

**New Brazilian Tafaliscina increase the diversity  
of this Neotropical cricket clade (Orthoptera:  
Grylloidea: Gryllidae: Oecanthinae: Paroecanthini)**

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COUVERTURE / *COVER*:

Adult female of *Veredatrypa rosai* n. gen., n. sp. living habitus.

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# New Brazilian *Tafaliscina* increase the diversity of this Neotropical cricket clade (Orthoptera: Grylloidea: Gryllidae: Oecanthinae: Paroecanthini)

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## ABSTRACT

*Tafaliscina* Desutter, 1988 (Grylloidea Laicharting, 1781, Gryllidae Laicharting, 1781, Oecanthinae Blanchard, 1845, Paroecanthini Gorochov, 1986) are a Neotropical cricket clade with a remarkable morphological diversity. We study here their Brazilian representatives. We describe one new genus (*Veredatrypa* Campos n. gen.) and three new species from Cerrado and Caatinga, i.e., *Veredatrypa rosai* n. gen., n. sp., *V. seca* n. gen., n. sp. and *V. fusca* n. gen., n. sp., and two new species of *Tafaliscina* Walker, 1869 from Amazon Forest, i.e., *T. duckeana* n. sp. and *T. vestigialis* n. sp. The new genus and the new species are mainly characterized by their male phallic complexes and forewings. An identification key of *Tafaliscina* Brazilian genera is provided, and the diversity of the subtribe is discussed in relation to the life habits and communication modalities of *Tafaliscina* genera.

## RÉSUMÉ

*De nouveaux Tafaliscina brésiliens augmentent la diversité de ce clade de grillons néotropicaux (Orthoptera: Grylloidea: Gryllidae: Oecanthinae: Paroecanthini).*

Les *Tafaliscina* Desutter, 1988 (Grylloidea Laicharting, 1781, Gryllidae Laicharting, 1781, Oecanthinae Blanchard, 1845, Paroecanthini Gorochov, 1986) constituent un clade néotropical de grillons caractérisé par une remarquable diversité morphologique. Nous étudions ici leurs représentants brésiliens. Un nouveau genre (*Veredatrypa* Campos n. gen.) et trois nouvelles espèces du Cerrado et de la Caatinga sont décrits, i.e., *Veredatrypa rosai* n. gen., n. sp., *V. seca* n. gen., n. sp. et *V. fusca* n. gen., n. sp., ainsi que deux nouvelles espèces de *Tafaliscina* Walker, 1869 de la forêt Amazonienne, i.e., *T. duckeana* n. sp. et *T. vestigialis* n. sp. Le nouveau genre et les nouvelles espèces se caractérisent principalement par leurs complexes phalliques et leurs ailes antérieures. Une clé d'identification des genres brésiliens de *Tafaliscina* est fournie, et la diversité de la sous-tribu est discutée en relation avec les modes de vie et les modalités de communication des genres de *Tafaliscina*.

## KEY WORDS

Crickets,  
morphology,  
forewings,  
phallic complex,  
biodiversity,  
new genus,  
new species.

## MOTS CLÉS

Grillons,  
morphologie,  
ailes,  
complexe phallique,  
biodiversité,  
genre nouveau,  
espèces nouvelles.

## INTRODUCTION

Tafaliscina Desutter 1988 is a subtribe of Neotropical crickets found on leaves of different heights of shrubs and trees at night. With great morphological differences between its representatives, the subtribe shows a remarkable diversity: from small and slender to a large and robust body, male tegmina with or without stridulatory apparatus, hindlegs with long spines and with or without denticles, distal portion of ovipositor widened and flattened or somewhat rectangular in ventral view (Desutter 1988; Gorochov 2017).

The diversity of forewings in Tafaliscina crickets are particularly impressive. They can be absent or reduced (*Cylindrogryllus* Saussure, 1878), elongated with longitudinal veins (*Tafalisca* Walker, 1869 and *Brazitrypa* Gorochov, 2011), or with stridulatory apparatus completely developed (e.g. *Adenophallusia* de Mello, 1990 and *Amblyrhethus* Kirby, 1906). Moreover, some species show a stridulatory file without the usual resonant structures present in crickets, i.e., the harp and the mirror, being able to produce a sound, but not the loud, musical ones usually emitted by crickets. Auditory tympana are also variable, from absence to full development. This morphological diversity is unique in a small clade as Tafaliscina, and it raises questions not only about the utility of forewings and different related elements for communication, but also about the evolution of morphology and life habits in those Neotropical crickets.

According to the Orthoptera Species File (Cigliano *et al.* 2019), Tafaliscina includes ten valid genera and 51 species. Four genera and 13 species are found in Brazil: *Amblyrhethus* Kirby, 1906 (two species); *Brazitrypa* Gorochov, 2011 (four species); *Cylindrogryllus* Saussure, 1878 (four species); *Tafalisca* Walker, 1869 (three species), which represent the morphological diversity of the clade.

In the present paper, we increase the knowledge of Tafaliscina diversity describing a new genus, *Veredatrypa* Campos n. gen. with three new species, and two new species of *Tafalisca*. We provide an identification key to the Brazilian genera of Tafaliscina, and discuss the diversity of the clade in relation with life habits and communication modalities.

We adopt here the familial classification derived from the molecular phylogenetic of Chintauan-Marquier *et al.* (2013, 2016). In particular, the family Gryllidae is restricted to one clade of the whole Grylloidea superfamily, which otherwise includes the Phalangopsidae and Trigonidiidae families. According to this topology, the Tafaliscina genera are the sister group of *Oecanthus* Blanchard, 1845, a result which is supported by additional phylogenetic investigations with molecular and morphological data (Campos, pers. obs.): we consequently modify the classification of Cigliano *et al.* (2019) to take this result into account.

## MATERIAL AND METHODS

The specimens were analyzed, compared and described using a Leica EZ4 stereomicroscope. Drawings of male

genitalia and forewings were made under a Leica MZ9.5 stereomicroscope coupled with a camera lucida. The photographs were taken under a Leica MZ16 stereomicroscope with a Leica DFC-420 camera, using the software Leica Application Suite LAS V4.0, with specimens immersed in ethanol 80%. Male genitalia and female copulatory papilla were photographed immersed in hand sanitizer (Su 2016). The photograph of *Veredatrypa rosai* n. gen., n. sp. (Fig. 1) were taken using a camera Canon T6i with a 100 mm macro lens attached. The distribution map was built with software QGIS 3.4.

Male phallic complexes were removed and treated with aqueous solution 10% KOH for 24 hours to remove muscular tissues and to clarify sclerites and membranes and stored in vial with 80% ethanol with the respective specimen. The female copulatory papillae were also dissected and stored in small vials with ethanol 80% with the respective specimen. Genitalia morphology follows Desutter (1987) and Desutter-Grandcolas (2003). Forewings venation follows Desutter-Grandcolas *et al.* (2017), modified by Schubnel *et al.* (2019).

### ABBREVIATIONS

#### Male genitalia

EctAp	ectophallic apodeme;
EctF	ectophallic fold;
EndSc	endophallic sclerite;
LLophi	lateral lophi of pseudepiphallus;
m	membrane (figured with dots);
MLophi	median lophi of pseudepiphallus;
PsP	pseudepiphallic paramere;
R	rami.

#### General morphology

I, II, III	anterior, median, posterior (leg, tarsomere);
DD	dorsal disc of pronotum;
F	femur;
FW	forewing;
iad, iam, iav	respectively, dorsal, median, ventral apical spurs of hind tibia on inner face;
LL	lateral lobe of pronotum;
oad, oam, oav	dorsal, median and ventral apical spurs of hind tibia on outer face;
T	tibia;
TIII	subapical and apical spurs formula indicated inner/outer respectively.

#### Male forewing venation

CuA	anterior branch of cubital vein;
CuP	posterior branch of cubital vein;
CuPa	anterior branch of CuP;
CuPb	posterior branch of CuP;
hv	harp vein;
M	median vein;
PCu	postcubital vein.

#### Measurements

FWL	forewing length;
FWW	forewing width (at mid-line);
HW	head width;
HWL	hindwing length;
IOD	inter ocular distance;
LBtarsIII	length of basitarsomere III;

LFIII	length of hind femur;
LTIII	length of hind tibia;
OL	ovipositor length;
PL	pronotum length;
PW	pronotum width (at mid-line);
WFIII	width of hind femur.

*Repositories*

ANSP	Academy of Natural Sciences of Philadelphia of Drexel University;
BOTU	Coleção de Insetos do Departamento de Zoologia (Zoology Department Insect Collection), Instituto de Biociências, Universidade Estadual Paulista, (UNESP), municipality of Botucatu, State of São Paulo;
MNHN	Muséum national d'Histoire naturelle, Paris;
MZSP	Museu de Zoologia da Universidade de São Paulo, São Paulo.

*Brazilian states*

AM	Amazonas;
CE	Ceará;
GO	Goiás;
MG	Minas Gerais;
PA	Pará.

The holotypes and allotypes will be deposited in MZSP. Paratypes will be deposited in MZSP, MNHN and BOTU as designed in “material examined”.

## SYSTEMATICS

Order OTHOPTERA Olivier, 1789  
 Superfamily GRYLLOIDEA Laicharting, 1781  
 Family GRYLLIDAE Laicharting, 1781  
 Subfamily OECANTHINAE Blancard, 1845  
 Tribe *Paroecanthini* Gorochov, 1986  
 Subtribe *Tafaliscina* Desutter, 1988

*Veredatrypa* Campos n. gen.

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TYPE SPECIES. — *Veredatrypa rosai* n. gen, n. sp.

SPECIES INCLUDED. — *Veredatrypa rosai* n. gen., n. sp.; *Veredatrypa seca* n. gen., n. sp.; *Veredatrypa fusca* n. gen., n. sp.

ETYMOLOGY. — Named after “Grande Sertão: Veredas”, a novel written by the Brazilian novelist João Guimarães Rosa. Grande Sertão: Veredas (in English, translated as The Devil to Pay in the Backlands) is one of the masterpieces of Brazilian literature and one of the most important novels in Portuguese language literature due to its style and complexity. Grande Sertão: Veredas is also a Brazilian National Park that protects a large fragment of Brazilian Cerrado, including wetlands areas known as “veredas”. That Park is located in the same area where the novel happened and is the type-locality of this new genus.

DISTRIBUTION. — This genus is recorded for Brazilian open forests as the Cerrado and Caatinga, in States of Minas Gerais, Goiás and Ceará.

DIAGNOSIS. — The genus is separated from the other genera of *Tafaliscina* by the following characters: median ocelli very reduced,

almost no discernible; DD with longitudinal lateral bands from cephalic to caudal margin. Male: metanotum with two pairs of projections, with cluster of bristles (absent in *V. seca* n. gen., n. sp.). FWs with anal vein area slightly bulged dorsally, stridulatory file surrounded by strong sclerotization, hv anterior region strongly sclerotized. Male genitalia: MLophi triangular, with a pointed apex; LLophi very short or absent; EctF strongly sclerotized, wide anteriorly, thin posteriorly, going along MLophi, apex folding dorsally, connecting to the apex of MLophi; endophallic apodeme bifid. Female: ovipositor short than cerci, with two lateral protuberances in dorsal and ventral views. Female genitalia: copulatory papilla distal half constricted, without furrow ventrally.

## DESCRIPTION

*General morphology*

**Body.** Size small to medium, slender in dorsal view, with yellowish pubescence, except on FWs and hindwings.

**Head.** Occiput and vertex slightly pubescent (Figs 2A; 5A; 8A). Three ocelli, nearly aligned in frontal view, the median very small, almost no discernible; lateral ocelli large, rounded (Figs 2C; 5C; 8C). Fastigium longer than wide, with two lateral rows of bristles. Antennal scape longer than wide (Figs 2C; 5C; 8C); antennae lightly colored with sparse dark antennomeres. Maxillary palpi pubescent, articles 3-5 almost same sized, article 5 clavate (Figs 2B, C; 5B, C; 8B; C).

**Pronotum.** DD slightly wider than long, with sparse bristles as well as bristles on cephalic and caudal margins; two longitudinal lateral bands from cephalic to caudal margins; two median maculae aligned, one close to cephalic margin, other central to DD. LL ventro-cephalic angle rounded, ventro-caudal angle gradually ascendant; without bristles on ventral margin (Figs 2A, J; 5A; 8A; H).

**Wings.** FWs covering hindwings, not covering last tergites of abdomen (Figs 2A, J; 5A; 8A, H).

**Abdomen.** Abdominal tergites less pubescent and darker than pronotum DD.

**Legs.** Legs I and II pubescent; TI and TII with two ventral spurs, one dorsal (except *V. seca* n. gen., n. sp. with two ventral and two dorsal spurs same-sized on TII); TI with oval outer tympanum, without inner tympanum. TIII subapical spurs 5/4, with two spines between them, the apical spine smaller than the distal, with five spines above the most basal subapical spur; apical spurs 3/3, longer on inner face; inner spurs: dorsal longest (iad), median slightly shorter (iam), ventral smaller (iav) (iad>iam>iav) (Figs 2H; 5H); outer apical spurs: median longest (oam), dorsal slightly shorter (oad), ventral smaller (oav) (oam>oad>oav) (Figs 2I; 8I). Basitarsus with three outer spines in line, same-sized; one inner spine (Figs 2H, I; 5H, I).

*Male*

Metanotum with two pairs of projections, one pair median, the other pair close to the distal margin of metanotum; with two clusters of bristles, one pair pointing to anterior margin



FIG. 1. — *Veredatrypa rosai* n. gen., n. sp. living habitus: **A**, adult female; **B**, adult male.

of metanotum, another pair pointing to posterior margin of metanotum (Figs 2E; 8E); metanotal structures lacking in *V. seca* n. gen., n. sp. (Fig. 5E). FWs covering  $\frac{2}{3}$  of abdomen, right FW dorsal field pigmented, left FW dorsal field transparent; two dark spots close to FWs insertion; anal vein area slightly bulged dorsally; stridulatory file present, slightly curved, surrounded by a strong sclerotization on right FW (less sclerotized on *V. fusca* n. gen., n. sp.); harp crossed by 2-4 diagonal veins, veins anterior region strongly sclerotized; mirror wider than long, divided in the middle by one transverse vein; chords 1 and 2 elongated, connected anteriorly, separated from chord 3; mirror divided on the middle; apical field reduced (Figs 2A, D; 5A, D; 8A, D); lateral field with 15-18 diagonal parallel veins (Figs 2B; 5B; 8B). Supra anal plate pubescent, constricted medially, posterior margin rounded (Figs 2F; 5F; 8F); subgenital plate pubescent, slightly longer than wide, posterior border rounded (Figs 2G; 5G; 8G).

