowish (Fig. 5 A); (2) posterior wings with basicostal subrectangular bluish white area and well delimited basal red marking (Fig. 5 A); (3) frons regularly rounded in dorsal view, not projecting anteriorly (Fig. 5 B, D), yellow-brown (Fig. 5 D); (4) protibiae slightly laminate, brown with broad pale yellow ring (Fig. 5 A, C); (5) abdomen red dorsally (Fig. 5 A); (6) genital segments red.

The closest species are *P. basalis* Hope, 1843 (Myanmar, India, Sumatra, Malaysia, Vietnam according to NAGAI & PORION, 1996 – Fig. 16), *P. jakli* Constant, 2016 (Siberut Island – CONSTANT, 2016: fig. 5), *P. johanna*e Lallemand, 1956 (Vietnam: Phu Quoc Island – Fig. 17), *P. negrito* (Distant, 1906) (Andaman Islands – CONSTANT & MOHAN, 2017: fig. 4) and *P. uniformis* (Walker, 1857) (Borneo, Thailand according to NAGAI & PORION, 1996 – Fig. 21), all having posterior wings with basicostal subrectangular bluish white area, from which *P. draysapensis* can be separated by characters (1): the five other species do not show bicolorous tegmina brown with basal 1/3 pale yellowish and (2): the five other species have no or not well delimited red basal marking on posterior wings.

ETYMOLOGY. The species epithet refers to Dray Sap, the type locality of this new species in Dak Nong Province, Vietnam.

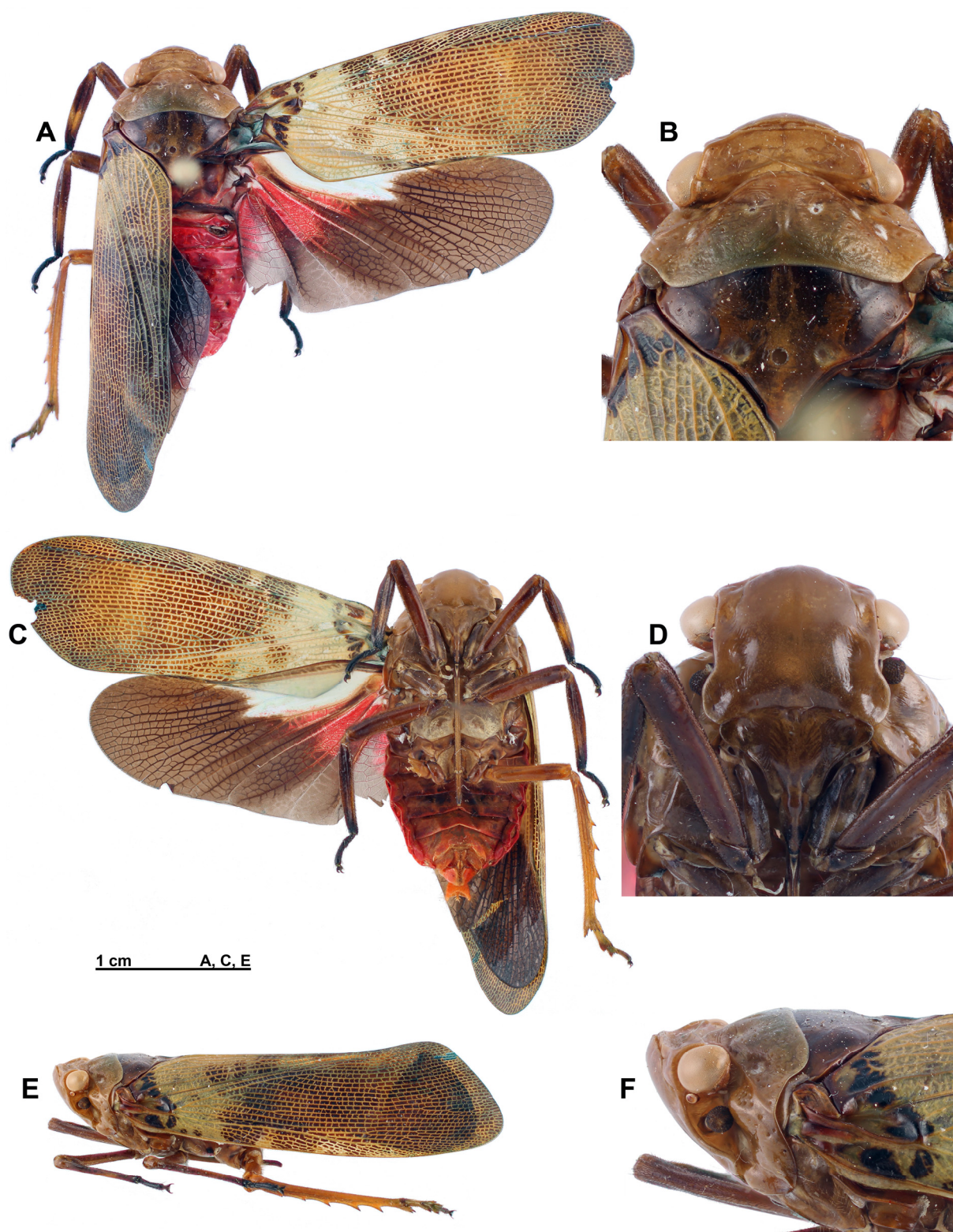


Fig. 5. *Polydictya draysapensis* sp. nov., holotype ♀ (VNMN). A, habitus, dorsal view; B, head, pro- and mesonotum, dorsal view. C, habitus, ventral view. D, frons, normal view. E, habitus, lateral view. F, head and prothorax, lateral view.

TYPE MATERIAL. VIETNAM: Holotype ♀ (Fig. 5): [12/10/2017, Dray Sap, Krong No, Dak Nong, Leg. Pham Hong Thai] (VNMN).

DESCRIPTION.

Measurements and ratios: LT: ♀ (n = 1): 29.0 mm; LTg/BTg = 2.8; BV/LV = 5.0; LF/BF = 0.76.

Head: (Fig. 5 B, D, F) pale yellow-brown with ventral portion of frons and clypeus darker; vertex weakly curved and deeply grooved transversely with lowest point in middle, and with all 4 margins carinate; frons slightly visible from above, convex, smooth, subquadrate with lateral margins emarginate at antennae, impressed in front of eye and with second, C-shaped impression following lateral margin on ventral half; clypeus narrower and shorter than frons; labium elongate, yellow brown, surpassing metacoxae; antennae dark brown with scape cylindrical, elongate; pedicel bulbous.

Thorax: (Fig. 5 B, D, F) prothorax pale yellow-brown with 6 whitish spots in a row along anterior margin; mesonotum castaneous with posteromedian portion slightly paler and whitish spot at each basal angles of scutellum. Pronotum coriaceous with median carina visible on central portion and concentric wrinkles on each side of carina anteriorly; lateral lobes of pronotum smooth with some impressed points. Mesonotum smooth without distinct carina. Tegulae yellow-brown; metanotum reddish brown.

Tegmina: (Fig. 5 A, C, E) irregular basal transverse line of black spots followed by pale yellowish area with veins concolorous on basal 1/3; distal 2/3 brown with veins paler and weak cloudy paler markings; costal and sutural margins subparallel, slightly widening after clavus; apex obliquely rounded.

Posterior wings: (Fig. 5 A, C) brown with veins darker; basicostal subrectangular bluish white area slightly surpassing half length with veins concolorous and bright red rather well demarcated markings basally with veins concolorous except in anal area with veins black; broader than tegmina.

Legs: (Fig. 5 A, C) elongate and slender with pro- and mesofemora and tibiae dorsoventrally flattened; pro- and mesotibiae narrowing basally and distally. Pro- and mesofemora and coxae brown; pro- and mesotibiae brown with a broad yellow ring slightly distally to mid length; pro- and mesotarsomeres black. Metafemora brown, paler than pro- and mesofemora; metatibiae yellow-brown, slightly darker basally; metatarsomeres yellow-brown. Metatibiotarsal formula: (5) 7/8/7.

Abdomen: (Fig. 5 A, C) entirely bright red.

Male genitalia: unknown.

DISTRIBUTION. Central Vietnam: Dak Nong Province (Fig. 4).

Polydictya khmera sp. nov.

urn:lsid:zoobank.org:act:1CC12CBC-68F7-4AF9-81EA-8A5DD880A854

Figs 4, 6–7

DIAGNOSIS. The species can be separated from all other *Polydictya* species by the following combination of characters: (1) tegmina with paler and darker areas forming cloudy effect (Fig. 6 A); (2) posterior wings with bright orange basal area extending to distal 2/3 and remaining part opaque (Fig. 6 A); (3) frons with dorsal margin very slightly projecting anterodorsally (Fig. 6 B, D), yellow-brown (Fig. 6 D); (4) protibiae slightly laminate, brown basally and black distally with pale yellowish ring in middle (Fig. 6 A, C); (5) abdomen red dorsally (Fig. 6 A); (6) genital segments orange.



Fig. 6. *Polydictya khmera* sp. nov., holotype ♂ (RBINS). A, habitus, dorsal view; B, head, pro- and mesonotum, dorsal view. C, habitus, ventral view. D, frons, normal view. E, habitus, lateral view. F, head and prothorax, lateral view.

The closest species are *P. chantrainei* Nagai & Porion, 2004 (Thailand, Malaysia – Fig. 1) *P. grootaerti* Constant & Pham, 2017 (Vietnam – CONSTANT & PHAM, 2017: fig. 3), and *P. kuntzi* Nagai & Porion, 2004 (Borneo – Fig. 18). It can be separated from *P. chantrainei* by character (2): the latter shows the brown coloured part of the posterior wings mostly translucent (entirely opaque in *P. khmera* sp. nov.), the more elongate anal tube (1.66 times longer than broad in *P. khmera* sp. nov.; 1.42 in *P. chantrainei*), the endosomal process of the aedeagus distally curved and broad in dorsal view (rather straight and narrow in *P. chantrainei*); from *P. grootaerti* by character (3): the latter shows strongly rounded anterior margin of frons (smoothly rounded and very slightly projecting anterodorsally in *P. khmera* sp. nov.), the endosomal process with a deep emargination on inner margin in dorsal view and weak lateral teeth (not emarginated and with strong teeth in *P. grootaerti*); from *P. kuntzi* by characters (2): the latter shows bright orange basal area of posterior wings extending to half-length and distal brown area extending towards base along costal margin (orange area extending to 2/3 of wing and brown area not extending towards base in *P. khmera* sp. nov.) and (5): *P. kuntzi* shows the central portion of dorsum of abdomen black (dorsum of abdomen red in *P. khmera* sp. nov.).

ETYMOLOGY. The species epithet derives from “*khmer*”, a hindi word meaning cambodian, and refers to the country of origin of this new species.

TYPE MATERIAL. CAMBODIA: Holotype ♂ (Fig. 6 – dissected): [Coll. I.R.Sc.N.B., Cambodia, Koh Kong prov., Tatai, 11°35'13"N 103°05'50"E, 9-19.x.2016, Malaise trap, GTI Project, Leg. J. Constant & J. Bresseel, I.G.: 33.345] (RBINS).

DESCRIPTION.

Measurements and ratios: LT: ♂ (n = 1): 20.3 mm; LTg/BTg = 3.1; BV/LV = 4.5; LF/BF = 0.81.

Head: (Fig. 6 B, D, F) yellow-brown with frons and clypeus slightly darker; vertex curved and deeply grooved transversely with lowest point in middle, and with all 4 margins carinate; frons barely visible from above, convex, smooth, subquadrate with strong impression before eye and elongate impression parallel to lateral margin on ventral half of frons; widening in rounded lobes laterally near frontoclypeal joint; clypeus slightly narrower and shorter than frons; labium elongate, brown, surpassing metacoxae; antennae dark brown with scape cylindrical, elongate and pedicel inflated, bulbous.

Thorax: (Fig. 6 B, D, F) pronotum yellow-brown dorsally with lateral lobes darker; mesonotum brown with pair of longitudinal irregular yellowish markings on each side of median line; pro-, meso- and metasternites brown. Pronotum weakly rugulose, longitudinal carina absent; central weak hump on median line with pair of impressed points on each side of disc. Mesonotum weakly rugulose centrally, smooth laterally to peridiscal carinae; obsolete median and peridiscal carinae; scutellum slightly impressed; tegulae yellow-brown; metanotum bright red.

Tegmina: (Fig. 6 A, C, E) dark brown cells and pale yellow-brown dense venation producing cloudy effect; basal irregular black transverse band; pale yellowish area at cubital angle; costal and postclaval margins subparallel, apex obliquely rounded.

Posterior wings: (Fig. 6 A, C) brown on distal half, along sutural margin and on large portion of anal area; basal half bright orange with bright red small basal area; orange zone slightly extending distally along CuA2; veins concolorous with ground colour, slightly darker on distal brown portion; broader than tegmina.

