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Research article

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Laberiini, a new tribe of Tropiduchidae planthoppers from Madagascar (Hemiptera: Fulgoroidea)

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Abstract. The tropiduchid monotypic genus *Laberia* Stål, 1866, endemic to Madagascar, is placed in a new tribe of its own Laberiini trib. nov. The tribe is placed in the subfamily Elicinae, and can be distinguished from other representatives of the subfamily by the unique combination of morphological characters of the head, tegmina, legs and genital structures. The genus *Laberia* and its only species *Laberia palliata* Stål, 1866 are redescribed, chresonymy is presented and nomenclatorial questions are clarified. Distributional data from Madagascar and doubtful presence of the taxon in Mauritius are discussed. Taxonomic content of Elicinae is briefly discussed.

Keywords. Fulgoromorpha, Madagascar Region, new tribe, taxonomic changes, redescriptions.

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Introduction

Tropiduchid planthoppers (Insecta Linnaeus, 1758, Hemiptera Linnaeus, 1758, Fulgoromorpha Evans, 1946) are most often found associated with herbaceous and woody dicotyledons, palms, grasses, rushes and ferns (Fennah 1982) in more than 20 plant orders (Bourgoin 2022), while several species are known to feed on crop plants (Fennah 1982; Bartlett *et al.* 2018). They are mainly present in the warmer regions of the globe (Fennah 1982), and distributed between the north temperate and the south subtropical bioclimatic zones (Bourgoin 2022). In these regions, they have adapted themselves to habitats ranging from rainforests to macchia and semideserts (Fennah 1982). Currently, the family Tropiduchidae Stål, 1866 includes 197 genera (7.8 % of the planthopper genera) and 680 species (4.9 % of the species), forming a medium-sized family within the Fulgoromorpha. They belong to the group of the 'higher Fulgoroidea' with 9 other families, whose monophyly and relationships have yet to be verified using phylogenetic analytical tools (Bartlett *et al.* 2018).

Planthoppers of the family Tropiduchidae Stål, 1866 (Hemiptera, Fulgoromorpha) have been given more attention in recent years, both with the description of several new extant representatives and revision of several tribes (Wang R.R. & Liang A.P. 2006, 2008, 2009, 2011; Liang A.P. & Wang R.R. 2008; Constant 2009, 2010; Wang R.R. *et al.* 2009, 2012, 2013, 2014; Gnezdilov 2012a, 2012b, 2013; Gnezdilov & Bourgoin 2015; Stroiński *et al.* 2015; Wang M. *et al.* 2015; Gnezdilov *et al.* 2016; Constant & Pham 2020) and the discovery of several key fossil taxa (Szwedo 2000; Shcherbakov 2006; Szwedo & Stroiński 2010, 2013, 2017) now dating back the family to at least the Eocene Lutetian–Priabonian (47–38 Mya) (Weitschat & Wichard 2010; Szwedo & Drohojowska 2016; Szadziewski *et al.* 2018; Sadowski *et al.* 2017, 2021). Simultaneously, the family taxonomic concept has been substantially modified with the addition of the new subfamily Elicinae Melichar, 1915, which includes taxa previously classified in various other planthopper families (Gnezdilov 2007).

Despite this important taxonomic activity, the history of the family and its classification remains relatively simple (Fig. 1) compared to that of other planthopper families (e.g., Issidae Spinola, 1839; Wang *et al.* 2016). Tropiduchidae was first recognized by Stål (1866) and subsequently divided into

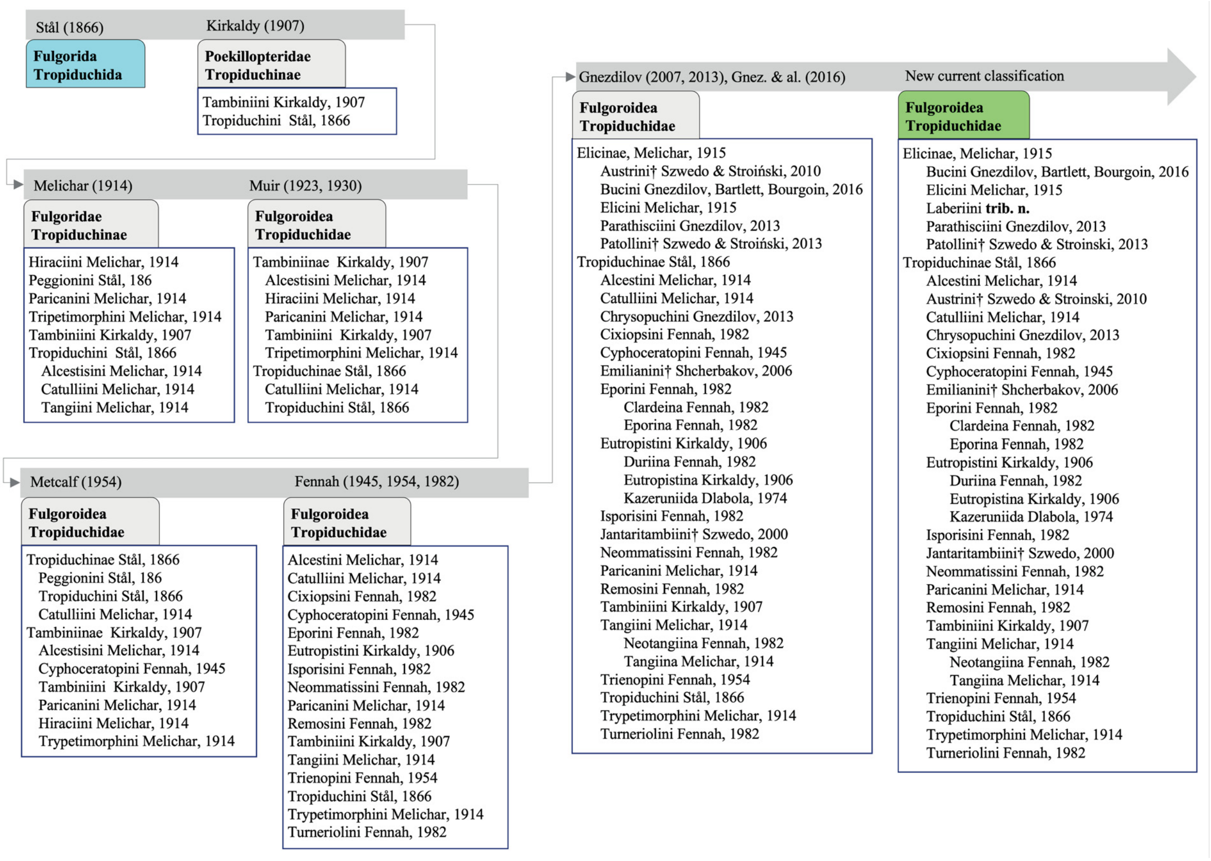


Fig. 1. History of tribal classification of the family Tropiduchidae.

Tambiini Kirkaldy, 1907 and Tropiduchini Stål, 1866. The first elaborated classification of the family was provided by Melichar (1914) who divided it into six groups – Hiraciini Melichar, 1914, Peggionini Stål, 1866, Paricanini Melichar, 1914, Tripetimorphini Melichar, 1914 [sic!], Tambiniini Kirkaldy, 1907, and Tropiduchini Stål, 1866; the latter divided into Alcestini Melichar, 1914, Catulliini Melichar, 1914 and Tangiini Melichar, 1914. After a few modifications by Muir (1923, 1930) and cataloguing by Metcalf (1954), the family was thoroughly reviewed by Fennah (1982) who divided it into 16 tribes. Several other extant and extinct tribes were successively added and, finally, Gnezdilov (2013) divided the family into two subfamilies, Tropiduchinae and Elicinae, the latter being the topic of this paper. With the result of this paper, the family now accounts for 25 tribes, the relationships of which still remain to be totally investigated on a phylogenetic basis, using both morphological and particularly molecular analyses, for which sequenced taxa remain very few compared to the diversity of the family.

Material and methods

The nomenclature of the fore wing (tegmen) follows the interpretation proposed by Bourgoin *et al.* (2015) and Stroiński (2020). Antennal structures were named following Stroiński *et al.* (2011). The terminology of the genitalia follows Bourgoin (1988) and Bourgoin & Huang (1990) for the male and Bourgoin (1993) for the female.

To reveal genital structures, the whole abdomen of a specimen examined was cut off and cleared for 30 min in a warm (50°C) 10 % potassium hydroxide (KOH) solution with a few drops of black chlorazol (CAS No. 1937-37-7) for staining the ectodermic genital structures, based on the method introduced by Carayon (1969). Dissections and cleaning of the genital structures were carried out in distilled water. Final observations were made in glycerol using Olympus SZH10 and SZX10 stereo microscopes. The photographs of the habitus and internal structures were taken using a stereo microscope Leica MZ 16 with IC3D camera. Final images were adjusted using Helicon ver. 5.0 software and Adobe Photoshop (ver. 7.0). The SEM photographs of uncoated specimens were taken in the Laboratory of Scanning Microscopy, MIZ PAS (Warsaw), using a scanning electron microscope HITACHI S-3400N under low vacuum conditions.

The different proposed taxonomic rearrangements are displayed according to standardized models proposed by Bourgoin (2022), Bourgoin *et al.* (2015) and in other tropiduchid papers: Gnezdilov *et al.* (2016), Bourgoin *et al.* (2019, 2021), Bourgoin & Wang M. (2020).

Measurements and abbreviations

Measurements were taken with a micrometer. The following measurements, ratios, and their abbreviations were used in this study:

Total length = length of specimen from head apex to tegmina apex (in dorsal view)
A/B = width of vertex measured at anterior margin/length of vertex measured at midline
C/E = width of frons at upper margin/length of frons at midline
D/E = maximum width of frons/length of frons at midline
F/B = length of pronotum at midline/length of the vertex at midline
G/F = length of mesonotum/length of pronotum at midline
G/B+F = length of mesonotum/cumulative length of vertex and pronotum at midline
G/H = length of mesonotum at midline/width of mesonotum between lateral angles
I/J = length of tegmen measured from the base to the apical margin in median portion/width of tegmen measured at the widest part

Label information of all specimens examined are provided verbatim with each line separated by a slash (/) and each label given in quotation marks (“”).

The administrative division of Madagascar follows the results of the Malagasy constitutional referendum in 2007 (HCC 2007).

The material studied is deposited in the following collections:

MMBC = Moravian Museum, Brno, Czech Republic
MNHN = Musée national d'histoire naturelle, Paris, France
MRAC = Musée Royal d'Afrique Centrale, Tervuren, Belgium
NHRS = Naturhistoriska Riksmuseet, Stockholm, Sweden
ZIN = Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia

Results

Tropiduchidae content and classification

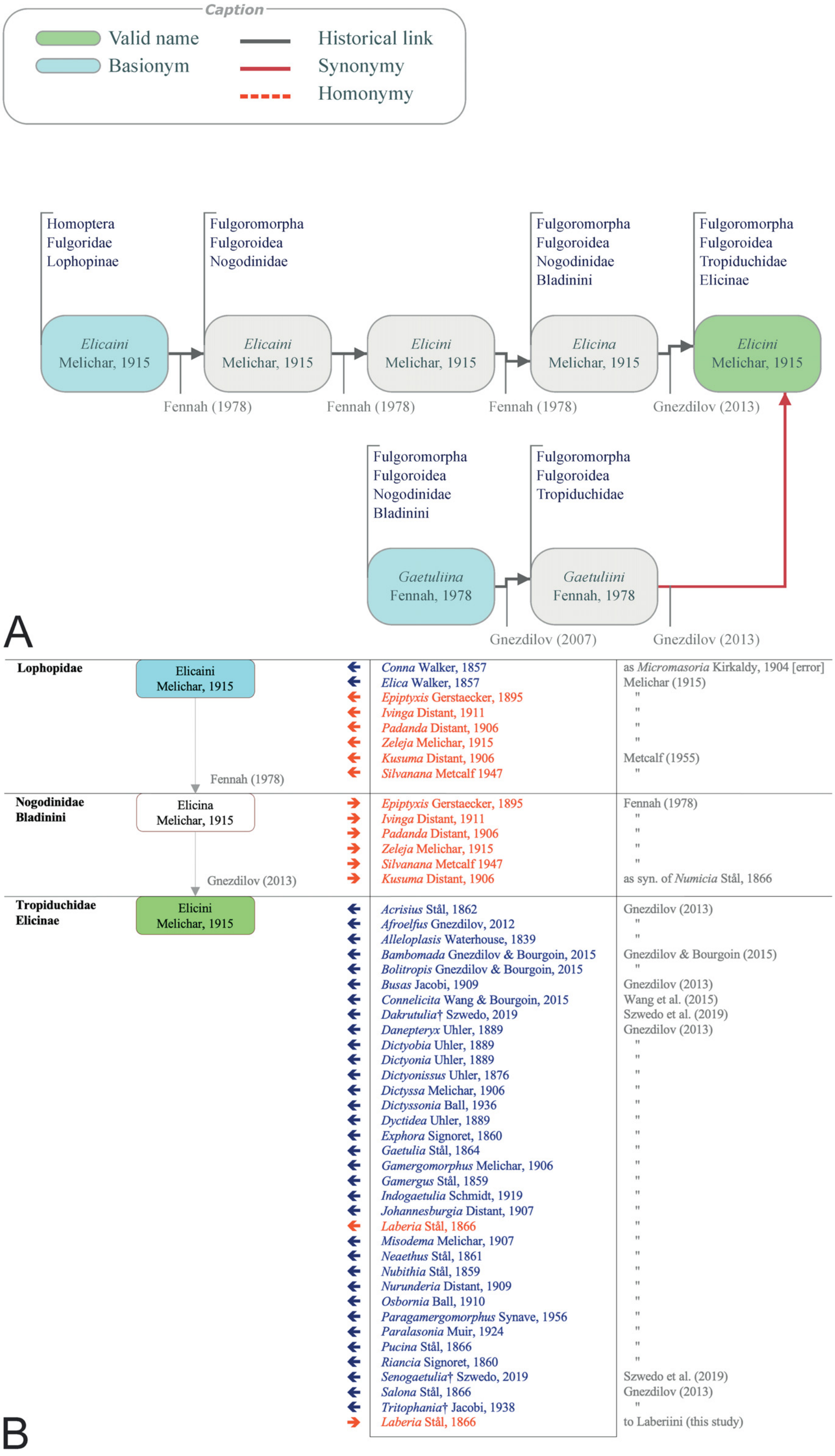
Including fossil tribes, Tropiduchidae is currently divided into 2 subfamilies and 25 tribes including the one described here (some of them subdivided into subtribes), as a result of several recent transfers and changes of the status of several taxa – genera, subtribes and tribes (Gnezdilov 2007, 2012a, 2013; Fletcher 2008; Stroiński & Gnezdilov 2009; Gnezdilov *et al.* 2016) (Fig. 2). A phylogenetic analysis was recently provided for Tropiduchini (Wang R.R. *et al.* 2017), but it remains the only one. The phylogeny of the family, including questions of its monophyly in the context of its current definition and content, as well as questions about the relationships of all these subunits (tribes and subtribes) to each other remain unanswered. An updated history of the classification of Tropiduchidae is summarized in Fig. 1.

