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Sub-brachypterous Ricaniidae (Hemiptera: Fulgoromorpha) of Madagascar with morphological notes for these taxa

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Abstract

Four new genera of sub-brachypterous Ricaniidae are described from Madagascar. *Globularica* **gen. nov.** is established for a single species, *Globularica diversicolorata* **sp. nov.** *Coniunctivena* **gen. nov.** is established for four species: *Coniunctivena antsignyensis* **sp. nov.**, *C. epaulettea* **sp. nov.** (type species), *C. montuosa* **sp. nov.**, *C. synavei* **sp. nov.** *Nasatus* **gen. nov.** is established for two species: *Nasatus sparsus* **sp. nov.** (type species) and *N. davidouvrardi* **sp. nov.** *Cyamosa* **gen. nov.** is established for four species: *Cyamosa adelinae* **sp. nov.**, *C. camelouca* **sp. nov.** (type species), *C. pauliani* **sp. nov.**, *C. splendens* **sp. nov.** *Isobium gibbosum* Melichar, 1906 is redescribed and transferred from the Issidae to the Ricaniidae. Photographs, drawings and maps of distribution for all mentioned species are presented. Discussion is provided on antennal plate organs, tegminal sub-brachypterism, and female bursa copulatrix structure, for these sub-brachypterous Ricaniidae.

Key words. Madagascar, Ricaniinae, morphology, taxonomy, antennal plate organs, brachypterism, bursa copulatrix.

INTRODUCTION

The planthopper family Ricaniidae Amyot et Serville, 1843 currently includes more than 400 “named” species in 50 genera (Bourgoin 2011). However, based on the examination of several major collections hosted in various museums of the world, the estimated number should exceed a thousand species, distributed mainly in the tropical and subtropical regions of the world (Stroiński 2010b). The generic classification and relationships between the genera remain superficial and still need a careful and deep analysis. Recently, Gnezdilov (2009) subdivided the family in two subfamilies: Ricaniinae Amyot et Serville, 1843 and Pharsalinae Gnezdilov, 2009. The subfamily Pharsalinae was established for two South American genera transferred to the Ricaniidae from the Issidae and Lophopidae respectively: *Pharsalus* Melichar, 1906 and *Silvanana* Metcalf, 1947. The status of this unit, as well as the taxonomic positions of other South American genera placed in the Ricaniidae are under revision.

Half of the genera (26) and about one third of the species of the world fauna are recorded from the Afrotropical Region (including Madagascar, Mascarene Islands and Southern Arabia). About 68 species belonging to 12 genera have been recorded from Madagascar so far (Metcalf 1955; Synave 1956, 1966). However as was shown by

Stroiński (2007a and unpublished data) this region is still “terra incognita” for Ricaniidae and remains in need of more detailed study. The overwhelming majority of Madagascarian genera are endemic except a few known also from Eastern Africa.

Traditionally the family Ricaniidae comprises species with flattened, membranous and triangular fore wings with postero-apical angle situated immediately beyond the apex of the clavus (Muir 1930; O’Brien & Wilson 1985; Shcherbakov 1981). Before our study only 2 American genera were known as having coleopterous tegmina (*Kruegeria* Schmidt, 1912, Fig. 255) and coriaceous tegmina (*Pharsalus* Melichar, 1906). The rest of the ricaniid taxa have membranous tegmina. During our study of planthoppers from several American and European Museums and several field trips to Madagascar, four new genera with 11 new species of sub-brachypterous Ricaniidae, externally similar to the members of the family Issidae Spinola, 1839, were discovered. All these genera belong to the sub-family Ricaniinae.

MATERIAL AND METHODS

Terminology

We follow here the classification of wing reduction proposed by Kerzhner (1981) for the family Nabidae (Heteroptera) and adopt it for the Ricaniidae as follows:

- 1) macropterous form—tegmina and wings are almost equal in length, both surpassing the apex of abdomen;
- 2) submacropterous form—wings are shorter than tegmina, with reduced anal lobe, tegmina surpassing the apex of abdomen;
- 3) sub-brachypterous form—tegmina reaching the apex of abdomen, wings are rudimentary;
- 4) brachypterous form—tegmina far not reaching the apex of abdomen, wings are rudimentary (not found in the Ricaniidae).

For the tegmina we proposed the following terminology:

- 1) coleopterous—strongly convex and stiff, with vein pattern weakly recognizable or venation reduced;
- 2) coriaceous—partly convex, with vein pattern clearly recognizable.

The nomenclature of male genitalia follows Bourgoïn & Huang (1990) and female genitalia follows Bourgoïn (1993). Terminology of sensory plate organs of antenna follows Bourgoïn & Deiss (1994).

Preparations and illustrations

The abdomens of the specimens examined were cut and boiled in 10% KOH with a few drops of black chlorazol for staining the ectodermic genital ducts based on the method introduced by Carayon (1969) and Bourgoïn (1993). Dissections and cleaning of genital structures were done in distilled water. Final observations and drawings were made in glycerin using a camera lucida attached to Olympus microscopes (SZH10 and BX50). The photos were made using digital camera Minolta 7D and microscopes Leica MZ 16 with camera IC 3D and Leica MZ8 with JVC video camera KYF70B. Images are produced using the software Synoptics Automontage® and Adobe Photoshop. The SEM photographs were made using the microscope HITACHI S-3400N.

Measurements and abbreviations

The following measurements and abbreviations were made and used in this study:

- Total length—measured (in dorsal view) from anterior margin of vertex to apex of tegmina;
A/B—width of vertex measured at the anterior margin/length of vertex measured in mid line;
C/E—width of frons at upper margin/length of frons in mid line;
D/E—maximum width of frons/length of frons in mid line;
F/B—length of pronotum in mid line/length of vertex in mid line;
G/B+F—length of mesonotum/cumulative length of vertex and pronotum in mid line;

G/H—length of mesonotum in mid line/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 from apex of clavus to the anterior margin.

Material

The material studied is deposited in the institutions listed below (names of the curators of the collections are given in parentheses):

CAS—California Academy of Sciences, San Francisco, California, USA (Dr N. Penny);

IRSNB—Royal Belgian Institute of Natural Sciences, Brussels, Belgium (Dr R. Detry, Mr J. Constant);

MIZ—Museum and Institute of Zoology PAS, Warsaw, Poland (Dr A. Stroiński);

NMB—Naturhistorische Museum Basel, Switzerland (Dr D. Burckhardt);

MNHN—Muséum national d' Histoire Naturelle, Paris, France (Prof. T. Bourgoïn);

ZIN—Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia (Dr V.M. Gnezdilov).

TAXONOMY

Key to the genera of sub-brachypterous Ricaniidae of Madagascar

1. Frontal disc concave, clypeus with median carina (Figs 1, 3, 5, 12, 13), posterior part of mesonotum strongly elevated, forming a caldera-like structure medially (Figs 9–11, 15–17), first metatarsomere with 2 lateral spines and a group of small intermediate spines arranged in a triangular area (Figs 24–27) *Isobium* Melichar, 1906
- Frontal disc not concave, clypeus without median carina, posterior part of mesonotum differently shaped, flattened or elevated posteriorly, first metatarsomere with a row of large intermediate spines (Figs 157, 202–203) 2
2. Tegmina colourful, with weakly visible veins (Figs 46–54) *Globularica* gen. nov.
- Tegmina black and white or brown, with well visible veins 3
3. Longitudinal veins Sc+RA and RP forming an elongate cell basally (Figs 89, 91, 106, 115) *Coniunctivena* gen. nov.
- Longitudinal veins Sc+RA and PR not forming such a cell 4
4. Lower part of frontal disc elevate, especially well visible in lateral view (Fig. 132); triangular eminence on the mesonotum with transverse carinae (Figs 136–137) *Nasatus* gen. nov.
- Lower part of frontal disc flattened, triangular eminence on the mesonotum without transverse carinae *Cyamosa* gen. nov.

Isobium Melichar, 1906

(Figs 1–45)

Isobium Melichar, 1906: 218.

Type species. *Isobium gibbosum* Melichar, 1906, by monotypy.

Diagnostic characters. Frontal disc concave, ocelli absent, clypeus with median carina, posterior part of mesonotum strongly elevated, with a triangular caldera-like structure medially and limited by carinae, surface of tegmen irregular, wing with precostal cell, first metatarsomere with 2 lateral spines and group of small intermediate spines arranged in a triangular area.

Description. Head with compound eyes (in dorsal view) about as wide as mesonotum (Figs 9–11, 14).

Head. Vertex transverse, distinctly wider than long in mid line, with all margins well carinated, posterior margin distinctly keel-shaped; disc of vertex strongly elevated medially, without median carina (Figs 9–11, 14).

Frons (Figs 1, 3, 5, 7, 12–14) subrectangular, at upper margin little wider than long in mid line, widest about the level of lower margin of compound eyes and wider than long in mid line; upper margin distinctly concave, elevated medially; lateral margins at upper portion almost straight and parallel each to other, incised above the level of antenna and below shallowly curved to frontoclypeal suture. Frontal disc not rugose, covered by very short and rarely arranged setae, median carina distinctly visible and elevated, almost reaching frontoclypeal suture. Frontal disc with a transverse wide ridge near the frontoclypeal suture (weak in some specimens). Median portion of frons near the median carina strongly concave. Compound eyes higher than long (in lateral view) with very small callus at lower margin. Ocelli absent. Pedicel elongate, club-shaped, with setae and one plus three frontal plate organs present only apically (Figs 13–14, 18–23).



FIGURES 1–6. *Isobium gibbosum*, female. (1, 3, 6)—Frontal view; (2, 4, 6)—body, lateral view.

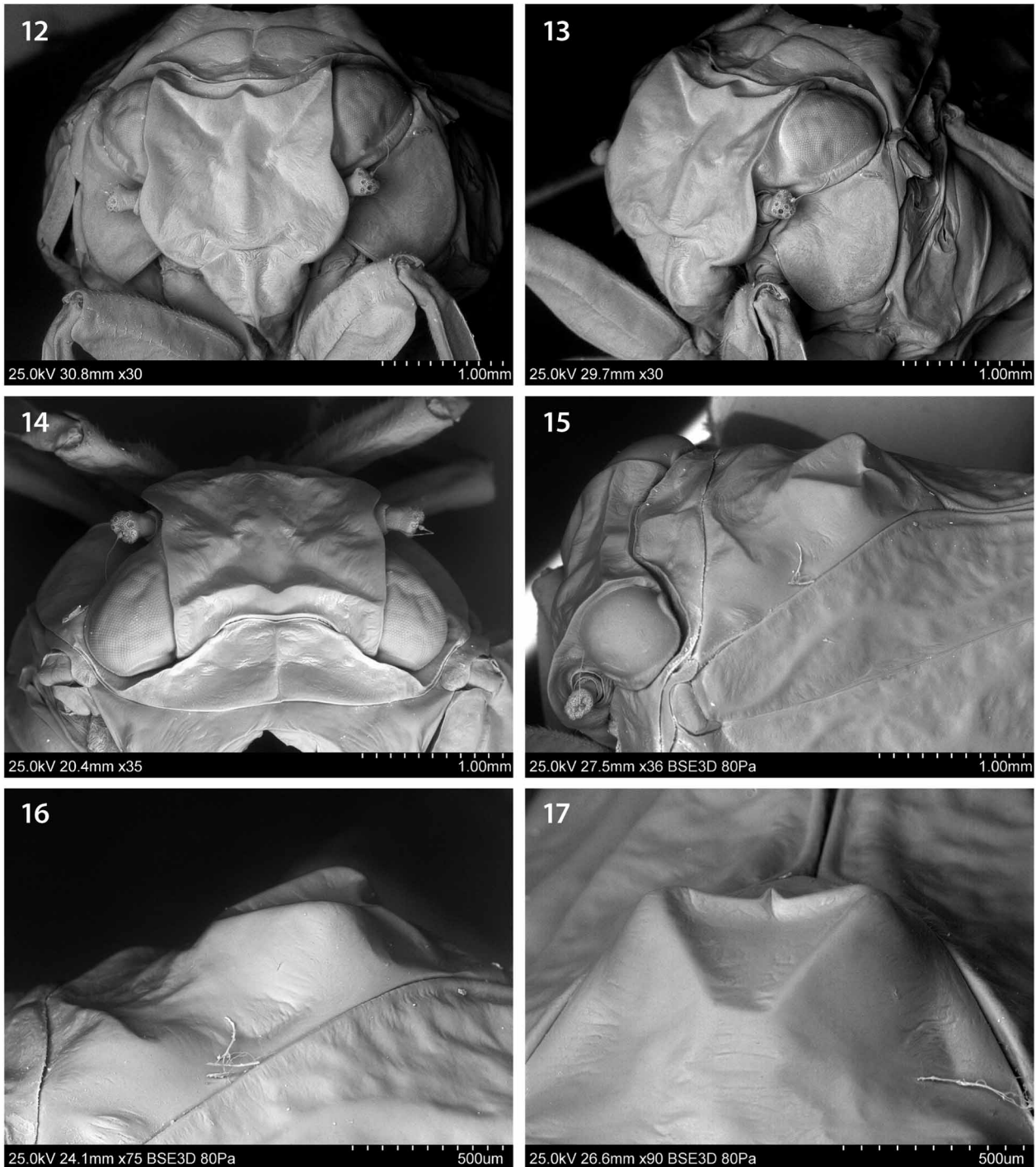
Clypeus distinctly narrower than frons, with median carina; covered by setae which are longer than the ones on the frons (Figs 1, 3, 5, 7, 12). Rostrum with apical segment about twice shorter than subapical one, its apex reaching metacoxae level.

Thorax. Pronotum distinctly longer in mid line than vertex; disc of pronotum very delicately rugose, with median carina and two lateral impressions; anterior part of disc flattened, concave near the impressions, posterior part and margin elevated (Figs 9–11, 14–15).

Mesonotum triangular, distinctly longer than cumulative length of vertex and pronotum in mid line; median carina weakly visible; lateral carinae distinctly visible, strongly arcuate, not reaching posterior margins, anterolateral carinae absent; posterior portion strongly elevated forming a caldera-like structure medially, with margins limited by carinae (Figs 2, 4, 6, 9–11, 15–17).



FIGURES 7–11. *Isobium gibbosum*. (7–9)—Male, (10, 11)—female. (7)—Frontal view; (8)—body, lateral view; (9–11)—same, dorsal view.

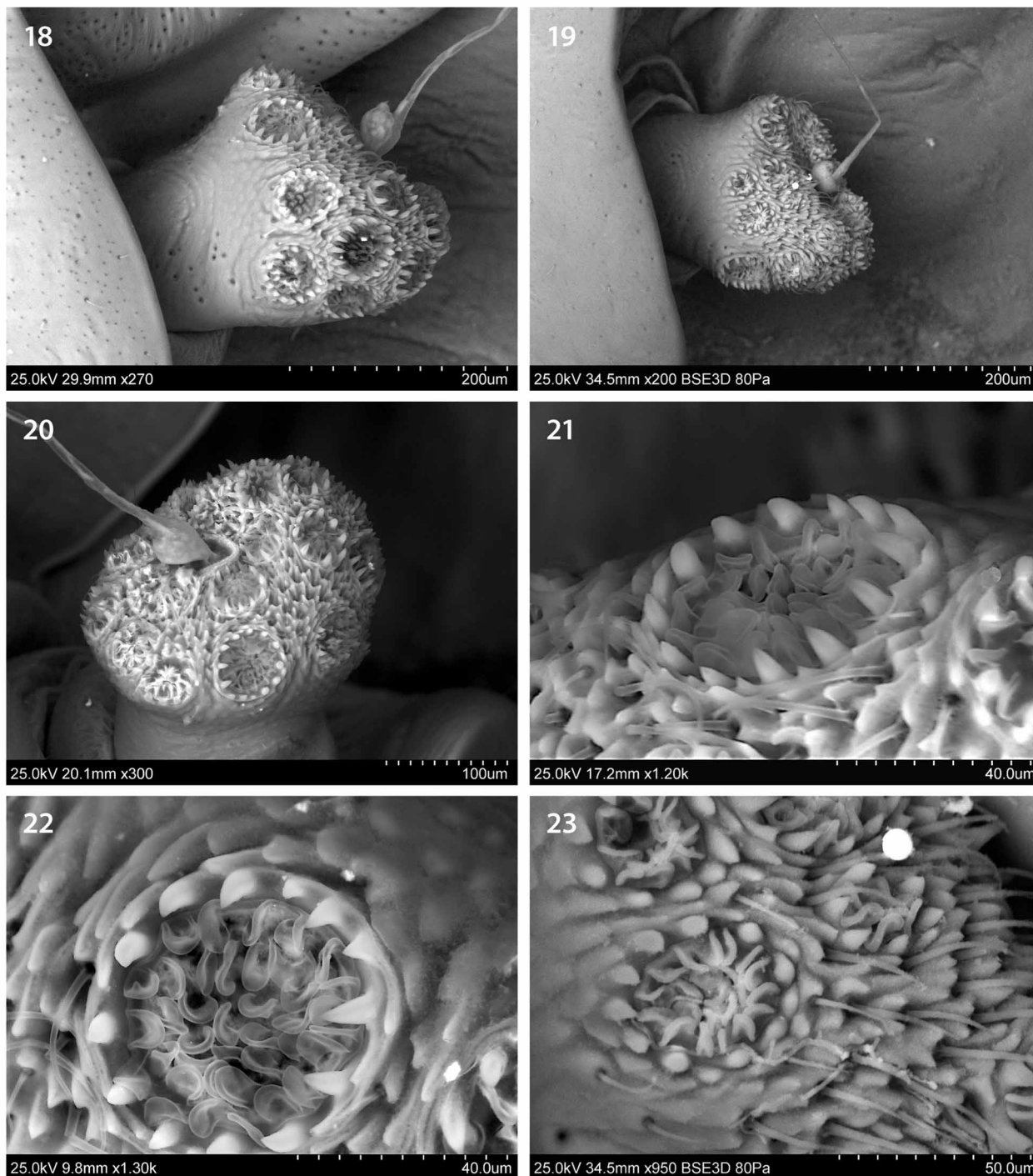


FIGURES 12–17. *Isobium gibbosum*, female. (12–15)—Anterior part of the body: (12)—frontal view, (13)—antero-lateral view, (14)—dorsal view, (15)—dorso-lateral view; (16, 17)—mesonotum: (16)—lateral view, (17)—anterior view.

Tegmina (Figs 2, 4, 6, 8, 9–11) coriaceous, irregularly and partly convex (distinctly concave in median portion of clavus), deltoid (in lateral view), with well visible venation (veins massive, elevated and partly melted); costal margin of tegmina with a few tuberculated setae; in basal half rolled up, in median portion concave; posterior margin almost straight or shallowly convex; anterior angle rounded, placed a little distad to claval angle, apex of clavus “normal”, claval angle obtuse. Costal area of the tegmina a little wider than costal cell, reaching about half of tegmina length, with simple transverse veinlets; costal cell longer than wide, basally without transverse veinlets, posteriorly with irregular net of transverse veinlets and branches of longitudinal veins Sc+RA; longitudinal veins irregular in shape; Sc+R leaving basal cell with common stem, M vein forked distad of Sc+R vein, Cu forked distad of M fork; median portion with very dense transverse veinlets, without any pseudonodal (more or less regularly

arranged transverse veinlets but not forming distinct line) or nodal line; posterior part with row of transverse veinlets forming an apical row of squared cells. Claval veins Pcu and A1 fused distinctly after half of length and connected with CuP; transverse veinlets present between CuP—Pcu and Pcu+A₁—CuP; claval margin rolled up.

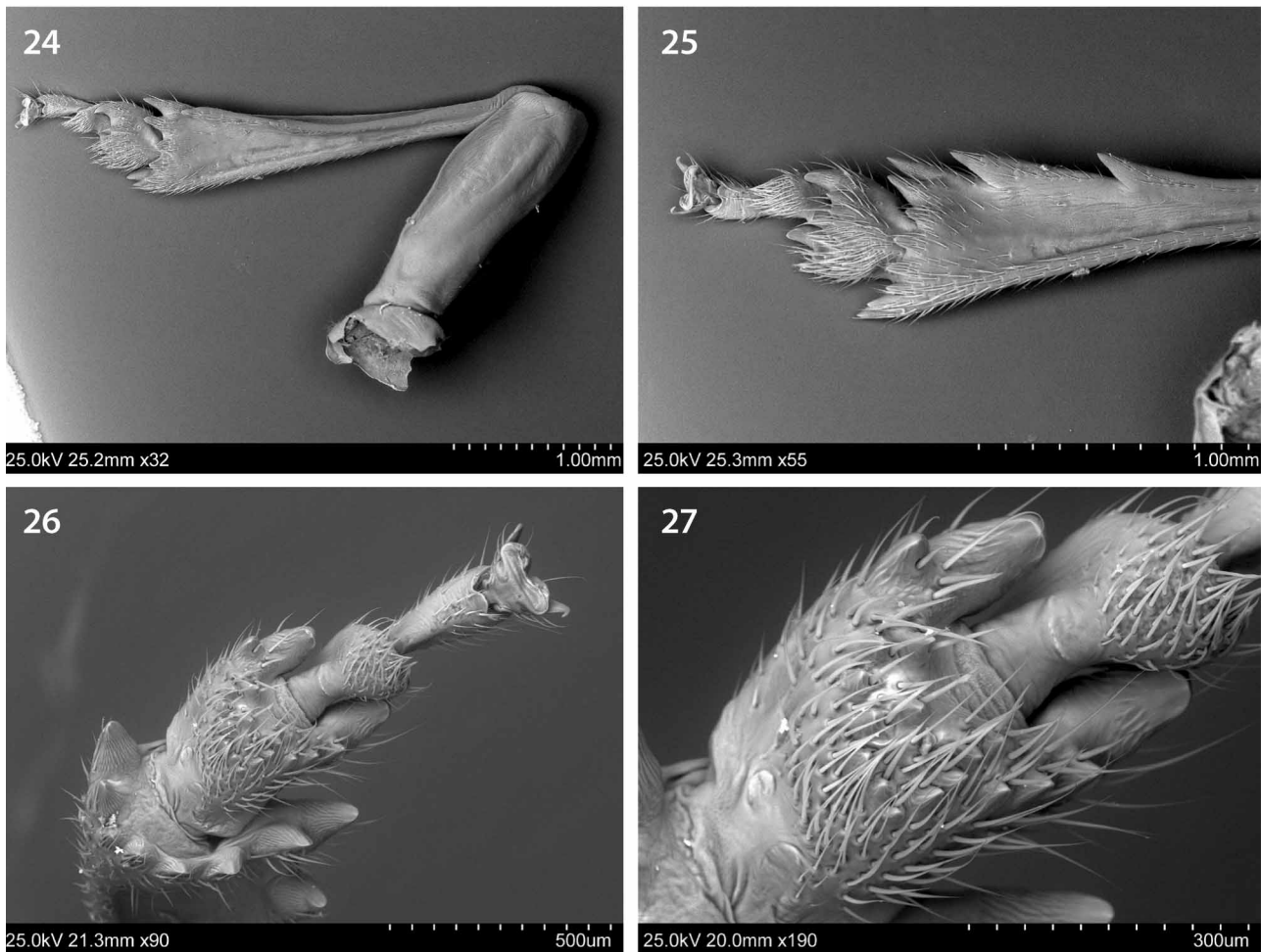
Wing about as long as tegmina; precostal cell present, very weakly visible (very narrow and very long) reaching half of wing's length, anal lobe small and relatively narrow; longitudinal veins multibranched, with 4–5 *r-m*, 3–4 *im* and 2–3 *m-cu* veinlets.



FIGURES 18–23. *Isobium gibbosum*. (18–20)—Antenna; (21–23)—antennal plate organs.

Pro- and mesofemora partly elliptic in cross section, about as long as tibiae, both tibiae square in cross section. Metafemur square in cross section, shorter than metatibia; metatibia partly flattened, especially in distal part, sub-rectangular, distinctly widened in apical part. Metatibia with 2 lateral spines distally and with a row of teeth api-

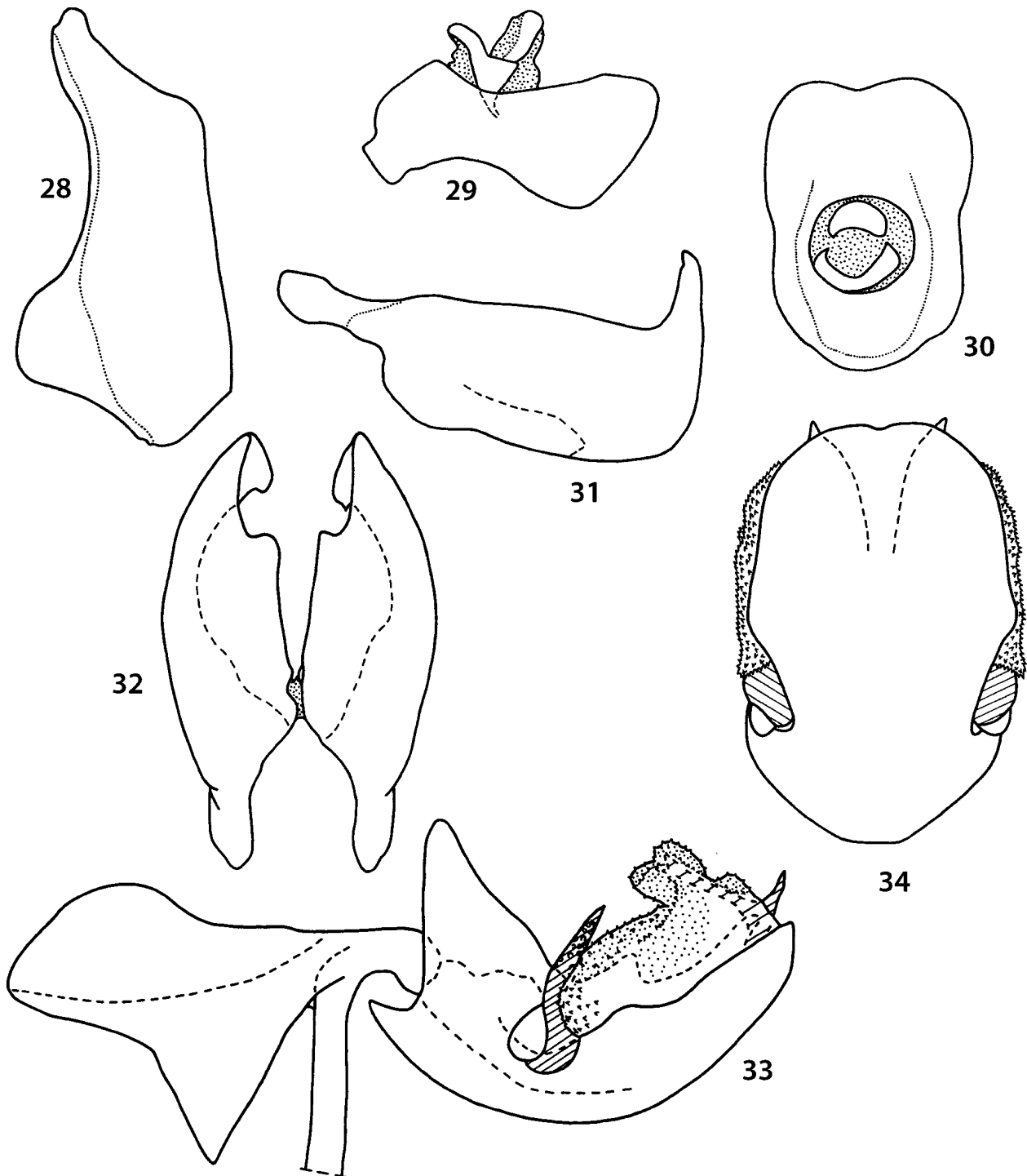
cally. First metatarsomere about as long as cumulative length of second and third metatarsomeres, with 2 huge lateral teeth and a group of small teeth arranged into a triangular area apically, ventral surface covered by long massive setae some (Figs 24–27).



FIGURES 24–27. *Isobium gibbosum*. (24)—Hind leg; (25)—distal part of tibia and tarsomeres, ventral view; (26)—tarsomeres, ventral view; (27)—basitarsomere, ventral view.

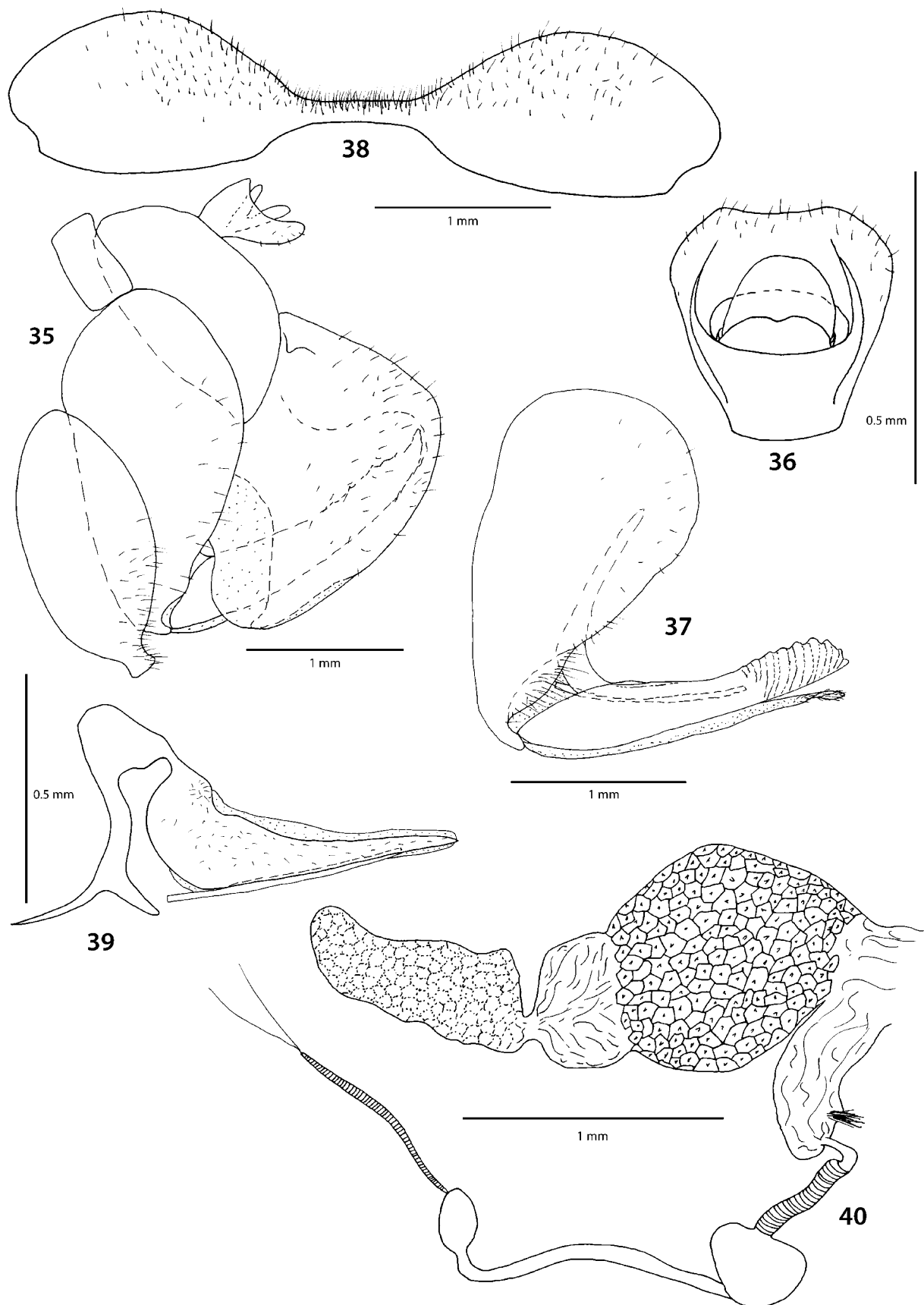
Male genitalia (Figs 28–34). *Genital capsule*. Anal tube elongate and massive in lateral view, distinctly surpassing posterior margin of pygofer; base of anal tube narrower than posterior part, anal opening placed before half of its length. In dorsal view, anal tube elongate subrectangular, base and apex are of about same width. Pygofer in lateral view distinctly longer than wide (narrow); postero-dorsal angle blunt, without process. Gonostyles in lateral view, distinctly longer than wide, bearing a distinct apical spine-like capitulum on dorsal margin; lower margin almost straight, in 1/3 portion with incises; hind margin in caudo-dorsal angle widely rounded and not surpassing the posterior margin of the capitulum; upper margin almost straight.

Phallic complex (Figs 33–34). Periandrium with long lateral split surpassing the half of his length (about 2/3); dorsal periandrium elevated in half of his length, with strong transverse threshold; upper margin without extra structures, apex slightly directed dorsally, median lateral fold of periandrium well developed, very narrow and smooth. Periandrium at lateral basal part smooth; apex of ventral part of periandrium slightly extending the apex of dorsal part; ventral margin without fold; posterior margins without additional structures, weakly concave medially; apical part of ventral periandrium with spiniferous microsculptures. Aedeagus s.l. with pair of well sclerotized lateral spinose processes. Each process with a single apex, base of the process placed under the lateral lobe of dorsal periandrium and partly flattened; apex of the process with denticulate margin and covered by small scales. Posterior lateral fold of aedeagus single and membranous, elongate, with irregular and partly denticulate margins; dorsal posterior part lobate, with surface covered by denticles. Apex of aedeagus sclerotized, oriented dorsally, with 2 hooks.



FIGURES 28–34. *Isobium gibbosum*, male genitalia. (28)—Pygofer, lateral view; (29)—anal tube, lateral view; (30)—same, dorsal view; (31)—genital style, lateral view; (32)—same, ventral view; (33)—phallic complex, lateral view; (34)—same, ventral view.