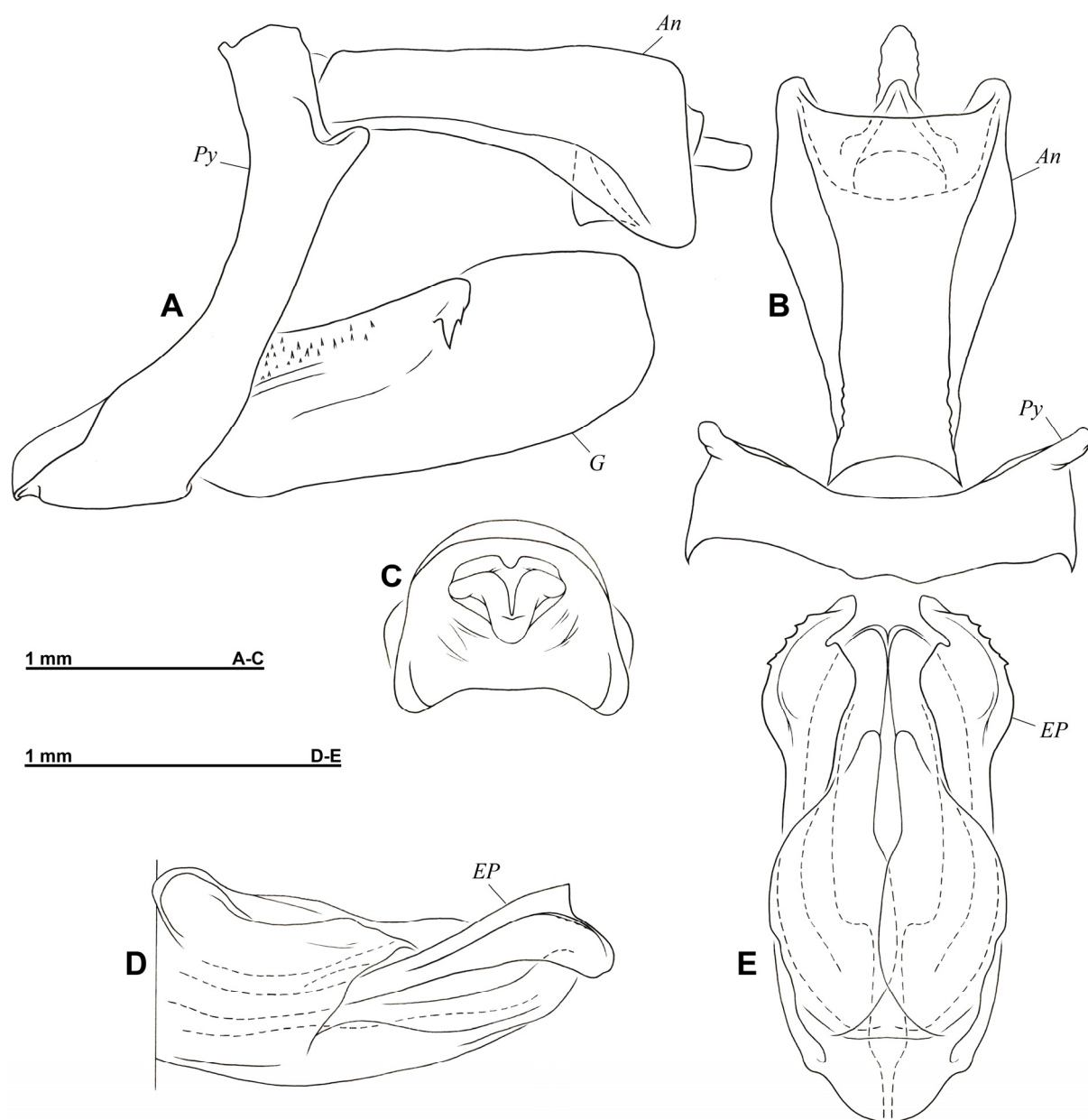


Fig. 7. *Polydictya khmera* sp. nov., holotype ♂ (RBINS), genitalia. A, pygofer, anal tube and gonostylus, left lateral view. B, anal tube and pygofer, dorsal view. C, apex of anal tube, postero-dorsal view. D, aedeagus, lateral view. E, aedeagus, dorsal view. An, anal tube – EP, endosomal process of aedeagus – G, gonostylus – Py, pygofer.

Legs: (Fig. 6 A, C) elongate and slender with pro- and mesofemora and tibiae dorsoventrally flattened; pro- and mesotibiae narrowing basally and distally. All coxae and trochanters dark brown. Pro- and mesofemora reddish brown; pro- and mesotibiae brown with irregular yellowish basal ring, broad yellow ring slightly distally to mid-length and distal portion black-brown; pro- and mesotarsomeres black. Metafemora pale brown, paler than pro- and mesofemora; metatibiae yellow-brown; metatarsomeres brown. Metatibiotarsal formula: (6–7) 7/8/5.

Abdomen: (Fig. 6 A, C) bright red dorsally; brown ventrally.

Male genitalia: (Fig. 7) pygofer, anal tube and gonostyli orange; pygofer much higher than long in lateral view, with posterior margin curved in lateral view and with blunt dorsolateral process directed laterodorsally and slightly posteriorly. Anal tube elongate, 1.66 times longer

than broad in dorsal view, broader at distal 2/3; dorsal margin nearly straight in lateral view and abruptly curved ventrally near apex; apicoventral angle rounded in lateral view; lateral margins bisinuate in dorsal view, slightly emarginate on distal 1/3; apical margin excavate in dorsal view, apicolateral angles rounded in dorsal view; in posterior view, dorsal margin rounded, lateral margins slightly sinuate, ventral margin bisinuate and lateral lamina visible on a distance. Gonostyli elongate, subrectangular with posterior half slightly wider and dorsal margin weakly excavate on basal half in lateral view; strong lateral tooth directed latero-ventrally at about half-length, bearing secondary small tooth at mid-length; apical margin nearly straight medially in lateral view. Aedeagus with endosomal process incurved distally in dorsal view, sinuate and curved ventrally on distal portion in lateral view; in dorsal view, strongly widening laterally on distal 1/3 due to lateral lamina; lamina not reaching apex and with 5 weak teeth laterally on distal half; inner margin strongly notched before apex; in lateral view, dorsal laminate crest ended in a tooth before apex, laterodorsal lamina incurved and apex rounded; phallus at rest about 2.1 times longer than broad.

DISTRIBUTION. Cambodia: Koh Kong Province (Fig. 4).

***Polydictya laotiana* sp. nov.**

urn:lsid:zoobank.org:act:D8EC96A2-7353-4D7E-82A8-749FFEDDDDB4A

Figs 4, 8–9

DIAGNOSIS. The species can be separated from all other *Polydictya* species by the following combination of characters: (1) tegmina with paler and darker areas forming cloudy effect (Fig. 8 A); (2) posterior wings with bright red basal area extending to half-length and distal part and broad band along anal margin translucent yellow-brown (Fig. 8 A); (3) frons with dorsal margin slightly projecting anterodorsally (Fig. 8 B, D), yellow-brown (Fig. 8 D); (4) protibiae slightly laminate, brown basally and black distally with pale yellowish ring in middle (Fig. 8 A, C); (5) abdomen red dorsally and brown ventrally. (Fig. 8 A); (6) genital segments orange.

The closest species are *P. nigrifrons* sp. nov. (Vietnam – Fig. 12), *P. thompsoni* sp. nov. (Thailand – Fig. 13) and *P. pantherina* Gerstaecker, 1895 (Sri Lanka – Fig. 19), from which *P. laotiana* sp. nov. can be separated by character (2): the three other species show the brown part of the posterior wings entirely opaque. The species can also be separated from *P. nigrifrons* sp. nov. by its yellow-brown frons (largely black in *P. nigrifrons* sp. nov.) and from *P. pantherina* by the broad brown band along the anal margin of posterior wings (in *P. pantherina* the red basal area extends to the anal margin).

ETYMOLOGY. The species epithet refers to the country of origin of this new species: Laos.

TYPE MATERIAL. LAOS: Holotype ♂ (Fig. 8 – dissected): [Coll. R.I.Sc.N.B., Laos, Luang Prabang. Sept. 1917. R.V. de Salvaza] [R.I.Sc.N.B., I.G. 17.865] (RBINS).

DESCRIPTION.

Measurements and ratios: LT: ♂ (n = 1): 21.2 mm; LTg/BTg = 3.0; BV/LV = 3.7; LF/BF = 0.80.

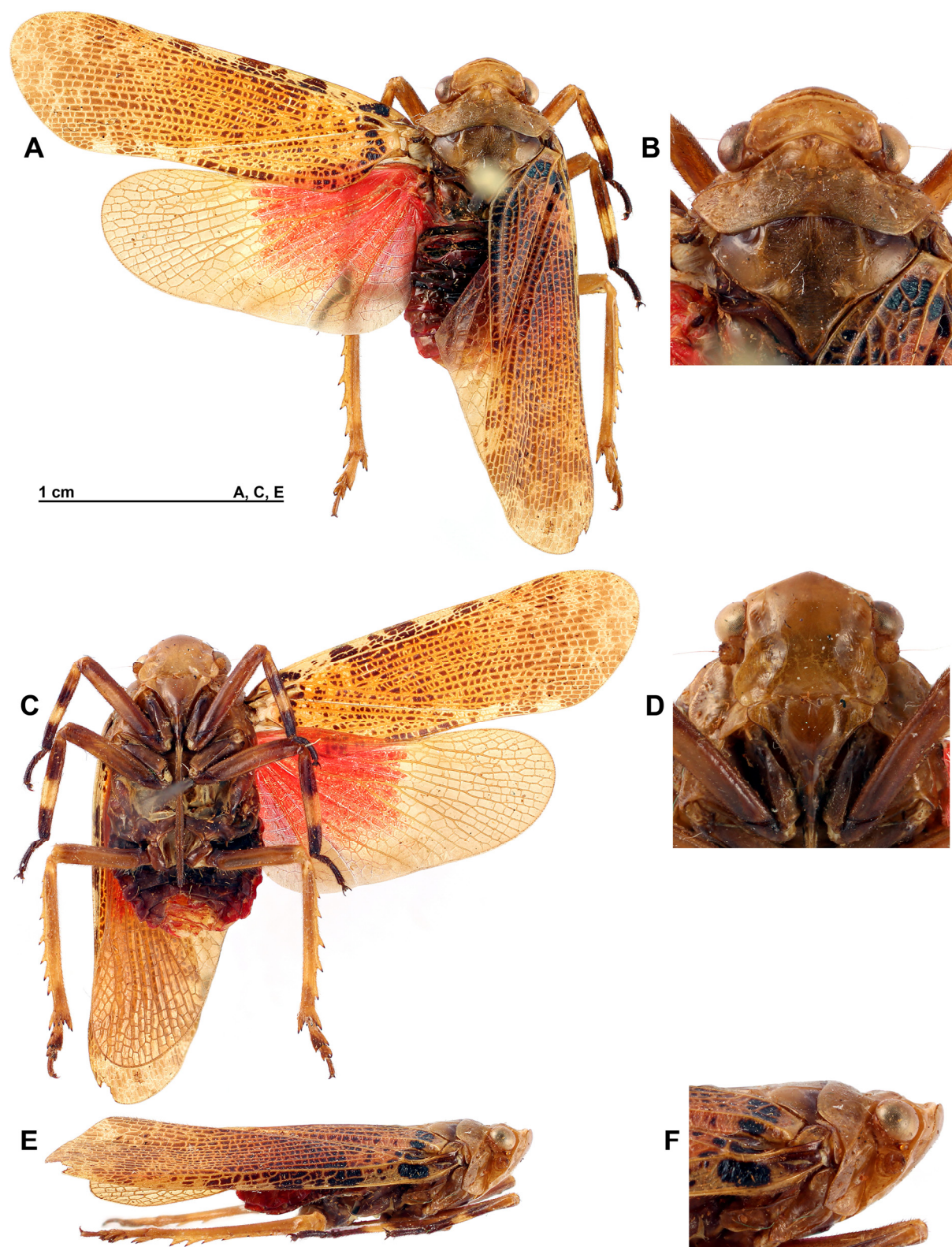


Fig. 8. *Polydictya laotiana* sp. nov., holotype ♂ (RBINS). A, habitus, dorsal view; B, head, pro- and mesonotum, dorsal view. C, habitus, ventral view. D, frons, normal view. E, habitus, lateral view. F, head and prothorax, lateral view.

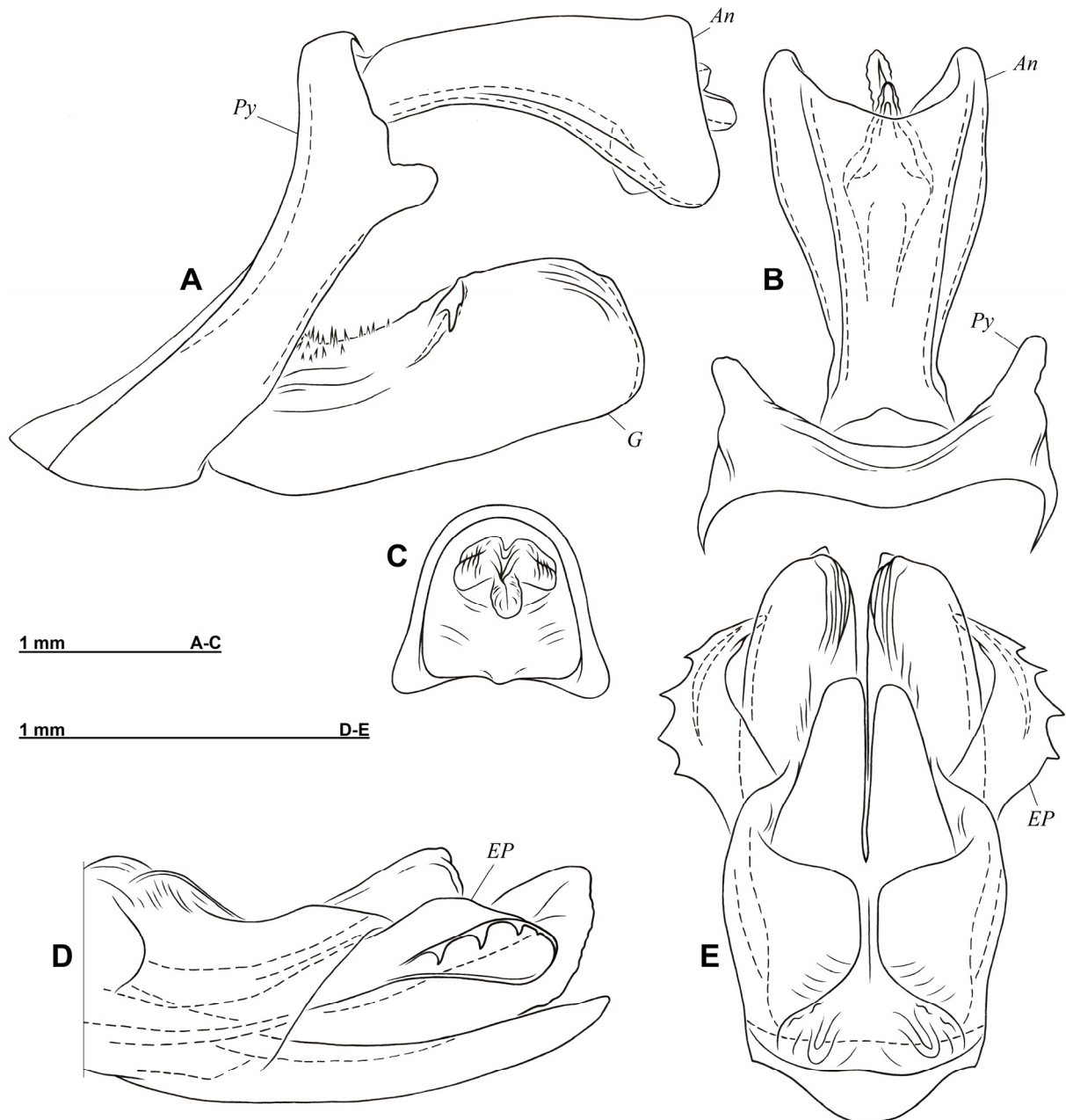


Fig. 9. *Polydictya laotiana* sp. nov., holotype ♂ (RBINS), genitalia. A, pygofer, anal tube and gonostylus, left lateral view. B, anal tube and pygofer, dorsal view. C, apex of anal tube, postero-dorsal view. D, aedeagus, lateral view. E, aedeagus, dorsal view. An, anal tube – EP, endosomal process of aedeagus – G, gonostylus – Py, pygofer.