In the subfamily Elicinae Melichar, 1915, taxa were originally put together to form the tribe Elicaini Melichar, 1915 in the family Lophopidae Stål, 1866 by Melichar (1915: 379) (Fig. 2A–B). It comprised six genera: *Elica* Walker, 1857, *Micromasoria* Kirkaldy, 1904, *Padanda* Distant, 1906, *Zeleja* Melichar, 1915, *Epiptyxis* Gerstaecker, 1895 and *Ivinga* Distant, 1911. The genus *Padanda* Distant, 1906 (type species *Padanda atkinsoni* Distant, 1906) first synonymized under *Cixiopsis* Matsumura, 1900 (Matsumura 1914: 268) was resurrected by Melichar (1915: 382) and successively transferred to Dictyopharidae Spinola, 1839 (Muir 1930), Issidae (Muir 1934), Dictyopharidae (Metcalf 1946) and Tropiduchidae: Cixiopsini Fennah, 1982 by Fennah (1982). The genera *Zeleja* Melichar, 1915 and *Epiptyxis* Gerstaecker, 1895 remain within the Lophopidae in the tribe Menoscini Melichar, 1915 (Emeljanov 2013) and genus *Ivinga* Distant, 1911 was first transferred to Issidae by Fennah (1954: 457), as a subgenus of *Trienopa* Signoret, 1860 and later synonymized with *Trienopa* in the Tropiduchidae: Trienopini Fennah, 1954 (Gnezdilov 2007: 295).

The generic name *Micromasoria* was proposed by Kirkaldy (1904: 279) to replace *Cona* White, 1879 (type species *Cona caelata* White, 1879) in the Delphacidae Leach, 1815 (now a synonym of *Ugyops* Guérin-Méneville, 1834 (Asche 1985: 285). Melichar (1915: 381) mistakenly used *Micromasoria* Kirkaldy, 1904 as a synonym of *Conna* Walker, 1857. The mistake was corrected by Metcalf (1955: 60), who also added two more genera: *Kusuma* Distant, 1906 (currently a synonym of *Numicia* Stål, 1866 in Tropiduchidae: Catulliini Melichar, 1914) and *Silvanana* Metcalf, 1947, currently placed in Ricaniidae Amyot & Audinet-Serville, 1843(Gnezdilov 2009).

Fennah (1978: 117) emended Elicaini and transferred it as a subtribe Elicina into the Bladinini Kirkaldy, 1907, of the family Nogodinidae Melichar, 1898, leaving the group with only two genera: *Elica* Walker, 1857 and *Conna* Walker, 1857.

More recently, Gnezdilov (2007: 295) transferred the subtribe Gaetuliina Fennah, 1978 from the tribe Bladinini Kirkaldy, 1907 (Nogodinidae) as a tribe to Tropiduchidae. In 2012, Gnezdilov (2012c) excluded five genera from Acanaloniidae Amyot & Audinet-Serville, 1843: *Thiscia* Stål, 1862, *Hemisthiscia*



Lophopidae	Elicaini Melichar, 1915	←	*Conna* Walker, 1857	as *Micromasoria* Kirkaldy, 1904 [error]
		←	*Elica* Walker, 1857	Melichar (1915)
		←	*Epiptyxis* Gerstaecker, 1895	"
		←	*Ivinga* Distant, 1911	"
		←	*Padanda* Distant, 1906	"
		←	*Zeleja* Melichar, 1915	"
		←	*Kusuma* Distant, 1906	Metcalf (1955)
		←	*Silvanana* Metcalf 1947	"
Nogodinidae **Bladinini**	Elicina Melichar, 1915	→	*Epiptyxis* Gerstaecker, 1895	Fennah (1978)
		→	*Ivinga* Distant, 1911	"
		→	*Padanda* Distant, 1906	"
		→	*Zeleja* Melichar, 1915	"
		→	*Silvanana* Metcalf 1947	"
		→	*Kusuma* Distant, 1906	as syn. of *Numicia* Stål, 1866
Tropiduchidae **Elicinae**	Elicini Melichar, 1915	←	*Acrisius* Stål, 1862	Gnezdilov (2013)
		←	*Afroelfus* Gnezdilov, 2012	"
		←	*Alleloplasis* Waterhouse, 1839	"
		←	*Bambomada* Gnezdilov & Bourgoin, 2015	Gnezdilov & Bourgoin (2015)
		←	*Bolitropis* Gnezdilov & Bourgoin, 2015	"
		←	*Busas* Jacobi, 1909	Gnezdilov (2013)
		←	*Connelicita* Wang & Bourgoin, 2015	Wang et al. (2015)
		←	*Dakrutulia*† Szwedo, 2019	Szwedo et al. (2019)
		←	*Danepteryx* Uhler, 1889	Gnezdilov (2013)
		←	*Dictyobia* Uhler, 1889	"
		←	*Dictyonia* Uhler, 1889	"
		←	*Dictyonissus* Uhler, 1876	"
		←	*Dictyssa* Melichar, 1906	"
		←	*Dictyssonia* Ball, 1936	"
		←	*Dyctidea* Uhler, 1889	"
		←	*Exphora* Signoret, 1860	"
		←	*Gaetulia* Stål, 1864	"
		←	*Gamergomorphus* Melichar, 1906	"
		←	*Gamergus* Stål, 1859	"
		←	*Indogaetulia* Schmidt, 1919	"
		←	*Johannesburgia* Distant, 1907	"
		←	*Laberia* Stål, 1866	"
		←	*Misodema* Melichar, 1907	"
		←	*Neaethus* Stål, 1861	"
		←	*Nubithia* Stål, 1859	"
		←	*Nurunderia* Distant, 1909	"
		←	*Osbornia* Ball, 1910	"
		←	*Paragamergomorphus* Synave, 1956	"
		←	*Paralasonia* Muir, 1924	"
		←	*Pucina* Stål, 1866	"
		←	*Riancia* Signoret, 1860	"
		←	*Senogaetulia*† Szwedo, 2019	Szwedo et al. (2019)
		←	*Salona* Stål, 1866	Gnezdilov (2013)
		←	*Tritophania*† Jacobi, 1938	"
		→	*Laberia* Stål, 1866	to Laberiini (this study)

Fig. 2. History of the classification of Elicini Melichar, 1915. **A**. Historical synopsis of Elicini supra generic classification. **B**. Historical generic composition of the tribe Elicini. Prontonyms are in blue boxes, current accepted name in green boxes. In Fig. 2B blue arrows indicate when a genus was first classified in the current classification of the tribe, red arrows indicate when a genus was first wrongly placed in the tribe, then withdrawn for another tribe (left red arrow). Last column in grey provide the corresponding reference and basic information.

Schmidt, 1912, *Paraphilatis* Melichar, 1914, *Parathiscia* Melichar, 1901 and *Pseudothiscia* Schmidt, 1912. While the first genus currently remains incertae sedis within Fulgoroidea Latreille, 1807, the last four genera were grouped a year later (Gnezdilov 2013) to form a new tribe Parathisciini Gnezdilov, 2013. In this same paper he transferred Elicina from Nogodinidae, Bladinini into the Tropiduchidae, and concurrently synonymized Gaetuliini Fennah, 1978 with Elicini Melichar, 1915 (Gnezdilov 2013: 184). Finally, he grouped (2013: 182) the tribes Elicini, Parathisciini, and the two fossil tribes Austrini Szwedo & Stroiński, 2010 and Patollini Szwedo & Stroiński, 2013 into a new tropiduchid subfamily Elicinae Melichar, 1915. In 2016, a fifth tribe Bucini Gnezdilov, Bartlett & Bourgoin, 2016, was erected in Elicinae for the Neotropical genus *Buca* Walker, 1858.

However, the attribution of the extinct tribes Patollini and Austrini to Elicinae was not discussed by Gnezdilov (2013: 182). The main characters present in the female genitalia are not available because only male fossils are available in both tribes, and the absence of a nodal line alone is insufficient to accredit them to Elicinae. However, according to the very regular basal conformation of the tegmina venation and late forking of the main veins (ScP+R, MP and CuA), particularly with first 2 transverse veins of cells C2 and C4 aligned (as prefiguring a nodal line), the densification of transverses in the second apical half of the forewing, the simple venation of the forewing, and the short vertex, wider than long, it seems more appropriate to transfer Austrini from Elicinae to Tropiduchinae. Conversely, the non-regular basal venation in Patollini supports keeping this tribe within Elicinae.

Class Insecta Linnaeus, 1758
Order Hemiptera Linnaeus, 1758
Suborder Fulgoromorpha Evans, 1946
Superfamily Fulgoroidea Latreille, 1807
Family Tropiduchidae Stål, 1866
Subfamily Elicinae Melichar, 1915

Tribe **Elicini** Melichar, 1915

Elicini Melichar, 1915: 379.

Type genus

Elica Walker, 1857: 86.

Content and distribution

Currently, Elicinae includes 46 genera and 158 species and Elicini remains the most diverse tribe within the subfamily with 37 genera (1.5% of the Fulgoromorpha) and 143 species (1% of the Fulgoromorpha) (Bourgoin 2022; Fig. 2). Due to its complex history chronologically listed here, that we complete, we provide a graphical historical synopsis of the generic composition of the tribe (Fig. 2A–B).

1915 Elicaini [sic!] Melichar (Melichar: 379; definition, list of genera, key)
1978 Gaetuliina (Fennah: 118; definition, list of genera comprised)
1978 Elicina (Fennah: 118; new status, definition, list of genera comprised)
1984 Gaetuliina Fennah (Fennah: 82; update of definition, transfer of genera from Issidae)
1985 Gaetuliina (O'Brien & Wilson: 89; difficulties of recognition of Nogodinidae after inclusion of Gaetuliinae)
1999 Gaetulina [sic!] (Szwedo & Stroiński: 203; taxonomy)
1999 Gaetulini [sic!] (Szwedo & Stroiński: 297; taxonomy, discussion of characters)
2007 Gaetuliini Fennah (Gnezdilov: 295; new status within Tropiduchidae)
2008 Gaetuliini (Fletcher: 119; transfer of the genus *Busas* Jacobi, 1909 to Gaetuliini)
2009 Gaetuliina (Stroiński & Gnezdilov: 459; taxonomy)
2009 Gaetuliini (Stroiński & Gnezdilov: 459, 460; redescription of *Busas* Jacobi, 1909, list of genera)

2010 Gaetuliina (Szwedo & Stroiński: 132; taxonomy)
2010 Gaetulina Fennah, 1978 [sic!] (Szwedo & Stroiński: 137; taxonomy)
2010 Gaetulini Fennah, 1978 [sic!] (Szwedo & Stroiński: 136, 137; fossil record, taxonomy)
2012b Gaetuliini Fennah, 1978 (Gnezdilov: 637, 638; taxonomy, distribution, description of new genus)
2013 Gaetuliina Fennah, 1978 (Szwedo & Stroiński: 371; taxonomy)
2013 Gaetuliini Fennah, 1978 (Szwedo & Stroiński: 380; characters, fossil record)
2013 Elicini Melichar, 1915 (Gnezdilov: 184; taxonomy)
2013 Elicaini Melichar, 1915 (Gnezdilov: 184; taxonomy, synonymy)
2013 Gaetuliina Fennah, 1978 (Gnezdilov: 184; taxonomy, synonymy)
2015 Elicini Melichar, 1915 (Wang M. *et al.* 2015: 563, 564; taxon concept history, new genus *Connelecita* Wang & Bourgoin, 2015)
2015 Elicini Melichar, 1915 (Gnezdilov & Bourgoin: 601; two new genera from Madagascar: *Bolitropis* Gnezdilov & Bourgoin, 2015 and *Bambomada* Gnezdilov & Bourgoin, 2015)
2019 Elicini Melichar, 1915 (Szwedo 2019 in Szwedo *et al.* 2019, fossil genera: *Senogaetulia* Szwedo, 2019 and *Dakrutulia* Szwedo, 2019)

The fossil taxa of Elicini are known from the Eocene Baltic amber (*Tritophania* Jacobi, 1938) and terminal Eocene deposits of Bembridge Marls, Isle of Wight, United Kingdom (*Senogaetulia* Szwedo, 2019 and *Dakrutulia* Szwedo, 2019) (Jacobi 1938; Szwedo & Stroiński 1999; Szwedo *et al.* 2019). The tribe Elicini is widely distributed in the New World, in South Africa and Madagascar, in south east continental Asia and Indonesia, and in Australia. It exhibits a bimodal latitudinal distribution with peaks in north and south subtropical regions, while it is less represented in the equatorial zone.