Female genitalia (Figs 35–40). Sternite VII with well developed lateral lobes (Fig. 38). Anal tube (in lateral view) short and high, not surpassing the half of upper margin of gonoplac; basal part narrower than posterior part (Fig. 35). Anal tube wide (in dorsal view), with anal opening placed a little before the half of its length (Fig. 36). Gonoplac unilobate, laterally flattened, posterior margin with 3 rows of blunt, short, dense placed and well developed teeth (in upper margins 3–4 melted rows), posterior margin placed about 45° in respect to longitudinal axis of the body, posterior ventral part partly membranous. Gonapophysis VIII: anterior connective lamina partly laterally



FIGURES 35–40. *Isobium gibbosum*, female genitalia. (35)—Genital capsule, lateral view; (36)—anal tube, dorsal view; (37)—gonapophysis VIII, lateral view; (38)—pregenital sternite, flattened; (39)—gonapophyses IX and gonospiculum bridge, lateral view; (40)—genital ducts, lateral view.

flattened, shallowly concaved dorsally, with sharp apex and well visible teeth situated at the postero-dorsal margin (Fig. 37). Bursa copulatrix with 2 pouches connected by an extremely short and narrow ductus; first pouch larger than second one and divided into 2 parts: anterior part with well visible cells-like sclerotized ornamentations which are absent in the posterior part; second pouch elongate and narrow, with weakly visible cells-like inprints (Fig. 40). Spermatheca well developed; *ductus receptaculi* as a distinctly ribbed ductus and a large and membranous apical bulba, ductus twice as long as bulba; *diverticulum ductus* distinctly longer than *ductus receptaculi*, as a very long and narrow ductus and a small, membranous and elongated apical bulba (Fig. 40).

Distribution (Fig. 41). Madagascar: Antsiranana, Mahajanga, and Toliar Provinces.

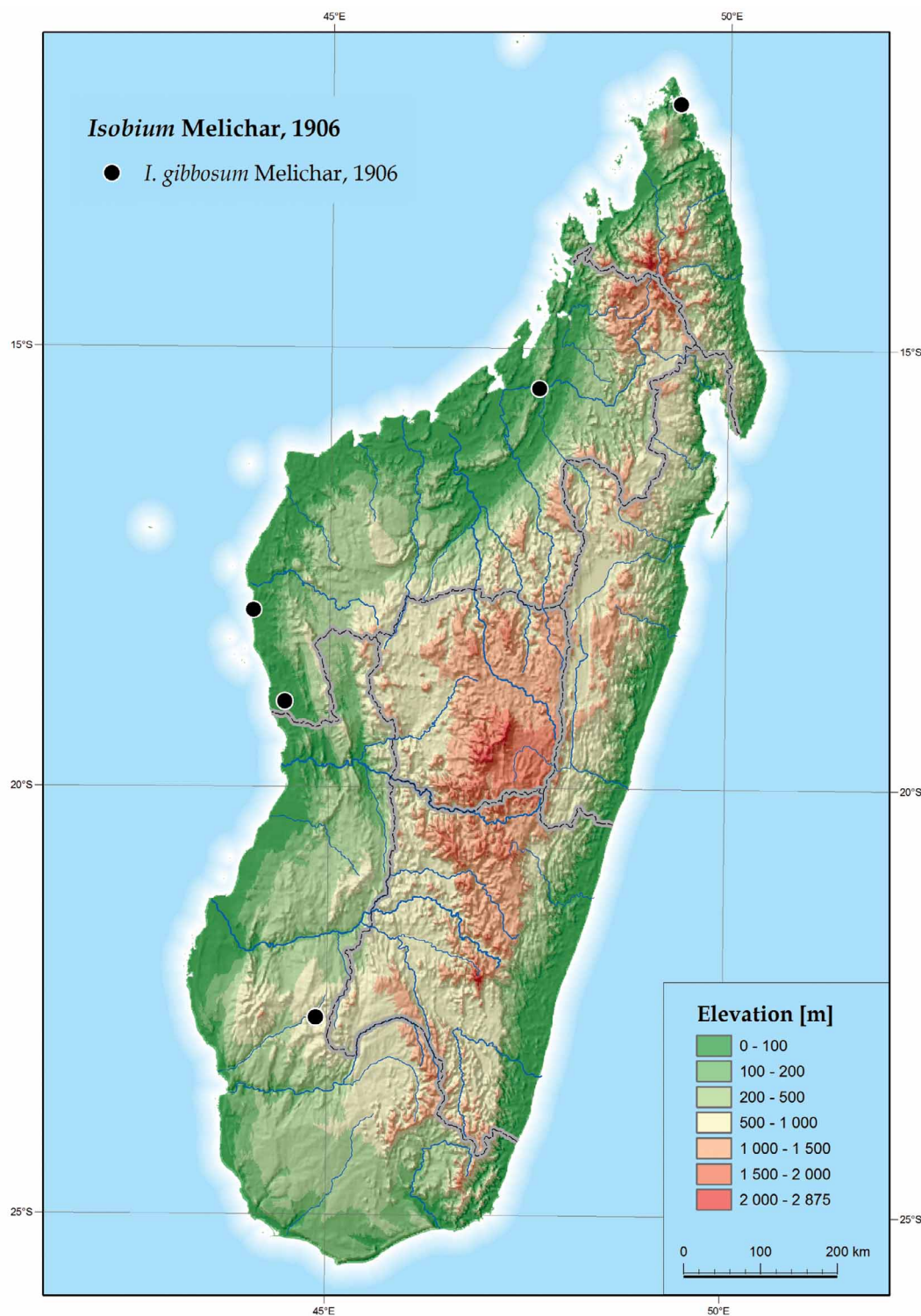


FIGURE 41. Distribution map of genus *Isobium*.

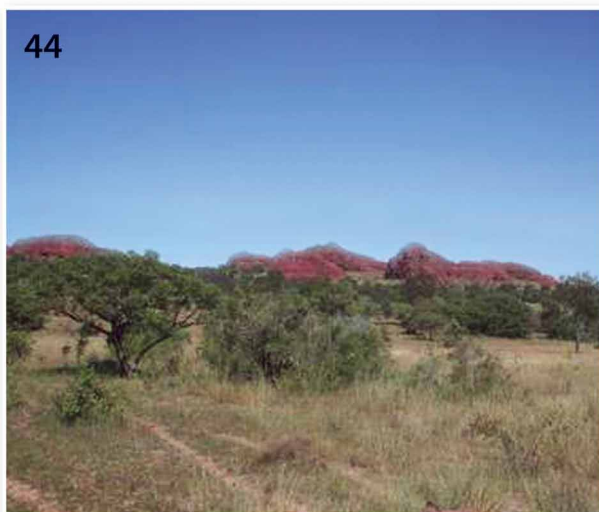


FIGURE 42–45. Habitats of *Isobium*.—rég. Atsimo-andrefana, Zombitse, Leobondro, 633 m, 22°40.460' S 44°51.633' E, pseudosavanna around a place with palms and Pandanus, 20.III.2006. (42–43)—Photos by A. Soulier- Perkin; (44–45)—photos by Th. Bourgoïn.

Isobium gibbosum Melichar, 1906

(Figs 1–45)

Isobium gibbosum Melichar, 1906: 218.**Description.** Total length 6.2–7.2 mm.

Head. Vertex: proportion A/B = 9.75–11.00; anterior margin (in dorsal view) shallowly convex in median portion delicately concave; lateral margins almost straight and parallel; posterior margin distinctly arcuate and partly straight in median portion; posterior margin more elevated than anterior margin, lateral margins more elevated; lateral parts of disc distinctly and deeply concaved. Frons: proportion C/E = 1.12–1.18; proportion D/E = 1.23–1.37. Frontoclypeal suture widely arcuate and flattened in median portion. Clypeus partly convex in median portion.

Thorax. Pronotum: proportion F/B = 2.5–3.5; anterior margin widely arcuate, partly flattened in median portion and shallowly concaved; posterior margin almost straight. Mesonotum: proportion G/F+B = 3.11–3.46, proportion G/H = 0.70–0.80; disc of mesonotum delicately rugose; scutellum with blunt apex. Tegmina: proportion I/J = 1.20–1.26. Metatibia with 8 apical teeth. First metatarsomere with 18–20 teeth.

Male genitalia. *Genital capsule.* Anal tube (in lateral view): lower margin sinusoidal, posterior margin almost straight, both angles widely rounded. Anal tube (in dorsal view): posterior margin arcuate; lateral margins almost straight, with incised about at half of its length; posterior margin shallowly concaved in median portion.

Phallic complex. Aedeagus: lateral process distinctly oriented dorsally; apex of aedeagus with 2 sharp hooks, basal hook is larger than apical one and oriented basally; apical hook directed apicad.

Female genitalia. Sternite VII with lateral lobes elongate-ovoid, incised in posterior-lateral parts; anterior and posterior margins straight. Anal tube (in lateral view) a little surpassing tergite IX. Anal tube (in dorsal view) cup-like, posterior margin almost straight, lateral margins almost straight, subparallel then curved distinctly posteriorly; posterior margin shallowly concave in median portion. Gonapophyses IX and gonospiculum bridge as in Fig. 39. Cells of first pouch of bursa copulatrix have ornamentation with single sharp sclerite.

Coloration (Figs 1–11). Frons, vertex, median parts of pronotum and mesonotum black, with light brown spots. Paradiscal fields of pronotum and tegulae light brown or light yellow. Gena, scape, lateral part of clypeus, and thorax light yellow. Pedicel black. Anterior part of clypeus dark brown or black. Procoxae black excluding light yellow apices. Pro- and mesofemora black, with light yellow or light brown spots. Pro- and mesotibiae dark brown or black, with light yellow spots. Metafemora and metatibiae brown yellowish, with dark brown stripes. First and second pro- and mesotarsomeres light yellow. Third tarsomeres light yellow, with dark brown or black apices. First and second metatarsomeres dark brown. Claws dark brown. Apices of spines black. Tegmina and parantotal lobes of pronotum light brown yellowish, with black spots and dots. Sometimes tegmina dark brown, with black veins excluding light brown yellowish clavus and dorso-posterior part of corium. Wings brown. Abdominal sternites light yellow, with black dots around setae. Abdominal tergites yellow.

Type material. Holotype, ♂: [Fairmaire / Madagascar], [gibbosum Mel. / det. Melichar], [*Isobium gibbosum*]. The type specimen is deposited in the Museum of Natural History in Vienna (Austria). Melichar (1906) did not give any information about the type locality in Madagascar.

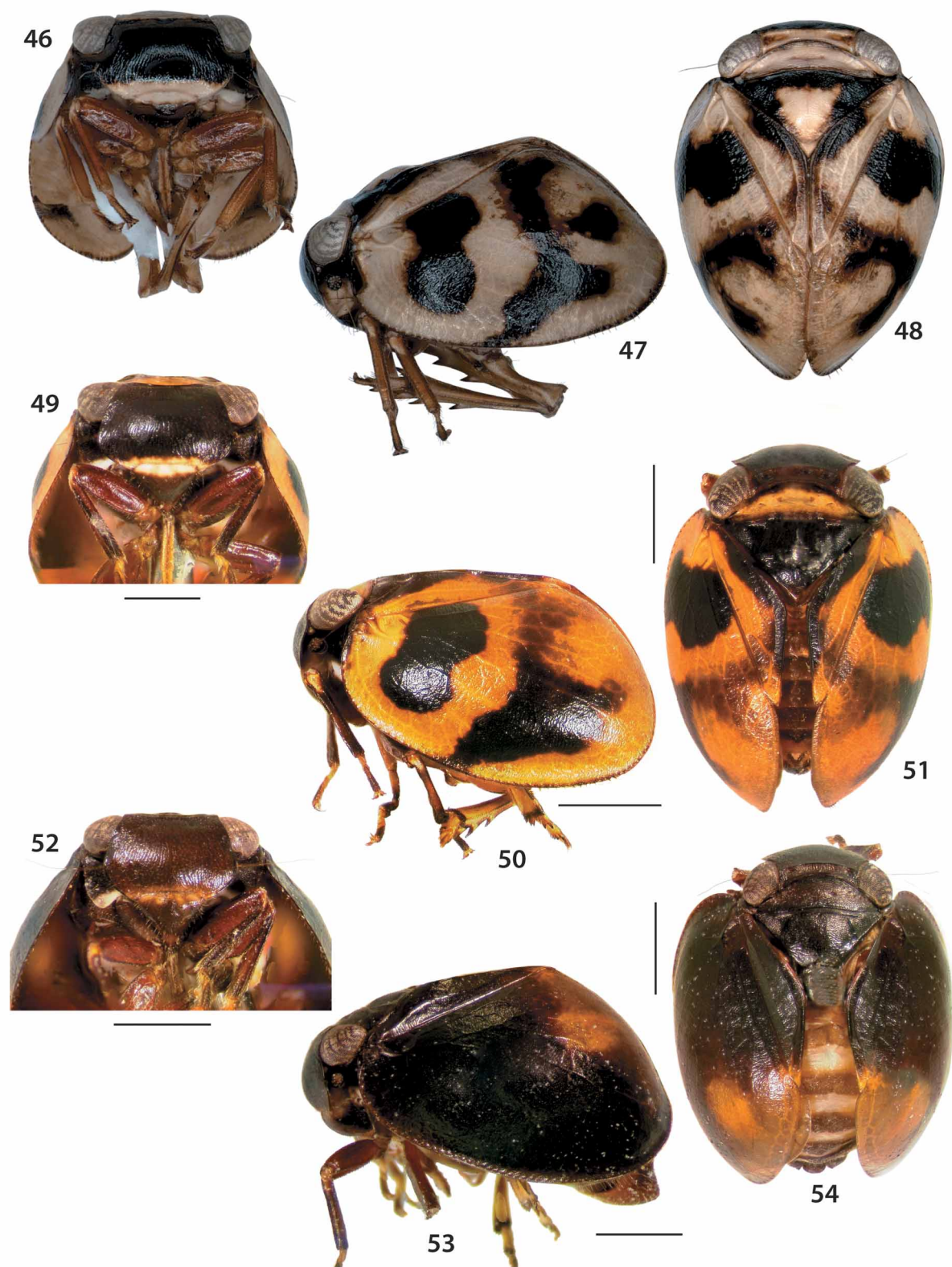
Material examined. Madagascar: [Madagascar: Province d'Antsiranana, Forêt d'Orangea, 3.6 km 128° SE Remena, elev. 90 m] [22–28 Feb 2001 12°15'32" S 49°22'29" E, coll. Fisher, Griswold et al.], [Calif. Academy of Sciences, beating low veg.—in littoral rainforest, code: BLF 3202], [CASENT 3000977–3000979]—(2♂, 1♀, CAS and ZIN); [Madagascar: Mahajanga Prov. Forêt de Tsimembo, 8.7 km 336° NNW Soatana elev 20 m 21–25 Nov. 2001 19°1'17" S 44°26'26" E], [coll. Fisher, Griswold et al. California Acad. of Sciences beating low vegetation tropical dry forest BLF4510], [CASENT 3004786]—(1♀, CAS); [Museum Paris Madagascar 2006 rég. Atsimo-andrefana, Zombitse, Leobondro, 633 m, 22°40.460' S 44°51.633' E, Palmiers & Pandanus, 20.III.2006, Th. Bourgoin leg.]—(1♀, MNHN); [Madagascar: Majunga Prov., Ambovomamy Belambo, 20 km NW of Port Berger, 15–23.XI.2007, 30 m, 15°27'07" S 47°36'80" E, coll. R. Harin'Hala, M. Irwin, F. Parker, malaise, secondary growth on white sand, MG-33-39], [CASLOT 038304]—(1♀, CAS); [Madagascar: Majunga Prov., Maintirano District, Asondrodava dry forest, 15 km N of Maintirano, 3–10.XII.2007, 200 ft., 17°57'92" S 44°02'13" E, coll. M. Irwin, R. Harin'Hala, malaise in dry forest, MG-43A-09], [CASLOT 038326]—(1♀, CAS).

Distribution. Madagascar: Antsiranana, Mahajanga, and Toliar Provinces.

Globularica gen. nov.

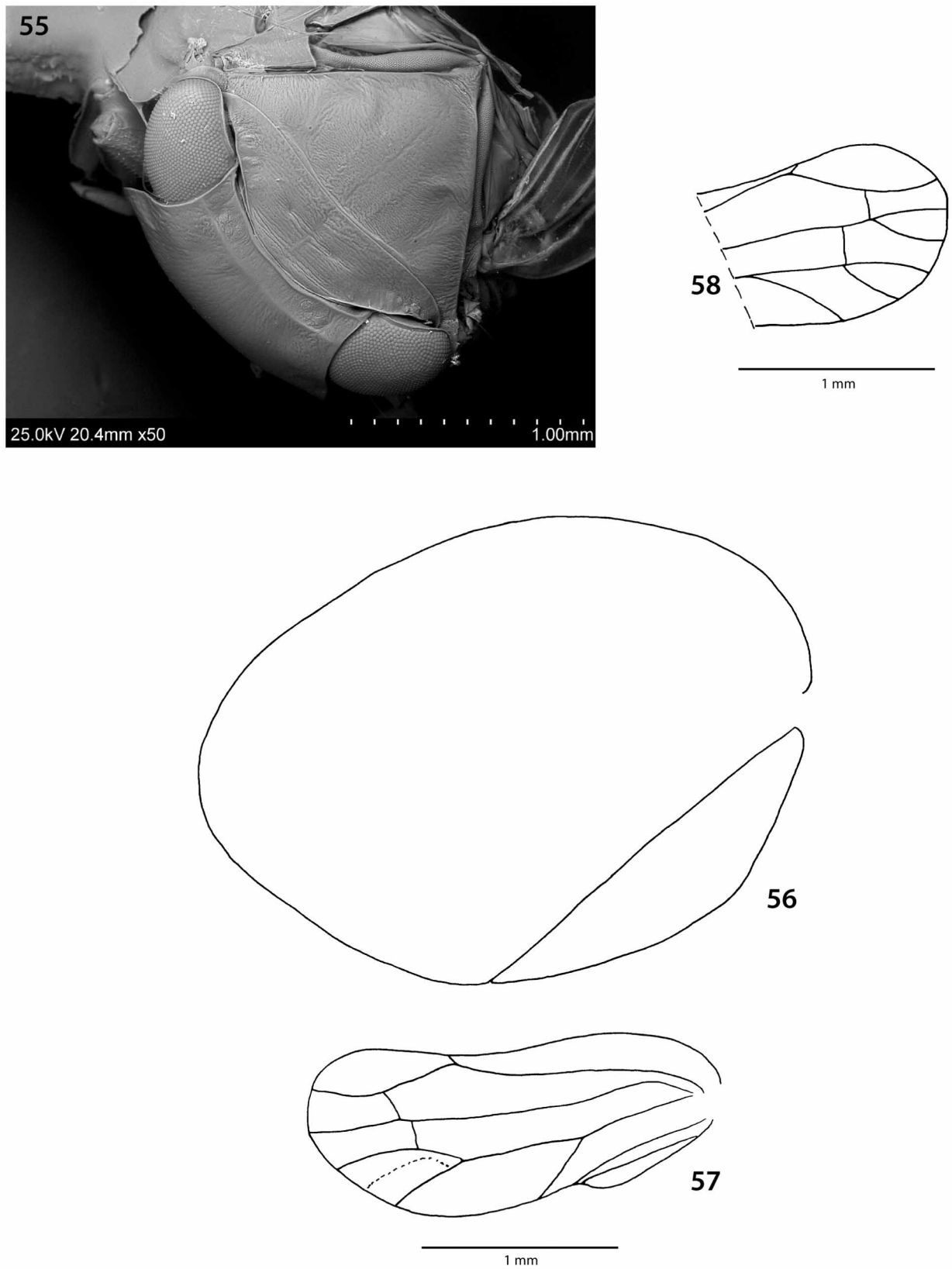
(Figs 46–84)

Type species. *Globularica diversicolorata* sp. nov., here designated.



FIGURES 46–54. *Globularica diversicolorata*. (46–48)—Holotype, male [CASENT 8107008]; (49–51)—paratype, male [CASENT 3004545]; (52–54)—paratype, female [CASENT 3004544]. (46, 49, 52)—Frontal view; (47, 50, 53)—lateral view; (48, 51, 54)—dorsal view.

Etymology. Generic name is derived from the combination of Latin “globulus” and “Ricania”. It refers to the shape of the body. Gender feminine.

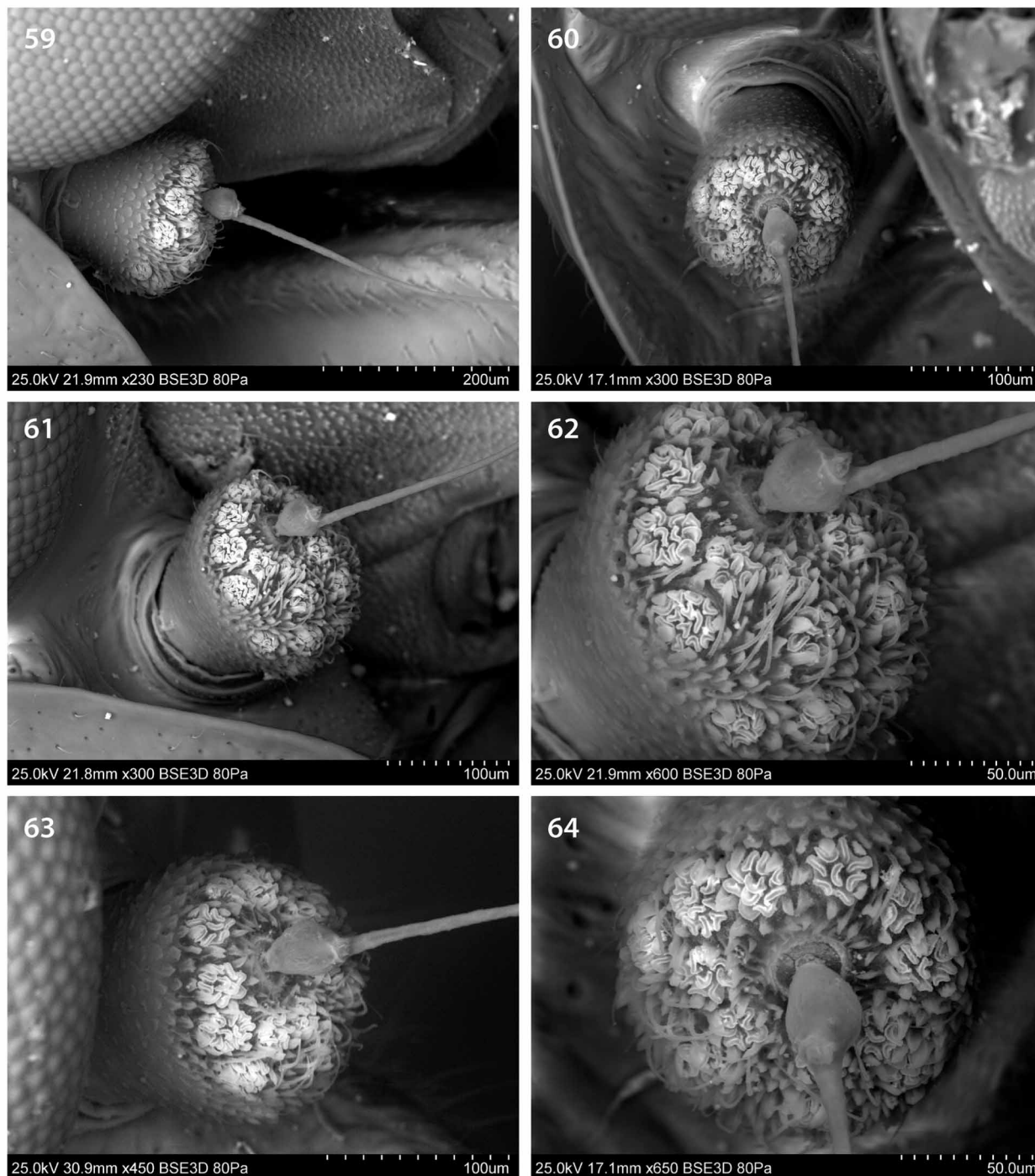


FIGURES 55–58. *Globularica diversicolorata*, holotype, male. (55)—Anterior part of the body, dorsal view; (56–57)—left tegmina and wing; (58)—apical part of right wing.

Diagnosis. Globular, colourful, ocelli present, clypeus without median carina, posterior part of mesonotum weakly convex with melted borders, tegmen strongly convex, wing without precostal cell, first metatarsomere with a row of teeth apically.

Description. Head with compound eyes in dorsal view about as wide as mesonotum (Figs 46–55).

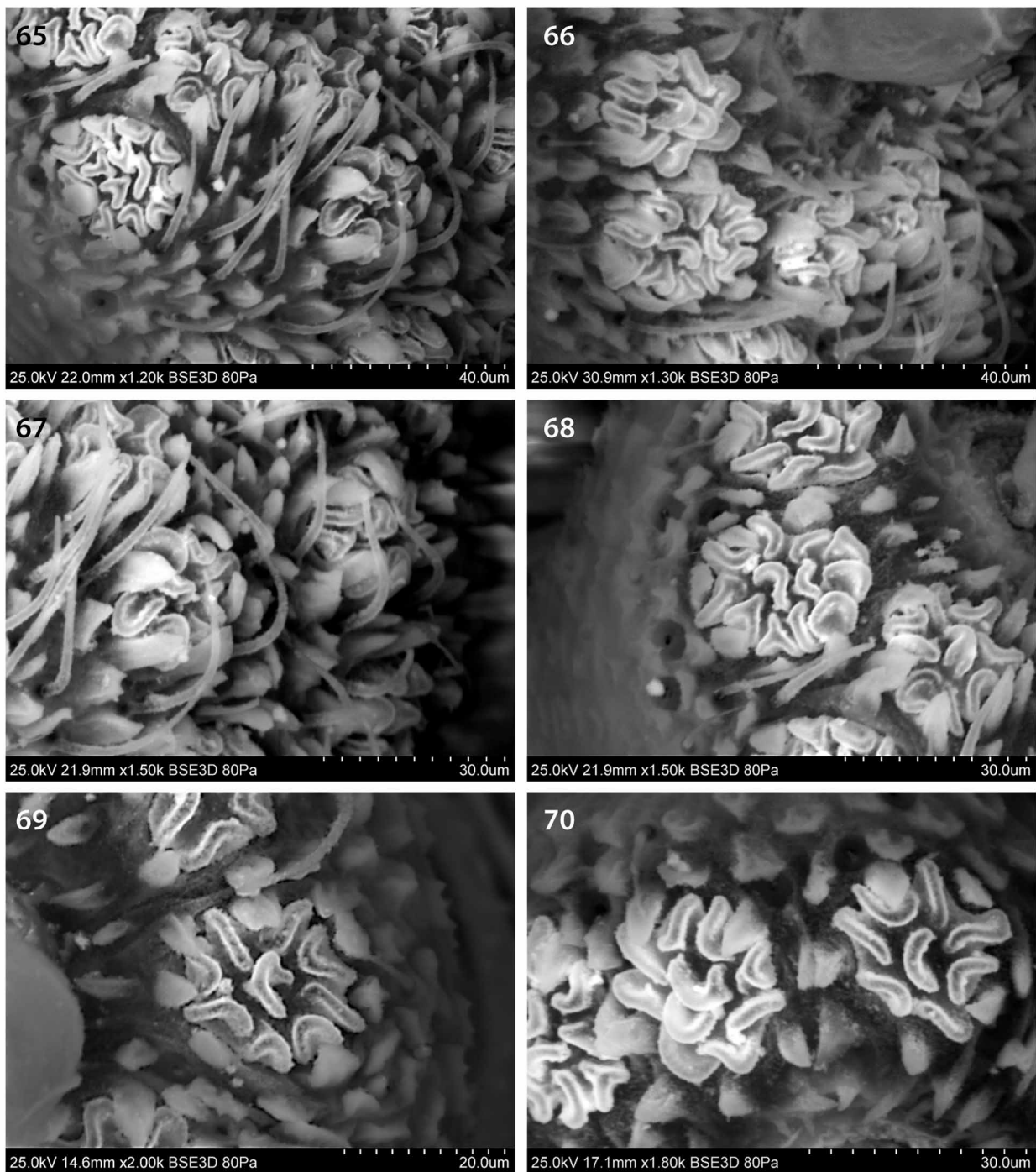
Head. Vertex transverse, distinctly wider than long in mid line, with all margins well carinated (keel-shaped); disc of vertex without median carina (Figs 48, 51, 54–55).



FIGURES 59–64. *Globularica diversicolorata*, holotype, antenna.

Frons transverse, at upper margin little wider than high in mid line, widest at lower part above clypeus. Lateral margins strongly convex, keel-shaped, almost cover pedicel in anterior view, not incised near the ocelli; in lower part distinctly curved to frontoclypeal suture. Frontal disc without carinae (weakly visible or trace of median carina

in female), distinctly rugose vertically and covered by very short hairs; frontal disc shallowly convex at lower part, near the frontoclypeal suture weakly concave (in lateral view). Pedicel elongate, barrel-shaped, with microsetae and a 2–3 rows of plate organs present only apically (Figs 59–70). Compound eyes elongate with very small callus at lower margin. Ocelli present.



FIGURES 65–70. *Globularica diversicolorata*, holotype, antennal plate organs.

Clypeus distinctly narrower than frons, without median carina, and covered by long hairs (Figs 46, 49, 52). Rostrum with apical segment about twice shorter than subapical one, its apex reaching metacoxae.

Thorax. Pronotum distinctly longer in mid line than vertex; disc of pronotum transversely wrinkled, with median carina (in some specimens extremely weakly visible) and two lateral impressions; anterior part almost flat, posterior part and margin of pronotum elevated (Figs 3, 6, 9–10).

Mesonotum triangular, distinctly longer in mid line than combined length of vertex and pronotum; median carina weakly visible (in some specimens trace-like); lateral carinae arcuate reaching posterior margin; anterolateral carinae absent; disc of mesonotum in anterior part almost flat, posterior part weakly convex with melted borders, posterior portion near the lateral margins and before scutellum weakly concave (Figs 48, 51, 54–55).

Tegmina (Figs 47–48, 50–51, 53–54, 56) coleopterous, surface glib, convex and ovoid-shaped, with obscure venation; costal margin distinctly curved and bearing tuberculated setae; posterior margin strongly curved with breaking point at upper half; anterior angle broadly rounded, placed distad to claval angle, apex of clavus claw-shaped, claval angle obtuse. Costal area of the tegmina narrow, about the same width throughout whole length, with single and dense transverse veinlets, reaching almost to apical angle of tegmina; costal cell distinctly wider than costal area, without transverse veinlets. Basal cell elongately rounded; Sc+R leaving basal cell with very a short common stem, Sc+RA distinctly curved to costal area; M vein forked distinctly distad than Sc+R; basal stem of Cu longer than M basal stem; transverse veinlets very dense and numerous, forming irregular cells; pseudonodal or full nodal lines absent; apical part with a row of subrectangular cells. Claval veins Pcu and A1 fused distinctly after half of length and connected with CuP; a few transverse (in some specimens oblique) veinlets between CuP—Pcu and Pcu+A₁—CuP.

Wings narrow, little shorter than tegmina, without precostal cell; anal lobe small and reduced; 2 transverse veinlets: *r-m*, *m-cu* present. R bifurcate, M simple or bifurcate, CuA trifurcate, CuP, PCu, and A1 veins simple (Figs 57–58).

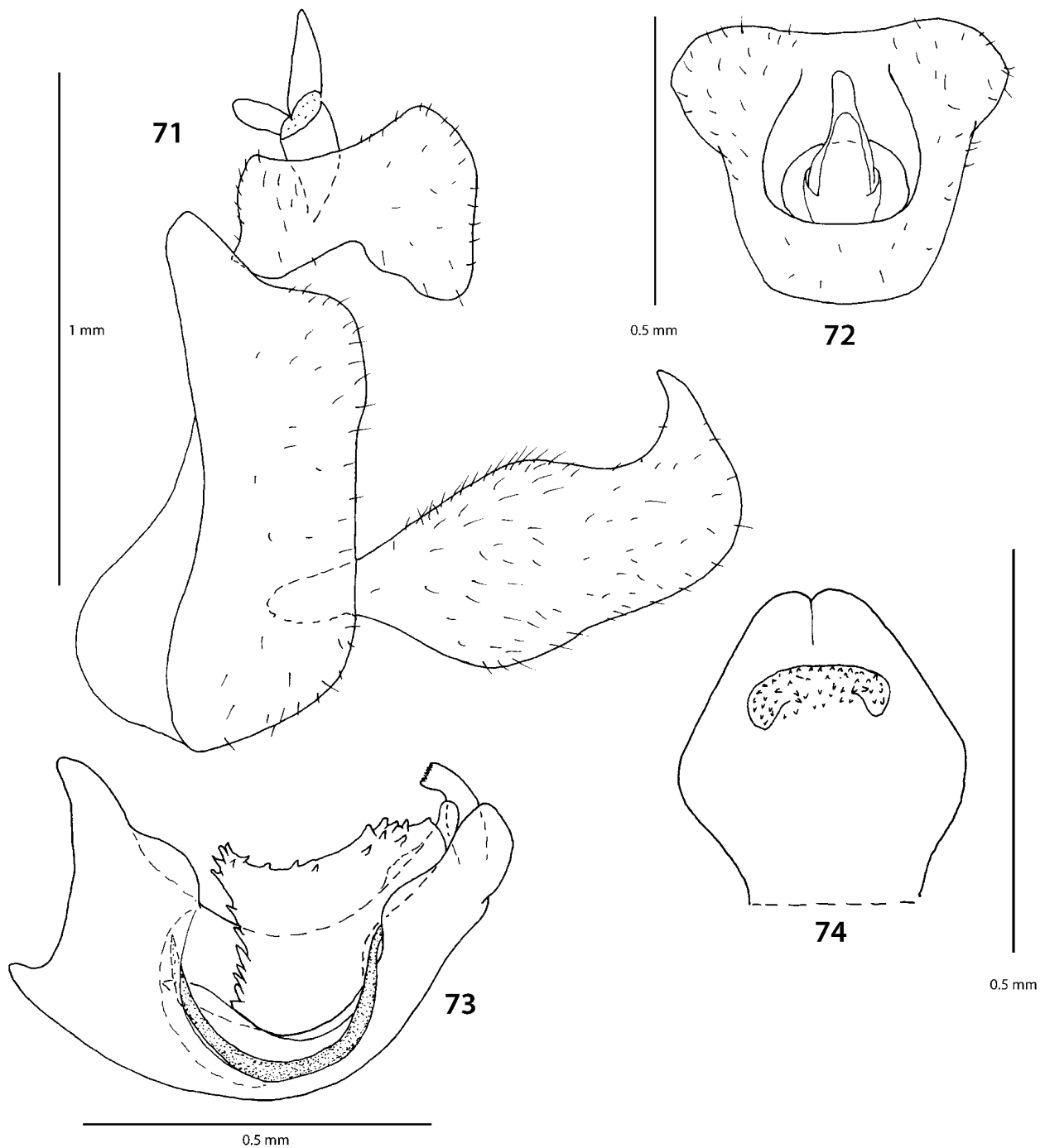
Pro- and mesofemora partly laterally flattened, and distinctly wider than tibiae, elliptic in cross section. Both pro- and mesotibiae square in cross section. Metatibia about twice as long as femur, delicately flattened and widened apically, with 2 lateral spines distally, apical teeth of similar size arranged in irregular line; basitarsomere longer than cumulative length of second and hind tarsomere, with a row of apical teeth of almost similar size (but lateral ones larger) arranged as an asymmetrical arcuate line.