Head: (Fig. 8 B, D, F) yellow-brown with clypeus slightly darker centrally and dark brown apically; vertex curved and deeply grooved transversely with lowest point in middle, and with all 4 margins carinate; frons weakly visible from above, convex, smooth, subquadrate with dorsal margin slightly protruding in middle in perpendicular view, with strong impression before eye and elongate oblique impression subparallel to lateral margin on ventral half of frons, impressions weakly wrinkled; widening in rounded lobes laterally near frontoclypeal joint; clypeus slightly narrower and shorter than frons; labium elongate, brown, darker apically and surpassing metacoxae; antennae yellow-brown with scape cylindrical, elongate and pedicel inflated, bulbous.

Thorax: (Fig. 8 B, D, F) pronotum yellow-brown dorsally and on lateral lobes; mesonotum brown, slightly darker anteriorly on each side and with yellowish markings at basal angles of scutellum; pro-, meso- and metasternites brown. Pronotum weakly rugulose with weak central transverse excavation with weak impressed point at each side; longitudinal carina absent. Mesonotum weakly rugulose centrally, smooth laterally to peridiscal carinae; median absent; peridiscal carinae obsolete; scutellum slightly impressed; tegulae yellow-brown; metanotum brown.

Tegmina: (Fig. 8 A, C, E) cells dark brown basally, progressively paler towards apex; dense venation yellow-brown basally, progressively paler towards apex; venation paler than background and irregularly distributed paler cells producing cloudy effect; 4 irregular blackish markings along costal margin; basal irregular black transverse band; pale yellowish area at cubital angle and at apex of clavus; costal and postclaval margins subparallel, apex obliquely rounded.

Posterior wings: (Fig. 8 A, C) translucent yellow-brown on distal half and along sutural margin; basal half bright red; veins concolorous with ground colour, slightly darker on distal yellow-brown portion; broader than tegmina.

Legs: (Fig. 8 A, C) elongate and slender with pro- and mesofemora and tibiae dorsoventrally flattened; pro- and mesotibiae weakly narrowing basally and distally. All coxae and trochanters dark brown. Pro- and mesofemora brown, slightly paler on middle portion; pro- and mesotibiae dark brown with small yellowish basal ring, broad contrasting pale yellow ring slightly distally to mid-length and distal portion darker; pro- and mesotarsomeres black. Metafemora pale brown, paler distally and paler than pro- and mesofemora; metatibiae yellow-brown with slightly paler portion before apex; metatarsomeres yellow-brown. Metatibiotarsal formula: (6–7) 7/9/5.

Abdomen: (Fig. 8 A, C) bright red dorsally; brown ventrally.

Male genitalia: (Fig. 9) pygofer, anal tube and gonostyli red; pygofer much higher than long in lateral view, with posterior margin curved in lateral view and with blunt dorsolateral process directed posteriorly and slightly laterally. Anal tube elongate, 1.69 times longer than broad in dorsal view, broader apically; dorsal margin weakly curved in lateral view and abruptly curved ventrally near apex; apicoventral angle rounded in lateral view; lateral margins weakly bisinuate in dorsal view, slightly emarginate on distal 1/3; apical margin excavate in dorsal view, apicolateral angles rounded in dorsal view; in posterior view higher than wide, dorsal margin rounded, lateral margins oblique, weakly tapering ventrally, ventral margin bisinuate; lateral lamina not visible. Gonostyli elongate, subrectangular with posterior half slightly wider and dorsal margin weakly excavate on basal half in lateral view; strong lateral tooth directed latero-ventrally at about half-length, bearing secondary small tooth at mid-length; apical margin nearly straight medially in lateral view. Aedeagus with endosomal process strongly incurved distally in dorsal view, sinuate and curved ventrally on distal portion in lateral view; in dorsal view, strongly widening laterally then progressively narrowing on distal 1/3 due to lateral lamina; lamina reaching apex and with 4 strong teeth laterally; inner margin regularly curved; in lateral view, dorsal margin humped at mid-length, laterodorsal lamina incurved and apex rounded; phallus at rest about 2.0 times longer than broad.

DISTRIBUTION. Laos: Luang Prabang Province (Fig. 4).

***Polydictya nami* sp. nov.**

urn:lsid:zoobank.org:act:262F9667-FB5B-44A2-866D-139D87B422DA

Figs 4, 10–11

DIAGNOSIS. The species can be separated from all other *Polydictya* species by the following combination of characters: (1) tegmina uniformly coloured, black-brown with pale yellowish veins (Fig. 10 A); (2) posterior wings with short basal bright red marking extending to basal $\frac{1}{4}$ and followed by black area along costal margin (Fig. 10 A); (3) frons regularly rounded in dorsal view, not projecting anterodorsally (Fig. 10 B, D), yellow-brown (Fig. 10 D); (4) protibiae not laminate, brown (Fig. 10 A, C); (5) abdomen bright red dorsally (Fig. 10 A); (6) genital segments red.

The closest species is *P. affinis* Atkinson, 1889 (northeast India – Fig. 15) from which *P. nami* sp. nov. can be separated by characters (1): *P. affinis* shows the distal $\frac{1}{4}$ of tegmina yellowish brown concolorous with cells (cells brown contrasting with yellowish veins in *P. nami* sp. nov.), (2): *P. affinis* lacks a dark grey area after the basal red marking and (3): the frons is more strongly rounded anteriorly in dorsal view in *P. affinis*.

ETYMOLOGY. The species epithet is a patronym dedicated to Mr Ba Nam Nguyen, “Mr Nam”, our guide in Chu Mom Ray National Park, in acknowledgement for all his help and enthusiasm during our field work in this national park.

TYPE MATERIAL. VIETNAM: Holotype ♂ (Fig. 10 – dissected): [Coll. I.R.Sc.N.B., Vietnam, Kon Tum prov., Chu Mom Ray N.P., 700-1200m, 20-25.vii.2018, GTI Project, 14°25'38"N 107°43'15"E, Leg. J. Constant, J. Bresseel & X. Vermeersch, I.G.: 33.769] (RBINS).

DESCRIPTION.

Measurements and ratios: LT: ♂ (n = 1): 23.5 mm; LTg/BTg = 3.0; BV/LV = 7.3; LF/BF = 0.79.

Head: (Fig. 10 B, D, F) yellow-brown with clypeus slightly darker and genae slightly paler. Vertex slightly curved and deeply grooved transversely with lowest point in middle, with all 4 margins carinate and with one oblique carina in middle at each side of groove not reaching anterior and posterior margins; frons slightly visible from above, convex, smooth, subquadrate with impressed, S-shaped longitudinal groove along lateral margin, starting in front of eye; clypeus slightly narrower and shorter than frons; labium elongate, brown, surpassing metacoxae; antennae dark brown with scape cylindrical, elongate; pedicel bulbous. *Thorax*: (Fig. 10 B, D, F) yellow-brown; mesonotum darker than pronotum; pronotum with short median paler marking along anterior margin and one slightly paler area along anterior margin at each side behind eye; lateroventral lobes of pronotum slightly reddish; mesonotum with paler spot at each basal angle of scutellum; pro-, meso- and metasternites brown; pronotum rugulose with transverse wrinkles on anterior portion, median longitudinal carina obsolete, visible on posterior half, transverse groove in middle with deep impressed point at each side, small impressed points irregularly distributed on lateral fields of pronotum; mesonotum smooth with disc wrinkled, obsolete peridiscal carinae and an impressed point at each side of base of scutellum; scutellum slightly impressed and transversely wrinkled; tegulae yellow-brown; metanotum bright red.

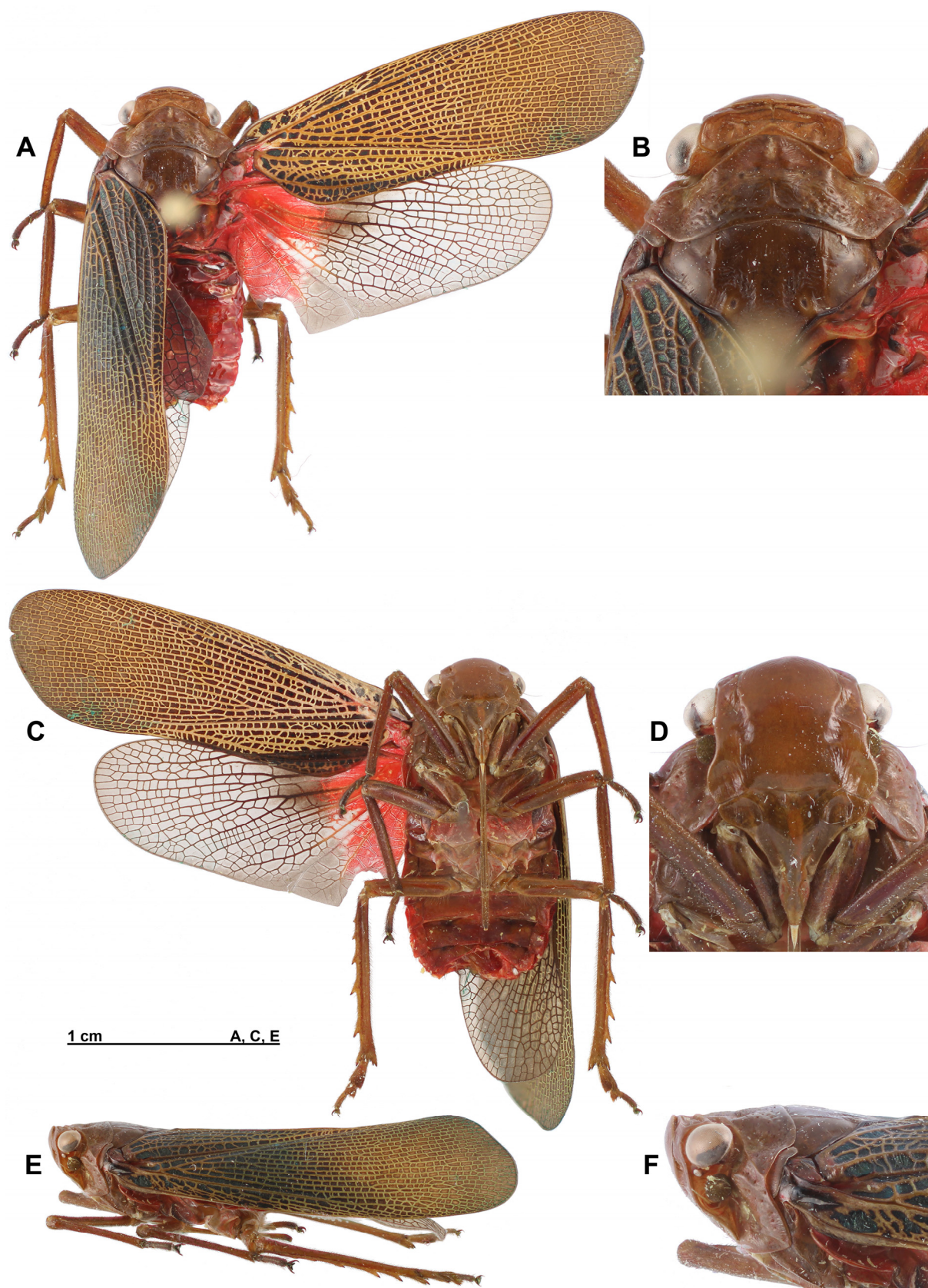


Fig. 10. *Polydictya nami* sp. nov., holotype ♂ (RBINS). A, habitus, dorsal view; B, head, pro- and mesonotum, dorsal view. C, habitus, ventral view. D, frons, normal view. E, habitus, lateral view. F, head and prothorax, lateral view.

