



## Hidden in the bushes: uncovering the diversity of the genus *Neometrypus* Desutter, 1988 n. status (Orthoptera: Gryllidae: Paroecanthini: Tafaliscina) in Neotropical forests

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### Abstract

*Neometrypus* Desutter, 1988 n. status is elevated to the generic level. Ten new species of this genus are described (*N. azevedoi* n. sp., *N. carvalhoi* n. sp., *N. catiae* n. sp., *N. couriae* n. sp., *N. lopesae* n. sp., *N. maiae* n. sp., *N. marcelae* n. sp., *N. mejdalanii* n. sp., *N. mendoncae* n. sp., *N. monnei* n. sp.). All the species are from Brazil, nine from the Atlantic Forest, and one from Amazonia. We also provide a distribution map of all type localities of *Neometrypus* n. status, an identification key for all 13 known species of the genus, the first record of the mating behavior, and a short discussion about pedomorphic characters and communication between these crickets.

**Key words:** crickets, Neotropical Region, new status, new species, pedomorphic characters

### Resumo

*Neometrypus* Desutter, 1988 n. status é elevado a nível de gênero. Dez espécies novas são descritas (*N. azevedoi* n. sp., *N. carvalhoi* n. sp., *N. catiae* n. sp., *N. couriae* n. sp., *N. lopesae* n. sp., *N. maiae* n. sp., *N. marcelae* n. sp., *N. mejdalanii* n. sp., *N. mendoncae* n. sp., *N. monnei* n. sp.). Todas as espécies são do Brasil, nove da Mata Atlântica e uma da Amazônia. Também fornecemos um mapa de distribuição com todas as localidades tipo de *Neometrypus* n. status, uma chave de identificação para todas as 13 espécies conhecidas do gênero, os primeiros registros do comportamento de acasalamento e uma breve discussão sobre caracteres pedomórficos e comunicação entre esses grilos.

**Palavras chave:** grilos, Região Neotropical, status novo, novas espécies, caracteres pedomórficos

### Introduction

The Neotropics, including central Mexico to southern South America (Morrone 2014), is the world's most biodiverse region (Antonelli *et al.* 2018; Antonelli & Sanmartín 2011). Neotropical biodiversity is a consequence of a series of conditions (*e.g.*, altitude and climate) and historical processes that contributed to the emergence of several biomes, including the vast, megadiverse forests Amazonia and Atlantic Forest (Antonelli *et al.* 2018). Several new taxa are frequently discovered in this region (*e.g.*, Cadena-Castañeda *et al.* 2021; Dios & Nihei 2020; Fianco 2021; Siewert *et al.* 2020), demonstrating that its biodiversity is far from fully known. The Neotropical cricket tribe Paroecanthini (Gryllidae) is one of those poorly known groups. Despite several recent taxonomic papers, the knowledge about this clade is still incipient compared to other gryllid taxa (Campos *et al.* 2020; Campos & Desutter-Grandcolas 2020). Here, we continue contributing to the understanding of this tribe, studying the Brazilian species of the genus *Neometrypus* Desutter 1988 n. status (Gryllidae: Paroecanthini: Tafaliscina).

Initially described as a genus, *Neometrypus* Desutter, 1988, had only one species, *N. amazonus*, from the Pe-

ruvian Amazon, and was grouped in the monogeneric tribe Neometrypini Desutter, 1988. Later, Mesa and García-Novo (2001) described *N. badius* from the Atlantic Forest of the Brazilian Southeast region, in Cardoso Island (São Paulo State). Gorochoh (2017) demoted *Neometrypus* to a subgenus of *Cylindrogryllus* Saussure, 1878, including *C. (Neometrypus) aculeatus* (Saussure, 1878) with two subspecies, *C. (Neometrypus) aculeatus aculeatus* (Saussure, 1878) and *C. (Neometrypus) aculeatus argentinus* Gorochoh, 2017; *C. (Neometrypus) amazonus* (Desutter, 1988); and *C. (Neometrypus) badius* (Mesa & García-Novo, 2001). Gorochoh (2017) also transferred *Cylindrogryllus* to the subtribe Tafaliscina (Paroecanthini), consequently invalidating the monogeneric Neometrypini (Cigliano *et al.* 2021).

Species of *Neometrypus* n. status are frequently found in the leaves of bushes and trees, mainly during the night. *Neometrypus* n. status is characterized by a slender and elongate body, tympana absent, short forewings, covering only the metanotum (except in the apterous *N. amazonus* Desutter 1988 and *N. couriae* n. sp.), and stridulatory file absent (Desutter 1988; Mesa & García-Novo 2001) (Fig. 1). Consequently, these crickets cannot hear or produce airborne acoustic signals by stridulation. Nonetheless, no studies describe the mechanisms of mating behavior in this genus, which remain unknown. Male features also characterize this genus, providing exclusive characters as a median projection of metanotum (trapezoidal or triangular), an internal membrane on the lateral lophi of pseudepiphallallic sclerite, and the median lophi absent.

In this paper, we elevate the subgenus *Neometrypus* to a genus based on significant morphological characters. We also describe ten new species of *Neometrypus* n. status from Brazilian tropical forests, provide an identification key for all the 13 known species, a distribution map with their type locality, and a brief discussion about paedomorphic characters, mating behavior, and communication.

This work is dedicated to our brave colleagues of the Departamento de Entomologia (Entomology Department) of the Museu Nacional – Universidade Federal do Rio de Janeiro, which are honored in the new species due to their great contribution to the knowledge of Brazilian biodiversity. We also express our admiration for their strength and resilience in continuing to advise students and researchers and producing high-quality science facing such a huge trauma as the terrible fire of 2018. You are truly an inspiration for us.

## Material and methods

**Studied material.** Specimens of the following institutions were studied: IBUSP, Laboratório de Sistemática e Biogeografia de Insetos, Universidade de São Paulo, Brazil; MNRJ, Museu Nacional, Universidade Federal do Rio de Janeiro, Brazil; BOTU, Laboratório de Insetos, Universidade Estadual Paulista, Brazil; MZSP, Museu de Zoologia da Universidade de São Paulo, Brazil; MNHN, Muséum national d'Histoire naturelle, Paris, France.

**Field trips.** Aside from the material taken in loan, field trips conducted by the authors over the last ten years in several localities allowed the collection of specimens studied herein. Among the localities sampled, we highlight: Estação Biológica de Boraceia (São Paulo State); Parque Nacional do Iguaçu (Paraná State); Parque Nacional do Itatiaia (Rio de Janeiro State); Parque Nacional do Monte Pascoal (Bahia State); Parque Nacional da Serra dos Órgãos (Rio de Janeiro State); Reserva Biológica da Serra do Japi (São Paulo State); Reserva Particular do Patrimônio Natural EcoParque (Bahia, Brazil).

**Taxonomy.** All the studied specimens are individually stored in glass tubes with ethanol 80%. They were analyzed, compared, and described with a Zeiss Stemi DV4 stereomicroscope. The photographs of the external morphology were taken with a Canon SL2 with a 100 mm macro lens attached. Male genitalia and female copulatory papilla were immersed in hand sanitizer (Su 2016) and photographed with a Canon SL2 attached to a Zeiss Stemi DV4 stereomicroscope.

Male and female (when available) were dissected to remove the phallic complex and copulatory papilla, respectively. Male phallic complexes were treated with an aqueous solution of 10% KOH for few hours to remove muscular tissues and clarify sclerites and membranes. Copulatory papilla was removed, but no chemical treatment was necessary to observe the structure. Both male and female genitalia were stored in a 200 µl microtube with 80% ethanol with the individual specimen. Genital nomenclature follows Desutter (1987), Desutter-Grandcolas (2003), and Campos & Desutter-Grandcolas (2020).

Each species' type locality was plotted and edited on a map using Quantum-gis 3.16.8 (QGIS Development Team 2021).

### Abbreviations

#### General morphology

I, II, III anterior, median, posterior (leg, tarsomere);

DD dorsal disc of pronotum;

LL lateral lobe of pronotum;

FW forewing;

F femur;

T tibia;

iad, iam, iav dorsal, median, ventral apical spurs of hind tibia on inner side;

oad, oam, oav dorsal, median, and ventral apical spurs of hind tibia on outer side;

TIII subapical and apical spurs formula indicated inner/outer respectively, counted from distal spurs upwards (Fig. 2).

#### Male genitalia

LLophi lateral lophi of pseudepiphallus;

m membrane;

PsP pseudepiphallic paramere;

EctAp ectophallic apodeme;

arc ectophallic arc

End endophallic sclerite;

r rami.

#### Measurements

HW head width;

IOD inter ocular distance;

PL pronotum length;

PW pronotum width (at midline);

FWL forewing length;

LFIII length of hind femur;

LTIII length of hind tibia;

OL ovipositor length.

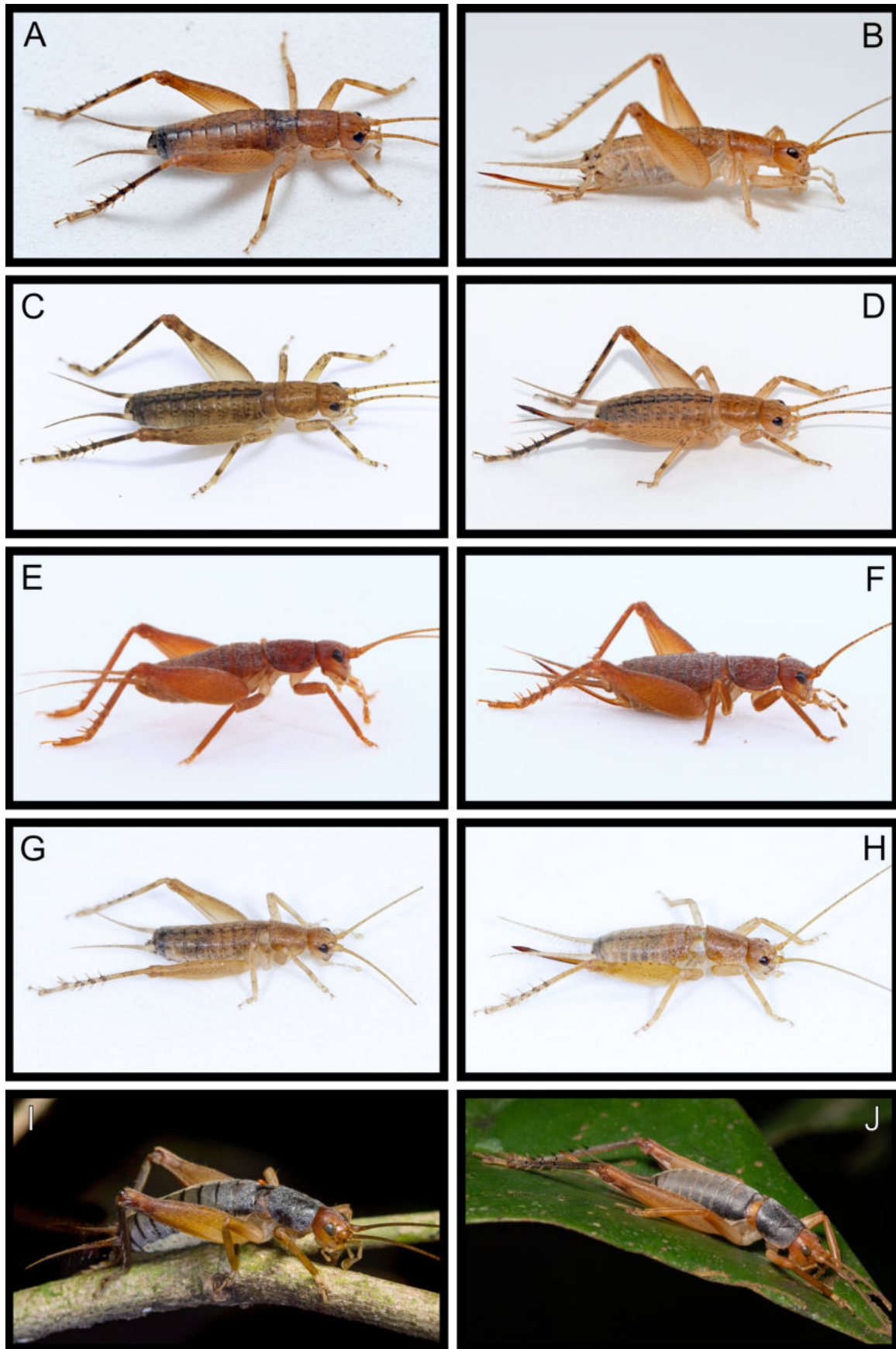
#### Repositories

BOTU Orthoptera Collection, Instituto de Biociências de Botucatu, Universidade Estadual Paulista “Júlio de Mesquita Filho” (UNESP), Brazil;

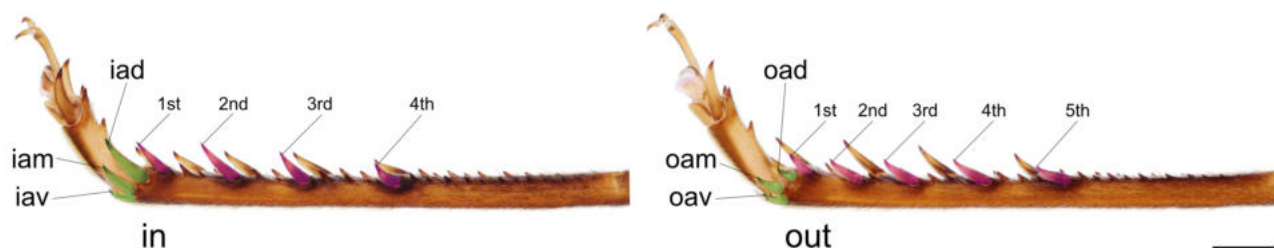
MNRJ Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil;

MZSP Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil.

