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Research article

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Malagasy spittlebugs (Hemiptera: Cercopidae), a taxonomic review of genera from Madagascar

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Abstract. The nine genera of Malagasy spittlebug are revised, with the addition of new characters, facilitating the identification of the species. *Nesaulax* Jacobi, 1917, is synonymized with *Amberana* Distant, 1908, leading to a new combination for *Amberana vittipennis* (Bergroth, 1894). A new endemic genus *Soulierana* Bucher & Bouteille gen. nov. is proposed for two species originally placed in *Literna* Stål, 1866, based on morphological characters of the head, tegmina and male genitalia. Also, three new species are described in this genus: *Soulierana bigidea* Bucher gen. et sp. nov., *Soulierana claudinae* Bouteille gen. et sp. nov. and *Soulierana kelymena* Le Cesne gen. et sp. nov. Pictures of species and drawings of the male genitalia for all genera, with the exception of *Rhinaulax* Amyot & Serville, 1843, *Alluaudensia* Lallemand, 1920 and *Literna*, are included. An identification key is available in both a dichotomous format and an interactive format (Xper3).

Keywords. Spittlebugs, Cercopidae, Madagascar, new species, new genus.

Bucher M., Bouteille E. & Le Cesne M. 2024. Malagasy spittlebugs (Hemiptera: Cercopidae), a taxonomic review of genera from Madagascar. *European Journal of Taxonomy* 935: 166–202. <https://doi.org/10.5852/ejt.2024.935.2555>

Introduction

Madagascar is the fourth largest island in the world and is located in the Indian Ocean, off the east coast of southern Africa. This territory is known for the exceptional diversity of its biota and their endemism in many taxonomic groups, making this island one of the most biologically rich hotspots and unique in the world (Myers *et al.* 2000). Madagascar started to be isolated from Africa and India some 165 Mya and 88 Mya, respectively (Ali & Aitchison 2008). The insularity and the presence of a large number of micro-habitats with a wide range of environmental conditions (Pearson & Raxworthy 2009) have led to the

speciation of a large number of endemic taxa to this territory (Vuataz *et al.* 2013). Over the last decades, many taxonomic studies have revealed a large number of undescribed species, showing that the current inventory of Malagasy biodiversity still only reflects a fraction of its real richness. Simultaneously, due to anthropisation, Madagascar's primary ecosystems have been drastically reduced in size and fragmented. Nowadays, more than 80% of the original habitats have been damaged, with an estimation of a loss of 44% of natural forest from 1953 to 2014 (Vieilledent *et al.* 2018). Therefore, the biological vulnerability of Madagascar shows the importance of identifying biodiversity and highlights the need to increase taxonomic knowledge to take adequate protective measures for these endangered ecosystems. Madagascar seems to be an important cradle for the Cercopidae biodiversity where 95% of the species listed on the island are endemic to this territory: 54 species are currently described within 9 genera (Metcalf 1961; Soulier-Perkins 2023): *Alluaudensia* Lallemand, 1920; *Amberana* Distant, 1908; *Bourgoinrana* Soulier-Perkins, 2012, three endemic genera of Madagascar and *Literna* Stål, 1866; *Locris* Stål, 1866; *Nesaulax* Jacobi, 1917; *Paramioscarta* Lallemand, 1949; *Pogonorhinella* Schmidt, 1910 and *Rhinaulax* Amyot & Serville, 1843.

Cercopidae Leach, 1815 (Hemiptera; Cicadomorpha) are characterized by the insertion of the antennae in a fovea of the cranium at the side of the postclypeus (Kramer 1950) and by features of the head, pronotum and forewings (Lallemand 1912). Cercopidae are represented by more than 1200 species worldwide, distributed within 108 genera with an Old-World distribution (Crispolon *et al.* 2023; Soulier-Perkins 2023). Malagasy cercopids have a specific association with particular habitats and vegetation, which makes them a useful bioindicator to determine the quality of an ecosystem, e.g., *Amberana vittipennis* (Bergroth, 1894) which was found only in the forest of Tanala, which is now heavily affected by deforestation and soil exploitation (Serpantié & Rakotonirina 2012). However, despite their great diversity and their ecological importance, Cercopidae remain poorly studied.

In this paper, we review the current classification of Cercopidae. Previous taxonomic descriptions are synthesized and completed by new descriptions and illustrations of male genitalia for several genera and Malagasy species. We propose here a new combination for *Amberana vittipennis* (Bergroth, 1894) comb. nov. and the description of a new genus, *Soulierana* Bucher & Bouteille gen. nov., for two species initially placed in *Literna* Stål, 1866 and for three new described species: *Soulierana bigidea* Bucher gen. et sp. nov., *Soulierana claudinae* Bouteille gen. et sp. nov. and *Soulierana kelymena* Le Cesne gen. et sp. nov. We also provide two identification keys both dichotomous and interactive (Xper3) in order to facilitate the recognition of the different genera and species of *Soulierana* for further taxonomic and inventory studies.

Material and methods

Abbreviations

The studied material comes from these entomological collections:

CAS	=	California Academy of Sciences, San Francisco, USA
RIScNB	=	Institut royal des Sciences naturelles de Belgique, Brussels, Belgium
MRAC	=	Musée royal de l'Afrique central, Tervuren, Belgium
MNHN	=	Muséum national d'histoire naturelle, Paris, France
MIZW	=	Muzeum Instytut Zoologii, Warsaw, Poland

Preparations and illustrations

The abdomen of each specimen examined was cut off and cleared for 20 minutes in warm (50°C) 10% KOH. Dissections and cleaning of genital structures were performed in distilled water. If required, a few drops of blue paragon for dyeing the ectodermic genital ducts were added for a few minutes. Final observations were done in glycerine using a Leica microscope (MZ16). The photos of the habitus were

taken using Canon EOS 6 D with a Macro lens Canon EF 100 mm f/2.8, view command on the computer with the Canon software and then assembly was conducted with the software Helicon focus 6. Final illustrations were produced using the Adobe Illustrator CS6 software.

In addition to the following dichotomous identification key for Malagasy genera, an interactive and illustrated one was elaborated using Xper3 (Vignes Lebbe *et al.* 2016). For each taxon, descriptors and states have been illustrated in order to provide as much clarity as possible and to avoid errors in character interpretation. For genitalia descriptions, we used the terms proposed by Le Cesne *et al.* (2021).

Key to the genera of Cercopidae Leach, 1815 known from Madagascar

1. Hindlegs with two spines *Alluaudensia* Lallemand, 1920
 – Hindlegs with one spine 2
2. Presence of a triangular dimple below the frons-postclypeus suture (Fig. 1A) 3
 – Absence of a triangular dimple below the frons-postclypeus suture (Fig. 1B) 4
3. Small parameres, which almost do not exceed the pygofer margin (Fig. 3E)
 *Amberana* Distant, 1908
 – Large parameres exceeding clearly the pygofer margin (Fig. 7E) .. *Paramioscarta* Lallemand, 1949
4. Body dorsoventrally flattened, aedeagus with a thumb-shaped process on the anterior margin
 *Bourgoinrana* Soulier-Perkins, 2012
 – General shape not flattened dorsoventrally, aedeagus without thumb-shaped process on the anterior margin 5
5. Tegmina with a fully embossed surface; pygofer with a lobe on the posterior margin above the anal tube; lateral margin of postclypeal furrow marked by two strong carinae
 *Soulierana* Bucher & Bouteille gen. nov.

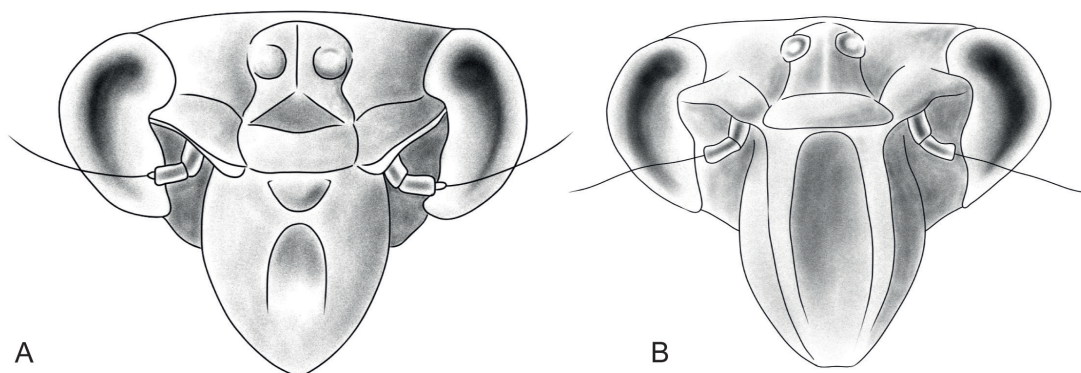


Fig. 1. Shape of the postclypeus in frontal view. **A.** Presence of a longitudinal furrow with a triangular dimple in the upper part below the frons margin (drawn from *Paramioscarta brunnea* (Lallemand, 1920)). **B.** Presence of a longitudinal furrow without triangular dimple in the upper part (drawn from *Soulierana claudinae* Bouteille gen. et sp. nov.).

- Tegmina relatively flat; posterior margin of pygofer straight; lateral margin of the postclypeus furrow without carina 6
- 6. Postclypeus strongly curved, largely exceeds the anterior margin of the head; aedeagus very slender, 3 times as long as pygofer height *Pogonorhinella* Schmidt, 1910
- Postclypeus not exceeding the anterior margin of the head; aedeagus wide, 2 times as long as pygofer height 7
- 7. Apex of the aedeagus bifid; males with wide and short sub-genital plate *Literna* Stål, 1866
- Apex of the aedeagus single, with a hanging structure; males with thin and long sub-genital plates *Locris* Stål, 1866

Interactive key (Xper3)

<https://app.xper3.fr/xper3GeneratedFiles/publish/identification/-4172653156917231114/mkey.html>

Results

Taxonomy

Class Insecta Linnaeus, 1758
 Order Hemiptera Linnaeus, 1758
 Infraorder Cicadomorpha Evans, 1946
 Superfamily Cercopoidea Leach, 1815
 Family Cercopidae Leach, 1815
 Subfamily Cercopinae Oshanin, 1916

 Genus *Alluaudensia* Lallemand, 1920
 Fig. 2

Alluaudensia Lallemand, 1920: 287.

Type species

Alluaudensia nigrolineata Lallemand, 1920 by monotypy.

Synthesis of Lallemand's description

Alluaudensia is an endemic genus from Madagascar known by only one species described from a single female specimen by Lallemand (1920). He augmented his original description in 1949 (Lallemand 1949). A synthesis based on Lallemand's descriptions is presented below:

HEAD. Vertex with a light hump carrying the ocelli on its anterior median part. Ocelli closer to each other than to compound eyes. Postclypeus with large furrow. Rostrum reaches mesocoxae.

THORAX. Pronotum strongly inclined on anterior part resulting in strongly humped shape; pronotum with dimples on each side and three transverse furrows. Hindlegs with two spines on metatibiae.

TEGMINA. Veins prominent. Apical part of tegmina with dense network of veins (Lallemand 1920, 1949).

Distribution (Fig. 2E)

Endemic genus of Madagascar.

Number of species: 1.

Alluaudensia nigrolineata Lallemand, 1920

Alluaudensia nigrolineata Lallemand, 1920: 288.

Material examined

Holotype

MADAGASCAR • 1 ♀; Diego-Suarez; 1893; C. Alluaud leg.; MNHN(EH) 7394.

Description

TOTAL LENGTH. 19.0 mm (holotype).

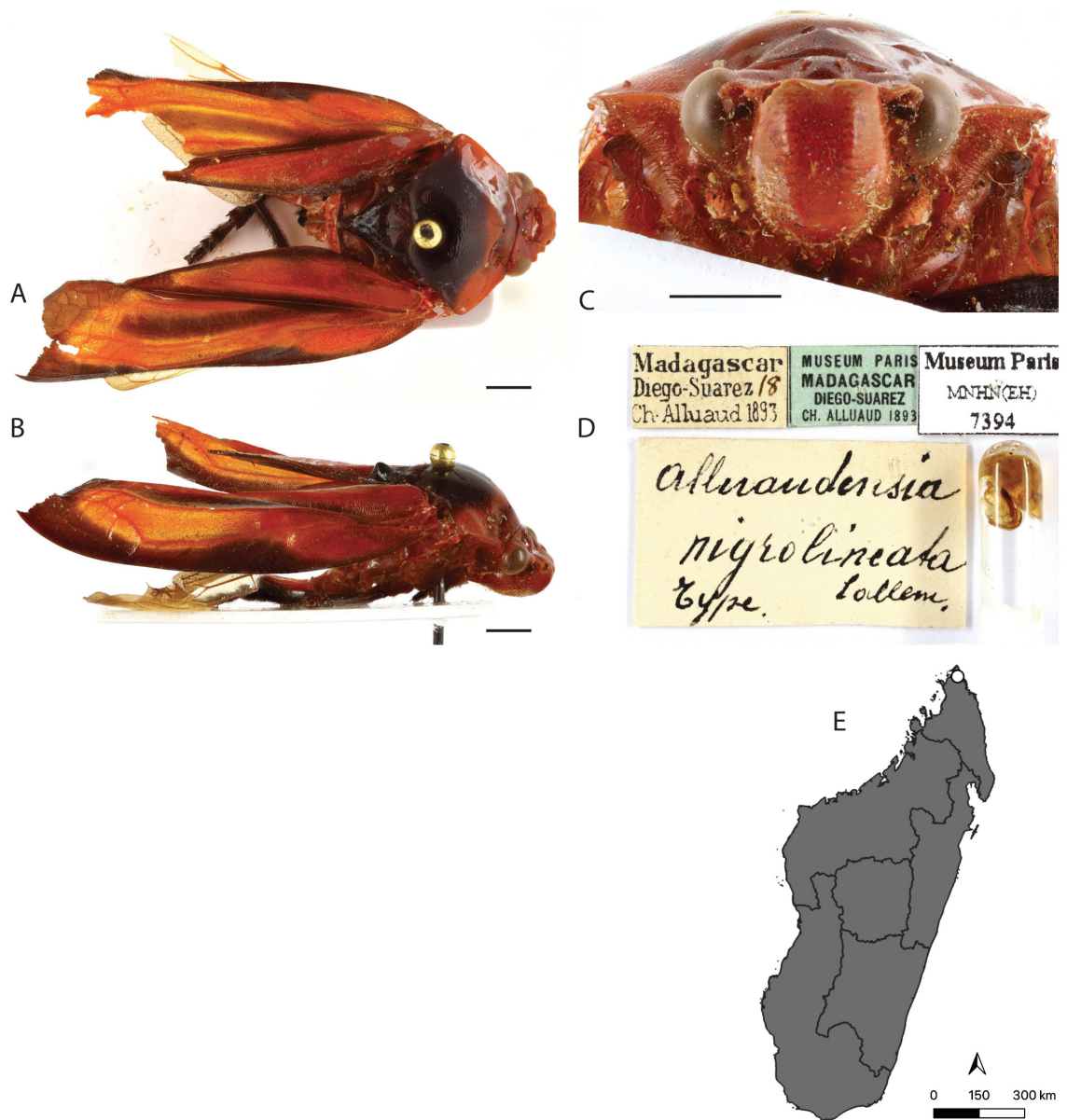


Fig. 2. *Alluaudensia nigrolineata* Lallemand, 1920, holotype, ♂ (MNHN(EH) 7394). **A.** Dorsal view. **B.** Lateral view. **C.** Frontal view. **D.** Labels. **E.** Distribution map. Scale bars = 1 mm.