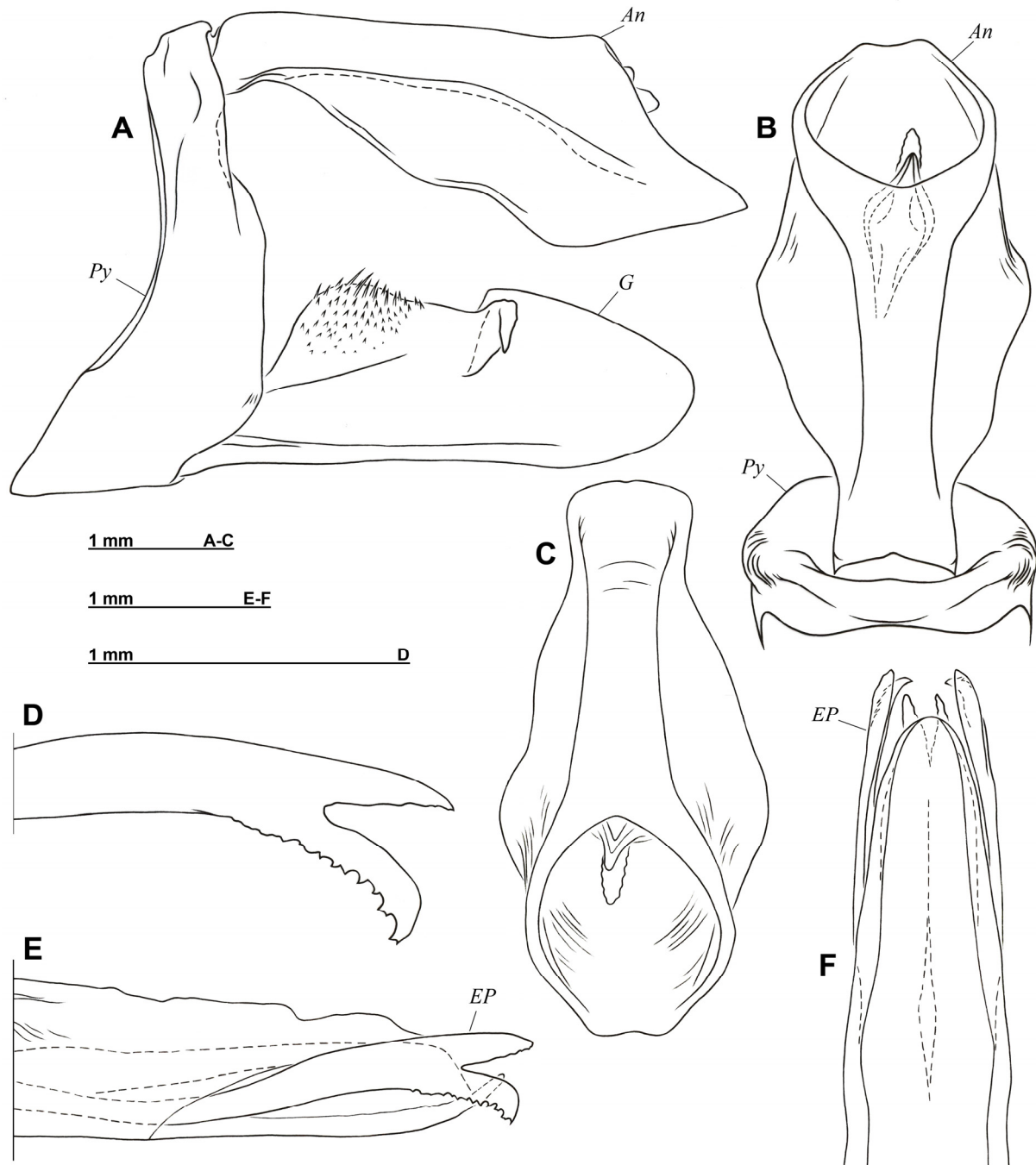


Fig. 11. *Polydictya nami* sp. nov., holotype ♂ (RBINS), genitalia. A, pygofer, anal tube and gonostylus, left lateral view. B, anal tube and pygofer, dorsal view. C, anal tube, postero-dorsal view. D, apical portion of endosomal process of aedeagus, posterolateral view. E, aedeagus, lateral view. F, aedeagus, dorsal view. An, anal tube – EP, endosomal process of aedeagus – G, gonostylus – Py, pygofer.

Tegmina: (Fig. 10 A, C, E) membrane of basal joint red, ground colour black basally progressively turning to brown towards distal portion, all veins pale yellow brown; costal and sutural margins subparallel, apex obliquely rounded.

Posterior wings: (Fig. 10 A, C) translucent greyish brown with bright red area on basal $\frac{1}{4}$ not reaching anal margin and dark grey marking after red area along costal margin; veins concolorous with background in red area, darker than background colour in other parts; broader than tegmina.

Legs: (Fig. 10 A, C) elongate and slender with pro- and mesotibiae not foliaceous. All legs uniform olivaceous brown with slightly reddish shade; tarsi slightly darker. Metatibiotarsal formula: (5) 7/9/6.

Abdomen: (Fig. 10 A, C) bright red.

Male genitalia: (Fig. 11) pygofer, anal tube and gonostyli red; pygofer higher than long, with posterior margin slightly sinuate in lateral view with ventral half straight along a large portion; anterior margin curved; dorsal portion of pygofer strongly shorter than ventral one. Anal tube rather massive and elongate, 1.97 times longer than broad in dorsal view, broader at about half of total length and with lateral laminae projecting lateroventrally; apical margin acute in lateral view, slightly notched in dorsal view; lateral margins slightly undulate in lateral view; in posterodorsal view, anal opening oval and lateral laminae visible to base. Gonostyli elongate, in lateral view with basidorsal lobe covered with short bristles, slightly narrowing from base to lateral tooth, then abruptly slightly widening and smoothly narrowing to rounded apex; lateral tooth strong and curved lateroventrally; ventral margin nearly straight on most of its length. Aedeagus with endosomal process bifid apically, strongly elongate, nearly straight in dorsal view, slightly sinuate in lateral view and with ventral portion of apical fork incurved; distal portion slightly widening in lateral view; dorsal portion of fork with inner margin concave, dorsal margin smooth in lateral view and ventral margin irregularly undulate; ventral portion of fork directed posteroventrally with dorsal margin curved and smooth and ventral margin denticulate; phallus strongly elongate, at rest about 3.4 times longer than broad.

DISTRIBUTION. Central Vietnam: Kon Tum Province (Fig. 4).

Polydictya nigrifrons sp. nov.

urn:lsid:zoobank.org:act:307C59A4-2C94-4E42-A0B4-6CBFD0E2DB06

Figs 4, 12

DIAGNOSIS. The species can be separated from all other *Polydictya* species by the following combination of characters: (1) tegmina with paler and darker areas forming cloudy effect (Fig. 12 A); (2) posterior wings with basal half bright red turning to bright orange around mid-length, then a sinuate pale yellowish band slightly extending towards apex along costal margin and brown area opaque (Fig. 12 A); (3) frons mostly brownish black with dorsal margin not projecting anterodorsally (Fig. 12 B, D); (4) protibiae not laminate, mostly black with obsolete paler ring (Fig. 12 A, C); (5) abdomen red dorsally and mostly black ventrally. (Fig. 12 A, C); (6) genital segments orange.

The closest species are *P. laotiana* sp. nov. (Laos – Fig. 8), *P. thompsoni* sp. nov. (Thailand – Fig. 13) and *P. pantherina* Gerstaecker, 1895 (Sri Lanka – Fig. 19), from which *P. nigrifrons* sp. nov. can be separated by character (3): the three other species show a yellowish brown frons (mostly brownish black in *P. nigrifrons* sp. nov.) and (4): the three other species show pro- and mesotibiae with broad well defined pale yellowish ring (pro- and mesotibiae mostly black with obsolete paler ring in *P. nigrifrons* sp. nov.).

ETYMOLOGY. The species epithet is formed from *niger* (adj., Latin) = black and *frons* (noun, Latin) = frons and refers to the diagnostic black frons of this species.



Fig. 12. *Polydictya nigrifrons* sp. nov., holotype ♀ (RBINS). A, habitus, dorsal view; B, head, pro- and mesonotum, dorsal view. C, habitus, ventral view. D, frons, normal view. E, habitus, lateral view. F, head and prothorax, lateral view.

TYPE MATERIAL. VIETNAM: Holotype ♀ (Fig. 12): [Coll. I.R.Sc.N.B., Vietnam, Lam Dong prov., Dambri, Bao Lam, ix.2017, leg. local collector, I.G.: 33.636] (RBINS).

VIETNAM: Paratype ♀: same data as holotype (RBINS).

DESCRIPTION.

Measurements and ratios: LT: ♀ (n = 2): 27.2–28.0 mm; LTg/BTg = 2.8; BV/LV = 3.8; LF/BF = 0.75.

Head: (Fig. 12 B, D, F) brownish black with vertex and narrow band along dorsal margin of frons pale yellow brown and basal angles of frons and clypeus, narrow band on frons along fronto-clypeal joint and apex of clypeus paler; vertex curved and deeply grooved transversely with lowest point in middle and with all 4 margins carinate; frons not visible from above, convex, smooth, subquadrate with impressed, slightly wrinkled longitudinal groove along lateral margin, starting in front of eye; clypeus slightly narrower and shorter than frons; labium elongate, dark brown, surpassing metacoxae; antennae black with scape cylindrical, elongate; pedicel bulbous.

Thorax: (Fig. 12 B, D, F) pronotum yellow-brown with lateroventral lobes brownish black; mesonotum blackish brown with brown markings at anterolateral angles and at basal angles of scutellum; pro-, meso- and metasternites blackish brown; pronotum rugulose with transverse groove on disc limited at each side by small impressed point covered in white wax, another point with white wax behind eye, median carina obsolete, more visible in middle; mesonotum smooth with disc wrinkled, median carina slightly marked from anterior margin to scutellum and obsolete peridiscal carinae; scutellum slightly impressed on disc; tegulae yellow-brown with dorsal and ventral apical portions darker; metanotum bright red.

Tegmina: (Fig. 12 A, C, E) pale yellow-brown with 4 black markings on costal cell; cells black with groups of pale yellow cells forming a cloudy effect; veins pale yellowish brown; costal and sutural margins subparallel, apex obliquely rounded.

Posterior wings: (Fig. 12 A, C) brown on distal third and along sutural margin; basal half bright red turning to bright orange around mid-length of wing; brightly coloured basal area and brown portion separated by sinuate pale yellowish band slightly extending towards apex along costal margin; veins concolorous with background except on pale yellowish portion with veins darker and in some portions of brown area with veins yellowish or red; broader than tegmina.

Legs: (Fig. 12 A, C) elongate and slender with pro- and mesotibiae not foliaceous. Anterior and median legs black with weak reddish brown tint, slightly paler dorsally; pro- and mesotibiae with obsolete paler ring at mid-length; pro- and mesotarsi black. Metacoxae, trochanters and femora blackish with reddish brown tint, slightly paler dorsally; metatibiae and tarsi dark reddish brown. Metatibiotarsal formula: (5–6) 7/8/7.

Abdomen: (Fig. 12 A, C) bright red dorsally with anal tube orange in female; lateral pleura bright red on dorsal half and brownish on ventral half; black ventrally with intersegmental membranes and lateral portion of last segments red.

DISTRIBUTION. Central Vietnam: Lam Dong Province (Fig. 4).

***Polydictya thompsoni* sp. nov.**

urn:lsid:zoobank.org:act:B3E960EF-EF0B-4E94-BB39-8E6271212297

Figs 4, 13–14

DIAGNOSIS. The species can be separated from all other *Polydictya* species by the following combination of characters: (1) tegmina with paler and darker areas forming cloudy effect (Fig. 13 A); (2) posterior wings with bright red basal area extending to half-length and distal part and broad band along anal margin opaque brown (Fig. 13A); (3) frons with dorsal margin not projecting anterodorsally (Fig. 13 B, D), yellow-brown (Fig. 13 D); (4) protibiae slightly laminate, brown basally then black with pale yellowish ring in middle (Fig. 13 A, C); (5) abdomen red dorsally and brown ventrally (Fig. 13 A, C); (6) genital segments yellow-brown.

The closest species are *P. laotiana* sp. nov. (Laos – Fig. 8), *P. nigrifrons* sp. nov. (Vietnam – Fig. 12), and *P. pantherina* Gerstaecker, 1895 (Sri Lanka – Fig. 19). The species can be separated from *P. laotiana* sp. nov. by character (2): in *P. laotiana* sp. nov. the brown area of the posterior wings is translucent (opaque in *P. thompsoni* sp. nov.); from *P. nigrifrons* sp. nov. by its yellow-brown frons (largely black in *P. nigrifrons* sp. nov.) and broad pale yellow ring on pro- and mesotibiae (pro- and mesotibiae mostly black with obsolete paler ring in *P. nigrifrons* sp. nov.) and from *P. pantherina* by the broad brown band along the anal margin of posterior wings (in *P. pantherina* the red basal area extends to the anal margin).

ETYMOLOGY. The species epithet is a patronym dedicated to Mr Paul Thompson who discovered and photographed the new species.

TYPE MATERIAL. THAILAND: Holotype ♀ (Fig. 13): [Coll. I.R.Sc.N.B., Thailand, Kaeng Krachan N.P., 12.xi.2017, leg. P. Thompson, I.G.: 33.636] (RBINS).

THAILAND: Paratype ♀: same collection data as holotype (RBINS).

DESCRIPTION.

Measurements and ratios: LT: ♀ (n = 2): 26.9 mm; LTg/BTg = 2.9; BV/LV = 4.3; LF/BF = 0.76.

Head: (Fig. 13 B, D, F) pale yellow-brown with frons and clypeus slightly darker in middle, anteclypeus with central yellow marking; vertex curved and deeply grooved transversely with lowest point behind middle of anterior margin, with all 4 margins carinate and with irregular small transverse carina in middle; frons not visible from above, convex, smooth, subquadrate with impressed, slightly wrinkled longitudinal groove along lateral margin, starting in front of eye; clypeus slightly narrower and shorter than frons; labium elongate, brown, surpassing metacoxae; antennae brown with scape cylindrical, elongate; pedicel bulbous.

Thorax: (Fig. 13 B, D, F) pronotum pale yellow-brown with lateroventral lobes brown, two pairs of white waxy spots on anteromedian portion and one pair of white waxy spots behind each eye; mesonotum brown with basal bilobed black marking in middle, subtriangular black marking at basilateral angles and small pale yellow spot at basal angles of scutellum; pronotum weakly rugulose with weak transverse groove on disc limited at each side by small impressed point covered in white wax, median carina obsolete, slightly visible in middle; mesonotum smooth with disc weakly wrinkled, median carina obsolete, very weakly visible basally and weak peridiscal carinae; scutellum weakly impressed on disc and transversely wrinkled; tegulae yellow-brown; metanotum brown.