The holotypes and allotypes will be deposited in MZSP and MNRJ. Paratypes will be deposited in BOTU, MNRJ, and MZSP. In labels transcriptions, slashes (/) separate lines, bars (|) separate labels, semicolons (;) indicate the repositories, parentheses () contain observations, and brackets [] interpretations. The described taxa were compared with all described species of *Neometrypus* n. status: *N. aculeatus* (Saussure, 1878) (Orthoptera Species File (OSF) pictures (Cigliano *et al.* 2021) and non-type material (collected by the authors), *N. amazonus* Desutter, 1988 (type material, MNHN), and *N. badius* Mesa & García-Novo, 2001 (non-type material, BOTU). We compared all species described under *Neometrypus*, including the species described herein, with *Cylindrogryllus* (*Cylindrogryllus*) *brevipennis* Saussure 1878 (OSF pictures, Cigliano *et al.*, 2021), *C. (Cylindrogryllus) pitanga* (de Mello, 1990) (type, MZSP), *C. (Apterotrypa) guyanensis* Campos & Desutter-Grandcolas 2020, and *C. (Apterotrypa) mitaraken-sis* Campos & Desutter-Grandcolas, 2020 (type, MNHN) to propose the new classification.



**FIGURE 1.** *Neometrypus* species, adults living habitus: *N. marcelae* **n. sp.** A—male, B—female; *N. catiae* **n. sp.** C—male, D—female; *N. couriae* **n. sp.** E—male, F—female; *N. mejdalanii* **n. sp.** G—male, H—female; *N. lopesae* **n. sp.** I—male (photo: © Bernardo Ferraz), J—female (photo: © Bernardo Ferraz).



**FIGURE 2.** *Neometrypus mendoncae* n. sp., posterior tibia. Green, apical spurs; pink, subapical spurs. iad— inner apical dorsal, iam— inner apical median, iav— inner apical ventral, oad— outer apical dorsal, oam— outer apical median, oav— outer apical ventral. Scale 1mm.

## Results

### Systematics

#### Order ORTHOPTERA Olivier, 1789

#### Superfamily GRYLLOIDEA Laicharting, 1781

#### Family GRYLLIDAE Laicharting, 1781

#### Subfamily OECANTHINAE Blancard, 1845

#### Tribe Paroecanthini Gorochov, 1986

#### Subtribe Tafaliscina Desutter, 1988

#### *Neometrypus* Desutter, 1988 n. status

*Neometrypus* n. status was included as a subgenus of *Cylindrogryllus* by Gorochov (2017). However, there are evident characters that support elevating this taxon as a genus. Unlike *Cylindrogryllus* Saussure, 1878, *Neometrypus* n. status has a larger body (*Neometrypus* males ~17mm, *Cylindrogryllus* males ~10mm) and FWs covering only the metanotum (absent in *N. amazonus* and *N. couriae* n. sp.). In *Cylindrogryllus*, the FWs are longer, covering the metanotum and two first abdominal tergites. According to Gorochov (2017), the ocelli are absent in *Cylindrogryllus*. They are present in *Neometrypus* n. status. The lateral ocelli are well-developed and rounded, the median ocellus is absent or reduced. Within *Neometrypus* n. status, the male metanotum bears a median trapezoidal or triangular projection crossing the entire metanotum, the LLOphi in the male genitalia have an internal membrane, and the female copulatory papilla is cylindrical. In *Cylindrogryllus*, the median projection is half-size of the metanotum, the LLOphi in the male genitalia do not have an internal membrane, and the female copulatory papilla is triangular. Besides the short FWs, these characters are more similar to *Brazitrypa* Gorochov, 2011 than *Cylindrogryllus*, indicating that *Neometrypus* n. status is closer to *Brazitrypa* than *Cylindrogryllus*. A preliminary phylogenetic tree including both genera corroborate the new status of *Neometrypus* (Campos *et al. in prep.*).

**EMENDED DIAGNOSIS.** Body medium size, covered by bristles; lateral ocelli large, rounded; median ocellus reduced or absent; TI auditory tympana absent. FWs translucent, short, covering only metanotum, posterior margin rounded, with vestigial veins almost no discernible; absent in *N. amazonus* and *N. couriae* n. sp. TIII subapical spurs 5/4, apical spurs 3/3; apical spurs longer on inner side. Male: metanotum with median projection longer than wide, crossing the entire metanotum longitudinally, trapezoidal or triangular in dorsal view. Male genitalia: anterior margin of pseudepiphallic sclerite upcurved in lateral view; MLOphi absent, LLOphi inner margin membranous; PsP posterior margin bilobate; EctF weakly sclerotized, short; End flattened dorso-ventrally, longer than wide, posterior margin less sclerotized than anterior; endophallic apodeme absent. Female: ovipositor upcurved; apex of oviposi-

tor arrow-like, lateral margins slightly serrulated. Female genitalia: copulatory papilla cylindrical, slightly curved downwards in lateral view.

TYPE SPECIES. *Neometrypus amazonus* Desutter, 1988.

***Neometrypus azevedoi* n. sp.**

(Figs 3, 4, 23; Table 1)

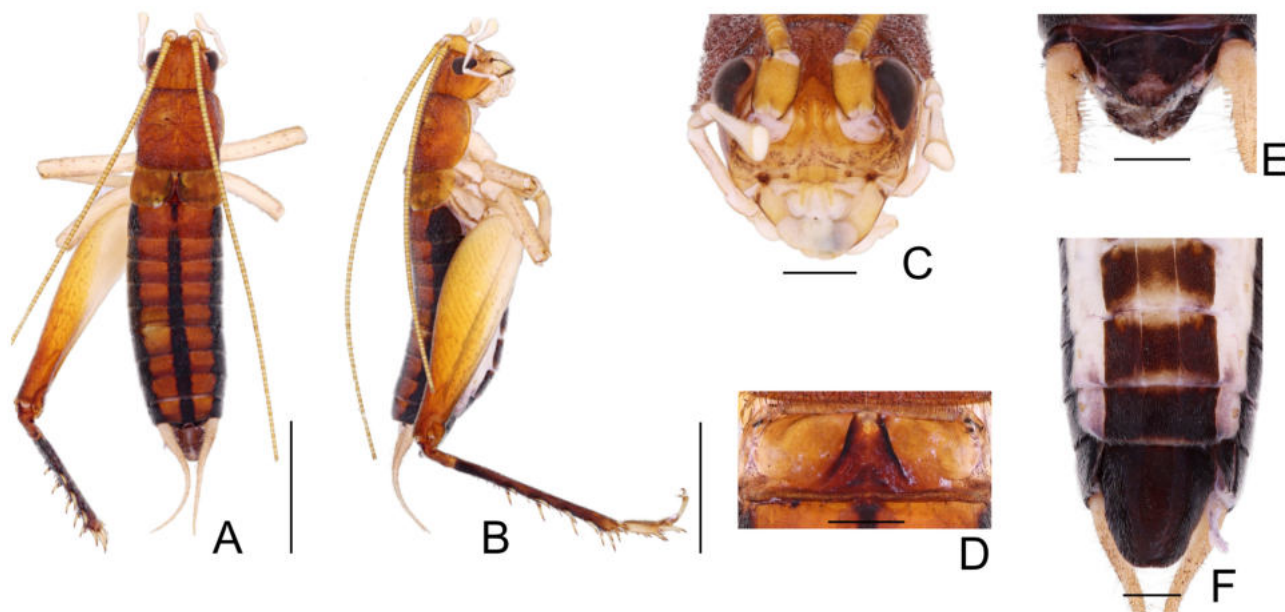
**Etymology.** Species named after Leonardo Gil Azevedo, dipterist (specialist in Simuliidae), and professor at the Departamento de Entomologia (Entomology Department) of the Museu Nacional – UFRJ.

**Type locality.** Brazil, Rio de Janeiro, Itatiaia.

**Type material.** Holotype male. BR[azil], R[io de]J[aneiro], Parque Nac[ional] Itatiaia/ Casa de Pedra/ 06.XI.2018/ Souza-Dias. P.G.B. col. (handwritten) | LDC\_152; MZSP. Paratype males. (1) Same data as for holotype; MZSP. (2) BR[asil], divisa entre M[inas]G[erais] e R[io de]J[aneiro]/ Parque Nacional Itatiaia/29–30.III.2014/ Acima de 2000m/ Souza-Dias, P.G.B; Rocha, M.T.; Benetti, J. col. | LDC\_005, LDC\_006; MZSP. (2) Same data as for previous paratype; MNRJ.

**Diagnosis.** This species is separated from the other species of *Neometrypus* by the following characters: general coloration brownish orange, abdominal tergites crossed lengthwise by median and lateral bands dark brown. Male: median projection of metanotum triangular, burnt red. Male genitalia: anterior margin of pseudepiphallic sclerite sub-straight on median region; LLOphi straight, inclined inwards.

**Description.** *General morphology.* Head. Fastigium as long as wide, pubescent (Fig. 3A). Lateral ocelli rounded, median ocellus absent (Fig. 3C); frons smooth (Fig. 3C). Antennal scape longer than wide, inner margin with bristles. Maxillary palpi articles 4 and 5 almost same-sized, article 3 slightly longer; article 5 slightly upcurved (Fig. 3B).



**FIGURE 3.** *Neometrypus azevedoi* n. sp. Male: A—habitus, dorsal; B—habitus, lateral, C—head, frontal; D—metanotum, dorsal; E—supra anal plate; F—subgenital plate and last abdominal sternites. Scales A–B: 5mm, C–F: 1mm.

Thorax. DD as long as wide, covered by bristles. DD cephalic margin sub-straight, caudal margin straight (Fig. 3A). LL ventro-cephalic angle rounded; ventro-caudal angle gradually ascendant in lateral view (Fig. 3B). FWs surpassing posterior margin of metanotum (Fig. 3A).

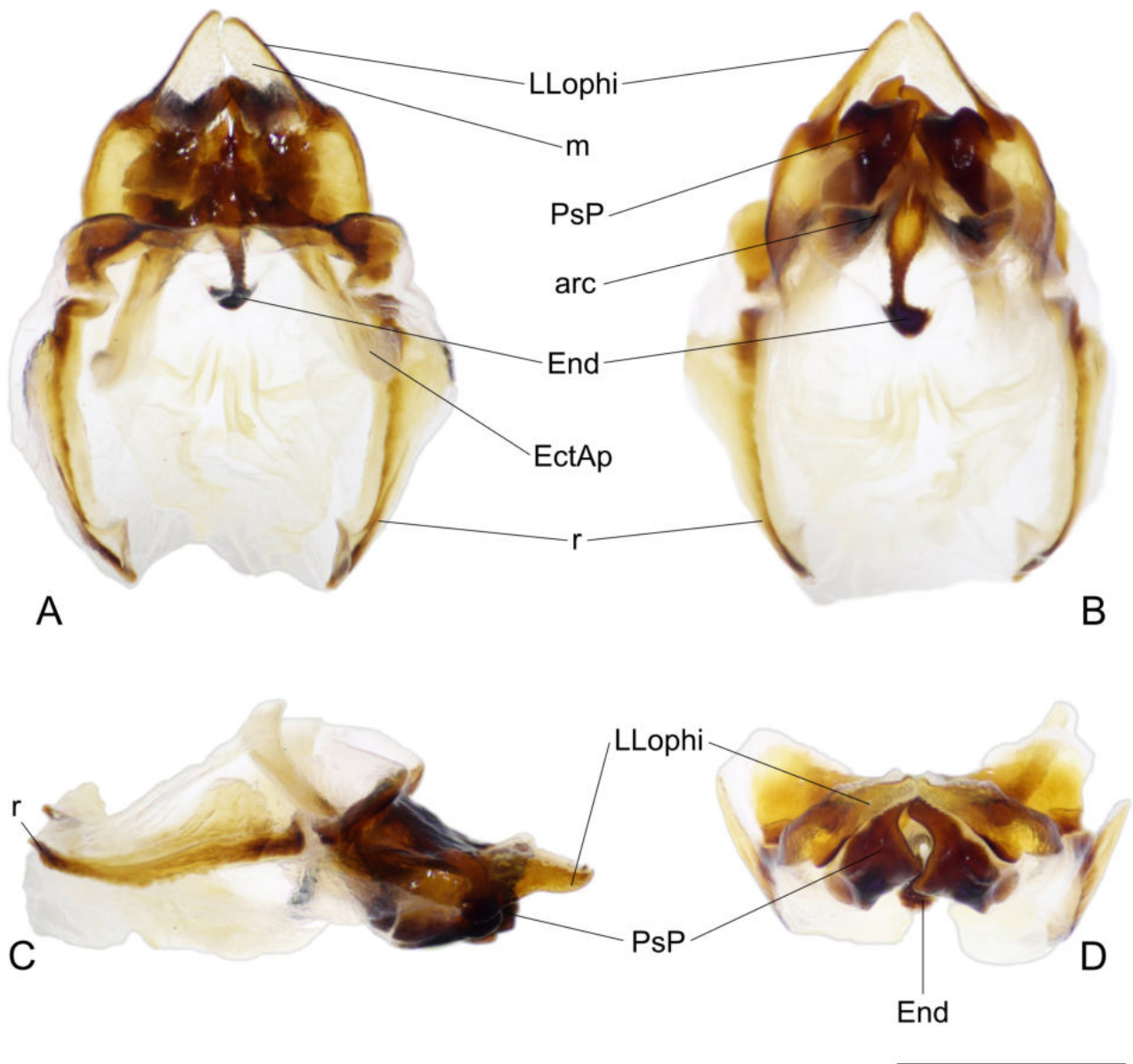
Legs. TI with three apical spurs, two ventral, one dorsal. TII with three apical spurs, two ventral, one dorsal. TIII subapical spurs have two (sometimes one) spines between each spur, five or seven spines above subapical spurs on inner and outer sides. TIII inner apical spurs: iad>iam>iav; outer apical spurs: oam>oav>oad. Basitarsus dorsal spines 2/1 sometimes 2/2; outer and inner apical spurs same-sized.