Male genitalia (Figs 71–74). *Genital capsule* (Figs 71–72). Anal tube in lateral view massive, distinctly surpassing posterior margin of pygofer; base of anal tube narrower than posterior part which is distinctly larger. Anal tube in dorsal view distinctly widest at posterior part, with anal opening placed distinctly before half of its length (about 1/3). Pygofer narrow in lateral view, with postero-dorsal angle rounded, without process. Gonostyles in lateral view, distinctly longer than wide, bearing distinct spine-like capitulum at the end of dorsal margin; lower margin almost straight, at 1/3 with weakly visible incisures; hind margin at caudo-dorsal angle widely rounded and little surpassing the posterior margin of process; upper margin arcuate, below upper process strongly concave.

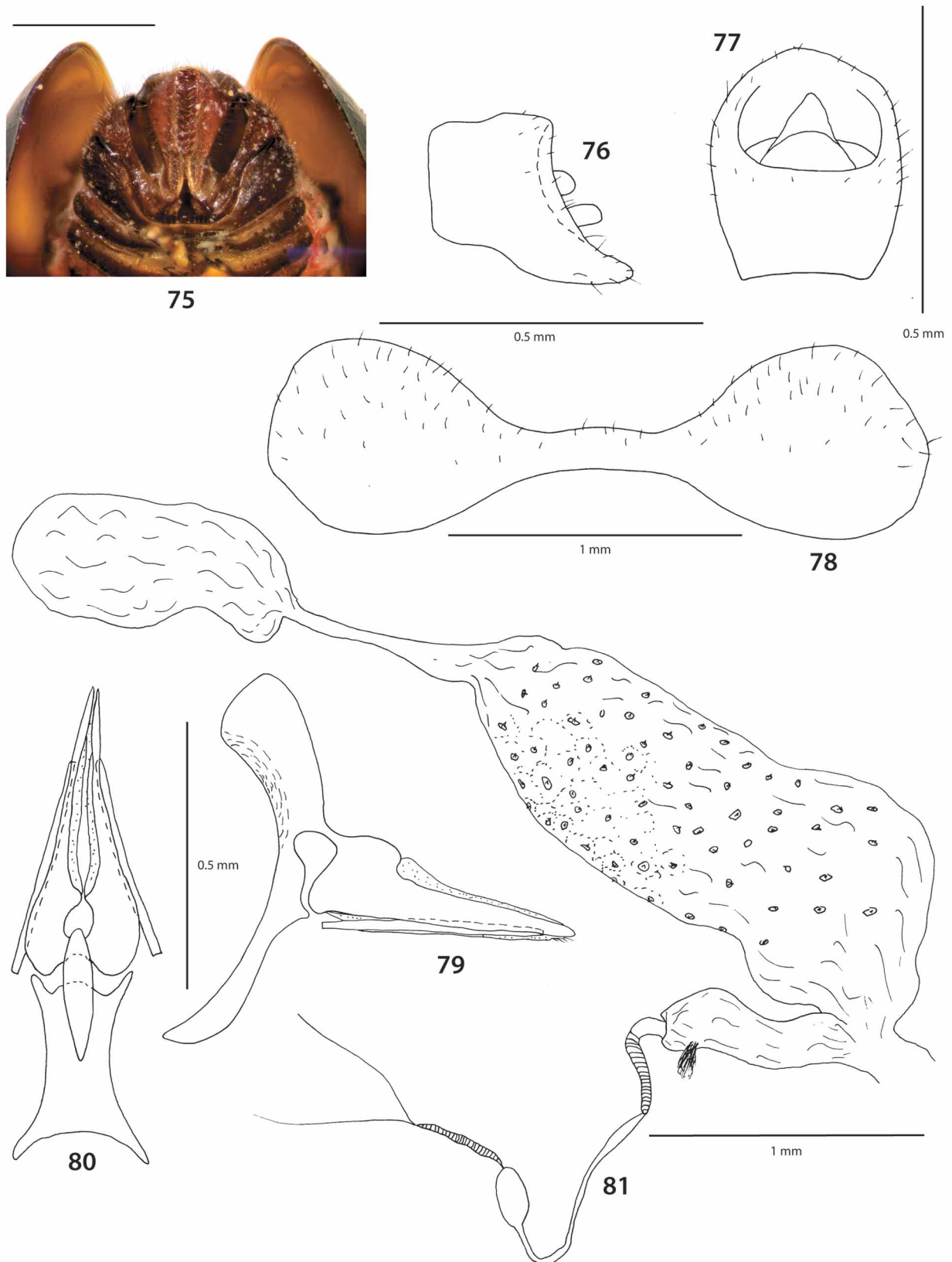
Phallic complex (Figs 73–74). Periandrium with long lateral split surpassing half of its length (reaching to about 2/3); dorsal part of dorsal periandrium not elevated basally and without extra structures; dorsal margin with 2 folds, apex slightly oriented dorsally, median lateral fold of dorsal periandrium distinctly developed, wide and smooth. Periandrium at lateral basal part with long concavities; apex of ventral part of periandrium slightly extending apex of dorsal one; ventral and posterior margin without fold and additional structures, posterior margin weakly concave medially; apical parts of ventral periandrium with small spiniferous microsculptures. Aedeagus with a pair of lateral processes. Each process with a single apex, narrow, sclerotized and smooth. The base of the process placed after the lateral lobe of dorsal periandrium. Process distinctly curved, oriented ventrally and basally. Posterior lateral fold of aedeagus membranous, single and huge, with dentate margins. Apex of aedeagus distinctly developed, blunt, delicately dentate and oriented dorsally.

Female genitalia (Figs 75–81). Sternite VII with well developed lateral lobes (Fig 78). Anal tube in lateral view short and high, not surpassing the half of upper margin of gonoplac; basal part narrower than posterior one (Fig. 76). Gonoplac unilobate, laterally flattened, posterior margin with a full row of well developed teeth, placed at about 45° in respect to longitudinal axis of the body, posterior ventral part partly weakly sclerotized. Gonapophysis VIII: anterior connective lamina partly laterally flattened; dorsal margin shallowly concave with a sharp apex and well visible teeth situated at the postero-dorsal margin. Bursa copulatrix with two pouches connected by a ductus; first pouch distinctly biggest and longer than second one, wall of first pouch with melted cells-like and sclerotized ornamentations mostly placed at posterior lower part of pouch: second pouch membranous without cell-like imprints (Fig. 81). Spermatheca well developed; *ductus receptaculi* with as a wrinkled ductus, distinctly shorter than *diverticulum ductus*; *diverticulum ductus* as a long and smooth basal ductus and elongate membranous apical bulba (Fig. 81).

Distribution (Fig. 82). Madagascar: Mahajanga and Toliar Provinces.



FIGURES 71–74. *Globularica diversicolorata*, male genitalia. (71)—Genital capsule, lateral view, (72)—anal tube, dorsal view; (73)—phallic complex, lateral view, (74)—posterior part of lower periandrium, ventral view.



FIGURES 75–81. *Globularica diversicolorata*, female. (75)—Genital capsule, ventral view; (76)—anal tube, dorsal view; (77)—same, dorsal view; (78)—pregenital sternite, flattened; (79)—gonapophyses IX and gonospiculum bridge, lateral view; (80)—same, dorsal view; (81)—genital ducts, lateral view.

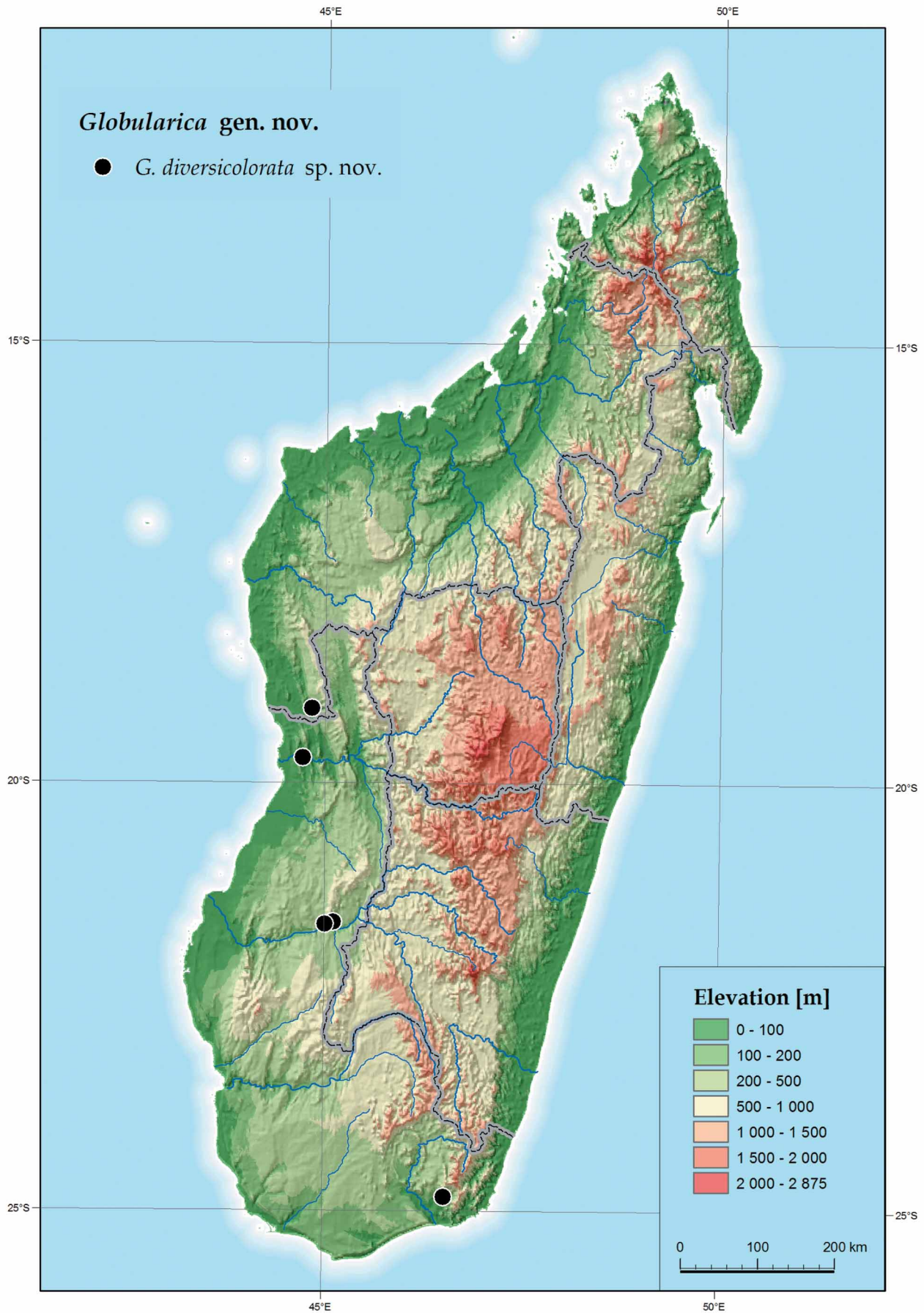


FIGURE 82. Distribution map of genus *Globularica*.

Globularica diversicolorata sp. nov.

(Figs 1–32)

Etymology. Name refers to multicoloured specimens.

Description. Total length 3.1–4.0 mm.

Head. Vertex: proportion A/B = 6.75–9.00; anterior margin almost straight or delicately convex; lateral margins straight and parallel; posterior margin distinctly concave; all margins are at about of same level. Frons: proportion C/E = 1.03–1.28; proportion D/E = 1.43–1.85; upper margin straight; lateral margins distinctly arcuate and curved to frontoclypeal suture. Frontoclypeal suture widely arcuate. Clypeus shallowly convex in median portion.

Thorax. Pronotum: proportion F/B = 2.75–3.33; anterior margin widely convex, posterior margins almost straight medially. Mesonotum: proportion G/F+B = 1.43–2.17, proportion G/H = 0.55–0.69; disc of mesonotum delicately and irregularly rugose; scutellum with a sharp apex. Tegmina: proportion I/J = 1.29–1.46. Metatibia with 7 apical teeth. Metabasitarsus with 8 apical teeth.

Male genitalia. *Genital capsule.* Anal tube (in lateral view): lower margin at basal half almost straight, at distal half sinusoidal, posterior margin at lower part almost straight, at upper part shallowly curved. Anal tube in dorsal view with posterior margin shallowly arcuate; lateral margins almost straight and subparallel, posterior part distinctly obtuse and strongly curved; posterior margin shallowly concaved medially; apical angles enlarged.

Aedeagus. Lateral processes distinctly curved basad.

Female genitalia. Sternite VII with almost straight anterior margin in median portion and shallowly convex (arcuate) posteriorly; lateral lobes rounded. Anal tube in lateral view subquadrate with lateroventral extension, a little surpassing tergite IX; in dorsal view roundly pentagonal, posterior margin almost straight; lateral margins shallowly arcuate, with breaking point after the half of length and after level of anal opening; anterior margin strongly convex, with distinct point of break; anal opening placed a little after the half of length. Gonapophyses IX and gonospiculum bridge as in Figs 79–80. Ornamentation of first pouch of bursa copulatrix with central sclerotized area bearing single, sharp and high spinacle and group of small petals.

Coloration (Figs 46–54, 75). Males and females present several variants of coloration. All of them are characterized by frontoclypeal suture with white, pale or yellow transverse band, paranotal lobes black, with white to yellow apices, pro- and mesofemora and tibiae brown reddish, metafemora and metatibiae brown yellowish, apices of leg's spines black. Wings hyaline.

Male. Three variants of coloration:

1) Head and scutellum black, clypeus dark brown. Abdominal sternites brown yellowish, tergites dark brown reddish. Anal tube light yellow, with dark brown lateral processes. Style light yellow, with black caudo-dorsal angle.

2) Head, pronotum, mesonotum, and scutellum dark brown or black. Tegmina dark brown or black with orange spot distally, obscure orange spot medially, small orange spot basally, and yellow apex of clavus.

3) Vertex yellow with brown lateral parts, frons pitch-black; pronotum yellow, with anterior and posterior margins brown, lateral impressions brownish; mesonotum black, with median triangular yellow patch, scutellum yellow; tegmina yellow, with black spots and bands. Abdominal tergites dark yellow; sternites yellow, with narrow reddish band near the posterior margin; genital capsule generally yellow; upper part of pygofer light brown to pale black.

Female. Head, pronotum, and scutellum black. Tegmina black, with large orange spot apically. Abdominal sternites and tergites dark brown. Sternites with light brown to yellow band near its anterior margins. Genital segments dark brown reddish.

Type material. Holotype, ♂: [Madagascar: Tulear Province, Andohahela Nat'l Park, Ihazofotsy Parcelle III 24° 49.85' S, 46° 32.17'E 16–26 December 2002], [California Acad of Sciences colls: M. Irwin, F. Parker, R. Harin'Hala. Elev 80m malaise trap—in dry spiny forest, MA-02-21-04], [CASENT 8107008]—(CAS).

Paratypes: 3♂♂ and 2♀♀: [Madagascar: Mahajanga Prov: Parc National Tsingy de Bemaraha, 3.4 km 93° E Bekopaka, Tombeau Vazimba, Elev 50m 6–10 Nov. 2001], [19°8'31" S 44°49'41" E, coll: Fisher, Griswold et al., California Acad. of Sciences, malaise trap, in tropical dry forest, coll. code BLF 4233], [CASENT 3004537]—(1♂, MNHN); [Madagascar: Mahajanga Province: Parc National Tsingy de Bemaraha, 10.6 km ESE 123° Antsalova, S elev 150m 16–20 November, 2001], [19°42'34" S 44°43'05" E coll: Fisher, Griswold et al. California Acad. of Sciences beating low veg.—tropical dry forest on Tsingy, BLF4434], [CASENT 3004545]—(1♂, CAS); [Madagas-



FIGURES 83–84. Habitats of *G. diversicolorata* in Toliar Province, Massif du Makay, dry forest: (83)— $21^{\circ}36.415'S$ $45^{\circ}06.769'E$, 12.01.2011, (84)— $21^{\circ}37.783'S$ $45^{\circ}00.286'E$, 23.01.2011. Photos by V.M Gnezdilov.

car: Mahajanga Prov.: Parc National Tsingy de Bemaraha, 10.6 km ESE 123° Antsalova, elev 150m 16–20 November, 2001], [19°42'34" S 44°43'05" E coll: Fisher, Griswold et al. California Acad. of Sciences beating low veg.—tropical dry forest on Tsigny, BLF4434], [CASENT 3004544]—(1♀, CAS); [Madagascar, Toliar Province, Massif du Makay, 21°36.415' S 45°06.769' E, 12.01.2011, V.M. Gnezdilov leg.]—(1♀, ZIN); [Madagascar, Toliar Province, Massif du Makay, 21°37.783' S 45°00.286' E, 170 m, 23.01.2011, V.M. Gnezdilov leg.]—(1♂, ZIN).

Distribution. Madagascar: Mahajanga and Toliar Provinces.

Ecology. The species inhabits dry forests. In Massif du Makay (Toliar Province) the species was collected in dry forest on low trees 1.5–2.5 m (Figs 83–84).

Coniunctivena gen. nov.

(Figs 85–123)

Type species. *Coniunctivena epaulettea* sp. nov., here designated.

Etymology. *Coniunctivena*—combination of the Latin words referring to venation of tegmina. Gender feminine.

Diagnosis. Ocelli present, clypeus without median carina, posterior part of mesonotum convex and elongate, triangular-shaped, with melted borders, tegmina elongate, weakly convex, with well visible veins, veins Sc and R leaving basal cell separately, next fusion forming closed cell, first metatarsomere with a row teeth apically.

Description. Head with compound eyes in dorsal view about as wide as mesonotum.

Head (Figs 85–90, 92, 105–107, 114–116). Vertex transverse, distinctly wider than long in mid line, with all margins well carinated (keel-shaped); disc of vertex without median carina.

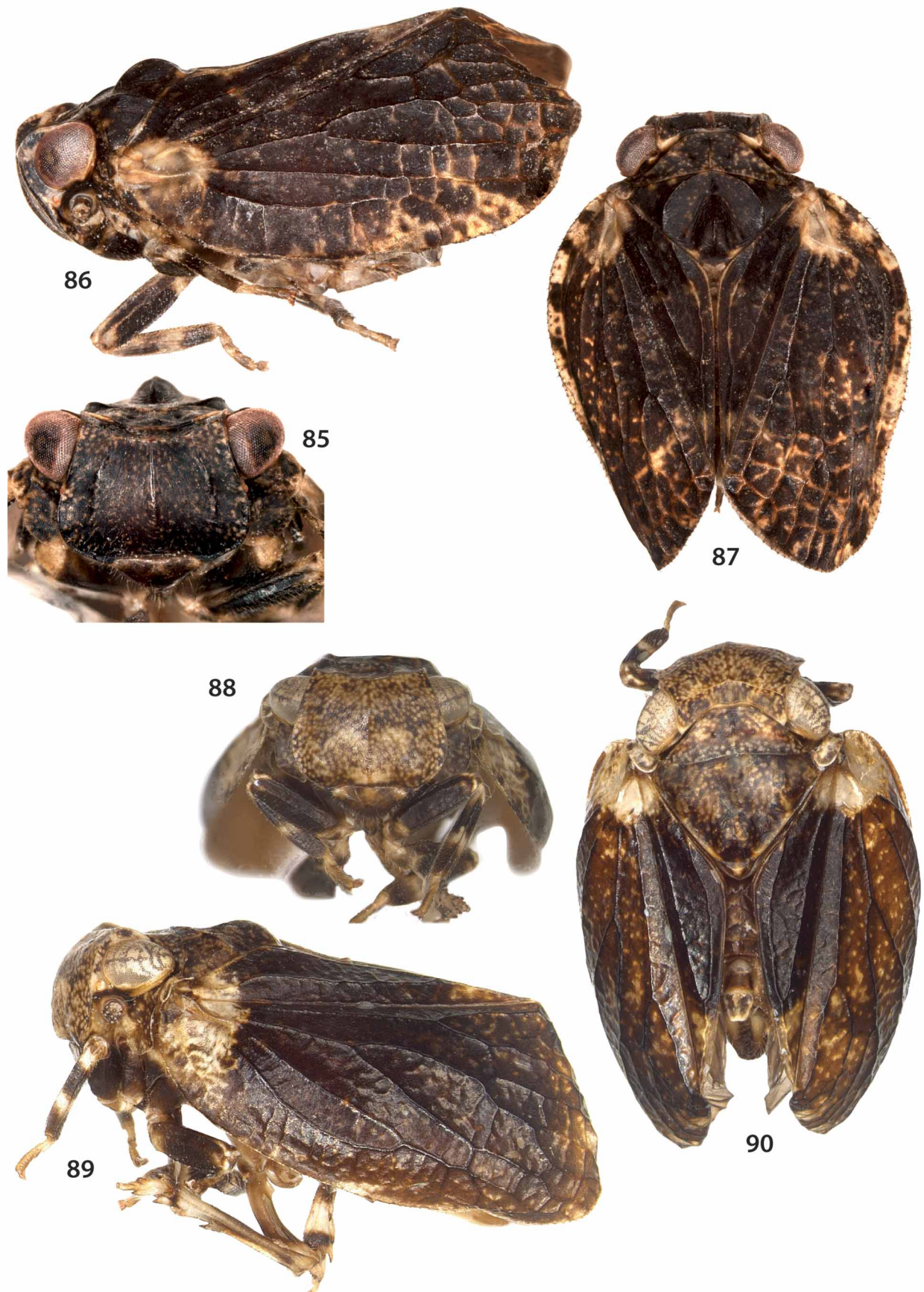
Frons transverse, at upper margin little wider than high in mid line, widest at lower part above clypeus. Lateral margins strongly convex, covering pedicel, not incised near the ocelli, distinctly curved to frontoclypeal suture in lower part. Frontal disc with 3 carinae separated basally, distinctly rugose vertically and covered by very short hairs. Frontal disc distinctly convex at lower part and weakly concaved near the frontoclypeal suture in lateral view. Pedicel elongate, with a wider apical part, with microsetae and a 2–3 rows of plate organs apically (Figs 92–94). Compound eyes elongate, with very small callus at lower margin. Ocelli present.

Clypeus narrower than frons, without median carina, covered very short hairs. Rostrum with apical segment about twice shorter than subapical one, with apex reaching almost metacoxae.

Thorax (86–87, 89–90, 106–107, 115–116). Pronotum distinctly longer in mid line than vertex; disc of pronotum with median carina (in some specimens weakly visible) and two lateral impressions; median portion of pronotum distinctly concave, posterior part of disc elevated.

Mesonotum triangular, distinctly longer in mid line than combined length of vertex and pronotum, with more or less visible median carina; lateral carinae keel-shaped, connected basally, arcuate, reaching posterior margin; anterolateral carinae absent; disc of mesonotum with elongate triangular eminence posteriorly which is strongly declivous before scutellum (Figs 86–87, 89–90, 107).

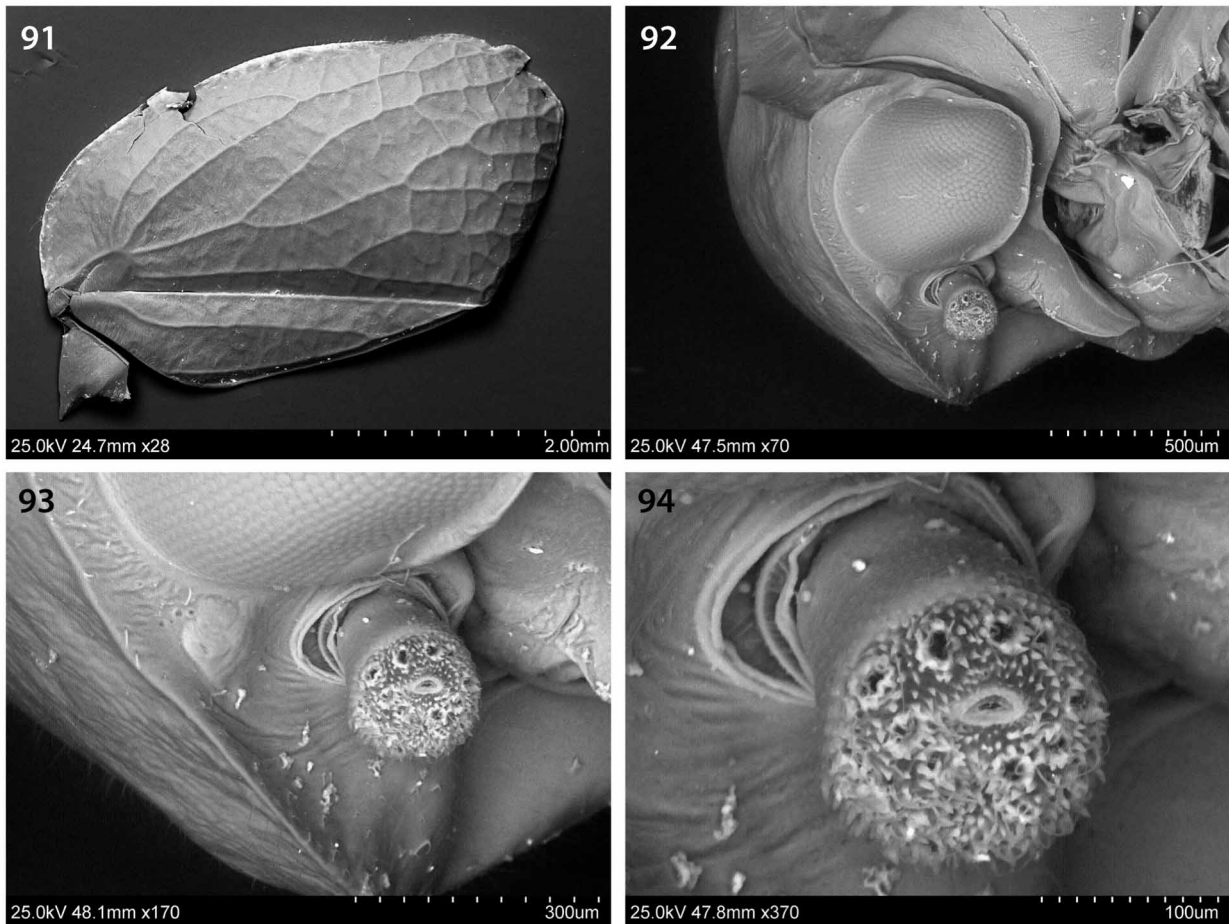
Tegmina (Figs 86–87, 89–91, 106–107, 115–116) coriaceous, partly convex, elongate, with well visible venation; costal margin curved and bearing tuberculated setae; anterior angle broadly rounded, placed a little distad to claval angle, apex of clavus “normal”, claval angle distinctly “broken”; posterior margin irregularly curved, with “broken point” in the upper part. Costal area of the tegmina narrow, about the same width throughout whole length, with single and sparse transverse veinlets, reaching nearly the half between Sc+R fused point and apical angle; costal cell about twice as wide as costal area, with single transverse veinlets. Basal cell elongate, about twice as long as wide; Sc and R leaving basal cell separately, forming elongate, wide and partly curved cell; connected/fused at about half of total tegmen length, after this level, with long branches curved to costal margin. M vein forked more basally than Sc+R fused point; Cu stem longer than M stem, forked after the Sc+R fused point; transverse veinlets mostly present at posterior half of tegmen and between CuA and CuP; pseudonodal or full nodal lines absent; apical part with row of more or less square cells. Claval veins Pcu and A₁ fused distinctly after the half of length and connected with posterior margin; transverse veinlets between CuP-Pcu and Pcu+A₁-CuP; a few very weakly visible transverse veinlets between Pcu and A₁.



FIGURES 85–90. *Coniunctivena epaulettea*. (85–87)—Male, (88–90) female. (85, 88)—Frontal view; (86, 89)—body, lateral view; (87, 90)—same, dorsal view.

Wings a little shorter than tegmina, with precostal cell; anal lobe normally developed. R bifurcate, M simple or bifurcate near the posterior margin, CuA trifurcate, CuP, Pcu, and A₁ simple, 2 transverse veinlets, *r-m* and *m-cu*, present.

Pro- and mesofemora laterally flattened and distinctly wider than tibiae; in upper part subrectangular, in lower part more elliptic in cross section. Pro- and metatibiae subrectangular in cross section. Metatibia about 1/3 longer than metafemur, flattened and widened apically, with 2 lateral spines distally; apical teeth of similar size arranged in irregular line; first metatarsomere about as long or little longer than cumulative length of second and third tarsomeres; with a row of apical teeth nearly equal size (lateral ones are a little larger) arranged almost straightly or in delicately arcuate line; metatibiotarsal formula: 2/7/7–8.

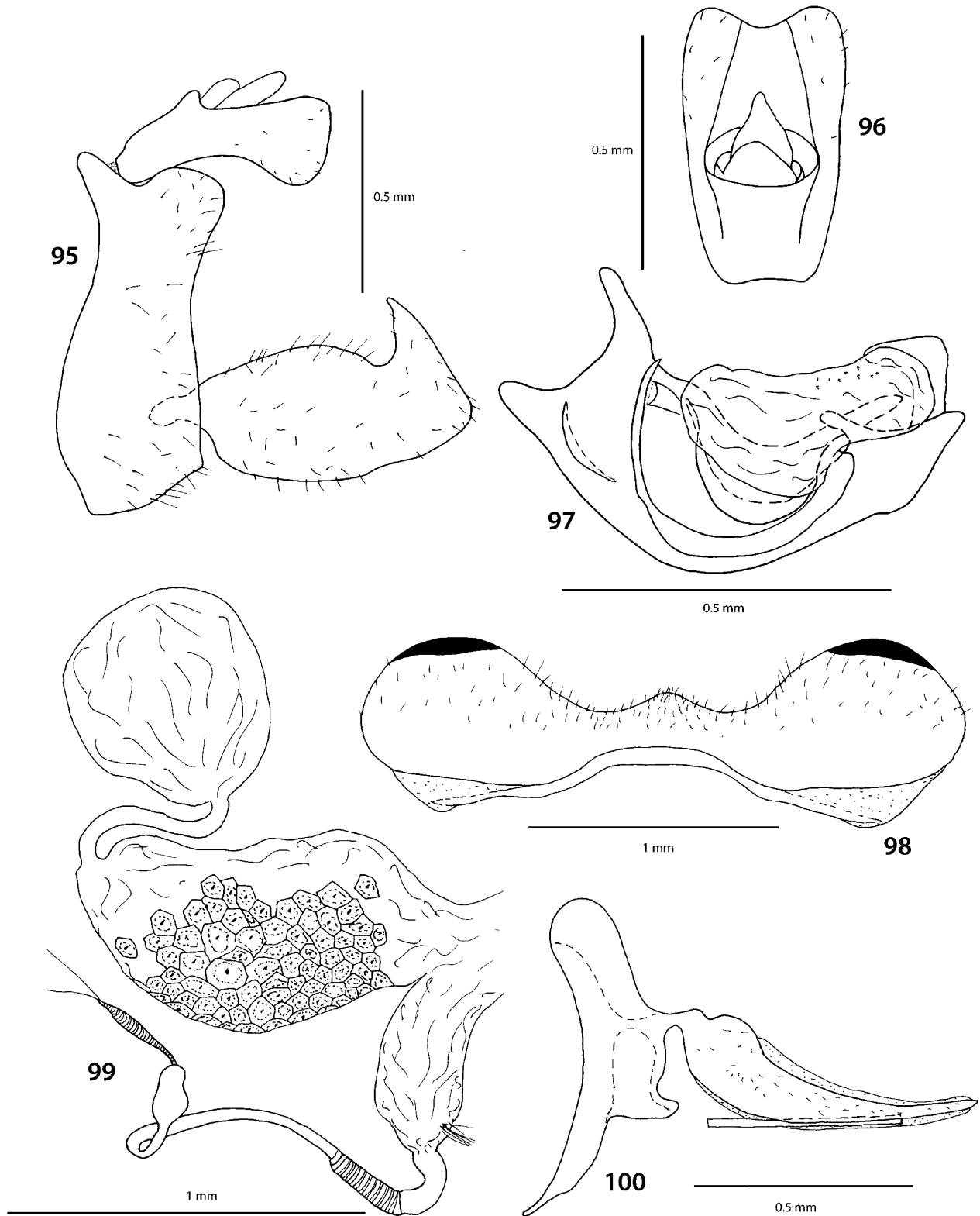


FIGURES 91–94. *Coniunctivena epaulettea*. (91)—Right tegmina, dorsal view; (92–94)—anterior part of head and antenna.

Male genitalia (Figs 95–97, 101–104, 108–113, 117–122). *Genital capsule*. Anal tube elongate, massive in lateral view; subrectangular or cup-shaped in dorsal view, distinctly surpassing posterior margin of pygofer in lateral view, enlarged posteriorly, with anal opening placed distinctly before half of its length. Pygofer narrow in lateral view, with postero-dorsal angle rounded, without process or with small process. Gonostyles in lateral view distinctly longer than wide, bearing distinct spine-like capitulum at the end of dorsal margin; lower margin almost straight or weakly arcuate; hind margin at caudo-dorsal angle widely rounded and not surpassing the posterior margin of the capitulum; upper margin more or less arcuate, strongly concaved below the capitulum.