HEAD. In dorsal view head 2 times as wide as long. Ocelli closer to each other than to compound eyes and placed on small hump. Postclypeus with large furrow on median part extending over its full height.

THORAX. Pronotum very prominent. Scutellum as long as large.

COLORATION. Head red with pedicels of antennae black. Anterior third of pronotum red. Posterior part of pronotum and scutellum black. In dorsal view, abdomen with first segment dark and rest red. In ventral view, specimen entirely red. Legs black except hindlegs, femurs brown. Tegmina mainly red-ochre, with a black stripe following the margins. Black stripe large on external and apical margins and thin on internal claval vein. Veins red and black in dark parts of the wing. Hindwings smoked with red veins on anterior part, brown on apical part.

Genus *Amberana* Distant, 1908

Fig. 3H

Amberana Distant, 1908: 313.

Dauphina Distant, 1908: 314 (synonymy by Lallemand 1949).

Nesaulax Jacobi, 1917: 541 **syn. nov.**

Amberana – Soulier-Perkins & Kunz 2012: 5–36, figs 1–122.

Type species

Amberana elongata Distant, 1908.

Synthetic description

Amberana is an endemic genus from Madagascar described by Distant in 1908. It was revised by Soulier-Perkins & Kunz in 2012. A synthesis based on their descriptions of this genus is presented below:

HEAD. Head as wide as long between eyes, anterior margin with carina. Median part of vertex strongly curved, flattened vertically on lower part to form triangle just above delimitation of postclypeus. Ocelli close to each other and separated by small carina. Postclypeus convex, striated laterally with triangular dimple just below frons-postclypeus suture. Middle part of postclypeus can be strongly marked or not by sulciform furrow. Rostrum reaching mesocoxae.

THORAX. Anterior margin of pronotum straight or slightly rounded, three small concavities present on each side along anterior margin. Scutellum a bit longer than wide. Hindlegs with one spine on metatibiae.

MALE GENITALIA. Male genitalia with sterno-lateral plates and small parameres not exceeding the pygofer margin (Distant 1908; Soulier-Perkins & Kunz 2012).

Distribution (Fig. 3H)

Endemic genus of Madagascar.

Number of species: 23.

Amberana attiei Soulier-Perkins, 2012

Amberana bergevini (Lallemand, 1920)

Amberana boucomonti (Lallemand, 1920)

Amberana brolemanni (Lallemand, 1920)

Amberana dimidiata (Signoret, 1860)
Amberana elongata Distant, 1908
Amberana fissurata Jacobi, 1917
Amberana harandranomasina Le Cesne & Soulier-Perkins, 2022
Amberana humeralis (Fallou, 1890)
Amberana kraussi Synave, 1957
Amberana lemuria (Distant, 1908)
Amberana limbata Lallemand, 1955
Amberana marginata (Fallou, 1890)
Amberana maromandiana Lallemand, 1949
Amberana melanops (Jacobi, 1917)
Amberana noualhieri (Lallemand, 1920)
Amberana ouvrardi Soulier-Perkins, 2012
Amberana pascali Soulier-Perkins, 2012
Amberana peyrierasi Soulier-Perkins & Le Cesne, 2022
Amberana pygmaea Schmidt, 1920
Amberana sexguttata (Melichar, 1915)
Amberana uncinata Jacobi, 1917

Amberana vittipennis (Bergroth, 1894) comb. nov.

Fig. 3

Rhinaulax vittipennis Bergroth, 1894: 160.

Nesaulax vittipennis – Jacobi 1917: 541.

Material examined

MADAGASCAR • 1 ♂; Forêt Tanala; 1901; C. Alluaud leg.; V. Lallemand det.; MNHN(EH) 24113 • 1 ♂; 1898; collection Noualhier; MNHN(EH) 24536 • 1 ♀; Forêt Tanala; 1901; C. Alluaud leg.; MNHN(EH) 24117 • 1 ♀; Forêt Tanala, rég. de Ranomafana Anjorojoro; Mar. 1901; C. Alluaud leg.; V. Lallemand det.; MNHN(EH) 24113 • 1 ♀; 1898; collection Noualhier; MNHN(EH) 24537 • 1 ♀; 1898; collection Noualhier; MNHN(EH) 24538.

Description

TOTAL LENGTH. Between 6.3 and 6.6 mm.

HEAD. In dorsal view (Fig. 3A, C), median part of vertex with small triangle, indistinct, on lower margin. Ocelli separated by thin carina. Lateral part of vertex curved on upper part and flattened on anterior margin of head. Postclypeus slightly convex forming obtuse angle in lateral view. Postclypeus with triangle dimple below frons-postclypeus suture with clear sulciform mark on middle.

THORAX. Anterior part of pronotum with very thin carina.

MALE GENITALIA. Subgenital plates long, reaching dorsal third of pygofer, strongly curved; diameter decreasing gently toward tip, which is rounded and covered with short setae (Fig. 3E). Dorsal margin of parameres possesses two rounded extensions: anterior than other. Sterno-lateral plates wide and exceeding pygofer with triangular shape with dorsal and ventral junction convex and oriented posteriorly (Fig. 3G). On ventral part of parameres, anterior and posterior margins mainly parallel with junction forming rounded endpoint. Aedeagus (Fig. 3F) not exceeding height of pygofer. Anterior margin of aedeagus with successively (from base to apex) short bump, small membranous part and with two

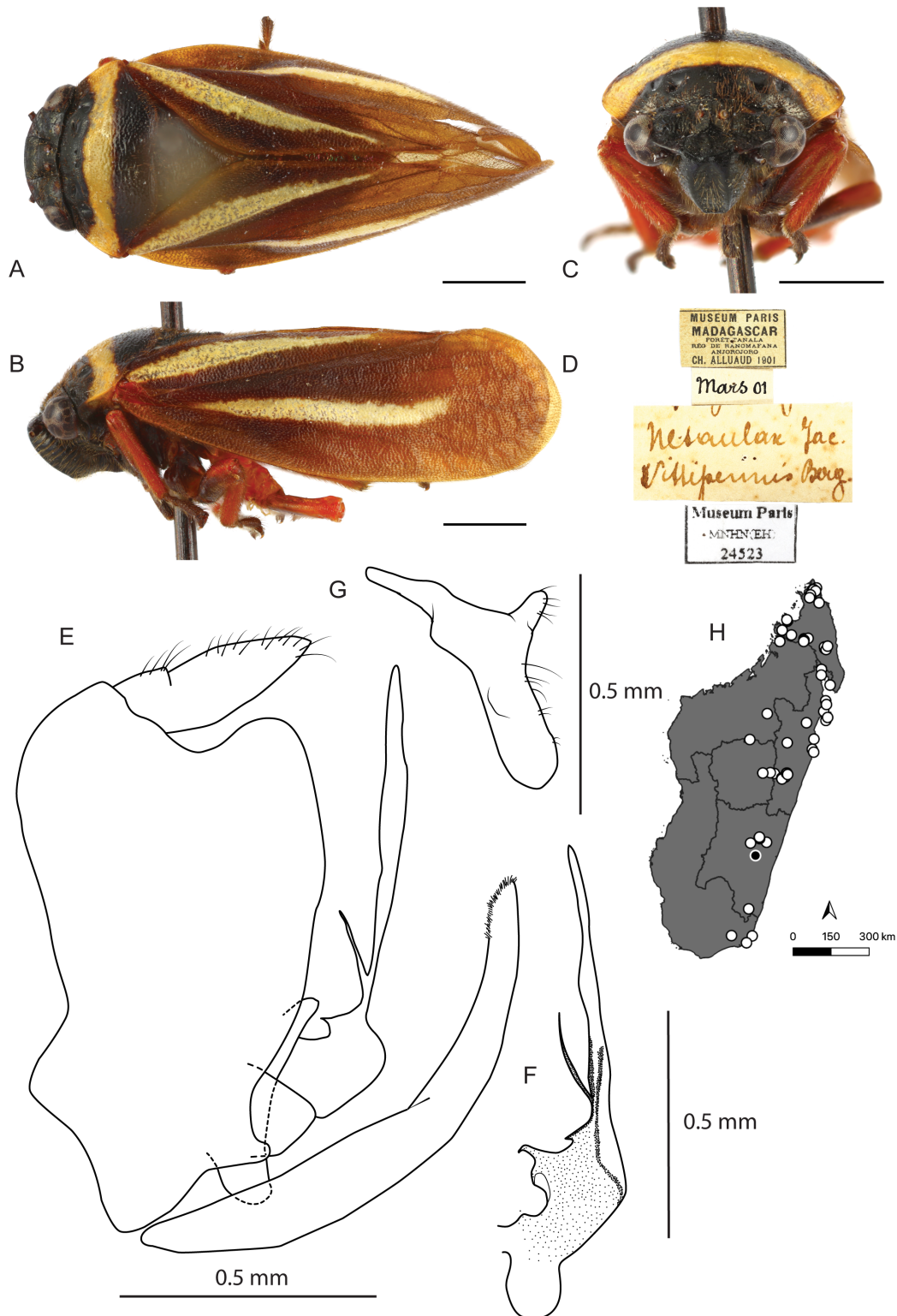


Fig. 3. *Amberana vittipennis* (Bergroth, 1894), ♂, (MNHN(EH) 24523). **A.** Dorsal view. **B.** Lateral view. **C.** Frontal view. **D.** Labels. **E.** Male terminalia in lateral view, pygofer, anal tube, aedeagus, left paramere and left subgenital plate. **F.** Aedeagus. **G.** Left paramere. **H.** Distribution map (white dots correspond to all occurrences of species of *Amberana* in Madagascar; the black dot refers only to *A. vittipennis*). Scale bars: A–C = 1 mm.

spined excrescences, lower one being longer. Ventral margin extending in very convex arc. Dorsal part of aedeagus arced in obtuse angle. Apical part of aedeagus bifid with anterior thin spine-like extension and a posterior wider extension with rounded apex; anterior extension one third length of posterior one.

COLORATION. Head and anterior third of pronotum uniformly dark brown. Middle of pronotum with continuous transverse yellow stripe (Fig. 3A–C). Rest of pronotum and scutellum dark to light brown. In ventral view, thorax dark as head (Fig. 3B). Abdomen and legs reddish brown with tarsi dark brown or black (Fig. 3B–C). Tegmina brown or slightly clearer than rest of body. Tegmina with two distinct yellow bands (Fig. 3A–B): one extending over clavus, starting from insertion of tegmina to apical part of PCu; other extending on corium between M and Cu. Insertion of tegmina reddish or light brown.

Key to species of *Amberana* Distant, 1908

1. Tegmina mainly red, orange or coral 2
 - Tegmina other than with a red or orange dominant colour 9
2. Thorax with uniform colour, red or black 3
 - Thorax with more than one colour 4
3. Thorax black, total length less than 11.0 mm 5
 - Thorax red, total length longer than 11.0 mm 7
4. Thorax black with transversal orange band on pronotum *A. boucomonti* (Lallemand, 1920)
 - Thorax coloured coral with apex of scutellum black
 *A. harandranomasina* Le Cesne & Soulier-Perkins, 2022
5. Total length not exceeding 8.0 mm 6
 - Total length longer than 9.0 mm *A. peyrierasi* Soulier-Perkins & Le Cesne, 2022
6. Black border following costal, apical and sutural margins of tegmina, from tip of clavus black border get narrower and follows shortly clavo-corial suture. Sometimes, a black patch can extend from the tip of clavus down to the costal margin *A. limbata* Lallemand, 1955
 - Black border on tegmina, starting only from tip of clavus, following apical margin and stopping at mid length of costal margin *A. pygmaea* Schmidt, 1920
7. Black border starting from tip of clavus and following apical and costal margins of tegmina
 *A. marginata* (Fallou, 1890)
 - Black line running along clavo-corial suture 8
8. Black border all around tegmina, thin black line on clavo-corial suture and a black line on corium starting after M + Cu split and finishing before reaching apex *A. uncinata* Jacobi, 1917
 - Larger black border around tegmina but finishing before last third of costal margin, black line on clavo-corial suture large, line on corium not individualized *A. fissurata* Jacobi, 1917
9. Tegmina partially translucent or smoked 10
 - Tegmina opaque 13
10. Tegmina without a black border following its apical margin *A. dimidiata* (Signoret, 1860)
 - Black border following apical margin of tegmina 11

11. Tegmina translucent with an orange patch along clavus basal margin and red area along base of costal margin *A. noualhierii* (Lallemand, 1920)
 – Tegmina yellowish smoked 12
12. Red patch at base of tegmina plus red spot within internal curve of black apical border; vertex and pronotum red *A. maromandiana* Lallemand, 1949
 – Orange patch at base of tegmina bordered posteriorly by perpendicular black line that follows clavo-corial suture within orange patch; vertex and scutellum black, pronotum orange
 *A. lemuria* (Distant, 1908)
13. Pronotum completely black 14
 – Pronotum black bearing a yellow to orange transversal band 21
14. Tegmina mainly cream, with a black border and some red *A. ouvrardi* Soulier-Perkins, 2012
 – Tegmina mainly dark brown to black 15
15. Tegmina with anterior third orange and rest black *A. humeralis* (Fallou, 1890)
 – Tegmina dark brown to black, bearing 2 or 3 spots of colour 16
16. Total length not exceeding 7.0 mm 17
 – Total length longer than 7.0 mm 18
17. Tegmina bearing three yellow spots, the two on corium are small *A. attiei* Soulier-Perkins, 2012
 – Tegmina bearing two patches of colour orange *A. kraussi* Synave, 1957
18. Total length inferior to 11.0 mm 19
 – Total length equal or longer than 11.98 mm *A. pascali* Soulier-Perkins, 2012
19. Apex of subgenital plate pointed *A. bergevini* (Lallemand, 1920)
 – Apex of subgenital plate slightly bulbous *A. elongata* Distant, 1908
20. Tegmina bearing only band of colour along anterior claval margin, rest of tegmina dark brown with some red *A. brolemanni* (Lallemand, 1920)
 – Tegmina bearing band of colour along anterior claval margin plus two other spots of same colour
 21
21. Clypeus black 22
 – Clypeus yellow to orange *A. sexguttata* (Melichar, 1915)
22. Tegmina with an orange spot on the clavus and two on the corium *A. melanops* (Jacobi, 1917)
 – Tegmina with two longitudinal yellow lines, one on clavus and one on corium
 *A. vittipennis* (Bergroth, 1894) comb. nov.