Abdomen. Tergites pubescent (Fig. 3A); Supra anal plate posterior margin rounded (Fig. 3E).

*Male*. Median projection of metanotum triangular; anterior margin slightly rounded, posterior margin wider than anterior margin in dorsal view (Fig. 3D). Subgenital plate longer than wide, posterior margin almost straight (Fig. 3F).

*Male genitalia* (Fig. 4A–D). Pseudepiphallos: pseudepiphallitic sclerite almost straight in lateral view; anterior margin sub-straight on median region, lateral region upcurved in lateral view (Fig. 4A). LLOphi straight, inclined inwards, posterior margin rounded in dorsal and ventral views; inner margin membranous, outer margin sclerotized, thin (Fig. 4A, B). PsP almost same-sized as LLOphi, posterior margin divided into two lobes, not surpassing posterior margin of pseudepiphallitic sclerite in dorsal and ventral views (Fig. 4B); apex of dorsal lobe finger-shaped, inclined inwards; apex of ventral lobe truncated. r elongate, longer than pseudepiphallitic sclerite, flattened laterally (Fig. 4A–C). Ectophallic invagination: EctAp longer than LLOphi, straight, slightly inclined to outwards in dorsal and ventral views (Fig. 4A); arc not complete, curved posteriorly; ventral projections of ectophallic invagination shorter than arc.

*Female*. Unknown.



**FIGURE 4.** *Neometrypus azevedoi* n. sp. Male genitalia: A—dorsal, B—ventral, C—lateral, D—posterior. Scale 1mm. Abbreviations see material and methods.

**TABLE 1.** Measurements in mm of *Neometrypus azevedoi* n.sp.

	IOD	HW	PL	PW	FWL	LFIII	LTIII	OL
Males	1.7–1.9	2.5–3.1	3.1–3.5	3–3.8	1.1–1.7	8.2–9.6	7.1–9	-
Mean (n=5)	1.74	2.74	3.26	3.3	1.5	8.78	7.98	-

**Coloration.** Occiput, vertex, pronotum, and abdominal tergites brownish orange (Fig. 3A). Occiput with two median longitudinal reddish stripes (Fig. 3A); face yellowish-brown with stripes gray on ventral margin (Fig. 3C); antennal scape and antennomeres yellowish-brown. FWs slightly translucent, orange; median projection of metanotum burnt red, apex whitish (Fig. 3D); abdominal tergites crossed lengthwise by median and lateral bands dark brown (Fig. 3A); sternites dark brown, anterior and posterior margins light brown; supra anal plate dark brown, posterior margin grayish (Fig. 3E); subgenital plate dark brown (Fig. 3F); cerci light brown. FI and FII light brown, medium brown spotted, TI and TII light brown; FIII yellowish-brown to light brown, slightly striped, distal apex reddish-brown; TIII dark brown, proximal portion reddish-brown; spurs light brown with apex and basis medium brown; tarsomeres light brown (Fig. 3B).

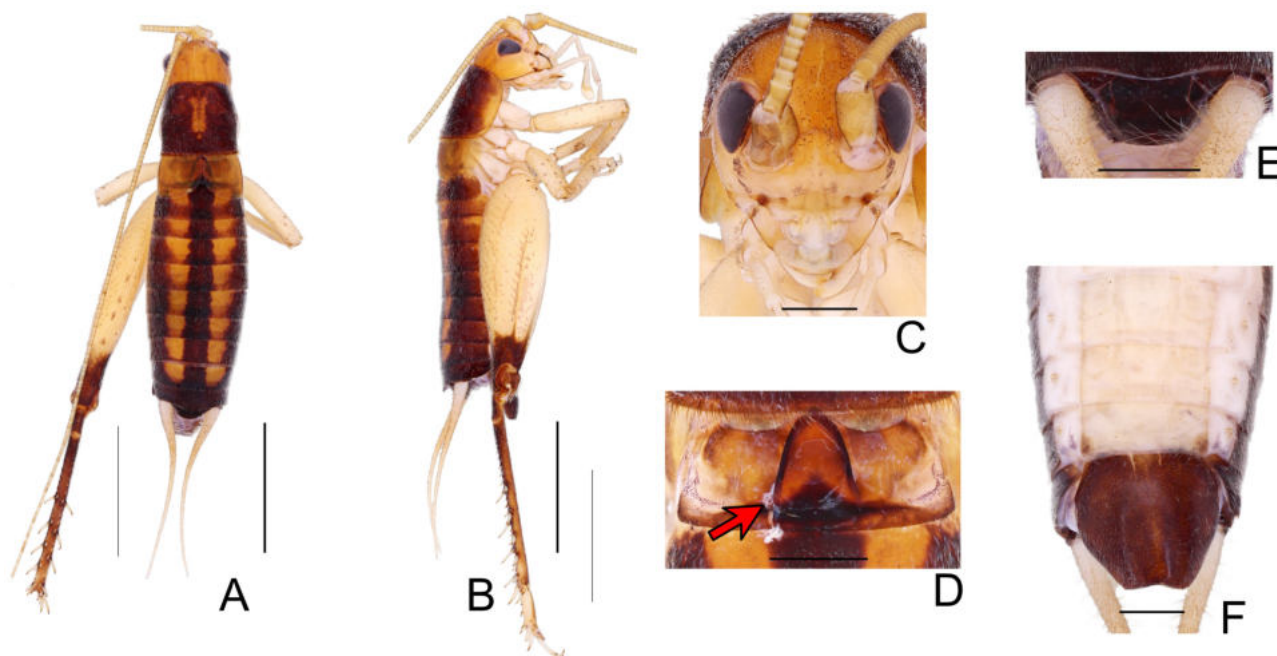
***Neometrypus carvalhoi* n. sp.**

(Figs 5, 6, 23; Table 2)

**Etymology.** Species named after Alcimar do Lago Carvalho, odonatologist, and professor at the Departamento de Entomologia (Entomology Department) of the Museu Nacional – UFRJ.

**Type locality.** Brazil, São Paulo, Jundiaí.

**Type material.** Holotype male. Reserva Biológica da Serra do Japi/ Brasil, S[ão]P[aulo], Jundiaí/ Disc[iplina de] Entomologia (IB-USP)/ 01-03.IV.2016 (ativa/dia)/ Nihei S.S. *et al.* col. | PSD121; MZSP. Paratype male. (1) Brasil, Jundiaí – S[ão]P[aulo]/ Base Ecol[ógica] da Serra do Japi/ 02.V.2013/ Denadai, L. C. leg. (handwritten) | PSD193; MZSP.



**FIGURE 5.** *Neometrypus carvalhoi* n. sp. Male: A—habitus, dorsal; B—habitus, lateral; C—head, frontal; D—metanotum, dorsal; E—supra anal plate; F—subgenital plate and last abdominal sternites. Scales A–B: 5mm, C–F: 1mm.

**Diagnosis.** This species is separated from the other species of *Neometrypus* by the following characters: pronotum dark brown with a longitudinal median band brownish orange; abdominal tergites crossed lengthwise by median and lateral bands dark brown, brownish orange between the bands; width of anterior and posterior margins



of median projection of metanotum similar in dorsal view; supra anal plate posterior margin sub-straight; subgenital plate posterior margin slightly concave. Male genitalia: dorsal lobe of PsP two times longer than ventral lobe; apex of r curved posteriorly forming a “v”.

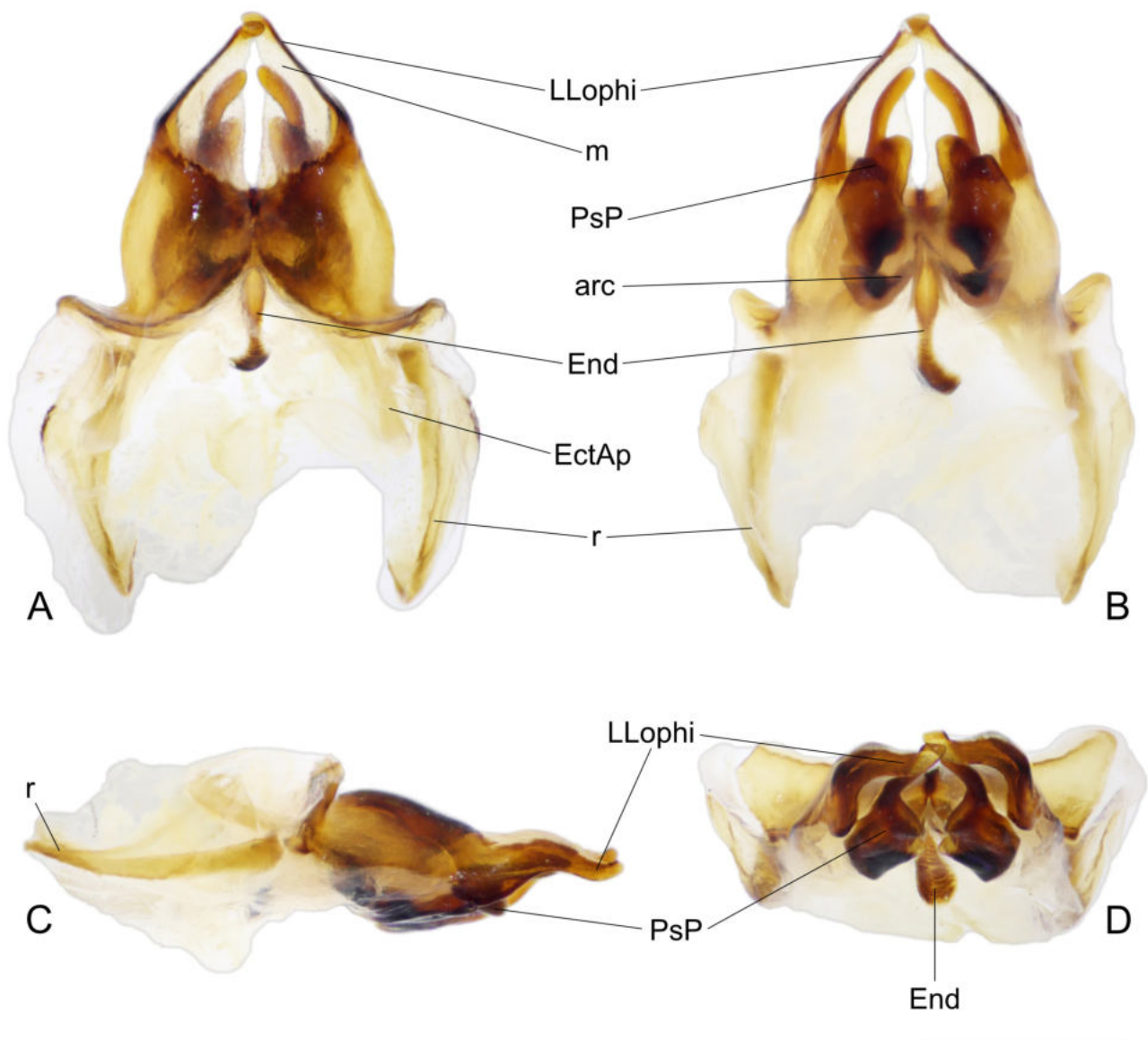
**Description.** *General morphology.* Head. Fastigium as long as wide, pubescent (Fig. 5A). Lateral ocelli rounded, median ocellus absent (Fig. 5C), frons smooth (Fig. 5C). Antennal scape longer than wide, inner margin with bristles. Maxillary palpi articles 4 and 5 almost same-sized, article 3 longer; article 5 upcurved (Fig. 5B).

Thorax. DD as long as wide, covered by bristles. DD cephalic margin straight, caudal margin slightly convex (Fig. 5A). LL ventro-cephalic angle rounded; ventro-caudal angle gradually ascendant in lateral view (Fig. 5B). FWs surpassing posterior margin of metanotum (Fig. 5A).

Legs. TI with three apical spurs, two ventral, one dorsal. TII with three apical spurs, two ventral, one dorsal. TIII subapical spurs with two spines between each spur, six or seven spines above subapical spurs on inner and outer sides. TIII inner apical spurs: iad>iam>iav; outer apical spurs: oam>oav>oad. Basitarsus dorsal spines 3/2; outer and inner apical spurs same-sized.

Abdomen. Tergites pubescent (Fig. 5A, B); Supra anal plate posterior margin sub-straight (Fig. 5E).

*Male.* Median projection of metanotum anterior margin rounded, anterior and posterior margins width similar in dorsal view (Fig. 5D). Subgenital plate as long as wide, posterior margin slightly convex (Fig. 5F).



**FIGURE 6.** *Neometrypus carvalhoi* n. sp. Male genitalia: A—dorsal, B—ventral, C—lateral, D—posterior. Scale 1mm. Abbreviations see material and methods.

*Male genitalia* (Fig. 6A–D). Pseudepiphallus: pseudepiphallic sclerite straight in lateral view, anterior margin V-shaped on median region, lateral region upcurved in lateral view. LLOphi straight, inclined inwards, posterior margin rounded in dorsal and ventral views (Fig. 6A, B); inner margin membranous, outer margin sclerotized, thin (Fig. 6A, B). PsP almost same-sized as LLOphi, posterior margin divided into two lobes, not surpassing posterior margin of pseudepiphallic sclerite in dorsal and ventral views (Fig. 6A, B); apex of dorsal lobe finger-shaped, curved inwards, two times longer than ventral lobe (Fig. 6B); apex of ventral lobe rounded. r elongate, same size as pseudepiphallic sclerite, flattened laterally, apex curved posteriorly forming a “v” (Fig. 6A–C). Ectophallic invagination: EctAp longer than LLOphi, straight, slightly inclined to outwards in dorsal and ventral views (Fig. 6A); arc not complete, curved posteriorly (Fig. 6B); ventral projections of ectophallic invagination short, shorter than arc (Fig. 6B).

*Female*. Unknown.