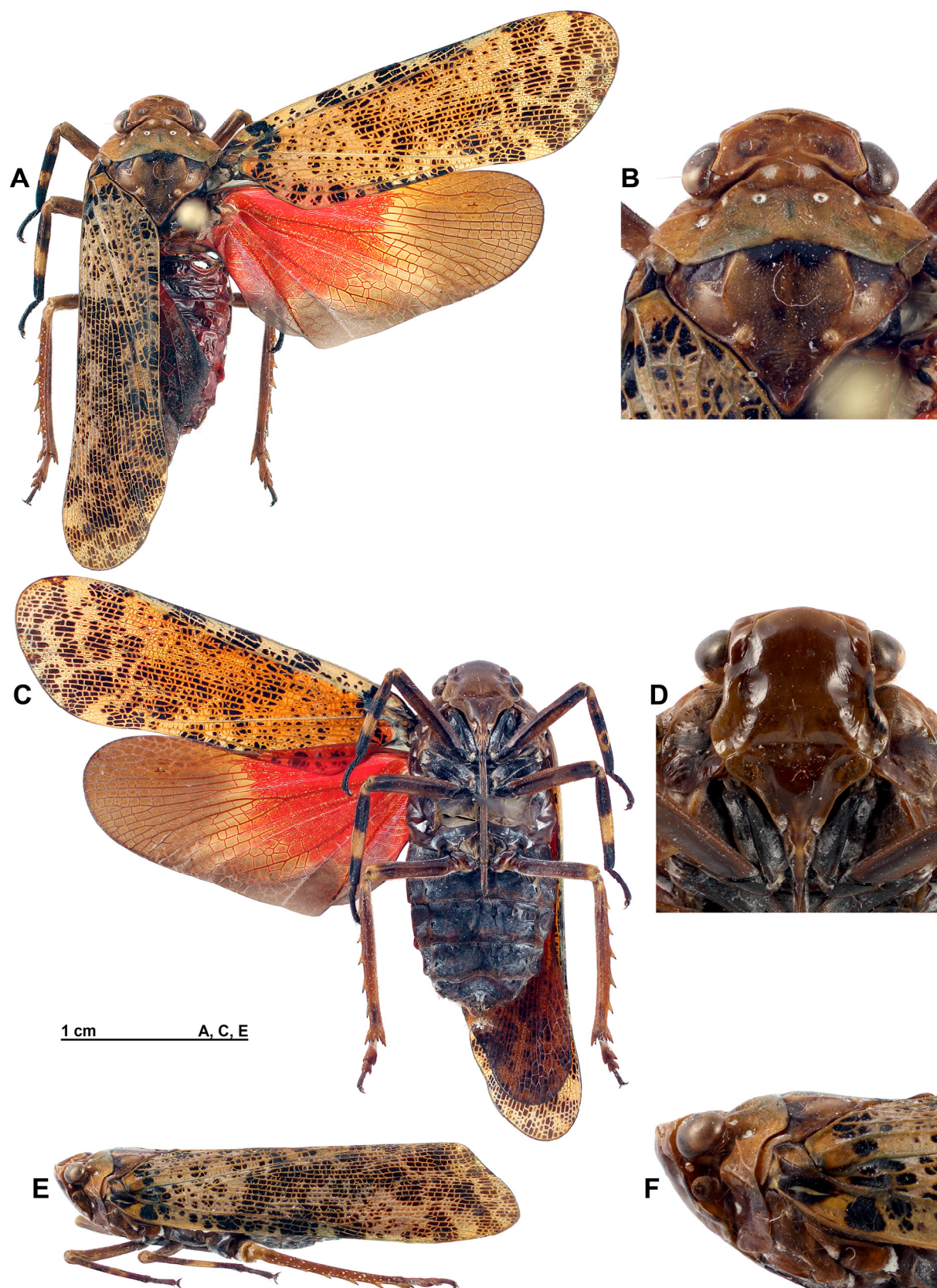


Fig. 13. *Polydictya thompsoni* sp. nov., holotype ♀ (RBINS). A, habitus, dorsal view; B, head, pro- and mesonotum, dorsal view. C, habitus, ventral view. D, frons, normal view. E, habitus, lateral view. F, head and prothorax, lateral view.



Fig. 14. *Polydictya thompsoni* sp. nov., A–B, in nature, Thailand, Kaeng Krachan N.P., 10.XI.2017. B, trophobiotic interaction with *Camponotus* sp. (Formicidae) (photographs © P. Thompson).

Tegmina: (Fig. 13 A, C, E) pale yellow-brown with 4 black markings on costal cell and narrow basal transverse ocre band; cells pale yellow-brown with groups of black cells and some cells pale yellow-brown with black centre, the whole forming a cloudy effect; veins pale yellow-brown; costal and sutural margins subparallel, apex obliquely rounded.

Posterior wings: (Fig. 13 A, C) brown on distal half and along sutural margin; basal half bright red; red basal area and brown portion separated by sinuate pale yellowish band; veins concolorous with background except on pale yellowish portion with veins reddish; broader than tegmina.

Legs: (Fig. 13 A, C) elongate and slender with pro- and mesotibiae dorsoventrally flattened but not foliaceous. Pro- and mesocoxae and trochanters black; pro- and mesofemora brown, slightly darker towards base and apex ventrally; pro- and mesotibiae with, from base to apex, short pale yellowish area, broad black-brown ring sometimes containing unclear paler ring, pale yellowish ring and black ring, each ring slightly shorter than preceding one from base to apex; pro- and mesotarsi black. Metacoxae, trochanters and femora brown, femora with distal

narrow pale yellowish ring; metatibiae and tarsi brown, paler than femora, tibiae with narrow basal pale yellowish ring. Metatibiotarsal formula: (5–6) 7/7/6.

Abdomen: (Fig. 13 A, C) bright red dorsally with anal tube yellowish brown in female; lateral pleura bright red on dorsal half and brownish on ventral half; brownish black ventrally with last segments yellow-brown.

DISTRIBUTION. Thailand, Phetchaburi Province (Fig. 4).

BIOLOGY. The specimens found in Kaeng Krachan National Park were sitting on the trunk of an unidentified species of tree (Fig. 14). At rest, they are very well camouflaged and difficult to spot. Trophobiosis with an ant of the genus *Camponotus* Mayr, 1861 was observed and documented for one specimen (Fig. 14 B). The ant was sitting still behind the lanternfly in the typical position taken during trophobiosis by ants and cockroaches with the anterior part of the body elevated (CONSTANT, 2015b; CONSTANT *et al.*, 2016; CONSTANT & BARTLETT, 2019), waiting to collect the honeydew drop that the lanternfly regularly projects while sap-feeding.

Comparison material examined for this study

Polydictya affinis Atkinson, 1889
(Fig. 15)

Polydictya affinis ATKINSON 1889: 339 [described, from Sikkim].

Polydictya fervida GERSTAECKER, 1895: 25 [described] (synonymized by DISTANT, 1906: 217).

TYPE MATERIAL EXAMINED. INDIA: Holotype ♀ (Fig. 15): [*Polydictya* n. sp.] [*Polydictya affinis*.] [Type] [Atkinson Coll. 92–3.] [BMNH(E) #651903] (BMNH).

Polydictya basalis (Hope, 1843)
(Fig. 16)

Eurybrachis (*sic!*) *basalis* HOPE, 1843: 134 [described], pl. 12 fig. 6, 6a [habitus and frons].

Polydictya basalis – GUÉRIN-MÉNEVILLE, 1844: 359 [described, transferred to *Polydictya*].

TYPE MATERIAL EXAMINED. BANGLADESH: Holotype ♀ (Fig. 16 – examined from photographs): [Silhet] [*Eurybrachys basalis*, Hope, Trans. Linn. Soc. 19. P. 134. Pl. 12 Fig 6.] [Type] [Type HEM: 475 1/2 *Eurybrachis basalis* Hope, Hope Dept. Oxford] (OUMNH).

Polydictya johannae Lallemand, 1956
(Fig. 17)

Polydictya johannae LALLEMAND, 1956: 3 [described].

TYPE MATERIAL EXAMINED. VIETNAM: Holotype ♀ (Fig. 17): [Cochinchinne, Phuquoc, le 29-VIII 1924, R. Vitalis de Salvaza] [Type] [*Polydictya* sp. not in BM., det. R.J. Izzard 1948] [*Polydictya johannae* Lall., V. Lallemand det., 1956] (FSAG).

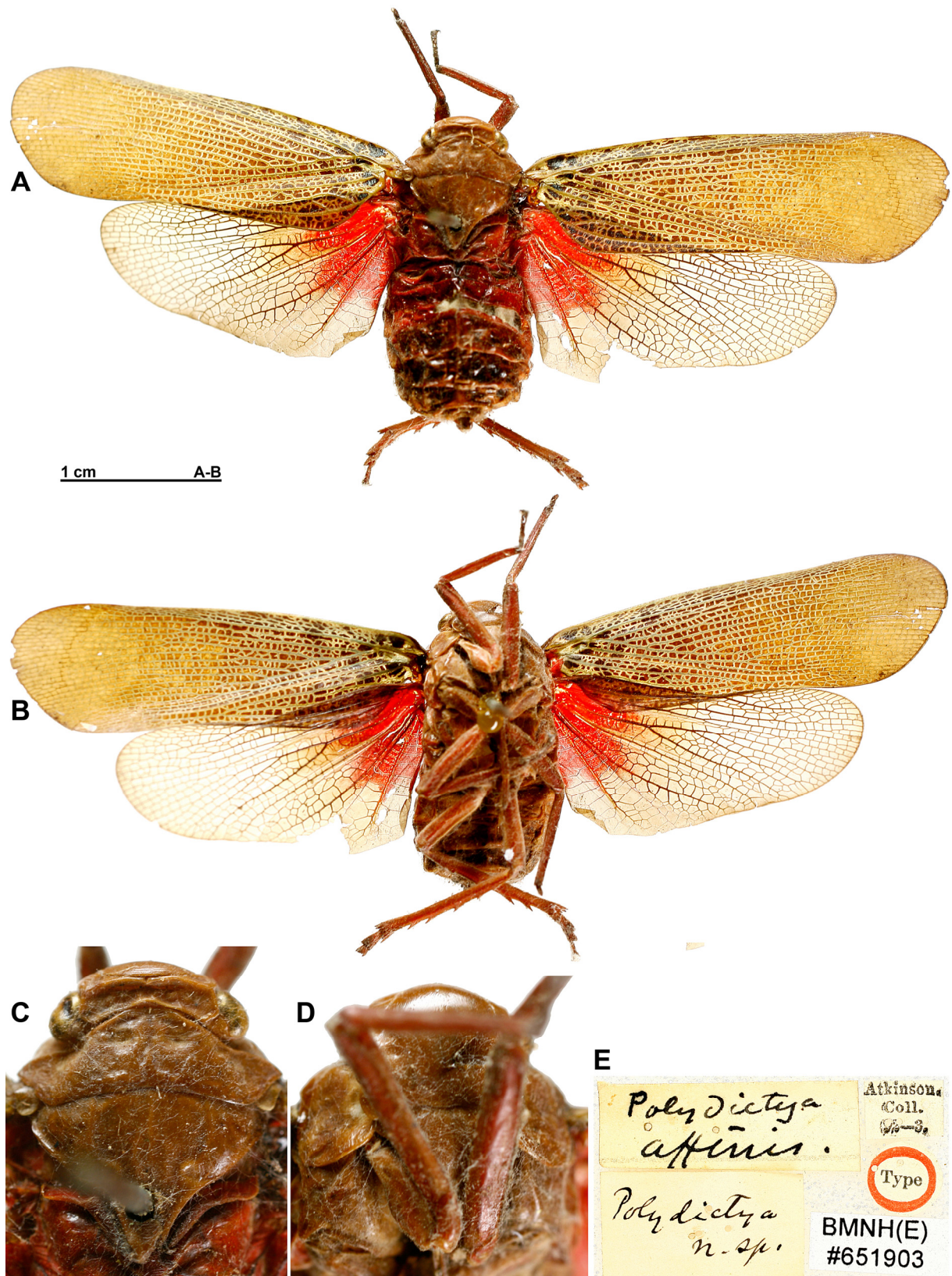


Fig. 15. *Polydictya affinis* Atkinson, 1885, holotype ♀ (BMNH). A, habitus, dorsal view; B, habitus, ventral view. C, head, pro- and mesonotum, dorsal view. D, frons, normal view. E, labels.