Genus *Bourgoinrana* Soulier-Perkins, 2012

Fig. 4

Bourgoinrana Soulier-Perkins & Kunz, 2012: 36–41 figs 123–140.

Type species

Bourgoinrana perinetana (Synave, 1957).

Material examined

Bourgoinrana perinetana (Synave, 1957)

MADAGASCAR • 1 ♂; Marojejy-Ouest; 1600 m a.s.l.; Nov. 1959; P. Soga leg.; A. Soulier-Perkins det.; Institut scientifique de Madagascar; I.G. 22.889 (RIScNBIG) • 1 ♂; Massif du Tsaratanana, versant Sud, Andohanambatoafo; 2030 m a.s.l.; 16–18 Dec. 1966; P. Soga leg.; A. Soulier-Perkins det.; MNHN(EH) 4819 • 1 ♀; Massif du Tsaratanana, versant Sud, Andohanambatoafo; 2030 m a.s.l.; 16–18 Dec. 1966; P. Soga leg.; A. Soulier-Perkins det.; coll. P. Viette; MNHN(EH) 4816.

Bourgoinrana sandrangatensis (Synave, 1957)

MADAGASCAR • 1 ♂; A. Soulier-Perkins det.; MNHN(EH) 22380.

Bourgoinrana rubescens (Synave, 1957)

MADAGASCAR • 1 ♂; Marojezy, Dec. 1972; A. Soulier-Perkins det.; mission CNRS; R. C. P. n°225; MNHN(EH) 4833 • 1 ♂; Marojezy, Dec. 1972; A. Soulier-Perkins det.; mission CNRS, R. C. P. n°225; MNHN(EH) 4834.

Synthetic description

Bourgoinrana is a genus which had all its species placed in *Amberana* until its description in 2012. It is an endemic genus of Madagascar, easy to differentiate from the other genera present there, mainly thanks to its flattened shape (Soulier-Perkins & Kunz 2012). A synthesis based on previous taxonomic descriptions and material examined is presented below:

HEAD. Vertex as broad as long. Anterior margin of head regularly rounded. Ocelli closer to each other than to compound eyes. Postclypeus with large longitudinal furrow.

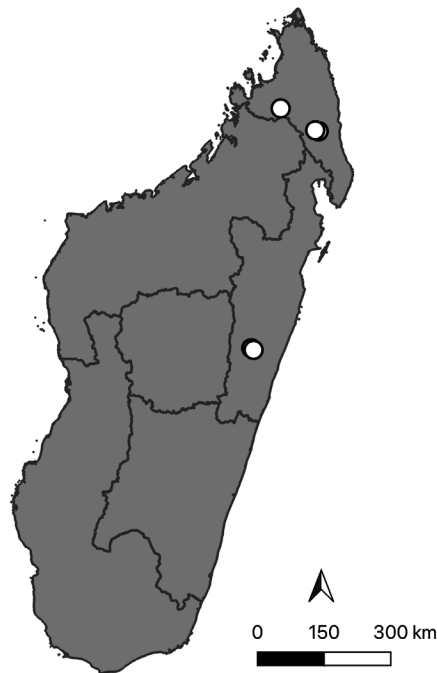


Fig. 4. Distribution map of *Bourgoinrana* Soulier-Perkins, 2012.

THORAX. Pronotum as wide as long and dorsoventrally flattened, giving aspect easy to identify to insects from genus. Pronotum with few distinct dimples, not deep. Hindlegs with one spine on metatibiae.

MALE GENITALIA. Have sterno-lateral plates and aedeagus with thumb shape on anterior margin (Soulier-Perkins & Kunz 2012).

Distribution (Fig. 4)

Endemic genus of Madagascar.

Number of species: 4.

Bourgoinrana beondrokaensis Le Cesne & Soulier-Perkins, 2021

Bourgoinrana perinetana (Synave, 1957)

Bourgoinrana rubescens (Synave, 1957)

Bourgoinrana sandrangatensis (Synave, 1957)

Genus *Literna* Stål, 1866

Fig. 5

Type species

Literna maura (Thunberg, 1822).

Synthetic description

Literna is an African genus, described long ago in a very brief manner by Stål (1866), making it impossible to currently determine the species with his original publication. Most of its species are present in Madagascar. Lallemand proposed a refined description of this genus in 1912 based on the general body shape and wing venation (Lallemand 1912). He updated his description in 1949 by adding genitalia characters for males and females, but they remained too general to qualify them as characteristic for this genus (Lallemand 1949). The male genitalia have been described for only three species: *L. altipeta* Lallemand & Synave, 1952; *L. muscophila* Lallemand & Synave, 1952 and *L. pauliani* Lallemand & Synave, 1952 (Lallemand & Synave 1952). Hence, the description of the male genitalia for this genus is not presented in this publication. Moreover, some species, such as *L. callosipennis* (Signoret, 1860), seem to show morphological characters similar to the species now assigned to the new genus *Soulierana* Bucher & Bouteille gen. nov. Nevertheless, types-specimen(s) were not consulted during this study and as a result, no taxonomic revisions have been made for these taxa. However, the lack of information for the genitalia characters highlights the need for further taxonomic studies. A synthesis based on the older descriptions for the Malagasy species is presented below:

HEAD. In dorsal view (Fig. 5A), head as wide as long. Ocelli closer to each other than to compound eyes and generally separated by carina, barely visible or even absent in some species (Fig. 5A, C); a carina can be observed on frons. Postclypeus with large furrow which can extend over its entire length, but not necessarily; lateral edges of furrow usually diffused (Fig. 5C). In some species, such as *L. callosipennis* (Signoret 1860), *L. hovana* Lallemand, 1949, *L. madegassa* Lallemand, 1949 and *L. signata* Jacobi, 1917, lateral part of postclypeus marked with two carina and deep furrow. Postclypeus striated laterally.

THORAX. Anterior margin of pronotum strongly declining; presence of a few dimples on anterior part. Scutellum longer than wide. Hindlegs with one spine on metatibiae.

TEGMINA. Tegmina longer than wide (Fig. 5A) in tapered shape, except for *L. ochracea* Jacobi, 1917, which possesses oval tegmina strongly rounded on posterior part. One or few bumps on anterior part of tegmina.

MALE GENITALIA. Male genitalia with sterno-lateral plates.

Distribution

Tropical Africa, South Africa and Madagascar.

Number of species: 25, 16 in Madagascar.

- Literna altipeta* Lallemand & Synave, 1952
- Literna ankaratrana* Lallemand & Synave, 1954
- Literna callosa* (Signoret, 1858)
- Literna callosipennis* (Signoret, 1860)
- Literna gracilis* Lallemand, 1949
- Literna hovana* Lallemand, 1949
- Literna lacomblei* Lallemand, 1920
- Literna madegassa* Lallemand, 1949
- Literna minuscula* Jacobi, 1917
- Literna muscophila* Lallemand & Synave, 1952
- Literna ochracea* Jacobi, 1917
- Literna pauliani* Lallemand & Synave, 1952
- Literna signata* Jacobi, 1917
- Literna sylvicola* Lallemand & Synave, 1952

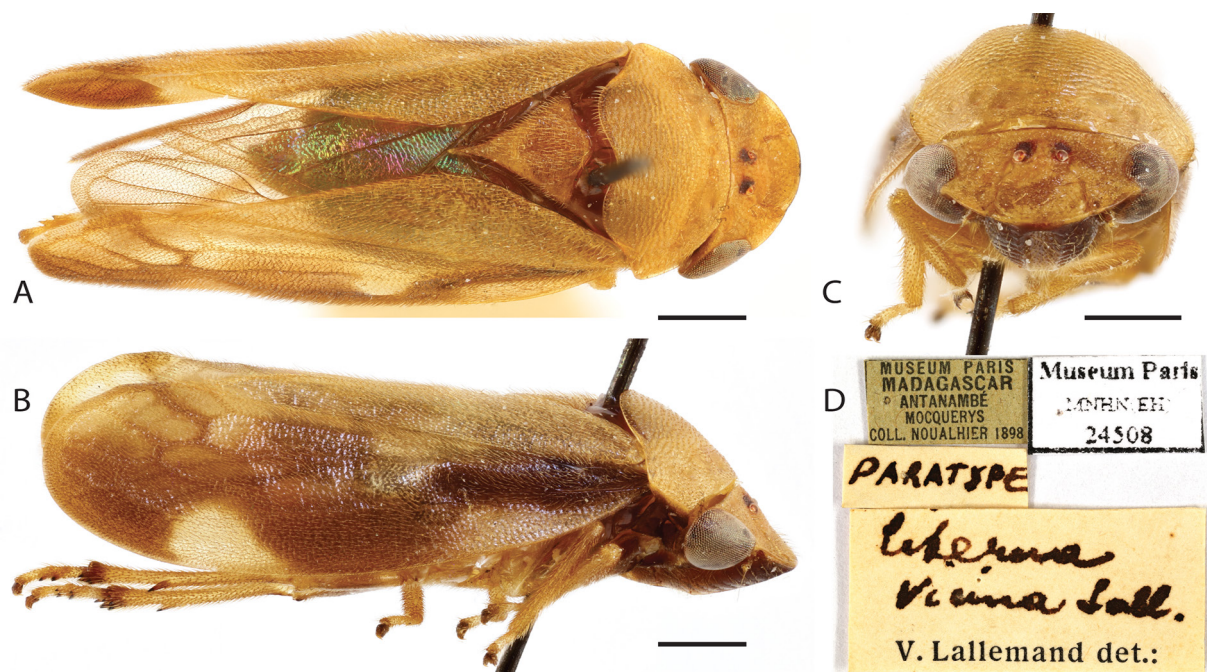


Fig. 5. *Literna vicina* Lallemand, 1942, ♂ (MNHN(EH) 24508). **A.** Dorsal view. **B.** Lateral view. **C.** Frontal view. **D.** Labels. Scale bars = 1 mm.

Literna tanalae Lallemand, 1920

Literna vicina Lallemand, 1942

Genus *Locris* Stål, 1866

Fig. 6

Locris Stål, 1866: 56.

Locris – Bouteille *et al.* 2021: 40–41, figs 6a–d, 7a–d.

Type species

Locris rubra (Fabricius, 1794).

Material examined

Locris bipunctata (Signoret, 1860)

MADAGASCAR • 1 ♂; “Ambabalame; V. Lallemand det.; Coll. Mus. Congo; 6664 H; Muséum Paris”; MNHN(EH) 24628 • 1 ♂; “Lavaudon; Coll. E. de Bergev”; MNHN(EH) 24115 • 1 ♂; “Amber-Geb.; Edm. Schmidt det.; Miz Pan Warszawa 12/1945 2487” • 1 ♂; “Amber-Geb.; Edm. Schmidt det.; 970; Miz Pan Warszawa 12/1945 2488” • 1 ♂; “Amber-Geb.; Edm. Schmidt det.; Miz Pan Warszawa 12/1945 2489”.

Locris nigrolimbata (Lallemand, 1910)

KENYA • 1 ♂; “Afrique orientale Anglaise St. 60; 600 m a.s.l.; Mar. 1911; Alluand and Jeannel; Coll. Mus. Congo; Coll. V. Lallemand; R det. 6665”; MRAC • 1 ♂; “Afrique orientale Anglaise, WaKikuyu,

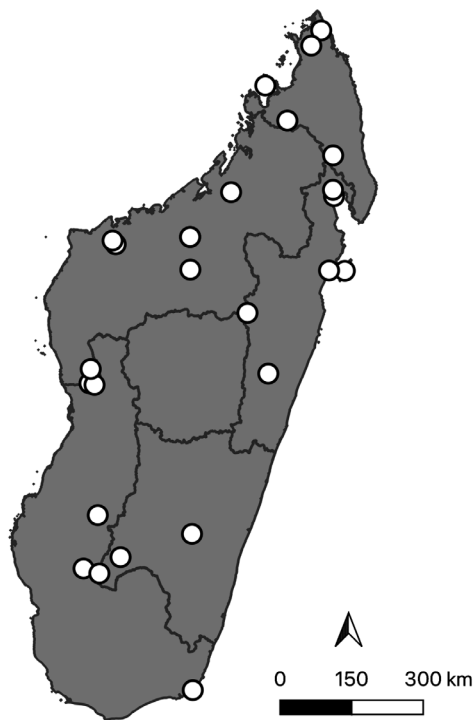


Fig. 6. Distribution map of *Locris* Stål, 1866.

Fort-Hall, St. 80; 1330 m a.s.l.; Jan. 1912; Alluaud and Jeannel; Coll. Mus. Congo; Coll. V. Lallemand; R det. 6665”; MRAC • 1 ♂; “Nairobi; Apr. 1923; G. Babault leg.; *Locris johannae* ssn. *nigrolimbata*”; MNHN(EH) 24629.

TANZANIA • 1 ♂; Mts. Uluguru, Kimboza ofr. Héliophile; 600 m a.s.l.; 24–30 Jul. 1971; L. Berger, N. Leleup and J. Debecker leg.; Coll. Mus. Tervuren; H. Synave det.; MNHN(EH) 24635.