Tropiduchidae new taxon

Tribe **Laberiini** trib. nov.

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Type genus

Laberia Stål, 1866; here designated.

Diagnosis

Head capsule narrower than thorax, projecting in front of eyes. Pedicel with plate organs on the whole surface reaching to its base. Rostrum long, ending between metacoxae. Tegmina broad, extending far beyond abdomen, held flattening tectiform, with their ventral faces not facing each other; costal area present and wide, with reticulate venation; nodal line not materialized. Hind tibia with 5–7 lateral spines. Metatarsal apical teeth asymmetrical. Male gonostyli symmetrical, not fused. Female: gonoplacs flat quadrangular, wide, without apical marginal teeth. Gonapophyses IX with a long, lateral, digitated process. Anal tube short, ring-shaped.

Content

Monotaxic tribe currently with one genus – *Laberia* Stål, 1866.

A new simplified key to higher taxa of Elicinae to accommodate the new tribe Laberiini trib. nov. is proposed here:

1. Tegmina usually with distinct nodal line and venation distinctly reticulate distally; gonoplacs elongated, usually with marginal teeth; gonapophyses IX in shape of isosceles triangle .... **Tropiduchinae** Stål, 1866
– Nodal line of tegmina not distinct; gonoplacs rounded without marginal teeth; gonapophyses IX not triangular .... **Elicinae** Melichar, 1915 ... 2

2. Tegmina short, reticulate, with transverse costal veins; ScP+R and MP with common stem .... **Patollini** Szwedo & Stroinski, 2013
– Tegmina short or surpassing abdomen; ScP+R and MP leaving basal cell separately 3

3. Tegmina steeply tectiform, surpassing abdomen; in dorsal view lateral margins of gonapophyses IX straight 4
– Tegmina flatly tectiform; in dorsal view lateral margins of gonaphysis distinctly protruded with tooth or long digitate process 5

4. Tegmina not reticulated; metatibia with one spine; metatarsal apical teeth asymmetrical .... **Bucini** Gnezdilov, Bartlett & Bourgoin, 2016
– Tegmina reticulated; metatibia without spines; metatarsal apical teeth regular .... **Parathisciini** Gnezdilov, 2013

5. In dorsal view lateral margin of gonapophysis protruded with a short tooth-like process .... **Elicini** Melichar, 1915
– In dorsal view lateral margin of gonapophysis bearing a long digitate process .... **Laberiini** trib. nov.

Genus ***Laberia*** Stål, 1866

Laberia Stål, 1866: 234. Type species: *Laberia palliata* Stål, 1866: 234; by monotypy.
Perinetia Lallemand & Synave, 1954: 81; **syn**. **nov**. Type species: *Perinetia reticulata* Lallemand & Synave, 1954: 82; by monotypy and original designation.
Aylaella Demir & Özdikmen, 2009: 271; **syn**. **nov**. Type species: *Perinetia reticulata* Lallemand & Synave, 1954: 82.

Description

Body. Head capsule with vertex longer than wide, strongly projecting in front of eyes. Anterior margin triangular, lateral margins slightly diverging posteriorly, posterior margin anteriorly rounded concave; no median carina. Frons with lateral margins slightly diverging down to below level of the antenna, then converging to continue with lateral margin of postclypeus; median carina weak and thin, continuing on the clypeus; a pair of short dorsal latero-median carinae vanishing at the level of the compound eyes. No median ocellus. Rostrum long, with tip between metacoxae. Pronotum with anterior margin strongly produced, rounded, postocular carina interrupted behind compounds eyes, laterally continuing in an anteriorly curved ridge. Mesonotum with a weak median carina and a pair of lateral ones, anteriorly bifid. Tegulae large, bicarinate. Tegmina broad, extending far beyond the end of abdomen, with venation distinctly reticulate; costal area present and wide, with reticulate venation; ScP+R, MP and CuA branched separately on the basal cell.

Legs. Hind tibia with 5–7 lateral spines. Metatarsus: basimetatarsomere with asymmetrical row of apical teeth, midmetatarsomere with symmetrical row of apical teeth. Metatibiotarsal formula: 8/12/2.

Male terminalia. Male gonostyli (Figs 12, 13B) symmetrical, not fused medioventrally, more or less trapezoidal, with a small basal triangular expansion on its dorsal margin; capitulum not developed.

Female terminalia. Gonoplacs wide, flat, quadrangular, with no apical marginal teeth. Gonapophyses IX with a long lateral digitated process. Anal tube short, ring-shaped.

Content

Laberia palliata Stål, 1866

Laberia palliata Stål, 1866
Figs 3–16

Perinetia reticulata Lallemand & Synave, 1954: 82; **syn**. **nov**.

Aylaella reticulata – Demir & Özdikmen 2009: 271.

Type material

Holotype of *Laberia palliata* Stål, 1866 (Fig. 3)
LOCALITY UNKNOWN • ♀; "Mauri- / tius.", "Stevens.", "Typus", "140 / 64", "*Laberia pallida* Stål / Holotype (Flatidae)", "NHRS-GULI / 000006158"; NHRS.

Holotype of *Perinetia reticulata* Lallemand & Synave, 1954 (Fig. 4)
MADAGASCAR • ♂; "MADAGASCAR / Rég. Périnet / G. Olsoutiett col. 193", "TYPE", "V. Lallemand et / H. Synave det., 195? / *Perinetia g. n.* / *reticulata sp. n.*", "Museum Paris / MNHN(EH) / 19341"; MNHN.

Additional material examined

MADAGASCAR – **Alaotra-Mangoro Region, Moramanga District** • 1 ♂; "Analamazotra / Perinet, Madag / *Олсуфъева* XI.930"; ZIN • 1 ♀; "Périnet / Madagascar / Seyrig 12.II.931"; ZIN • 1 ♀; "Madagascar / province de Toamasina / Andasibe, 1049 m / S18°53,410, E48°22,881", "Museum Paris / frt humid, brd piste nicke / 04-XI-2011 / Th. Bourgoin Rèc.", "Museum Paris / MNHN(EH) / 19347"; MNHN • 1 ♂, 1 ♀; "Madagascar –CE / border of Andasibe N.P. / "Parc de Orchidés"/ at light; 3.-6. xi.2010 / P. Bănař & local coll. lgt.", "Collectio / Moravské museum / Brno"; MMBC. – **Analamanga Region, Manjakandriana District** • 1 ♀; "MADAGASCAR CENTRE / EST LAC MANTASOA / AMBOHIBOATAVO", "III-1973 / A. Peyrieras", "Museum Paris / MNHN(EH) / 16576"; MNHN • 1 ♀; "MADAGASCAR CENTRE / EST LAC MANTASOA / AMBOHIBOATAVO", "III-1973 / A. Peyrieras", "Museum Paris / MNHN(EH) / 16577"; MNHN. – **Vatovavy Fitovinany Region, Ifanadiana District** • 1 ♂; "Madagascar –CE / Ranomafana N.P.; 11.– / 18.xi.2010, 958m / S21°15′22.6″ E47°25′17.8″ / at light; P. Bănař lgt.", "Collectio / Moravské museum / Brno"; MMBC. – **Vatovavy Fitovinany Region: Ifanadiana District, Ranomafana commune** • 1 ♀; "COLL. MUS. CONGO / Madagascar: Nandihizina / XII – 1937, J. Vadon", "*Laberia paliata* Stål, det / RGFennah"; MRAC.

Redescription

MEASUREMENT. Total length 15–18 mm.

HEAD. Head with compound eyes narrower than pronotum (Fig. 6A–B). Disc of vertex, pronotum and mesonotum in one plane (Fig. 7A). Vertex (Fig. 6A–D): ratio A/B = 1.0–1.1, with margins slightly elevated, carinate; anterior margin of vertex triangularly produced, apex of vertex obtusely angled; posterolateral margins of vertex slightly diverging posteriad; posterior margin distinctly triangularly incised, to the level of anterior margins of compound eyes; disc of vertex flat, without median carina, with incomplete furrow spreading from posterior margin to anterior ¼ of vertex length in mid line. Frons (Fig. 7C–D): ratio C/E = 0.41–0.49; D/E = 1.58–1.67; frons longer than wide, widest below level of antennal bases; anterior margin prolonged, lateral margins carinately elevate; disc of frons with three carinae, median carina reaching frontoclypeal suture, lateral carinae not exceeding level of lower margins of compound eyes, median and lateral carinae connected at base. Postclypeus with median and lateral carinae; anteclypeus medially carinate; anterior margin of preocular field covered with row of short setae (Fig. 7C–D). Rostrum reaching between metacoxae; apical segment shorter than subapical one. Compound eyes ellipsoidal, posteriorly with narrow callus. Ocelli distinct. Antennal fovea emarginate, posteriorly elevated, shifted to posterior margin of gena. Scape short, cylindrical. Pedicel bulbous, slightly longer than wide, arista

Fig. 3. *Laberia palliata* Stål, 1866, holotype, ♀ (NHRS). **A**. Habitus, dorsal view. **B**. Same, ventral view. **C**. Anterior part of body, lateral view. **D**. Labels. (CC BY-NC 3.0) Attribution: Swedish Museum of Natural History, NHRS, photographed by Gunvi Lindberg.

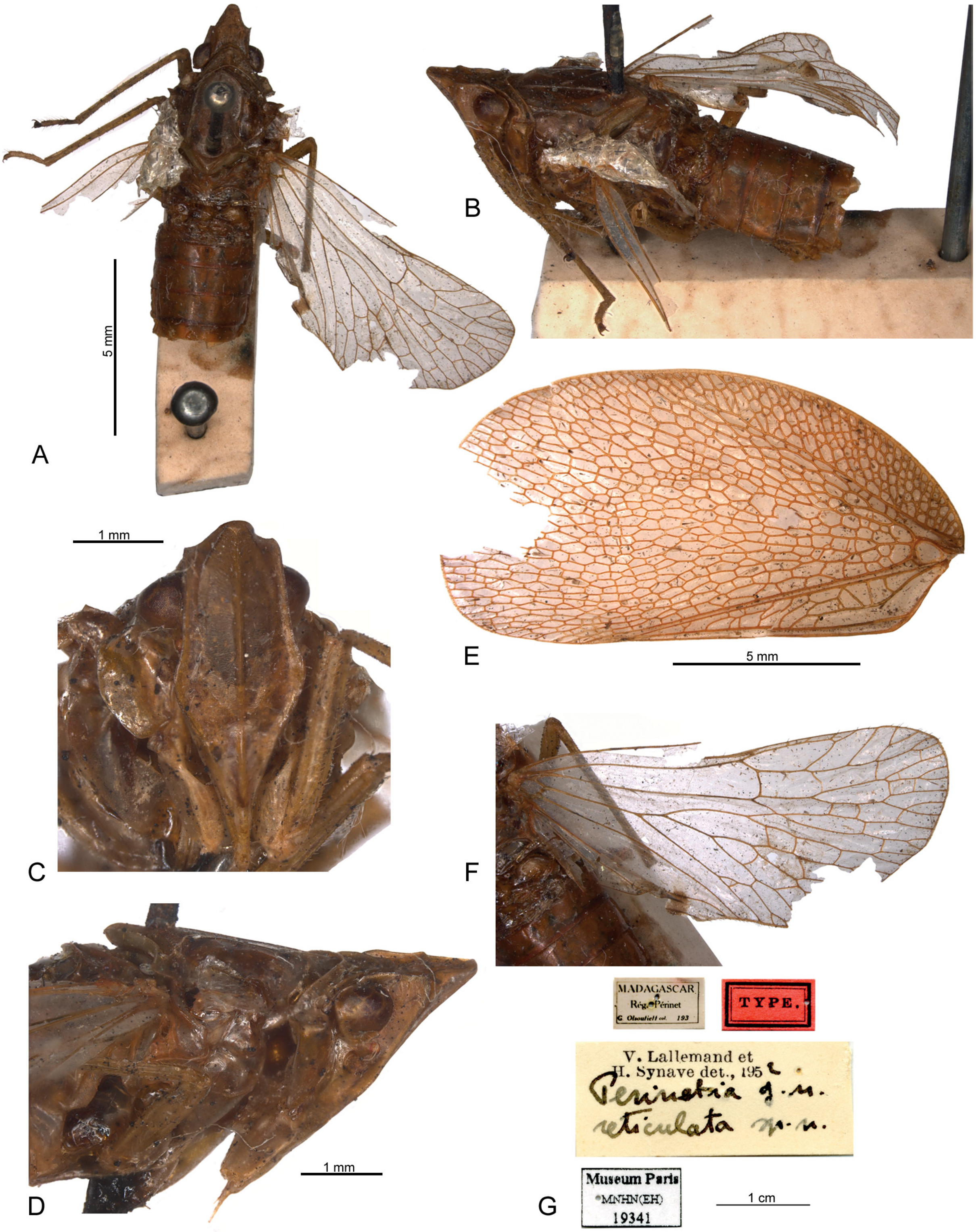

Fig. 4. *Perinetia reticulata* Lallemand & Synave, 1954, holotype, ♂ (MNHN). **A**. Habitus, dorsal view. **B**. Same, lateral view. **C**. Anterior part of body, frontal view. **D**. Same, lateral view. **E**. Tegmen. **F**. Hind wing. **G**. Labels.