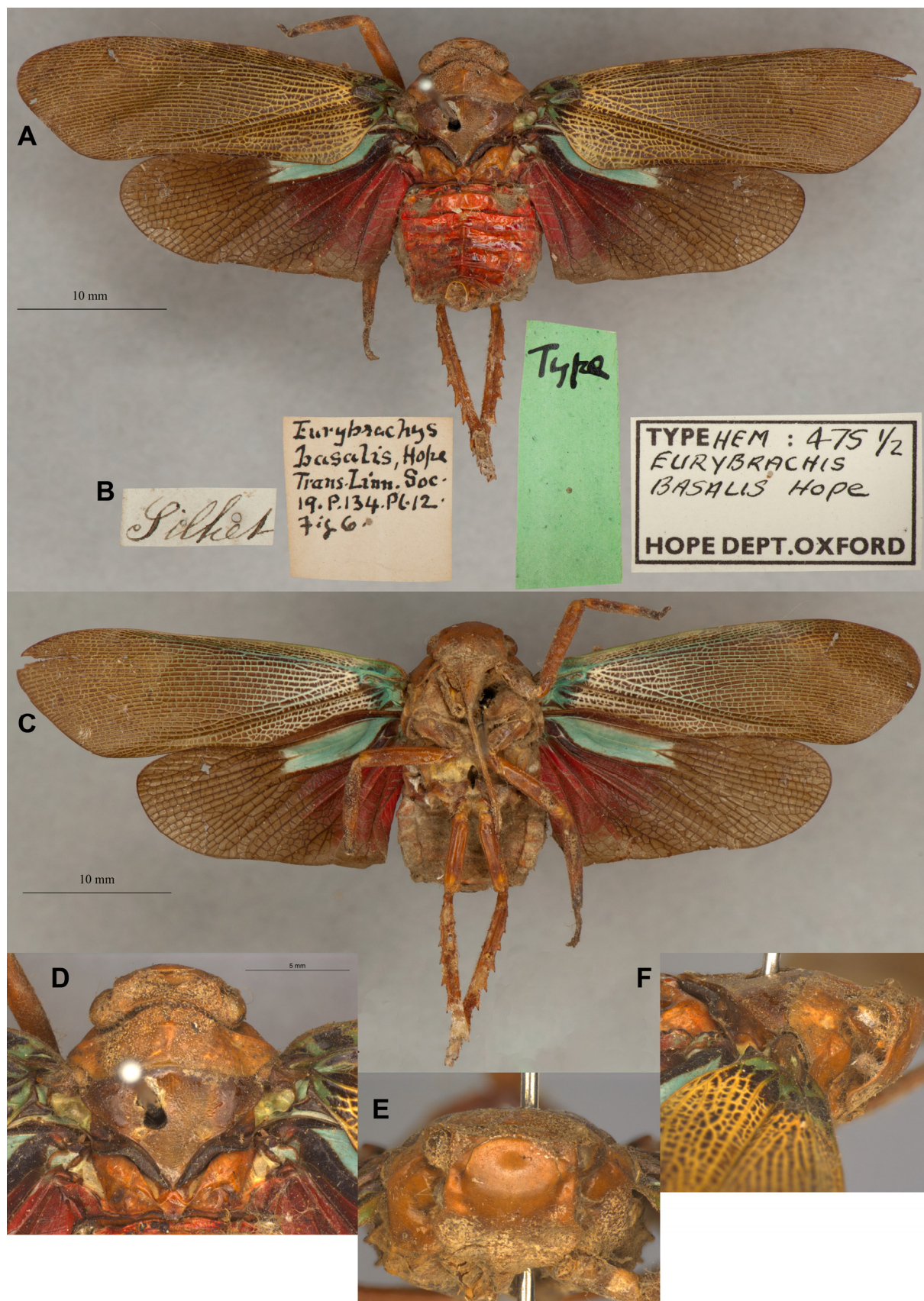


Fig. 16. *Polydictya basalis* (Hope, 1843), holotype ♀ (OUMNH – photographs © Z. Simmons). A, habitus, dorsal view; B, labels. C, habitus, ventral view. D, head, pro- and mesonotum, dorsal view. E, head, frontal view. F, head and thorax, lateral view.

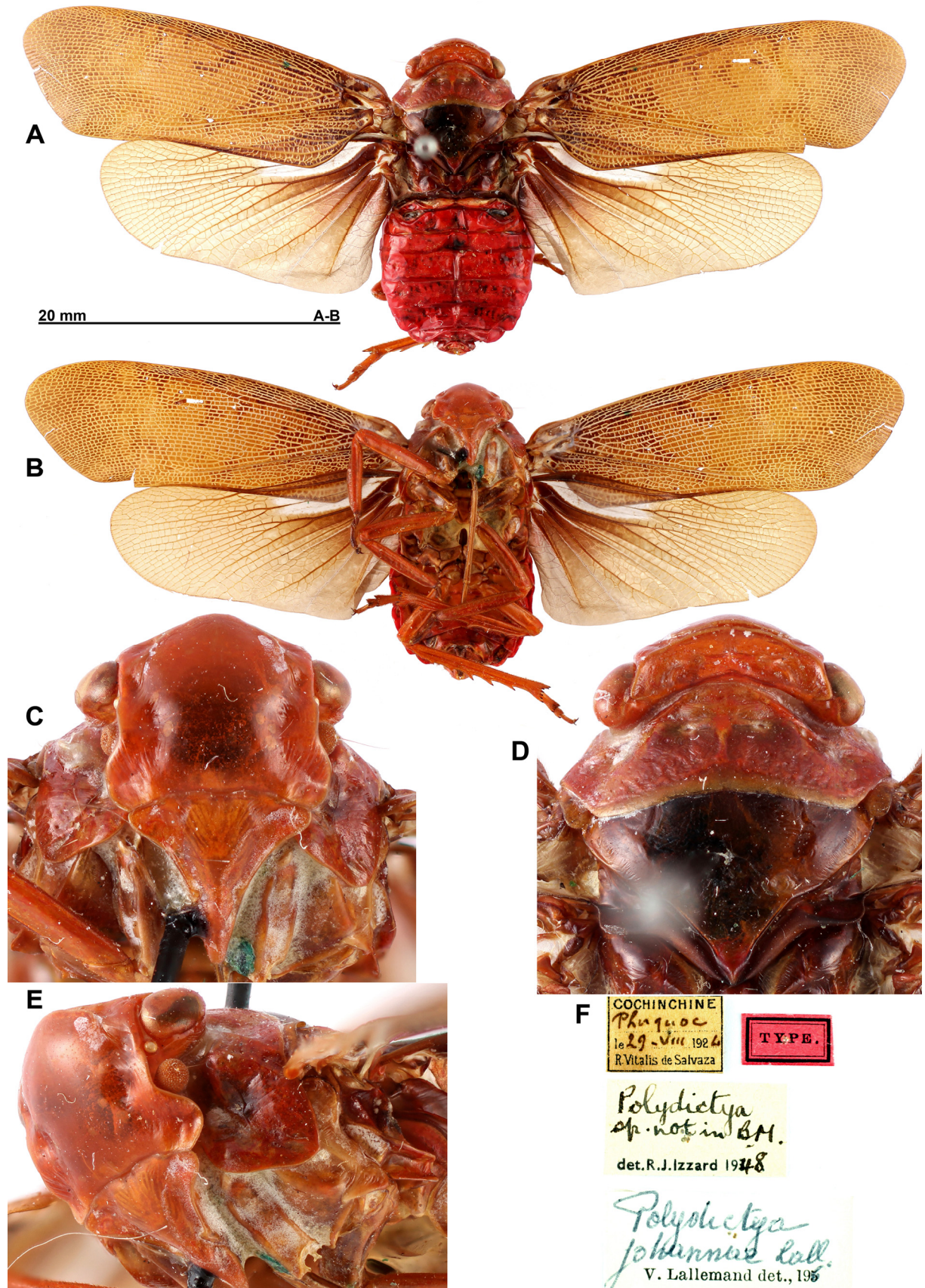


Fig. 17. *Polydictya johannae* Lallemand, 1956, holotype ♀ (FSAG). A, habitus, dorsal view; B, habitus, ventral view. C, frons, normal view. D, head, pro- and mesonotum, dorsal view. E, head and thorax, lateroventral view. F, labels.

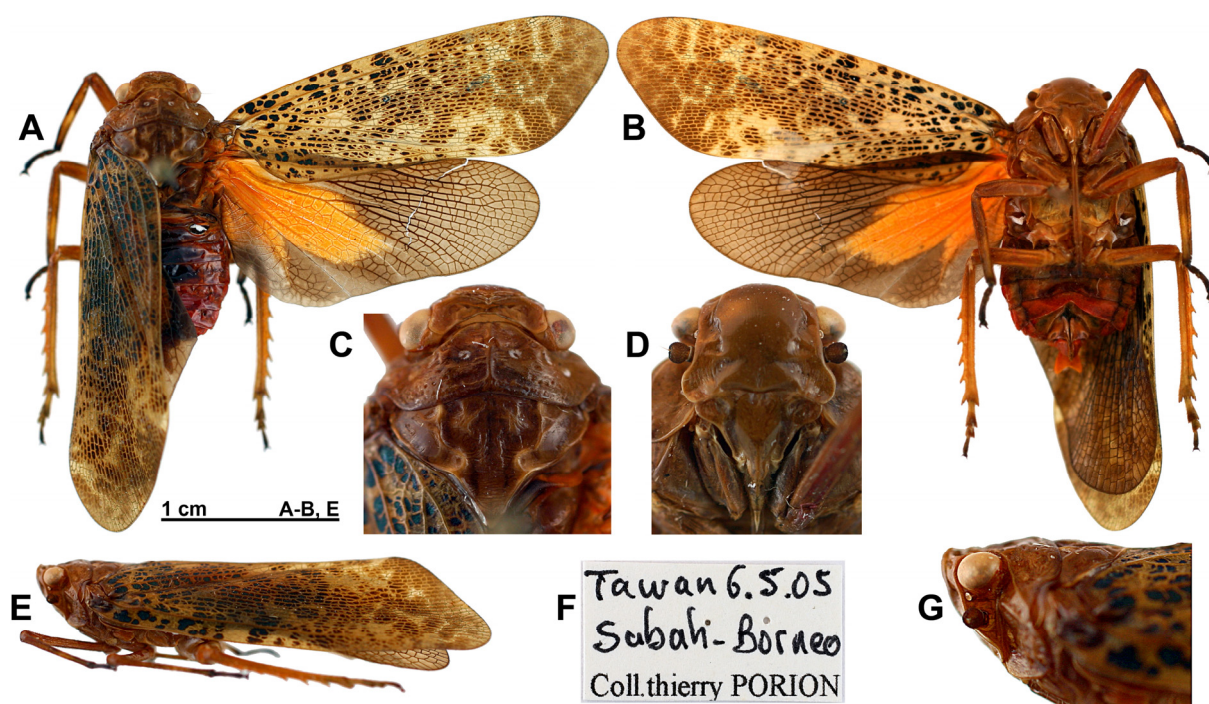


Fig. 18. *Polydictya kuntzi* Nagai & Porion, 2004, ♀ (MHNL). A, habitus, dorsal view; B, habitus, ventral view. C, head, pro- and mesonotum, dorsal view. D, frons, normal view. E, habitus, lateral view. F, label. G, head and thorax, lateral view.

***Polydictya kuntzi* Nagai & Porion, 2004**
(Fig. 18)

Polydictya kuntzi NAGAI & PORION, 2004: 4 [described], pl. 2 fig. 7 [habitus].

MATERIAL EXAMINED. MALAYSIA (Borneo): 1 ♀ (Fig. 18): Sabah, Tawau, 6.V.2005, coll. Thierry Porion (MHNL).

***Polydictya pantherina* Gerstaecker, 1895**
(Fig. 19)

Polydictya pantherina GERSTAECKER, 1895: 26 [described, compared with *P. tricolor* (Westwood, 1845)].

Polydictya krisna KIRKALDY, 1902: 49 [described], pl. A fig. 4 [habitus] (synonymized by NAGAI & PORION, 1996: 13).

Thaumastodictya krisna – KIRKALDY, 1902: 307 [transferred to *Thaumastodictya* as type species]. — MELICHAR, 1903: 72 [returned to *Polydictya*].

TYPE MATERIAL EXAMINED. SRI LANKA: holotype ♀ (Fig. 19 A–C – examined from photographs): [*Polydictya pantherina* ♀ Ceylon merid. Fruhst.] [Zool. Mus. Greifswald II 27378] (ZMIG).

SRI LANKA: holotype ♂ of *P. krisna* Kirkaldy, 1902 (Fig. 19 D–G): [Kandy, Ceylon XII 97] [*Thaumastodictya krisna* (Kirk.) Type.] [Type H. T.] [Kirkaldy Coll. 1912–513] (BMNH).

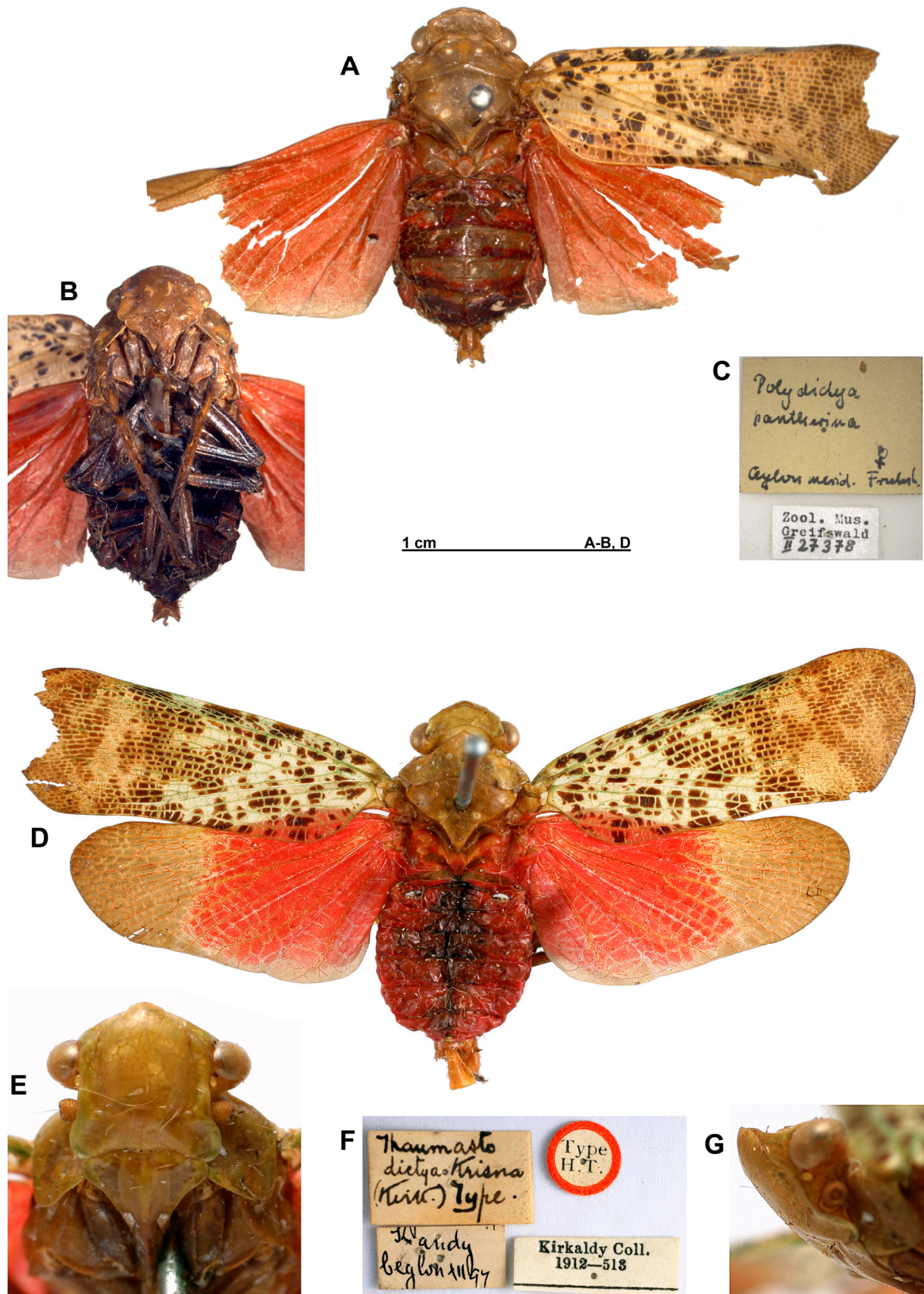


Fig. 19. *Polydictya pantherina* Gerstaecker, 1895. A–C, holotype ♀ (ZIMG – photographs © P. Michalik). A, habitus, dorsal view; B, habitus, ventral view. C, labels. D–G, holotype ♂ of synonym *Polydictya krisna* Kirkaldy, 1902 (BMNH). D, habitus, dorsal view. E, frons, normal view. F, labels. G, head, lateral view.