**TABLE 2.** Measurements in mm of *Neometrypus carvalhoi* n.sp.

	IOD	HW	PL	PW	FWL	LFIII	LTIII
Males	1.6–1.7	2.6–2.7	3.1–3.2	3.1–3.2	2	8.6–8.9	7.5
Mean (n=2)	1.6	2.6	3.1	3.1	2	8.7	7.5

*Coloration*. Occiput and vertex yellow; pronotum dark brown with a median longitudinal band brownish orange; abdominal tergites dark brown and brownish orange (Fig. 5A). Occiput with two median longitudinal stripes light gray (Fig. 5A). Face light brown with grey stripes under eyes in frontal view (Fig. 5C); antennal scape and antennomeres yellowish-brown. FWs slightly translucent, yellow; median projection of metanotum reddish-brown (Fig. 5A); abdominal tergites crossed lengthwise by median and lateral bands dark brown, brownish orange between the bands (Fig. 5A), last abdominal tergite dark brown; sternites light brown; supra anal plate dark brown (Fig. 5E); subgenital plate reddish-brown (Fig. 5F); cerci light brown. FI and FII light brown, medium brown spotted, TI and TII light brown; FIII light brown, slightly striped, distal apex dark brown; TIII dark brown, distal portion getting lighter; spurs light brown with apex and basis medium brown; tarsomeres light brown (Fig. 5B).

### *Neometrypus catiae* n. sp.

(Figs 1C, D; 7; 8; 23; Table 3)

**Etymology.** Species named after Cátia Antunes de Mello Patiu, dipterist (specialist in Sarcophagidae), and retired professor of the Departamento de Entomologia (Entomology Department) of the Museu Nacional – UFRJ.

**Type locality.** Brazil, São Paulo, Biritiba Mirim.

**Type material.** Holotype male. Estação Biológica de Boracéia/ Brasil, S[ão]P[aulo], Biritiba Mirim/ Disc[iplina] Sist[emática de] Orthoptera/ X.2016 | PSD117; MZSP. Allotype female. Estação Biológica de Boracéia/ Brasil, S[ão]P[aulo], Biritiba Mirim/ Disc[iplina] Sist[emática de] Orthoptera/ X.2016 | PSD189; MZSP. Paratype males. (2) Same data as for holotype | PSD187; MZSP | PSD118; MNRJ. (2) Estação Biológica de Boracéia/ Brasil, S[ão]P[aulo], Salesópolis/ 14-17.I.2018/ L.D. Campos, L.C.B. de Paula, D. Tavares col. | LDC\_042; MZSP | LDC\_043; BOTU. Paratype females. (2) Same data as for holotype | PSD188; MZSP | PSD120; MNRJ. (2) Estação Biológica de Boracéia/ Brasil, S[ão]P[aulo], Salesópolis/ 14–17.I.2018/ L.D. Campos, L.C.B. de Paula, D. Tavares col. | LDC\_037; MZSP | LDC\_044; BOTU.

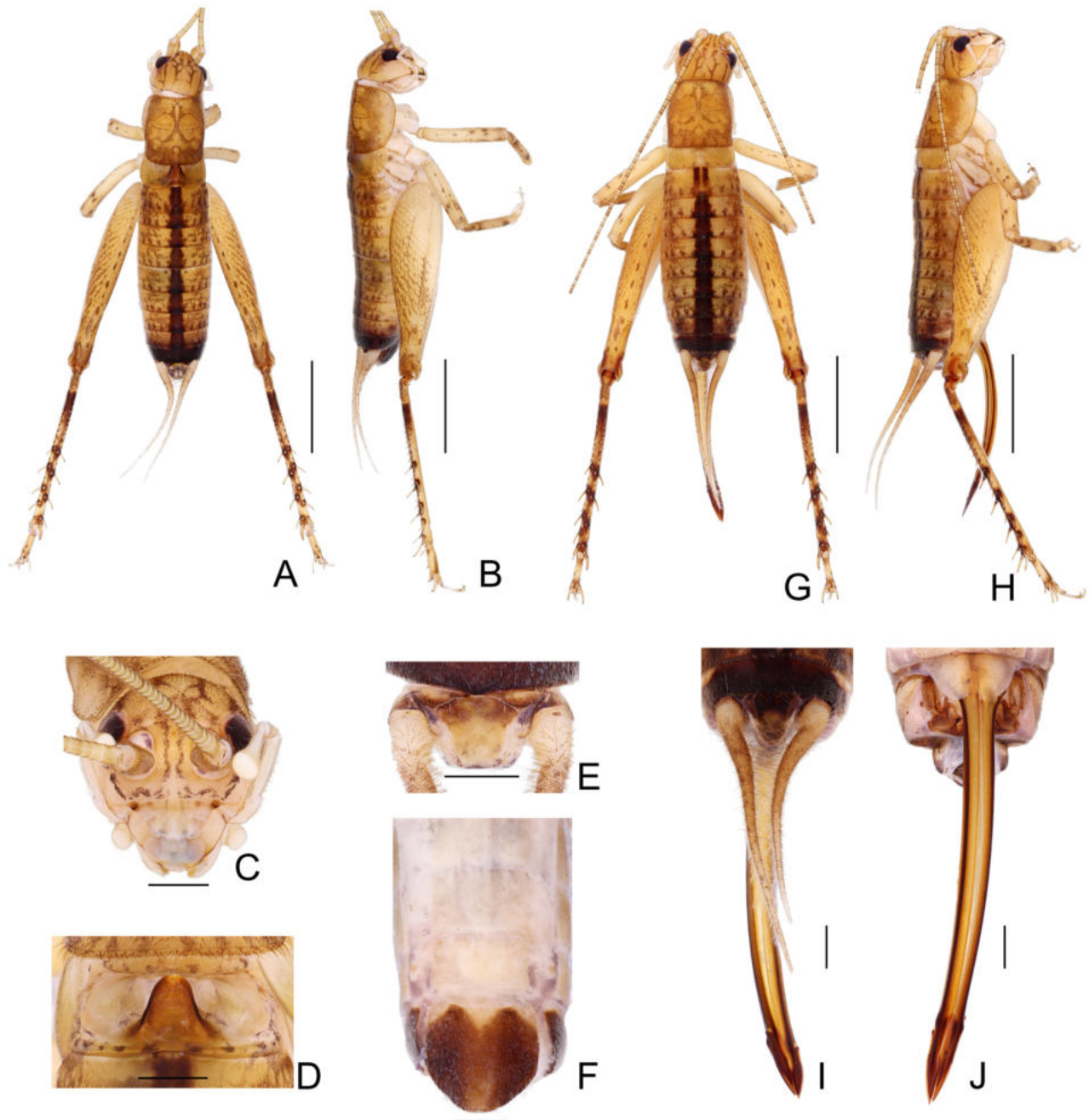
**Diagnosis.** This species is separated from the other species of *Neometrypus* by the following characters: face with stripes medium brown surrounding antennal scapes in frontal view; abdominal tergites with a median band dark brown, medium brown spotted laterally; supra anal plate posterior margin straight, anterior portion dark brown, posterior portion light brown. Male: anterior margin of median projection of metanotum rounded posterior margin wider than anterior margin in dorsal view. Female genitalia: ventral face of copulatory papilla two times longer than dorsal face; ventral face with a median slit

**Description.** *General morphology.* Head. Fastigium as long as wide, pubescent (Fig. 7A, G). Three ocelli, the median reduced, slightly under lateral ones in frontal view (Fig. 7C), frons smooth (Fig. 7C). Antennal scape longer than wide, inner margin with bristles. Maxillary palpi articles 3 and 5 almost same-sized, article 4 slightly shorter; article 5 slightly upcurved (Fig. 7B, H).

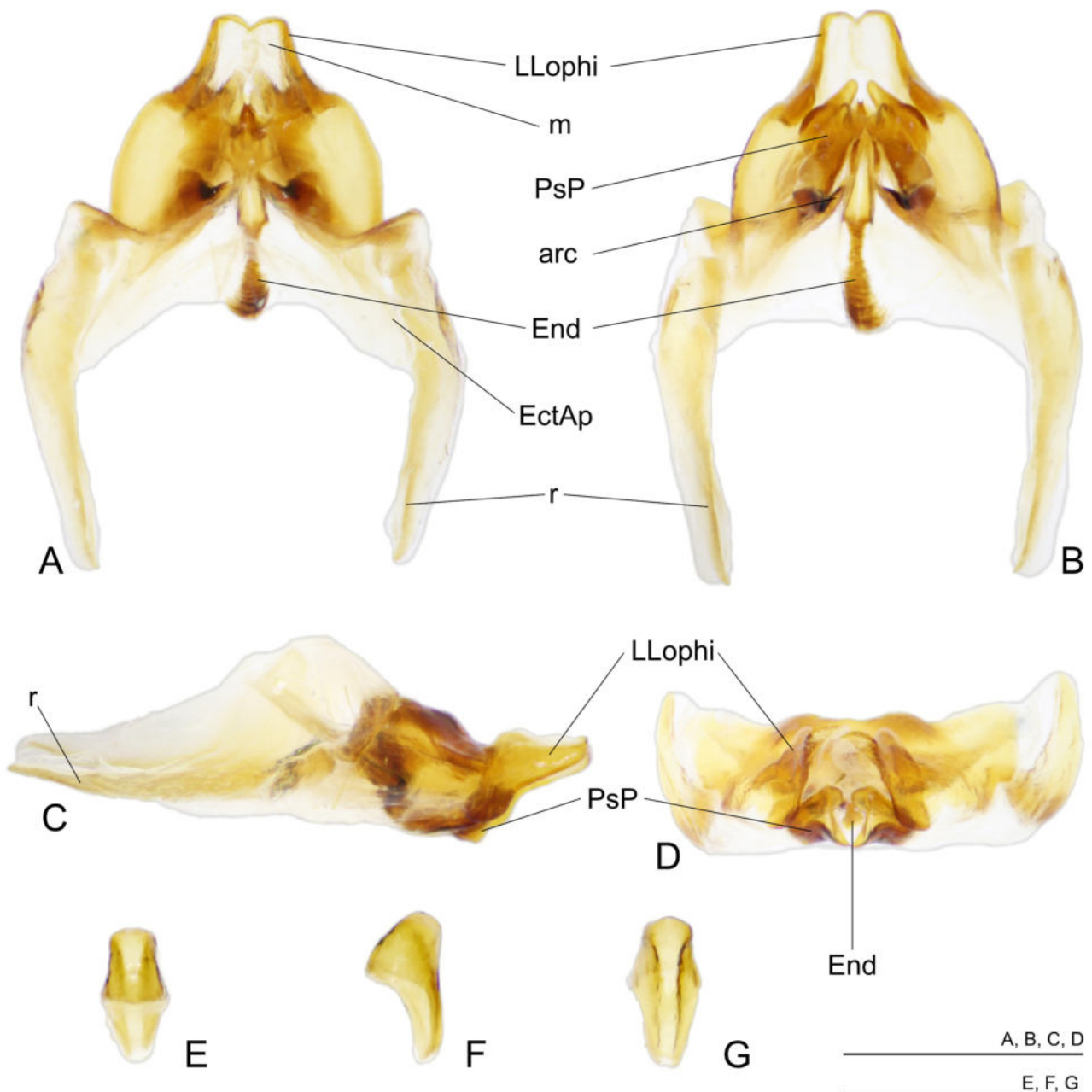
Thorax. DD longer than wide, covered by bristles. DD cephalic margin slightly concave, caudal margin straight (Fig. 7A, G). LL ventro-cephalic angle rounded; ventro-caudal angle gradually ascendant in lateral view (Fig. 7B, H). FWs surpassing posterior margin of metanotum (Fig. 7A, G).

**TABLE 3.** Measurements of in mm *Neometrypus catiae* n.sp.

	IOD	HW	PL	PW	FWL	LFIII	LTIII	OL
Females	1.9–2.1	3.2–3.5	4–4.4	3.6–4.1	1.3–2	10.6–12.1	9.2–10.8	9.3–10.4
Mean (n=5)	2	3.2	4.1	3.8	1.5	11.2	10.1	9.7
Males	1.8–2	3–3.2	3.5–4	3.2–3.5	1.4–1.9	10–10.5	8.7–9.2	-
Mean (n=5)	1.9	3.08	3.74	3.3	1.72	10.24	8.9	-



**FIGURE 7.** *Neometrypus catiae* n. sp. Male: A—habitus, dorsal; B—habitus, lateral; C—head, frontal; D—metanotum, dorsal; E—supra anal plate; F—subgenital plate and last abdominal sternites. Female: G—habitus, dorsal; H—habitus, lateral; I—supra anal plate and ovipositor, dorsal; J—subgenital plate and ovipositor, ventral. Scales A–B, G–H: 5mm; C–F, I–J: 1mm.



**FIGURE 8.** *Neometrypus catiae* n. sp. Male genitalia: A—dorsal, B—ventral, C—lateral, D—posterior. Copulatory papilla: E—dorsal, F—lateral, G—ventral. Scales 1mm. Abbreviations see material and methods.

Legs. TI with three apical spurs, two ventral, one dorsal. TII with three apical spurs, two ventral, one dorsal. TIII subapical spurs with two (sometimes one) spines between each spur, eight or nine spines above subapical spurs on inner and outer sides. TIII inner apical spurs: iad>iam>iav; outer apical spurs: oam>oav>oad, oav and oad almost same-sized. Basitarsus dorsal spines 2 /1; outer and inner apical spurs same-sized.

Abdomen. Tergites pubescent (Fig. 7A, G); Supra anal plate posterior margin straight (Fig. 7E).

*Male.* Anterior margin of median projection of metanotum rounded posterior margin wider than anterior margin in dorsal view (Fig. 7D). Subgenital plate as long as wide, posterior margin convex (Fig. 7F).