Phallic complex. Periandrium with long lateral split surpassing the half of his length reaching to about 2/3 of length; dorsal periandrium not elevated basally and without extra structures; dorsal margin with or without folds, apex of dorsal periandrium slightly oriented dorsally, median lateral fold of dorsal periandrium well developed, wide and smooth. Periandrium with vertical or horizontal concavities latero-basally; apex of ventral periandrium slightly extending apex of dorsal part; ventral margin sometimes with folds; with small or large concavity medially in ventral view; apical parts of ventral periandrium with small spiniferous microsculpture. Aedeagus with pair of

lateral processes. Each process with single apex, smooth, narrow, full or partly sclerotized. The base of the process situated above the lateral lobe of dorsal periandrium. Process distinctly curved, oriented ventrally and basally. Posterior lateral fold of aedeagus membranous, single and small or huge, with smooth margins. Apex of aedeagus well developed, blunt, without hooks, oriented dorsally and basally.



FIGURES 95–100. *Coniunctivena epauletta*. (95–97)—Male; (98–100)—female. (95)—Genital capsule, lateral view, (96)—anal tube, dorsal view; (97)—phallic complex, lateral view; (98)—pregenital sternit, flattened; (99)—genital ducts, lateral view; (100)—gonapophyses IX and gonospiculum bridge, lateral view.

Female genitalia (Figs 99–100). Sternite VII with well developed lateral lobes. Anal tube destroyed in examined specimen. Gonoplac unilobate, laterally flattened, posterior margin with a full row of well developed teeth, placed about 45° in respect to longitudinal axis of body, partly membranous postero-ventrally. Gonapophysis VIII: anterior connective lamina partly laterally flattened, with shallowly concaved dorsal margin bearing well visible teeth and sharp apex. Bursa copulatrix with 2 pouches. First pouch connected with second one by narrowed ductus nearly as long as second pouch. First pouch with clearly visible cells-like sclerotized ornamentation in lower part. Second pouch without cell-like imprints. Spermatheca well developed; *ductus receptaculi* very short, distinctly ribbed; *diverticulum ductus* more than twice as long as *ductus receptaculi*, very long and narrow and a small, membranous and elongate apical bulba.

Distribution (Fig. 123). Madagascar: Mahajanga and Toliar Provinces.

Key to the species of *Coniunctivena*

1. Latero-posterior fold of aedeagus huge, covering more than half of phallic complex (Figs 97, 103) 2
- Latero-posterior fold of aedeagus not covering half of phallic complex (Figs 112, 121). 3
2. Periandrium with a horizontal fold latero-basally. Dorsal and ventral margins of periandrium without folds (Fig. 97). *C. epaulettea* sp. nov.
- Periandrium with a vertical fold latero-basally. Dorsal and ventral margin of periandrium with folds (Fig. 103) *C. antsignyensis* sp. nov.
3. Periandrium with a small horizontal fold near the end of the lateral split. Ventral margin of periandrium without fold. Lateral process of aedeagus well sclerotized (Fig. 112) *C. montuosa* sp. nov.
- Periandrium with a vertical fold latero-basally and near the dorsal margin. Ventral margin of periandrium with 2 folds. Lateral process of aedeagus membranous basally (Fig. 121) *C. synavei* sp. nov.

Coniunctivena epaulettea sp. nov.

(Figs 85–100, 123)

Etymology. Epaulette is a French word meaning "little shoulder" and refers to white spot on the base of tegmina.

Diagnosis. The species is distinguished by the following features: postero-dorsal angle of pygofer distinctly rounded without process, margins of periandrium without fold, lateral process of aedeagus well sclerotized narrowing posteriorly, latero-posterior fold of aedeagus huge.

Description. Total length 4.0–4.4 mm.

Head. Vertex: proportion A/B = 6.25–7.1; anterior margin weakly arcuate or almost straight; lateral margins almost straight and parallel, posterior margin elevated, keel-shaped, distinctly concaved laterally and partly straight medially. Frons: proportion C/E = 1.00–1.07; proportion D/E = 1.52–1.57; upper margin shallowly concaved; median carina reaching almost to frontoclypeal suture, lateral carinae reaching nearly its middle or little far; frontoclypeal suture widely and shallowly arcuate. Clypeus in median portion almost straight in male or weakly convex in female.

Thorax. Pronotum: proportion F/B = 2.5–2.86; anterior margin strongly convex, with partly flattened median portion; posterior margin almost straight or weakly concaved in median portion; anterior margin elevated, keel-shaped, especially in lateral portions. Mesonotum: proportion G/F+B = 1.88–1.95, proportion G/H = 0.58–0.70. Tegmina: proportion I/J = 1.94–2.0. On the left tegmina of the male holotype, veins Sc and R not fused; the right tegmina is normally developed.

Male genitalia (Figs 11–16). *Genital capsule.* Anal tube in lateral view with lower margin concaved in median portion; apical part enlarged and rounded; in dorsal view elongate and subrectangular, basal margin almost straight, lateral margins almost straight, posterior margin distinctly concaved medially. Pygofer: postero-dorsal angle distinctly rounded and elevated, without process.

Phallic complex. Periandrium: dorsal margin without fold, with narrow and elongate concavity under the margin; median lateral lobe of dorsal periandrium about as long as wide, partly rounded; latero-basal part with horizontal fold; ventral margin without fold; posterior margin with well visible concavity medially in ventral view. Lateral processes of aedeagus well sclerotized, from about ¾ narrowing, with sharp apex. Latero-posterior fold of aedeagus huge, oriented vertically. Apex of aedeagus large, with elongated apical part.

Female genitalia (Figs 99–100). Sternite VII: lateral lobes rounded; anterior margin almost straight medially; posterior margin convex medially. Anal tube destroyed in examined specimen.

Coloration (Figs 85–90). Frons, vertex, pronotum, and mesonotum dark brown to black with more or less dense yellow dots (male darker). Pedicel dark brown. Clypeus brown anteriorly and dark brown to black laterally. Rostrum light brown yellowish, with dark brown apex. Thorax from brown to black. Tegmina from brown to black with large yellow basal patch and rounded spots and dots. In male the patches on costal area of tegmina distinctly visible. Wings matte, with light brown veins. Legs brown or dark brown, with light yellow bands. Apices of spines black. Abdominal sclerites light brown or brown.

Type material. Holotype, ♂, [Madagascar, Toliara Province, massif du Makay, 265 m S 21°36′08.9″E 45°06′46.5″, 11.01.2011, A. Soulier-Perkins], [Forêt sèche]—(MNHN).

Paratype, ♀: [Madagascar: Toliara Prov. Forêt de Mite, elev 75m, 20.7 km WNW Tongobory 23°31′27″S 44°7′17″E 27 Feb–3 March 2002], [coll: Fisher, Griswold et al. California Acad. of Sciences malaise trap—in gallery forest collection code: BLF5849], [CASENT 3004519]—(CAS).

Distribution (Fig. 123). Madagascar: Toliar Province.

Coniunctivena antsignyensis sp. nov.

(Figs 101–104)

Etymology. The name refers to locus typicus—Antsigny.

Diagnosis. The species is similar to *C. synavei*, but differs by the following features: postero-dorsal angle of pygofer widely rounded, without process (in *C. synavei* postero-dorsal angle of pygofer with sharp and distinctly elongate process), fold in dorsal margin of periandrium small, oriented dorsally (in *C. epaulettea* the fold large and oriented almost apically), lateral process of aedeagus is sclerotized throughout its whole length (in *C. epaulettea* lateral process of aedeagus membranous basally), latero-posterior fold of aedeagus huge, covering more than half of phallic complex and oriented horizontally (in *C. epaulettea* latero-posterior fold of aedeagus small, triangular and oriented dorsally).

Description. Total length. Male—4.5 mm.

Head. Vertex: proportion A/B = 5.2. Anterior margin arcuate; lateral margins almost straight and subparallel; posterior margin concave, with similar curvature like anterior margin; lateral and posterior margins elevated (keel-shaped). Frons: proportion C/E = 1.06; proportion D/E = 1.49.

Thorax. Pronotum: proportion F/B = 2.2. Anterior margin widely arcuate, with partly flattened median portion; posterior margin weakly concaved medially; median carina weakly visible; anterior margin weakly elevated, keel-shaped, medially and laterally. Mesonotum: proportion G/F+B = 1.94; G/H = 0.67. Tegmina: proportion I/J = 1.70.

Male genitalia (Figs 101–104). *Genital capsule.* Anal tube in lateral view massive, median portion not distinctly narrower than apical portion; lower margin concave; apical part massive, but not enlarged; in dorsal view elongate and calyciform; basal margin distinctly concave, lateral margins sinusoidal, postero-lateral angles enlarged and rounded, posterior margin straight medially and situated below the lateral angles. Pygofer: postero-dorsal angle widely rounded, without process.

Phallic complex. Periandrium: dorsal margin with small triangular fold oriented almost dorsally; median lateral lobe of dorsal periandrium distinctly longer than height, ventral margin almost straight; latero-basal part of periandrium with vertical fold; ventral margin with long and wide fold basally, posterior margin in ventral view, with narrow and deep concavity medially. Lateral processes of aedeagus well sclerotized, with sharp apex, nearly reaching the margin of lateral split. Posterior lateral fold of aedeagus huge, oriented horizontally, covering more than half of aedeagus. Apex of aedeagus large, with short apical part.

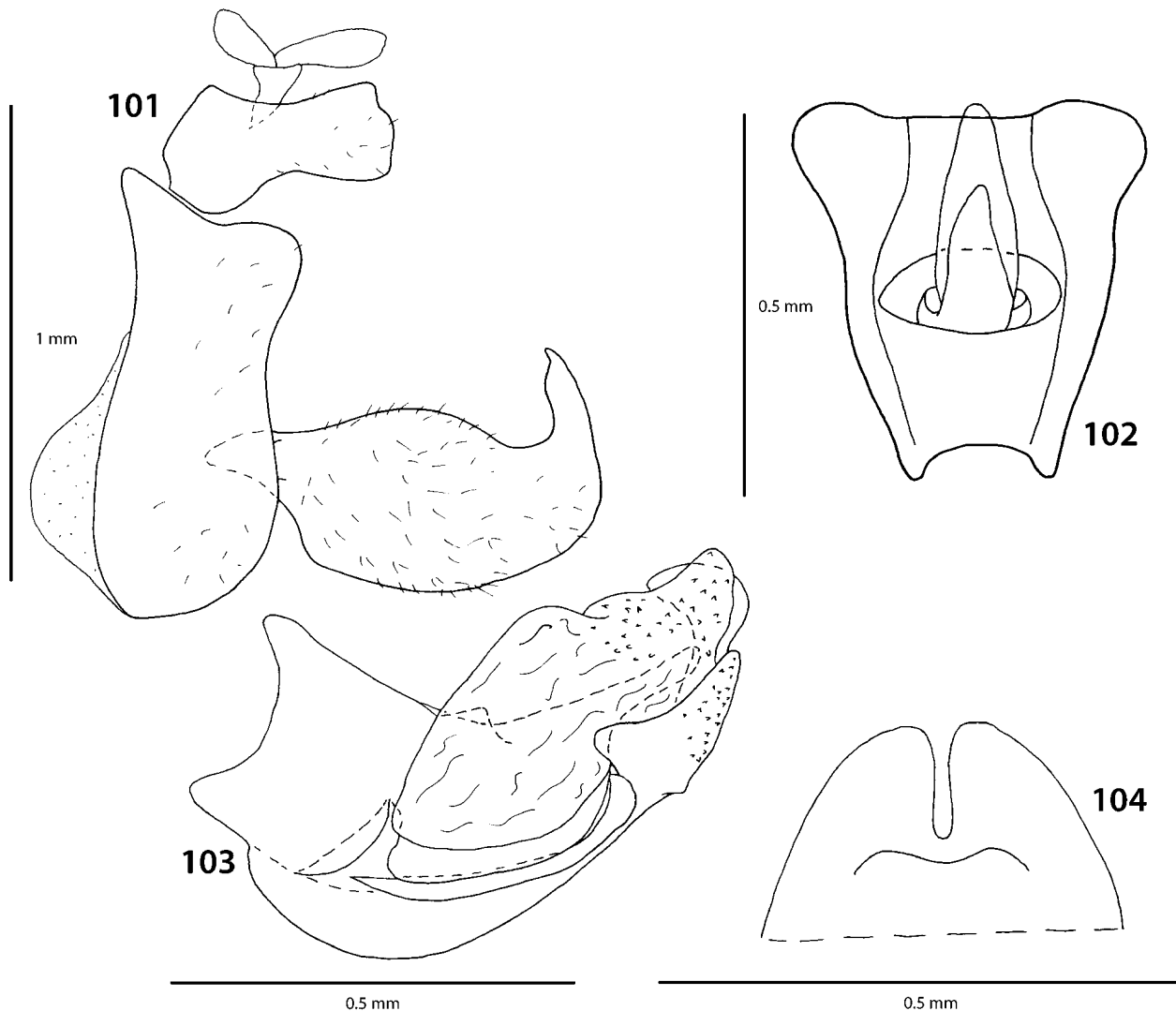
Female genitalia. Unknown.

Coloration. Frons dark brown, with dense yellow dots. Clypeus brown, with yellowish spots. Genae light yellow. Pedicel dark brown excluding light yellow apex. Vertex dark brown, with dense yellow dots and with light yellow posterior angles. Rostrum light brown yellowish, with dark brown apex. Pronotum light yellow excluding brown bands on paranotal lobes. Mesonotum with dark brown angles and light yellow central part. Tegmina brown, with vague light spots and dots. Wing transparent, with light or dark brown veins. Thorax light brown yellowish.

Pro- and mesocoxae brown. Pro- and mesofemora and tibiae dark brown, with yellow bands. Metafemora and metatibiae and tarsi light brown yellowish. Apices of spines black.

Type material. Holotype, ♂, [Antsigny N 63 km, Est Maintirano, forêt, VII-49 R.P., Inst. Scient. Madagascar], [Coll.R.I.Sc.N.B. Madagascar]—(IRSNB).

Distribution (Fig. 123). Madagascar: Mahajanga Province.



FIGURES 101–104. *Coniunctivena antsighniensis*, male. (101)—Genital capsule, lateral view; (102)—anal tube, dorsal view; (103)—phallic complex, lateral view; (104)—apical part of lower periandrium, ventral view.

***Coniunctivena montuosa* sp. nov.**

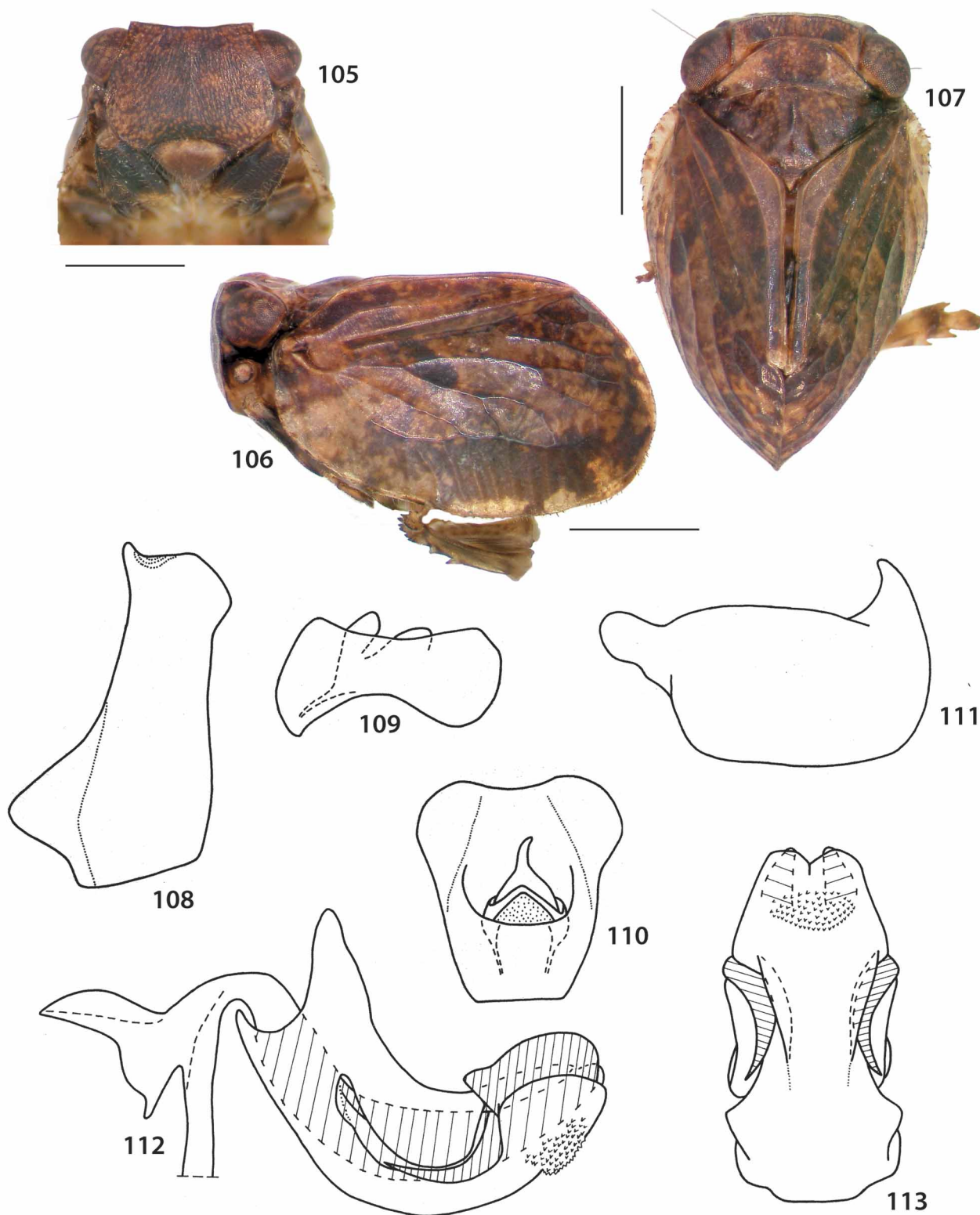
(Figs 105–113)

Etymology. *Montuosa*—Latin word refers to the type locality situated in mountains.

Diagnosis. The species differs from other species of the genus by the absence of the folds in dorsal and ventral margin of periandrium and the presence of the horizontal fold near the end of the lateral split.

Description. Total length. Male—3.7 mm.

Head. Vertex: proportion A/B = 6.0. Anterior margin arcuate, lateral margins almost straight and parallel; posterior margin conave, with similar curvature like anterior margin; posterior margin elevated, keel-shaped. Frons: proportion C/E = 1.07; proportion D/E = 1.54. Upper margin almost straight; median carina well visible, almost reaching frontoclypeal suture; lateral carinae a little surpassing its middle; frontal disc weakly convex in comparison to other species of the genus. Clypeus: almost flat medially, frontoclypeal suture distinctly arcuate.



FIGURES 105–113. *Coniunctivena montuosa*, male. (105)—Frontal view; (106)—body, lateral view; (107)—same, dorsal view; (108)—pygofer, lateral view, (109)—anal tube, lateral view; (110)—same, dorsal view; (111)—genital style, lateral view; (112)—phallic complex, lateral view, (113)—same, dorsal view.

Thorax. Pronotum: proportion F/B = 2.2. Anterior margin distinctly arcuate; posterior margin weakly concaved medially; anterior margin weakly elevated, keel-shaped, medially and laterally. Mesonotum: proportion G/F+B = 1.56, proportion G/H = 0.54. Tegmina: proportion I/J = 1.78. Left tegmina with MA branches curved to Sc+R in the male holotype. Right tegmina with a normal M.

Male genitalia (Figs 108–113). *Genital capsule* (Figs 108–111). Anal tube in lateral view massive, median portion distinctly narrower than apical and basal portions; lower margin distinctly concaved; apical part massive and enlarged. Anal tube in dorsal view, elongate and calyciform, basal margin straight, lateral margins shallowly sinusoidal, postero-lateral angles enlarged and rounded, posterior margin weakly concaved medially. Pygofer: postero-dorsal angle with small, wide and blunt process.

Phallic complex (Figs 112–113). Perianthrium: dorsal margin without fold; medio-lateral lobe of dorsal perianthrium distinctly longer than height, lower margin arcuate; latero-basal part of perianthrium with horizontal fold near the end of lateral split; ventral margin of perianthrium without folds; posterior margin with small, well visible concavity medially in ventral view. Aedeagus: lateral processes well sclerotized, with sharp apex, not surpassing the margin of the lateral split. Posterior lateral fold of aedeagus large, oriented horizontally, covering about 1/3 of aedeagus length. Apex of aedeagus small and rounded.

Female genitalia. Unknown.

Coloration (Figs 105–107). Frons, vertex, pronotum medially, and mesonotum dark brown, with dense yellow dots. Postclypeus brown anteriorly, with yellow band close to the frontoclypeal suture and dark brown or black laterally. Anteclypeus brown. Genae black above antenna and light brown under antenna. Pedicel dark brown or black, excluding light brown apex. Rostrum light brown yellowish, with dark brown apex. Paradiscal fields of pronotum with light brown yellowish bands. Tegmina brown, with large dark brown spots, especially with long spot between costa and radius. Thorax, coxae and trochanters light brown yellowish. Pro- and mesofemora and tibiae dark brown or black, excluding light brown yellowish places of their articulation. Metafemora and metatibiae brown yellowish. Apices of spines black. Abdominal sternites brown yellowish.

Type material. Holotype, ♂, [Andohahejo, 1800 m, R.P], [Coll. R.I.Sc.N.B. Madagascar]—[IRSNB].

Distribution (Fig. 123). Madagascar: Toliar Province.

Coniunctivena synavei sp. nov.

(Figs 114–123)

Etymology. This species is named after famous Belgian entomologist Henri Synave who made a great contribution to the knowledge of Fulgoromorpha.

Diagnosis. The species is distinguished by the following features: postero-dorsal angle of pygofer with sharp and distinctly elongate process, fold in dorsal margin of perianthrium large and oriented almost apically, lateral process of aedeagus membranous basally, latero-posterior fold of aedeagus small, triangular and oriented dorsally.

Description. Total length. Male—3.8 mm.

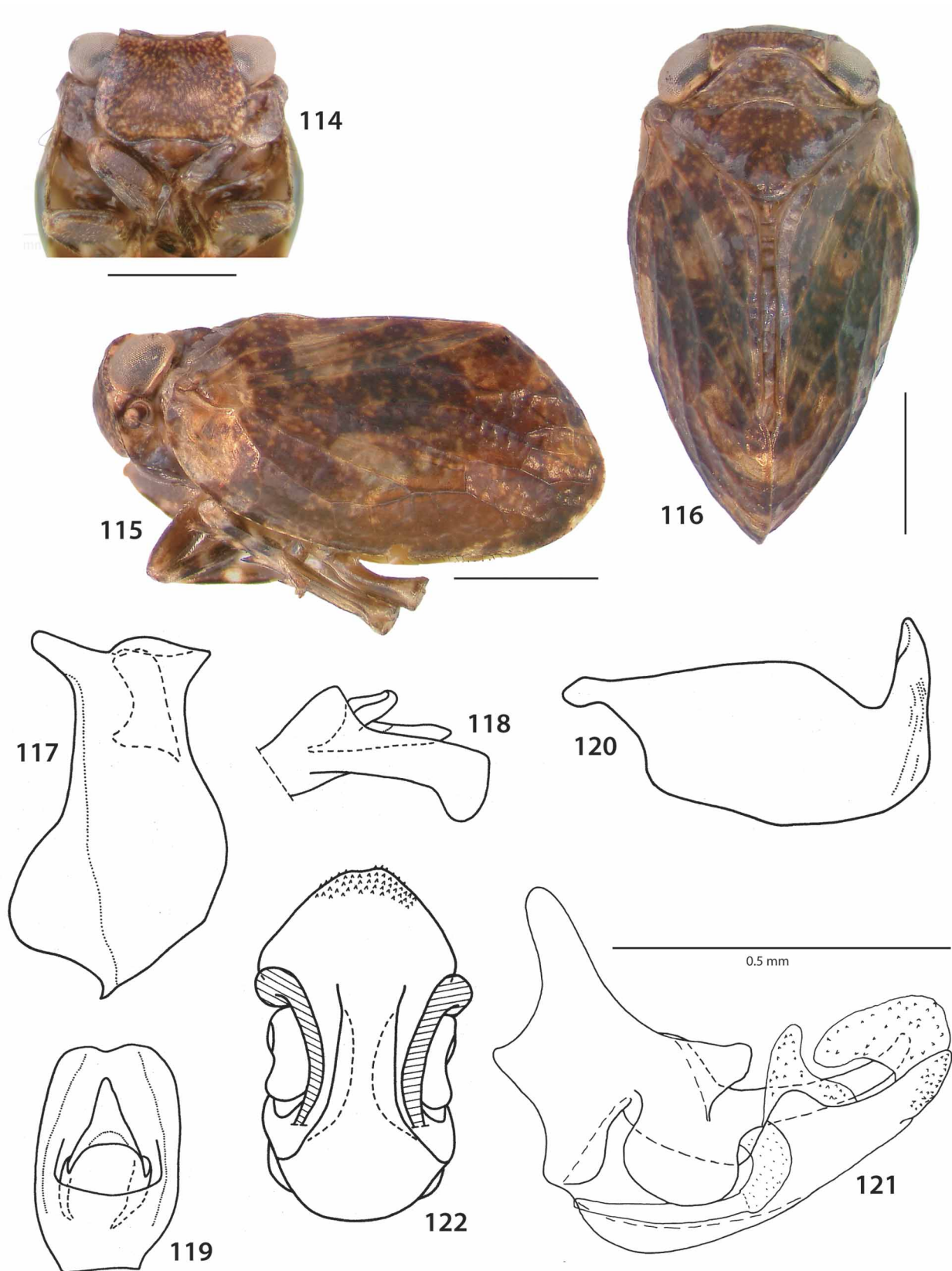
Head. Vertex: proportion A/B = 4.83; anterior margin almost straight; lateral margins almost straight and parallel each to other, posterior margin elevated, keel-shaped, distinctly concaved laterally and partly straight medially. Frons: proportion C/E = 1.05; proportion D/E = 1.5; upper margin shallowly concaved; median carina reaching almost to frontoclypeal suture, lateral carinae reaching nearly its middle; frontoclypeal suture widely and shallowly arcuate. Clypeus in median portion almost straight.

Thorax. Pronotum: proportion F/B = 2.0; anterior margin strongly convex, with partly flattened median portion; posterior margin almost straight or weakly concaved in median portion; anterior margin elevated, keel-shaped, especially in lateral portions. Mesonotum: proportion G/F+B = 1.85, proportion G/H = 0.59. Tegmina: proportion I/J = 1.75.

Male genitalia (Figs 117–122). *Genital capsule.* Anal tube in lateral view lower margin in median portion straight; apical part distinctly enlarged and rounded; in dorsal view elongate and subrectangular; basal, lateral and posterior margins almost straight; the later weakly concaved medially. Pygofer: postero-dorsal angle with sharp and distinctly elongate process.

Phallic complex. Perianthrium under the dorsal margin with large triangular and distinctly visible fold oriented almost apically; median lateral lobe of dorsal perianthrium about as long as wide, partly rounded; latero-basal part with a vertical fold bearing concavity; ventral margin with 2 folds small and long and wide; posterior margin with weakly visible concavity medially in ventral view. Lateral processes of aedeagus membranous basally and well sclerotized distally, narrowing apically, with blunt apex reaching the margin of lateral split. Posterior lateral fold of aedeagus small and narrow, oriented vertically. Apex of aedeagus large, with elongated apical part.

Female genitalia. Unknown.



FIGURES 114–122. *Coniunctivena synavei*, male. (114)—Frontal view; (115)—body, lateral view; (116)—same, dorsal view; (117)—pygofer, lateral view; (118)—anal tube, lateral view; (119)—same, dorsal view; (120)—genital style, lateral view; (121)—phallic complex, dorsal view; (122)—same, lateral view.

Coloration (Figs 114–116). Frons, vertex, pronotum, and mesonotum dark brown, with more or less dense yellowish dots. Pedicel dark brown. Clypeus brown anteriorly and dark brown laterally. Rostrum light brown yellowish, with dark brown apex. Tegmina brown, with large yellow basal patch and a few large rounded spots and dots. Wings matte, with light brown veins. Legs brown or dark brown, with light yellow bands. Apices of spines black. Abdominal sclerites light brown or brown.

Type material. Holotype, ♂: [Madagascar Maj., Amborovy, 29.VI.58, F. Keiser], [H. Synave det.195 Issidae]—(NMB).

Distribution (Fig. 123). Madagascar: Mahajanga Province.

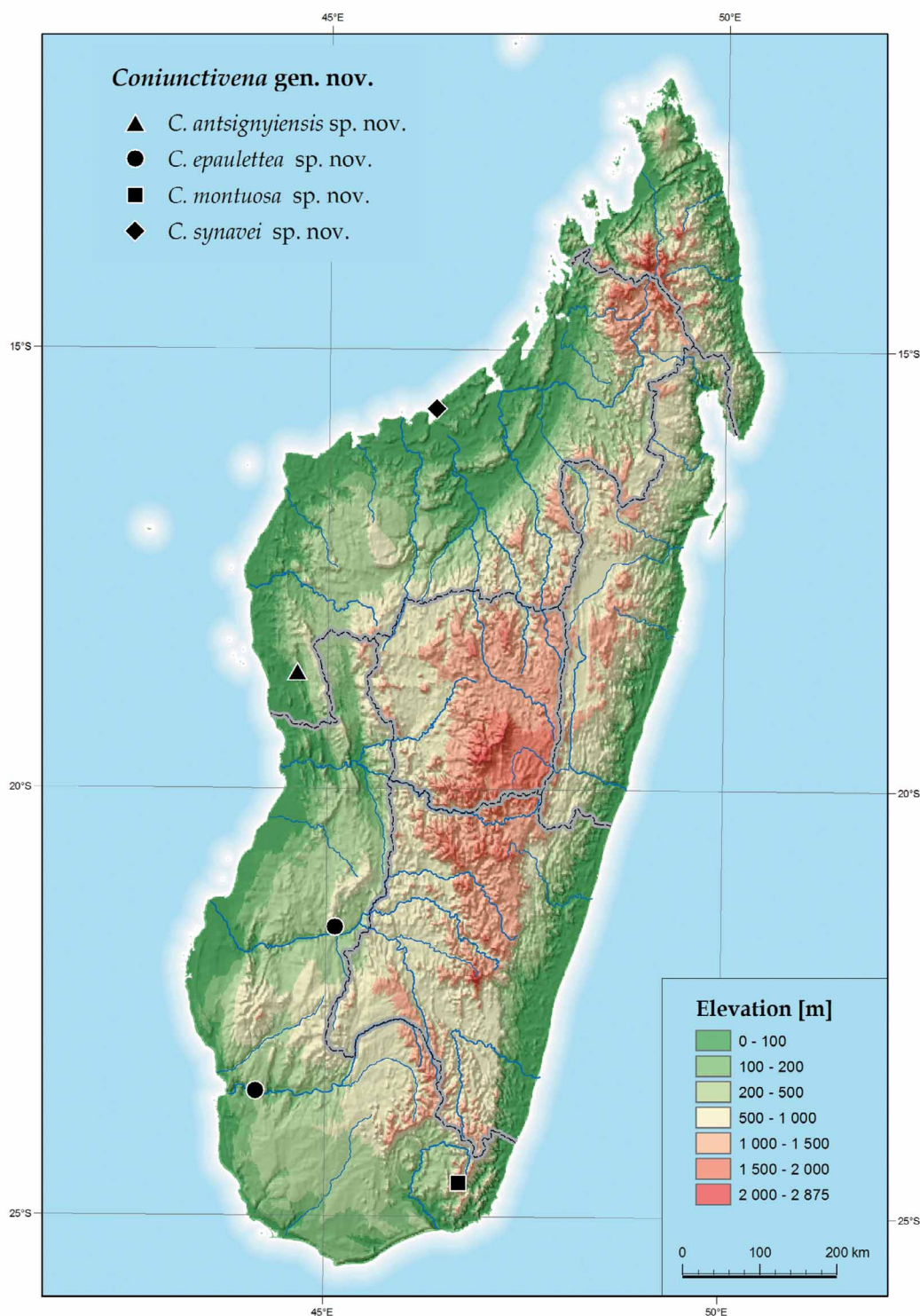


FIGURE 123. Distribution map of genus *Coniunctivena*.

Nasatus gen. nov.

(Figs 124–189)

Type species. *Nasatus sparsus* sp. nov., here designated.

Etymology. The Latin name refers to the elevated lower part of frons, especially well visible in lateral view, which looks like a nose. Gender masculine.

Diagnosis. Very similar to *Cyamosa* gen. nov. but differs by the following characters: frons at lower part elevated (in *Cyamosa* frons flat), triangular eminence on the mesonotum with transverse carinae (in *Cyamosa* without carinae); posterior part of male anal tube narrower than base (in *Cyamosa* posterior part wider than base of anal tube).

Description. Head with compound eyes, in dorsal view about as wide as mesonotum.

Head. Vertex transverse, distinctly wider than long in mid line, with all margins well carinated; anterior margin almost straight or weakly arcuate, lateral margins almost straight and parallel; posterior margin distinctly concave, with elevated, keel-shaped margin; disc of vertex without median carina.

Frons at upper margin weakly concave, and as wide or weakly wider than high in mid line, widest at lower part above the clypeus. Lateral margins strongly convex, keel-shaped, almost cover pedicel in anterior view, not incised near the ocelli, in lower part distinctly curved to frontoclypeal suture. Frontal disc with well visible median carina, reaching frontoclypeal suture; extremely weakly visible lateral carinae reaching about the half of its length, separated basally; disc distinctly rugose vertically and covered by very short and thick hairs; frontal disc shallowly convex at lower part and especially along the median carina at lower part, in lateral view it looks like a nose, disc of frons is deeply concaved near the frontoclypeal suture. Compound eyes rounded with very small callus at lower margin. Ocelli present. Pedicel short with microsetae and a 2–3 rows (from anterior part) of plate organs present at its upper portion. Frontoclypeal suture widely and shallowly arcuate.

Clypeus distinctly narrower than frons, without median carina, and covered by hairs, median portion of clypeus delicately convex. Rostrum with apical segment about twice as short as subapical one, its apex nearly reaching hind coxae.

Thorax. Pronotum distinctly longer in mid line than vertex; anterior margin widely arcuate and partly flattened, in lateral portion partly elevated (keel-shaped); posterior margin in median portion weakly concave; disc of pronotum with median carina and two lateral impressions; antero-median portion of disc concave, posterior part elevated.