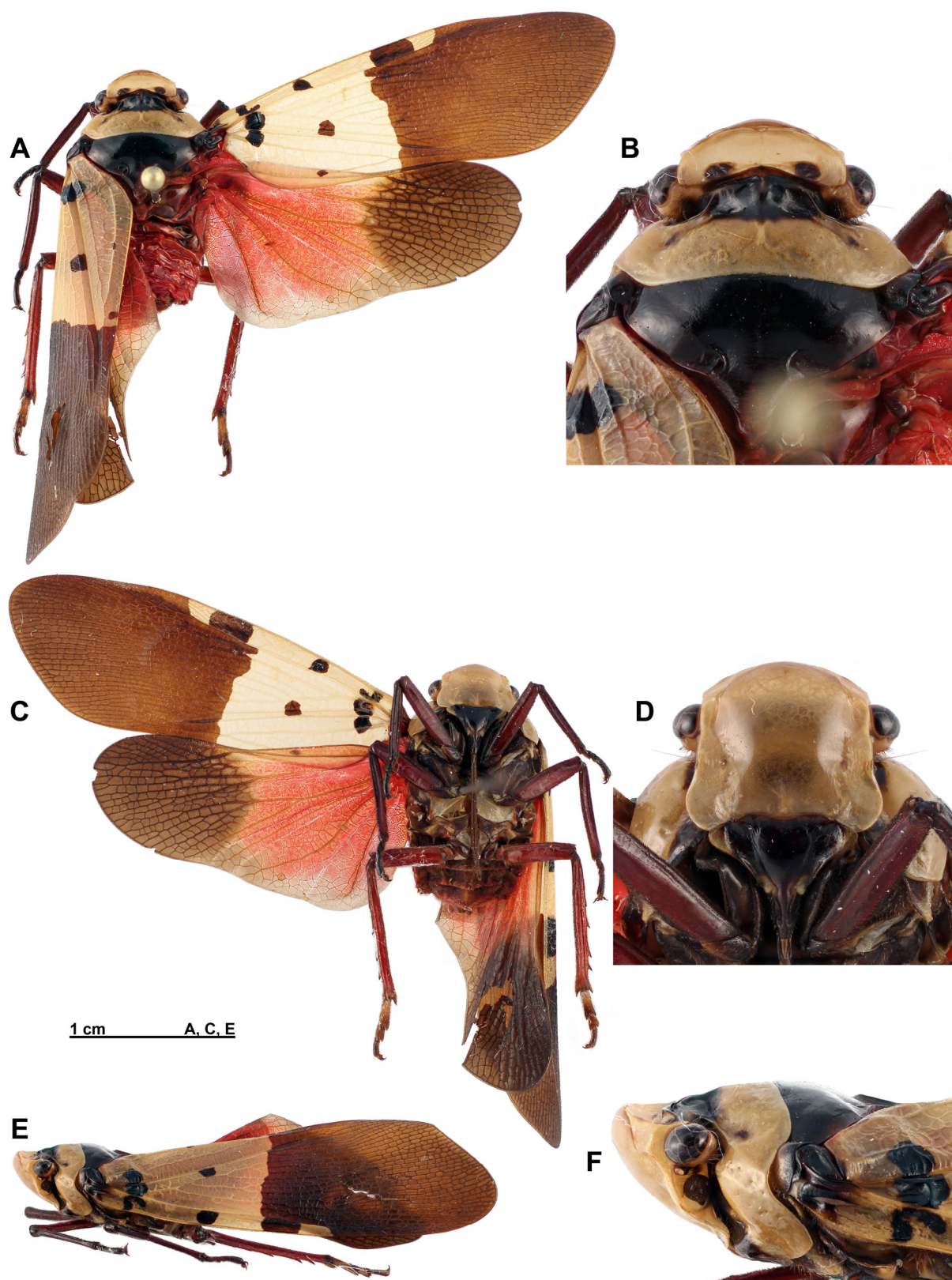


Fig. 20. *Polydictya tricolor* (Westwood, 1845) ♀, Vietnam, Kon Ka Kinh N.P., V.2017 (RBINS). A, habitus, dorsal view; B, head, pro- and mesonotum, dorsal view. C, habitus, ventral view. D, frons, normal view. E, habitus, lateral view. F, head and prothorax, lateral view.

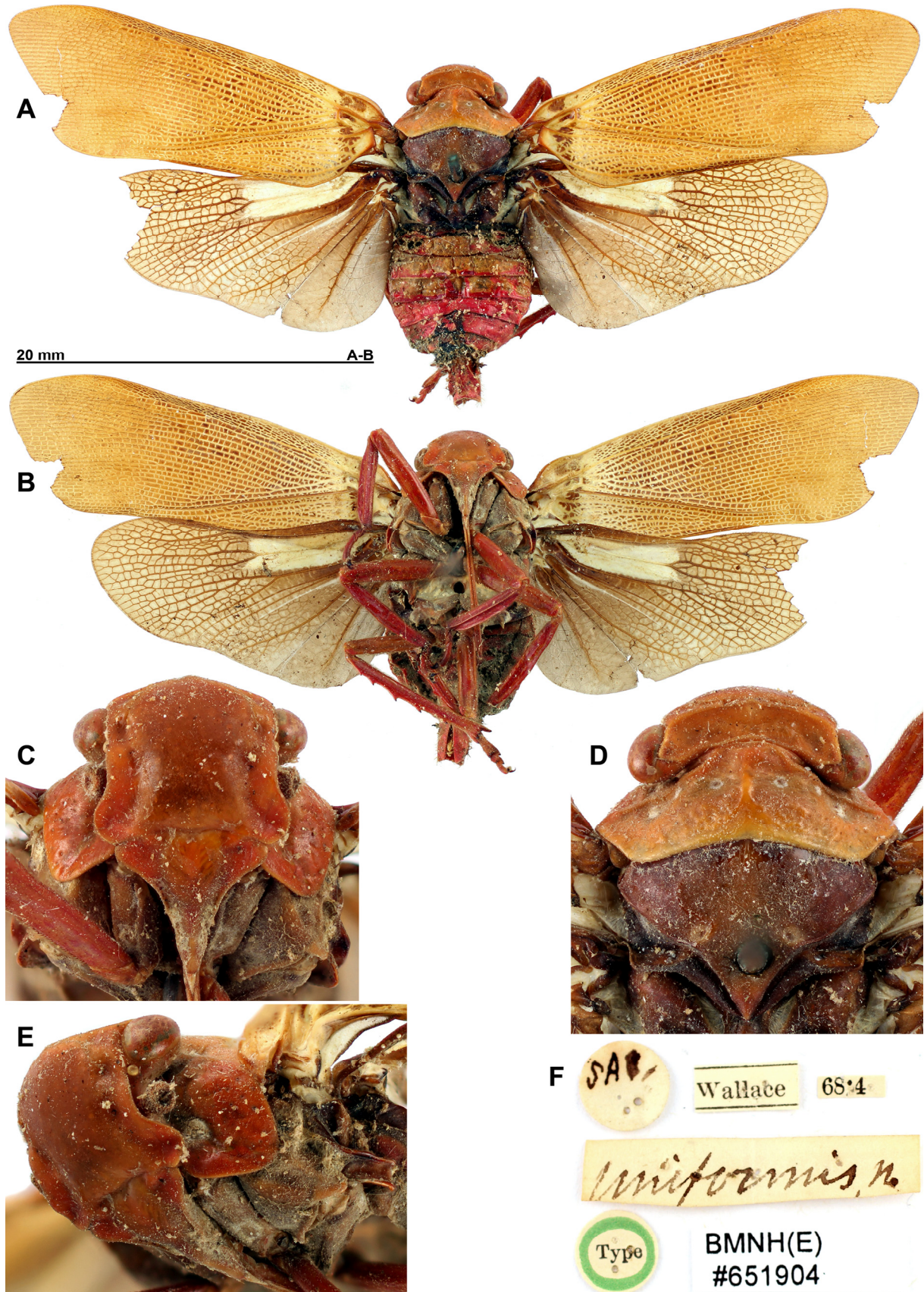


Fig. 21. *Polydictya uniformis* Walker, 1957, holotype ♂ (BMNH). A, habitus, dorsal view; B, habitus, ventral view. C, frons, normal view. D, head, pro- and mesonotum, dorsal view. E, head and thorax, lateroventral view. F, labels.

Polydictya tricolor (Westwood, 1845)
(Fig. 20)

Lystra tricolor WESTWOOD, 1845: 35[described], pl. 57, figs. 4, 4a [habitus, frons].

Polydictya tricolor – WALKER, 1851: 290 [described, transferred to *Polydictya*].

MATERIAL EXAMINED. VIETNAM: 1 ♀ (Fig. 20): Gia Lai Province, Kon Ka Kinh N.P., 14°13'N 108°19'E, V.2017, leg. I. Semenyuk, I.G.: 33.498 (RBINS).

Polydictya uniformis (Walker, 1857)
(Fig. 21)

Aphaena uniformis WALKER, 1857: 144 [described, compared with *P. tricolor* (Westwood, 1845)].

Polydictya basalis – STÅL, 1862: 500 [*Aphaena uniformis* transferred to *Polydictya* as a (erroneous!) synonym of *P. basalis*].

Polydictya uniformis – DISTANT, 1906: 216 [good species].

TYPE MATERIAL EXAMINED. MALAYSIA (Borneo, Sarawak): holotype ♂ (Fig. 21): [SAR.] [Wallace] [68·4] [*uniformis* n.] [Type] [BMNH(E) #651904] (BMNH).

Discussion

The genus *Polydictya* now contains 36 species, including 13 of them distributed in the Indochinese region. The progress in documenting these species was very slow until the recent years, with only three species recorded in the period 1918–2004 (Fig. 22). Ten species were added since 2004, with nine of them, representing nearly 70% of the Indochinese species and 25% of the total number of species of *Polydictya*, described in studies in the framework of Global Taxonomy Initiative projects (CONSTANT *et al.*, 2018). This shows again the importance of such projects and of the availability of dedicated specialists to speed up the documentation of the biodiversity (see also CONSTANT & BARTLETT, 2019 for similar example from Cambodia). The number of recently described species of *Polydictya* leaves no doubt that more species exist in the Indochinese region.

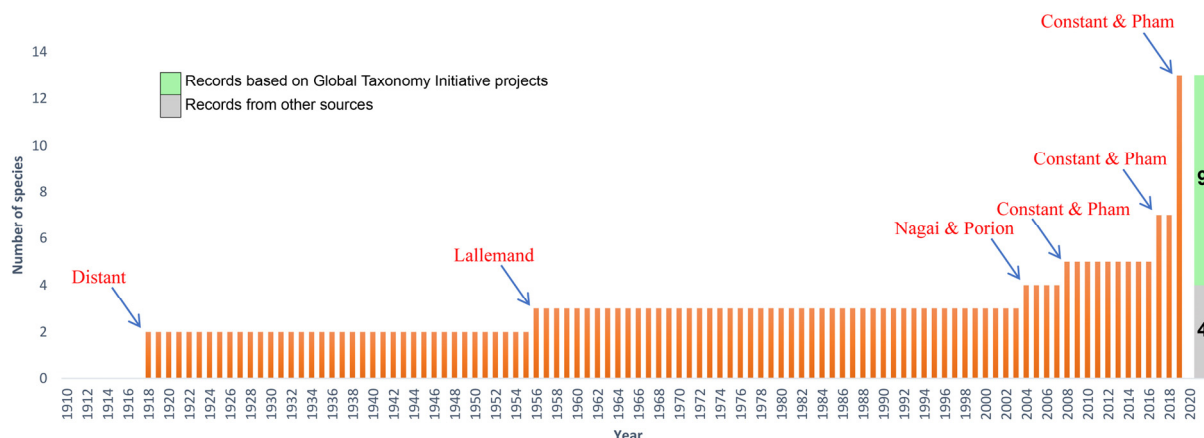


Fig. 22. *Polydictya* spp. from Indochinese region: cumulative totals of numbers of species recorded since 1910.

It also highlights the importance to review what we already know in planthopper taxonomy using adapted morphological characters, particularly such as the ones carried by the male terminalia, that allow a more precise identification than wing color patterns only as it was used in the old time. These updated morphological descriptions will adequately be used as references supporting future identifications using molecular characters such as the barcoding. Moreover and despite the long lasting interest of entomologists and collectors for lanternflies, host plants, biology, phenology and other aspects of the natural history of *Polydictya* species remain totally undocumented, with here only the first record of trophobiosis with ants assumed to be quite general in fulgorid planthoppers (BOURGOIN & CONSTANT, 2017).