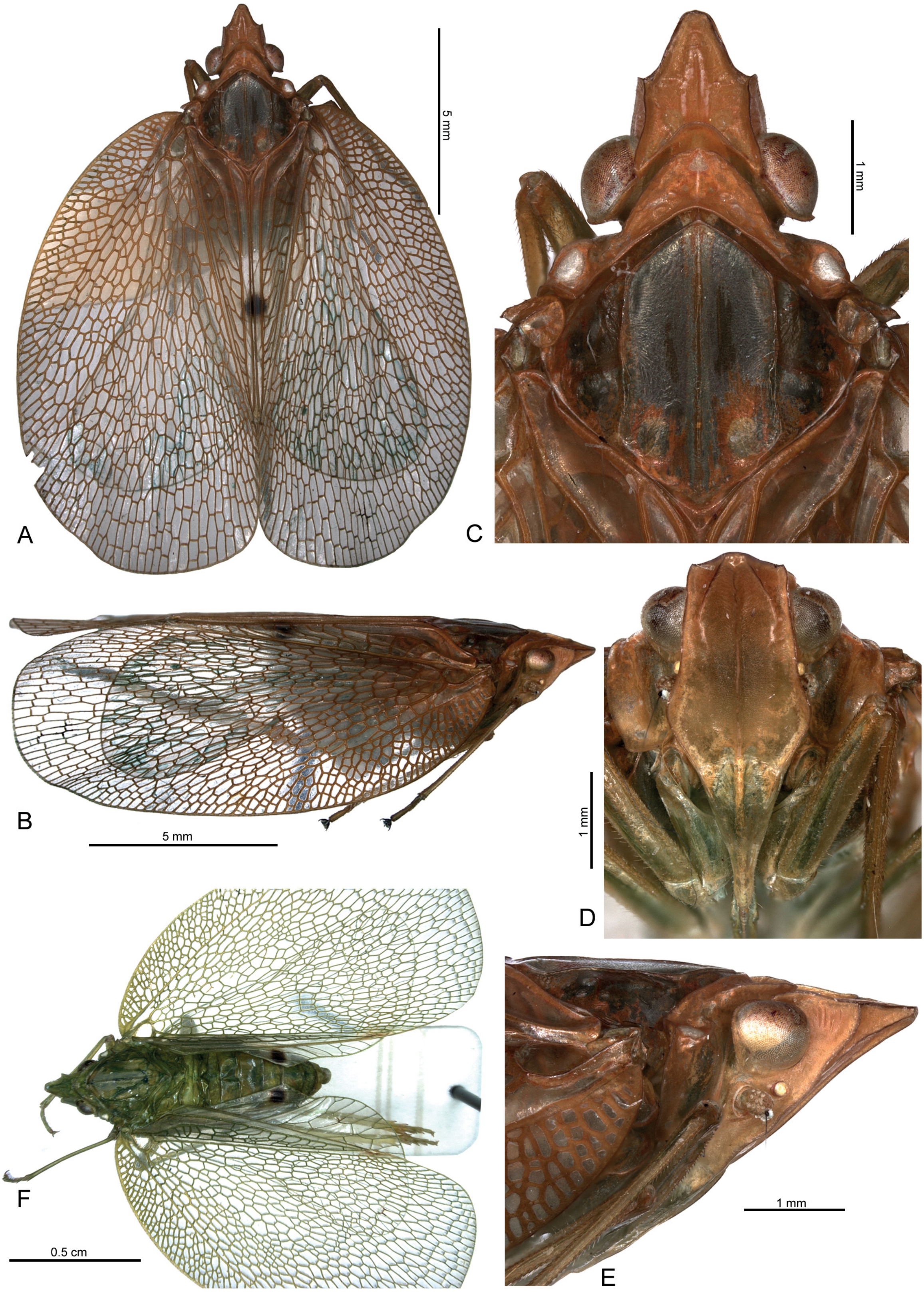

Fig. 5. *Laberia palliata* Stål, 1866 (MMBC). **A**. Habitus, dorsal view. **B**. Same, lateral view. **C**. Anterior part of body, dorsal view. **D**. Same, frontal part. **E**. Same, lateral view. **F**. Habitus with visible black spots on hind wings, dorsal view.

about 3 times as long as pedicel; antennal plate organs evenly distributed on pedicel, organized in rows, reaching base of pedicel. Plate organs of crenelated plate type in the merged-tip type group, with ear-like lobes paired organized on the external circle of them, isolated in the internal area (Fig. 8).

Thorax. Pronotum (Figs 6, 7E–F): ratio F/B = 0.44–0.54; disc of pronotum arcuate, with median carina and lateral impressions, lateral carinae not reaching posterior margin, anterior angle incised between

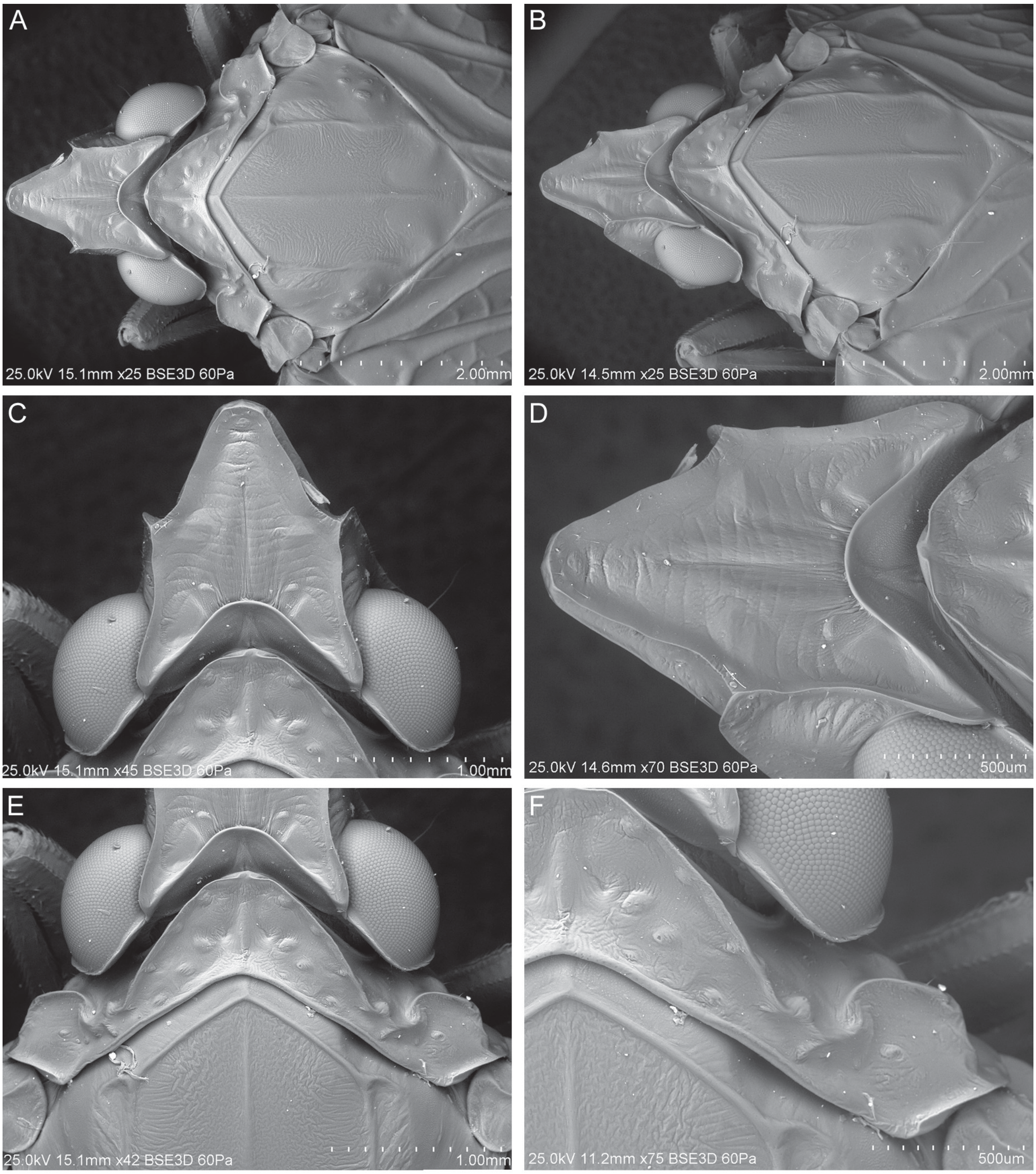

Fig. 6. *Laberia palliata* Stål, 1866 (MMBC), SEM photographs. **A**. Anterior part of body, dorsal view. **B**. Same, latero-dorsal view. **C**. Head, dorsal view. **D**. Vertex dorso-lateral view. **E**. Pronotum and basal part of mesonotum, dorsal view. **F**. Pronotum, lateral part, dorsal view.

compound eyes, exceeding anteriorly half of compound eyes length; posterior margin of pronotum widely triangularly incised, incision reaching level of posterior margins of compound eyes; lateral lobes with curved anteriad; distinctly elevated postocular carinae, not reaching posterior margin of pronotum; lateral carina and horizontal carina of side of pronotum absent. Mesonotum (Figs 6A–B, E–F, 7E–F): ratio G/F = 5.3–6.13, G/B+F = 1.80–2.08, G/H = 0.99–1.03; in mid line about as long as wide, diamond-shaped, with disc flat and lateral portions declivous, with five parallel carinae; median carina reaching almost

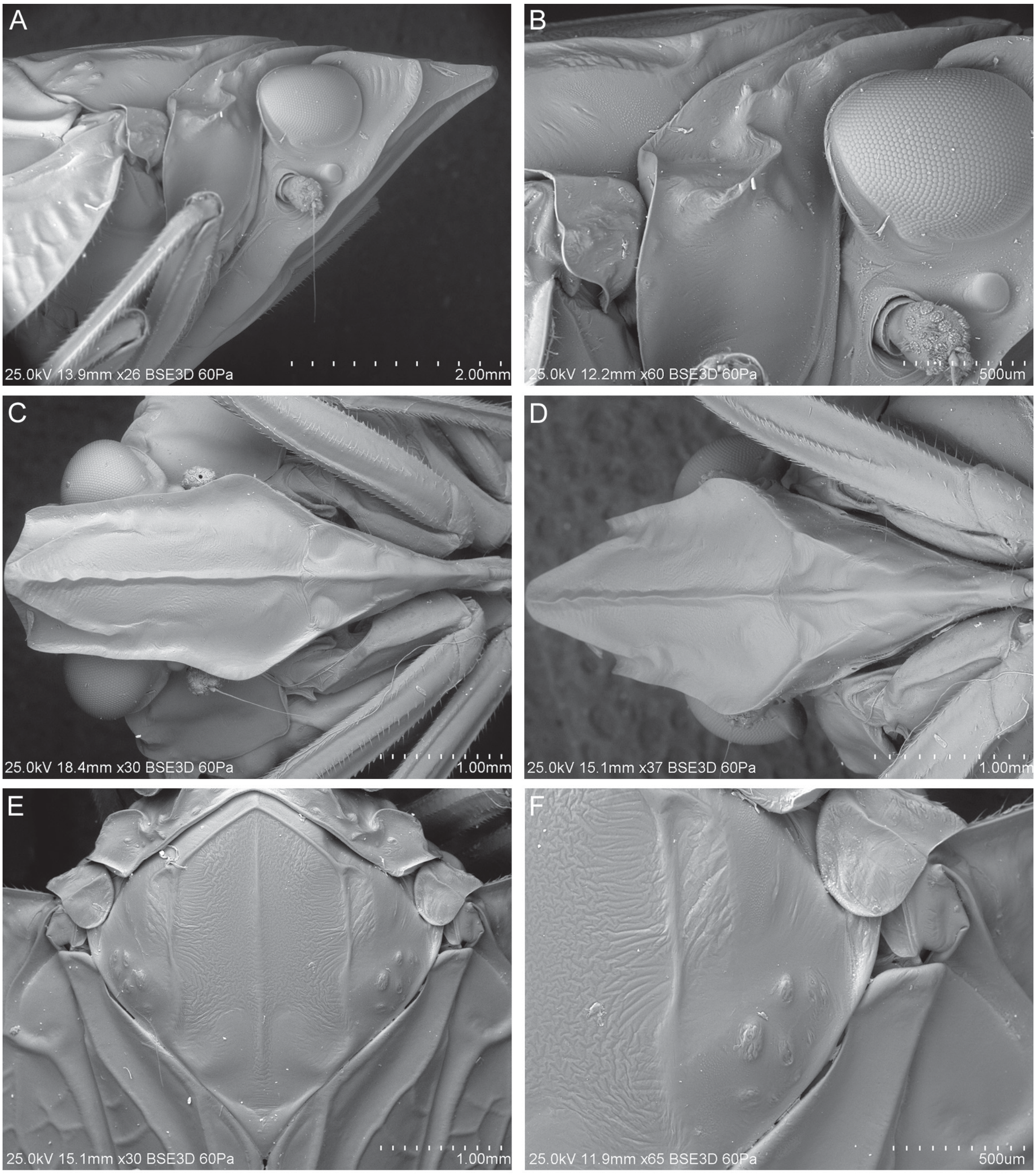

Fig. 7. *Laberia palliata* Stål, 1866 (MMBC), SEM photographs. **A**. Anterior part of body, lateral view. **B**. Head and pronotum, lateral view. **C**. Head, frontal view. **D**. Frons and clypeus, fronto-ventral view. **E**. Mesonotum, dorsal view. **F**. Mesonotum, lateral part and tegula, dorsal view.

to scutellum, lateral carinae reaching posterior margins, anterolateral carinae pronounced at base than obsolescent posteriad; mesoscutellar groove arcuate posteriad. Tegula with two parallel carinae (Fig. 9A).