*Male genitalia* (Figs 3A-C; 4; 6; 7; 9A-C; 10)

Elongated, slightly upcurved in lateral view. Pseudepiphallus: pseudepiphallic sclerite, posterior region constricted forming MLOphi, triangular, with a pointed apex (not so constricted in *V. seca* n. gen., n. sp.), LLOphi very reduced or absent; posterior margin of MLOphi bearing membranes laterally (visible in ventral view); R elongated, two times longer than pseudepiphallic sclerite, almost connected anteriorly. PsP well sclerotized, upcurved, posterior half two times wider than anterior half in ventral view. Ectophallic invagination: EctAp elongated, thin; ectophallic arc not complete medially; EctF strongly sclerotized, wide anteriorly, thin posteriorly, going along MLOphi, apex folding dorsally, connecting to the apex of MLOphi; ventral projections of ectophallic invagination elongated, almost as long as EctAp. Endophallus: EndSc small; endophallic apodeme bifid.

*Female*

Body larger than male; FWs covering half of abdomen, with parallel veins (Figs 2K; 8H). Supra anal plate pubescent, wider than long, distal margin rounded (Figs 2L; 8I). Subgenital plate less pubescent than supra anal plate, almost as long as wide, distal margin concave (Figs 2M; 8J). Ovipositor shorter than cerci, flattened dorso-ventrally, slightly upcurved, apex thinner, with two protuberances laterally in dorsal and ventral views (Figs 2K, L; 8I, J).

*Female genitalia* (Figs 3D-F; 9D-F)

Copulatory papilla longer than wide, slightly curved downwards in lateral view, distal half constricted, without furrow ventrally.

*Veredatrypa rosai* n. gen., n. sp.  
(Figs 1-4)

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TYPE LOCALITY. — Brazil, State of Minas Gerais, municipality of Chapada Gaúcha, Parque Nacional Grande Sertão Veredas.

ETYMOLOGY. — Name after the Brazilian novelist João Guimarães Rosa, author of the novel “Grande Sertão: Veredas”.

TYPE MATERIAL. — **Holotype**. Brazil • ♂; MG, Chapada Gaúcha, P[arque] N[acional] Grande Sertão Veredas; 15°11'S, 45°39'W; 3-9. II.2018; P. G. B Souza-Dias, L. D. Campos, M. D. de Santis and D. M. A. Garcia leg.; genitalia removed and kept with the specimen; right foreleg removed for DNA extraction; preserved in ethanol 80%; LDC\_047; MZSP.

**Allotype**. Brazil • ♀; same data as for holotype; copulatory papilla dissected and kept with the specimen; left foreleg removed for DNA extraction; preserved in ethanol 80%; LDC\_048; MZSP.

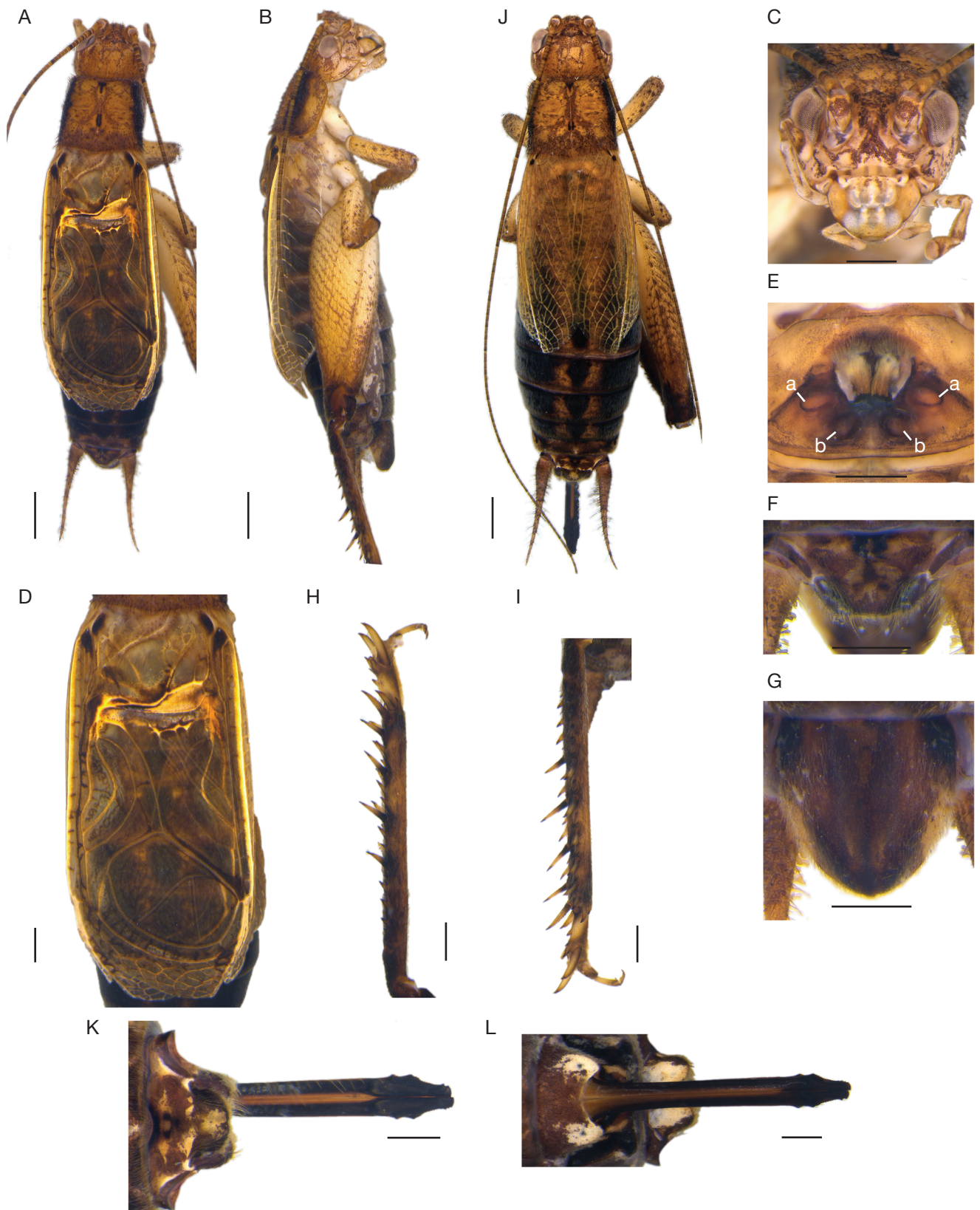


FIG. 2. — *Veredatrypa rosai* n. gen., n. sp. male: **A**, dorsal habitus; **B**, lateral habitus; **C**, frontal head; **D**, right FW, dorsal field; **E**, metanotum, dorsal; **F**, supra anal plate; **G**, subgenital plate; **H**, hind tibia, inner face; **I**, hind tibia, outer face. Female: **J**, dorsal habitus; **K**, supra anal plate and ovipositor, dorsal; **L**, subgenital plate and ovipositor, ventral. Scale bars: A, B, K, 2 mm; C–J, L, M, 1 mm.



FIG. 3. — *Veredatrypa rosai* n. gen., n. sp. male genitalia: **A**, dorsal; **B**, ventral; **C**, lateral. Female copulatory papilla: **D**, dorsal; **E**, ventral; **F**, lateral. Scale bars: A-C, 1 mm; D-F, 0.5 mm.

**DIAGNOSIS.** — Each sternite with two blackish points, close to lateral margin. Male: Metanotum with one pair of median elliptical projections and one pair of rounded projections close to the caudal margin; two clusters of central bristles, one pointing to caudal margin, other pointing to cephalic margin. FWs not covering last three abdominal tergites, lateral borders very sclerotized, yellowish; region between anal veins well sclerotized, yellowish. Stridulatory apparatus: hv not connected to CuPa; first very reduced, third and fourth connected apically; mirror distal cell divided by a longitudinal vein. Male genitalia: MLOphi triangular; LLOphi very reduced, tip rounded in dorsal and ventral views; EctF anterior portion concave, forming lateral lobes in anterior and ventral views, posterior portion thinner, upcurved to dorsal, almost reaching MLOphi apex, apex inflated; endophallic apodemes long as EndSc, curved inwards in dorsal and ventral views.

#### DESCRIPTION

*In addition to the characters of the genus*

**Body.** Size medium. Head and pronotum general coloration reddish brown, abdomen dark brown almost black; body covered by brownish bristles.

**Head.** Occiput and vertex yellowish brown, marmored medium brown (Fig. 2A, C, J). Fastigium marmored medium to dark brown (Fig. 2C). Antennal scape with few bristles on the distal margin in frontal view, light brown, with a medium to dark brown maculae on distal portion in frontal view (Fig. 2C); antennomeres light to medium brown with some isolated antennomeres dark brown. Frons light brown with a median triangular and dark brown macula in frontal view (Fig. 2C). Gena light brown, marmored medium brown in frontal and lateral views. Mandibles yellowish brown. Clypeus light brown, whitish laterally, with two median stripes medium brown; labrum whitish, lower margin yellowish brown (Fig. 2C). Maxillary palpi slightly pubescent, light brown, marmored medium brown; articles 3-5 elongated, article 3 the longest, articles 4 and 5 almost same-sized; apex of article 5 whitish (Fig. 2B, C).

**Pronotum.** DD yellowish brown; median maculae dark brown, almost black, one close to the cephalic margin, “T” shaped, one in the middle of DD, rounded; caudal margin medium to dark brown. DD cephalic margin almost straight, DD caudal margin slightly convex (Fig. 2A, B).

**Legs.** Legs I and II pubescent. FI and FII pale brown, medium to dark brown punctuated; TI and TII darker. FIII pubescent, light brown, medium to dark brown apically; TIII medium to dark brown, yellowish brown ventrally; TI, TII, TIII composition of subapical and apical spurs same as the genus description (Fig. 2H, I). Basitarsus III pale brown, medium brown ventrally.

**Abdomen.** Tergites dark brown, almost black; with two bands, thin, median, longitudinal, light brown. Sternites medium brown; each sternite with two dark points, close to the lateral margin. Cerci pilose, light to medium brown.

#### Male

Metanotum lighter than pronotum DD; metanotal projections: median pair as in Fig. 2Ea, caudal pair as in Fig. 2Eb; clusters of bristles as in Fig. 2E. FWs long, covering hindwings, mainly medium brown; dorsal and lateral field divided by very sclerotized vein (M + CuA vein), yellowish; anal vein area well sclerotized, yellowish; harp crossed by four diagonal veins, not connected to CuPa; first very reduced, third and fourth connected apically; CuPb short; mirror distal cell divided by a longitudinal vein; apical field reduced (Fig. 2A, D); lateral field with *c.* 15 diagonal, parallel veins (Fig. 2B). Supra anal plate slightly pubescent, dark brown, lateral-anterior maculae median to light brown, median maculae light brown; anterior and posterior margins almost straight (Fig. 2F). Subgenital plate medium to dark brown; lateral-posterior borders yellowish-brown; anterior margin almost straight, posterior margin convex (Fig. 2G).

#### Male genitalia (Figs 3A-C; 4)

Pseudepiphallus: MLOphi apex pointed, longer than LLOphi in dorsal view; LLOphi tip rounded in dorsal and ventral views. PsP short, posterior half two times wider than anterior half in ventral view; R straight in dorsal and ventral views, anterior half slightly curved in lateral view; almost connected to pseudepiphallic sclerite. Ectophallic invagination: EctAp, half size of R, curved outwards in dorsal and ventral views; ventral projections of ectophallic invagination slightly curved