Locris vicina (Signoret, 1860)

MADAGASCAR • 1 ♂; Parc de Zombitse Leobondro, rég. Atsimo-andrefana, bord rivière; 22°40.460' S, 44°51.633' E; 633 m a.s.l.; 20 Mar. 2006; A. Soulier-Perkins leg. and det.; MNHN(EH) 24659 • 1 ♂; Ambodimanga; 1906; S.I. Hammerstem leg.; Edm. Schmidt det.; Miz Pan Warszawa 12/1945 2490 • 1 ♂; Ambodimanga; 1906; S.I. Hammerstem leg.; Edm. Schmidt det.; Miz Pan Warszawa 12/1945 2491.

Synthetic description

Locris is a large African genus with more than 80 species currently described (Soulier-Perkins 2023). It is known in Madagascar by three species. Stål (1866) initially described *Locris* in a very brief manner, making it impossible to currently determine the genus with his original publication. Lallemand proposed a refined description of this genus in 1949 on the basis of morphological characters that are not all completely consistent, according to Bouteille *et al.* (2021). It is true that in addition to a list of general characters supposed to describe the genus, Lallemand (1949) also listed a series of exceptions in order to include more species, probably making the genus paraphyletic. The homogeneity of this genus and its taxonomic unity is therefore questionable. Bouteille *et al.* (2021) revised the three Malagasy species of *Locris* and provided descriptions of their genitalia with new characters. Nevertheless, the lack of systematic information for the genitalic characters of the entire genus highlights the need for further taxonomic studies. A synthesis based on previous taxonomic descriptions and material examined is presented below:

HEAD. Postclypeus rounded in lateral view with longitudinal carina in median part and transverse ridges. Rostrum short, barely extending to base of median trochanter. Antennae short. Vertex as broad as long with length equal to half length of pronotum. Ocelli closer to each other than to compound eyes.

THORAX. Pronotum large with straight posterior margin. Scutellum as long as large with 3 dimples; 2 small dimples above anterior margin and a bigger one on median part. Hindlegs with one spine on metatibiae.

TEGMINA. Tegmina 3 times as long as wide. Cu and M linked from base to middle of tegmina. Apical veins form dense network on apex.

MALE GENITALIA. No sterno-lateral plates. Subgenital plates wide and sometimes silky at base, forming thin and long filament (Lallemand 1949) curved up or downwards on its apical half. Parameres silky and wide from pygofer's attachment to its tip and they can form a cup prolonged by one or two structures that can have a little spine curved up- or downwards (Bouteille *et al.* 2021). Aedeagus can have little bumps on top. Apex with hanging structure (Bouteille *et al.* 2021) which varies in size and shape, with presence in many species of bifid branch connected in middle. Apex sometimes silky and wider than rest of aedeagus (Bouteille *et al.* 2021).

Distribution (Fig. 6)

Tropical Africa, South Africa and Madagascar.

Number of species: 87, 3 in Madagascar.

Locris bipunctata (Signoret, 1860)
Locris bipunctata bipunctata (Signoret, 1860)
Locris bipunctata atra (Lallemand, 1950)
Locris nigrolimbata (Lallemand, 1910)
Locris vicina (Signoret, 1860)

Genus ***Paramioscarta*** Lallemand, 1949

Fig. 7

Paramioscarta Lallemand, 1949: 88

Type species

Paramioscarta brunnea (Lallemand, 1920) by monotypy.

Synthetic description

Paramioscarta is an endemic monospecific genus of Madagascar. It shares features with the genus *Amberana* but can be differentiated by its broader general shape and by the large parameres of male genitalia. A synthesis based on Lallemand descriptions (Lallemand 1920, 1949) and material examined is presented below:

HEAD. Wider than long. Ocelli closer to each other than to compound eyes and separated by a carina. Median part of vertex strongly domed; lateral margins of dome not parallel, with recess in middle giving this structure a lock shape. Postclypeus rounded in lateral view, striated laterally with triangular dimple just below frons-postclypeus suture as in genus *Amberana*. Upper part of postclypeus with vertical furrow.

THORAX. Three clear dimples just behind anterior margin on each side of pronotum; another one discernable in middle part. Hindlegs with one spine on metatibiae.

MALE GENITALIA. Male genitalia with sterno-lateral plates and large parameres clearly exceeding pygofer margin.

Distribution (Fig. 7H)

Endemic genus of Madagascar.

Number of species: 1.

Paramioscarta brunnea (Lallemand, 1920)

Dauphina brunnea Lallemand, 1920: 282.

Paramioscarta brunnea – Lallemand 1949: 88.

Material examined

MADAGASCAR • 1 ♂; Province d'Analalava Maromandia; 1923; R. Decary leg.; V. Lallemand det.; MNHN(EH) 24505 • 1 ♂; Reserve spéciale du Zombitsy, Est de Sakaraha matsabory; 640 m a.s.l.; 13 Feb. 1974; P. Viette and A. Peyrieras leg.; MNHN(EH) 24531 • 1 ♂; Ouest S-P. Antsalova Antsingy, Rés. Nat. 9; Jan. 1975; A. Peyrieras leg.; MNHN(EH) 24532 • 1 ♂; Province de Toliara, massif du Makay; 21°37'46.1" S, 45°00'17.7" E; 200 m a.s.l.; 23 Jan. 2011; D. Ouvrard leg.; light trap; MNHN(EH) 24120 • 1 ♂; Sakaraha, Zombitsy; P. Griveaud leg.; MNHN(EH) 24533 • 1 ♂; Sakaraha, Lambomakandro;

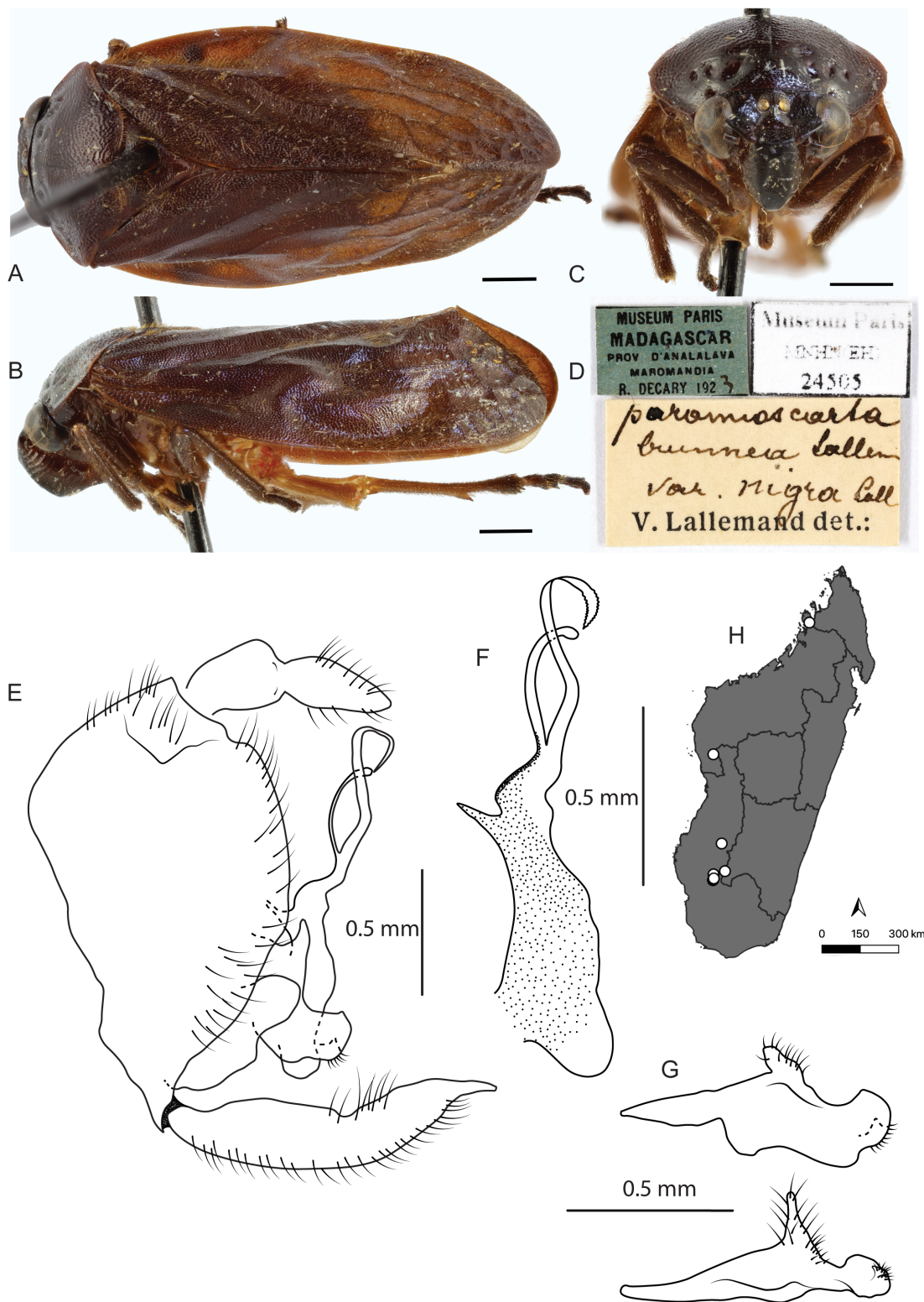


Fig. 7. *Paramioscarta brunnea* (Lallemand, 1920), ♂ (MNHN(EH) 24505). **A.** Dorsal view. **B.** Lateral view. **C.** Frontal view. **D.** Labels. **E.** Male terminalia in lateral view, pygofer, anal tube, aedeagus, left paramere and left subgenital plate. **F.** Aedeagus. **G.** Left paramere, inside view on the top and outside view on the bottom. **H.** Distribution map. Scale bars: A–C= 1 mm.

Mar. 1956; MNHN(EH) 24540 • 1 ♀; Andobo, forêt d'Antsingy, det. Antsalova; 190 m a.s.l.; Feb. 1957; P. Griveaud leg.; MNHN(EH) 24534 • 1 ♀; rég. Atsimo-andrefana, Parc de Zombitse; 22°53.002' S 44°41.956' E; 783 m a.s.l.; 18 Mar. 2006; A. Soulier-Perkins leg.; light trap; MNHN(EH) 24535 • 1 ♂; Province Toliara, Parc National de Zombitse, 19.8 km, 84° E Sakaraha; 22°50'36" S, 44°42'36" E; 770 m a.s.l.; 5–9 Feb. 2003; Fisher and Griswold leg.; M. Bucher det.; light trap; collection code: BLF7508; CASENT 3007841 • 1 ♀; Madagascar, Province Toliara, Parc National de Zombitse, 19.8 km, 84° E Sakaraha; 22°50'36" S, 44°42'36" E; 770 m a.s.l.; 5–9 Feb. 2003; Fisher and Griswold leg.; M. Bucher det.; light trap; collection code: BLF7508; CASENT 3007840 • 1 ♀; Madagascar, Fianarantsoa Province, Forêt d'Analalava, 29.6 km 280°W Ranohita; 22°35'30" S, 45°07'42" E; 700 m a.s.l.; 1–5 Feb. 2003; Fisher and Griswold leg.; M. Bucher det.; collection code: BLF7387; CASENT 3007856.

Description

TOTAL LENGTH. Between 8.5 and 11.5 mm.

HEAD. Median part of vertex with very strong carina extending to anterior margin of head. Frons flat but slightly domed in middle. Postclypeus not exceeding anterior margin of head; longitudinal furrow, wide in its lower part.

THORAX. Anterior part of pronotum relatively flat and rising up halfway back. Presence of thin and short carina in median part of pronotum, not reaching anterior or posterior margin.

TEGMINA. Apical network with concave cells. Two well-marked bumps in anterior part: one between R and bifurcation of M and Cu; second on the bifurcation of R.

MALE GENITALIA. Posterior margin of pygofer forming convex arc in apical part and becoming concave on basal margin. Subgenital plates short, wide with narrowing in middle section, slightly exceeding level of end of anal tube. Terminus forming small bulb serrated on apical part. Large sterno-lateral plates. Parameres developed anteriorly with long and thin extension, representing third of total length. On dorsal margin, presence of thumb-like protrusion covered with setae, followed by small tip-shaped extension. Presence of large thorn-like excrescence located internally in posterior part of parameres. Aedeagus developed anteriorly in single pointed protrusion and not exceeding height of pygofer; basal part sclerified but membranous ventrally. Apical part of aedeagus very thin and bifid. Posterior extension with a serrated apex; anterior extension two thirds length of posterior one.

COLORATION. Dark brown or light brown with darker legs. In ventral view, abdomen red.

Genus *Pogonorhinella* Schmidt, 1910

Fig. 8

Pogonorhinella Schmidt, 1910: 334.

Type species

Pogonorhinella madagascariensis Schmidt, 1910 by monotypy.