Mesonotum triangular, distinctly longer in mid line than combined length of vertex and pronotum; median carina well visible, almost reaching scutellum; lateral carinae connected with median carina, keel-shaped and arcuate, reaching its posterior margin; anterolateral carinae absent; disc of mesonotum in the posterior part with elongate triangular eminence, posterior part of eminence strongly declivous before scutellum and limited from the anterior part by the transverse carinae.

Tegmina coriaceous, partly convex and ovoid-shaped with well visible and ‘massive’ venation, with short hairs on the veins; costal margin distinctly curved and bearing tuberculated setae; posterior margin strongly curved, with breaking point at upper half; anterior angle broadly rounded, situated a little distad to claval angle, apex of clavus claw-shaped. Costal area of the tegmina narrow, of nearly same width throughout its whole length, with simple and relatively sparsely placed transverse veinlets; apex of costal area ending a little before claval angle; costal cell distinctly wider than costal area, with numerous transverse veinlets and branches of Sc vein. Basal cell elongate; Sc+R leaving basal cell with very short common stem, Sc+RA distinctly multifurcate and curved to costal area; M vein forked distinctly distad than Sc+R; Cu stem longer than M stem; transverse veinlets very dense, forming a dense net of irregular cells; pseudonodal or full nodal lines absent; apical part without a row of apical cells; transverse veinlets present between CuP and Pcu. Claval veins Pcu and A¹ fused distinctly after half of their length, transverse veinlets distinctly present between CuP-Pcu and Pcu+A₁-CuP; a few transverse veinlets between Pcu and A₁.

Hind wings as long as tegmina, without precostal cell and with rudimentary anal lobe. Radius bifurcate distally, median bi- or tetrafurcated distally, cubitus anterior tri- or tetrafurcated distally, 2 transverse veinlets: *r-m*, *m-cu* present, cubitus posterior and postcubitus are fused in one vein, first anal simple.

Pro- and mesofemora partly laterally flattened, and distinctly wider than tibiae, elliptic in cross section. Pro- and metatibiae more or less square in cross section. Metatibia about twice as long as metafemur, delicately flattened and widened apically, with 2 lateral spines distally, apical teeth of similar size arranged in an irregular line;

basitarsomere about as long as cumulative length of second and hind tarsomere, with a row of apical teeth nearly equal in size (lateral ones larger) arranged in arcuate line. Metatibiotarsal formula 2/7/10–11.

Male genitalia. *Genital capsule.* Anal tube in lateral view elongate, tapering apicad, distinctly surpassing posterior margin of pygofer; base of anal tube wider than posterior part. Anal tube in dorsal view elongate and subrectangular, basal margin straight or concave, posterior margin deeply concave; anal opening placed distinctly before half of length, at about 1/3. Pygofer narrow in lateral view, with distinctly blunt process at postero-dorsal angle. Gonostyles in lateral view distinctly longer than wide, bearing distinct spine-like capitulum at the end of dorsal margin; lower margin weakly arcuate, without visible incises; margin at caudo-dorsal angle widely rounded and not surpassing the posterior margin of process; upper margin weakly arcuate, below upper process more or less concave.

Phallic complex. Periandrium with a long lateral split surpassing half of its length and reaching about 2/3 of length; dorsal part of periandrium not elevated basally and without extra structures; dorsal margin with single long and narrow fold at basal part, apex of dorsal periandrium slightly orientated dorsally, median lateral fold of dorsal periandrium weakly visible very narrow, wide and smooth. Periandrium at lateral basal part with or without fold concavities; apex of ventral part of periandrium slightly extending apex of dorsal one; lower margin with long and distinctly visible fold; posteriorly without additional structures, in ventral view with small concavity in its median portion; apical parts of ventral periandrium with small spiniferous microsculptures. Aedeagus with two lateral processes. Each process with single apex, narrow, smooth and sclerotized; lower process oriented more or less straight or weakly curved; the posterior process oriented apically, strongly re-oriented basally at about half of its length. The base of the processes situated after the posterior margin of lateral lobe of the periandrium dorsal part. Aedeagus: posterior lateral fold single, small and membranous without dentate margins. Apex of aedeagus small, blunt, oriented dorsally.

Female genitalia. Sternite VII with well developed lateral lobes; anterior margin shallowly concaved, posterior margin in median portion distinctly convex. Anal tube in lateral view longer than height, a little surpassing tergite IX but not surpassing the half of upper margin of gonoplac; basal part wider than posterior part. Anal tube in dorsal view subrectangular, posterior margin concave; lateral margins shallowly arcuate, with breaking point after half of its length; anal opening a little before half of its length. Gonoplac unilobate, laterally flattened, posterior margin with full row of well developed teeth, situated at about 45° in respect to longitudinal axis of the body, posterior ventral part partly membranous. Gonapophysis VIII partly laterally flattened; dorsal margin shallowly concave with sharp apex and well visible teeth at the postero-dorsal margin. Gonapophyses IX and gopsculum bridge as in figs 42, 43. Bursa copulatrix with two pouches connected by a short ductus; first pouch larger than second one; wall of first pouch with cells-like sclerotized ornamentations mostly situated at lower part of pouch; second pouch membranous without cell-like imprints. Ornamentations of first pouch of bursa copulatrix with central sclerotized area with single, sharp and high spinacle and group of small petals. Spermatheca well developed; *ductus receptaculi* as a wrinkled ductus, shorter than *diverticulum ductus*; *diverticulum ductus* as a long and smooth basal ductus and membranous bulba apically.

Distribution. Madagascar: Antananarivo and Toamasina Provinces.

Key to the species of *Nasatus*

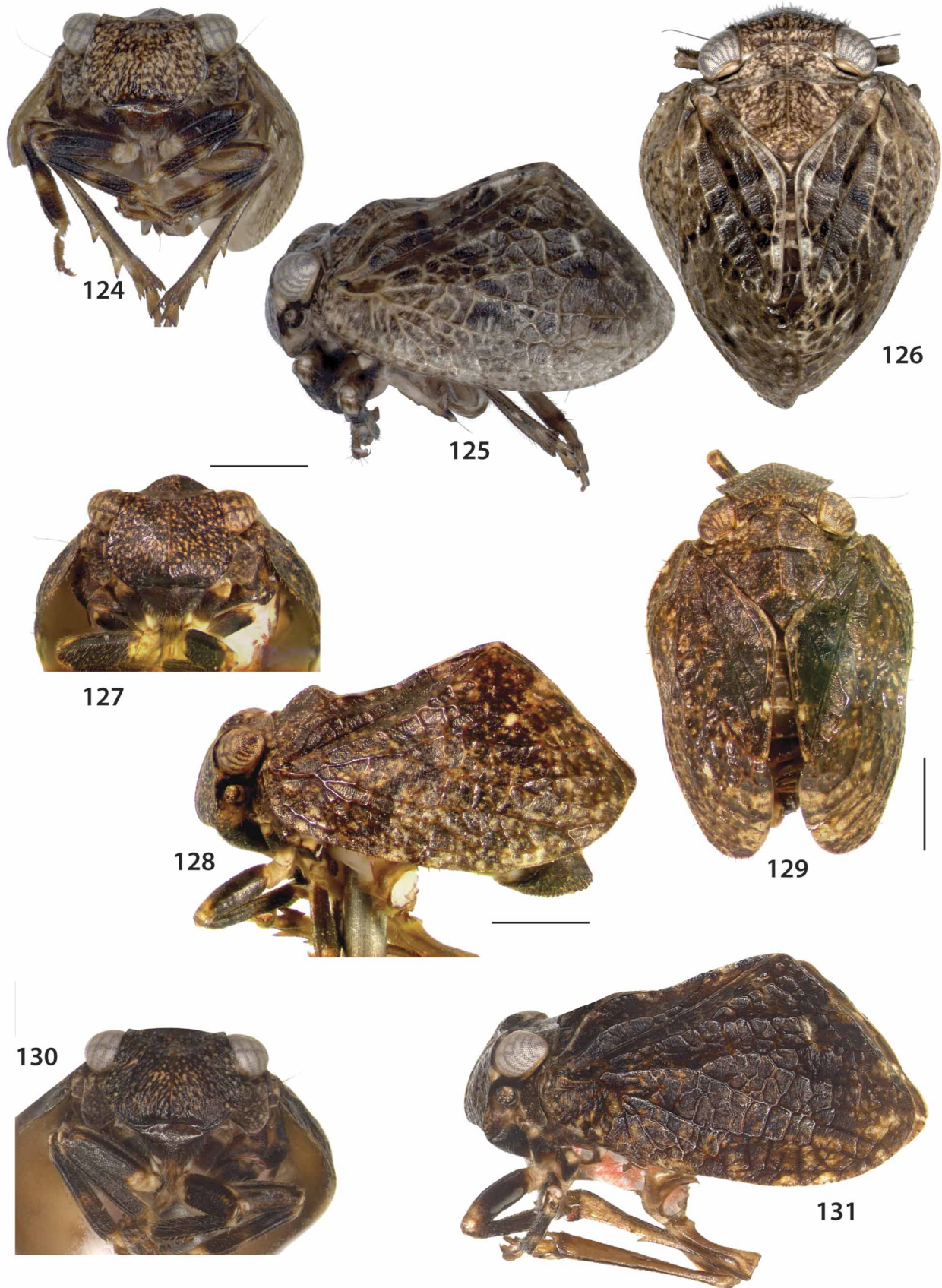
1. Male: latero-basal part of periandrium with long and narrow fold oriented apically, lower process of aedeagus extending the lateral split of periandrium, and distinctly longer than upper one in lateral view. Female: lateral lobes of pregenital sternite without lateral incision; median portion of posterior margin convex, with small depression/hollow on the top. *N. sparsus* sp. nov.
- Male: latero-basal part of periandrium without any extra structures, lower process of aedeagus short, not extending the lateral split of periandrium, and nearly as long as upper process in lateral view. Female: lateral lobes of pregenital sternite with lateral incision; median portion of posterior margin convex with partly flattened or sharp apex *N. davidouvrardi* sp. nov.

Nasatus sparsus sp. nov.

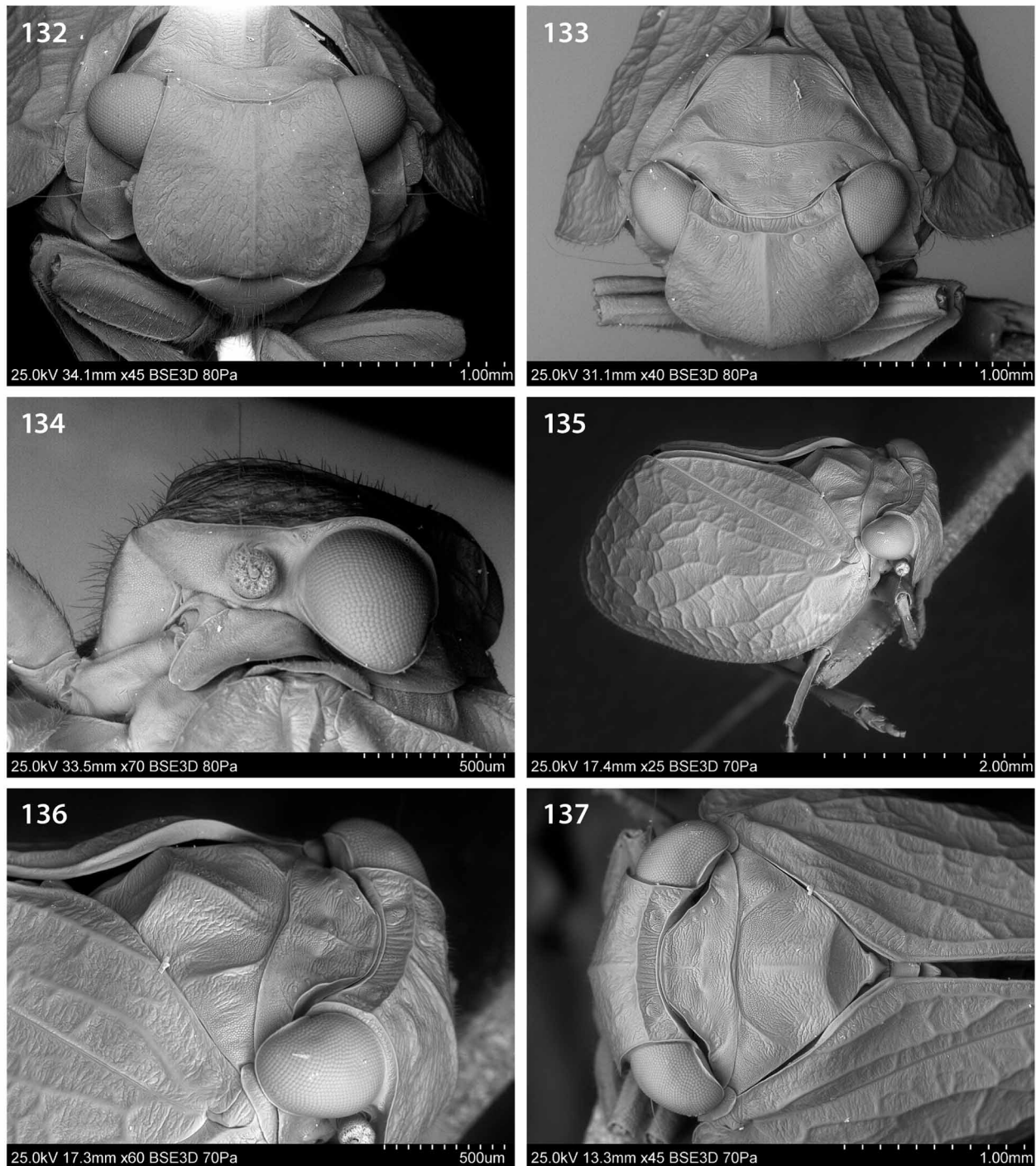
(Figs 124–131, 132, 134, 142–145, 148–151, 154–166, 189)

Etymology. The Latin “sparsus” (scattered, spread) refers to the coloration of the frons of the species.

Diagnosis. As mentioned in the key.



FIGURES 124–131. *Nasatus sparsus*. (124–126)—Holotype, male [CASENT 8107324], (127–131) female [127–129 CASENT 3001086, 130–131 CASENT 8107383]. (124, 127, 130)—Frontal view; (125, 128, 131)—body, lateral view; (126, 129)—same, dorsal view.



FIGURES 132–137. (132, 134) *Nasatus sparsus*. [CASENT 8107383], (133, 135–136) *Nasatus davidouvrardi*. [RN4 entre Antananarivo]. (132)—Frontal view; (133)—anterior part of the body, antero-dorsal view; (134)—head, lateral view; (135)—body, lateral view; (136)—anterior part of the body, latero-dorsal view; (137)—same, dorsal view.

Description. Total length 3.5–4.5 mm.

Head. Vertex: proportion A/B = 6.75–8.33. Frons: proportion C/E = 1.00–1.14; proportion D/E = 1.43–1.72.

Thorax. Pronotum: proportion F/B = 2.71–3.00. Mesonotum: proportion G/F+B = 1.88–2.17 proportion G/H = 0.60–0.69. Tegmina: proportion I/J = 1.48–1.78.

Male genitalia (Figs 158–159). *Genital capsule*. In dorsal view, basal margin of anal tube straight.

Phallic complex. Periandrium: dorsal margin basally with elongate triangular fold; latero-basal part of periandrium with long and narrow fold oriented apically. Aedeagus: lower process extending the lateral split of periandrium, distinctly longer than upper process in lateral view; apex of upper process straight.

Female genitalia (Figs 161–166). Median portion of anal tube anterior margin shallowly convex in dorsal view. Sternite VII: lateral lobes elongate, rounded, without lateral incision; median portion of posterior margin convex and with small hollow on the top. Spermatheca: *diverticulum ductus* shorter than in *N. davidouvrardi*, bulba rounded apically.

Coloration (Figs 124–131). Frons, vertex, pronotum, and scutellum black with light yellow dots. Postclypeus black. Anteclypeus light yellow. Tegmina dark brown or black with small light yellow spots and dots. Pro- and mesotrochanters black excluding basal and apical parts. Pro- and mesotibiae black. Pro- and mesofemora black excluding basal parts. Pro- and mesotarsi and hind legs brown. Abdominal male tergites from dark brown to black, with a narrow yellow band near the posterior margin; sternites brown from light to dark with yellowish patches, genital capsule yellowish with weakly brown patches. Gonoplac black with yellow posterior margin.

Type material. Holotype, ♂: [Madagaskar: Province Antananarivo, 46 km NE of Ankazobe: Ambohilantely 18° 11.88' S, 47° 16.89'E 29 Nov–6 Dec 2003], [California Acad of Sciences coll: M. Irwin, R Harin'Hala malaise trap—in sclerophyl forest elev 700m MA-27-08], [CASENT 8107324]—(CAS).

Paratypes: 3 ♀♀: [first label as holotype], [CASENT 8107383]—(CAS); [CASENT 3000443 Madagascar: Antananarivo Rés. Spéciale d'Ambohitantely, 20.9 km NE d'Ankazobe,], [18° 13'31"S, 47°17'13"13E, 1410m, 17–22 April 2001, B. Fisher, C. Griswold, et al., BLF3693]—(CAS); [Madagascar: province d'Antananarivo, Réserve Spéciale d'Ambohitantely Forêt d'Ambohitantely], [20.9 km 72° NE d'Ankazobe, 1410m 17–22 April 2001, 18° 13'31"S, 47°17'13"E], [coll. Fisher, Griswold, et al., beating low veg. in montane rainforest, code BLF3695], [CASENT 3001086]—(ZIN).

Distribution (Fig. 189). Madagascar: Antananarivo Province.

Nasatus davidouvrardi sp. nov.

(Figs 133, 135–136, 138–141, 146–147, 152–153, 168–189)

Etymology. The species is named after Dr David Ouvrard (MNHN, Paris, France).

Diagnosis. As mentioned in the key.

Description. Total length 3.5–4.4 mm.

Head. Vertex: proportion A/B = 8.00–8.46. Frons: proportion C/E = 1.00–1.14; proportion D/E = 1.42–1.72.

Thorax. Pronotum: proportion F/B = 2.66–3.66. Mesonotum: proportion G/F+B = 1.72–2.00 proportion G/H = 0.53–0.64. Tegmina: proportion I/J = 1.46–1.72.

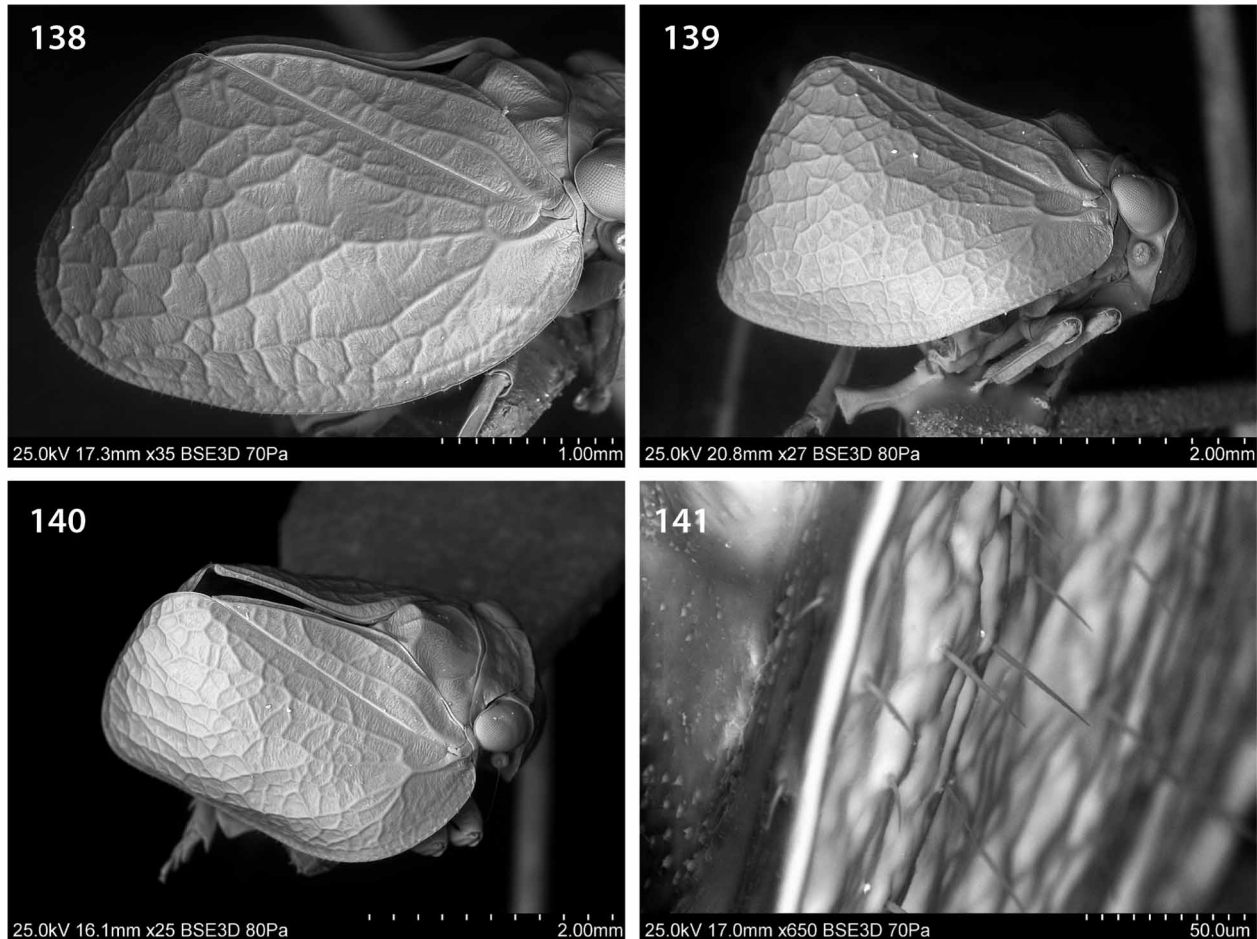
Male genitalia. (Figs 181–186). *Genital capsule*. Anal tube in dorsal view with basal margin concave.

Phallic complex. Periandrium: dorsal margin at basal part with elongate narrow fold; latero-basal part of periandrium without any structure. Aedeagus: lower process short not extending the lateral split of periandrium; in lateral view nearly as long as upper process; apex of upper process curved and sharp (distinctly visible in the holotype and weakly visible in other males).

Female genitalia (Figs 187–188). Sternite VII: lateral lobes elongately rounded, with lateral incision; median portion of posterior margin convex, with partly flattened or sharp apex in specimens from Lac Alaotra. Anal tube in dorsal view with anterior margin almost straight in median portion. Spermatheca: *diverticulum ductus* longer than in *N. sparsus*, bulba with egg-shaped apex.

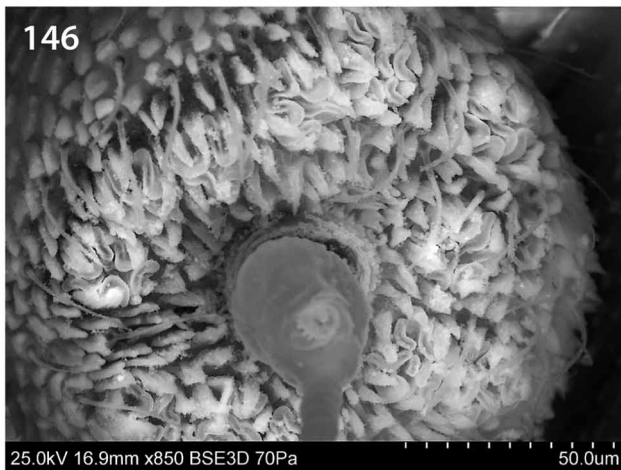
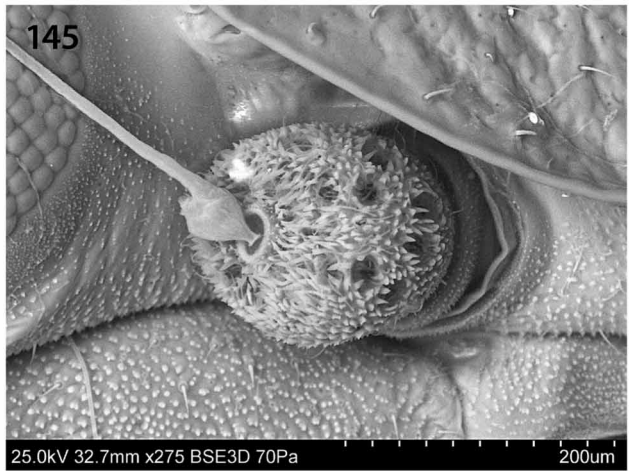
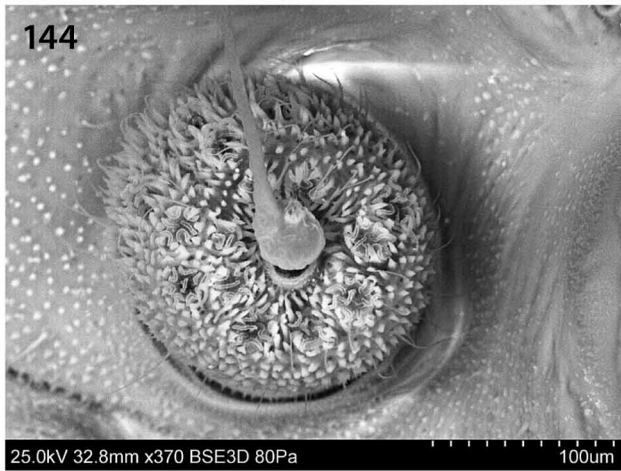
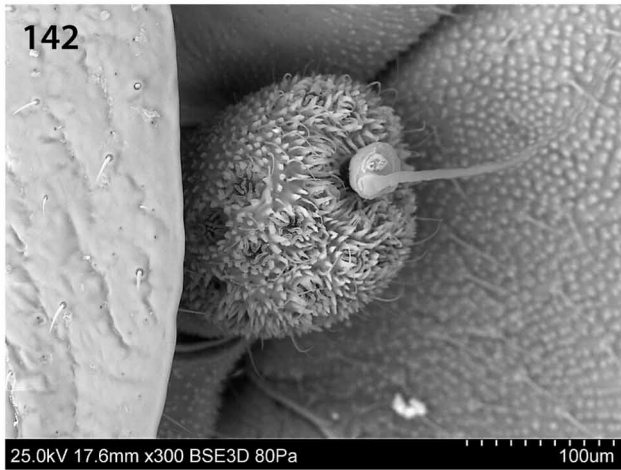
Coloration (Figs 168–180). General coloration light brown yellowish. Head, pronotum, and scutellum with dense dark brown dots. Fore wings with rare small dark brown spots or each wing with a large semicircular black spot at its base on costal margin or with just 1–2 small black spots. Fore wings may be also entirely dark brown without dots or spots. Postclypeus dark brown laterally. Apex of post- and anteclypeus light brown yellowish. Apex of rostrum dark brown. Pro- and meso- trochanters, femora and tibiae brown or dark brown with light spots. Apices of teeth and spines black. Hind wing light gray. Male: abdomen dark brown, anal tube yellow-brown, posterior-apical process yellow. The females from Moramanga are paler (probably the specimens are weatherstained), excluding dark brown band and spots of fore wings, postclypeus, pro and metathoracic legs.

Type material. Holotype, ♂: [Madagascar, RN4 entre Antananarivo et Mahajanga, forêt galerie de plateaux, près Mahatsinjo, 17°52.869'S 47°04.684'E, 1500 m, 08.XI.2005, Th. Bourgoïn, A. Soulier-Perkins, D. Ouvrard & M. Attié]—(MNHN); Paratypes: 2♂♂, 4♀♀: [2♀♀ with labels as in holotype]—(MNHN); [Madagascar, Tam., Moramanga 13.5 km S, 18.XII.57, F. Keiser]—(1♀, NMB); [Madagascar, Tam., Moramanga 13.5 km S, 20.XII.57, F. Keiser]—(1♀, ZIN); [Madagascar, Tam., Moramanga, 20.XII.57, F. Keiser]—(1♂, NMB); [La Mandraka, XII.51, (?N.S. H. Kranss)], [Coll.R.I.Sc.N.B. Madagascar]—(1♂, IRSNB); [Madagascar, Region du Lac Alaotra, Roselières pres d'Ambohitsilaozana, 771 m, S17.37.833 E48.30.060, 22.XI.2005, T. Bourgoïn, A. Soulier-Perkins, D. Ouvrard, M. Attié leg.]—(1♀, MNHN).

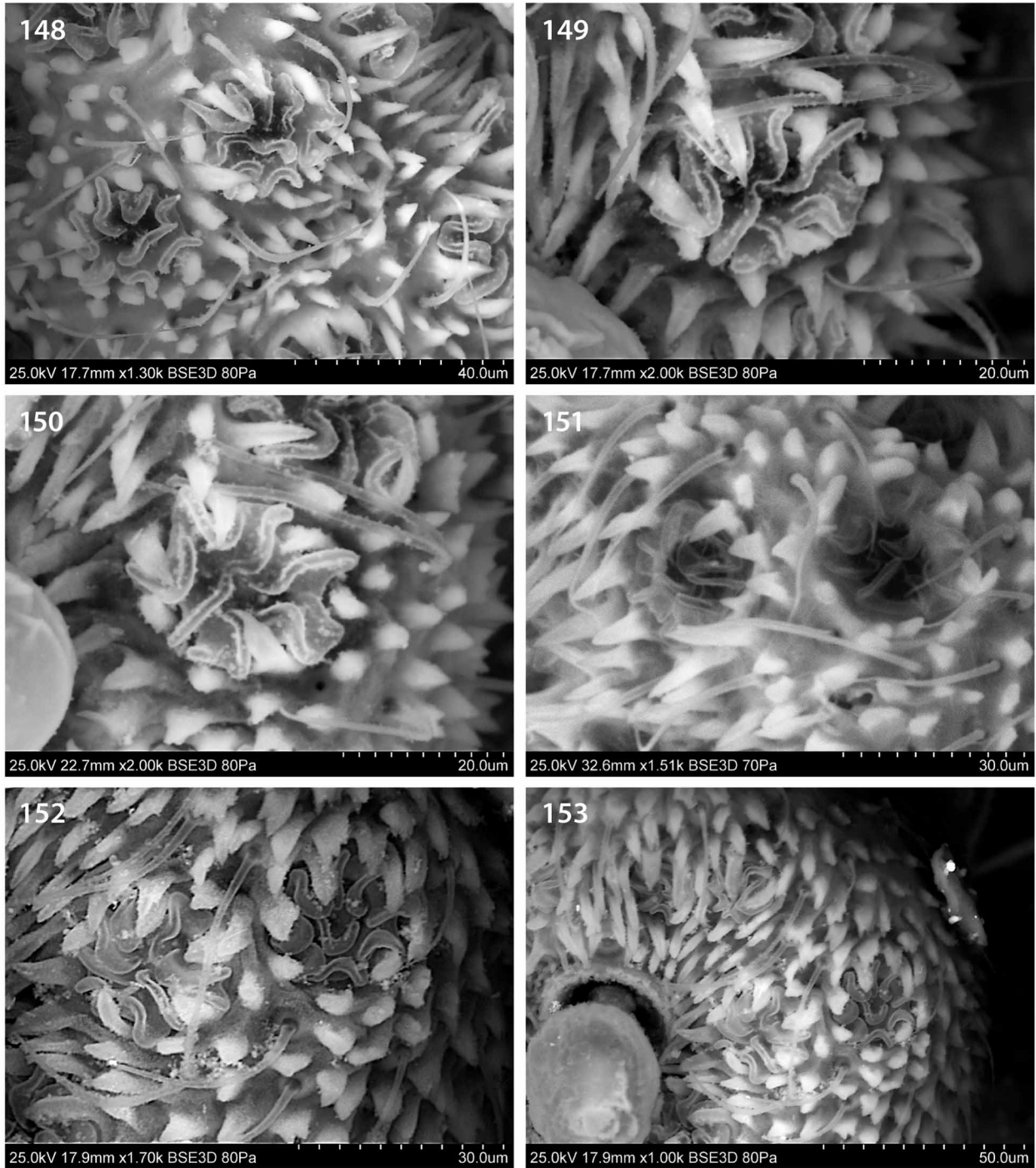


FIGURES 138–141. *Nasatus davidowvardi*. [RN4 entre Antananarivo]. (138–140)—Body, lateral view; (141)—setae on tegmina surface.

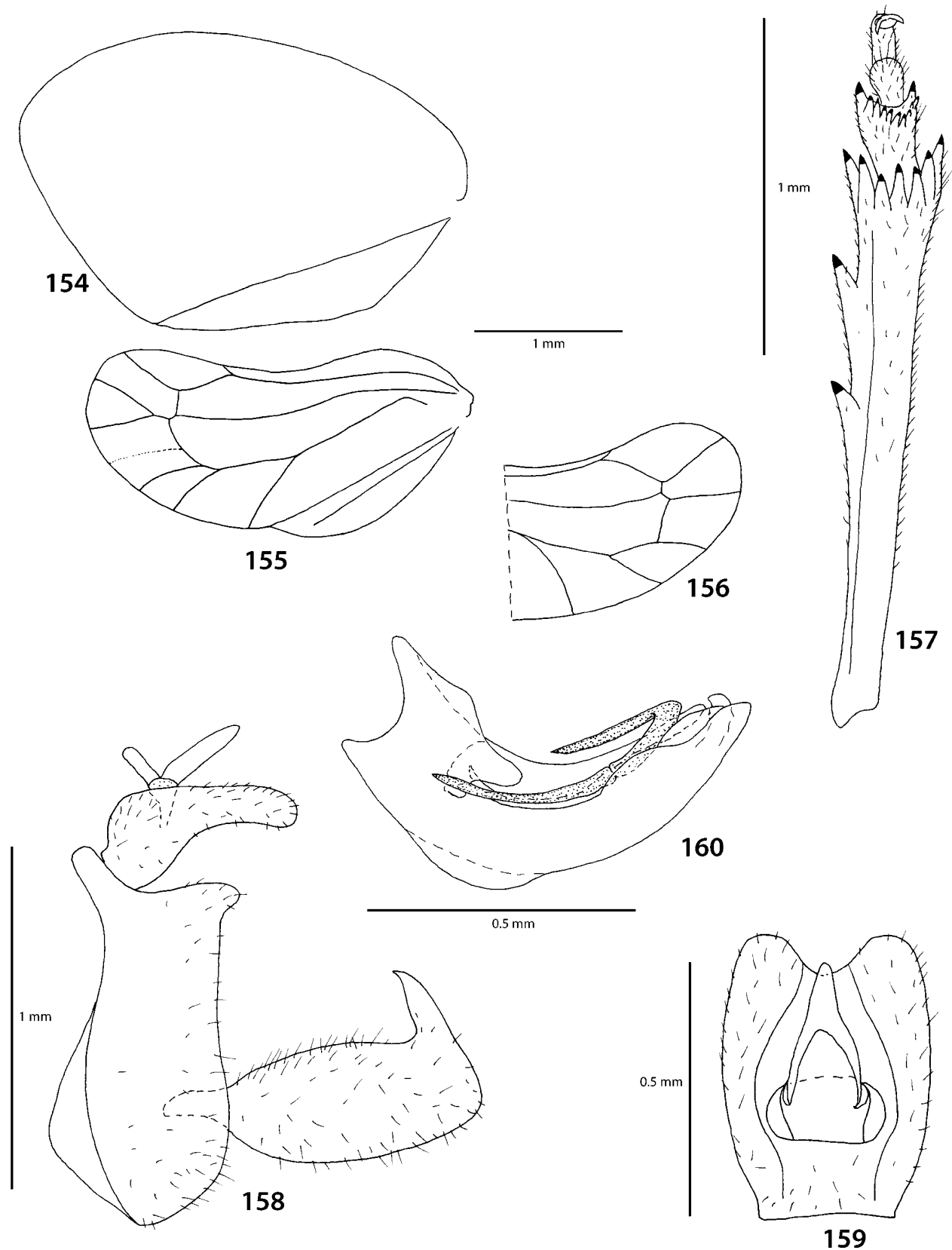
Distribution (Fig. 189). Madagascar: Antananarivo and Toamasina Provinces.