Acknowledgements

We thank Mr Joachim Bresseel (RBINS), Mr Van Dat Nguyen (VNMN), Mr Xavier Vermeersch (RBINS), Mr Thanh Trung Vu (VNMN), Miss Thi Ha Dong Tran and Mr Ba Nam Nguyen (Chu Mom Ray National Park, Vietnam) and Mr Sophany Phauk and his students of the Cambodian Entomology Initiative (Royal University of Phnom Penh) for their help and permanent enthusiasm during the collecting trips in Vietnam and Cambodia; Mr Cédric Audibert (MHNL), Mrs Jeanine Bortels (FSAG), Prof. Thierry Bourgoïn (MNHN), Mr Peter Michalik (ZIMG), Miss Irina Semenyuk (Russian Academy of Sciences, Moscow, Russia), Mr Amoret Spooner (OUMNH), Mr Paul Thompson (U.K.) and Mr Mick Webb (BMNH) for providing specimens, photographs and/or access to collections under their care; Miss Mado Berthet (RBINS) for the genitalia drawings and for improving the plates of habitus; Dr Wouter Dekoninck (RBINS) for identifying the ants; Dr Frederik Hendrickx, Dr Patrick Grootaert, Dr Marie-Lucie Susini Ondafe and Dr Luc Janssens de Bisthoven (RBINS), Dr On Norong (Royal University of Phnom Penh), Prof. Dr Trung Minh Nguyen (VNMN) and the authorities of the protected areas we were authorized to sample, for supporting our Global Taxonomy Initiative projects in Vietnam and Cambodia; Prof. Thierry Bourgoïn (MNHN) and Prof. Murray J. Fletcher (Orange Agricultural Institute, Australia) for reviewing the manuscript. This paper is a result of the projects “A step further in the Entomodiversity of Vietnam” and “A step further in the Entomodiversity of Cambodia” supported through grants issued by the capacity building Programme of the Belgian Global Taxonomy Initiative National Focal Point that runs under the CEBioS programme with financial support from the Belgian Directorate-General for Development Cooperation (DGD). The present study was also supported by the Vietnam National Foundation for Science and Technology Development (NAFOSTED) under the grant number 106-NN.05-2016.04, Vietnam and the Project TN17/T06 of the National Programme Tay Nguyen 2016–2020 for the second author.

References

- ATKINSON E.T., 1885. - Notes on Indian Rhynchota. No. 4. *Journal of the Asiatic Society of Bengal* 54: 127–158. Available from <http://hemiptera-databases.org/flowpdf/644.pdf>
- ATKINSON E.T., 1889. - XIII.—New or little known Indian Rhynchota. *Journal of the Asiatic Society of Bengal* 57: 333–345.
- BOSUANG S., AUDIBERT C. & PORION T., 2015. - Two new *Polydictya* from Borneo (Hemiptera: Fulgoromorpha: Fulgoridae). *Faunitaxys* 3(3): 1–4.
- BOSUANG S., AUDIBERT C., PORION T. & CHAN C.L., 2017. - *A guide to lanternflies of Borneo*. Natural History Publications (Borneo), Kota Kinabalu, 119 pp.
- BOURGOIN T., 1988. - A new interpretation of the homologies of the Hemiptera male genitalia illustrated by the Tettigometridae (Hemiptera, Fulgoromorpha). In: VIDANO C. & ARZONE A. (Eds.). *Proceedings of the 6th Auchenorrhyncha Meeting, Turin, Italy, September 7–11, 1987*, Consiglio Nazionale delle Ricerche, IPRA Rome, 113–120.
- BOURGOIN T., 2019. - FLOW (Fulgoromorpha Lists on The Web): a world knowledge base dedicated to Fulgoromorpha. V.8, updated [XII.2018]. <http://hemiptera-databases.org/flow/> [Accessed April 2nd, 2019].
- BOURGOIN T. & CONSTANT J., 2017. - Macropatterns of planthopper interspecific relationships (Hemiptera Fulgoromorpha). *XV International Auchenorrhyncha Congress 2017, July 9th-15th, Mendes Brazil. Programme and abstract book*, 22–23.
- BOURGOIN T. & HUANG J., 1990. - Morphologie comparée des genitalia mâles des Trypetimorphini et remarques phylogénétiques (Hemiptera: Fulgoromorpha: Tropiduchidae). *Annales de la Société Entomologique de France (Nouvelle Serie)*, 26: 555–564.

- BOURGOIN T., WANG R.R., ASCHE M., HOCH, H., SOULIER-PERKINS A., STROIŃSKI A., YAP S., & SZWEDO J., 2015. - From micropterism to hyperpterism: recognition strategy and standardized homology-driven terminology of the forewing venation patterns in planthoppers (Hemiptera: Fulgoromorpha). *Zoomorphology*, 134: 63–77.
- CHEW KEA FOO S., PORION T. & AUDIBERT C., 2010. - Cinq nouveaux Fulgoridae asiatiques (Hemiptera : Fulgoromorpha). *Les cahiers du Musée des Confluences - Etudes scientifiques*, 1 (2010), 51–64.
- CONSTANT J., 2004. - Révision des Eurybrachidae (I). Le genre *Amychodes* Karsch, 1895 (Homoptera: Fulgoromorpha: Eurybrachidae). *Bulletin de l'Institut royal des Sciences naturelles de Belgique*, 74: 11–28.
- CONSTANT J., 2009. - A new species of *Polydictya* from Sumatra and notes on *P. chantrainei* Nagai et Porion, 2004 (Hemiptera: Fulgoromorpha: Fulgoridae). *Annales zoologici*, 59(3): 293–296. <http://dx.doi.org/10.3161/000345409X476378>
- CONSTANT J., 2010. - A new species of *Polydictya* from Lombok (Hemiptera, Fulgoromorpha, Fulgoridae). *Nouvelle Revue d'Entomologie*, 26(2) (2009): 155–161.
- CONSTANT J., 2015a. - The Lanternfly genus *Polydictya* (Hemiptera: Fulgoromorpha: Fulgoridae) from Sulawesi and neighbouring islands, with the description of three new species. *European Journal of Taxonomy*, 110: 1–19. <http://dx.doi.org/10.5852/ejt.2015.110>
- CONSTANT J. 2015b. Review of the *effusus* group of the Lanternfly genus *Pyrops* Spinola, 1839, with one new species and notes on trophobiosis (Hemiptera: Fulgoromorpha: Fulgoridae). *European Journal of Taxonomy* 128: 1–23. <http://dx.doi.org/10.5852/ejt.2015.128>
- CONSTANT J., 2016. - Two new species of *Polydictya* from Borneo and Siberut, and notes on *P. chewi* Nagai & Porion, 2004 and *P. tanjiewhoei* Bosuang, Audibert & Porion, 2015 (Hemiptera: Fulgoromorpha: Fulgoridae). *Belgian Journal of Entomology*, 43: 1–17.
- CONSTANT J. & BARTLETT C.R., 2019. - New records and species in five planthopper families from Keo Seima Wildlife Sanctuary, Cambodia with checklist of Cambodian planthoppers (Hemiptera: Fulgoromorpha). *Belgian Journal of Entomology*, 83: 1–27.
- CONSTANT J., BOURGOIN T., BARTOLOZZI L., BRESSEEL J., GUILBERT E., SOULIER-PERKINS A., PHAM H.T., SUSINI ONDAFE M.-L., JANSSENS DE BISTHOVEN L., LORN S. & KHEAM S., 2018. - Vietnam, a champion for insect biodiversity: a win-win commitment. *CEBioS PB*, 6: 1–4. Available from <https://www.researchgate.net/publication/322557227>
- CONSTANT J. & MOHAN A.V., 2017. - The lanternflies from Andaman and Nicobar: one new *Pyrops* species, new records and illustrated key to the species (Hemiptera: Fulgoromorpha: Fulgoridae). *Belgian Journal of Entomology*, 49: 1–24.
- CONSTANT J. & PHAM H.T., 2008. - A new species of *Polydictya* from Vietnam (Hemiptera, Fulgoromorpha, Fulgoridae). *Nouvelle Revue d'Entomologie (N.S.)*, 25 (1): 27–31.
- CONSTANT J. & PHAM H.T., 2017. - Indochinese *Polydictya* lanternflies: Two new species from Vietnam, identification key and notes on *P. vietnamica* (Hemiptera: Fulgoromorpha: Fulgoridae). *European Journal of Entomology*, 114: 279–290. <https://doi.org/10.14411/eje.2017.034>
- DISTANT W.L., 1888. - An enumeration of the Rhynchota received from Baron von Müller, and collected by Mr. Sayer in New Guinea during Mr. Cuthbertson's expedition. *Transactions of the Entomological Society of London*, 1888: 475–489. <http://dx.doi.org/10.1111/j.1365-2311.1888.tb01315.x>
- DISTANT W.L., 1906. - *The fauna of British India, including Ceylon and Burma. Rhynchota*. Vol. 3. Taylor & Francis, London. <http://dx.doi.org/10.5962/bhl.title.48423>
- DISTANT W.L., 1918. The Homoptera of Indo-China. *Annals and Magazine of Natural History. London. (Ser. 9)* 1: 196–200.
- GERSTAECKER C.E.A., 1895. - Ueber einige bemerkenswerthe Fulgorinen der Greifswalder zoologischen Sammlung. *Mittheilungen aus dem Naturwissenschaftlichen Verein für Neu-Vorpommern und Rügen*, 27: 1–50.
- GUÉRIN-MÉNEVILLE F.E., 1844. - Insectes. In: Cuvier G.L.C.F.D. *Iconographie du règne animal*: 355–370. <http://dx.doi.org/10.5962/bhl.title.10331>
- HOPE, F.W., 1843. - On some rare and beautiful insects from Silhet, chiefly in the collection of Frederick John Parry, Esq. F. L. S. *Transactions of the Linnean Society of London*. 19: 131–136.
- JACOBI A., 1910. - 12. Hemiptera. 7. Homoptera. In: Sjöstedt Y. (ed.) *Wissenschaftliche ergebnisse der Schwedischen Zoologischen Expedition nach dem Kilimandjaro, dem Meru und den Umgebenden Massaisteppen Deutsch-Ostafrikas 1905–1906, unter leitung von Prof. Dr. Yngve Sjöstedt*. Vol. 2: 97–136. P. Palmquists aktiebolag, Stockholm. <http://dx.doi.org/10.5962/bhl.title.1805>
- KARSCH F.A.F., 1890. - Afrikanische Fulgoriden. *Berliner Entomologische Zeitschrift*, 35(1): 57–70. <http://dx.doi.org/10.1002/mmnd.18900350105>
- KIRKALDY G.W., 1902. - Memoirs on Oriental Rhynchota. *The Journal of the Bombay Natural History Society*, 14: 46–58 & 294–309, pl. A-C. <http://biodiversitylibrary.org/page/30157663>

- KIRKALDY G.W., 1907. - "Current criticism." *The Entomologist* 40: 58–60.
<http://biodiversitylibrary.org/page/11406497>
- LALLEMAND V., 1956. - Contribution à l'étude des Fulgoridae (Hemiptera) (1re note). *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique* XXXII(39): 1–7.
- LALLEMAND V., 1963. - Révision des Fulgoridae (Homoptera). Deuxième partie. Faunes asiatique et australienne. *Mémoires de l'Institut royal des Sciences naturelles de Belgique* (2e série) 75: 1–99, pl. 1–11.
- MELICHAR L., 1903. - *Homopteren-Fauna von Ceylon*. F. L. Dames, Berlin, 248 pp. Available from <http://ag.udel.edu/research/delphacid/documents/Melichar1903-Ceylon.pdf>
- METCALF Z.P., 1947. - *General Catalogue of the Homoptera. Fascicle IV Fulgoroidea. Part 9 Fulgoridae*. Raleigh (U.S.A.) North Carolina State College, 280 pp.
- NAGAI S. & PORION T., 1996. - *Fulgoridae 2: Catalogue illustré des faunes asiatique et australienne*. Sciences Nat, Compiègne, 80 pp., 236 figs.
- NAGAI S. & PORION T., 2004. - *Fulgoridae 2, supplement 2: Nouveaux Fulgoridae d'Asie du Sud-Est*. Hillside Books, Canterbury, 13 pp., 14 figs.
- O'BRIEN L.B. & WILSON S.W., 1985. - *Planthoppers systematics and external morphology*. pp. 61–102. In: NAULT L.R. & RODRIGUEZ J.G. [eds], *The Leafhoppers and Planthoppers*. John Wiley & Sons. New York, ix + 500.
- SCHMIDT E., 1907. - Beitrag zur Kenntnis der Fulgoriden. Die Arten des Genus *Myrilla* Distant. *Stettiner Entomologische Zeitung*, 68: 113–116. Available from <http://hemiptera-databases.org/flowpdf/957.pdf>
- SCHMIDT E., 1912. - Diagnosen neuer Fulgoriden Gattungen und Arten. *Stettiner Entomologische Zeitung*, 73: 67–102. <http://biodiversitylibrary.org/page/8824601>
- SHORTHOUSE D.P., 2010. - SimpleMapp, an online tool to produce publication-quality point maps. [Retrieved from <http://www.simplemapp.net>. Accessed May 13, 2019].
- STÅL C., 1862. - Synonymiska och systematiska anteckningar öfver Hemiptera. *Öfversigt af Kongliga Svenska Vetenskaps-Akademiens Förhandlingar*. 19: 479–504.
- STÅL C., 1866. - *Hemiptera Africana*. Vol. 4. *Hemiptera Homoptera Latr.* Ex officina Norstedtiana, Stockholm: 1-276. <http://dx.doi.org/10.5962/bhl.title.8566>
- WALKER F., 1851. - *List of the specimens of Homopterous insects in the collection of the British Museum*. Part.2. British Museum (Natural History), London. <http://dx.doi.org/10.5962/bhl.title.9063>
- WALKER F., 1857. - Catalogue of the homopterous insects collected at Sarawak, Borneo, by Mr. A.R. Wallace, with descriptions of new species. *Journal of the Proceedings of the Linnean Society*, 1: 141–175, pl. 7–8.
- WESTWOOD J.O., 1845. - Description of some Homopterous insects from the East Indies. *Arcana Entologica or illustrations of new, rare, and interesting insects*, 2: 33–35.