Synthetic description

Pogonorhinella is a monospecific endemic genus of Madagascar which possesses a peculiar shape due to its small head and the narrow anterior margin of the pronotum. A synthesis based on Schmidt, 1910 description and material examined is presented below:

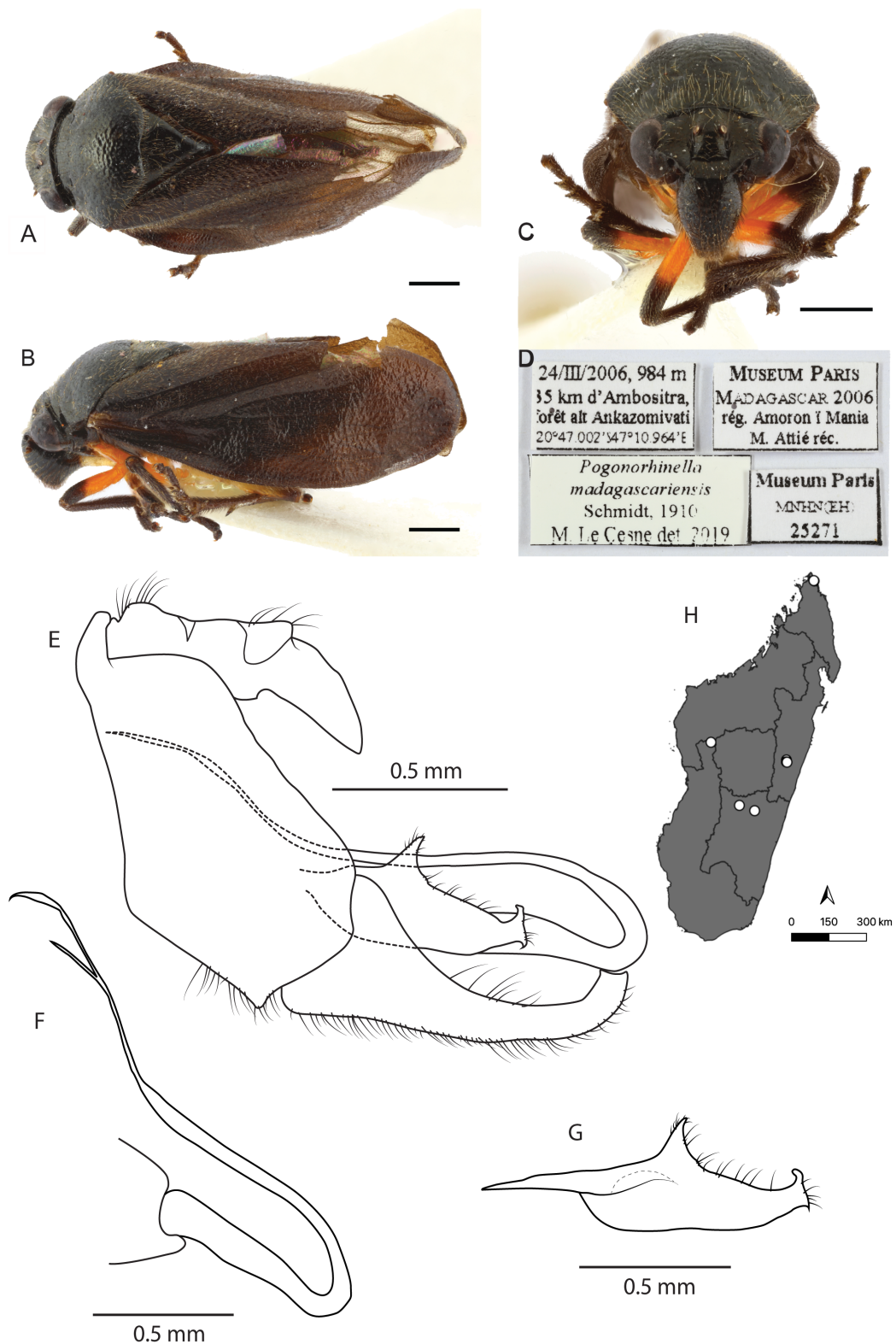


Fig. 8. *Pogonorhinella madagascariensis* Schmidt, 1910, ♂ (MNHN(EH) 25271). **A.** Dorsal view. **B.** Lateral view. **C.** Frontal view. **D.** Labels. **E.** Male terminalia in lateral view, pygofer, anal tube, aedeagus, left paramere and left subgenital plate. **F.** Aedeagus. **G.** Left paramere. **H.** Distribution map. Scale bars: A–C = 1 mm.

HEAD. Small with short vertex. Postclypeus narrow with strong carina and striated on sides, producing obtuse angle in lateral view. Rostrum reaching posterior margin of metacoxae. Antennae long, first segment very large, prominent pedicel.

THORAX. Anterior half of pronotum trapezoidal giving impression of neck. Hindlegs with one spine on metatibiae.

TEGMINA. Tegmina longer than wide.

MALE GENITALIA. Male genitalia without sterno-lateral plates. Aedeagus longer than pygofer height.

Distribution (Fig. 8H)

Endemic genus of Madagascar.

Number of species: 1.

Pogonorhinella madagascariensis Schmidt, 1910

Pogonorhinella madagascariensis Schmidt, 1910: 335.

Locris bicoloripes Bergroth, 1910: 234 (synonymy by Lallemand 1949: 34).

Material examined

MADAGASCAR • 1 ♂; Province de Toamasina, Andasibe; 18°53.410' S, 48°23.881' E; 1049 m a.s.l.; 5 Nov. 2011; A. Soulier-Perkins leg.; MNHN(EH) 24119 • 1 ♂; Province de Toamasina, Andasibe; 18°57.723' S, 48°25.716' E; 940 m a.s.l.; 8 Nov. 2011; A. Soulier-Perkins leg.; MNHN(EH) 24521 • 1 ♂; forêt d'Amboasary; 1300 m a.s.l.; Jan. 1961; P. Griveaud leg.; MNHN(EH) 24520 • 1 ♀; Province de Toamasina, Andasibe; 18°53.021' S, 48°25.792' E; 951 m a.s.l.; 4 Nov. 2011; A. Soulier-Perkins leg.; MNHN(EH) 24522 • 1 ♀; Region Amoron i Maia, 35 km d'Ambositra, forêt alt. Ankazomivati; 20°47.002' S, 47°10.964' E; 984 m a.s.l.; 24 Mar. 2006; M Attié leg.; MNHN(EH) 24530 • 1 ♂; Province Diego-Suarez, Sakalava beach, dwarf littoral forest; 12°15'46" S, 49°23'51" E; 10 m a.s.l.; 7–22 Apr. 2001; R. Harin'Hala leg.; malaise trap; MA-0104B-06; CASENT 3001902 • 1 ♀; Toliara Province, Rés. spéciale d'Ambohijanahary, forêt d'Ankazotsihitafofotra, 35.2 km 312° NW Ambaravaranala; 18°16'00" S, 45°24'24" E; 1050 m a.s.l.; 13–17 Jan. 2003; Fisher and Griswold leg.; malaise trap montane rainforest; collection code BLF7023; CASENT 3007937 • 1 ♀; Province Diego-Suarez, Montaigne français; 12°15'8" S, 49°38'51" E; 150 m a.s.l.; 15 Feb.–6 Mar. 2001; R. Harin'Hala leg.; malaise along forested limestone ridge; MA-01-06-06; CASENT 3004723 • 1 ♀; Province d'Antananarivo, 7 km SE of Andasibe National Park headquarters; 18°57.76' S, 48°27.16' E; 1050 m a.s.l.; 9–23 Apr. 2001; R. Harin'Hala leg.; malaise trap in tropical rainforest; MA-01-08A-06; CASENT 3001997 • 1 ♀; Fianarantsoa province, forêt d'Atsiraamiaty, 7.6 km 285° WNW Itremo; 20°35'36" S, 46°33'48" E; 1550 m a.s.l.; 22–26 Jan. 2003; Fisher and Griswold; malaise trap montane rainforest; collection code BLF7155; CASENT 3008211.

Description

TOTAL LENGTH. Between 6.5 and 7.6 mm.

HEAD. Small head and short vertex. From dorsal view, head 1.5 times wider than long in midline between eyes. Antennae long with first segment broad and large pedicel. Postclypeus very slim.

TEGMINA. Tegmina long and narrow.

MALE GENITALIA. Subgenital plates bit longer than pygofer height. Subgenital plates with large base becoming thinner until last third; dorsal and ventral margin parallel and curved dorsally, ending in flat junction. Dorsal and ventral margin of parameres mainly parallel with large spine on dorsal margin. External extremity with two hooks shape, one curving dorsally, other one ventrally joining two margins. Aedeagus really long and slender, measuring around three times as long as pygofer height and curving strongly dorsally. Apical part of aedeagus bifid with ventral thin spine and spoon-shaped dorsal one covering ventral spine.

COLORATION. Dorsal body all black or dark blue from the anterior extremity of vertex to end of tegmina. Ventral part of head and coxa orange or ochre. Thorax and abdomen black. Legs black except for first half of each femur.

Genus *Rhinaulax* Amyot & Serville, 1843

Rhinaulax Amyot & Serville, 1843: 560.

Type species

Rhinaulax analis (Fabricius, 1794).

Synthetic description

Rhinaulax is a small genus with only three species described. Among them, *Rhinaulax limbata*, described by Signoret in 1860 is from Madagascar. Since its description, Jacobi (1917) and Lallemand (1949) mentioned this species briefly in their works as present in Madagascar based on the original description. Signoret mentioned neither specific material nor the locality of the type specimens, which indeed seems to be unfindable, as suggested by Jacobi.

Number of species: 3, 1 in Madagascar.

Rhinaulax limbata Signoret, 1860.

Genus *Soulierana* Bucher & Bouteille gen. nov.

[urn:lsid:zoobank.org:act:25F2E561-3864-4E4D-9085-BBB74D41641E](https://doi.org/10.25503/25F2E561-3864-4E4D-9085-BBB74D41641E)

Figs 9–13

Type species

Literna rugosa (Fallou, 1890).

Diagnosis

Postclypeus strongly compressed laterally with the presence of a deep and narrow furrow on the median part; medial margin of postclypeus composed of two very thick carinae. Very pronounced tegmina veins forming numerous cavities and bumps on the general surface of the tegmina. Presence of a strongly pronounced lobe on the dorso-posterior margin of the pygofer below the anal tube. This very typical character is only observed in *Soulieriana* gen. nov. and separates it from all other genera within Cercopidae.

Etymology

This new genus is named after the last name of our hemipterist colleague Adeline Soulier-Perkins with the postfix ‘ana’ in reference to *Amberana* and *Bourgoinrana*. The gender is feminine.

Description

HEAD. Head wider than long. Ocelli closer to each other than to compound eyes and separated by strong carina extending over the frons to anterior margin of head. Postclypeus compressed laterally; in frontal view, presence of deep and narrow median furrow bordered by edges and forming two clearly bulges striated laterally. Rostrum reaching mesocoxae.

THORAX. Hindlegs with one spine on metatibiae.

TEGMINA. Tegmina longer than wide with large number of bumps, making them strongly embossed; cells of apical network very concave.

MALE GENITALIA. With sterno-lateral plates. Pygofer not straight in its dorsoposterior part; presence of a lobe clearly identifiable just below anal tube. Anal tube with sparsely sclerified area on anterior part.

Distribution (Figs 9H, 10H, 11H, 12I, 13I)

Endemic genus of Madagascar.

Number of species: 5.

Soulierana bigidea Bucher gen. et sp. nov.

Soulierana claudinae Bouteille gen. et sp. nov.

Soulierana kelymena Le Cesne gen. et sp. nov.

Soulierana laeviuscula (Stål, 1866) gen. et comb. nov.

Soulierana rugosa (Fallou, 1890) gen. et comb. nov.

Key to the species of *Soulierana* Bucher & Bouteille gen. nov.

1. Total length greater than 8.5 mm *S. rugosa* (Fallou, 1890) gen. et comb. nov.
- Total length smaller than 8.5 mm 2
2. Presence of black spot on middle of wing, apical wing margin black
- *S. claudinae* Bouteille gen. et sp. nov.
- Wings with no black spot on middle and no black colouration on the apical margin 3
3. Body completely black (or dark brown) *S. laeviuscula* (Stål, 1866) gen. et comb. nov.
- Other colouration of body 4
4. Body completely red (that can turn towards pink) except femur and tibia of prolegs brow
- *S. kelymena* Le Cesne gen. et sp. nov.
- Mainly ochre coloured tending towards green *S. bigidea* Bucher gen. et sp. nov.

Soulierana laeviuscula (Stål, 1866) comb. nov.

Fig. 9

Literna laeviuscula Stål, 1866: 64.

Material examined

MADAGASCAR • 1 ♂; Province de Toliara, massif du Makay, forêt sèche “humide”; 21°37'41.6" S, 45°00'13.7" E; 203 m a.s.l.; 23 Jan. 2011; D. Ouvrard leg.; MNHN(EH) 24704 • 1 ♂; Province de Toliara, massif du Makay, forêt sèche; 21°36.236" S, 45°06.464" E; 243 m a.s.l.; 12 Jan. 2011; D. Ouvrard leg.; MNHN(EH) 24541 • 1 ♂; Province de Toliara, massif du Makay, forêt sèche; 21°36'236" S, 45°06'464" E;

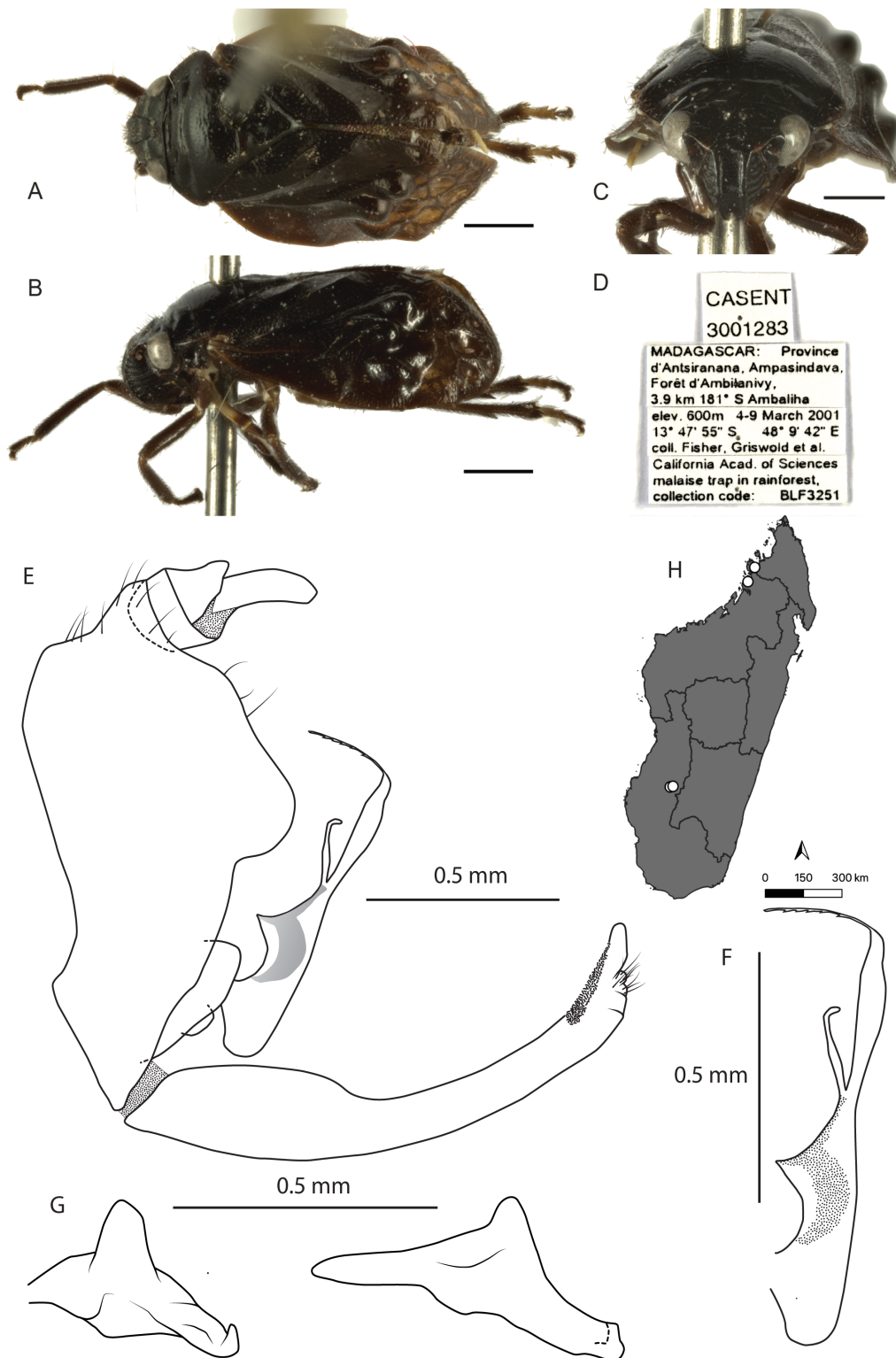


Fig. 9. *Soulierana laeviuscula* (Stål, 1866), ♂ (CASENT 3001283). **A.** Dorsal view. **B.** Lateral view. **C.** Frontal view. **D.** Labels. **E.** Male terminalia in lateral view, pygofer, anal tube, aedeagus, left paramere and left subgenital plate. **F.** Aedeagus. **G.** Left paramere, inside view on the left and outside view on the right. **H.** Distribution map. Scale bars: A–C = 1 mm.