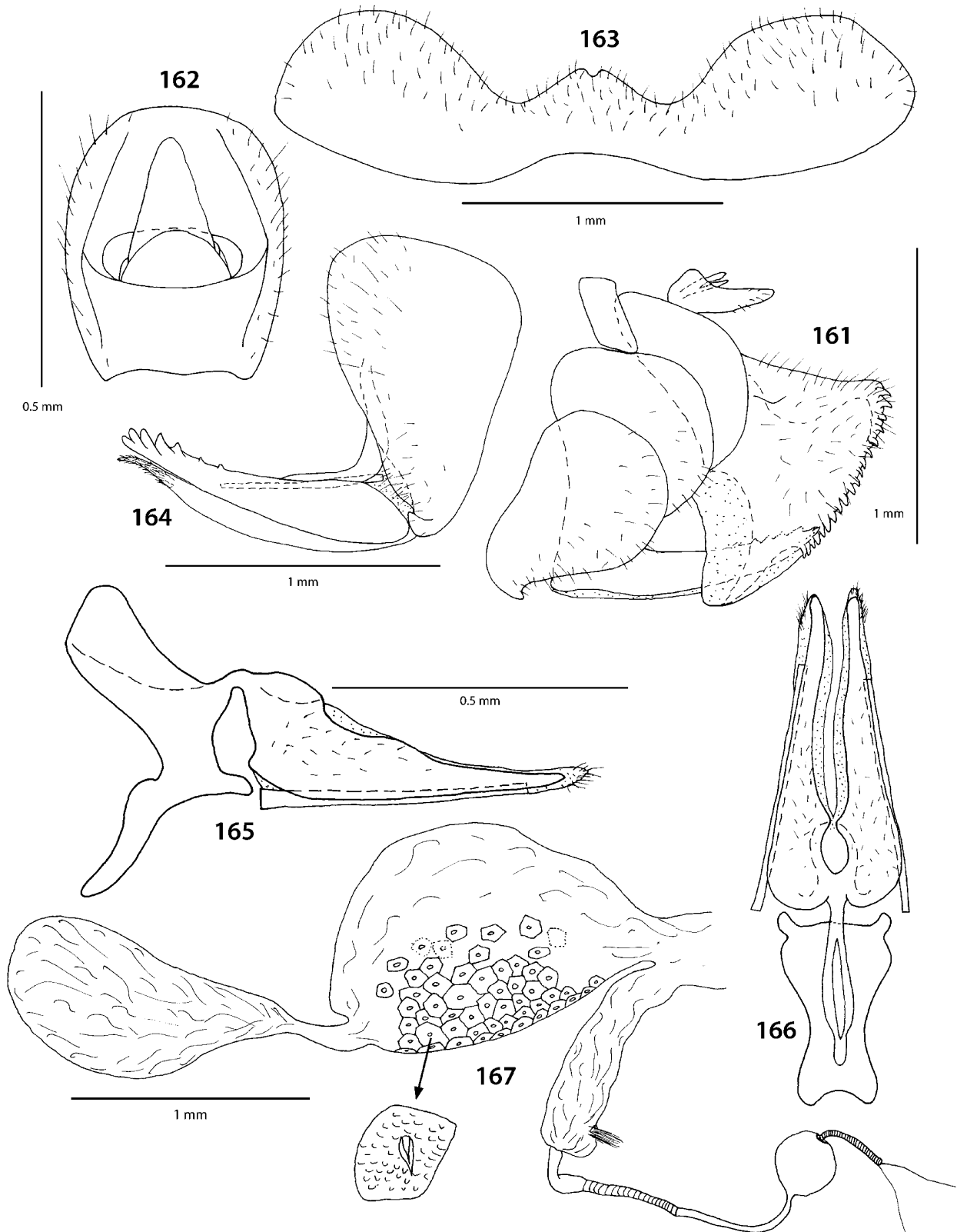
FIGURES 142–147. Antenna. (142–145) *Nasatus sparsus*. [CASENT 8107383]; (146–147) *Nasatus davidouvrardi*. [RN4 entre Antananarivo].



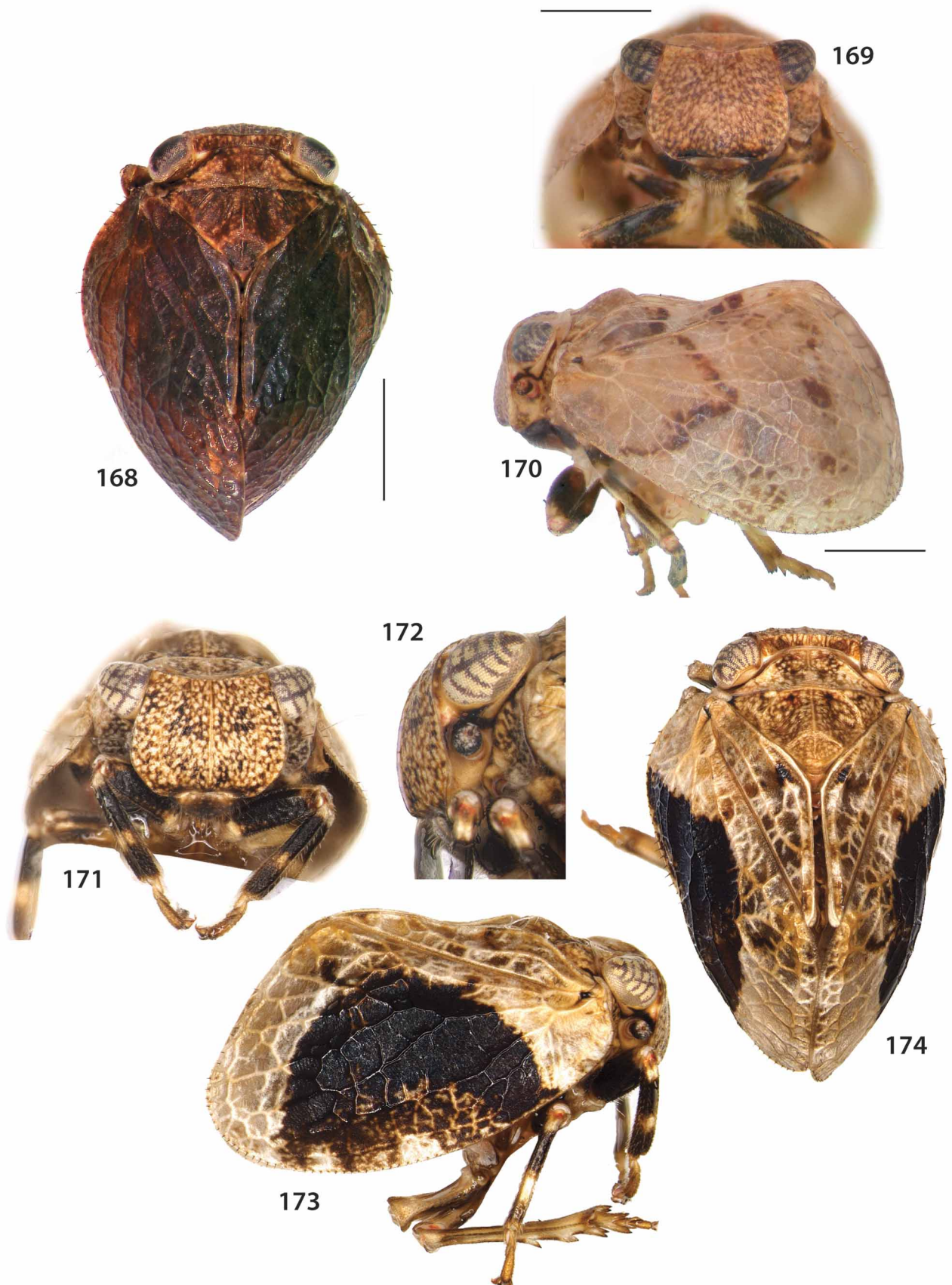
FIGURES 148–153. Antennal plate organs. (148–151) *Nasatus sparsus*. [CASENT 8107383]; (152–153) *Nasatus davidouvrardi*. [RN4 entre Antananarivo].



FIGURES 154–160. *Nasatus sparsus*, male. (154)—Left tegmina; (155)—left wing; (156)—apical part of right wing; (157)—hind leg, ventral view; (158)—genital capsule, lateral view; (159)—anal tube, dorsal view; (160)—phallic complex, lateral view.



FIGURES 161–166. *Nasatus sparsus*, female. (161)—Genital capsule, lateral view; (162)—anal tube, dorsal view; (163)—pregenital sternit, flattened; (164)—gonapophysis VIII, lateral view; (165)—gonapophyses IX and gonospiculum bridge, lateral view; (166)—same, dorsal view; (167)—genital ducts, lateral view.



FIGURES 168–174. *Nasatus davidouvrardi*. (168) Male, holotype; (169–174) females (paratypes), specimens from “RN4 entre Antananarivo et Mahajanga”.



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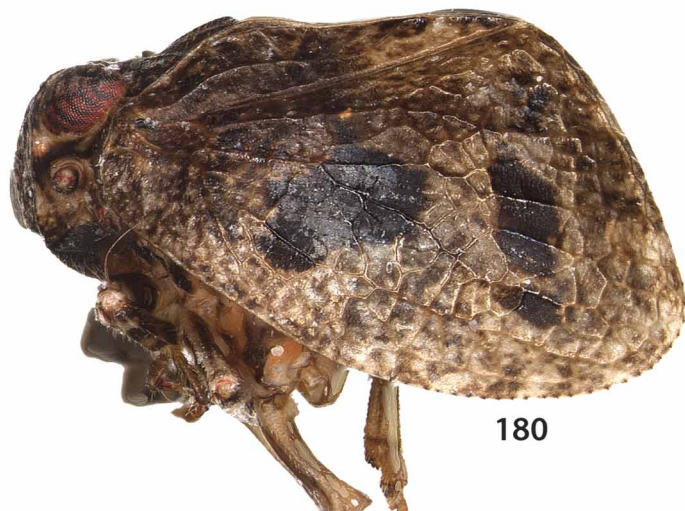
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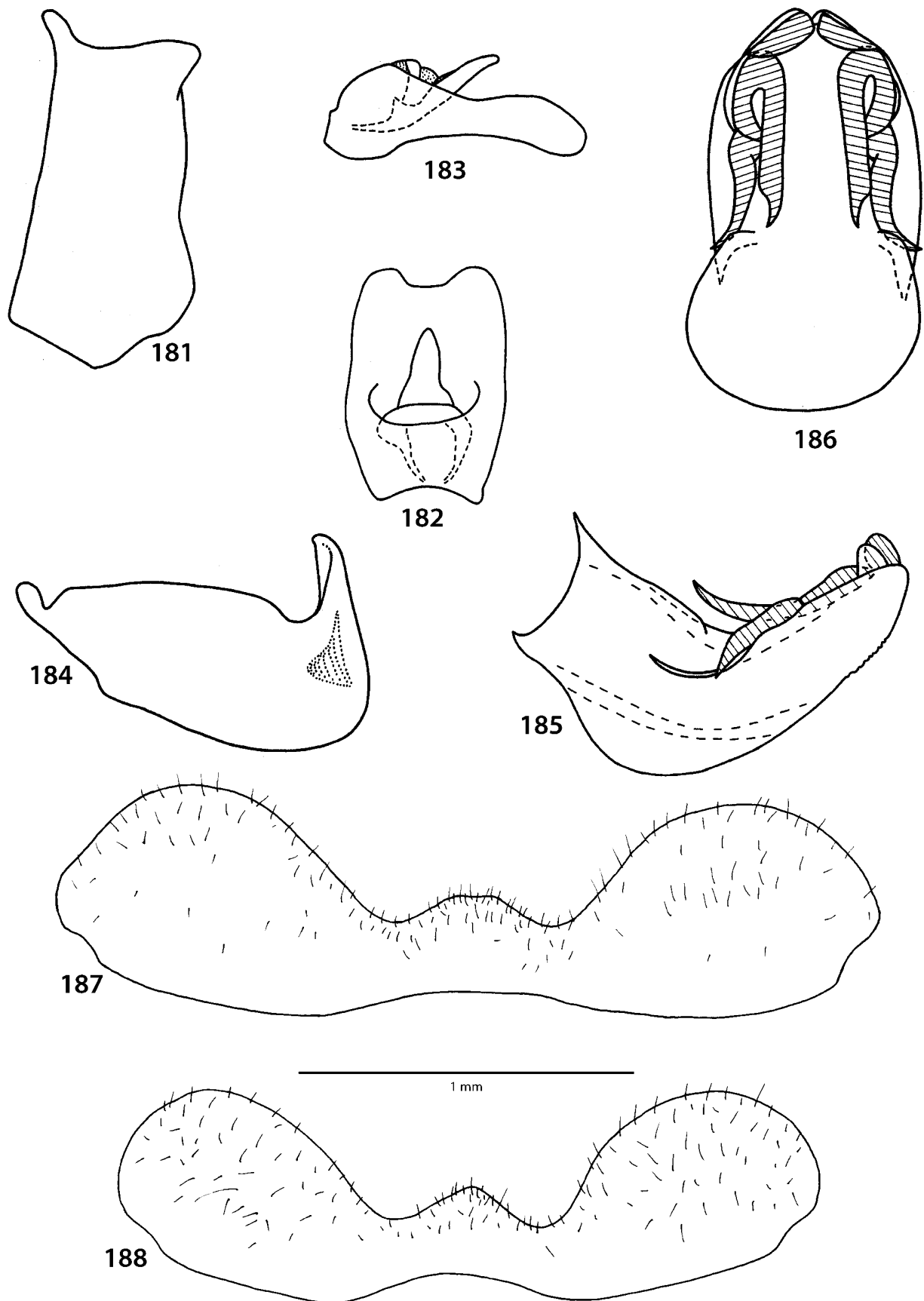


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FIGURES 175–180. *Nasatus davidouvrardi*, female. (175–176) Specimen from “RN4 entre Antananarivo et Mahajanga”; (179–180) specimen from “Region du Lac Alaotra”.



FIGURES 181–188. *Nasatus davidouvrardi*. (181–186) Male, (187–188) female. (181)—Pygofer, lateral view; (182)—anal tube, lateral view; (183)—same, dorsal view; (184)—genital style, lateral view; (185)—phallic complex, lateral view; (186)—same, dorsal view; (187–188)—pregenital sternite, flattened.

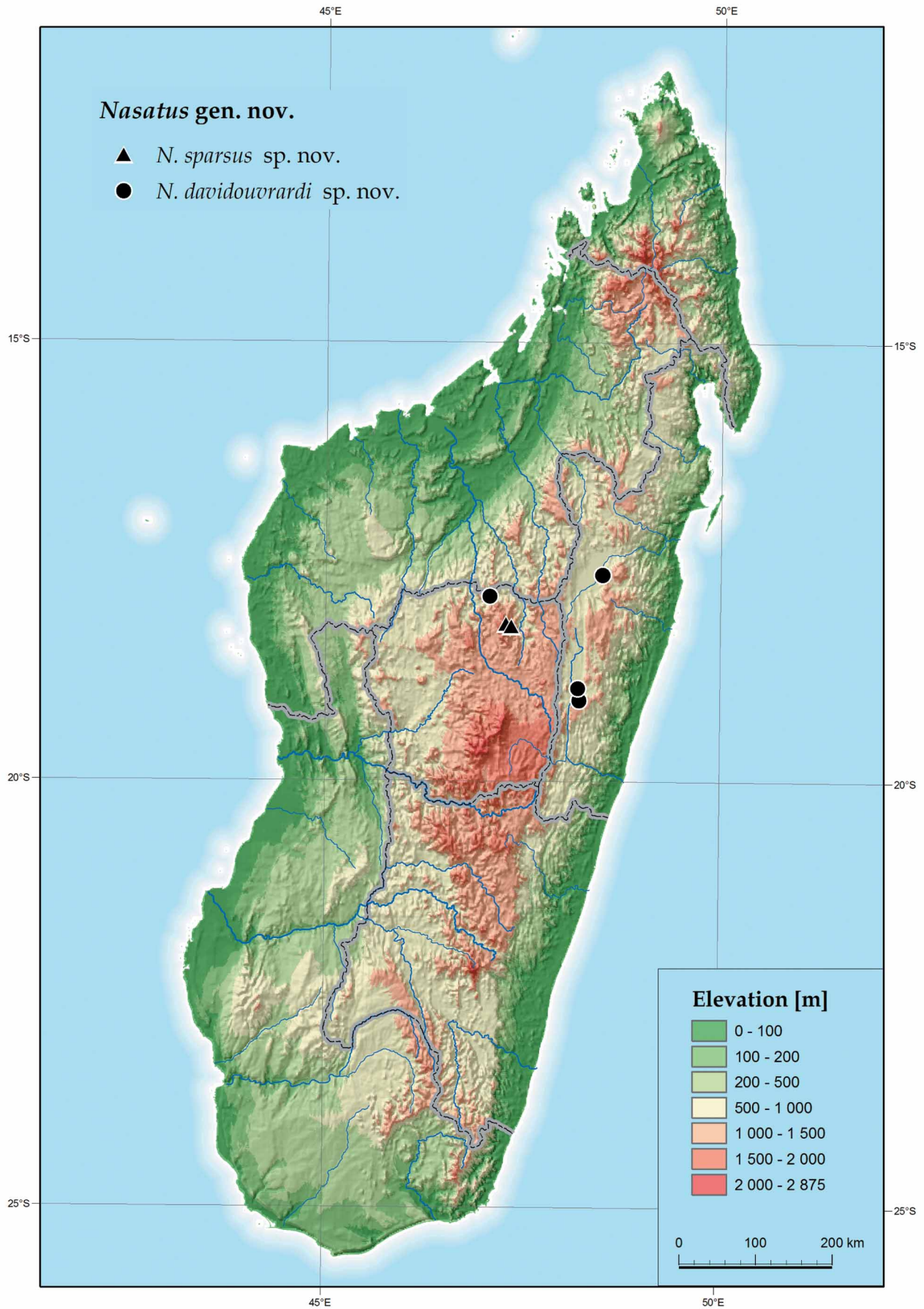


FIGURE 189. Distribution map of genus *Nasatus*.

***Cyamosa* gen. nov.**

(Figs 190–252)

Type species. *Cyamosa camelouca* sp. nov., here designated.

Etymology. The Latin “cyamosa” (bean) refers to the general shape of the body. Gender feminine.

Diagnosis. Very similar to *Nasatus* gen. nov. but differs by the following characters: frons at lower part flat (in *Nasatus* frons elevated), triangular eminence on mesonotum without transverse carinae (in *Nasatus* with carinae); posterior part of male anal tube (in lateral view) wider than its basal part (in *Nasatus* posterior part of anal tube narrower than basal part).

Description. Head with compound eyes in dorsal view slightly wider than mesonotum.

Head (Figs 190–201, 226–227, 235–236, 243–244). Vertex transverse, distinctly wider than long in mid line, with all margins well carinated; anterior margin weakly arcuate with more or less flattened median portion; lateral margins almost straight and parallel each to other; posterior margin distinctly arcuate and elevated, posterior margin elevated, keel-shaped; disc of vertex without median carina.

Frons at upper margin straight, and as wide or slightly wider than high in mid line, widest at lower part. Lateral margins strongly convex, keel-shaped, almost cover pedicel in anterior view, not incised near the ocelli, in lower part distinctly toward the frontoclypeal suture. Frontal disc with well visible median carina and visible lateral carinae reaching the $\frac{3}{4}$ of frons, carinae separated basally, disc distinctly rugose vertically and covered by very short and thick hairs; frontal disc almost flat, concave near the frontoclypeal suture. Compound eyes rounded with very small callus at lower margin. Ocelli present. Pedicel short, plate organs present in its apical part (Figs 210–225). Frontoclypeal suture widely and shallowly arcuate.

Clypeus distinctly narrower than frons, without median carina, covered by hairs, median portion of clypeus delicately convex. Rostrum with apical segment about twice as short as subapical one, its apex nearly reaching metacoxae.

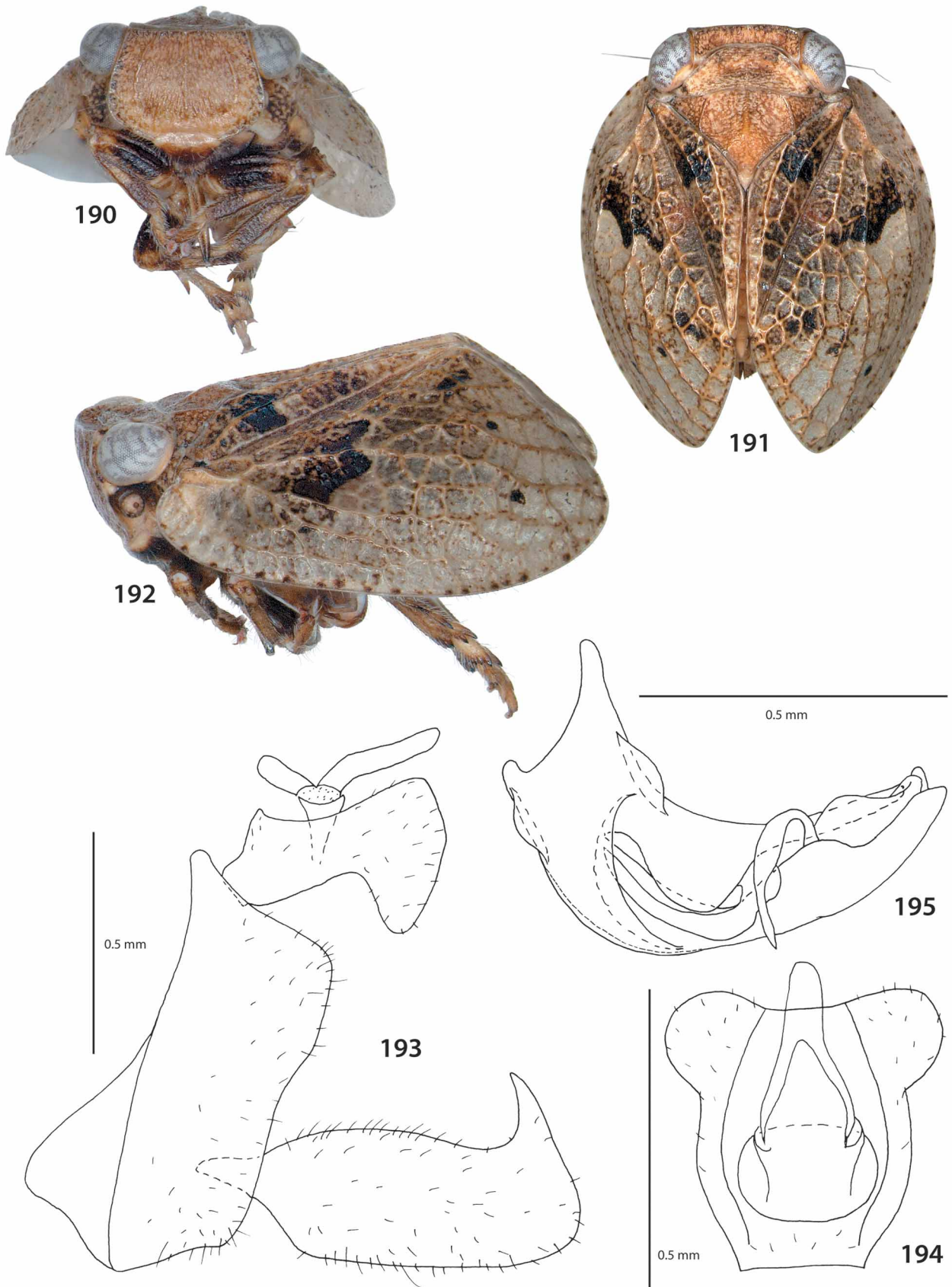
Thorax (Figs 191–192, 196–199, 227, 236, 244). Pronotum distinctly longer in mid line than vertex; disc of pronotum distinctly transversely wrinkled, with a median carina weakly visible in some specimens and two lateral impressions; median portion of the disc distinctly concave near the impression. Anterior margin widely arcuate, with partly flattened median portion and small concavity in central part; posterior margin widely and shallowly concave.

Mesonotum triangular, distinctly longer in mid line than combined length of vertex and pronotum; median carina well visible; lateral carinae arcuate and elevated reaching posterior margin; anterolateral carinae absent; disc of mesonotum in the posterior part with elongate triangular eminence, posterior part of eminence strongly declivous before scutellum and not limited by the transverse carinae.

Tegmina (Figs 191–192, 204–208, 227–228), 236–237, 244–245) subcoriaceous, partly convex and ovoid-shaped with well visible and strong venation; costal margin distinctly curved; posterior margin strongly curved with breaking point at upper half; anterior angle broadly rounded, placed a little distad to claval angle, apex of clavus claw-shaped. Costal area of the tegmina narrow, about the same width throughout its whole length, with simple and relatively sparse transverse veinlets, nearly reaching claval angle level; costal cell distinctly wider than costal area, with numerous transverse veinlets and branches of Sc vein. Basal cell elongate; Sc+R leaving basal cell with a very short common stem, Sc+RA distinctly multiforked; M vein forked distinctly distad than Sc+R; Cu stem a little longer than M stem; transverse veinlets numerous, forming a dense net of irregular cells; pseudonodal or nodal lines absent; apical part without a row of apical cells; transverse veinlets present between CuP and Pcu. Claval veins Pcu and A₁ fused distinctly after half of their length, transverse veinlets distinctly present.

Wings (Fig. 209) reduced or as long as abdomen, without precostal cell. In well developed wing, R bifurcated distally, M bi- or tetrafurcated distally, CuA tri- or tetrafurcated distally, CuP and PCu fused in one vein, A₁ simple; 2 transverse veinlets *r-m* and *m-cu* present.

Pro- and mesofemora partly laterally flattened, nearly as long as tibiae. Pro- and metatibiae square in cross section. Metatibia (Figs 202–203) longer than metafemur, delicately flattened and widened apically, with 2 lateral spines distally, apical teeth of equal size arranged in irregular line; basitarsomere nearly as long as second and third tarsomeres, with a row of apical teeth nearly equal in size (lateral teeth are larger) arranged in asymmetrical arcuate line. Metatibiotarsal formula 2/7/9–10.



FIGURES 190–195. *Cyamosa camelouca*, holotype, male. (190)—Frontal view; (191)—body, dorsal view; (192)—same, lateral view; (193)—genital capsule, lateral view; (194)—anal tube, dorsal view; (195)—phallic complex, lateral view.

Male genitalia (Figs 193–195, 229–233, 238–242, 246–251). *Genital capsule*. Anal tube in lateral view massive, distinctly surpassing posterior margin of pygofer; posterior part of anal tube distinctly larger with a ventral lobe; in dorsal view distinctly widest posteriorly, basal margin almost straight or weakly concave; lateral margins weakly arcuate, distinctly curved posteriorly; with large latero-apical projections; posterior margin in median portion more or less concave. Anal opening situated distinctly before half of median length reaching about 1/3 of its length. Pygofer narrow in lateral view with postero-dorsal angle blunt, without process, posterior margin at upper part more protruding than lower part. Upper margin of pygofer perpendicular to posterior margin. Gonostyles in lateral view distinctly longer than wide, bearing distinct spine-like capitulum at the end of dorsal margin; lower margin almost straight; hind margin at caudo-dorsal angle widely rounded and not surpassing the posterior margin of process; upper margin weakly arcuate; below the upper process weakly concaved.

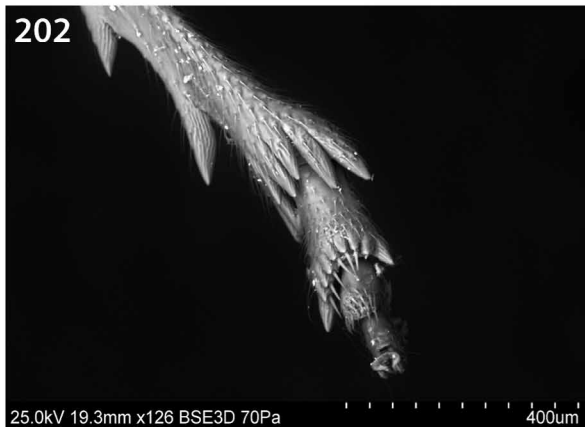
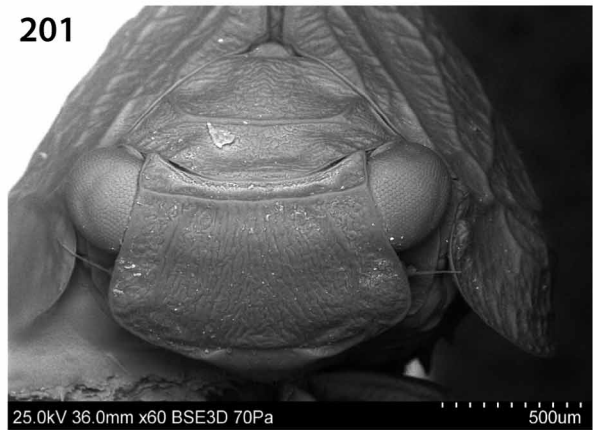
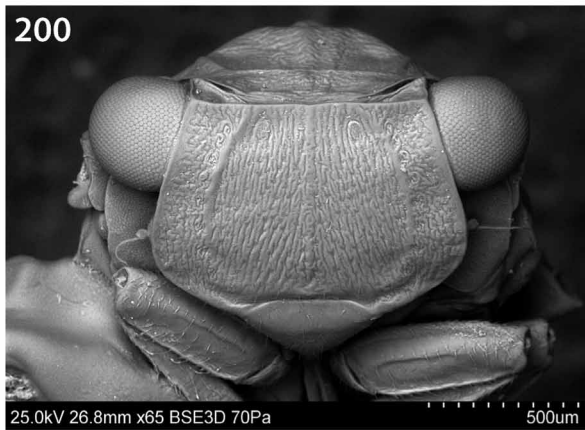
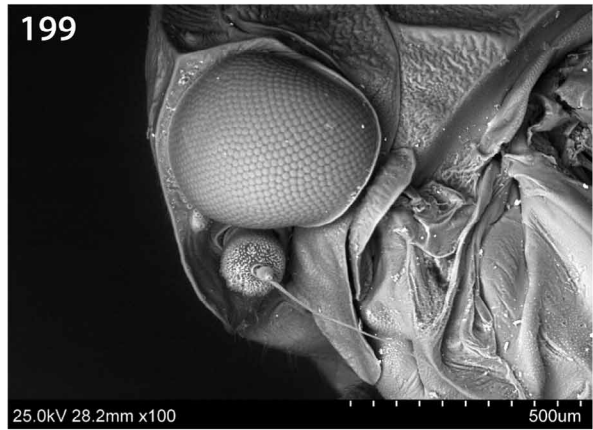
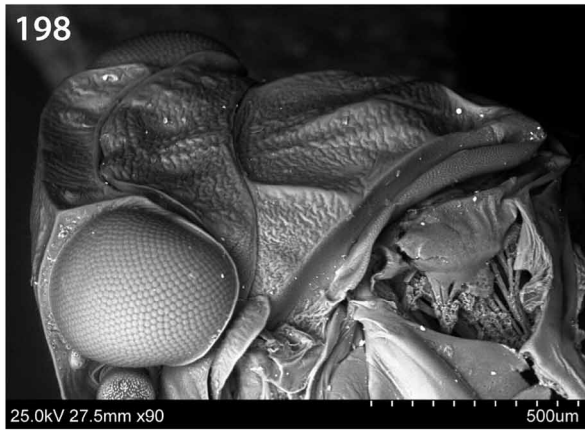
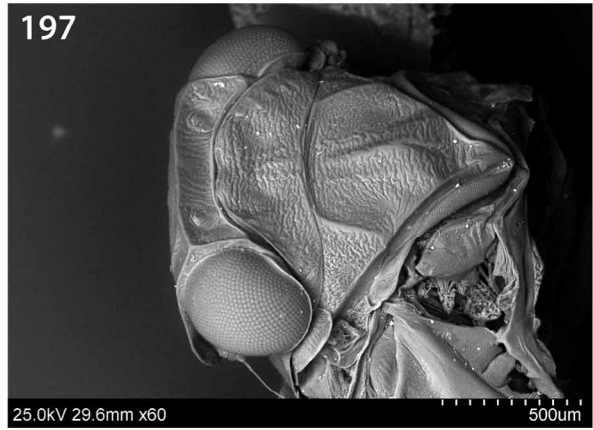
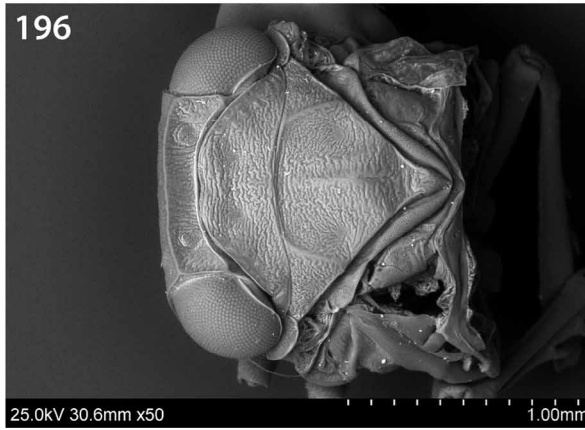
Phallic complex (Figs 195, 233, 242, 250). Periandrium with a long lateral split reaching about 2/3 of its length; dorsal periandrium not elevated basally and without extra structures; apex trilobed in dorsal view; dorsal margin with basal fold or without fold; apex slightly oriented dorsally or almost straight, median lateral lobe of dorsal periandrium well or weakly developed, wide and smooth. Periandrium at lateral basal part with or without concavities; apex of ventral periandrium slightly extending apex of dorsal part; ventral margin with or without folds; posterior margin without additional structures, with apical concavity medially; apical parts of ventral periandrium with small spiniferous microsculptures. Aedeagus with pair of lateral processes, separated basally. Each process with single apex oriented basad. The base of the process placed after the lateral lobe of periandrium dorsal part. Single posterior lateral fold of aedeagus membranous, with smooth margins, partly spiniferous. Apex of aedeagus small, with smooth margins.