*Male genitalia* (Fig. 8A–D). Pseudepiphallus: pseudepiphallic sclerite slightly upcurved in lateral view, anterior margin V-shaped on median region, lateral region upcurved in lateral view (Fig. 8A, C). LLOphi curved inwards (Fig. 8A, B); posterior margin truncated in dorsal and ventral views; inner margin membranous; outer margin sclerotized, thin (Fig. 8A, B). PsP same-sized as LLOphi, posterior margin divided into two lobes, not surpassing posterior margin of pseudepiphallic sclerite in dorsal and ventral views (Fig. 8B); apex of dorsal lobe finger-

shaped, inclined inwards; apex of ventral lobe finger-shaped, shorter than dorsal lobe (Fig. 8B). *r* elongate, longer than pseudepiphallic sclerite, flattened laterally (Fig. 8A–C). Ectophallic invagination: EctAp longer than LLophi, straight, inclined to outwards in dorsal and ventral views (Fig. 8A); arc not complete, curved posteriorly; ventral projections of ectophallic invagination short, same size as arc (Fig. 8B).

*Female.* Body larger than male (Fig. 7G, H). Subgenital plate wider than long, posterior margin concave on the middle (Fig. 7J). Ovipositor as in fig. 7I, J.

*Female genitalia.* Copulatory papilla (Fig. 8E–G) longer than wide, slightly curved downwards in lateral view; ventral face two times longer than dorsal face; ventral face with a median split.

*Coloration.* Male and female with similar coloration. Occiput, vertex, pronotum, and abdominal tergites medium brown to yellowish-brown (Fig. 7A, G). Occiput with two median and two lateral longitudinal stripes medium brown (Fig. 7A, G). Face light brown with stripes medium brown surrounding antennal scapes in frontal view (Fig. 7C); antennal scape light brown to yellowish-brown, antennomeres light brown interspaced by some medium brown ones. FWs somewhat translucent, yellowish; median projection of metanotum brownish-orange (Fig. 7D); abdominal tergites with a median band dark brown, medium brown spotted laterally (Fig. 7A, G); last abdominal tergite dark brown; sternites light brown almost whitish; supra anal plate anterior portion medium brown, posterior portion light brown (Fig. 7E, I); subgenital plate reddish-brown with anterior margin light brown (Fig. 7F); female subgenital plate light brown, darker medially (Fig. 7J); cerci anterior margin light brown, middle region medium brown, getting lighter on the apex (Fig. 7I); ovipositor apex reddish-brown (Fig. 7I, J). FI and FII light brown, medium brown spotted, TI and TII light brown with two maculae median brown on dorsal region, one distal and one proximal; FIII yellowish-brown to light brown, medium brown striped, distal apex medium brown; TIII light brown, proximal portion dark brown, dark brown spotted on the base of subapical spurs; spurs light brown with apex dark brown; tarsomeres light brown (Fig. 7B, H).

### *Neometrypus couriae* n. sp.

(Figs 1E, F; 9; 10; 23; Table 4)

**Etymology.** Species named after Márcia Couri, dipterist (specialist in Muscidae), and professor at the Departamento de Entomologia (Entomology Department) of the Museu Nacional – UFRJ.

**Type locality.** Brazil, Pará, Belterra.

**Type material.** Holotype male. Fazenda Treviso/ Brasil, PA[rá], Belterra/ 3°8'58.26"S//54°50'4.14"W/30.XI-11XII.2018/ Souza-Dias, P.G.B.; Redu, D.R.; Campos L.D. leg. | LDC\_200; MZSP Allotype female. Same data as for holotype | LDC\_206; MZSP Paratype female. Same data as for holotype | LDC\_221; MZSP.

**Diagnosis.** This species is separated from the other species of *Neometrypus* by the following characters: FWs absent. Male: median projection of metanotum absent. Male genitalia: PsP flattened dorso-ventrally in posterior view, posterior margin not divided into two lobes; EctAp longer than LLophi, straight, inclined to outwards in dorsal and ventral views. Female genitalia: dorsal and ventral faces of copulatory papilla with a median split.

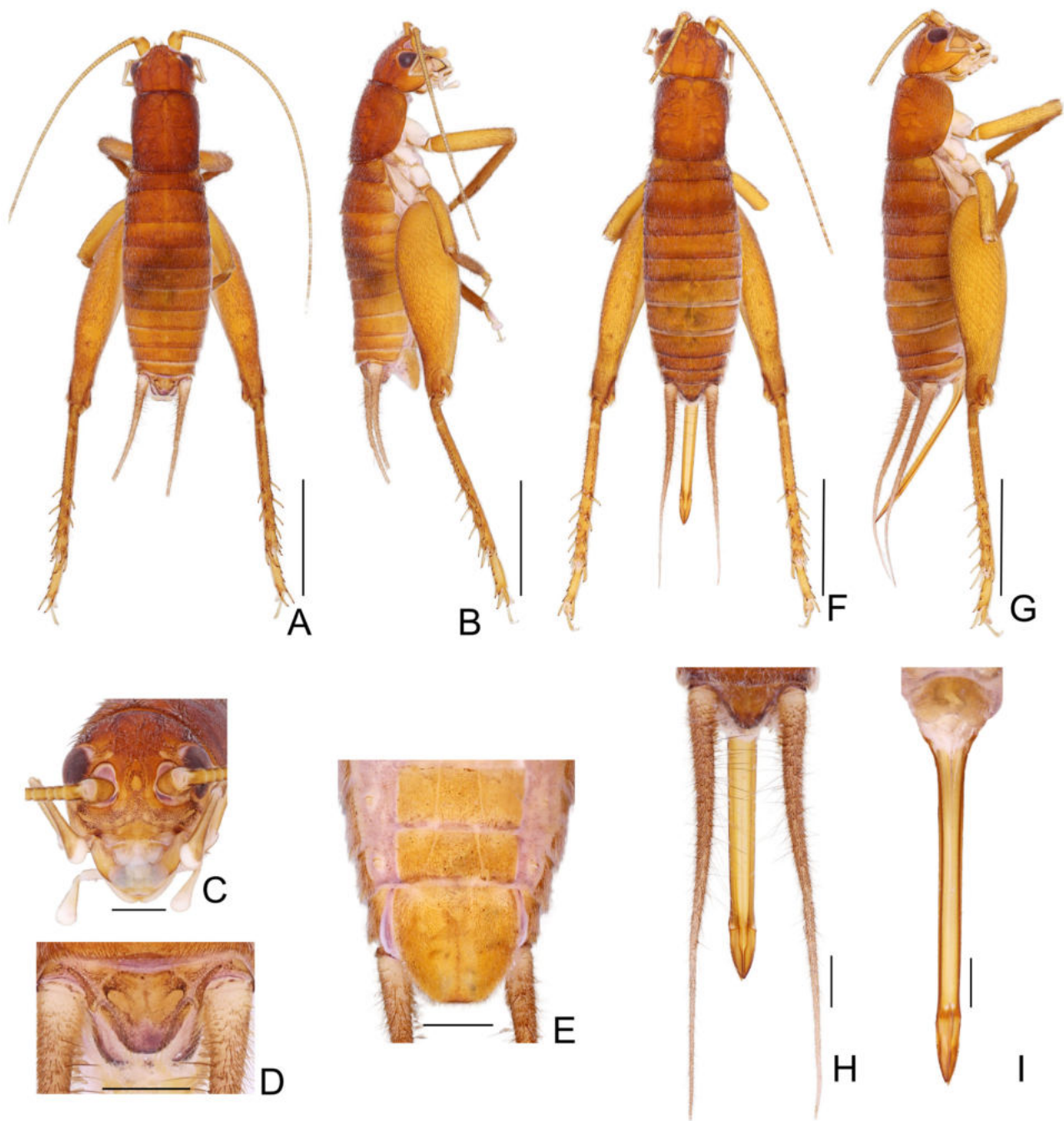
**Description.** *General morphology.* Head. Fastigium as long as wide, pubescent (Fig. 9A, F). Three ocelli, the median reduced, under lateral ones in frontal view (Fig. 9C); lateral ocelli rounded. Frons smooth (Fig. 9C). Antennal scape longer than wide, inner margin with bristles. Maxillary palpi articles 3, 4, and 5 almost same-sized; article 5 upcurved (Fig. 9B, G).

Thorax. DD longer than wide, covered by bristles. DD cephalic margin straight, caudal margin slightly convex (Fig. 9A, F). LL ventro-cephalic angle rounded; ventro-caudal angle gradually ascendant in lateral view (Fig. 9B, G). FWs absent (Fig. 9A, F).

Legs. TI with three apical spurs, two ventral, one dorsal. TII with three apical spurs, two ventral and one dorsal. TIII subapical spurs with two spines between each spur, ten or more spines above subapical spurs on inner and outer sides. TIII inner apical spurs: iad>iam>iav; outer apical spurs: oam>oav>oad, oav and oad almost same-sized. Basitarsus dorsal spines 3/1; outer and inner apical spurs same-sized

Abdomen. Tergites and sternites pubescent (Fig. 9A, F, E). Supra anal plate posterior margin rounded (Fig. 9D, H).

*Male.* Median projection of metanotum absent. Subgenital plate as long as wide, posterior margin straight (Fig. 9E).



**FIGURE 9.** *Neometrypus couriae* n. sp. Male: A—habitus, dorsal; B—habitus, lateral, C—head, frontal; D—supra anal plate; E—subgenital plate and last abdominal sternites. Female: F—habitus, dorsal; G—habitus, lateral; H—supra anal plate and ovipositor, dorsal; I—subgenital plate and ovipositor, ventral. Scales A–B, F–G: 5mm; C–E, H–I: 1mm.

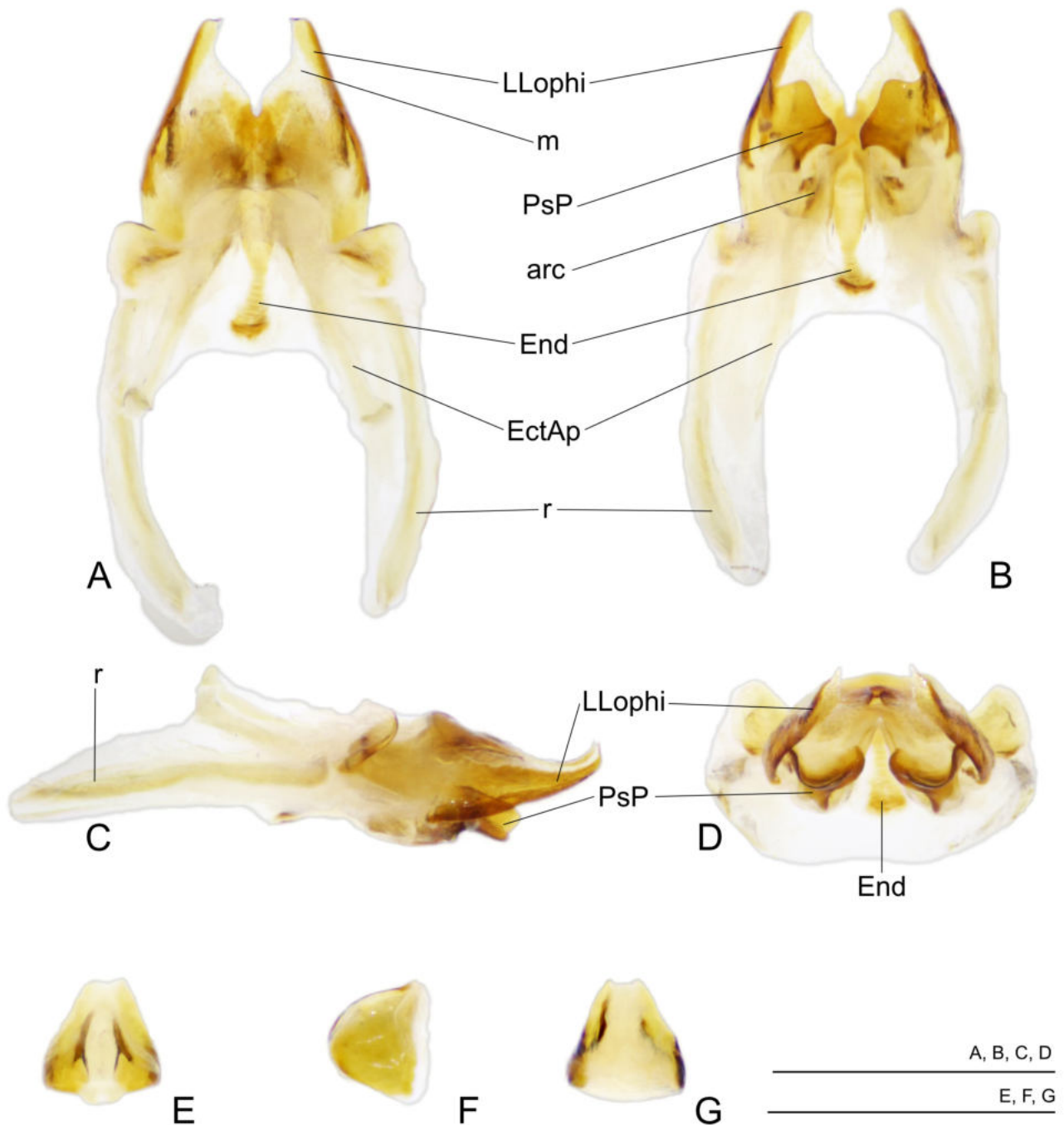
*Male genitalia* (Fig. 10A–D). Pseudepiphallus: pseudepiphallic sclerite straight in lateral view, anterior margin straight on median region, lateral region upcurved in lateral view (Fig. 10A–C). LLOphi slightly curved inwards, posterior margin truncated in dorsal and ventral views; inner margin membranous, outer margin sclerotized, thin (Fig. 10A, B). PsP shorter than LLOphi, flattened dorso-ventrally in posterior view (Fig. 10B, D); posterior margin not divided into two lobes, not surpassing posterior margin of pseudepiphallic sclerite in dorsal and ventral views (Fig. 10B). r elongate, longer than pseudepiphallic sclerite, flattened laterally (Fig. 10A–C). Ectophallic invagination: EctAp longer than LLOphi, straight, inclined to outwards in dorsal and ventral views (Fig. 10A); arc not complete, curved posteriorly; ventral projections of ectophallic invagination very short, shorter than arc (Fig. 10B).