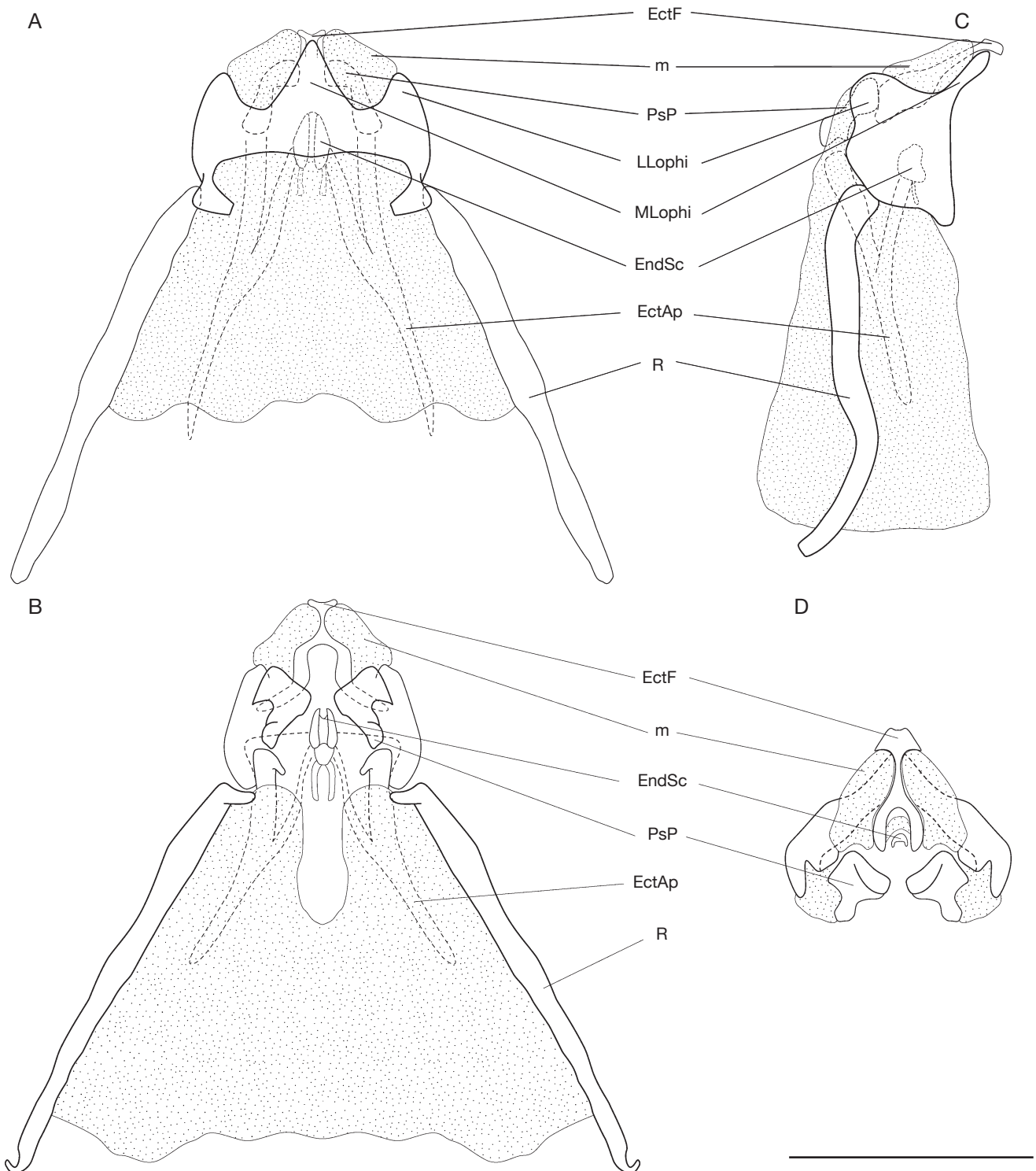


FIG. 4. — *Veredatrypa rosai* n. gen., n. sp. male genitalia: **A**, dorsal; **B**, ventral; **C**, lateral; **D**, posterior. Abbreviations: **EctAp**, ectophallic apodeme; **EctF**, ectophallic fold; **EndSc**, endophallic sclerite; **LLophi**, lateral lophi of pseudepiphallus; **m**, membrane; **MLophi**, median lophi of pseudepiphallus; **PsP**, pseudepiphallus paramere; **R**, rami. Scale bar: 1 mm.

outwards in ventral view; EctF anterior portion concave, forming lateral lobes in anterior and ventral views, posterior portion thinner, upcurved to dorsal, almost reaching MLOphi apex, apex inflated. Endophallus: endophallic longer than wide, concave in ventral view; endophallic apodeme as long as EndSc, curved inwards in dorsal and ventral views.

#### Female

General color as in male. FWs not covering last four abdominal tergites, slightly translucent, medium to light brown (Fig. 2J). Supra anal plate similar to the male, lighter (Fig. 2K). Subgenital plate wider than long, medium brown; posterior margin concave forming two lateral lobes light brown (Fig. 2L). Ovipositor shorter than TIII; dark brown almost black; ovipositor apex slightly serrulated laterally; medium to dark brown (Fig. 2K, L).

#### Female genitalia (Fig. 3D-F)

Copulatory papilla slightly curved downwards in lateral view; anterior half wider than posterior half in dorsal and ventral views; ventral face of posterior half with a whitish macula; posterior apex rounded, unpigmented.

#### Measurements (mm)

Male holotype: HW, 3.4; IOD, 1.8; PL, 3.1; PW, 4; FWL, 12.75; FWW, 5.2; HWL, 7.8; LFIII, 11.25; WFIII, 3.6; LTIII, 8.85; LBtarsIII, 1.5.

Female allotype: HW, 4.2; IOD, 2.1; PL, 4.1; PW, 4.5; FWL, 10.5; FWW, 3.7; HWL, 8.1; LFIII, 13.5; WFIII, 3.6; LTIII, 9.3; LBtarsIII, 1.5; OL, 6.75.

### *Veredatrypa seca* n. gen., n. sp. (Figs 5-7)

[urn:lsid:zoobank.org:act:8A1380FF-9EB5-46F1-92D0-1DEE7DB68D17](https://doi.org/10.21203/rs.3.rs-1000000/v1)

TYPE LOCALITY. — Brazil, State of Ceará, municipality of Ubajara, Chapada de Ibiapaba, Parque Nacional de Ubajara.

ETYMOLOGY. — The word “seca” means “dry” in Portuguese, referring to the climatic conditions of the region where this species was collected. The name is a noun in apposition.

TYPE MATERIAL. — **Holotype.** Brazil • ♂; CE, Ubajara, Chapada de Ibiapaba, P[arque] N[acional] de Ubajara; 3°51'05"S, 40°54'35"W; 860 m; 20-26.I.2013; F. A. G. de Mello leg.; genitalia removed and kept with the specimen; right foreleg removed for DNA extraction; kept in ethanol 80%; LDC\_096; GRYLLO/IBI/J519S; MZSP.

DIAGNOSIS. — General coloration light brown covered by spots medium to dark brown. Vertex with two bands close to antennal scape and eyes. Male: Metanotum with two latero-anterior protuberances, without metanotal projections or cluster of bristles. Harp with three diagonal veins; the third reduced, connected apically with second vein, not connected to CuPa. Male genitalia: MLOphi apex pointed, LLOphi non-discernible; line of strong setae on membrane of distal margin of pseudepiphallic sclerite; anterior margin of pseudepiphallic sclerite with small “V” shaped indentation centrally; median portion of EctF cordiform, posterior portion upcurved to dorsal, not reaching MLOphi apex, apex pointed.

#### DESCRIPTION

*In addition to the characters of the genus:*

**Body.** Small to median size (in comparison with *V. rosai* n. gen., n. sp. and *V. fusca* n. gen., n. sp.); general coloration light brown, medium to dark brown spotted, body covered by sparse bristles, yellowish.

**Head.** Occiput and vertex light brown, with two bands close to antennal scape and eyes, dark brown (Fig. 5A, C). Antennal scape almost as long as wide, few bristles on the distal margin in frontal view, light brown, with a few medium brown spots in frontal view; antennomeres light brown. Frons and gena light brown, median brown spotted in frontal view (Fig. 5C). Clypeus light brown; superior margin with two vertical and lateral bands medium to dark brown; labrum whitish (Fig. 5C). Maxillary palpi slightly pubescent, light brown, medium brown spotted; articles 3-5 elongated, almost same-sized.

**Pronotum.** DD light brown, with medium brown spots; two median maculae dark brown, one close to cephalic margin, one in middle of DD, “V” shaped; caudal margin darker than cephalic margin. DD cephalic margin almost straight, DD caudal margin slightly convex (Fig. 5A, B).

**Legs.** Legs I and II less pubescent than in *V. rosai* n. gen., n. sp. FI, FII, TI and TII light brown, medium brown punctuated; FIII slightly pubescent, light brown, medium brown punctuated; TIII light brown, apical margin with dorsal maculae medium brown, circles medium brown surrounding subapical spurs; TI, TII, TIII subapical and apical spurs as in genus description (Fig. 5H, I); apical and subapical spurs light brown, apex medium brown. Basitarsus III light brown.

**Abdomen.** Tergites slightly pubescent, medium brown, posterior margin lighter; without median longitudinal bands. Sternites, slightly pubescent, light brown; median band darker. Cerci pilose, light brown.

#### Male

Metanotum light brown; with two latero-anterior protuberances, whitish; without metanotal projections or cluster of bristles (Fig. 5E). FWs long for the genus, not covering last two abdominal tergites, mainly light brown; anal vein area very sclerotized, yellowish; anterior region of diagonal vein very sclerotized; harp crossed with three diagonal veins; third vein reduced, connected apically with second vein, not connected to CuPa; CuPb short; apical field reduced, less cells than *V. rosai* n. gen., n. sp. (Fig. 5A, D); lateral field with *c.* 16 diagonal, parallel veins (Fig. 5B). Supra anal plate slightly pubescent, light brown, lateral-anterior margins dark brown; anterior margin almost straight, posterior margin rounded (Fig. 5F). Subgenital plate slightly pubescent, light brown; median region lighter; posterior margin yellowish; anterior margin almost straight, posterior margin convex (Fig. 5G).

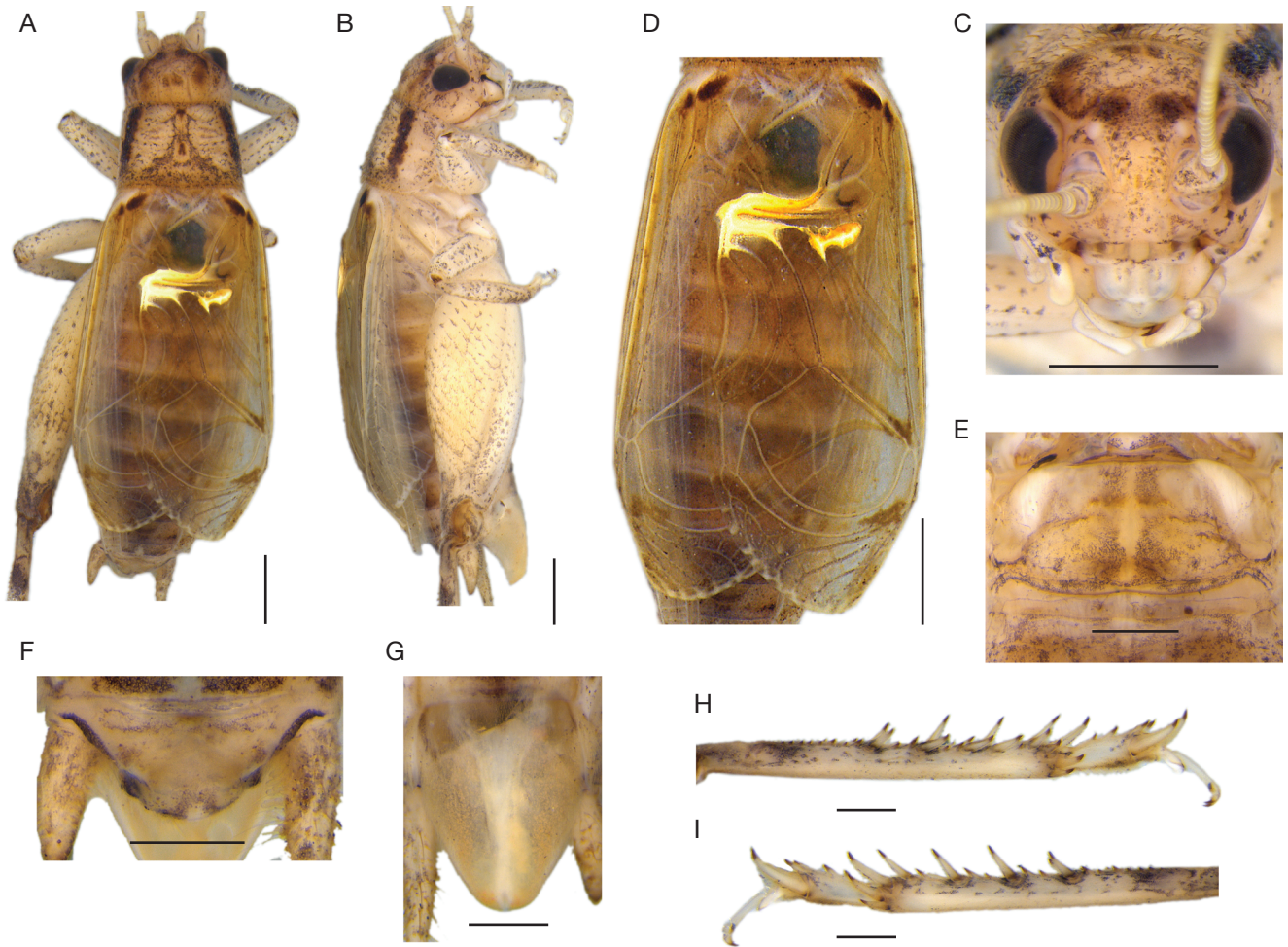


FIG. 5. — *Veredatrypa seca* n. gen., n. sp. male: **A**, dorsal habitus; **B**, lateral habitus; **C**, frontal head; **D**, right FW, dorsal field; **E**, metanotum, dorsal; **F**, supra anal plate; **G**, subgenital plate; **H**, hind tibia, inner face; **I**, hind tibia, outer face. Scale bars: A, B, D, 2 mm; C, E-I, 1 mm.

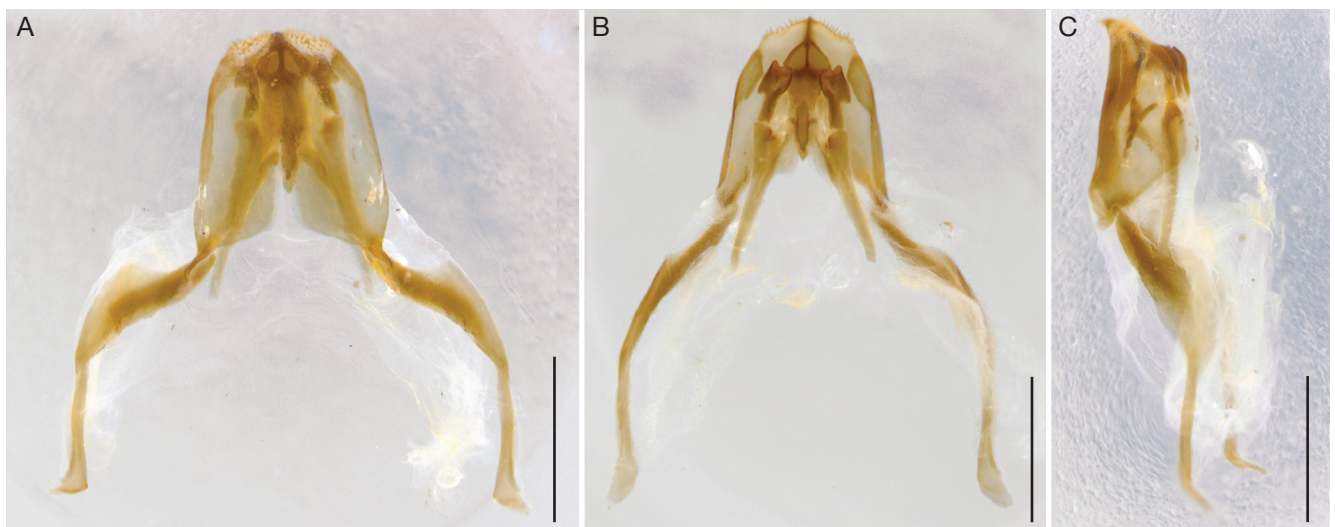


FIG. 6. — *Veredatrypa seca* n. gen., n. sp. male genitalia: **A**, dorsal; **B**, ventral; **C**, lateral. Scale bars: 1 mm.