Female genitalia. Sternite VII with well developed lateral lobes; anterior margin shallowly concave, posterior margin in median portion straight or convex. Anal tube in lateral view longer than high, a little surpassing tergite IX but not surpassing the half of upper margin of gonoplac; basal part wider than posterior part; in dorsal view posterior margin straight or weakly concave; lateral margins shallowly arcuate, “broken” after the half of length, posterior margin distinctly arcuate; anal opening a little before half of its length. Gonoplac unilobate, laterally flattened, posterior margin with a full row of well developed teeth situated at about 45° in respect to longitudinal axis of the body, posterior ventral part partly membranous. Gonapophysis VIII partly laterally flattened, at dorsal margin shallowly concave with sharp apex and well visible teeth at the postero-dorsal margin. Bursa copulatrix with two pouches connected by a short ductus, slightly shorter than second pouch; first pouch distinctly larger than the second one; wall of first pouch with cell-like sclerotized ornamentations mostly present in the lower part, second pouch membranous, without cell-like imprints but with pore-like ornamentation. Cell-like sclerotized ornamentation of first pouch of bursa copulatrix with a central sclerotized area with a single, sharp and high spinacle and a group of small petals. Spermatheca well developed; *ductus receptaculi* wrinkled, flattened, slightly shorter or about as long as *diverticulum ductus*; *diverticulum ductus* long and smooth basally with a membranous pear-shaped apical bulba.

Distribution (Fig. 252). Madagascar: Antananarivo and Fianarantsoa Provinces.

Key to the species of *Cyamosa*

1. Hind wing elongate, reaching nearly the end of abdomen 2
- Hind wing reduced (Figs 208–209) 3
2. Male: dorsal margin of periandrium with basal fold “broken”. Periandrium latero-basally without concavity; ventral margin with single, distinctly visible triangular fold; lateral lobe of dorsal periandrium weakly developed (Fig. 233) *C. adelinae* sp. nov.
- Male: dorsal and ventral margin of periandrium and latero-basal part of periandrium without any fold or structure; lateral lobe of dorsal periandrium very small and narrow developed (Fig. 242) *C. splendens* sp. nov.
3. Male: dorsal margin of periandrium with simple basal fold. Periandrium latero-basal part with a narrow and long concavity; ventral margin with 2 folds, basal one very small, the second narrow and long. Lateral lobe of dorsal periandrium distinctly visible (Fig. 195) *C. camelouca* sp. nov.
- Male: dorsal margin of periandrium without fold. Periandrium latero-basally without concavity; ventral margin with single narrow and long fold. Lateral lobe of dorsal periandrium narrow, small and weakly visible (Fig. 250) *C. pauliani* sp. nov.

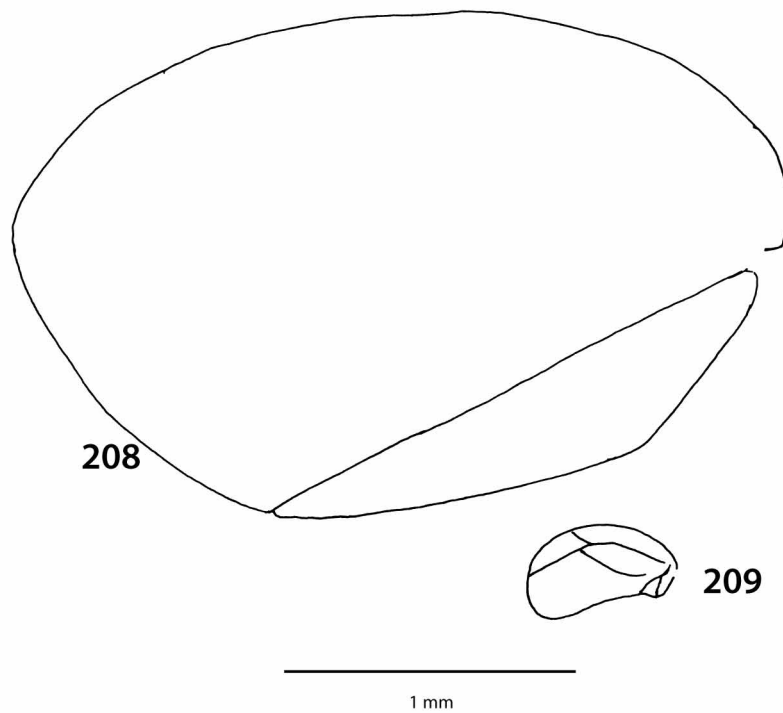
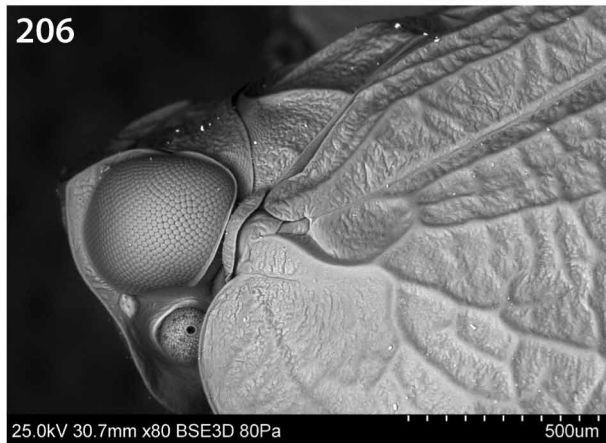
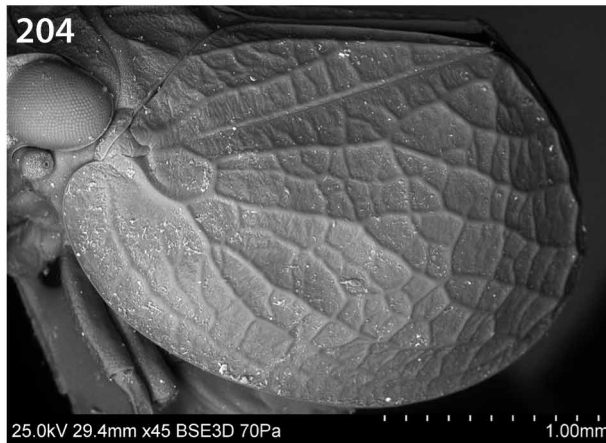


FIGURES 196–203. *Cyamosa camelouca*. (196–199)—Anterior part of the body, dorsal and latero-dorsal view; (200–201)—frontal view; (202–203)—hind tibia and tarsomeres.

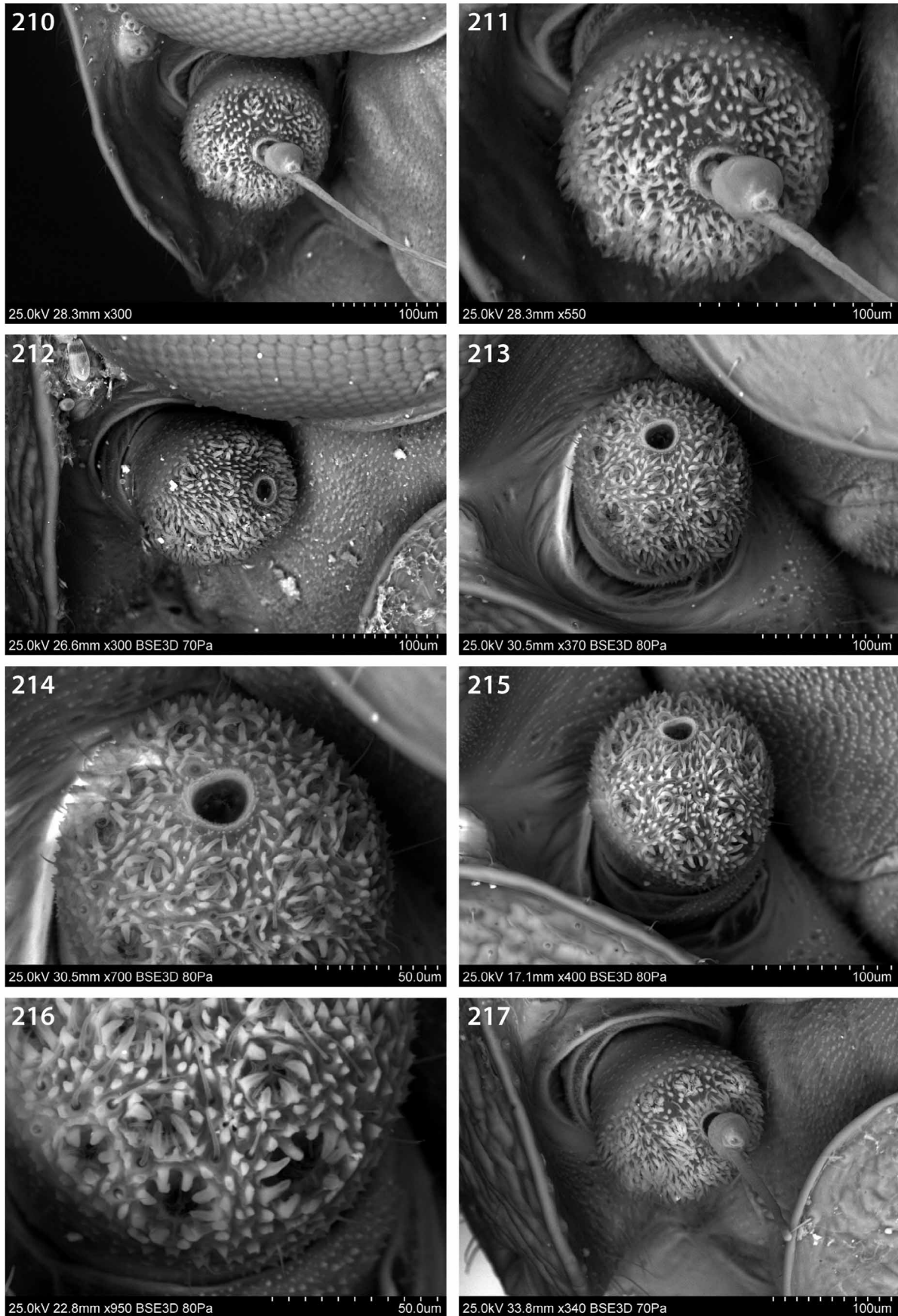
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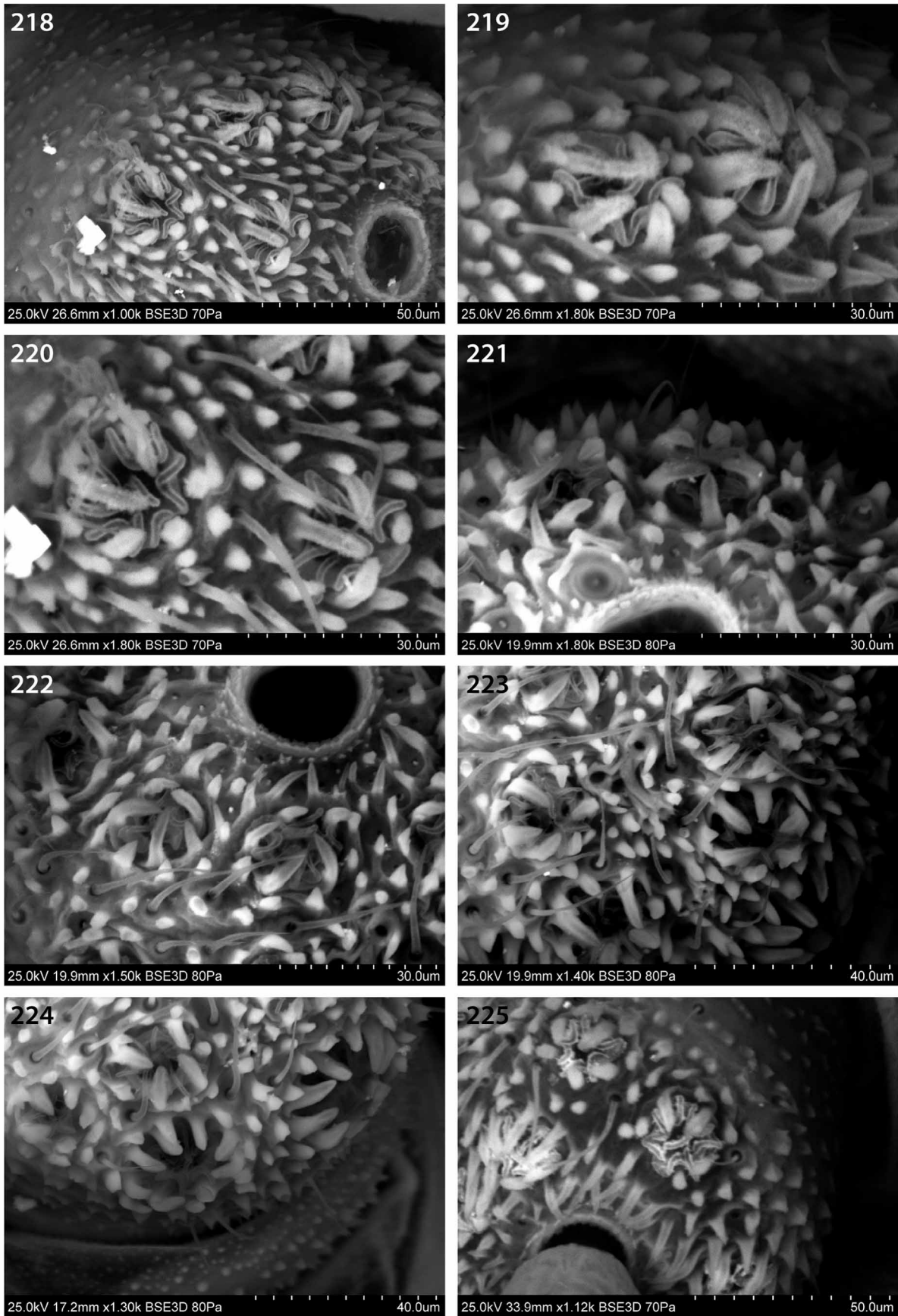
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FIGURES 204–209. *Cyamasa camelouca*. (204–207)—Tegmina, lateral view; (208)—tegmina shape, dorsal view; (209)—wing.



FIGURES 210–217. *Cyamosa camelouca*. Antenna.



FIGURES 218–225. *Cyamosa camelouca*. Antennal plate organs.

Cyamosa camelouca sp. nov.

(Figs 190–225, 252)

Etymology. From the Latin “*camelaucum*” meaning small hemispherical camel skin hat.

Diagnosis. Similar to *C. pauliani* sp. nov. by the reduced hind wing but differs by the male genital characters: upper margin of periandrium with simple basal fold (in *C. pauliani* without fold); periandrium latero-basally part with narrow and long concavity (in *C. pauliani* without concavity); lower margin with 2 folds (in *C. pauliani* single fold).

Description. Total length 3.3–4.6 mm.

Head. Vertex: proportion A/B = 8.00–8.46. Frons: proportion C/E = 1.00–1.14; proportion D/E = 1.42–1.72.

Thorax. Pronotum: proportion F/B = 2.66–3.66. Mesonotum: proportion G/F+B = 1.72–2.00 proportion G/H = 0.53–0.64. Tegmina: proportion I/J = 1.46–1.72.

Male genitalia (Figs 193–195). *Phallic complex.* Dorsal margin of periandrium with simple basal fold. Periandrium latero-basally part with narrow and long concavity; ventral margin with 2 folds, basal fold very small, the second fold narrow and long. Lateral lobe of dorsal periandrium distinctly developed. First process of aedeagus with a widened and partly membranous basal part, second process curved basad, not surpassing the lateral split. Second process distinctly shorter than first one, with partly membranous basal part, widened in median portion. Posterior lateral fold of aedeagus distinctly longer than wide.

Female genitalia. Sternite VII: posterior margin in median portion almost straight.

Coloration (Figs 190–192). Vertex, pronotum and mesonotum reddish-brown with yellow/yellowish spots. Frons brown with yellowish small spots. Clypeus dark brown with narrow transverse yellow band near the fronto-clypeal suture. Fore wing greyish white or dirty white with black patches.

Type material. Holotype, ♂: [MADAGASCAR: Province Fianarantsoa, Miandritsara Forest, 40 km S Ambositra, 20°47.56′ S, 47°10.54′ E 27 Dec 2005– 5 Jan 2006], [California Acad of Sciences coll. M. Irwin, R. Harin’Hala malaise trap, in low altitude rainforest, elev 825m MA-29-39], [CASENT 8107983]—(CAS).

Paratypes, 5♂♂, 5♀♀: [MADAGASCAR: Province Fianarantsoa, Miandritsara Forest, 40 km S Ambositra, 20°47.56′ S, 47°10.54′ E 22 Nov—1 Dec 2006, California Acad of Sciences coll. M. Irwin, R. Harin’Hala malaise trap, in low altitude rainforest, elev 825m MA-29-69], [CASLOT 038317]—(2♂♂, 3♀♀, CAS, MIZ, ZIN); [MADAGASCAR: Province Fianarantsoa, Miandritsara Forest, 40 km S Ambositra, 20°47.56′ S, 47°10.54′ E 24—31 January 2007, California Acad of Sciences coll. M. Irwin, R. Harin’Hala malaise trap, in low altitude rainforest, elev 825m MA-29-76], [CASLOT 038322]—(♂, CAS); [MADAGASCAR: Province Fianarantsoa, Miandritsara Forest, 40 km S Ambositra, 20°47.56′ S, 47°10.54′ E 15–24 January 2007, California Acad of Sciences coll. M. Irwin, R. Harin’Hala malaise trap, in low altitude rainforest, elev 825m MA-29-75], [CASLOT 038323]—(2♂♂, CAS, ZIN); [MADAGASCAR: Province Fianarantsoa, Itaviana, 35 SSE of Antsirabe Forest, 40 km S Ambositra, 20°10.40′ S, 47°05.16′ E 30 March–9 April 2003, California Acad of Sciences coll. M. Irwin, R. Harin’Hala malaise trap, in Uapacca forest, elev 1360 m MA-24-12], [CASLOT 038329]—(♀, CAS); [Madagascar Antsirabe 8-III-2006]—(♀, MNHN).

Distribution (Fig. 252). Madagascar: Antananarivo and Fianarantsoa Provinces.

Cyamosa adelinae sp. nov.

(Figs 226–234, 252)

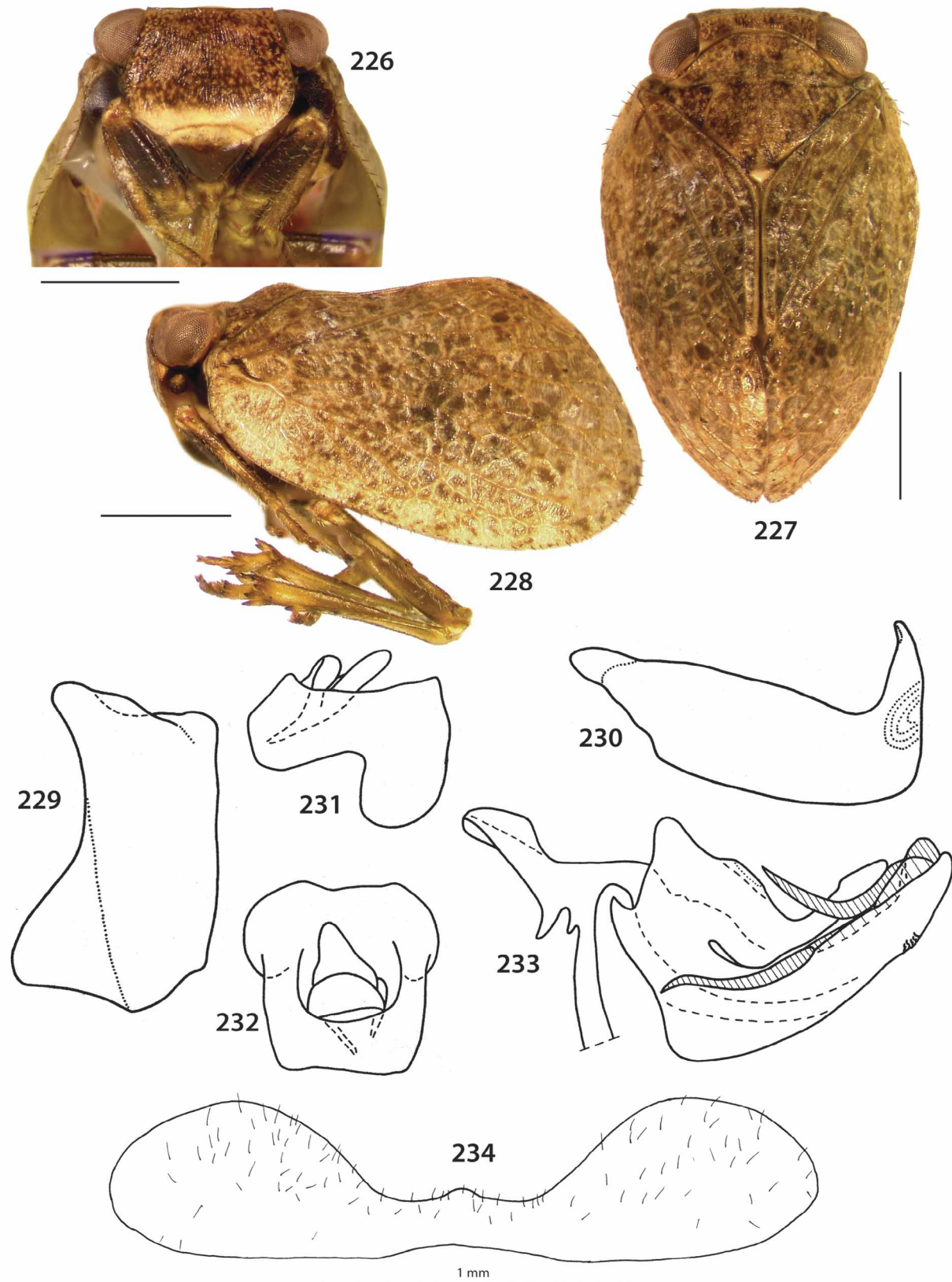
Etymology. This species is named after Dr Adeline Soulier-Perkins (MNHN, Paris, France).

Diagnosis. Similar to *C. splendens* sp. nov. by the elongate hind wing, which reaching about the end of abdomen but differs by the characters of male genitalia: dorsal margin of periandrium with basal fold; ventral margin with single, distinctly visible triangular fold (in *C. splendens* without any fold).

Description. Total length 3.5–4.5 mm.

Head. Vertex: proportion A/B = 6.75–8.33. Frons: proportion C/E = 1.04–1.14; proportion D/E = 1.44–1.57.

Thorax. Pronotum: proportion F/B = 2.5–3.0. Mesonotum: proportion G/F+B = 1.73–1.93 proportion G/H = 0.53–0.58. Tegmina: proportion I/J = 1.46–1.72.



FIGURES 226–234. *Cyamosa adelinae*. (226–233)—Male, (234)—female. (226)—Frontal view; (227)—body, dorsal view; (228)—same, lateral view; (229)—pygofer, lateral view; (230)—genital style, lateral view; (231)—anal tube, lateral view; (232)—same, dorsal view; (233)—phallic complex, lateral view; (234)—pregenital sternite, flattened.

Male genitalia (Figs 229–233). *Phallic complex*. Dorsal margin of periandrium with basal fold with dorsal part “broken”. Periandrium latero-basally without concavity; ventral margin with single, distinctly visible triangular fold; lateral lobe of dorsal periandrium weakly developed. First process fully sclerotized, not widened at base, surpassing the lateral split; second process distinctly “broken” in half of its length, both parts are nearly equal in length, the second half of process not widened. Posterior lateral fold of aedeagus small, oriented dorsally.

Female genitalia (Fig. 234). Sternite VII: posterior margin in median portion convex.

Coloration (Figs 226–227). General coloration light brown yellowish. Frons is covered with dense dark brown dots, with yellow transverse stripe above clypeus. Postclypeus dark brown with light basal part. Anteclypeus light. Tegmina with rare small dark brown spots. Pro and mesotrochanters and metafemora brown. Pronotum under eyes with wide dark brown transverse stripe. Male abdominal sternites brown with yellowish hind margins, genital segments yellowish. Apices of teeth and spines black.

Type material. Holotype, ♂: [Museum Paris, Madagascar Centre, mission C.N.R.S. R.C.P. n°225], [HFAM 2], [Andringitra Centre, plat. Andohariana, 2000–2100 m, 9.XI/10-XII-1970]—(MNHN).

Paratypes: 5 ♀♀, labeled as holotype (MNHN, ZIN, MIZ).

Distribution (Fig. 252). Madagascar: Fianarantsoa Province.

Cyamosa splendens sp. nov

(Figs 235–242, 252)

Etymology. The name of the species refers to the characteristically polished tegmina.

Diagnosis. Similar to *C. adelinae* sp. nov. by the elongate hind wing, which reaching about the end of abdomen but differs by the characters of male genitalia: dorsal and ventral margin of periandrium without any fold (in *C. adelinae* dorsal margin with a basal fold, ventral margin with a single, distinctly visible, triangular fold).

Description. Total length. Male—3.3 mm.

Head. Vertex: proportion A/B = 7.33. Frons: proportion C/E = 1.33; proportion D/E = 1.66.

Thorax. Pronotum: proportion F/B = 2.83. Mesonotum: proportion G/F+B = 1.82; proportion G/H = 0.52. Tegmina: proportion I/J = 1.62.

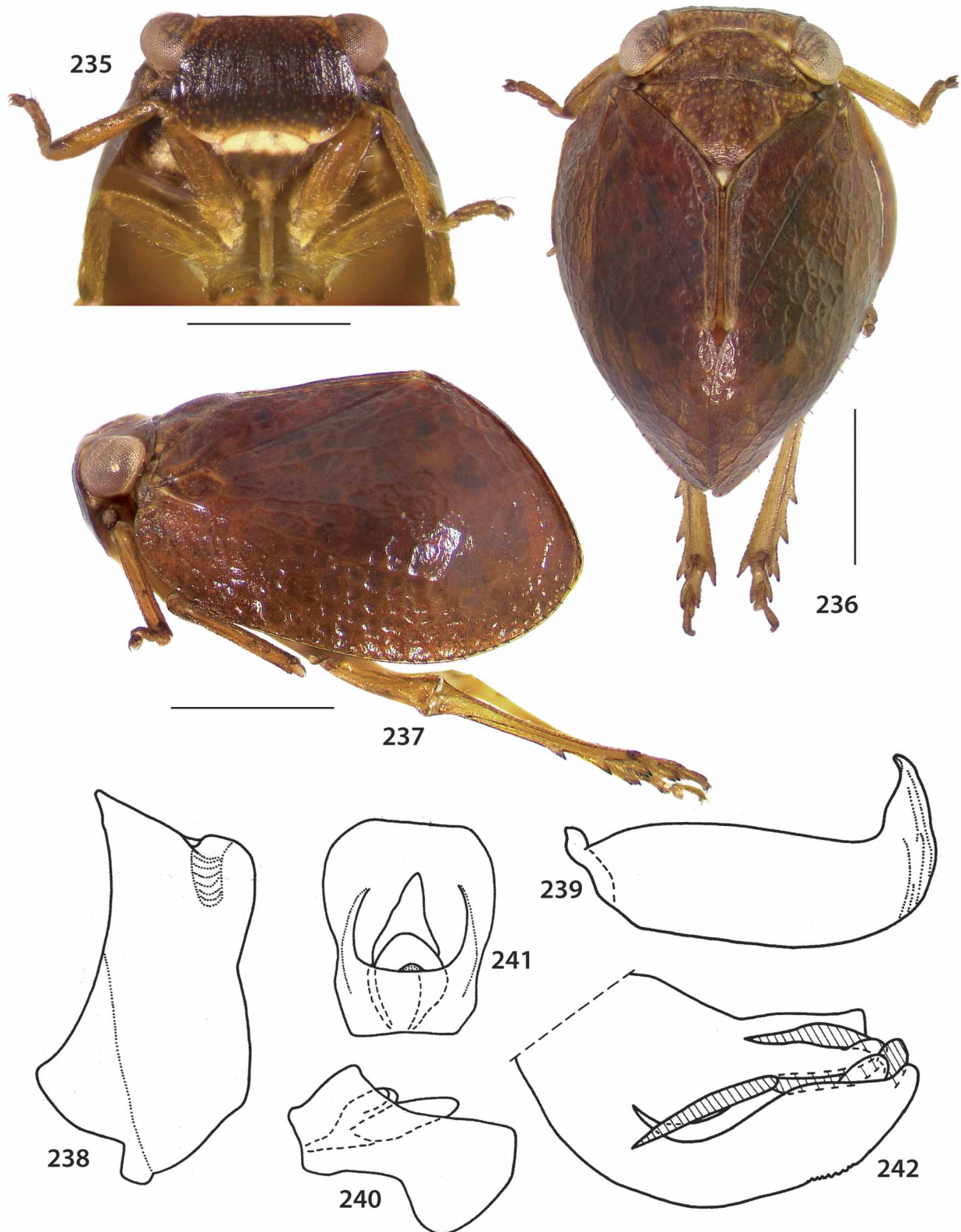
Male genitalia (Figs 238–242). *Phallic complex*. Dorsal and ventral margin of periandrium, latero-basal part of periandrium without any fold or structure; lateral lobe of dorsal periandrium very small and narrow. First process fully sclerotized, not widened at base, a little surpassing the lateral split, almost straight; second process distinctly “broken” in median part then not widened, curved. Posterior lateral fold of aedeagus distinctly small; a little longer than height, oriented dorsally.

Female genitalia. Unknown.

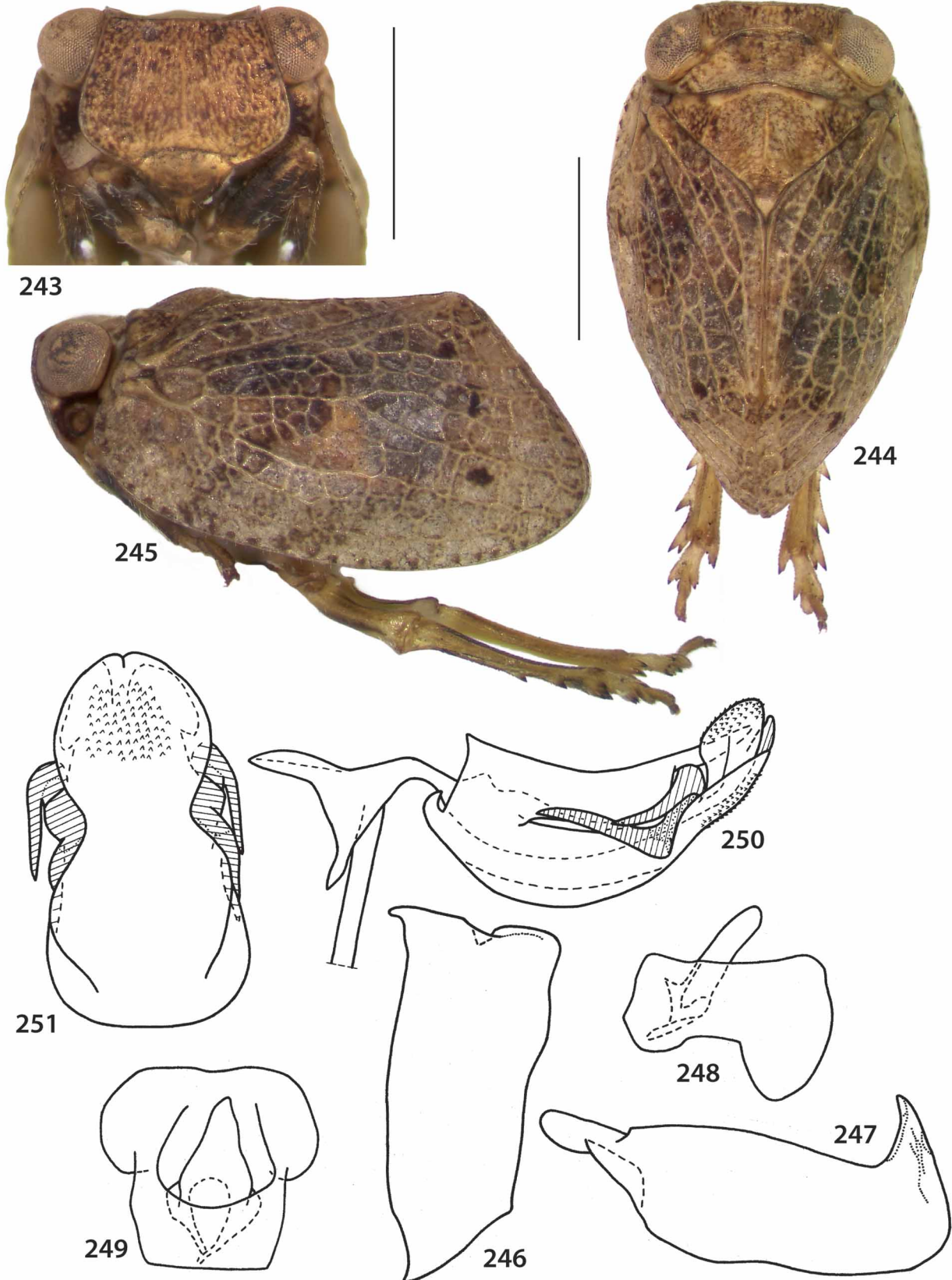
Coloration (Figs 235–237). Vertex, pronotum, mesonotum brown yellowish. Frons and clypeus, excluding yellow basal part near to frontoclypeal suture, and tegmina dark brown. Tegmina polished. Anteclypeus and legs light brown yellowish. Abdominal sternites dark brown. Apices of spines of legs black.