**TABLE 4.** Measurements in mm of *Neometrypus couriae* n.sp.

	IOD	HW	PL	PW	LFIII	LTIII	OL
Females	1.9–2	3.2–3.4	4–4.3	3.5–3.8	9.3–10.1	7.8–8	7.5–8.8
Mean (n=2)	1.9	3.3	4.1	3.6	9.7	7.9	8.1
Male (n=1)	1.6	3	3.9	3.2	8.5	7.1	-

*Female.* Body larger than male (Fig. 9F, G). Subgenital plate wider than long, posterior margin concave on the middle (Fig. 9I). Ovipositor as in fig. 9H, I.

*Female genitalia.* Copulatory papilla (Fig. 10E–G), triangular in dorsal and ventral views, straight in lateral view; posterior margin truncated; dorsal and ventral faces with a median split.



**FIGURE 10.** *Neometrypus couriae* n. sp. Male genitalia: A—dorsal, B—ventral, C—lateral, D—posterior. Copulatory papilla: E—dorsal, F—lateral, G—ventral. Scales 1mm. Abbreviations see material and methods.

**Coloration.** Male and female with similar coloration. Occiput, vertex, and pronotum reddish-brown; abdominal tergites medium brown to reddish-brown (Fig. 9A, B, F, G). Face medium brown to yellowish-brown (Fig. 9C); antennal scape and antennomeres medium brown; abdominal tergites reddish-brown getting lighter posteriorly; sternites yellowish-brown, supra anal plate light to medium brown (Fig. 9D, H), subgenital plate yellowish-brown (Fig. 9E); female subgenital plate light brown (Fig. 9I); ovipositor apex yellowish-brown; cerci medium brown (Fig. 9H). FI and FII yellowish-brown, TI and TII medium brown; FIII yellowish-brown, distal apex slightly darker; TIII medium brown, spurs medium brown with apex dark brown; tarsomeres yellowish-brown.

***Neometrypus lopesae* n. sp.**

(Figs 11, J; 11; 12; 23; Table 5)

**Etymology.** Species named after Sônia Maria Lopes Fraga, specialist in Blattaria, and professor at the Departamento de Entomologia (Entomology Department) of the Museu Nacional – UFRJ.

**Type locality.** Brazil, Rio de Janeiro, Rio de Janeiro.

**Type material.** Holotype male. Brasil, R[io de]J[aneiro]/P[arque]E[stadual] Pedra Branca, Camorin/ Trilha Açude do Camorin/Próximo às ruínas/11.XII.2017–11.I.2018/ Malaise, ALDF col. (handwritten) | LDC\_154; MZSP. Allotype female. Brasil, Brasil, R[io de]J[aneiro], Parque Nacional de Itatiaia/ Picada do Veu da Noiva/ 10.X.95, 1100m altit[ude]/ A. Mesa, E. Zefa, L. de Souza, C. Sperber leg.; MZSP. Paratype males. (1) Brasil, S[ão]P[aulo], Ubatuba/ Núcleo Picinguaba/II.1990/ F.A.G. Mello col. (handwritten); BOTU. (1) Brasil, R[io de] J[aneiro], Rio de Janeiro/ Parque Nacional da Tijuca/ Setor Floresta/ 10.ix.2021/ Pedro Souza Dias & equipe cols. | PSD 570 | MNRJ-ENT6-29506; MNRJ. Paratype females. Brasil, S[ão]P[aulo], Ubatuba/ Núcleo Picinguaba/II.1990/ F.A.G. Mello col. (handwritten); BOTU. (2) Brasil, R[io de] J[aneiro], Rio de Janeiro/ Parque Nacional da Tijuca/ Setor Floresta/ 10.ix.2021/ Pedro Souza Dias & equipe cols. | MNRJ-ENT6-29505; MNRJ. Same data as for previous paratype | PSD 571 | MNRJ-ENT6-29507; MNRJ.

**Diagnosis.** This species is separated from the other species of *Neometrypus* by the following characters: occiput and vertex yellowish-brown, pronotum and abdomen dark brown; basitarsus dorsal spines 2/2 or 3/3. Male: Median projection of metanotum trapezoidal. Male genitalia: median region of r prominent laterally in dorsal and ventral views; apex of ventral lobe of PsP finger-shaped, shorter than dorsal lobe. Female genitalia: copulatory papilla anterior margin rounded on dorsal face, straight on ventral face, shorter than dorsal.

**Description. General morphology.** Head. Fastigium as long as wide, pubescent (Fig. 11A, G). Three ocelli, the median reduced, slightly under lateral ones in frontal view (Fig. 11C); lateral ocelli rounded. Frons smooth (Fig. 11C). Antennal scape longer than wide, inner margin with bristles. Maxillary palpi articles 4 and 5 almost same-sized, article 3 slightly longer; article 5 upcurved (Fig. 11B).

Thorax. DD longer than wide, covered by bristles. DD cephalic margin straight, caudal margin slightly convex (Fig. 11A, G). LL ventro-cephalic angle rounded; ventro-caudal angle gradually ascendant in lateral view (Fig. 11B, H). FWs surpassing posterior margin of metanotum (Fig. 11A, G).

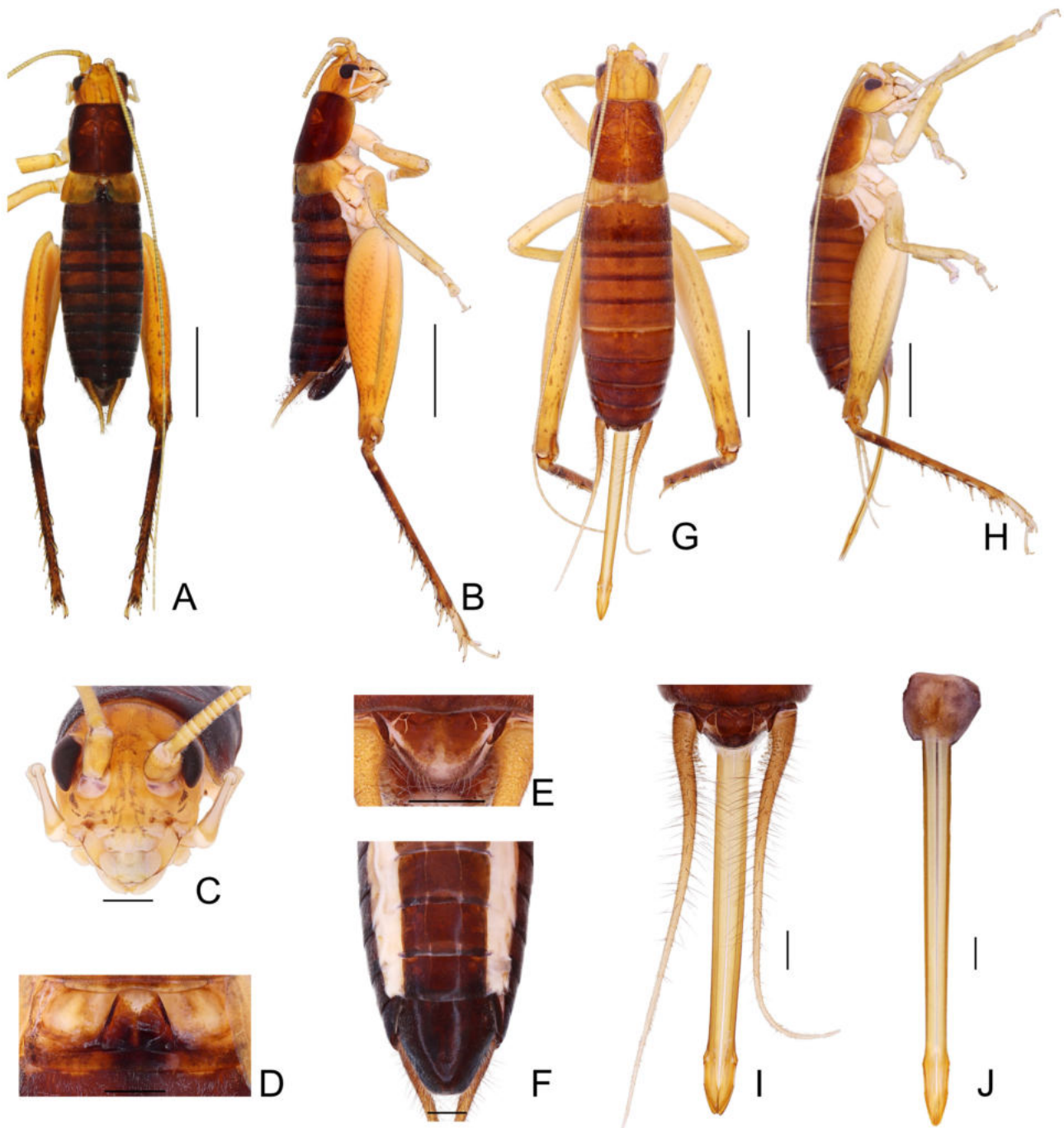
Legs. TI with three apical spurs, two ventral, one dorsal. TII with four apical spurs, two ventral and two dorsal. TIII subapical spurs with two or three spines between each spur, seven or eight spines above subapical spurs on inner and outer sides. TIII inner apical spurs: iad>iam>iav; outer apical spurs: oam>oav>oad, oav and oad almost same-sized. Basitarsus dorsal spines 2/2 or 3/3; outer and inner apical spurs same-sized.

Abdomen. Tergites and sternites pubescent (Fig. 11A, G, F); supra anal plate posterior margin rounded (Fig. 11E, I).

**TABLE 5.** Measurements in mm of *Neometrypus lopesae* n.sp.

	IOD	HW	PL	PW	FWL	LFIII	LTIII	OL
Females	2.1–2.2	3.7–3.9	5.1–5.2	4.5–4.9	1.8–2	12.9–13.6	11.7–12.1	11.5–14.2
Mean (n=2)	2.1	3.8	5.1	4.7	1.9	13.2	11.9	11.9
Males	1.8	3.2	4–4.1	3.8–3.9	1.8–2	10.4–11.4	9.2–10	-
Mean (n=2)	1.8	3.2	4.1	3.8	1.9	10.9	9.6	-



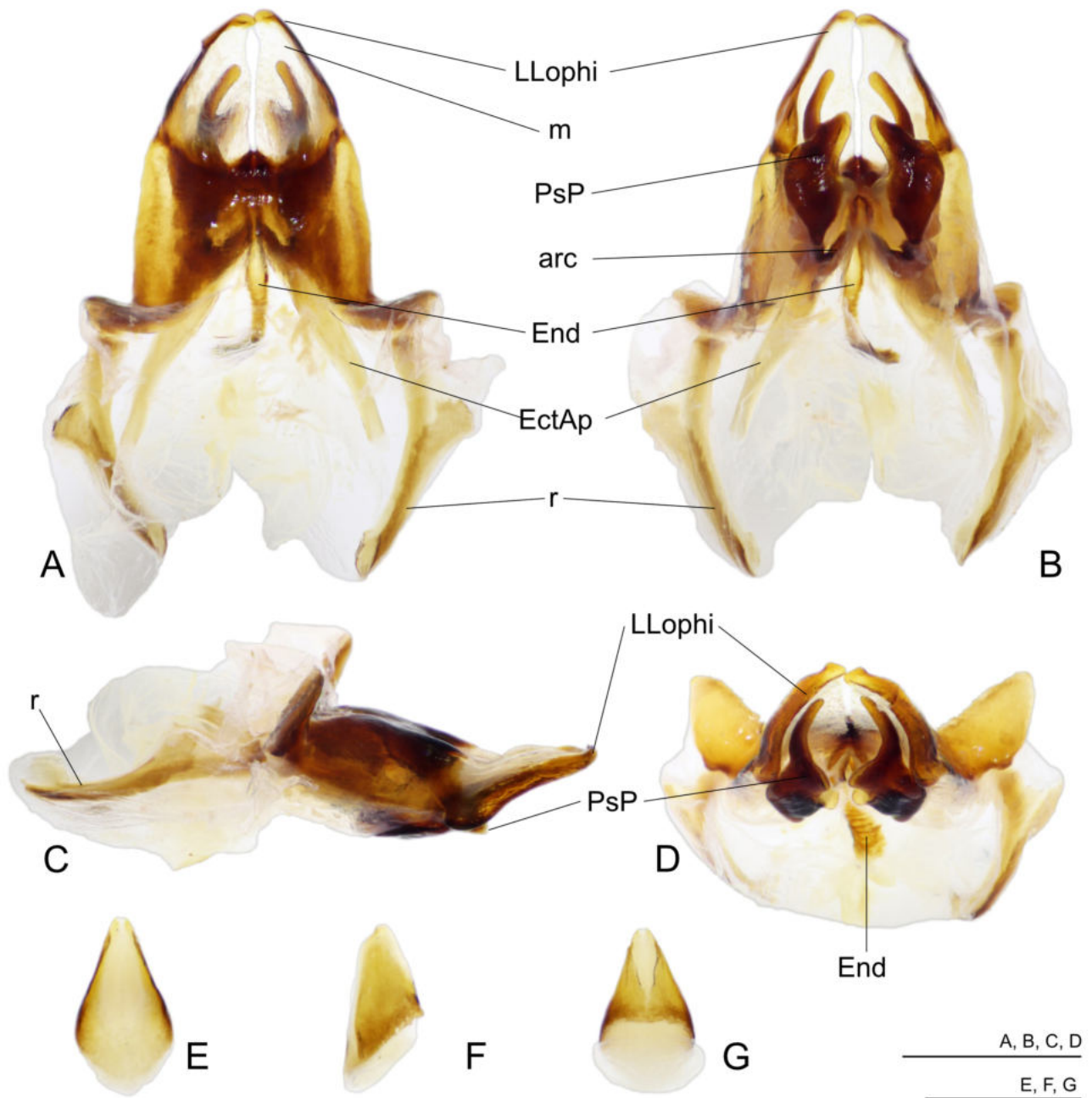


**FIGURE 11.** *Neometrypus lopesae* n. sp. Male: A—habitus, dorsal; B—habitus, lateral, C—head, frontal; D—metanotum, dorsal; E—supra anal plate; F—subgenital plate and last abdominal sternites. Female: G—habitus, dorsal; H—habitus, lateral; I—supra anal plate and ovipositor, dorsal; J—subgenital plate and ovipositor, ventral. Scales A–B, G–H: 5mm; C–F, I–J: 1mm.