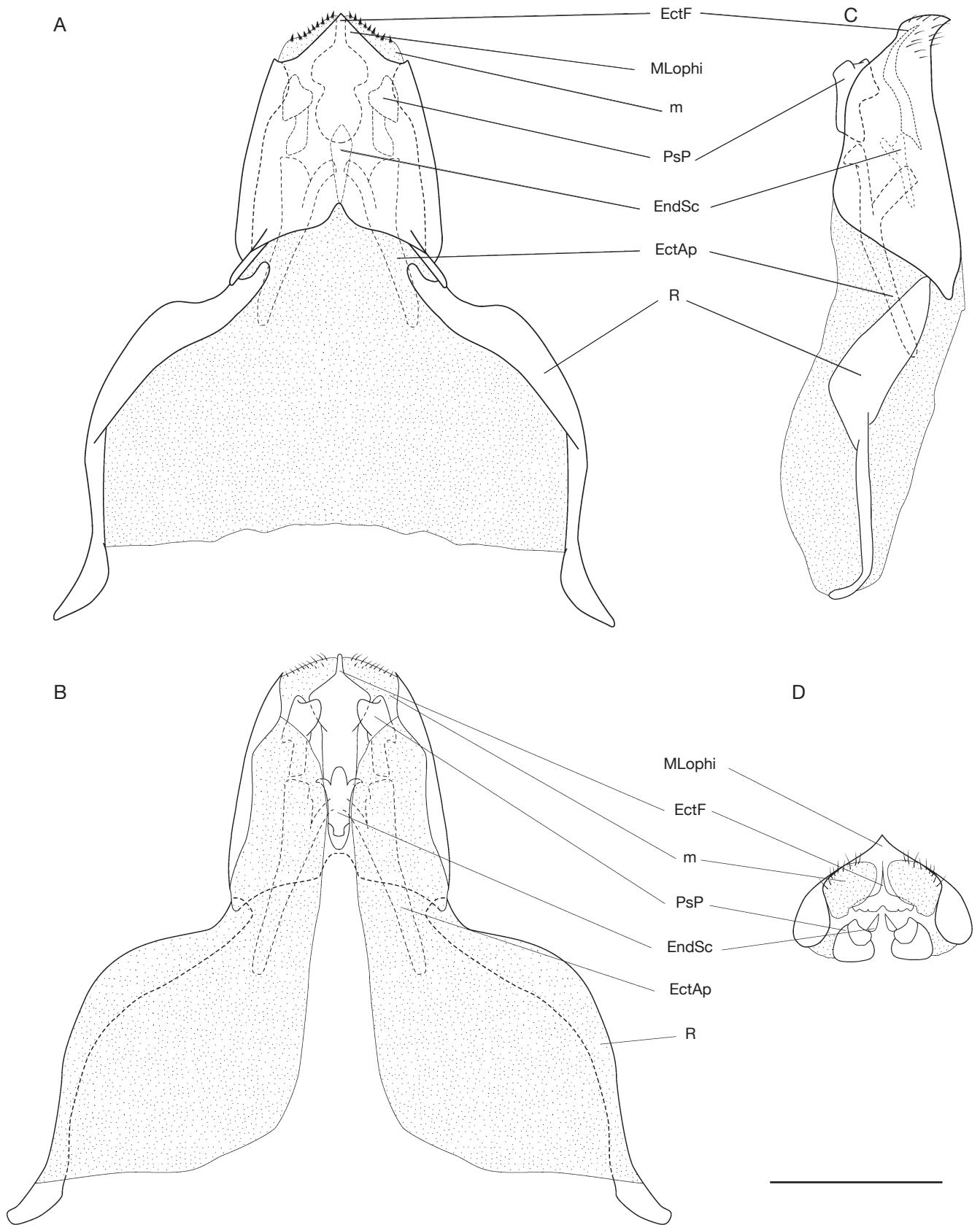


FIG. 7. — *Veredatrypa seca* n. gen., n. sp. male genitalia: **A**, dorsal; **B**, ventral; **C**, lateral; **D**, posterior. Abbreviations: **EctF**, ectophallic fold; **EctAp**, ectophallic apodeme; **EndSc**, endophallic sclerite; **MLOphi**, median lophi of pseudepiphallus; **m**, membrane; **PsP**, pseudepiphallic paramere; **R**, rami. Scale bar: 1 mm.

*Male genitalia* (Figs 6; 7)

Pseudepiphalus: MLOphi apex pointed, LLOphi very reduced, non-discernible; presence of membrane on distal margin of pseudepiphallic sclerite, with line of strong setae; anterior margin of pseudepiphallic sclerite with small "V" shaped indentation. PsP short, posterior margin slightly concave in ventral view; posterior half wider than anterior half in ventral view; R curved inwards in dorsal and ventral views, poster half flattened, anterior apex curved outwards; almost connected to pseudepiphallic sclerite. Ectophallic invagination: EctAp thin, shorter than in *V. rosai* n. gen., n. sp., straight in dorsal and ventral views; ventral projections of ectophallic invagination short; EctF median portion cordiform, posterior portion thinner, upcurved to dorsal, not reaching MLOphi apex, apex pointed. Endophallus: EndSc longer than wide, concave in ventral view; endophallic curved outwards in dorsal and ventral views.

*Female*

Unknown.

*Measurements (mm)*

Male holotype: HW, 3.2; IOD, 1.7; PL, 2.8; PW, 3.5; FWL, 11.25; FWW, 4.6; HWL, 10.95; LFIII, 9.3; WFIII, 3.3; LTIII, 6.3; LBtarsIII, 1.5.

*Veredatrypa fusca* n. gen., n. sp.  
(Figs 8-10)

[urn:lsid:zoobank.org:act:EF40324F-22D5-46F0-B0F9-AC7DF7A999EE](https://doi.org/10.21203/rs.3.rs-1111111/v1)

TYPE LOCALITY. — Brazil, State of Goiás, municipality of Pirenópolis.

ETYMOLOGY. — From Latin, "fusca" means "dark". This species is darker than the other species of the genus.

TYPE MATERIAL. — **Holotype.** Brazil • ♂; GO, 17 km E from Pirenópolis; 15°48'11"S, 48°51'94"W; 12-17.X.1997; 1349 m; A. Mesa and P. Garcia leg.; rupestrian field; genitalia removed and kept with the specimen, preserved in ethanol 80%; Alejo Mesa Collection; MZUSP004864; MZSP.

**Allotype.** Brazil • ♀; same data as for holotype; copulatory papilla dissected and kept with the specimen; preserved in ethanol 80%; MZSP.

**Paratypes.** Brazil • 1 ♂; same data as for holotype; preserved in ethanol 80%; MZUSP004857, MZSP. 2 ♀; same data as for holotype; preserved in ethanol 80%; MZUSP004866, MZUSP004855; MZSP.

DIAGNOSIS. — General coloration medium to dark brown. Male: cephalic pair of projections elliptical in the median line of metanotum, large, concave anteriorly; caudal pair of projections, median, small, apex pointed; a pair of clusters of bristles pointing to caudal margin, one single cluster, larger, pointing to cephalic margin. FWs: connection region of anal veins strongly sclerotized. Male genitalia: MLOphi elongated, apex pointed; EctF very sclerotized; anterior portion concave, forming lateral lobes with spines, posterior portion very thin. Female genitalia: anterior  $\frac{2}{3}$  wider than posterior third in dorsal and ventral views; dorsal face posterior third whitish; ventral face with a whitish macula.

## DESCRIPTION

*In addition to the characters of the genus*

**Body.** Small to medium size; head and pronotum general coloration medium brown, abdomen dark brown almost black; body covered by brownish and yellowish bristles.

**Head.** Occiput medium brown, vertex slightly pubescent, medium to dark brown (Fig. 8A, C). Fastigium yellowish brown (Fig. 8A, C). Antennal scape slightly longer than wide, few bristles on the distal margin in frontal view, yellowish brown (Fig. 8C); antennomeres yellowish brown with some isolated antennomeres medium to dark brown. Frons yellowish brown, almost uniform (Fig. 8C); epistomal suture dark brown under antennal scape region. Gena yellowish brown, slightly marmored medium brown in frontal and lateral views (Fig. 8B, C). Mandibles yellowish brown, external margins dark brown (Fig. 8C). Clypeus light brown, median region yellowish-brown; labrum whitish, lower margin yellowish-brown (Fig. 8C). Maxillary palpi slightly pubescent, light brown, marmored medium brown; articles 3-5 elongated, article 3 the longest, articles 4 and 5 almost same-sized; apex of article 5 whitish (Fig. 8B, C).

**Pronotum.** DD wider than long, with sparse setae, anterior half reddish-brown, posterior half medium to dark brown; DD cephalic margin almost straight, dark brown, DD caudal margin slightly convex (Fig. 8A, B).

**Legs.** Legs I and II slightly pubescent. FI and FII light to medium brown, medium brown punctuated; TI and TII medium brown. FIII slightly pubescent, light brown, medium to dark brown apically; TIII medium to dark brown; apical and subapical spurs yellowish brown, apex and base medium to dark brown; TI, TII, TIII subapical and apical spurs same as in genus description. Basitarsus III very pubescent ventrally; medium brown.

**Abdomen.** Tergites almost without bristles, dark brown, almost black; without median longitudinal bands. Sternites, slightly pubescent, dark brown. Cerci pubescent, medium brown.

*Male*

Metanotum cephalic half dark brown, caudal half yellowish-brown; with a pair of latero-anterior protuberances, pubescent; with two pairs of metanotal projections; one pair of projections in the median line of metanotum, large, elliptical, concave anteriorly; other pair of projections close to caudal margin, median, small, apex pointed; a pair of cluster of bristles pointing to posterior margin, one single cluster, larger, pointing to anterior margin (Fig. 8E). FWs long, covering hindwings, not covering last three abdominal tergites, mainly medium brown, veins light brown; dorsal and lateral field divided by very sclerotized vein (M + CuA vein), yellowish; anal vein area not so as sclerotized as in *V. rosai* n. gen., n. sp. and *V. seca* n. gen., n. sp., connection

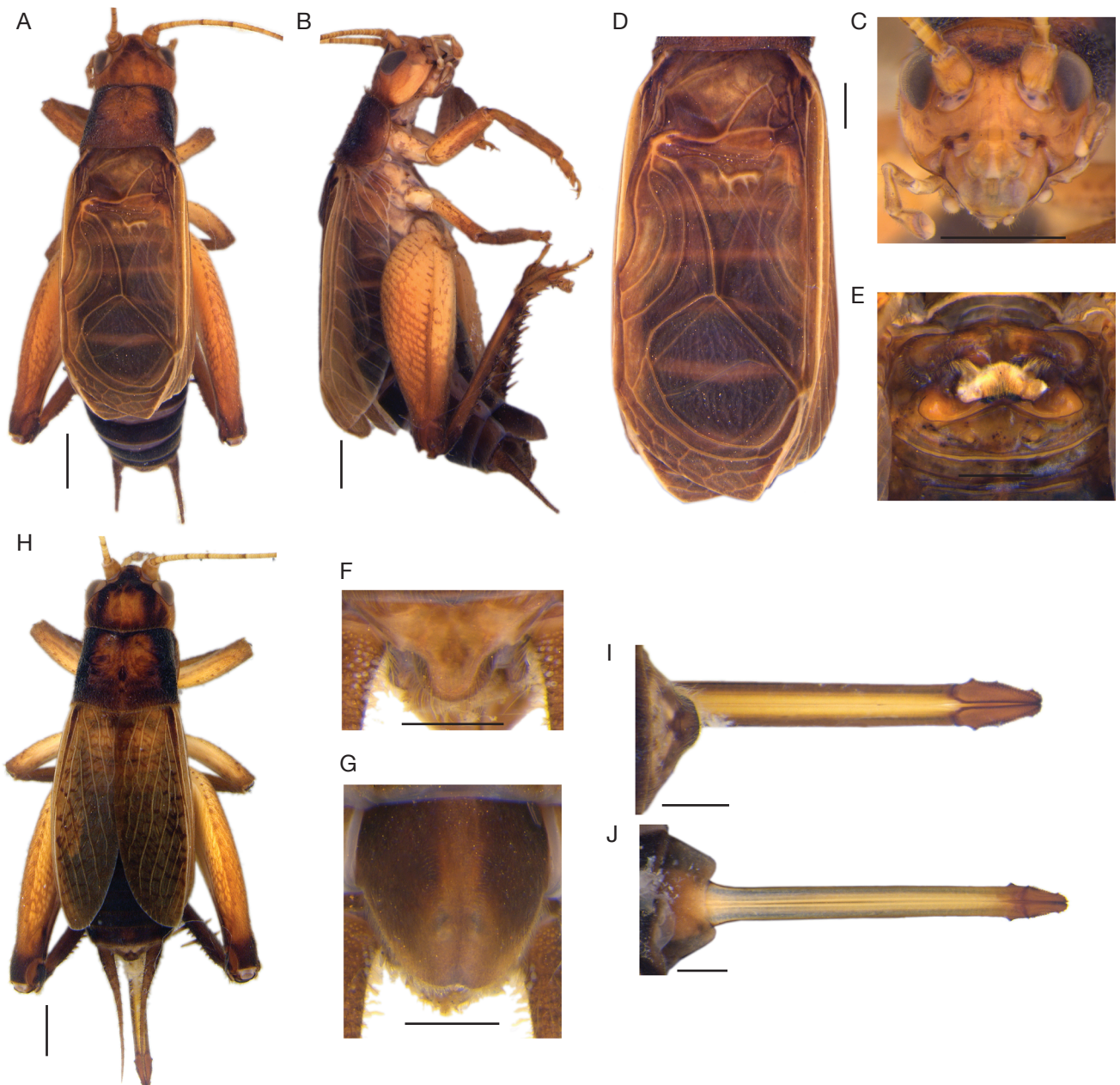


FIG. 8. — *Veredatrypa fusca* n. gen., n. sp. male: **A**, dorsal habitus; **B**, lateral habitus; **C**, frontal head; **D**, right FW, dorsal field; **E**, metanotum, dorsal; **F**, supra anal plate; **G**, subgenital plate. Female: **H**, dorsal habitus; **I**, supra anal plate and ovipositor, dorsal; **J**, subgenital plate and ovipositor, ventral. Scale bars: A, B, H, 2 mm; C-G, I, J, 1 mm.

between anal veins more sclerotized, yellowish; harp crossed with four diagonal veins, not connected to CuPa; first very reduced, fourth somewhat reduced, third and fourth connected apically; CuPb short; apical field reduced (Fig. 8A, D); lateral field with *c.* 14 diagonal, parallel veins (Fig. 8B). Supra anal plate slightly pubescent, yellowish-brown, lateral-posterior margin dark brown; anterior margin almost straight, posterior margin rounded (Fig. 8F). Subgenital plate pubescent, anterior half median band reddish-brown, posterior half median maculae greyish brown; anterior margin almost straight, posterior margin rounded, with a median slightly indentation (Fig. 8G).