TEGMINA (Figs 9B–F, 10A–D). Ratio I/J = 1.86–2.02; membranous, with dense network of veins and veinlets. Costal margin curved at base, arcuate to anteroapical angle; anteroapical angle widely arcuate, posterior margin arcuate, posteroapical angle widely obtuse; tornus straight; apex of clavus reaching ⅔ of tegmen length. Costal area present, wide, with apex reaching almost to ⅔ of tegmen length, merely basad

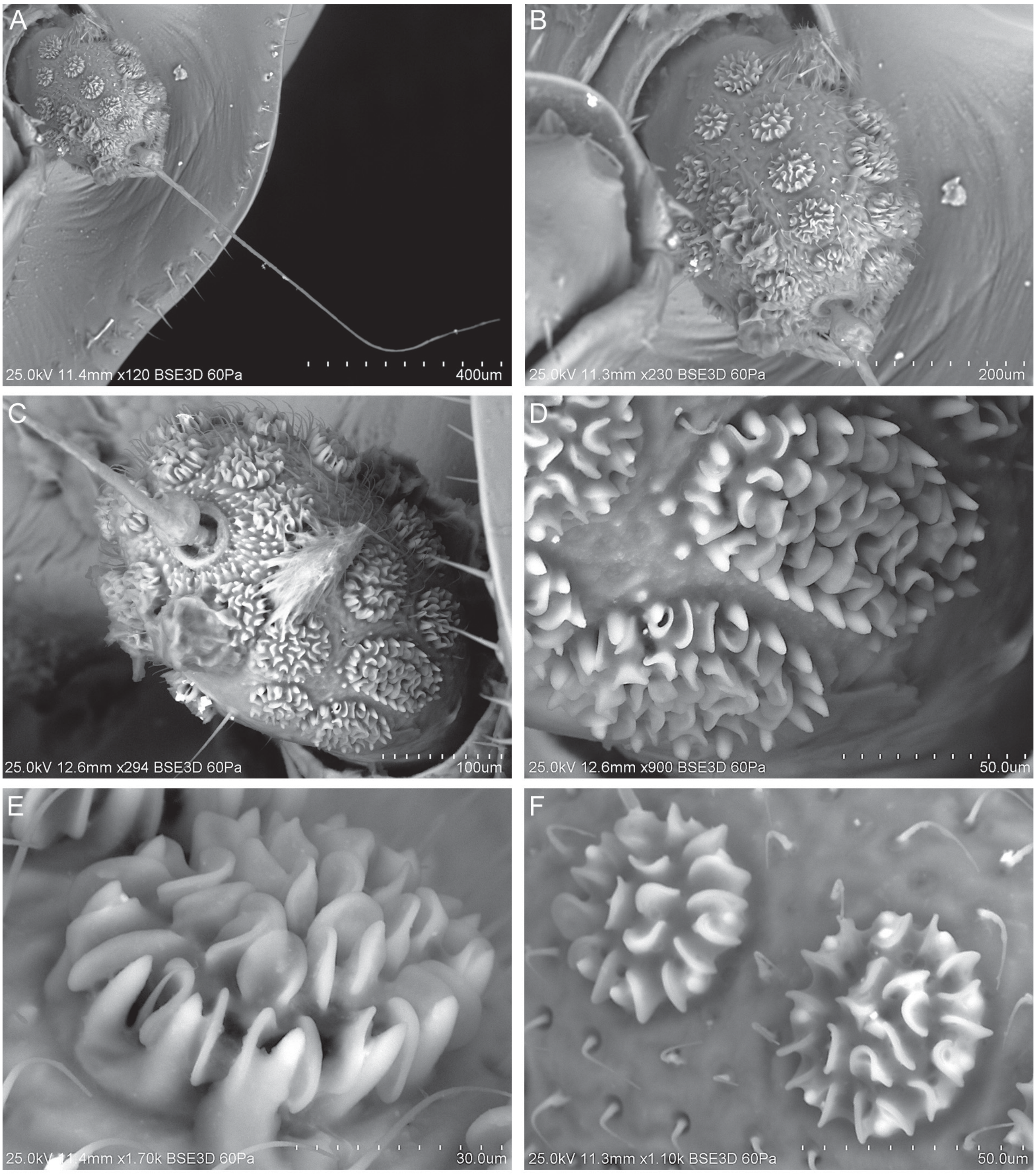

Fig. 8. *Laberia palliata* Stål, 1866 (MMBC), SEM photographs. **A–B**. Antenna, dorso-posterior view. **C**. Antenna, frontal view. **D–F**. Antennal plate organs.

of apex of clavus; costal area with prominent, reticulate network of veinlets. Basal cell rounded, slightly longer than wide. Stems ScP+R, MP and CuA leaving basal cells separately, in ScP+R→MP→CuA forking sequence on corium. Stem ScP+R with short stalk, shorter than basal cell, both branches ScP+RA and RP with few furcations, together with veinlets resulting in reticulate pattern, ultimate terminal of RP reaching anteroapical angle. Common stalk of MP about as long as basal cell, both branches MP_{1+2} and MP_{3+4} with number of furcations, together with veinlets resulting in reticulate pattern, the earliest

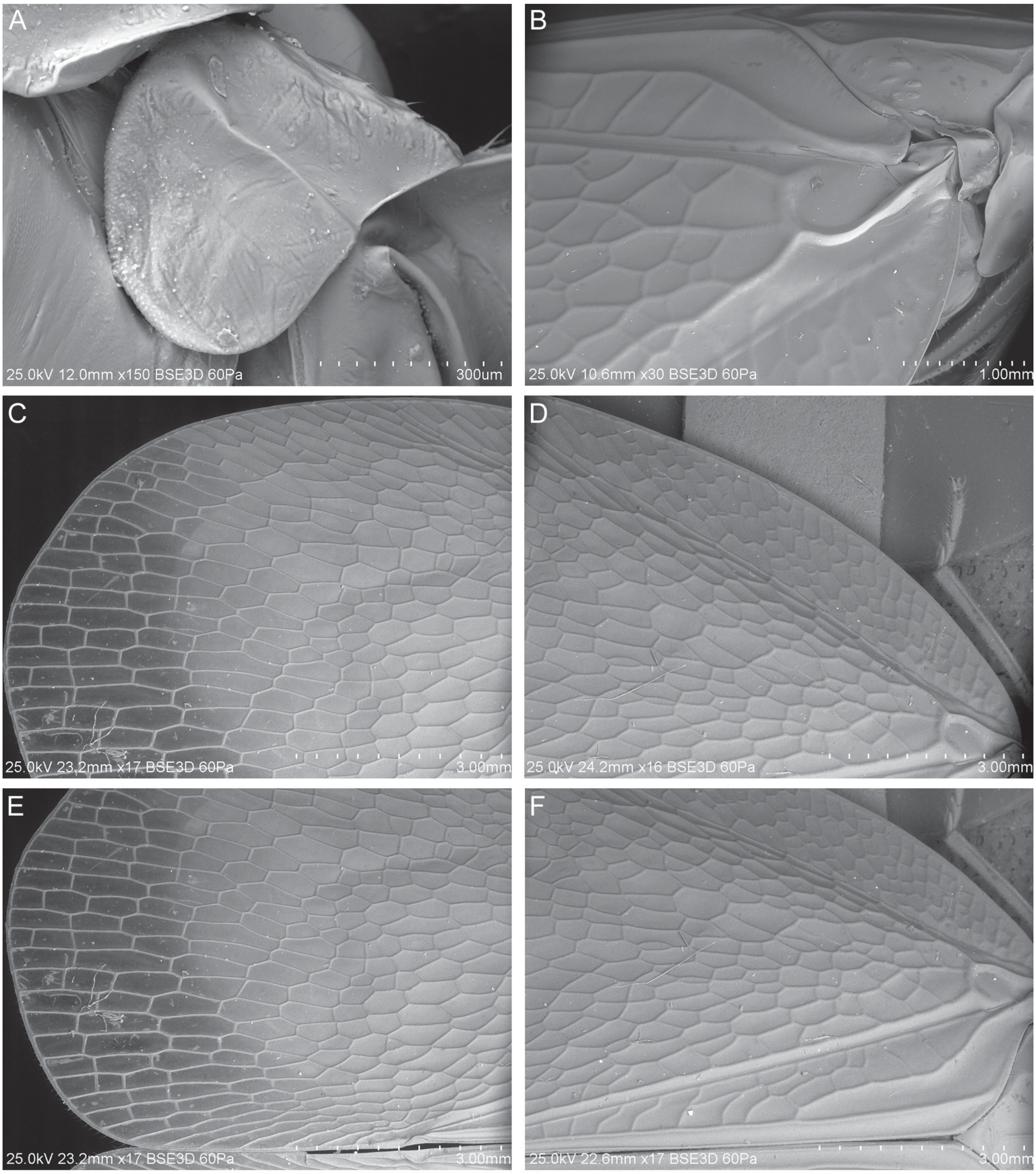

Fig. 9. *Laberia palliata* Stål, 1866 (MMBC), SEM photographs. **A**. Tegula, dorso-lateral view. **B**. Tegmen, basal part. **C**. Tegmen, postero-dorsal part. **D**. Same, basal part. **E**. Same, postero-ventral part. **F**. Same, basal part with clavus.

terminal of MP_{1+2} reaching anteroapical angle, the ultimate terminal of MP_{3+4} exceeding posteroapical angle, reaching tornus. Common stem CuA distinctly longer than basal cell; branch CuA_1 weaker, with a few furcations, reaching tornus with three terminals, branch CuA_2 stronger, parallel to claval suture and vein CuP, reaching margin with single terminal. Claval suture and vein CuP distinct. Claval veins Pcu and A_1 fused in basal half of clavus length, joined vein Pcu+A_1 reaching apex of clavus; irregular veinlets between CuP and Pcu present. Costal cell narrow, with a few veinlets between stems Pc+CP and

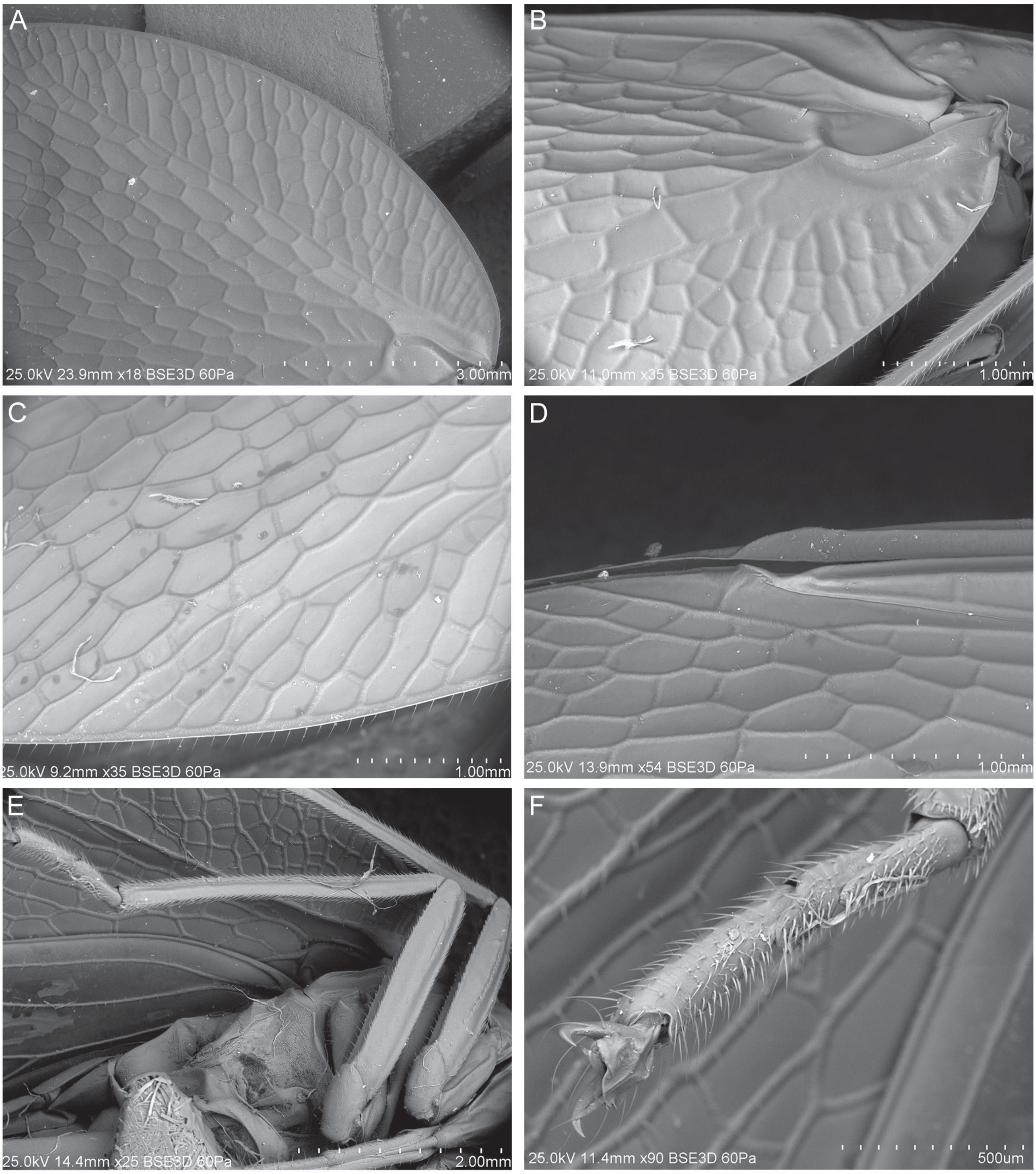

Fig. 10. *Laberia palliata* Stål, 1866 (MMBC), SEM photographs. **A**. Tegmen, costal area. **B**. Same, basal part. **C**. Costal angle. **D**. Apex of clavus. **E**. Pro- and mesolegs, ventral view. **F**. Mesotarsomere.