*Male.* Median projection of metanotum trapezoidal, anterior margin slightly rounded (Fig. 11D). Subgenital plate longer than wide, posterior margin slightly rounded (Fig. 11F).

*Male genitalia* (Fig. 12A–D). Pseudepiphallus: pseudepiphallic sclerite slightly upcurved in lateral view, anterior margin V-shaped on median region, lateral region upcurved in lateral view (Fig. 12A, C). LLOphi curved inwards, posterior margin rounded in dorsal and ventral views; inner margin membranous, outer margin sclerotized, thin (Fig. 12A, B). PsP almost same-sized as LLOphi, posterior margin divided into two lobes, not surpassing posterior margin of pseudepiphallic sclerite in dorsal and ventral views (Fig. 12B); apex of dorsal lobe finger-shaped, inclined

inwards (Fig. 12A, B); apex of ventral lobe finger-shaped, shorter than dorsal lobe. *r* elongate, longer than pseudopiphallic sclerite, flattened laterally, median region prominent laterally in dorsal and ventral views (Fig. 12A–D). Ectopiphallic invagination: EctAp same size as LLOphi, slightly curved inwards, inclined to outwards in dorsal and ventral views (Fig. 12A, B); arc not complete, curved posteriorly; ventral projections of ectopiphallic invagination very short, shorter than arc (Fig. 12B).



**FIGURE 12.** *Neometrypus lopesae* n. sp. Male genitalia: A—dorsal, B—ventral, C—lateral, D—posterior. Copulatory papilla: E—dorsal, F—lateral, G—ventral. Scales 1mm.

*Female.* Body larger than male (Fig. 11G, H). Subgenital plate as long as wide, posterior margin almost straight on the middle (Fig. 11J). Ovipositor as in fig. 11I, J.

*Female genitalia.* Copulatory papilla (Fig. 12E–G) longer than wide, straight in lateral view; posterior margin thinner than anterior in dorsal and ventral views; anterior margin rounded on dorsal face, straight on ventral face, shorter than dorsal. Median region on ventral face depigmented.

*Coloration.* Male and female with similar coloration. Occiput and vertex yellowish-brown, pronotum and abdominal tergites dark brown (Fig. 11A, B, G, H). Occiput with two medians longitudinal grayish stripes (Fig. 11A,

G). Face light brown to yellowish-brown with two median stripes (Fig. 11C); antennal scape and antennomeres yellowish-brown. FWs slightly translucent, dark yellow; median projection of metanotum dark brown, anterior margin whitish (Fig. 11D); abdominal tergites without longitudinal median band (Fig. 11A, G); sternites reddish-brown to dark brown; supra anal plate medium to dark brown (Fig. 11F), subgenital plate dark brown (Fig. 11F); female subgenital plate grayish brown (Fig. 11J); cerci anterior portion medium brown, getting lighter on the apex; ovipositor apex yellow (Fig. 11I). FI and FII light brown, medium brown spotted, TI and TII light brown to yellowish-brown; FIII yellowish-brown to light brown, medium brown striped; TIII medium to dark brown; spurs light brown with apex dark brown; tarsomeres light brown (Fig. 11B, H).

***Neometrypus maiae* n. sp.**

(Figs 13, 14, 23, 25; Table 6)

**Etymology.** Species named after Valéria Cid Maia, dipterist (specialist in Cecidomyiidae), and professor at the Departamento de Entomologia (Entomology Department) of the Museu Nacional – UFRJ.

**Type locality.** Brazil, Espírito Santo, Santa Teresa.

**Type material.** Holotype male. Santa Teresa, E[spirito]S[anto], Brasil/ Estação Ecológica Santa Lúcia/ 19°53'56"S 40°32'26.4"W/ 12–28.xi.2015/ Redü, D.R. leg.; MZSP Allotype female. Same data as for holotype | PSD132; MZSP. Paratype males. (1) same data as for holotype | PSD129; MNRJ. (2) Brasil, E[spirito]S[anto], Linhares, Reserva/ Vale do Rio Doce. Mata. I-[19]96./ 19°09'10"S//40°03'93"W/ F.A.G. Mello – S.S. Nihei , leg.; MZSP. (2) Same data as for previous paratype; BOTU. Paratype females. (1) same data as for holotype; MNRJ. (1) Brasil, E[spirito]S[anto], Linhares, Reserva/ Vale do Rio Doce. Mata. I-[19]96./ 19°09'10"S//40°03'93"W/ F.A.G. Mello – S.S. Nihei , leg.; MZSP. (2) same data as for previous paratype; BOTU. (1) Brasil, E[spirito]S[anto], Cariacica/ Reserva Duas Bocas. I-[19]96./ 20°16'38"S//40°28'66"W/ F.A.G. Mello – S.S. Nihei, leg.; MZSP. (1) same data as for previous paratype; BOTU.

**Diagnosis.** This species is separated from the other species of *Neometrypus* by the following characters: abdominal tergites with median band dark brown fading on posterior margin, except on the last three tergites, last 3–5 abdominal tergites dark brown; first abdominal sternite prominent, less prominent than in *Neometrypus mendoncae* n. sp.; basitarsus dorsal spines 3/2. Male genitalia: PsP longer than LLophi, posterior margin divided into two lobes same sized. Female genitalia: copulatory papilla triangular, straight in lateral view; anterior margin on dorsal face concave, anterior margin on ventral face convex.

**Description.** *General morphology.* Head. Fastigium as long as wide, pubescent (Fig. 13A, G). Three ocelli, the median reduced, slightly under lateral ones in frontal view (Fig. 13C); lateral ocelli rounded. Frons smooth (Fig. 13C). Antennal scape longer than wide, inner margin with bristles. Maxillary palpi articles 4 and 5 almost same-sized, article 3 longer; article 5 upcurved (Fig. 13B, H).

Thorax. DD longer than wide, covered by bristles. DD cephalic margin sub-straight, caudal margin slightly convex (Fig. 13A, G). LL ventro-cephalic angle rounded; ventro-caudal angle gradually ascendant in lateral view (Fig. 13B, H). FWs not surpassing posterior margin of metanotum (Fig. 13A, G).

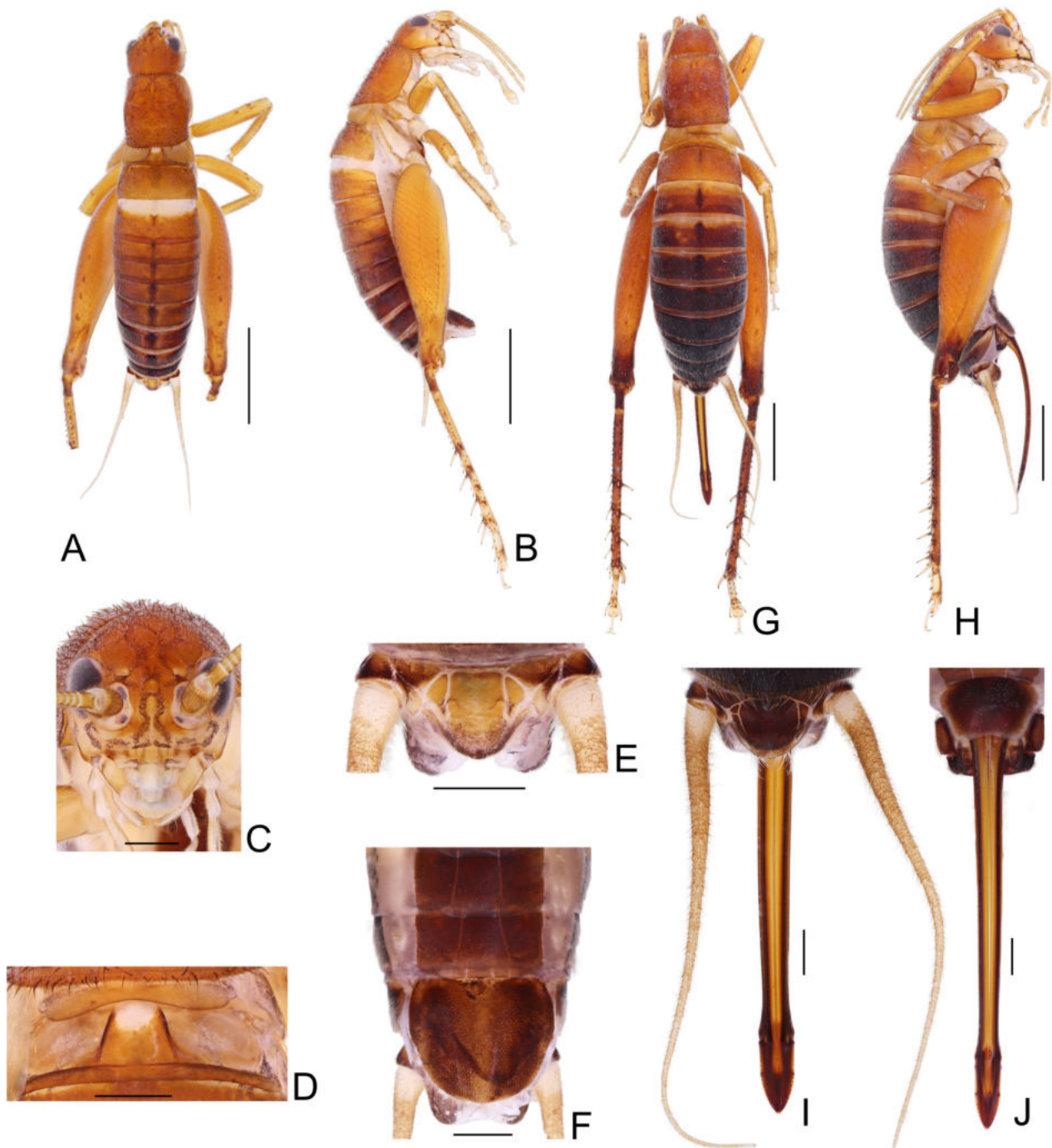
Legs. TI with three apical spurs, two ventral, one dorsal. TII with four apical spurs, two ventral and two dorsal. TIII subapical spurs with two spines between each spur (rarely one), eight or nine spines above subapical spurs on inner and outer sides. TIII inner apical spurs: iad>iam>iav; outer apical spurs: oam>oav>oad, oav and oad almost same-sized. Basitarsus dorsal spines 3/2 (rarely 3/1); outer and inner apical spurs same-sized.

Abdomen. Tergites and sternites pubescent (Fig. 13A, F, G); first abdominal sternite prominent, less prominent than in *Neometrypus mendoncae* n. sp. Supra anal plate posterior margin rounded (Fig. 13E, I).

**TABLE 6.** Measurements in mm of *Neometrypus maiae* n.sp.

	IOD	HW	PL	PW	FWL	LFIII	LTIII	OL
Females	1.9–2.1	3.1–4	4.7–5.3	4.2–4.6	1.3–2	12–13.4	10.1–12.1	9.8–11.2
Mean (n=5)	2	3.6	4.9	4.4	1.7	12.8	11.2	10.5
Males	1.7–2	3–3.2	4–4.3	3.6–4	1.2–2	10.1–11.1	8.8–9.5	-
Mean (n=5)	1.8	3.1	4.1	3.8	1.5	10.7	9.1	-

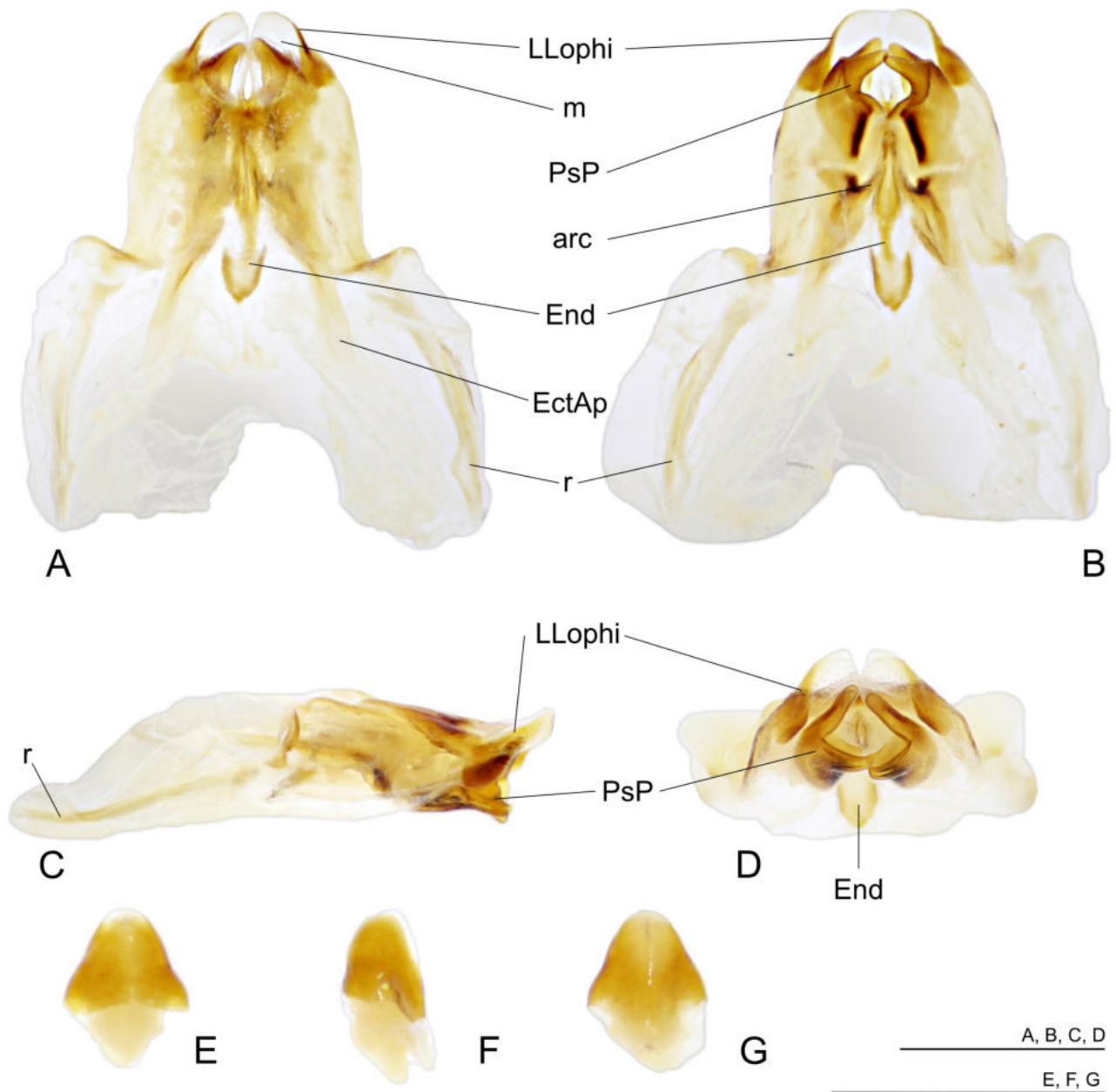
*Male.* Anterior margin of median projection of metanotum rounded, posterior margin slightly wider than anterior margin in dorsal view (Fig. 13D). Subgenital plate as long as wide, posterior margin convex (Fig. 13F).