*Male genitalia* (Figs 9A-C; 10)

Pseudepiphalus: MLOphi elongated, apex pointed, longer than LLOphi in dorsal view; LLOphi very reduced, tip rounded in dorsal and ventral views; presence of thin membrane between MLOphi and LLOphi. PsP short, well sclerotized, posterior half wider than anterior half in ventral view; R long, slightly curved inwards in dorsal and ventral views, curved downwards in lateral view, almost connected to pseudepiphallic sclerite. Ectophallic invagination: EctAp thin, shorter than R, slightly curved outwards in dorsal and ventral views; ventral projections of ectophallic invagination elongated, same size of EctAp, curved outwards in ventral view; EctF anterior

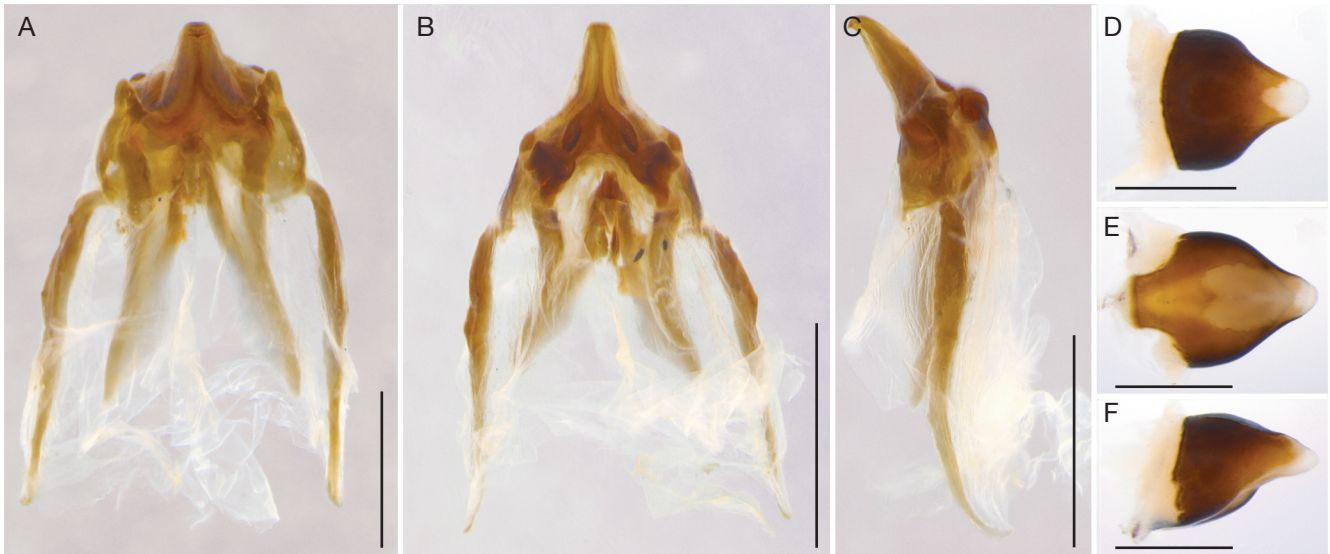


FIG. 9. — *Veredatrypa fusca* n. gen., n. sp. male genitalia: **A**, dorsal; **B**, ventral; **C**, lateral. Female copulatory papilla: **D**, dorsal; **E**, ventral; **F**, lateral. Scale bars: A-C, 1 mm; D-F, 0.5 mm.

portion concave, forming lateral lobes with spines in anterior and ventral views, posterior portion very thin, upcurved to dorsal, almost reaching MLOphi apex, apex inflated. Endophallus: endophallic slightly wider than long, concave in ventral view; endophallic apodeme as long as EndSc, thicker than in *V. rosai* n. gen., n. sp. endophallic apodeme, curved inwards in dorsal and ventral views.

#### Female

Larger than male, general color as in male. FWs not covering last two abdominal tergites, slightly translucent, medium brown (Fig. 8H); dorsal field with parallel and longitudinal veins, separated by crossed veins. Supra anal plate pubescent, anterior half light brown, posterior half dark brown (Fig. 8I). Subgenital plate wider than long, yellowish-brown, dark brown laterally; anterior margin convex, posterior margin concave (Fig. 8J). Ovipositor short, almost same size as TIII; yellowish-brown; apex of ovipositor slightly serrulated laterally; reddish-brown (Fig. 8I, J).

#### Female genitalia (Fig. 9D-F)

Copulatory papilla slightly curved downwards in lateral view; anterior  $\frac{2}{3}$  wider than posterior third in dorsal and ventral views; dorsal face posterior third whitish; ventral face with a whitish macula; posterior apex rounded, unpigmented.

#### Measurements (mm)

Male (n = 2, holotype and paratype): HW,  $3.1 \pm 0.14$  (3-3.2); IOD,  $1.55 \pm 0.21$  (1.4-1.7); PL,  $2.75 \pm 0.07$  (2.7-2.8); PW,  $3.35 \pm 0.35$  (3.1-3.6); FWL, 10.05; FWW,  $4.65 \pm 0.21$  (4.5-4.8); HWL, 7.05; LFIII,  $8.1 \pm 0.63$  (7.65-8.55); WFIII,  $2.62 \pm 0.31$  (2.4-2.85); LTIII,  $6.52 \pm 0.31$  (6.3-6.75); LBtarsIII, 1.2.

Female (n = 3, allotype and paratypes): HW,  $3.73 \pm 0.05$  (3.7-3.8); IOD,  $1.83 \pm 0.05$  (1.8-1.9); PL,  $3.33 \pm 0.15$  (3.2-3.5); PW,  $4.03 \pm 0.11$  (3.9-4.1); FWL,  $9.5 \pm 0.48$  (9.15-

10.05); FWW,  $3.06 \pm 0.11$  (3-3.2); HWL,  $7.45 \pm 0.91$  (6.45-8.25); LFIII,  $10.15 \pm 0.56$  (9.75-10.8); WFIII,  $3.2 \pm 0.08$  (3.15-3.3); LTIII,  $7.8 \pm 0.15$  (7.65-7.95); LBtarsIII,  $1.4 \pm 0.08$  (1.35-1.5); OL,  $8.55 \pm 0.39$  (8.25-9).

#### Genus *Tafalisca* Walker, 1869

TYPE SPECIES. — *Tafalisca lurida* Walker, 1869.

DIAGNOSIS. — FWs with only parallel and longitudinal veins, not specialized for producing sounds (sometimes bearing only a stridulatory file), absence of tympanum, small protuberances in the dorsal face of fore and mid tibiae (not present in all species). Male genitalia: pseudepiphallic sclerite divided in median (bilobate) and lateral lobes, apex of R curved inwards, EctF somewhat membranous, EndSc short, endophallic apodeme very short (sometimes almost no discernible).

#### *Tafalisca duckeana* n. sp.

(Figs 11-13)

[urn:lsid:zoobank.org:act:68EA6793-A06D-4EE1-8BDF-3E90F0CADAD4](https://doi.org/10.21203/rs.3.rs-1120312/v1)

TYPE LOCALITY. — Brazil, State of Amazonas, municipality of Manaus, Reserva Florestal Adolpho Ducke.

DISTRIBUTION. — Brazil, State of Amazonas, municipalities of Humaitá and Manaus.

ETYMOLOGY. — Referring to “Reserva Florestal Adolpho Ducke”, a forest area managed by the Instituto Nacional de Pesquisas da Amazônia (INPA), where this species was discovered.

MATERIAL EXAMINED. — **Holotype.** Brazil • ♂; AM, Manaus, Reserva Adolfo Ducke;  $2^{\circ}55'47.07''S$ ,  $59^{\circ}58'29.48''W$ ; 1-15.VI.2011; E. A. G. Mello and collaborators leg.; genitalia removed and kept with the specimen; right foreleg removed for DNA extraction; preserved in ethanol 80%; CNPq-SISBIOTA; LDC\_012; MZSP.

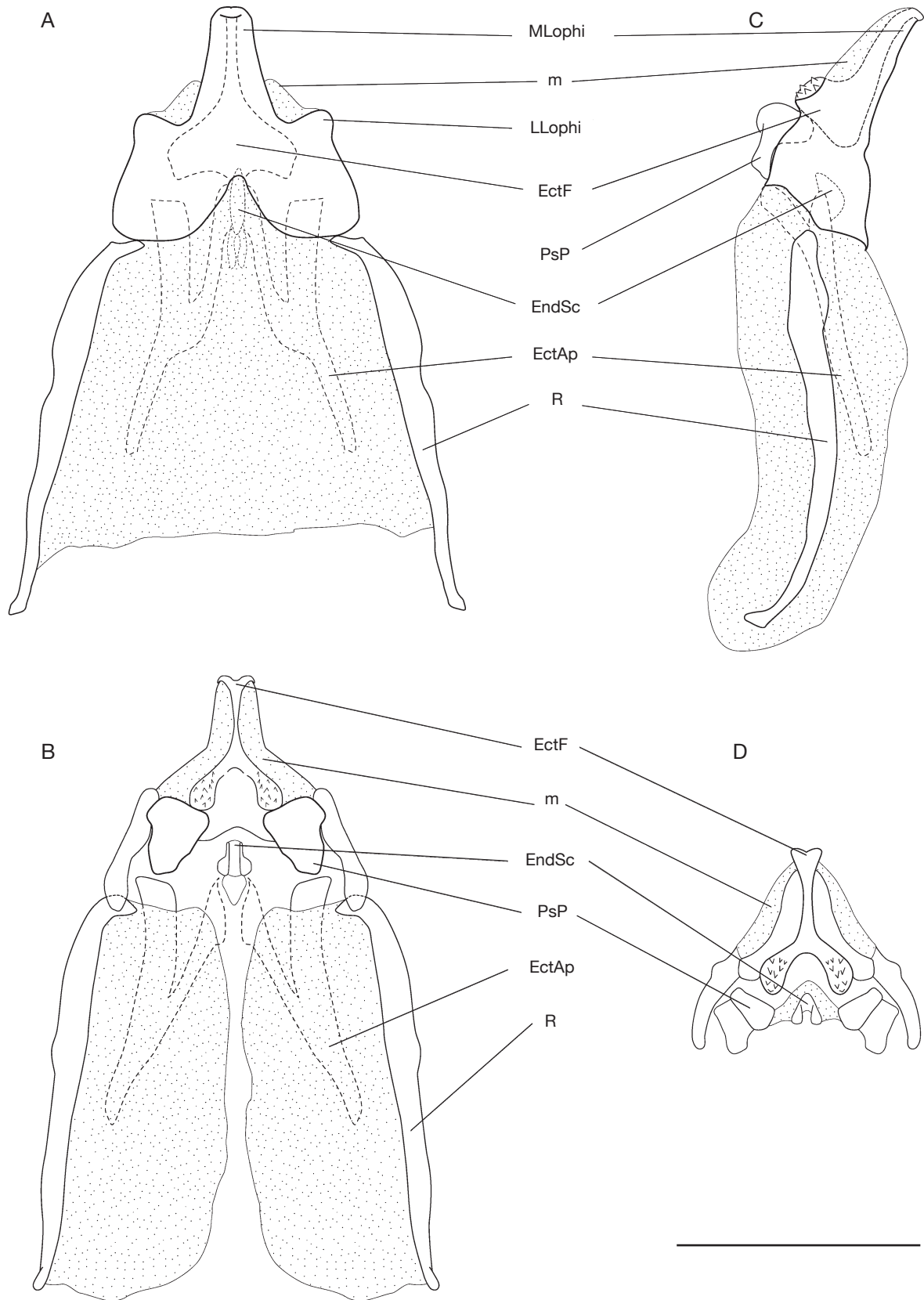


FIG. 10. – *Veredatrypa fusca* n. gen., n. sp. male genitalia: **A**, dorsal; **B**, ventral; **C**, lateral; **D**, posterior. Abbreviations: **EctAp**, ectophallic apodeme; **EctF**, ectophallic fold; **EndSc**, endophallic sclerite; **LLOphi**, lateral lophi of pseudepiphallus; **m**, membrane; **MLOphi**, median lophi of pseudepiphallus; **PsP**, pseudepiphallic paramere; **R**, rami. Scale bar: 1 mm.





FIG. 11. — *Tafaliscina duckeana* n. sp. male: **A**, dorsal habitus; **B**, lateral habitus; **C**, frontal head; **D**, metanotum, dorsal; **E**, fore and middle tibia; **F**, hind tibia, inner face; **G**, hind tibia, outer face; **H**, supra anal plate; **I**, subgenital plate. Female: **J**, dorsal habitus; **K**, supra anal plate and ovipositor, dorsal; **L**, subgenital plate and ovipositor, ventral. Scale bars: A, B, J, 2 mm; C-I, K, L, 1 mm.