Type material. Holotype, ♂: [I.S. Madagascar Forêt d’Ambohitantely, 21, 23.XII.47, p R.P.], [Coll. R.I.Sc.n.B. Madagascar]—(IRSNB).

Distribution (Fig. 252). Madagascar: Antananarivo Province.



FIGURES 235–242. *Cyamosa splendens*, male. (235)—Frontal view; (236)—body, dorsal view; (237)—same, lateral view; (238)—pygofer, lateral view; (239)—genital style, lateral view; (240)—anal tube, lateral view; (241)—same, dorsal view; (242)—phallic complex, lateral view.



FIGURES 243–251. *Cyamosa pauliani*, male. (243)—Frontal view; (244)—body, dorsal view; (245)—same, lateral view; (246)—pygofer, lateral view; (247)—genital styles, lateral view; (248)—anal tube, lateral view; (249)—same, dorsal view; (250)—phallic complex, lateral view; (251)—same, ventral view.

Cyamosa pauliani sp. nov.

(Figs 243–252)

Etymology. This species is named after Prof. Renaud Paulian famous for his research in Madagascar.

Diagnosis. Similar to *C. camelouca* sp. nov. by the hind wing reduced but differs by the male genital characters: dorsal margin of periandrium without fold (in *C. camelouca* with simple basal fold); periandrium latero-basally part without concavity (in *C. camelouca* with narrow and long concavity); ventral margin with single fold (in *C. camelouca* with 2 folds).

Description. Total length. Males—3.3–3.5 mm.

Head. Vertex: proportion A/B = 6.00–6.92. Frons: proportion C/E = 1.20–1.25; proportion D/E = 1.66–1.83.

Thorax. Pronotum: proportion F/B = 2.0–2.44. Mesonotum: proportion G/F+B = 1.8–2.09 proportion G/H = 0.56–0.66. Tegmina: proportion I/J = 1.58–1.66.

Male genitalia (Figs 246–251). *Phallic complex.* Dorsal margin of periandrium without fold. Periandrium latero-basally without concavity; ventral margin with single narrow and long fold. Lateral lobe of dorsal periandrium narrow small and weakly visible. First process with a long and narrow membranous base (1/3 of its length), then “broken” and well sclerotized, not surpassing the lateral split; second process distinctly shorter than first one, with very short membranous basal part. Posterior lateral fold of aedeagus distinctly visible highest than long, oriented dorsally.

Female genitalia. Unknown.

Coloration (Figs 243–245). General coloration light brown yellowish, with brown dots. Clypeus brown or dark brown, excluding yellow basal part near to frontoclypeal suture. Usually each tegmina with fuzzy dark brown transverse band proximally and 3 dark brown or black dots distally. Pro- and mesofemora and tibiae brown or dark brown. Apices of spines of legs black.

Type material. Holotype, ♂, [Inst. Scient. Madagascar Ambohitantely, Lot № 4B, P.C.], [Coll. R.I.Sc.N.B., Madagascar]—(IRSNB).

Paratypes: 2♂♂, labeled as holotype (IRSNB, ZIN).

Distribution (Fig. 252). Madagascar: Antananarivo Province.

DISCUSSION

The genera described above are externally similar to the members of the family Issidae Spinola by the convex, coriaceous or coleopterous tegmina and general shape of the body. Based on such external similarity, Melichar (1906) ascribed the genus *Isobium* to the family Issidae. However this genus is characterised by the second metatarsomere without spines, which is, in general, a character of the families Ricaniidae, Gengidae, Hypochthonellidae, Lophopidae, Eurybrachidae and some Caliscelidae.

All Madagascan sub-brachypterous genera discussed above belong to the subfamily Ricaniinae Amyot et Serville, 1843 *sensu* Gnezdilov (2009) according to the following features: vertex wide and short, clypeus considerably narrower than frons; R, M, and Cu anterior veins of tegmina are multifurcate; gonostyles with cuneiform capitulum, without lateral tooth; gonoplas widely triangular, flat, with marginal teeth; anterior connective lamina of gonapophysis VIII narrow.

OVERVIEW OF SOME MORPHOLOGICAL CHARACTERS IN SUB-BRACHYPTEROUS RICANIIDAE

HEAD CAPSULE

Two characters of the head capsule of the genus *Isobium* are unique within the Ricaniidae. These are the absence of the lateral ocelli (present in other genera) and concave disc of the frons (rather flat in other genera).

The antennal sensory plate organs. The planthoppers antennal morphology is autapomorphic for the Fulgoro-morpha (Bourgoin 1985, Asche 1988). It consists of three parts (Bourgoin & Deiss 1994):

- 1) surrounded by the antennal socket, a basal and cylindrical scape bearing few sensilla;

2) a prominent pedicel ending in an apical cupule where take place the flagellum. The pedicel bears most of the sensory equipment of the antenna, and particularly a set of characteristic plate organs or sensilla placodea; a basal hollow is often observed on the anterodorsal basal part of the pedicel (Bourgoin & Deiss 1994). Arrangement or number (from a few ones to several hundreds) of these plate organs, the apical or subapical position of the cupule and form of the pedicel might be of taxonomic value (Bourgoin 1985, Bourgoin & Yap 2010, Bartlett & Hamilton 2011).

3) an apical or subapical long and thin flagellum that can bear in its basal swelling (the bulb) two different and non-homologous sensory structures:

- a projected sensory process (“antennal second projection”, Shih & Yang 1996 or “basal flagellar process”, Liang 2001) as observed in Cixiidae
- a complex internal sensory structure (Bourgoin 1985) or Bourgoin's organ (Cobben 1988) that seems to be present in all planthoppers families. It is often surrounded by a fringed membranous.

The role of these flagellum sensory structures was recently investigated by Romani *et al.* (2009). The thin arista of the flagellum should act as a proprioceptor to detect air-borne vibrations and therefore it should play the role of a sound-receptive hair. The projected sensory process bears sensilla styloconica generally involved in the perception of humidity and temperature. The more complex Bourgoin's organ appears as a small internal utricle sheltering a few sensilla in two distinct chambers (Bourgoin 1985, Romani *et al.* 2009). It represents probably a complex sensory organ for thermo-hygroreception, olfactory reception and CO₂ concentration reception.

However, it is the pedicel that has been paid most attention because of the presence of their particular plate organs of probable olfactory function (Lewis & Marschall 1970, Aljunid & Anderson 1983; Nam Youn 2002). These sensory structures are surrounded by a circular furrow bearing externally or internally a more or less structured row of non-sensory denticles (from 5 to 25) of various shapes (tip acute or rounded, smooth or ridged, straight or bent, setae- or tooth-like) according to the taxa (Shih & Yang 1996). These denticles are absent in Tettigometridae and some Cixiidae (Bourgoin 1985, Bourgoin & Deiss 1994).

In planthoppers, plate organs exhibit important structural variations. They were first studied by Bugnion (1908) in the fulgorid *Pyrops candelaria* (Linné, 1758). Marshall and Lewis (1971) studied a few representatives of various families and the first ultrastructural studies were provided by Lewis and Marshall (1970) and Marshall (1973). Since that time, several scanning (SEM), environmental scanning (ESEM) or transmission (TEM) electron microscopy illustrations in various taxonomic groups of Fulgoromorpha has been reported: Delphacidae: Aljunid & Anderson 1983 (TEM), Bourgoin & Deiss (1994), Bartlett & Hamilton, 2011 (ESEM); Tettigometridae: Bourgoin 1985 (SEM), Bourgoin & Deiss (1994); Fulgoridae: Bourgoin & Deiss (1994); Achilixiidae: Wilson 1989 (SEM), Liang 2001 (SEM); Tropiduchidae: Huang & Bourgoin 1993 (SEM); Meenoplidae and Kinnaridae: Bourgoin & Deiss 1994 (SEM), Liang 2002 (SEM); Cixiidae: Shih & Yang 1996 (SEM), Sforza *et al.* 1999 (SEM), Romani *et al.* 2009 (TEM and SEM); Flatidae: Lewis & Marshall 1970 (SEM), Zhang *et al.* 2011 (SEM). A review and synthesis of these data including families Dictyopharidae and Lophopidae was provided in Bourgoin & Deiss (1994).

Based on the TEM studies of the previous authors and their SEM morphological comparative study, Bourgoin & Deiss (1994) provided a terminology for their description and study. They suggested that planthopper plate organs have evolved from clusters of basiconic receptors which have become reduced and have lost their separate identities to aggregate into the placoid structure. From this plesiomorphic state, several evolutionary trends were recognized in various taxa. With the description of the very aberrant antennal pattern observed in some derbid genera (*Dendrokara* Melichar, 1914 and *Neodendrokara* Muir, 1917), Bourgoin and Yap (2010) have recently reviewed the taxonomic distribution of these different morphological types and they reduced them to 5 main types:

- the setae-like projected plate: Kinnaridae, Tropiduchidae, Delphacidae;
- the flattened star-shaped plate: Achilixiidae, Meenoplidae, Kinnaridae, Cixiidae;
- the crenellated plate (linear, U or Y shaped ridges): Cixiidae, Dictyopharidae, Fulgoridae, and the Ricaniids of this study;
- the folded flattened plate (often clover leaf-like): Flatidae, Lophopidae;
- the circular flattened plate: Tettigometridae.

All these studies show that planthopper placodea sensilla appear as highly polymorphic organs that have evolved in different trends, probably independently and several times. It is likely that looking for any phylogenetical signal at higher taxonomic units will remain useless due to expected evolutionary convergences. However some

exceptions are noticeable as in Tettigometridae that exhibit their particular circular flattened plate pattern in all genera of the family (Bourgoin 1985) or with the general structure of the antenna in Delphacinae: Delphacini as suggested by Bartlett & Hamilton (2011).

The Madagascan ricaniid genera of this study are good examples of plate organ morphological disparity. *Nasatus* species are characterised by the presence of 7–8 denticles surrounding the circular furrow with a moderately linear or U-shaped ridges crenellated plate. In *Isobium gibbosum* 9–13 denticles are observed with a more complex crenellated plate of U-shaped ridges (Figs 18–23). The genus *Globularica* exhibits a relatively similar pattern to *Nasatus* species but with more diverse ridges: linear, U or Y shaped (Figs 59–70). *Cyamosa* and *Coniunctivena* show the simplest pattern with 5–6 external denticles around a moderately crenellated plate of 5–7 U-shaped ridges. Aperture of flagellum Bourgoin's organ is fringed in *Nasatus* species only and the antennal second projection was not observed in any studied species.

The Ricaniid pattern observed here is close to the one observed in Dictyopharidae and Fulgoridae (Marshall & Lewis 1971, Bourgoin & Deiss 1994) and it should be considered as a simplified morphological variation of it: few surrounding denticles, a more or less crenellated plate with linear, U- or Y-shaped ridges. Accordingly, the crenellated plate with Y-shaped ridges should not be considered as characteristic of Fulgoridae and Dictyopharidae as proposed earlier (Bourgoin & Deiss 1994), while the surrounding row of numerous denticles is probably characteristic at lower taxonomic units in these taxa.

THORAX

Mesonotum. All studied sub-brachypterous Ricaniidae have extra structures on the disc of the mesonotum. Generally, among Ricaniidae, the mesonotum lacks extra structures, except in the genus *Meliprivesa* Metcalf, 1952 (Fig. 253), with triangular and elongate eminence on the posterior part, and in *Privesa cixii* (Walker, 1851) and *P. cristata* (Signoret, 1886), with mesonotum bearing a big crista (Fig. 254). All these taxa are distributed in the Afrotropical Region.

Tegmina and hind wings. Brachypterism of described taxa is probably connected with environmental conditions (dry or mountain areas of Madagascar) rather than with an island effect. As already proposed by Kerzhner (1981), living in biotopes with low and thinly growing vegetation may be associated with reduction of insect wings. Fennah (1967) provided similar reasons for brachypterism of South African Fulgoroidea as follows: "the vegetal habitat of machia is characterized by profuseness of branches, small leaves and erect stems, and the individual plants often are closely aggregated. Flight within such vegetation is probably difficult, and an ability to fly over the top of it may offer no particular advantage". A similar explanation could be proposed for these sub-brachypterous Ricaniidae but this needs to be investigated more thoroughly.

As we remarked in the Introduction, in the family Ricaniidae only two American genera do not have membranous tegmina. The genus *Isobium*, originally described in the family Issidae (Melichar, 1906) and transferred in this paper to Ricaniidae, and all new taxa described in our study have a coleopterous or a coriaceous tegmen. Based on our definition (see Material and Methods) we are ranking to coleopterous taxa the following genera: *Kruegeria* Schmidt, 1912 and *Globularica* gen. nov. The genera *Pharsalus* Melichar, 1906, *Isobium* Melichar, 1906, *Coniunctivena* gen. nov., *Nasatus* gen. nov., *Cyamosa* gen. nov. belongs to coriaceous taxa. *Isobium gibbosum* exhibits a tegmen with an irregular surface in contrast to other known species with tegmina with regular surface.

The genus *Coniunctivena* gen. nov. exhibits two noticeable and unusual characters: 1) veins Sc and R leaving basal cell separately and 2) Sc and R fusing later to form an elongate cell. This first character state is rare in the family. While it is also observable in *Armacia* Stål, 1862 and *Scotinax* Fennah, 1969, veins Sc and R leave typically the basal cell by a common Sc+R stem in Ricaniidae. The second character state is also unusual. The genus *Ricanopsis* Melichar, 1898 distributed in Africa (Fig. 256) shows a similar condition to *Coniunctivena* gen. nov. by the presence of a fusiform cell due to the late fusing of Sc and R, however contrary to *Coniunctivena* gen. nov, *Ricanopsis* Sc+R vein exhibits the typical character state with a short common stem branched on the basal cell.

Shcherbakov (1982) based on his analysis of characters of hind wing proposed as an apomorphy for the Ricaniidae the presence of a precostal cell on the anterior margin. In some sub-brachypterous Ricaniidae this character was not recorded (e.g. *Globularica* gen. nov., *Cyamosa* gen. nov., *Nasatus* gen. nov.). In macropterous taxa the absence of a precostal cell is reported for the genus *Tarundia* Stål, 1859 from Mauritius (Williams & Fennah 1980). The precostal cell is also present in *Nogodina reticulata* (Fabricius, 1781) (Nogodinidae) from South America. Further studies on this character in planthoppers families are necessary.

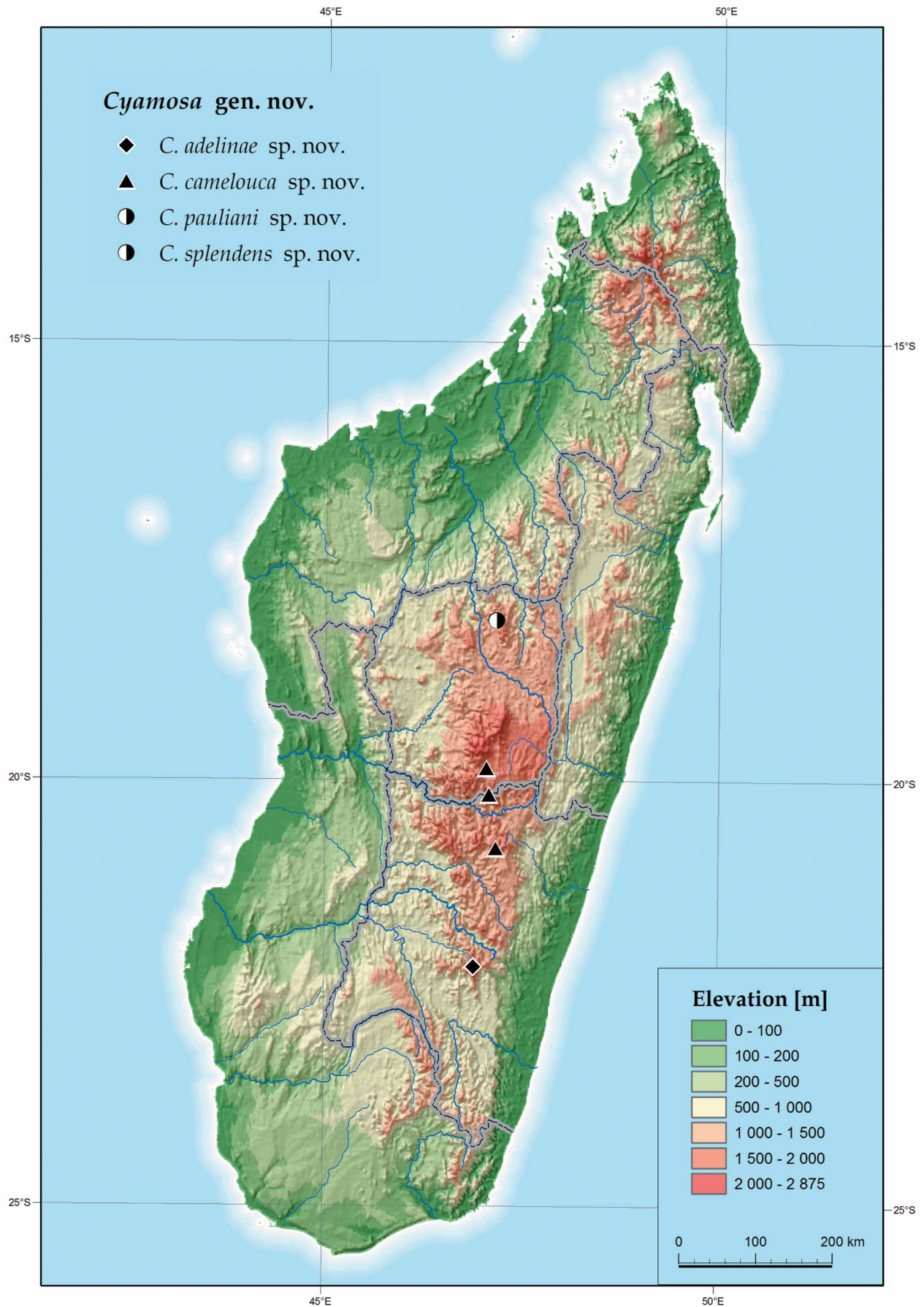
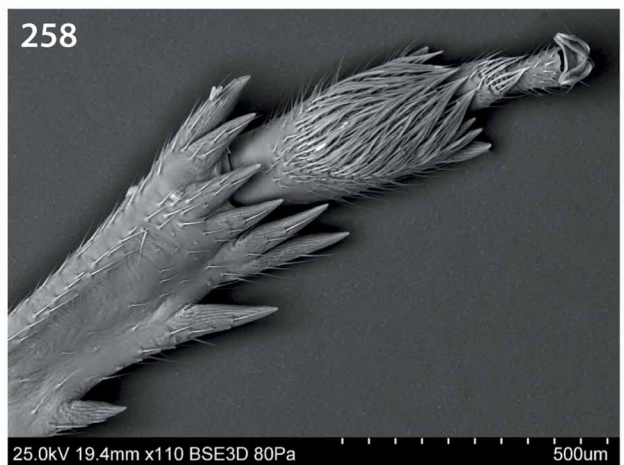
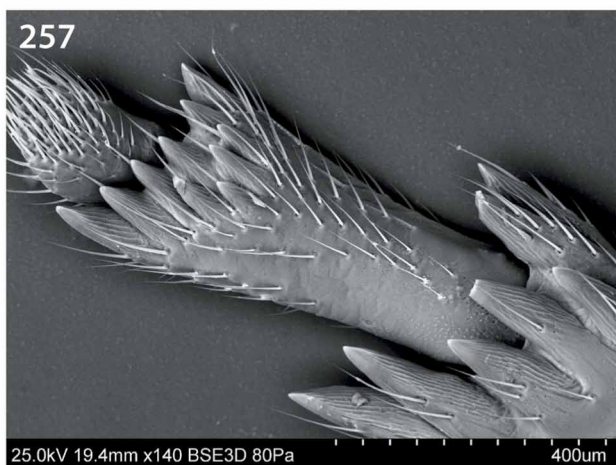
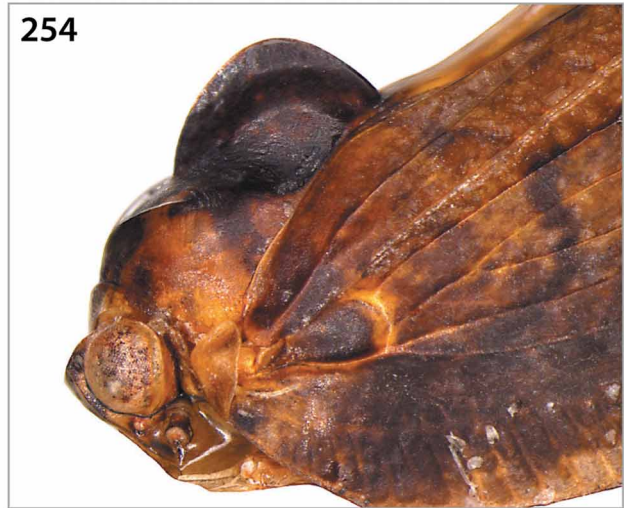


FIGURE 252. Distribution map of genus *Cyamosa*.



FIGURES 253–258. (253)—*Meliprivesa disturbata* (Melichar, 1898), anterior part of the body, dorso-lateral view, (254)—*Privesa cixii* (Walker, 1851), anterior part of body, lateral view, (255)—*Kruegeria clavispina* Schmidt, 1911, dorsal view; (256)—*Ricanopsis* sp., basal part of tegmen, dorsal view; (257)—*Pochazina* sp., apical part of hind leg, ventral view, (258)—*Mulvia albizona* (Spinola, 1839), apical part of hind leg, ventral view.

Hind legs. Usually in the Ricaniidae, the first segment of the hind tarsus is ornamented with a row (line—straight or arcuate) of spines. In *Isobium gibbosum* the spines of the basitarsomere are organized in a triangular patch. Similar structures (triangular zone of spines) are observed in the genus *Pochazina* Melichar, 1898 from the Philippines (Fig. 257) and some other taxa from the *Pochazoides* generic group from Madagascar (Stroiński, in prep.). Another type is observed in the genus *Mulvia* Stål, 1866 from Africa (Fig. 258) which has the basitarsomere provided with an interrupted row of 4 small teeth in formula 3+1 with the median part covered by long setae.

Female genitalia. The bursa copulatrix with two pouches is a common condition in the Ricaniidae (Stroiński, 2002, 2007a, 2010a, 2010b and unpublished data, Xu *et al.*, 2006, Bu *et al.*, 2010). These pouches may be connected widely (e.g. *Acroprivesa* Schmidt, 1912, *Euricania* Melichar, 1898) or by a narrow ductus (e.g. *Meliprivesa* Metcalf, 1952). This second condition is present in the sub-brachypterous genera described here. In *Isobium* both pouches are connected by a extremely short ductus.

Generally the bursa copulatrix with two pouches is unusual for the planthoppers. It was recorded for the Dictyopharidae, Fulgoridae and Nogodinidae (Bourgoin 1993) and observed in some other planthopper species, particularly in derbids (Bourgoin unpublished). In the Ricaniidae, the single pouch represents a relative rare character and observed only in a few genera recorded from the Afrotropical, Oriental and Neotropical Regions e.g. *Aliscella* Fennah, 1969, *Paici* Stroiński, 2010, *Ricanopsis* Melichar, 1898 (Stroiński 2007b, 2010c).

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REFERENCE

- Aljunid, S.F. & Anderson, M. (1983) Ultrastructure of sensilla on the antennal pedicel of the brown planthopper *Nilaparvata lugens* Stal (Insecta: Homoptera). I. Plaque organs and trichoid sensilla. *Cell and Tissue Research*, 228, 313–322.
- Asche, M. (1988) Preliminary thoughts on the phylogeny of Fulgoromorpha (Homoptera, Auchenorrhyncha). In: *Proceedings of the 6th Auchenorrhyncha Meeting, Turin, Italy, 7–11 September 1987*. pp: 47–53.
- Bartlett, C.R. & Hamilton, K.G.A. (2011) *Aethodelphax prairianus* gen. et sp. nov. (Hemiptera: Delphacidae) and seven congeneric species from North American *Delphacodes*. *Zootaxa* 2837, 48–66.
- Bourgoin, T. (1985) Morphologie antennaire des Tettigometridae (Hemiptera Fulgoromorpha). *Nouvelle Revue d'Entomologie (N.S.)*, 2(1), 11–20.
- Bourgoin T. (1993) Female genitalia in Hemiptera Fulgoromorpha, morphological and phylogenetic data. *Annales de la Société entomologique de France (N.S.)*, 26, 555–564.
- Bourgoin, T. (2011) FLOW Fulgoromorpha Lists On the Web, 1997-2011. Version 7, updated 20.iv.2011. <http://flow.snv.jussieu.fr/> [accessed: 28.09.2011]
- Bourgoin, T. & Deiss, V. (1994) Sensory plate organs of the antenna in the Meenoplidae-Kinnaridae group (Hemiptera: Fulgoromorpha). *International Journal of Insect Morphology and Embryology*, 23(2), 159–168.
- Bourgoin, T. & Huang, J. (1990) Morphologie compare des genitalia males des Trypetimorphini et remarques phylogénétiques (Hemiptera: Fulgoromorpha: Tropiduchidae). *Annales de la Société entomologique de France (N.S.)*, 5: 179–193.
- Bourgoin, T. & Yap S.A. (2010) Antennal morphology: the so odd *Dendrokara* case (Hemiptera: Derbidae). *13th International Auchenorrhyncha Congress, Abstracts: Talks and Posters Vaison-la-Romaine, France, June 28 - July 2, 2010*, 89–90.
- Bu C.-P., Larivière M.C. & Liang A.-P. (2010) *Parapiromis* nom. nov., a new name for *Piromis* Fennah (Hemiptera: Fulgoromorpha: Ricaniidae), with descriptions of three new species. *Zootaxa* 2400: 29–40.

- Bugnion, E. (1908) Le système nerveux et les organes sensoriels du Fulgore tacheté des Indes et de Ceylan (*Fulgora maculata*). *Journal für Psychologie und Neurologie*, 13, 326–354.
- Carayon, J. (1969) Emploi du noir chlorazol en anatomie microscopique des insectes. *Annales de la Société entomologique de France (N.S.)*, 5, 179–193.
- Cobben, R. (1988) What do we really know about host selection in Auchenorrhyncha? In: *Proceedings of the 6th Auchenorrhyncha Meeting. Turin, Italy, 7–11 September 1987*. pp: 81–92.
- Fennah, R.G. (1967) New and little known Fulgoroidea from South Africa (Homoptera). *Annals of the Natal Museum*, 18(3), 655–714.
- Gnezdilov, V.M. (2009) Novoe podsemeistvo sem. Ricaniidae Amyot et Serville (Homoptera, Ricaniidae). *Entomologicheskoe Obozrenie*, 88(4), 807–812. (In Russian). Published in English as: Gnezdilov V. M. (2009) A new subfamily of the planthopper family Ricaniidae Amyot et Serville (Homoptera, Fulgoroidea). *Entomological Review*, 89(9), 1082–1086.
- Huang, J. & Bourgoin, T. (1993) The planthopper genus Trypetimorpha: systematics and phylogenetic relationships (Hemiptera, Fulgoromorpha, Tropiduchidae). *Journal of Natural History*, 27(3), 609–629.
- Kerzhner, I.M. (1981) Poluzhestkokrylye semeystva Nabidae [Heteroptera of the family Nabidae]. *Fauna SSSR. Nasekomye khobotnye [Fauna of the USSR. Rhynchota]*, Leningrad: Nauka, 13(2), 1–326. (In Russian).
- Lewis, C.T. & Marschall A.T. (1970) The ultrastructure of the sensory plaque organs of the antennae of the Chinese lantern fly, *Pyrops candelaria* L. (Homoptera, Fulgoridae). *Tissue Cell*, 2, 375–385.
- Liang, A.P. (2001) Morphology of antennal sensilla in *Achilixius sandakanensis* Muir (Hemiptera: Fulgoromorpha: Achilixiidae) with comments of the phylogenetic position of the Achilixiidae. *The Raffles Bulletin of Zoology*, 49(2), 221–225.
- Liang, A.P. (2002) Seven new species of *Kinnara* Distant (Hemiptera: Fulgoroidea: Kinnaridae), with notes on antennal sensilla and wax glands. *Zoological Studies*, 41(4), 388–402.
- Marschall, A.T. (1973) Vesicular structures in the dendrites of an insect olfactory receptor. *Tissue Cell*, 5, 233–241.
- Marschall, A.T. & Lewis C.T. (1971) Structural variation in the antennal sense organs of Fulgoroid Homoptera (Insecta). *Zoological Journal of the Linnean Society*, 50, 181–184.
- Melichar, L. (1906) Monographie der Issiden (Homoptera). *Abhandlungen der K. K. zool.-botan. Gesellschaft in Wien*, 3(4), 1–327.
- Metcalf, Z.P. (1955) Fascicle IV, Part 16, Ricaniidae. General Catalogue of the Homoptera: pp. 1–199.
- Muir, F. (1930) On the classification of the Fulgoroidea. *Annals and Magazine of Natural History*, Ser. 10, 6: 461–478.
- Nam Youn, Y. (2002) Electroantennogram responses of *Nilaparvata lugens* (Homoptera: Delphacidae) to plant volatile compounds. *Journal of Economic Entomology*, 95(2), 269–277.
- O'Brien, L.B. & Wilson, S.W. (1985) Planthopper systematics and external morphology. Nault, L.R. & Rodriguez J.G. (Eds.). *In: The leafhoppers and planthoppers*: 61–102. New York: J. Wiley & Sons.
- Romani, R., Rossi Stacconi, M. V., Riolo, P. & Isidoro, N. (2009) The sensory structures of the antennal flagellum in *Hyalesthes obsoletus* (Hemiptera: Fulgoromorpha: Cixiidae): A functional reduction? *Arthropod Structure & Development*, 38(6), 473–483.
- Shcherbakov, D.E. (1981) Diagnostics of the families of Auchenorrhyncha (Homoptera) based on wings: 1. Forewing. *Entomologicheskoe Obozrenie*, 60(4), 828–843. [In Russian with English summary; translated into English: *Entomological Review*, 60(4), 64–81].
- Shcherbakov, D.E. (1982) Diagnostics of the families of Auchenorrhyncha (Homoptera) on wings. II. Hind wing. *Entomologicheskoe Obozrenie*, 61(3), 528–536. (In Russian with English summary; translated into English: *Entomological Review*, 61(3), 70–78].
- Sforza, R., Bourgoin, T., Wilson, S. & Boudon-Padiou, El. (1999) Field observations, laboratory rearing and descriptions of immatures of the planthopper *Hyalesthes obsoletus* (Hemiptera: Cixiidae). *European Journal of Entomology*, 96(4), 409–418.
- Shih, H.-Tz. & Yang, C.-T. (1996) The antennal second projection of Cixiidae (Homoptera: Fulgoroidea). *Chinese Journal of Entomology*, 16, 279–285.
- Stroiński, A. (2002) Three new species of *Meliprivesa* Metcalf, 1952 (Hemiptera: Fulgoromorpha: Ricaniidae). *Annales Zoologici*, 52(4), 587–591.
- Stroiński, A. (2007a) Rewizja systematyczna, filogeneza i klasyfikacja, pluskwiaków z grupy rodzajowej *Privesa* (Hemiptera: Fulgoromorpha: Ricaniidae). PhD thesis, ms unpublished (In Polish). Museum and Institute of Zoology PAS, Warszawa, 269 pp.
- Stroiński, A. (2007b) *Ricanopsis atromarginata* n. sp. from Angola (Hemiptera: Fulgoromorpha: Ricaniidae). *Genus*, 18(3): 341–344.
- Stroiński, A. (2010a) *Mulvia trialbofasciata* n. sp. from Africa (Hemiptera: Fulgoromorpha: Ricaniidae). *Genus*, 21(1): 1–9.
- Stroiński, A. (2010b) Revision of the African genus *Acroprivesa* Schmidt, 1912 (Hemiptera, Fulgoromorpha, Ricaniidae). *Deutsche Entomologische Zeitschrift*, 57(2): 259–270. DOI 10.1002/mmnd.201000023
- Stroiński, A. (2010c) *Paici cassani* gen. et sp. nov. (Hemiptera: Ricaniidae) from New Caledonia. *Annales Zoologici*, 60(4): 573–582.
- Synave, H. (1956) Les Ricaniidae de Madagascar (Hemiptera-Homoptera). *Mémoires de l'Institut scientifique de Madagascar*, Ser. E., 7, 219–242.
- Synave, H. (1966) Homoptères de Madagascar. *Verhandlungen der Naturforschenden Gesellschaft in Basel*, 77(1): 55–75.

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- Williams, J.R. & Fennah, R.G. (1980) Ricaniidae (Hemiptera: Fulgoroidea) from Mauritius, with a description of *Trysanor cicatricosus* spec. nov, gen. nov. *Journal of the Entomological Society of Southern Africa*, 43(1), 7–22.
- Wilson, M. R. (1989) The planthopper family Achilixiidae (Homoptera Fulgoroidea): a synopsis with a revision of the genus *Achilixius*. *Systematic Entomology*, 14, 487–506.
- Xu, C.-Q., Liang, A.-P. & Jiang, G.-M. (2006) The genus *Euricania* Melichar (Homoptera: Ricaniidae) from China. *The Raffles Bulletin of Zoology*, 54(1), 1–10.
- Zhang, Y.-L., Peng, L.-F. & Wang Y.-L. (2011) *Nivalios* gen. nov. (Hemiptera: Fulgoromorpha: Flatidae) first record of the tribe Nephesini from China. *Zootaxa*, 2882, 19–26.