243 m a.s.l.; 12 Jan. 2011; D. Ouvrard leg.; MNHN(EH) 24700 • 1 ♀; Province de Toliara, massif du Makay forêt sèche; 21°36'236" S, 45°06'464" E; 243 m a.s.l.; 12 Jan. 2011; D. Ouvrard leg.; MNHN(EH) 24696 • 1 ♀; Province de Toliara, massif du Makay forêt sèche; 21°36'236" S, 45°06'464" E; 243 m a.s.l.; 12 Jan. 2011; D. Ouvrard leg.; MNHN(EH) 24697 • 1 ♂; Province d'Antsiranana, Forêt d'Anabohazo, 21.6 km 247° WSW Macromandia; 14°18'32" S, 47°54'52" E; 120 m a.s.l.; 11–16 Mar. 2001; Fisher and Griswold leg.; malaise trap in tropical dry forest; California Academy of Sciences; collecting code: BLF336; CASENT 3001856 • 1 ♂; Province d'Antsiranana, Ampasindava, Forêt d'Ambilanivy, 3.9 km 181° S Ambaliha; 13°47'55" S, 48°9'42" E; 600 m a.s.l.; 4–9 Mar. 2001; Fischer and Griswold leg.; malaise trap in rainforest; California Academy of Sciences; collection code: BLF3251; CASENT 3001283.

Description

This species was first described by Stål (1866) from a single female specimen. Here, we propose its integration into the genus *Soulierana* Bucher & Bouteille gen. nov. with the description of the male genitalia for the first time.

TOTAL LENGTH. Between 5.2 and 5.5 mm.

HEAD. Median part of vertex relatively flat, forming very obtuse angle with postclypeus. Median furrow on postclypeus wide, deep, beginning below front margin of head and straight at upper extremity. Lateral bulges very thin and comparable to two carinae, parallel and keeping same width over entire length; in dorsal view, postclypeus slightly exceeding anterior margin of head; in lateral view, postclypeus convex and forming obtuse angle slightly pronounced.

THORAX. Scutellum relatively flat.

TEGMINA. Three bumps clearly distinguishable on each tegmen. Apical network not dense with fewer than 15 concave cells per tegmen.

MALE GENITALIA. Subgenital plates longer than length of pygofer, margin wider on first third and curved dorsally on apical third; on apical margin, flattened internal part covered with setae forming rounded protuberance. Sterno-lateral plates greatly exceeding posterior margin of pygofer. Parameres inserted almost entirely in pygofer and not very visible in lateral view, their dorsal margin bearing dorsal extension, posterior tip forming spine hook-shaped clearly visible in dorsal view. Aedeagus developed anteriorly in one-pointed protrusions; ventral margin forming convex arc and going straight up linearly towards dorsal part. Aedeagus bifid on its apical part; posterior extension with thin serrated apex, on last third; anterior dorsal extension with rounded apex representing one third length of posterior one.

COLORATION. Specimens entirely black except for thorax ochre-yellow in ventral view.

Soulierana rugosa (Fallou, 1890) comb. nov.

Fig. 10

Monecphora rugosa Fallou, 1890: 352.

Literna jeanneli Lallemand, 1920: 285 (synonymy by Lallemand 1949: 67).

Literna rugosa – Jacobi 1917: 541.

Material examined

Lectotype

MADAGASCAR • ♀; collection Fallou; MNHN(EH) 24695.

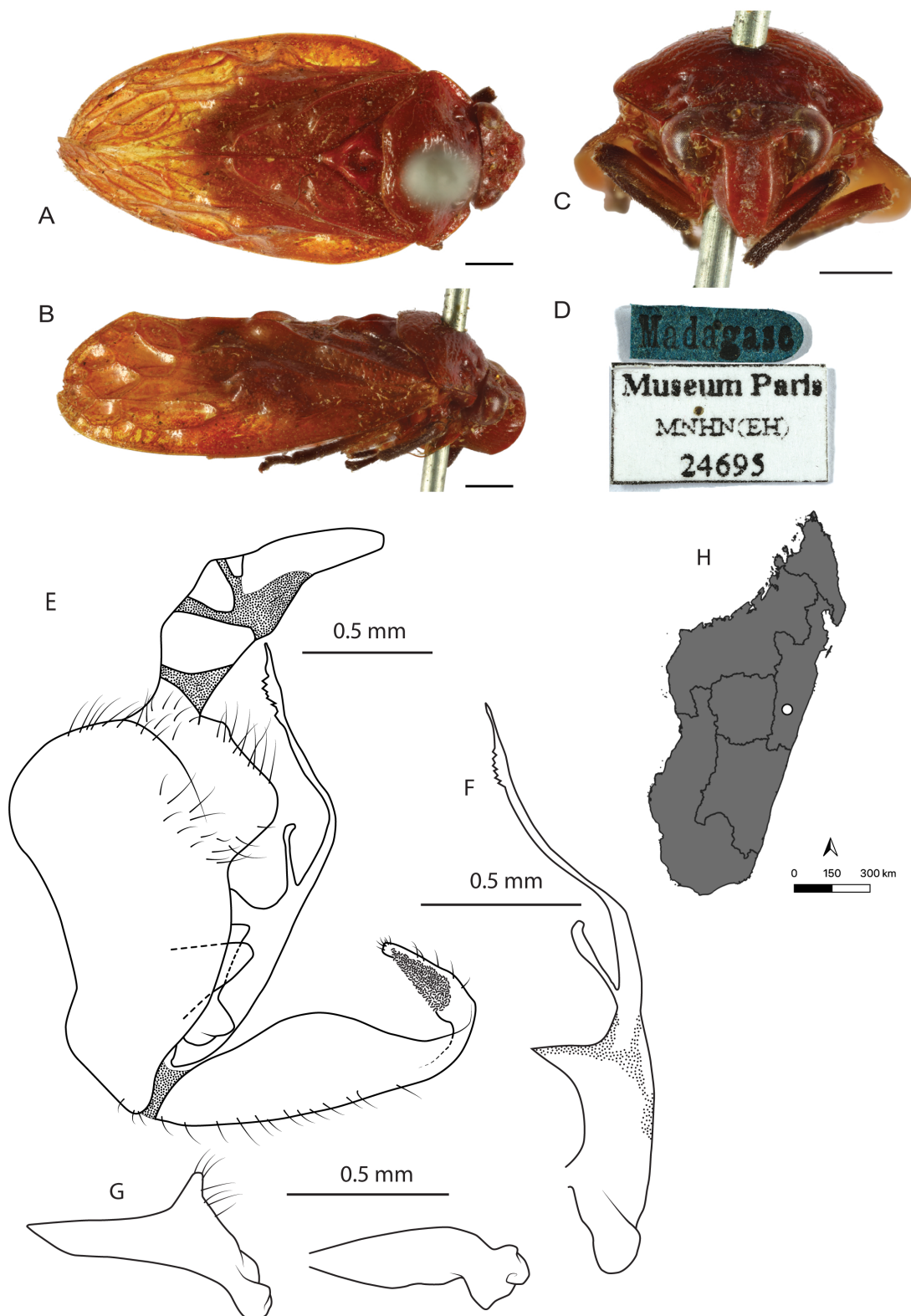


Fig. 10. *Soulierana rugosa* (Fallou, 1890), ♂ (MNHN(EH) 24695). **A.** Dorsal view. **B.** Lateral view. **C.** Frontal view. **D.** Labels. **E.** Male terminalia in lateral view, pygofer, anal tube, aedeagus, left paramere and left subgenital plate. **F.** Aedeagus. **G.** Left paramere, outside view on the left and top view on the right. **H.** Distribution map. Scale bars: A–C = 1 mm.

Paralectotype

MADAGASCAR • 1 ♀; collection Fallou; MNHN(EH) 24694.

Other material

MADAGASCAR • 1 ♂; Province de Toamasina Andasibe, forêt humide, s/*Hisbiscus*; 18°58.871' S, 48°25.202' E; 944 m a.s.l.; 9 Nov. 2011; A. Soulier-Perkins leg.; MNHN(EH) 24118 • 1 ♂; Province de Toamasina Andasibe, forêt humide, s/*Hisbiscus*; 18°58.871' S, 48°25.202' E; 944 m a.s.l.; 9 Nov. 2011; A. Soulier-Perkins leg.; MNHN(EH) 24634 • 1 ♂; Province de Toamasina Andasibe, forêt humide, s/*Hisbiscus*; 18°58.871' S, 48°25.202' E; 944 m a.s.l.; 9 Nov. 2011; A. Soulier-Perkins leg.; MNHN(EH) 24698 • 1 ♂; Province de Toamasina Andasibe, forêt humide, s/*Hisbiscus*; 18°58.871' S, 48°25.202' E; 944 m a.s.l.; 9 Nov. 2011; A. Soulier-Perkins leg.; MNHN(EH) 24699 • 1 ♂; Province de Toamasina Andasibe, forêt humide, s/*Hisbiscus*; 18°58.871' S, 48°25.202' E; 944 m a.s.l.; 9 Nov. 2011; A. Soulier-Perkins leg.; MNHN(EH) 24703.

Description

TOTAL LENGTH. Between 9.0 and 10.0 mm.

HEAD. Median part of vertex strongly domed forming an obtuse angle with postclypeus. Frons concave in its middle. Postclypeus not exceeding anterior margin of head. Furrow on postclypeus wide, rounded at its upper extremity. Lateral bulges parallel, narrower than width of furrow and keeping same width over their entire length. In lateral view, postclypeus convex, forming an obtuse angle slightly pronounced. Rostrum reaching mesocoxae.

THORAX. Scutellum thick and main dimple deep; tip of scutellum slightly raised.

TEGMINA. Tegmina 2.5 times as long as wide with many tubers all over surface; anal vein on clavus strongly wave-shaped. Apical network dense with more than 20 concave cells per tegmina.

MALE GENITALIA. Under anal lobe, posterior margin of pygofer forming convex arc; margin becoming concave on ventral part. Subgenital plates shorter than length of pygofer; in lateral view, dorsal margin forming lobe on anterior part. Apical extremity of subgenital plates folded inwards with flattened internal part covered with setae. Sterno-lateral plates extend from pygofer in tapered shape; slightly dorsally oriented with convex apex. Dorsal margin of parameres bearing thin dorsal extension and posterior area excavated in its middle forming two separate bulbs. Aedeagus developed anteriorly in one-pointed protrusion at end of convex arc. Aedeagus bifid on apical part; posterior extension with serrated apex on last quarter. Anterior dorsal extension with a rounded apex representing one quarter length of posterior one.

COLORATION. Head red with end of rostrum and pedicels black. Pronotum and tegmina red; apical network sometimes with black colouration. In ventral view, thorax and abdomen fully red. Red legs with tibiae fore and mid-leg black; all tarsi black.

Nomenclatural note

The type specimens designated by Fallou in the monograph of *Monecphora rugosa* were conserved in his personal collection located in the MNHN. The number of type specimens was not mentioned in his original publication. Nevertheless, in Fallou's collection, the pinholes at the bottom of the collection boxes correspond to the number of specimens referenced. Only two female specimens were placed under the pinned label of *Monecphora rugosa*, with no supernumerary pinholes, suggesting that only these two specimens were considered to be the types. We choose to designate the better-shaped specimen as lectotype and the second one as paralectotype.

Soulierana bigidea Bucher gen. et sp. nov.

urn:lsid:zoobank.org:act:27ACD9DF-474C-408C-990E-71D6AFEE05A8

Fig. 11

Diagnosis

In general shape, *Soulierana bigidea* Bucher gen. et sp. nov. is most similar to *S. rugosa*. It is distinguished by the combination of the following characters: anterior part of the frons protruding and raised upward; median furrow on the postclypeus very tight and lateral bulges wide; colouring ochre in dorsal view; colouring green and pale pink in ventral view.

Etymology

This specific epithet is derived from the name of the band The Big Idea, which was regularly listened to during the writing of this article and as a tribute to Manon Bucher's childhood friends.

Type material

Holotype

MADAGASCAR • 1 ♂; Province Antsiranana, Marojejy Nat'l Park, 5 km W of Manantenina village, Camp Mantella; 14°26.29' S, 49°46.44' E; 490 m a.s.l.; 18–26 Sep. 2005; M. Irwin and R. Harin'Hala leg.; malaise trap, low altitude, rainforest; California Academy of Sciences; MA31-31; CASENT 8107935.