**Allotype.** Brazil • ♀; same data as for holotype; copulatory papilla dissected and kept with the specimen; preserved in ethanol 80%; CNPq-SISBIOTA, MZSP.

**Paratypes.** Brazil • 1 ♂; same data as for holotype; preserved in ethanol 80%; CNPq-SISBIOTA; BOTU. 1 ♂; AM, Humaitá; VI.1984; A. S. Abe leg.; pinned; Alejo Mesa Collection; MZSP6145; MZSP. 1 ♂; AM, Manaus, km 45; 25.II.1982; J. W. Morais leg.;

pinned; MZSP. 1 ♀; AM, 100 km north of Manaus, Camp. Colosso; 2°24'36"S, 59°52'3"W; 2.VI.1988; A. Mesa and C. Silva leg.; pinned; Alejo Mesa Collection; MZSP6143; MZSP.

**DIAGNOSIS.** — This species is separated from the other species of *Tafaliscina* by the following characters: General coloration reddish-brown, antennomeres light to medium yellow; metanotum without

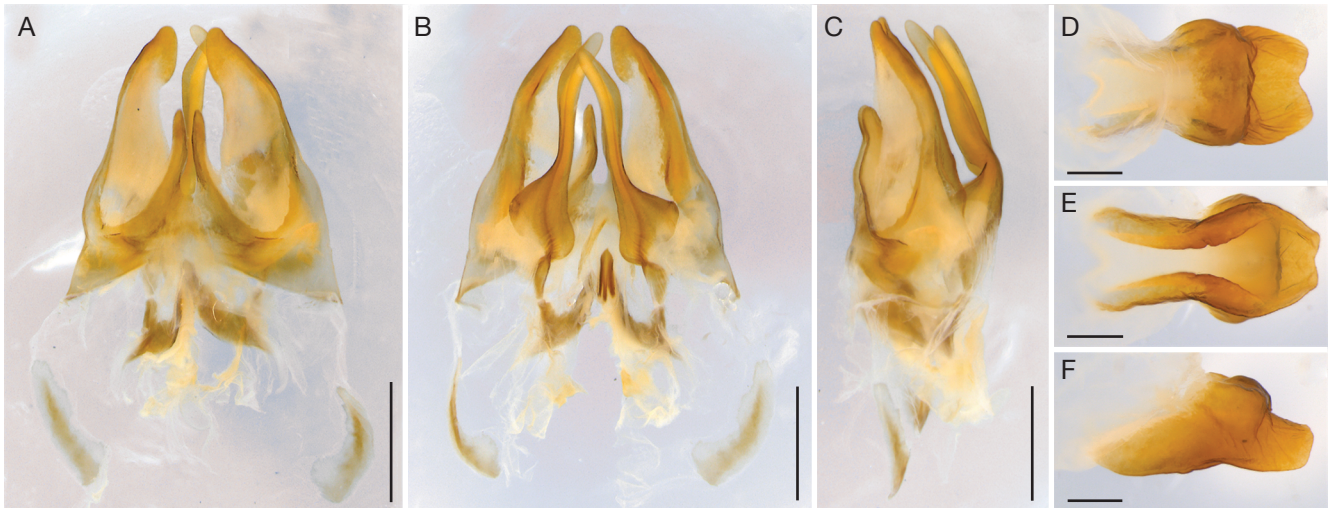


FIG. 12. — *Tafalisca duckeana* n. sp. male genitalia: **A**, dorsal; **B**, ventral; **C**, lateral. Female copulatory papilla: **D**, dorsal; **E**, ventral; **F**, lateral. Scale bars: A-C, 1 mm; D-F, 0.5 mm.

projections; dorsal field with reticulated veins between parallel veins; TI and TII with a small, rounded and unpigmented protuberance on apical region of dorsal face, this region without bristles. Male genitalia: MLOphi not surpassing LLOphi of pseudepiphallus apex in dorsal view, curved outwards in dorsal view; LLOphi apex curved inwards forming an angle less than 90°; basis of PsP twisted.

#### DESCRIPTION

##### *General morphology*

**Body.** Medium to large size; general coloration reddish-brown; body almost entirely covered by small yellowish bristles, except FWs and hindwings.

**Head.** Occiput and vertex covered by small bristles, reddish-brown, almost uniform (Fig. 11A, C). Frons pubescent, light brown (Figs 11A, C; 4A, C); fastigium longer than wide, covered by small bristles, lighter than vertex (Fig. 11A, C). Three ocelli, the median elliptical, very reduced, smaller than lateral ones; lateral ocelli rounded (Figs 11B, C; 4B, C). Antennal scape longer than wide in frontal view, few bristles on the inner face in frontal view, yellowish; pedicel same color as the scape; antennomeres light to medium yellow (Fig. 11C). Gena pale light brown in frontal and lateral views. Mandibles light brown, apex dark brown almost black (Fig. 11C). Clypeus light brown, whitish laterally; labrum whitish (Fig. 11C). Maxillary palpi pubescent, articles 3-5 elongated almost same-sized; article 3 light brown, articles 4 and 5 medium to dark brown; apex of article 5 unpigmented (Fig. 11B, C).

**Pronotum.** DD wider than long, pubescent, reddish-brown; with two median elliptical maculae yellowish (one specimen medium brown); caudal margin medium to dark brown. DD cephalic margin slightly concave, and caudal margin slightly convex; LL ventro-cephalic angle rounded, ventro-caudal angle gradually ascendant (Fig. 11A, B, J).

**Legs.** Legs I and II pubescent, with a small, rounded and unpigmented protuberance on apical region of dorsal face

of TI and TII, this region without bristles (arrows on Fig. 11E). FI and FII yellow-brown to light brown; TI and TII reddish brown. TI with two ventral apical spurs same-sized, one dorsal spur smaller, tympana absent. TII with two ventral spurs same-sized and two dorsal spurs, inner spur smaller or absent. FIII slightly pubescent, reddish-brown, darker apically; TIII dark brown (Fig. 11E, F). TIII subapical spurs 5/4 with a spine between them, two spines above the first subapical spur; apical spurs 3/3, longer on inner face; inner spurs: dorsal longest (iad), median slightly shorter (iam), ventral smaller (iav) (iad>iam>iav) (Fig. 11F, G); outer apical spurs: median longest (oam), dorsal slightly shorter (oad), ventral smaller (oav) (oam>oad>oav) (Fig. 11F, G). Basitarsus dark brown, with three outer spines in line, apical longest, one inner apical spine.

**Abdomen.** Tergites slightly pubescent, light brown, without longitudinal band. Sternites yellowish brown. Cerci pilose, light brown; with dark brown setae. Supra anal plate pubescent, medium to dark brown; posterior margin rounded (Fig. 11H, K).

##### *Male*

Metanotum without projections, antero-lateral regions inflated, medio-posterior region somewhat elevated, lighter than pronotum DD (Fig. 11D). FWs long, covering entire abdomen, medium brown, slightly translucent; left and right FWs with same color and texture; FW dorsal field without stridulatory apparatus; eight longitudinal and parallel veins light yellow; reticulated veins between parallel veins; lateral field with ten diagonal and parallel veins light yellow; (Fig. 11A, B). Hindwing apex surpassing FW apex. Subgenital plate pubescent, anterior margin concave, posterior margin rounded, yellowish-brown (Fig. 11I).

##### *Male genitalia (Figs 12A-C; 13)*

Pseudepiphallus: pseudepiphallic sclerite upcurved in lateral view, divided into two lobes: MLOphi and LLOphi. MLOphi thin, bilobate, curved outwards, somewhat short, not surpassing

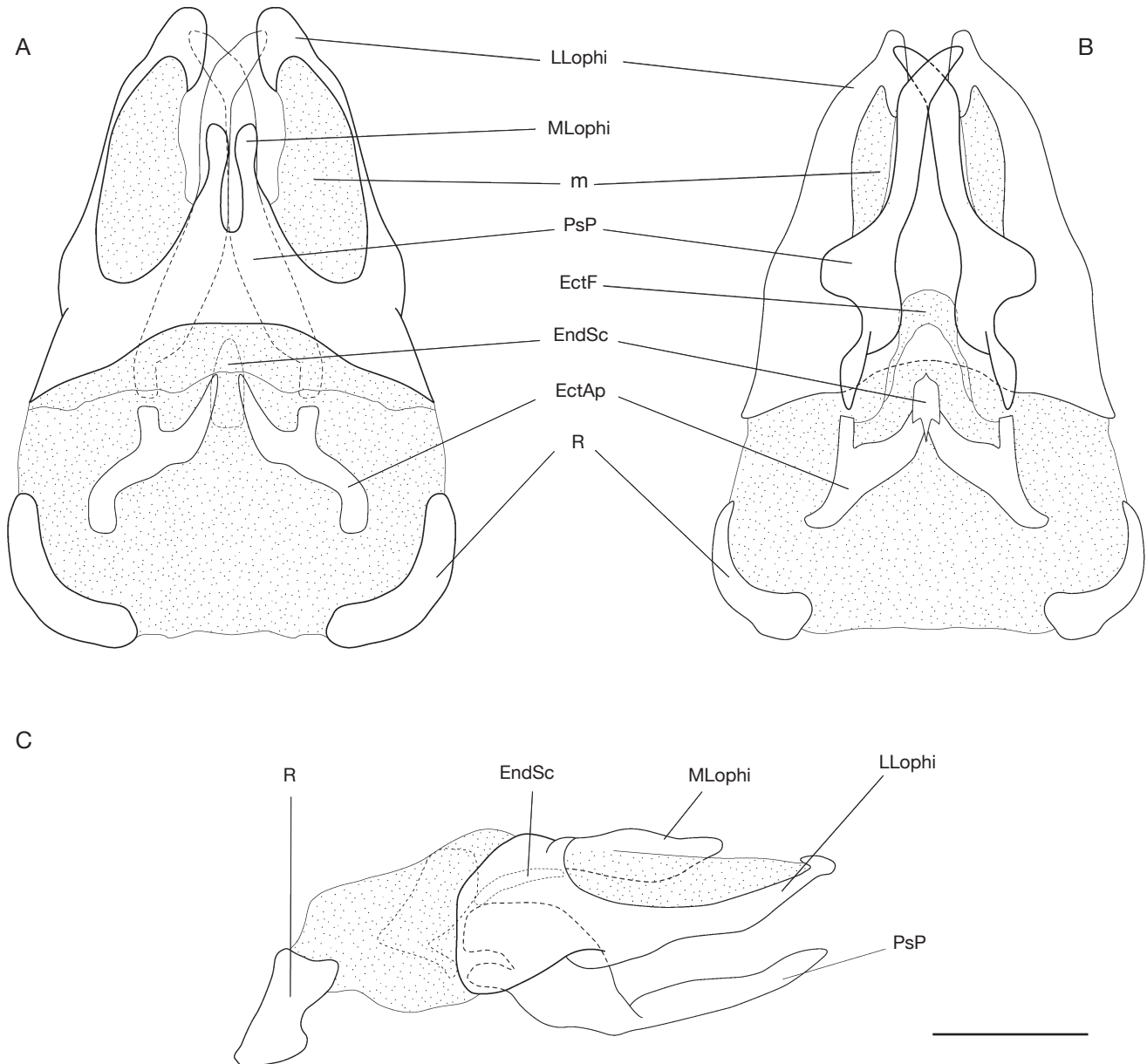


FIG. 13. — *Tafaliscia duckeana* n. sp. male genitalia: **A**, dorsal; **B**, ventral; **C**, lateral. Abbreviations: **EctAp**, ectophallic apodeme; **EctF**, ectophallic fold; **EndSc**, endophallic sclerite; **LLOphi**, lateral lophi of pseudepiphallus; **m**, membrane; **MLOphi**, median lophi of pseudepiphallus; **PsP**, pseudepiphallic paramere; **R**, rami. Scale bar: 1 mm.

LLOphi in dorsal view; LLOphi thin, elongated, curved inwards in dorsal view; apex curved inwards forming an angle less than 90°; MLOphi and LLOphi sharing a membrane between them. PsP as long as pseudepiphallic sclerite, curved inwards in ventral view, upcurved in lateral view; distal 2/3 thin, proximal 1/3 larger; proximal apex twisted; R short connected to pseudepiphallic sclerite by membranes. Ectophallic invagination: EctAp short, curved outwards in dorsal and ventral views, flattened dorso-ventrally; ectophallic arc not complete medially; ventral projections of ectophallic invagination very short; EctF slightly sclerotized, “U” shaped in ventral view. Endophallus: EndSc longer than wide, shorter than EctAp; with two lateral-posterior projections; endophallic apodeme short.

#### Female

Body slightly larger than male, general color darker than male (Fig. 11J). FWs covering entire abdomen, not surpassing hindwings apex, slightly translucent, medium brown; apical field with parallel and longitudinal veins; veins thinner than males FW veins; light yellow (Fig. 11J). Supra anal plate pubescent, wider than long, distal margin rounded (Fig. 11K). Subgenital plate pubescent, anterior margin convex, posterior margin concave, yellowish-brown (Fig. 11L). Ovipositor elongated, flattened dorso-ventrally, yellowish; apex of ovipositor with two small protuberances and slightly serrulated laterally; medium to dark brown (Fig. 11K, L).