ScP+RA. Nodal line not materialized. Chitinized pterostigmal area absent. Veinlet *icu* present, connecting CuA_2 and apex of clavus. Veins with short, scarce setae on ventral surface.

Hind wing. Membranous, costal margin slightly curved at base, then almost straight, slightly concave at level of wing coupling apparatus, anteroapical angle widely rounded, apical margin distinctly curved, posteroapical angle widely rounded, anal lobe widely rounded. Basal cell slightly longer than wide, stems ScP+R and M leaving basal cell with a short common stalk. Stem ScP+R forked at level of wing coupling apparatus, $ScP+RA_1$ reaching margin distinctly basad of anteroapical angle, with 3 terminals; single *ra-rp* veinlet present. RP forked apicad of transverse veinlet *rp-mp*, about at the level of ending RA vein; RP with 4–6 terminals reaching margin basad of and at anteroapical angle. Transverse veinlets *rp-mp* 3–4. Stem MP forked usually about level of first fork of RP, with 4–5 terminals, single *imp* vein present between MP_{1+2} and MP_{3+4}. Stem CuA forked distinctly basad of stem ScP+R forking, before half of wing, multifurcation with 11–16 terminals and with 10–12 *icu* veins. Stem CuP single, stem Pcu subparallel to CuP in basal portion, apically curved towards CuP. Veins with short scarce setae on ventral surface.

Legs (Figs 10E–F, 11). Profemur slightly flattened, with rows of short setae along margins, subquadrate in cross section, with rows of short setae along margin; basiprotarsomere as long as midprotarsomere, apical protarsomere slightly longer than cumulative length of basi-and midprotarsomeres; tarsal claws distinct, arolium bilobate, wide. Mesofemur (Fig. 10E) slightly longer than profemur, subquadrate in cross section, with rows of short setae along margins, basimesotarsomere (Figs 10E, 11A) as long as midmesotarsomere,

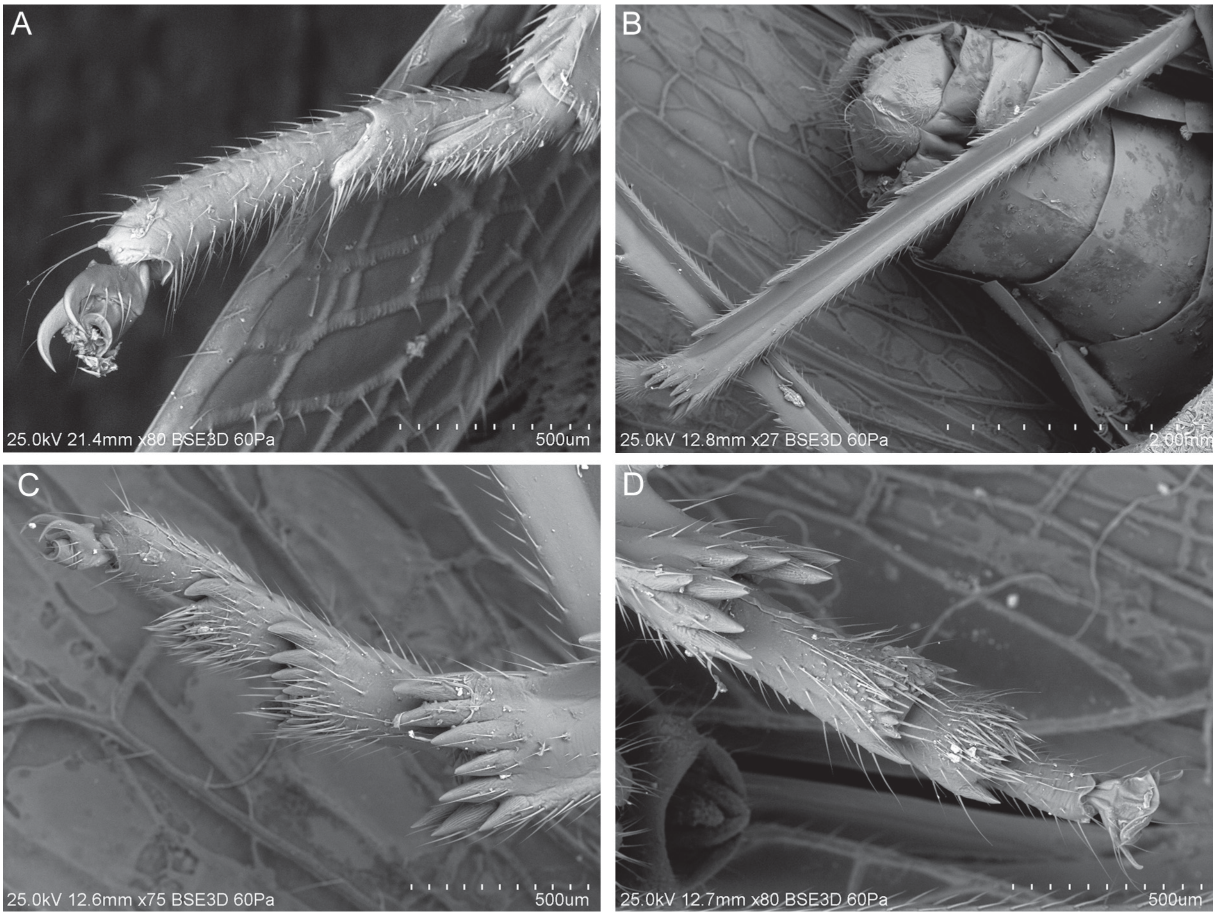

Fig. 11. *Laberia palliata* Stål, 1866 (MMBC), SEM photographs. **A**. Mesotarsomere, lateral view. **B**. Metatibia, dorsal view. **C–D**. Apical part of metatibia and metatarsus.

apical mesotarsomere slightly longer than cumulative length of basi-and midmesotarsomeres; tarsal claws distinct, arolium bilobate, wide. Metafemur (Fig. 11B) shorter than metatibia, metatibia with 5–7 lateral spines, subquadrate in cross sections, with margins covered with rows of short setae, with asymmetrical 8 apical teeth (Fig. 11B–D). Basimetatarsomere (Fig. 11C–D) long, about as long as cumulative length of mid- and apical metatarsomeres, apical margin incised, with 12 apical teeth, with subapical setae, except the external ones; midmetatarsomere long, lateral teeth distinct, ventromedian margin arcuately

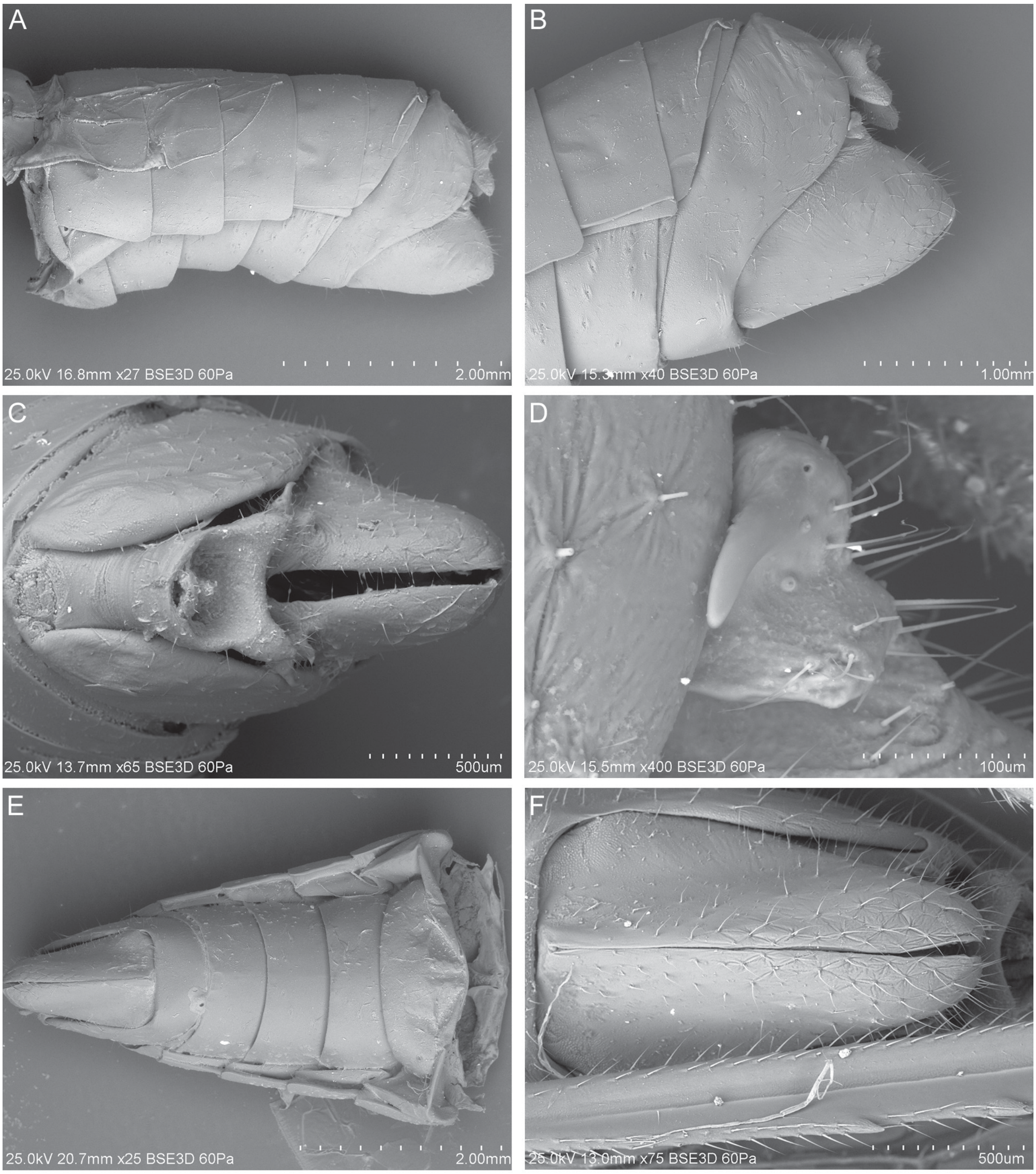

Fig. 12. *Laberia palliata* Stål, 1866 (MMBC), SEM photographs, ♂. **A**. Abdomen and terminalia, lateral view. **B**. Terminalia, lateral view. **C**. Same, dorsal view. **D**. Spine of stylus, dorsal view. **E**. Abdomen, ventral view. **F**. Genital styles, ventral view.