Paratypes

MADAGASCAR • 1 ♂; same collection data as for holotype; 26 Sept.–4 Oct. 2005; MA-31-32; CASENT 8107937; MNHN(EH) 24707 • 1 ♂; same collection data as for holotype; 26 Sept.–4 Oct. 2005; MA31-32; CASENT 8107938; MNHN(EH) 24706 • 1 ♂; same collection data as for holotype; 26 Sept.–4 Oct. 2005; California Academy of Sciences; MA31-32; CASENT 8107943; MNHN(EH) 24705 • 1 ♀; same collection data as for holotype.; 11–18 Feb. 2005; MA-31-11; CASENT 8107906; MNHN(EH) 24701 • 1 ♂; same collection data as for holotype; 18–30 May 2005; MA31-22; CASENT 8107921 • 1 ♂; same collection data as for holotype; 28 Aug.–11 Sep. 2005; MA-31-29; CASENT 8107924 • 1 ♂; same collection data as for holotype; 14–22 Oct. 2005; MA-31-34; CASENT 8107949 • 1 ♀; same collection data as for holotype; 18–25 Mar. 2005; MA-31-16; CASENT 8107914.

Description

TOTAL LENGTH. Between 7.0 and 7.6 mm (holotype is 7.6 mm).

HEAD. Head in dorsal view 1.3 times wider eye to eye than long in midline. Median part of vertex moderately domed, flattening slightly on lower part. Frons concave, bearing very marked median carina in middle part; anterior margin of frons exceeding anterior margin of vertex giving impression that superior part of postclypeus is raised up. Postclypeus not exceeding anterior margin of head. Furrow on postclypeus very narrow, thinner than lateral bulges which are much wider than in other species of this genus and narrowing ventrally. In lateral view, postclypeus barely convex and almost straight down to anteclypeus to form very pronounced obtuse angle.

THORAX. Pronotum in dorsal view 1.9 times as wide as long in midline. Anterior pronotum with small median carina, sometimes not distinguishable, on posterior part. Scutellum wide and main dimple deep.

TEGMINA. Veins clearly distinct and with few sharp bumps on anterior part. Apical network not dense with less than 15 concave cells per tegmen.

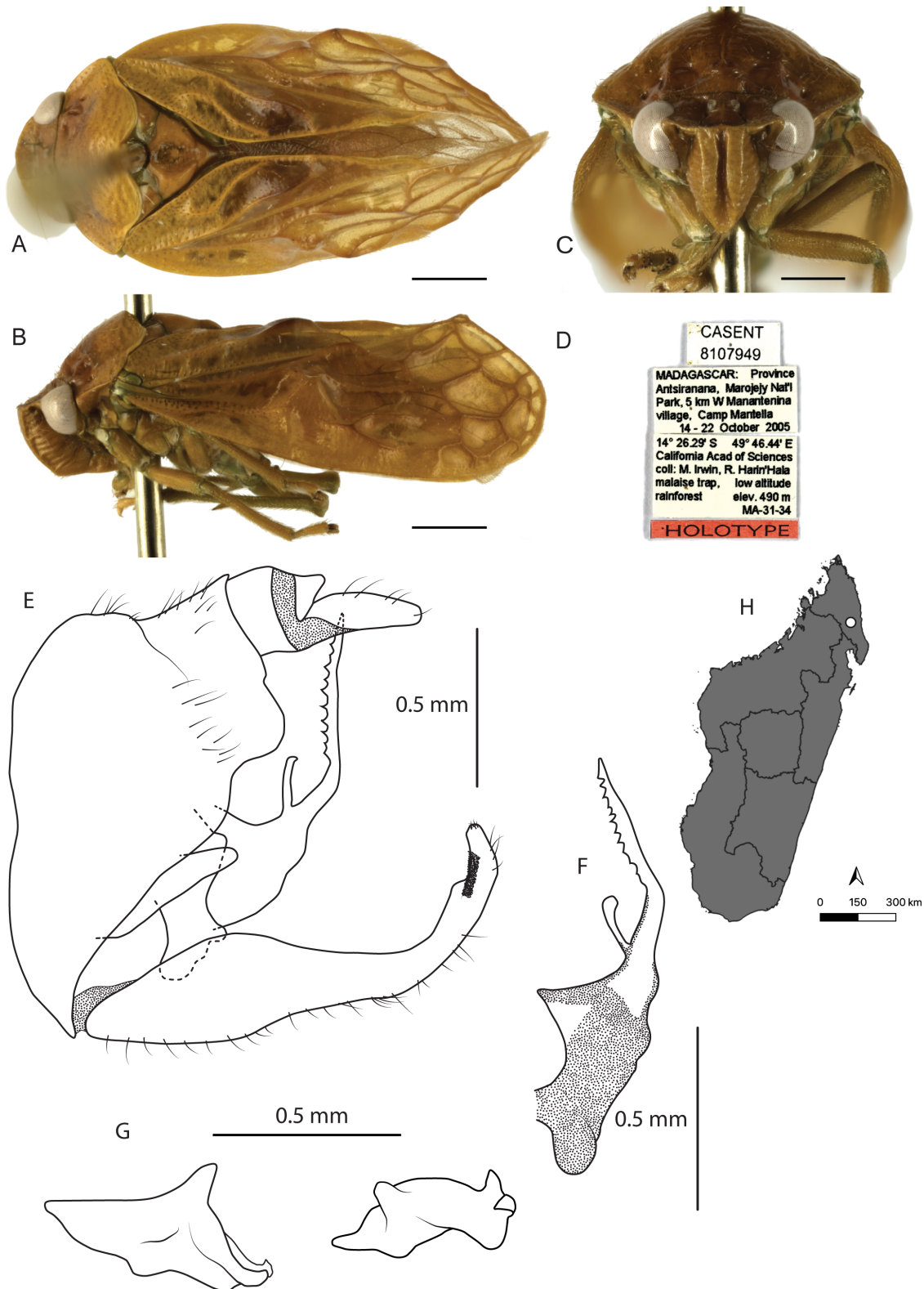


Fig. 11. *Soulierana bigidea* Bucher gen. et sp. nov., holotype, ♂ (CASENT 8107949). **A.** Dorsal view. **B.** Lateral view. **C.** Frontal view. **D.** Labels. **E.** Male terminalia in lateral view, pygofer, anal tube, aedeagus, left paramere and left subgenital plate. **F.** Aedeagus. **G.** Left paramere, outside view on the left and inside view on the right. **H.** Distribution map. Scale bars: A–C = 1 mm.

MALE GENITALIA. Pygofer much wider in its dorsal than its ventral part; its basal apex forms protruding tip oriented downward. Subgenital plates long; in lateral view they are wider in first third and dorsal margin forms convex arc; apex protruding into sprouting extension on which flattened internal part is partially covered with setae. Sterno-lateral plates exceed pygofer; ventral margin shrinking and joining dorsal margin to form strong convex extremity. Dorsal margin of parameres bearing thin dorsal extension; posterior area excavated to form three separate parts, middle one being small thorn-like excrescence. Aedeagus developed anteriorly in one-pointed protrusion which is wide and rounded at apex; ventral margin declining in convex arc to form basal protuberance and going up towards apical part in three discernable waves. Aedeagus bifid on apical part; posterior extension with serrated apical two-thirds, serrations wide and spaced. Anterior dorsal extension with rounded apex, representing one third length of posterior one.

COLORATION. In dorsal view head, thorax and tegmina ochre with exception of insertion point of tegmina green. In ventral view, thorax green, abdomen pale pink orange spotted with green. Legs ochre apart from hindlegs light green.

Soulierana claudinae Bouteille gen. et sp. nov.

urn:lsid:zoobank.org:act:E8C7DD9F-1E93-4105-B061-ED7900BA2BC8

Fig. 12

Diagnosis

In general shape, *Soulierana claudinae* Bouteille gen. et sp. nov. is most similar to *S. bigidea* Bucher gen. et sp. nov. This new species is distinguished by the combination of the following characters: the colouring is golden except for the apex and the middle dot of the tegmina which are brown, lateral bulges on the postclypeus are wide and spaced by a large furrow.

Etymology

This specific epithet is derived from the name of E. Bouteille's twin sister Claudine Bouteille.

Type material

Holotype

MADAGASCAR • 1 ♂; Province Diego-Suarez, Parc National, Montagne d'Ambre; 12°31'13" S, 49°10'45" E; 1125 m a.s.l.; 14–30 May 2001; R. Harin'Hala leg.; malaise trap; MA-0101D-11; CASENT 3001255.

Paratypes

MADAGASCAR • 1 ♂; Province Diego-Suarez, Sakalava Beach, dwarf littoral forest; 12°15'46" S, 49°23'51" E; 10 m a.s.l.; 16–31 May 2001; R. Harin'Hala leg.; malaise trap, across sandy trail; MA-01-04B-10; CASENT 3001220; MNHN(EH) 25189 • 1 ♂; Province Diego-Suarez, Sakalava Beach, dwarf littoral forest; 12°15'46" S, 49°23'51" E; 10 m a.s.l.; 16–31 May 2001; R. Harin'Hala leg.; malaise trap, across sandy trail; MA-01-04B-10; CASENT 3001222.

Description

TOTAL LENGTH. Between 7.0 and 7.2 mm (holotype is 7.0 mm).

HEAD. Head in dorsal view 1.4 times wider eye to eye than long in midline. Head triangular, covered with golden silk. Central part of vertex salient and wide towards frons. Frons with median ridge. Ridges of postclypeus very wide. Space between two longitudinal ridges three times width of one ridge. Parallel ridges extending horizontally from furrows towards sides of postclypeus.

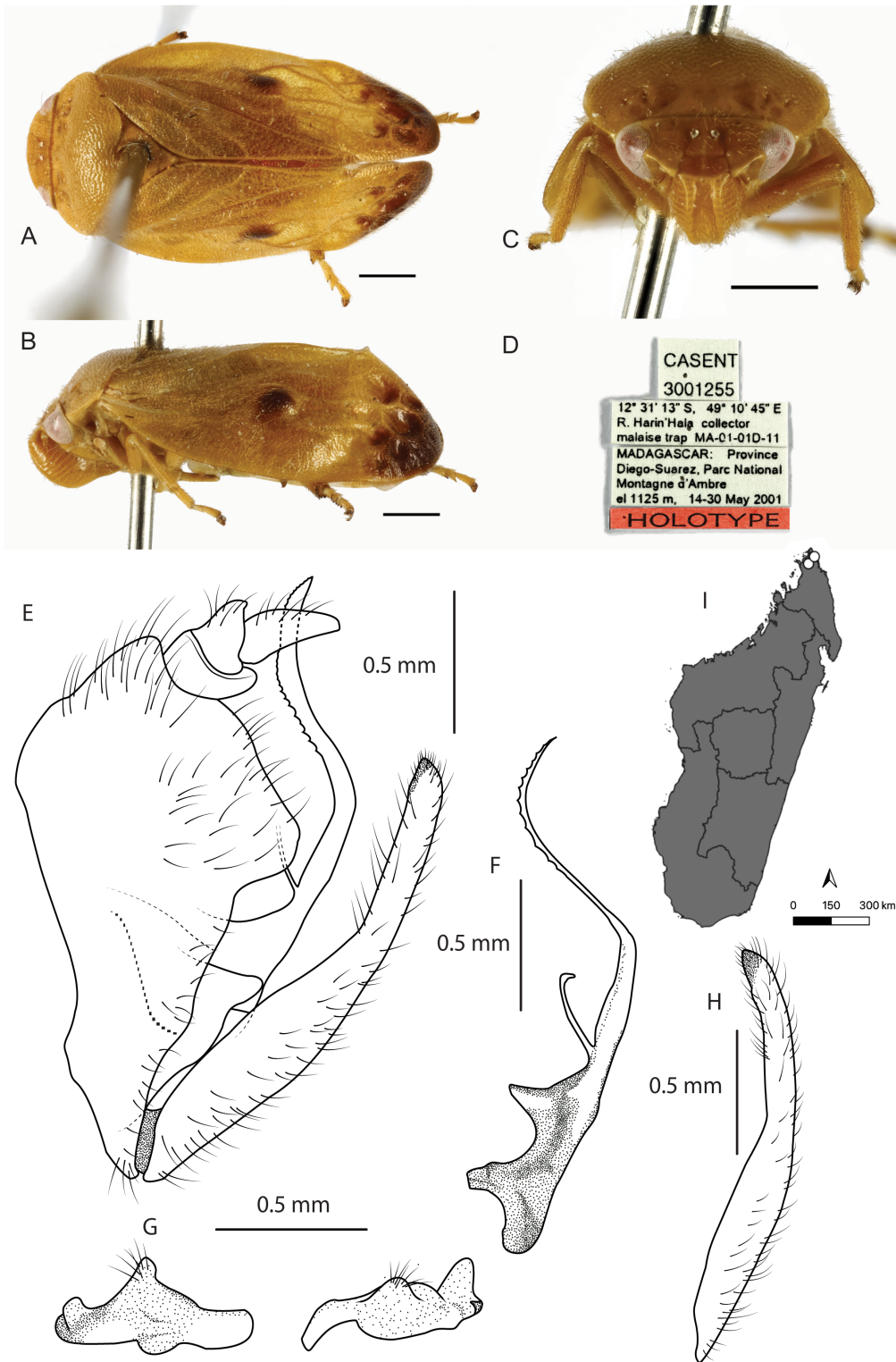


Fig. 12. *Soulierana claudinae* Bouteille gen. et sp. nov., holotype, ♂ (CASENT 3001255). **A.** Dorsal view. **B.** Lateral view. **C.** Frontal view. **D.** Labels. **E.** Male terminalia in lateral view, pygofer, anal tube, aedeagus, left paramere and left subgenital plate. **F.** Aedeagus. **G.** Left paramere, outside view on the left and inside view on the right. **H.** Left subgenital plate. **I.** Distribution map. Scale bars: A–C = 1 mm.

THORAX. Pronotum in dorsal view 1.9 times as wide as long in midline, covered with golden silk. Dimples slightly darker than pronotal ground colour. Posterior margin bilobed. Scutellum with 2 small dimples along anterior margin and large central dimple.

TEGMINA. Veins distinct forming few sharp bumps on anterior part; single brown dot present in middle, apex of tegmina brown.