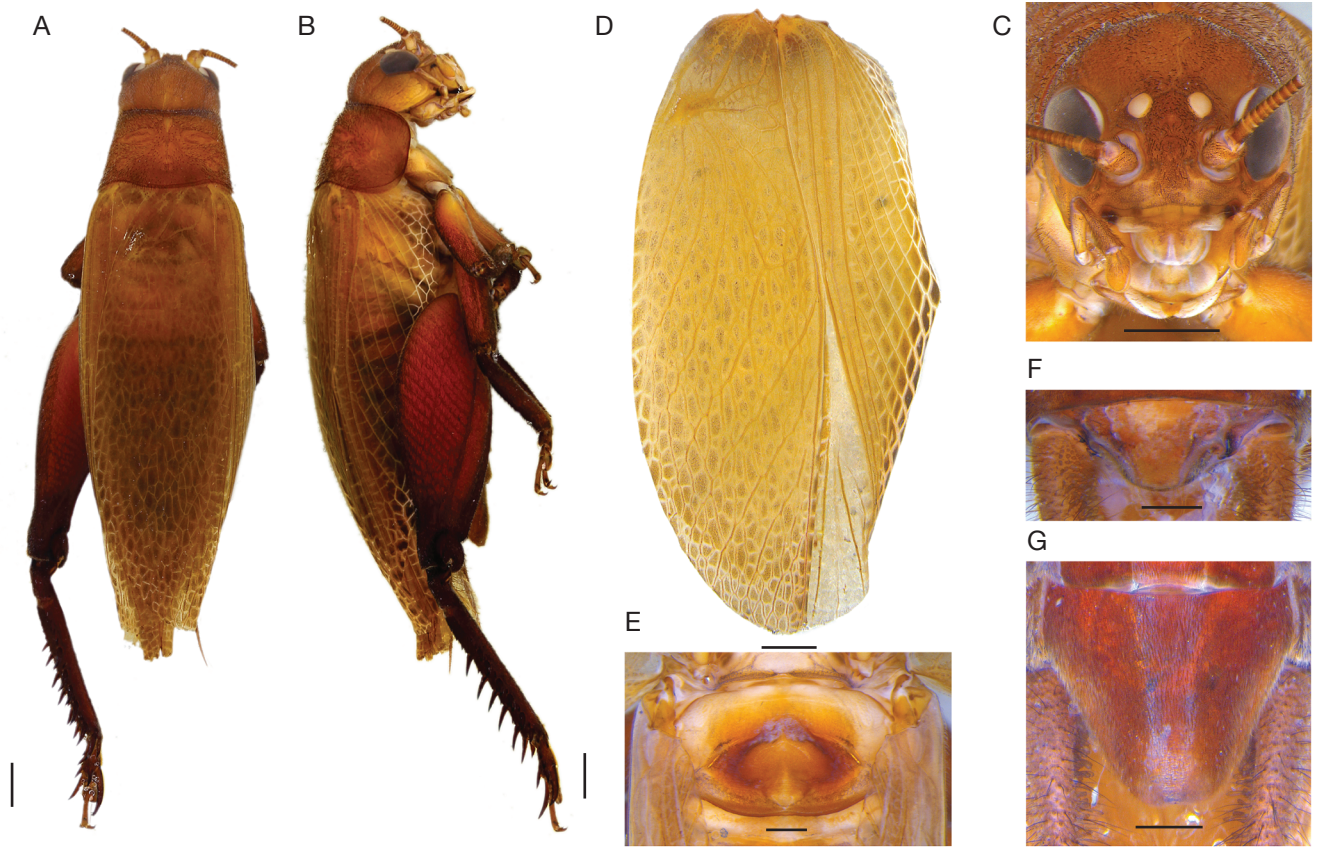


FIG. 14. — *Tafalisca vestigialis* n. sp. male: **A**, dorsal habitus; **B**, lateral habitus; **C**, frontal head; **D**, right FW; **E**, metanotum, dorsal; **F**, supra anal plate; **G**, subgenital plate. Scale bars: A-D, 2 mm; E-G, 1 mm.



FIG. 15. — *Tafalisca vestigialis* n. sp. male genitalia: **A**, dorsal; **B**, ventral; **C**, lateral. Scale bars: 1 mm.

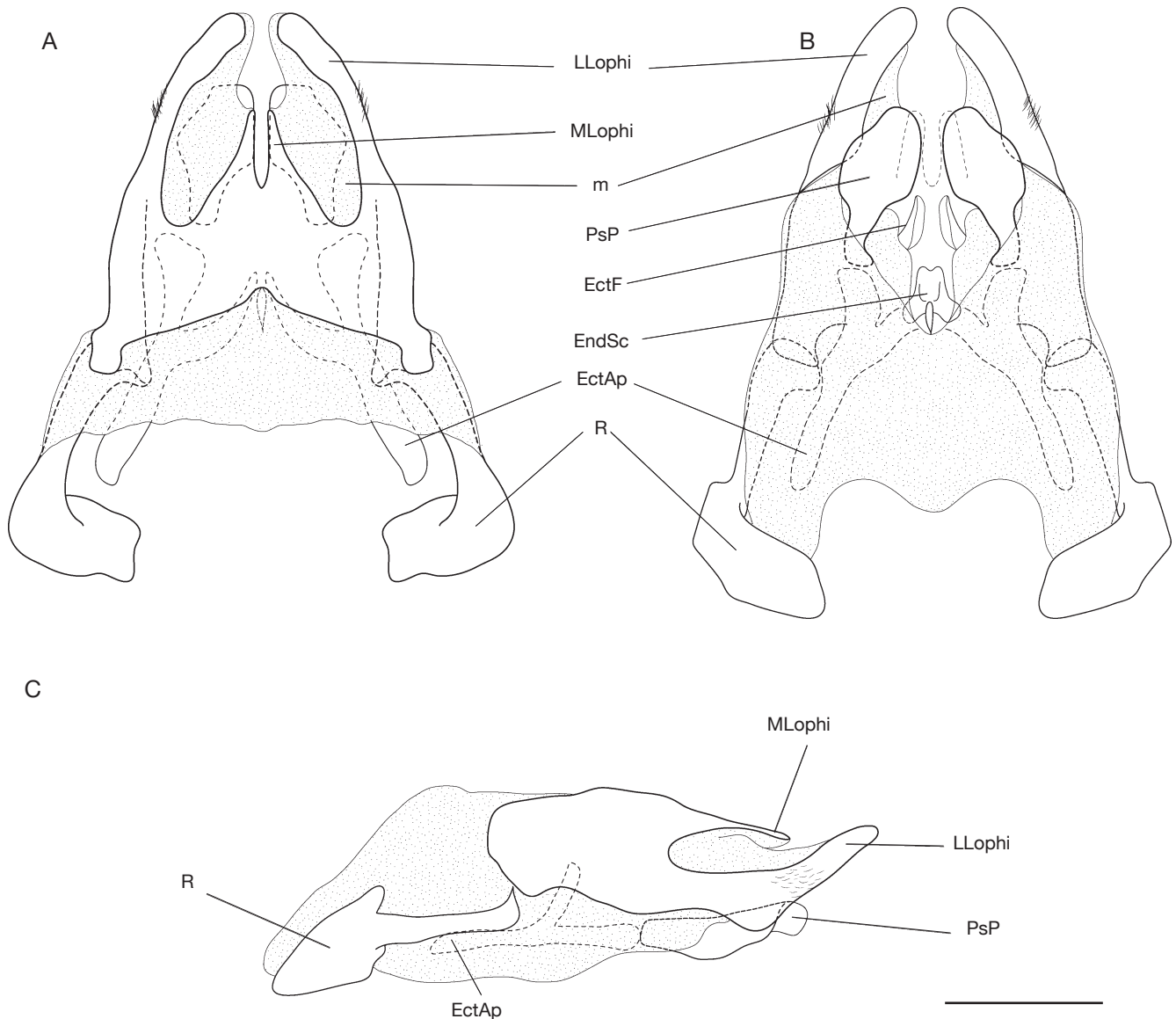


FIG. 16. — *Tafaliscia vestigialis* n. sp. male genitalia: **A**, dorsal; **B**, ventral; **C**, lateral. Abbreviations: **EctAp**, ectophallic apodeme; **EctF**, ectophallic fold; **EndSc**, endophallic sclerite; **LLOphi**, lateral lophi of pseudepiphallus; **m**, membrane; **MLOphi**, median lophi of pseudepiphallus; **PsP**, pseudepiphallic paramere; **R**, rami. Scale bars: 1 mm.

#### Female genitalia (Fig. 12D-F)

Copulatory papilla constricted medially in dorsal and ventral views; distal third thinner than proximal portion in lateral view; grooved ventrally; posterior margin slightly invaginated like “w” form.

#### Measurements (mm)

Male (n = 2, holotype and paratype): HW,  $4.35 \pm 0.21$  (4.2-4.5); IOD,  $2.05 \pm 0.07$  (2-2.1); PL,  $4.05 \pm 0.07$  (4-4.1); PW,  $4.9 \pm 0.42$  (4.6-5.2); FWL,  $18.82 \pm 0.31$  (18.6-19.05); FWW,  $5.25 \pm 0.35$  (5-5.5); HWL,  $21.45 \pm 0.63$  (21-21.9); LFIII,  $13.95 \pm 0.42$  (13.65-14.25); WFIII, 4.35; LTIII,  $12.45 \pm 0.42$  (12.15-12.75); LBtarsIII,  $1.72 \pm 0.1$  (1.65-1.8).

Female allotype: HW, 5; IOD, 2.35; PL, 4.8; PW, 5.9; FWL, 23.4; FWW, 6; HWL, 24.9; LFIII, 15.45; WFIII, 5.5; LTIII, 15.45; LBtarsIII, 1.8; OL, 14.25.

#### *Tafaliscia vestigialis* n. sp. (Figs 14-16)

[urn:lsid:zoobank.org:act:EA0301A6-3524-4AA6-BB4C-941C54D8BDA5](https://doi.org/10.21203/rs.3.rs-1234567/v1)

TYPE LOCALITY. — Brazil, State of Para, municipality of Belterra, Fazenda Treviso.

DISTRIBUTION. — Brazil, State of Para, municipality of Belterra; French Guyana (Oyapock), Camp Pinot between Trois Sauts and mont Saint-Marcel.

ETYMOLOGY. — From Latin, “vestigialis” means “vestigial”, referring to the vestigial stridulatory file of this species.

TYPE MATERIAL. — **Holotype**. Brazil • ♂; PA, Belterra, Faz[enda]. Treviso;  $3^{\circ}8'58.26''S$ ,  $54^{\circ}50'4.14''W$ ; 30.XI-11.XII.2018; P. G. B. Souza-Dias, D. R. Redü and L. D. Campos leg.; genitalia

removed and kept with the specimen; right foreleg removed for DNA extraction; preserved in ethanol 80%; LDC\_230; MZSP.

**Paratype.** French Guiana • 1 ♂; Oyapock, Camp Pinot entre Trois Sauts and mont Saint-Marcel; 30.III.1976; M. Descamps leg.; genitalia removed and kept with the specimen; pinned; MNHN-EO-ENSIF10875; MNHN.

**DIAGNOSIS.** — This species is separated from the other species of *Tafalisca* by the following characters: general coloration reddish, antennomeres medium to dark brown; FW bearing a vestigial stridulatory vein, bearing *c.* 70 reduced teeth. Male genitalia: MLOphi straight; LLOphi apex not curved; presence of a membrane between median and LLOphi; PsP well sclerotized, distal portion larger than proximal, oblique in dorsal and ventral views.

#### DESCRIPTION

Large size; general coloration reddish; body almost entirely covered by small brown bristles.

#### General morphology

**Head.** Occiput and vertex reddish, almost uniform, covered by small bristles (Fig. 14A, C). Frons reddish brown (Fig. 14C); fastigium longer than wide, covered by small bristles (Fig. 14A, C). Three ocelli, the median elliptical, very reduced, smaller than lateral ones; lateral ocelli rounded (Fig. 14B, C). Antennal scape longer than wide in frontal view, with bristles on the inner face in frontal view, light brown; pedicel and antennomeres medium brown (Fig. 14C). Gena light brown in frontal and lateral views (Fig. 14B, C). Mandibles light yellow, apex dark brown almost black (Fig. 14B, C). Clypeus medium to light brown, lower margin whitish; labrum whitish (Fig. 14C). Maxillary palpi pubescent, articles 3-5 elongated, articles 4 and 5 almost same-sized; articles 3-5 medium brown; apex of article 5 unpigmented (Fig. 14B, C).

**Pronotum.** DD wider than long, pubescent, reddish; with one median elliptical macula yellowish on cephalic margin; caudal margin medium to dark brown. DD cephalic margin slightly concave, caudal margin slightly convex; LL ventro-cephalic angle rounded, ventro-caudal angle gradually ascendant (Fig. 14A, B).

**Legs.** Legs I and II pubescent. FI and FII reddish-brown; TI and TII dark brown. TI with two ventral apical spurs same-sized, one dorsal spur smaller, tympana absent. TII with two ventral spurs same-sized and two dorsal spurs, inner spur smaller. FIII slightly pubescent, reddish, darker apically; TIII dark brown (Fig. 14A, B). TIII subapical spurs 5/4 with a spine between them, two spines above the first subapical spur; apical spurs 3/3, longer on inner face; inner spurs: dorsal longest (iad), median slightly shorter (iam), ventral smaller (iav) (iad>iam>iav); outer apical spurs: median longest (oam), dorsal slightly shorter (oad), ventral smaller (oav) (oam>oad>oav). Basitarsus dark brown, with three outer spines in line, apical longest, one inner apical spine.

**Abdomen.** Tergites slightly pubescent, without longitudinal band, light brown. Sternites yellowish brown. Cerci pilose,

medium to dark brown; with dark brown setae. Supra anal plate slightly pubescent, medium brown; posterior margin rounded (Fig. 14F).

#### Male

Metanotum without projections, antero-lateral regions inflated, medio-posterior region somewhat elevated, central region with bristles, lighter than pronotum DD (Fig. 14E). FWs long, covering entire abdomen, medium brown, slightly translucent; left and right FWs with same color and texture; FWs dorsal field bearing a vestigial stridulatory file bearing *c.* 70 very reduced teeth (Fig. 14D, arrow); apparently without other veins modified to sound production; with *c.* 7 diagonal and parallel veins, yellow; reticulated veins between parallel veins; lateral field with ten diagonal and parallel veins light yellow (Fig. 14D). Hindwing apex surpassing FWs apex in dorsal view. Subgenital plate pubescent, anterior margin concave, posterior margin rounded, yellowish-brown (Fig. 14G).