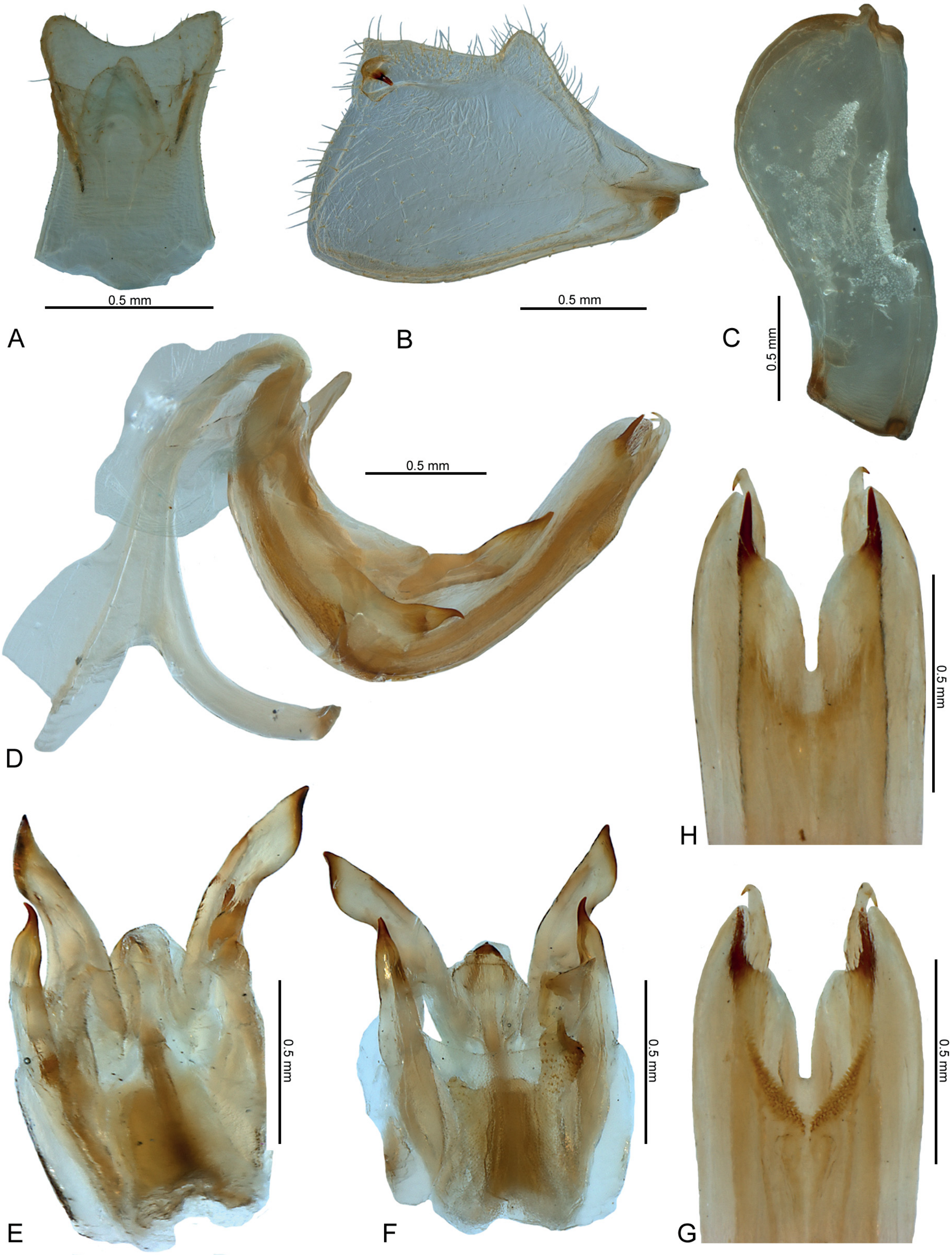

Fig. 13. *Laberia palliata* Stål, 1866, ♂ (MMBC). **A**. Anal tube, dorsal view. **B**. Genital style, left lateral view. **C**. Pygofer, left lateral view. **D**. Phallic complex, right lateral view. **E**. Periandrium, apical part, dorsal view. **F**. Same, ventral view. **G**. Aedeagus, apical part, ventral view. **H**. Same, dorsal view.

convex, with bunch of setae; apical metatarsomere with rows of longitudinal setae; tarsal claws distinct, arolium bilobate.

Male terminalia (Figs 12–13). Anal tube (Figs 12A–C, 13A) tubular, slightly longer than wide with posterior margin concave in dorsal view, produced ventrally in lateral view. Pygofer (Figs 12A–B, 13C) with upper part distinctly wider than ventral, posterior margin strongly sinuated, without any processes.

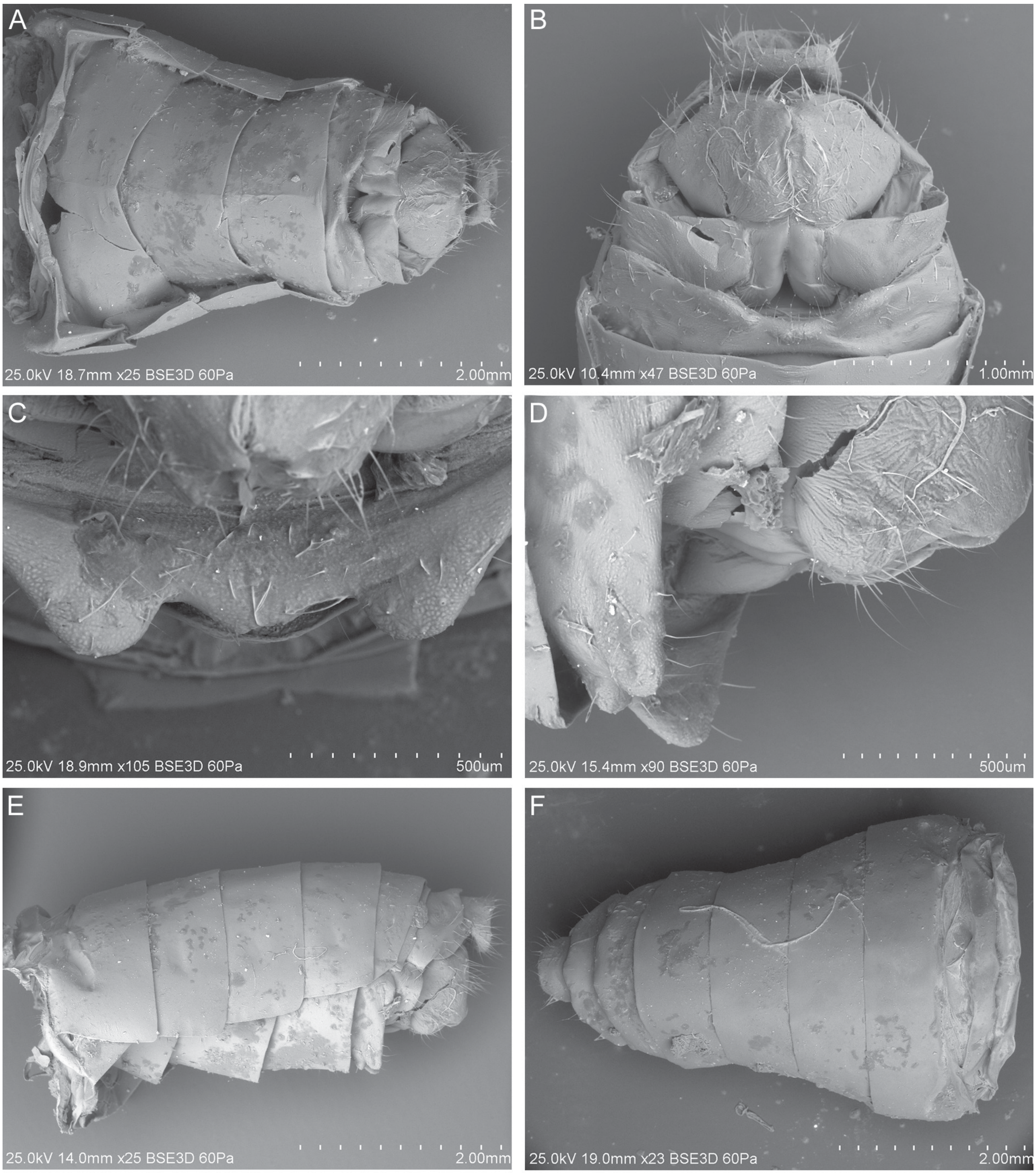

Fig. 14. *Laberia palliata* Stål, 1866 (MMBC), SEM photographs, ♀. **A**. Abdomen and terminalia, ventral view. **B**. Terminalia, ventral view. **C**. Pregenital sternite, postero-ventral view. **D**. Same, lateral view. **E**. Abdomen and terminalia, lateral view. **F**. Same, dorsal view.

Corpus connectivi (Fig. 13D) short and robust; alae connectivi large, bearing well developed crista. Periandrium (Fig. 13D–F) covering half of aedeagus, slightly asymmetrical, with two pairs of broad spine-like processes; dorsal processes bigger than ventral ones; ventral basal spine-like process on right side and a short membranous bulb, covered with minute teeth. Aedeagus (Fig. 13G–H) distinctly longer than periandrium, long and narrow, apically, with a pair of dorsal sclerotized strong spines, surrounding a pair of hook-like longer processes.

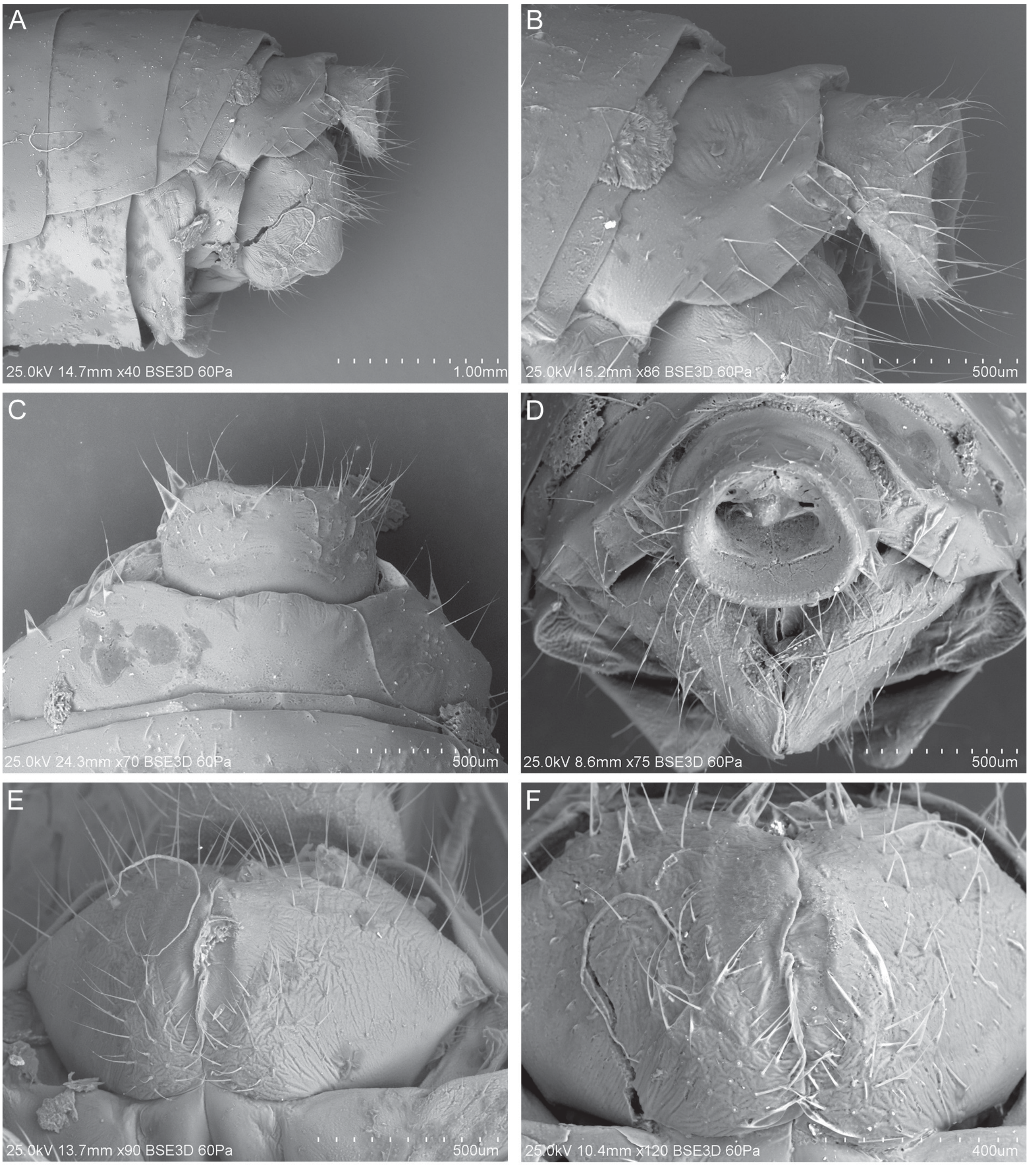

Fig. 15. *Laberia palliata* Stål, 1866, ♀ (MMBC), SEM photographs. **A**. Terminalia, lateral view. **B**. Anal tube, lateral view. **C**. Same, dorsal view. **D**. Same, postero-dorsal view **E–F**. Gonoplac, ventral view.