MALE GENITALIA. Pygofer much wider in dorsal than ventral part. Subgenital plates long; in lateral view, plates wider in first two thirds. Intern margin of apex covered with setae; basal apex forming tip oriented downward. Dorsal margin of parameres bearing two excrescences: rounded extension and tiny thin dorsal curved; another rounded excrescence in middle of parameres. Aedeagus bifid on apical part; posterior extension serrated on dorsal margin of last two-thirds, serrations fine and spaced, wider from base on first third and thinner on last two thirds. Anterior dorsal extension with protruding tip oriented ventrally on apex and one quarter length of posterior one. As in *Soulierana bigidea* Bucher gen. et sp. nov., ventral margin of aedeagus declining in convex arc, forming rounded protuberance, much longer than *Soulierana bigidea* and going up straight towards apical part with a single wave. Dorsal margin declining in concave arc to form pointed protuberance as long as ventral protuberance.

COLORATION. Body, tegmina and legs gilded. Apex and middle dot of tegmina brown black. In dorsal view, two closed tegmina form smiley face.

Soulierana kelymena Le Cesne gen. et sp. nov.

[urn:lsid:zoobank.org:act:A8AC3F00-92E9-4BFC-92E1-5C16D0C398F7](https://zoobank.org/urn:lsid:zoobank.org:act:A8AC3F00-92E9-4BFC-92E1-5C16D0C398F7)

Fig. 13

Diagnosis

This new species is easily distinguishable from all the other *Soulierana* Bucher & Bouteille gen. nov. by its small size (< 7.0 mm) and its typical pale red colouration and the colouration of its legs, but also by the length of its long rostrum reaching the anterior margin of the abdomen, a pronotum 2.1 times as wide as long and short tegmina embracing the abdomen.

Etymology

‘*Kely*’ means ‘small’ and ‘*mena*’ ‘red’ in Malagasy, ‘*kelymena*’ therefore refers to the small size and colour of the species.

Type material

Holotype

MADAGASCAR • 1 ♂; Province Diego-Suarez, Montaigne Français; 12°18'8" S, 49°38'51" E; 150 m a.s.l.; 15 Feb.–6 Mar. 2001; R. Harin'Hala leg.; malaise trap, along forested limestone ridge; MA-01-06-06; CASENT 3004738.

Paratypes

MADAGASCAR • 1 ♂; Antsiranana Réserve Spéciale de l'Ankarana 22.9 km SW of Anivorano Nord; 12°54'32" S, 49°6'35" E; 80 m a.s.l.; 10–16 Feb. 2001; B. Fischer and C. Griswold leg.; BLF2857; CASENT 8080999; MNHN(EH) 4890 • 1 ♂; Province Diego-Suarez, Montagne d'Ambre; 12°31'13" S, 49°10'45" E; 1125 m a.s.l.; 11 Feb.–4 Mar. 2001; R. Harin'Hala leg.; malaise trap; MA-01-01D-04; CASENT 3001751; MNHN(EH) 4894 • 1 ♀; Province Diego-Suarez, Parc National Montagne d'Ambre; 12°31' S, 49°11' E; 975 m a.s.l.; 19 Mar.–5 Apr. 2001; M. Irwin, E.I. Schlinger and R. Harin'Hala leg.; malaise trap; MA-01-01B-07; CASENT 3001827; MNHN(EH) 4893 • 1 ♂; Province Diego-Suarez,

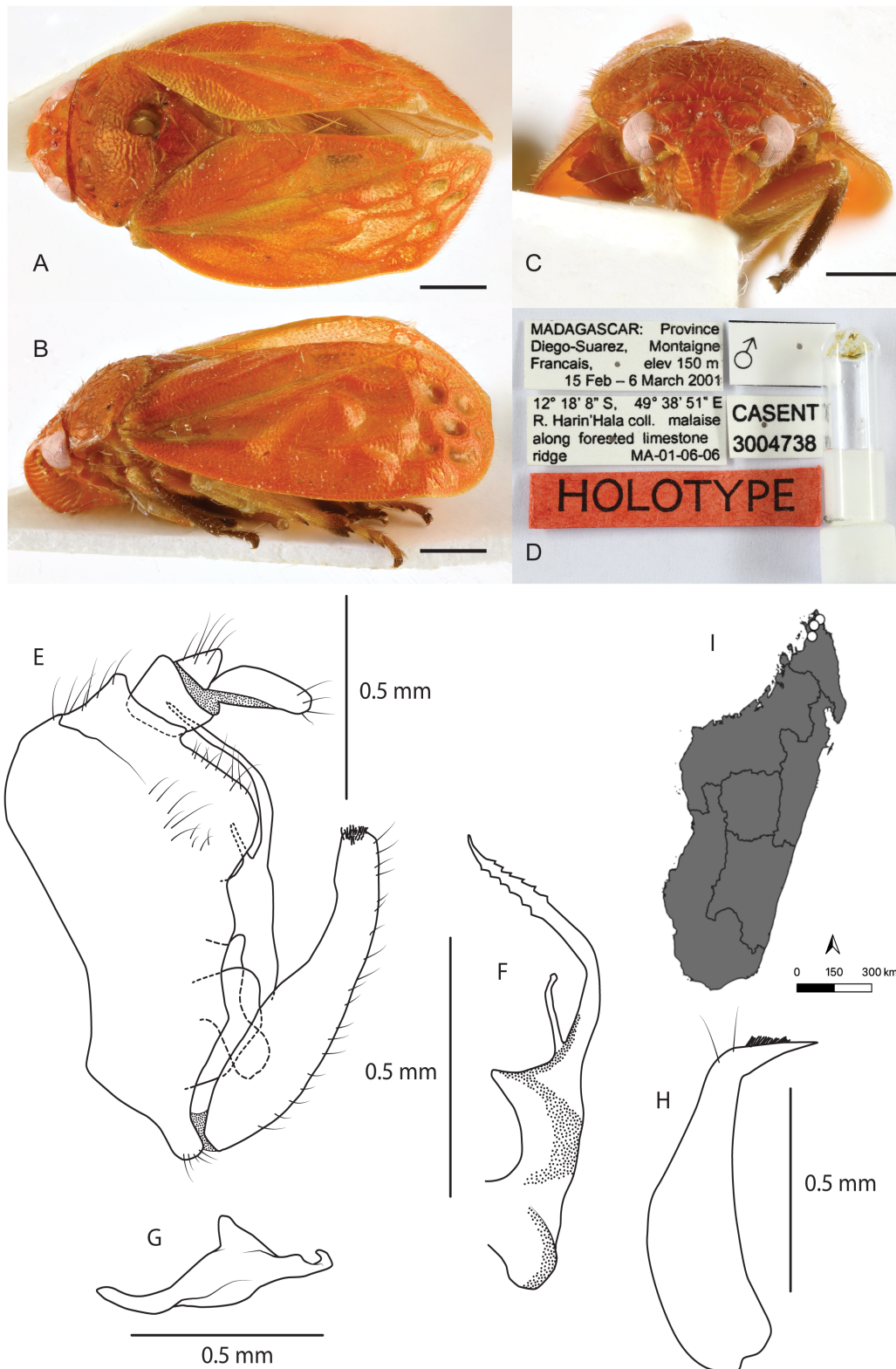


Fig. 13. *Soulierana kelymena* Le Cesne gen. et sp. nov., holotype, ♂ (CASENT 3004738). **A.** Dorsal view. **B.** Lateral view. **C.** Frontal view. **D.** Labels. **E.** Male terminalia in lateral view, pygofer, anal tube, aedeagus, left paramere and left subgenital plate. **F.** Aedeagus. **G.** Left paramere. **H.** Right subgenital plate. **I.** Distribution map. Scale bars: A–C = 1 mm.

Montaigne Français; 12°18'8" S, 49°38'51" E; 150 m a.s.l.; 15 Feb.–6 Mar. 2001; R. Harin'Hala leg.; malaise trap, along forested limestone ridge; MA-01-06-06; CASENT 3004724 • 1 ♀; Province Diego-Suarez, Parc National Montagne d'Ambre; 12°30'52" S, 49°10'53" E; 960 m a.s.l.; 12 Feb.–4 Mar. 2001; R. Harin'Hala leg.; malaise trap; MA-01-01A-07; CASENT 3001228 • 1 ♀; Province Diego-Suarez, Montaigne Français; 12°18'8" S, 49°38'51" E; 150 m a.s.l.; 15 Feb.–6 Mar. 2001; R. Harin'Hala leg.; malaise trap, along forested limestone ridge; MA-01-06-06; CASENT 3004733.

Description

TOTAL LENGTH. Between 6.3 and 6.7 mm (holotype is 6.7 mm).

HEAD. Head in dorsal view 2.8 times wider eye to eye than long in midline, vertex short with anterior margin rounded. Ocelli closer to each other than to eyes. Antenna with large pedicel bearing long flagellum. Postclypeus with narrow central furrow strongly marked by keel on each side. Long rostrum reaching ventral anterior margin of abdomen.

THORAX. Pronotum in dorsal view 2.1 times as wide as long in midline. Anterior margin rounded, with two central small dimples framed on each side by bigger one. Posterior margin slightly wave-shaped. Scutellum triangular with large anterior base and sharp posterior point.

TEGMINA. Short tegmina, embracing the abdomen. Veins clearly distinct and few bumps on apical part where network is not dense with only few cells.

MALE GENITALIA. Subgenital plates elongated and curved laterally to sharp apex wearing setae. Sternolateral plates slightly rounded. Aedeagus developed anteriorly in one-pointed protrusion; ventral margin declining in convex arc to form protuberance and going straight up to apical part. Parameres bearing rounded lobe on dorsal margin and with hook-shaped apical apex. Aedeagus bifid, posterior margin ending in acute apex bearing teeth on each side in its last third. Anterior margin with slim extension, long as one third of posterior one, ending in rounding apex. Anterior protrusion pointing into rounded tooth.

COLORATION. Body pale red. Tegmina of same colouration with dark red veins and some of apical cells dark brown. Tibia and tarsus of first pair of legs dark brown. Midlegs with apical half of tibia and tarsus dark brown. Hindlegs with single black tibial spine; distal extremities of tibia and tarsus dark brown, rest of each pair of legs pinkish ochre.

Discussion

Classification of Cercopidae

Cercopidae constitutes one of the largest families of spittlebugs with more than 1200 collated species and is distributed throughout the Old World region. Within this family, described 200 years ago, no consensual classification has been provided for many years. These disagreements are mainly due to the fact that a very large number of genera and species have been described in a very fragmented way, without standardization of the morphological terms that allow for a clear and precise comparison, as well as a large number of species that are still awaiting description and taxonomic revision. Nevertheless, Crispolon *et al.* (2023) proposed a classification for the family Cercopidae *sensu stricto*, at least at subfamilial classification and few for tribal classification based on molecular data. As a result, it currently recognizes 108 genera of Cercopidae divided into the two subfamilies Cercopinae (Lallemand, 1949) and Cosmoscartinae (Fennah, 1968).

Morphological insights for the Malagasy spittlebugs

Here, we focused our study on the revision of the Cercopidae of the Malagasy territory with a standardized synthesis of all the previous taxonomic descriptions for the nine genera that we currently recognize. We also augmented these descriptions with new morphological characters, based on male genitalia, to facilitate differentiation among the genera, which is sometimes complicated by the absence of recent taxonomic studies for most of the genera included (Le Cesne *et al.* 2021). We present for the first time an extensive re-description for all monospecific Malagasy genera and their species: *Alluaudensia nigrolineata*, *Paramioscarta brunnea* and *Pogonorhinella madagascariensis*. These supplemented descriptions and illustrations of male genitalia (with the exception of *A. nigrolineata*, which is known only from female holotype referenced in the MNHN collection) will provide morphological references for future taxonomic studies.

Morphological disparity in *Literna*

During this taxonomic study, a huge morphological disparity within the genus *Literna* has been noted. The glaring discrepancy between the representative species of this genus suggests the need for its taxonomic revision. Indeed, *Literna* was described 180 years ago and a plausible hypothesis explaining this contrast would be that many species have been assigned to it by default. Initially, the species of *Literna* were gathered in this genus based on the presence of bumps on the anterior part of the tegmina and on the presence of a furrow on the median part of the postclypeus. However, these characters are strongly polymorphic between the species and the variability made it possible to remove two species from this genus: *S. rugosa* and *S. laeviuscula*. For them, in addition to their common character of the general structure of the head, the male genitalia showed a large number of structural similarities. These structures have been compared to those of some species of *Literna*, including *L. altipeta*, *L. muscophila*, *L. pauliani* and *L. vicina* in which the general shape of the parameres and the aedagus presents clear morphological similarities (the description of the male genitalia for *L. vicina* is not yet published and will be the subject of a further taxonomic study). This comparative analysis, even on a small number of species, supports the exclusion of these two species from *Literna* and the establishment of the genus *Soulierana* Bucher & Bouteille gen. nov., endemic to Madagascar.

Madagascar's deforestation impact

Several diagnostic characters were observed from *Nesaulax* (Fig. 3), such as the presence of a dimple just below the anterior margin of the head and the male genitalia conformation, suggesting a synonymy of this genus with *Amberana*. During this study, almost every genus has been observed in recently collected material. Only the species *Amberana vittipinennis* (formerly assigned to *Nesaulax*) (Fig. 3) was absent in the material collected over the past 15 years. Specimens preserved in the collection of MNHN dating from the beginning of the 20th century, indicated that these had been collected in the Tanala forest, in the large forests on the eastern side of the island. Madagascar is experiencing a very high rate of deforestation in this area (Serpantié & Rakotonirina 2012) and so it would not be impossible that this species is now extinct due to the destruction of its living environment. As a result, *Literna tanalae*, also associated with this rainforest, could be affected by this extinction as well.

Conclusion

To summarize, knowledge of the Malagasy Cercopidae is still unsatisfactory, further taxonomic studies are required to make a precise classification of the present species, as a revision of some genera, notably *Literna*, remains to be carried out. Phylogenetic studies are also to be considered in order to test the monophyly of the established genera. Furthermore, an extensive study on the distribution and the ecological associations for the species of Cercopidae will permit quantification of habitat degradation and high rates of deforestation in order to propose more effective conservation practices.

Acknowledgements

We would like to thank the following people: Adeline Soulier-Perkins, Thierry Bourgoïn and Laurent Fauvre for supplying the data and the discussion for the improvement of this paper. We are particularly grateful to the late Norman Dale Penny (CAS Museum) for providing us with the majority of the studied material. We also would like to thank Ciara Lucking for her native English proofreading and corrections.

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Manuscript received: 29 June 2023

Manuscript accepted: 15 December 2023

Published on: 31 May 2024

Topic editor: Tony Robillard

Desk editor: Marianne Salaiün

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