#### Male genitalia (Figs 15A-C; 16A-C)

Pseudepiphallus: pseudepiphallic sclerite upcurved in lateral view; divided in two lobes: MLOphi and LLOphi. MLOphi thin, bilobate, elongated, not surpassing LLOphi apex in dorsal view, almost straight in dorsal view; LLOphi external to MLOphi in dorsal view; thin, elongated, curved inwards in dorsal view; apex not curved; MLOphi and LLOphi sharing a membrane between them. PsP shorter than pseudepiphallic sclerite, curved inwards in ventral view, almost straight in lateral view; distal half wider than proximal half; R elongated, posterior apex close to pseudepiphallic sclerite. Ectophallic invagination: EctAp longer than *T. duckeana* n. sp., straight, oblique in dorsal and ventral views, flattened dorso-ventrally; ectophallic arc not complete medially; ventral projections of ectophallic invagination longer than *T. duckeana* n. sp.; EctF sclerotized, “U” shaped in ventral view. Endophallus: EndSc as long as wide, shorter than EctAp; with two lateral-posterior projections; endophallic apodeme short.

#### Female

Unknown.

#### Measurements (mm)

Male holotype: Hw, 5.7; iod, 2.55; Lpron, 4.8; awpron, 5.7; pwpron, 7.35; wpron, 6.6; LFW, 23.1; wFW, 7.5; LHW, 25.05; LFIII, 14.55; wFIII, 5.85; LTIII, 11.1; Ltars1-III, 1.65.

#### DISCUSSION

The morphological diversity within *Tafaliscina* is remarkable for such a small clade within crickets. As previously mentioned, it mainly concerns the body size and shape, the hind leg armature, the shape and ornamentation of female ovipositor, and the forewing development and venation. Its representatives

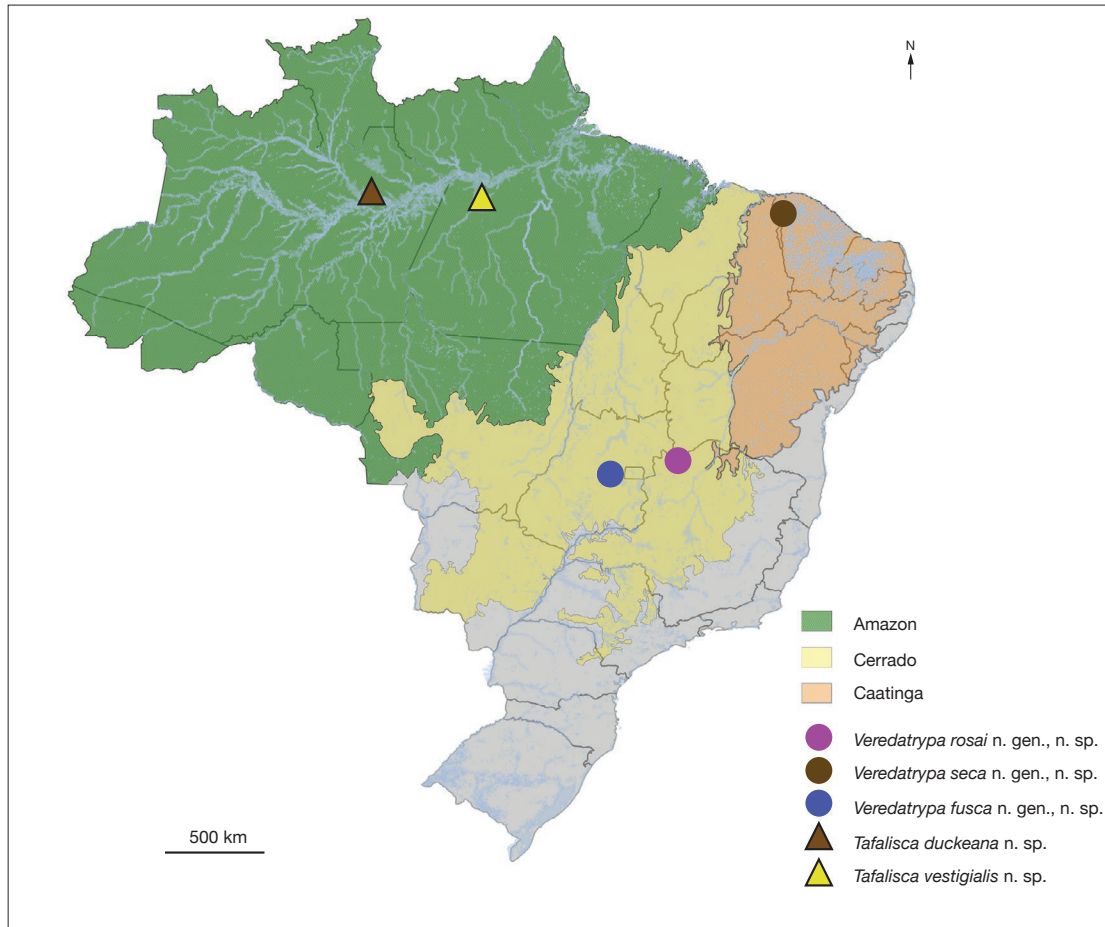


FIG. 17. — Brazilian map, type locality of *Veredatrypa* n. gen. species and *Tafalisca* new species.

KEY TO BRAZILIAN GENERA OF TAFALISCINA DESUTTER-GRANDCOLAS, 1988.

1. FWs absent or short, covering the metanotum, and sometimes reaching the second abdominal tergite ..... *Cylindrogryllus* Saussure, 1878 (2)
- FWs developed, covering the entire abdomen or reaching the last abdominal tergites ..... 3
2. FWs longer than wide, covering the two first abdominal tergites; LLOphi completely sclerotized ..... *Cylindrogryllus* (*Cylindrogryllus*) Saussure, 1878
- FWs wider than long, covering only metanotum; LLOphi inner margin membranous ..... *Cylindrogryllus* (*Neometrypus*) Desutter, 1988
3. Male FWs with longitudinal veins, without a stridulum, or sometimes with a vestigial stridulatory file ..... 4
- Male FWs with a developed stridulum, including a well-developed stridulatory file ..... 5
4. Ocelli present, well developed; PCu vein curved inwards, sometimes with teeth on ventral side; metanotum without projections, or with two lateral projections; male genitalia with MLOphi and LLOphi. Female apex of ovipositor truncated or slightly acuminate ..... *Tafalisca* Walker, 1869
- Ocelli generally absent, reduced when present; PCu not curved, without teeth on ventral side; metanotum with median region elevated; male genitalia only with LLOphi. Female apex of ovipositor pointed ..... *Brazitrypa* Gorochov, 2011
5. Male FWs covering the entire abdomen, stridulatory file not surrounded by strong sclerotization, apical field developed; TI with auditory tympanum on both faces; LLOphi well developed, endophallic apodeme not bifid. Female apex of ovipositor without protuberances in dorsal and ventral sides ..... *Amblyrbethus* Kirby, 1906
- Male FWs not covering the entire abdomen, stridulatory file surrounded by a strong sclerotization, apical field not developed; TI with auditory tympanum on outer face only; MLOphi well developed, endophallic apodeme bifid. Female apex of ovipositor with two protuberances in dorsal and ventral sides ..... *Veredatrypa* Campos n. gen.

have body lengths ranging from 10 mm (*Cylindrogryllus*) until 40 mm (*Tafalisca*), which is quite huge for crickets: this size range could imply different habitats of activity and refuge. *Tafaliscina* are often found at night on leaves of bushes and trees, but some species of *Tafalisca* and *Brazitrypa*, which body shape is cylindrical and elongated, with short and heavy hind legs, have been found inside tree branches both during the day and the night (LDC & PGBSD pers. obs.).

Regarding the importance of forewings in the communication of crickets, the diversity of forewings in *Tafaliscina* suggests different kinds of communication within the group. Species of *Cylindrogryllus* are apterous or brachypterous and, when present, their forewings are not modified for sound production; they also lack the auditory tympana, which means that this genus does not use acoustic signals for mating. On the other side, males of *Cylindrogryllus* generally have some structures on the metanotum under the forewings, that seem to be glandular, and may be used on mating behavior (Walker & Gurney 1967; Prado 2006) and/or chemical communication, as described for Rhabdiphoridae (Haley & Gray 2013).

Within *Tafalisca*, the forewings are symmetrical and well-developed, covering the entire abdomen (except for *T. mexico* Gorochov, 2011 and *T. pallidocincta* Kirby, 1890) but the veins are not modified for sound-production. In some species, as *T. lineatipes* Bruner, 1916 and *T. vestigialis* Campos, Souza-Dias & Nihei n. sp., the PCu vein is curved as a stridulatory file with teeth on the ventral side, possibly being able to produce sound, but the lack of resonant structures (harp, mirror) precludes the emission of loud calls as generally emitted by crickets. Moreover, *Tafalisca* species do not have auditory tympana, and they probably receive the signals in another way. Female drumming has been observed in rearing conditions (Campos & Desutter-Grandcolas in press), which could reveal vibratory communication in at least some species of this genus. The forewings of *Brazitrypa* species are similar to that of *Tafalisca* for venation, but the PCu is not curved and has no stridulatory teeth in the species described so far: these species could be unable to emit sounds. Besides developed not functional forewings for sound production, *Brazitrypa* species have structures on the metanotum (Souza-Dias & De Mello 2010; Gorochov 2011) which could be used for mating behavior and/or chemical communication (Walker & Gurney 1967; Prado 2006; Haley & Gray 2013), as for *Cylindrogryllus*.

By contrast, other genera like *Adenophallusia*, *Amblyrbethus*, and *Veredatrypa* Campos n. gen., have forewings with stridulatory apparatus completely developed, as well as auditory tympana: these taxa should be able to a fully acoustic communication. The position of *Tafaliscina* in the subfamily Oecanthinae based on molecular phylogenetic evidence (Chintauan-Marquier *et al.* 2013, 2016) still increases the diversity of *Tafaliscina* direct relatives for body shape and communication modalities (see Otte 1994, Mhatre *et al.* 2012, 2017).

*Veredatrypa* Campos n. gen. is closely related to the genus *Amblyrbethus*. The new genus was compared with all Brazilian genera of *Tafaliscina*: *Amblyrbethus* Kirby, 1906 (*Amblyrbethus manni* Rehn, 1917, *Amblyrbethus natalensis* Rehn, 1917),

*Cylindrogryllus* Saussure, 1878 (*Cylindrogryllus* (*Cylindrogryllus*) *pitanga* (de Mello, 1990), *Cylindrogryllus* (*Neometrypus*) *badius* (Mesa & García-Novo, 2001)), *Brazitrypa* Gorochov, 2011 (*Brazitrypa paulista* (Rehn, 1918), *Brazitrypa paranaensis* (de Mello & Souza-Dias, 2010)), *Tafalisca* Walker, 1869 (*Tafalisca furfurosa* Otte, 2006, *Tafalisca lineatipes* Bruner, 1916, *Tafalisca lurida* Walker, 1879, *Tafalisca maroniensis*, Chopard, 1930, *Tafalisca mexico* Gorochov, 2011, *Tafalisca pallidocincta* (Kirby, 1890), *Tafalisca periplanes* Otte & Perez-Gelabert, 2009, *Tafalisca porteri* Chopard, 1930, *Tafalisca bahiensis* (Saussure, 1878)). The specimens examined belong to ANSP, MNHN, and MZSP.

The morphology of *Veredatrypa* Campos n. gen. is similar to *Amblyrbethus*, differing in the following characters: FW length, stridulatory file area sclerotization, apical field length, TI tympanum, male genitalia, and female ovipositor ornamentation (see Diagnosis above). Furthermore, preliminary molecular data confirm the sistership relation of the two genera (Campos unpublished data).

We also compared the new species of *Tafalisca* with the genera and species mentioned above. *Tafalisca* can be separated from other *Tafaliscina* genera mainly by its forewing venation (parallel and longitudinal veins), the lack of sound-producing structures (sometimes only a stridulatory file present), absence of tympanum, small protuberances in the dorsal face of fore and mid tibiae (not present in all species), and male genitalia (pseudepiphallallic sclerite divided in median (bilobate) and lateral lobes, apex of rami curved inwards, ectophallic fold somewhat membranous, endophallic sclerite short, endophallic apodeme very short (sometimes almost no discernible)). The new species can be separated from other species of *Tafalisca* mainly by FWs and male genitalia structures (see above Diagnosis of *T. duckeana* n. sp. and *T. vestigialis* n. sp.).

Based on known species records (Fig. 17), *Tafalisca* and *Veredatrypa* Campos n. gen. may exhibit specialized distribution and habitats. *Tafalisca* species are distributed over localities covered by tropical rainforests of South America (Amazon Forest) and Central America, while *Veredatrypa* Campos n. gen. species occurs on open and xeric vegetation areas in Brazilian Cerrado and Caatinga biomes. Those characters will be studied in a phylogenetic frame by the first author of this paper (LDC).

Clearly, the diversity of *Tafaliscina* is very underestimated. The group initially proposed with six genera (*Amblyrbethus*, *Tafalisca*, *Cylindrogryllus*, *Diatrypa* Saussure, 1874, *Prodiatrypa* Desutter, 1988, and *Paroecanthus* Saussure, 1859) (Desutter 1988), nowadays counts 11 genera including *Veredatrypa* Campos n. gen. (Cigliano *et al.* 2019). Based on the remarkable diversity of the Neotropical region (Antonelli *et al.* 2018) and the poor sampling of *Tafaliscina* (mainly in Brazil), we estimate that several genera and many species are still waiting to be described: the study of the material from French Guiana, collected during the Mitaraka 2015 survey “Our Planet Revisited” (Touroult *et al.* 2018), supports this hypothesis, with the discovery of ten new taxa (Campos & Desutter-Grandcolas in press). However, these crickets are quite hard to collect, due to their ways of life, nocturnal habits and low densities; they



are collected mostly through casual findings on plants, top of trees, and inside tree branches. They could also be sensitive to environmental degradation (Chapin *et al.* 2000). Owing to its diversity mainly based on morphology and forewings, the Tafiliscina clade shows up an excellent model to clarify and understand questions about the evolution of morphology, communication and modification of life habits. Furthermore, all the diversity mentioned above about this group probably leads to a diverse repertoire of behaviors, which is totally unexplored.

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