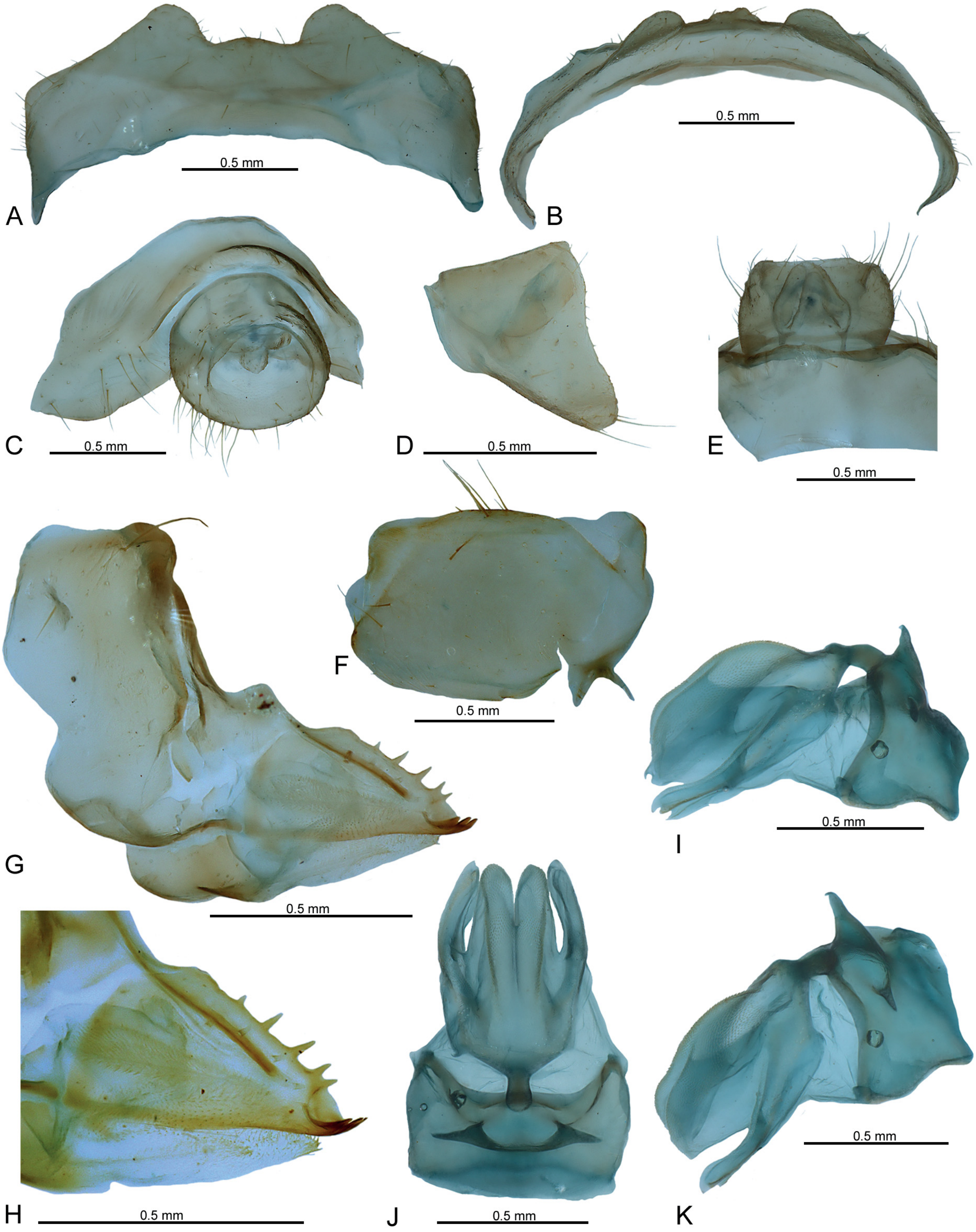

Fig. 16. *Laberia palliata* Stål, 1866, ♀ (MMBC). **A**. Pregenital sternite, flattened, ventral view. **B**. Same, posterior view. **C**. Anal tube, postero-dorsal view. **D**. Same, lateral view. **E**. Same, dorsal view. **F**. Gonoplac, lateral view. **G**. Gonapophysis VIII and endogonocoxal process, lateral view. **H**. Same, apical part. **I**. Gonapophyses IX and gonospiculum bridge, lateral view. **J**. Same, dorsal view. **K**. Same, dorso-lateral view.

Female terminalia. Pregenital sternite (Figs 14A–D, 16A–B) well developed with posterior margin with huge submedian protruding lobes with margin between them weakly arcuate. Anal tube (Figs 14A, 15A–D, 16C–E) round, short: shorter than wide in dorsal view. Paraproct small, apical margin widely rounded, reaching posterior margin of anal tube. Epiproct slightly shorter than paraproctal lobe. Gonoplac (Figs 14A–B, 15E–F, 16F) quadrangular, slightly sclerotized. Gonospiculum bridge short and robust (Fig. 16I–K). Gonocoxa VIII (Fig. 16G–H) trapezoidal, with a deep concave incision on its anterior margin. Endogocoxal lobe (Fig. 16G–H) bearing a membranous endogonocoxal process with minute apical teeth, slightly shorter than the anterior connective lamina. Anterior connective lamina with some strong 5 subterminal and 3 apical well sclerotized teeth (Fig. 16G–H). Fibula anterior slightly curved. Gonapophysis IX elongated, membranous with median lobes united medially, straight, densely covered dorsally with minute, scale-like denticulations, almost as long as lateral lobes, which bear the posterior fibulae; lateral margin with a long, developed finger-like lobe, covered dorsally with minute, scale-like denticulations.

Coloration (Figs 3A–C, 4A–F, 5). General coloration green. In dry and older specimens, general coloration reddish-brown or brown. Hind wing membranous, transparent, with one dark, round spot on anal area. Abdomen in 'fresh' specimens with orange tergites and sternites yellowish, yellowish-brown to brown in oldest specimens.

Distribution (Fig 17A)

Madagascar (East): Alaotra-Mangoro Region: Moramanga District: Andasibe commune; Analamanga Region: Manjakandriana District, Mantasoa commune; Haute Matsiatra Region: Ambohimahasoa District, Morafeno commune; Vatovavy Fitovinany Region: Ifanadiana District, Ranomafana commune.

Note

The genus *Laberia* was described by Stål (1866), based on single female specimen labelled as originating from Mauritius (Fig. 3D), as a new genus belonging to Ricaniidae. This seems to be a case of mislabelling, as since the original description it was never reported on Mauritius, and all specimens available came from Madagascar. Melichar (1898: 296) moved this genus to Nogodinidae, and Fennah (1978: 118) placed it in the tribe Bladinini Kirkaldy, 1907, subtribe Gaetulina Fennah, 1978. The subsequent changes in placement of *Laberia* in Tropiduchidae resulted from taxonomic views and opinions concerning Gaetuliini (see above). However, the type material of *Laberia* has never been re-examined since its description and its characters and taxonomic status needed to be reconciled with the taxonomic changes that took place around the families Nogodinidae-Tropiduchidae and their respective delimitation. A few additional specimens of the species were found dispersed in various collections enabling this revisionary study that led to our separation of the genus into a new tropiduchid Elicinae tribe, Laberiini trib. nov. Additionally, during this study, we also discovered that another 'mythical' taxon from Madagascar, *Perinetia reticulata* Lallemand & Synave, 1954, originally described as a species of a monotypic genus of the family Acanaloniidae Amyot & Serville, 1834, was conspecific with *Laberia palliata* Stål, 1866.

The generic name *Perinetia* was proposed by various authors several times for various species of animals. Currently, all these usages have been replaced by new names. Hence, the generic name *Perinetia* becomes again available for the purposes of taxonomy. However, the oldest usage of this name for a genus is now believed to be a junior objective synonym. All subsequent proposals with *Perinetia* as generic name have already been replaced.

The usages of the generic name *Perinetia* are presented below:

1936 *Perinetia* Collenette: 165 [Insecta: Lepidoptera: Lymantriidae]; type species: *Perinetia leucocloea* Collenette, 1936: 166, pl. 12, fig. 8; by original designation.

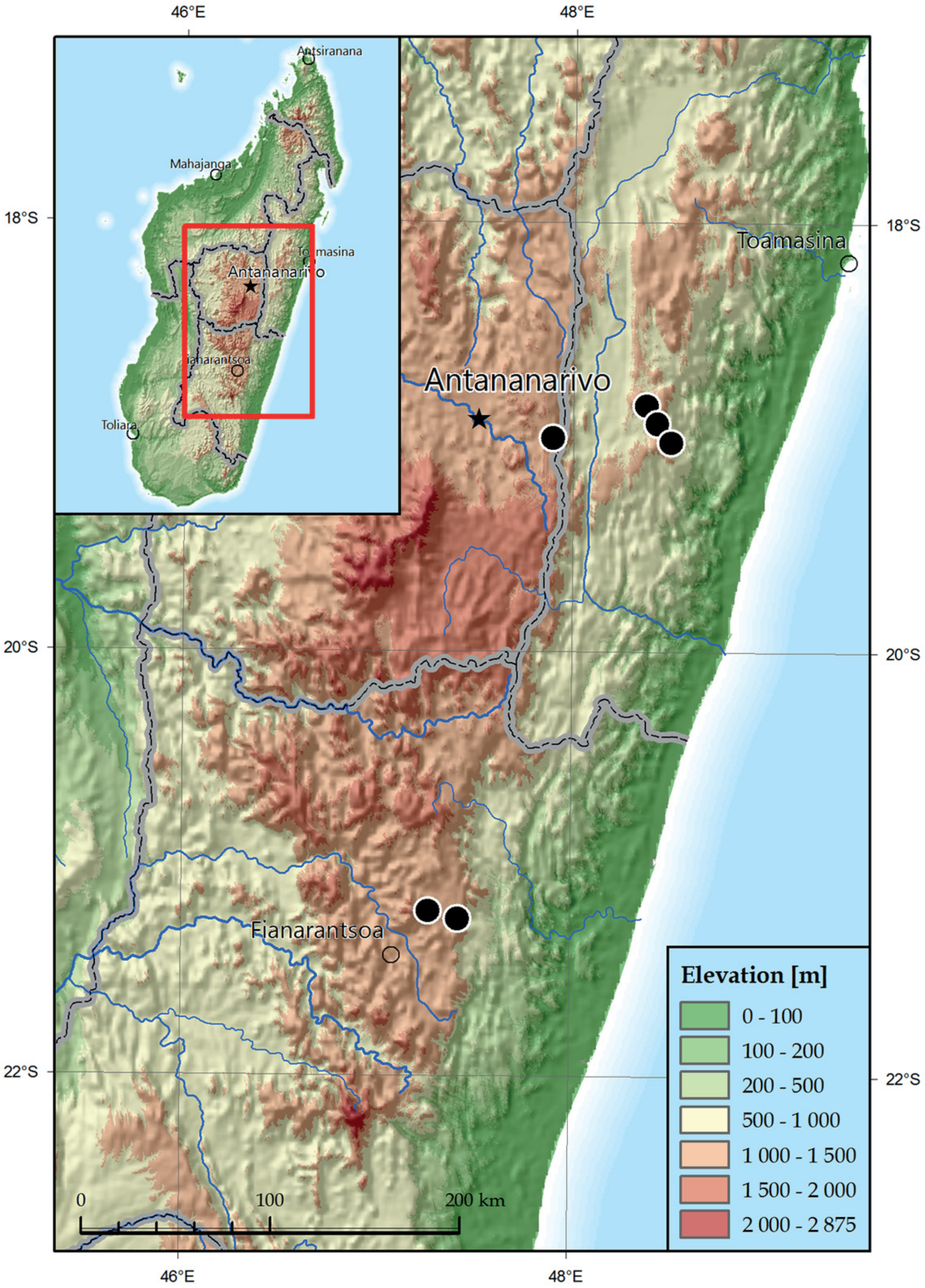

Fig. 17. *Laberia palliata* Stål, 1866. Distribution map.

Remark. *Perinetia* Collenette, 1936 has priority, while the other names should be treated as junior homonyms (Article 60 of the International Code of Zoological Nomenclature – ICZN 1999). *Perinetia* Collenette, 1936 is a junior subjective synonym of *Stenaroa* Hampson, 1910: 444 [Insecta: Lepidoptera: Lymantriidae].

1952 *Perinetia* Seyrig: 193. [Insecta: Hymenoptera: Ichneumonidae]; type species: *Perinetia nigrifacies* Seyrig, 1952: 194; by original designation.

Remark. This name was proposed to be replaced by *Madagascesa* Koçak & Kemal, 2008: 6.

1954 *Perinetia* Lallemand & Synave: 81 [Insecta: Hemiptera: Acanaloniidae]; type species: *Perinetia reticulata* Lallemand & Synave, 1954: 82.

Remark. This name was proposed to be replaced by *Aylaella* Demir & Özdikmen, 2009: 271.

1959 *Perinetia* Barnard: 81 [Crustacea: Malacostraca: Philosciidae]; type species: *Philoscia* (*Perinetia*) *reducta* Barnard, 1958: 81.

Remark. This name was proposed to be replaced by *Barnardetia* Xing & Chen, 2013: 399.

1964 *Perinetia* Descamps: 203, 206 [Insecta: Orthoptera: Eumastacidae]; type species: *Perinetia annulipes* Descamps, 1964: 208, figs 349–351; by original designation and monotypy.

Remark. This name was proposed to be replaced by *Perinetella* Descamps & Wintrebert, 1965: 96. However, this name was preoccupied by *Perinetella* Synave, 1956: 211; type species: *Perinetella nigroflava* Synave, 1956: 2012, figs 9–10; by original designation and monotypy (Insecta: Hemiptera: Flatidae), and a new replacement name was proposed – *Descampsiella* Özdikmen, 2008: 67.

1988 *Perinetia* Domergue: 135 [Reptilia: Serpentes: Colubridae]; type species: *Perinetia coulangesi* Domergue, 1988; by original designation and monotypy.

Remark. This name was proposed to be replaced by *Brygophis* Domergue & Bour, 1989: 805.

Discussion

The only known species of Laberiini trib. nov., *Laberia palliata* Stål, 1866, is a spectacular and large insect, with a distribution restricted to the Madagascan lowland forests ecoregion (= humid forests ecoregion) of eastern Madagascar. However, it is poorly represented in museum collections and, due to its endemism, it is very probably severely endangered by current rapid and drastic biotic changes in the area.

With the result of this paper, the family now includes 25 tribes whose relationships have yet to be fully resolved on a phylogenetic basis, using both morphological and especially molecular analyses. Currently, very few sequenced taxa are available, given the diversity of the family, leaving doubts about its monophyly and preventing sufficient representation of the family in larger molecular phylogenetic analyses.

The Fulgoromorpha of Madagascar is very insufficiently known. However, groups well represented, with high levels of endemicity and strong correlation with specific habitats are known (e.g., some Flatidae Spinola, 1839; see summary in Świerczewski & Stroiński 2021). On the other hand, other groups, such as Dictyopharidae are very scarce (Stroiński & Szwedo 2015; Song *et al.* 2016). Madagascar is one of the world's biodiversity hotspots with an unparalleled combination of diversity and uniqueness of its flora and fauna, much of which is endemic. The high degree of threat due to years of political crisis with economic and environmental degradation make Madagascar one of the highest conservation priority areas in the world (Myers *et al.* 2000; Ganzhorn *et al.* 2001; Roy 2016).

Acknowledgements

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