**FIGURE 13.** *Neometrypus maiiae* n. sp. Male: A—habitus, dorsal; B—habitus, lateral; C—head, frontal; D—metanotum, dorsal; E—supra anal plate; F—subgenital plate and last abdominal sternites. Female: G—habitus, dorsal; H—habitus, lateral; I—supra anal plate and ovipositor, dorsal; J—subgenital plate and ovipositor, ventral. Scales A–B, G–H: 5mm; C–F, I–J: 1mm.

*Male genitalia* (Fig. 14A–D). Pseudepiphallus: pseudepiphallic sclerite slightly upcurved in lateral view, anterior margin concave on median region, lateral region upcurved in lateral view (Fig. 14A–C). LLOphi curved inwards; posterior margin rounded in dorsal and ventral views; inner margin membranous, outer margin sclerotized, thin (Fig. 14A, B). PsP longer than LLOphi, posterior margin divided into two lobes, same-sized, not surpassing posterior margin of pseudepiphallic sclerite in dorsal and ventral views (Fig. 14B); apex of dorsal and ventral lobes finger-shaped, inclined inwards. r elongate, as long as pseudepiphallic sclerite, flattened laterally, apex bifid (Fig. 14A–C).

Ectophallic invagination: EctAp longer than LLOphi, slightly curved inwards, inclined to outwards in dorsal and ventral views (Fig. 14A); arc not complete, curved posteriorly; ventral projections of ectophallic invagination very short, shorter than arc (Fig. 14B).



**FIGURE 14.** *Neometrypus maiae* n. sp. Male genitalia: A—dorsal, B—ventral, C—lateral, D—posterior. Copulatory papilla: E—dorsal, F—lateral, G—ventral. Scales 1mm. Abbreviations see material and methods.

*Female.* Body larger than male (Fig. 13G, H). Subgenital plate wider than long, posterior margin slightly concave on the middle (Fig. 13J). Ovipositor as in fig. 13I, J.

*Female genitalia.* Copulatory papilla (Fig. 14E–G), triangular, straight in lateral view; posterior margin somewhat rounded; anterior margin on dorsal face concave, anterior margin of ventral face convex, longer than anterior margin of dorsal face. Posterior margin depigmented.

*Coloration.* Male and female with similar coloration. Occiput, vertex, pronotum, and abdominal tergites reddish-brown (Fig. 13A, G); last abdominal tergites dark brown (Fig. 13F). Face medium to light brown with stripes medium brown on the middle and under antennal scapes in frontal view (Fig. 13C); antennal scape medium brown, antennomeres light brown. FWs slightly translucent, medium to light brown; median projection of metanotum

ocher, anterior margin whitish (Fig. 13D); abdominal tergites with median band dark brown fading on posterior margin, except on the last three tergites (Fig. 13A, G), last 3–5 abdominal tergites dark brown; sternites dark brown; supra anal plate anterior portion medium brown, posterior portion yellowish-brown (Fig. 13E); subgenital plate dark brown (Fig. 13F); female subgenital plate dark brown (Fig. 13J); cerci light to medium brown; ovipositor apex dark brown (Fig. 13I, J). FI, FII, TI, and TII yellowish-brown, medium brown spotted; FIII yellowish-brown, slightly medium brown striped, distal apex slightly darker; TIII light brown, dark brown spotted on the base of subapical spurs; spurs light brown with apex medium brown; tarsomeres light brown (Fig. 13B, H).

***Neometrypus marcelae* n. sp.**

(Figs 1A, B; 15; 16; 23; Table 7)

**Etymology.** Species named after Marcela Monné, coleopterologist (specialist in Cerambycidae), and professor at the Departamento de Entomologia (Entomology Department) of the Museu Nacional – UFRJ.

**Type locality.** Brazil, Rio de Janeiro, Itatiaia.

**Type material.** Holotype male. P[arque]N[acional] de Itatiaia/ Brasil, R[io de]J[aneiro], Itatiaia/ Trilha dos Três Picos – Alt[titude] 1030m/ 22°26'26.7"S/44°36'26.5"W/ 12–18.III.2017/ L.D. Campos, S.S. Nihei, F.M. Gudin, D.M.A. Garcia, R.V.P. Dios col.; MZSP. Allotype female. Same data as for holotype; MZSP. Paratype males. (1) Same data as for holotype | PSD158; MZSP. (1) Brasil, R[io de]J[aneiro], Itatiaia, Parque Nac[cional] de Itatiaia/ 22°26'97"S/44°36'62"W/ 09–14.III.1997/ F.A.G. Mello, N.D. Jago leg.; BOTU. (1) Brasil, Brasil, R[io de]J[aneiro], Parque Nacional de Itatiaia/ Picada do Veu da Noiva/ 10.X.95, 1100m altit[ude]/ A. Mesa, E. Zefa, L. de Souza, C. Sperber leg.; MNRJ. Paratype Females. (3) Same data as for holotype | PSD159, PSD160, PSD178; MZSP. (1) P[arque]N[acional] de Itatiaia/ Brasil, R[io de]J[aneiro], Itatiaia; Trilha Rui Braga – Alt[titude] 1198m/ 22°26'09.1"S/44°37'31.2"W/ 12–18.III.2017/ L.D. Campos, S.S. Nihei, F.M. Gudin, D.M.A. Garcia, R.V.P. Dios col. | PSD179; MZSP. (2) Same data as for previous paratype; MNRJ. (1) Brasil, Brasil, R[io de]J[aneiro], Parque Nacional de Itatiaia/ Picada do Veu da Noiva/ 10.X.95, 1100m altit[ude]/ A. Mesa, E. Zefa, L. de Souza, C. Sperber leg.; MNRJ. (1) Brasil, R[io de]J[aneiro], Itatiaia, Parque Nac[cional] de Itatiaia/ 22°26'97"S/44°36'62"W/ 09–14.III.1997/ F.A.G. Mello, N.D. Jago leg.; BOTU.

**Diagnosis.** This species is separated from the other species of *Neometrypus* by the following characters: cerci anterior margin light brown, middle region medium brown, getting lighter on the apex; seven or eight spines above subapical spurs on inner and outer sides of TIII; anterior margin of median projection of metanotum slightly pointed, posterior margin almost same-sized than anterior margin in dorsal view. Male genitalia: LLOphi posterior margin truncated in dorsal and ventral views.

**Description.** *General morphology.* Head. Fastigium as long as wide, pubescent (Fig. 15A, G). Lateral ocelli rounded, median ocellus absent (Fig. 15C); frons smooth (Fig. 15C). Antennal scape longer than wide, inner margin with bristles. Maxillary palpi articles 4 and 5 almost same-sized, article 3 slightly longer; article 5 slightly upcurved (Fig. 15B, H).

Thorax. DD longer than wide, covered by bristles. DD cephalic margin sub-straight, caudal margin straight (Fig. 15A, G). LL ventro-cephalic angle rounded; ventro-caudal angle gradually ascendant in lateral view (Fig. 15B, H). FWs surpassing posterior margin of metanotum (Fig. 15A, G).

Legs. TI with three apical spurs, two ventral, one dorsal. TII with three apical spurs, two ventral, one dorsal. TIII subapical spurs with two (sometimes one) spines between each spur, seven or eight spines above subapical spurs on inner and outer sides. TIII inner apical spurs: iad>iam>iav; outer apical spurs: oam>oav>oad, oav and oad almost same-sized. Basitarsus dorsal spines 2/1 (rarely 3/1); outer and inner apical spurs same-sized.

Abdomen. Tergites pubescent (Fig. 15A, G); Supra anal plate posterior margin rounded (Fig. 15E, I).

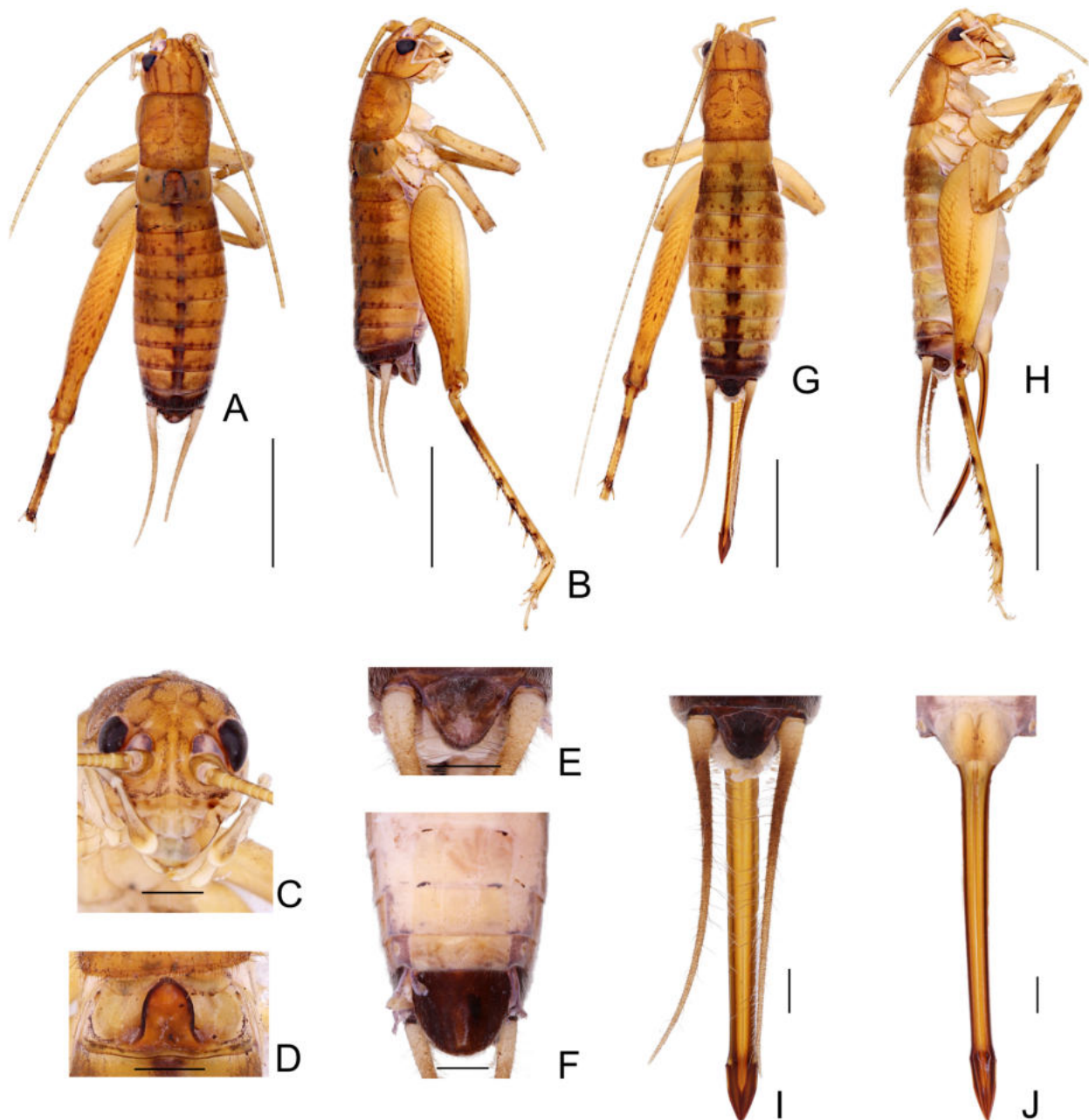
*Male.* Anterior margin of median projection of metanotum slightly pointed posterior margin almost same-sized than anterior margin in dorsal view (Fig. 15D). Subgenital plate as long as wide, posterior margin convex (Fig. 15F).

*Male genitalia* (Fig. 16A–D). Pseudepiphallus: pseudepiphallic sclerite slightly upcurved in lateral view, anterior margin V-shaped on median region, lateral region upcurved in lateral view (Fig. 16A–C). LLOphi curved inwards, posterior margin truncated in dorsal and ventral views; inner margin membranous, outer margin sclerotized, thin (Fig. 16A, B). PsP almost same-sized as LLOphi, posterior margin divided into two lobes, not surpassing posterior margin of pseudepiphallic sclerite in dorsal and ventral views; apex of dorsal lobe finger-shaped, slightly

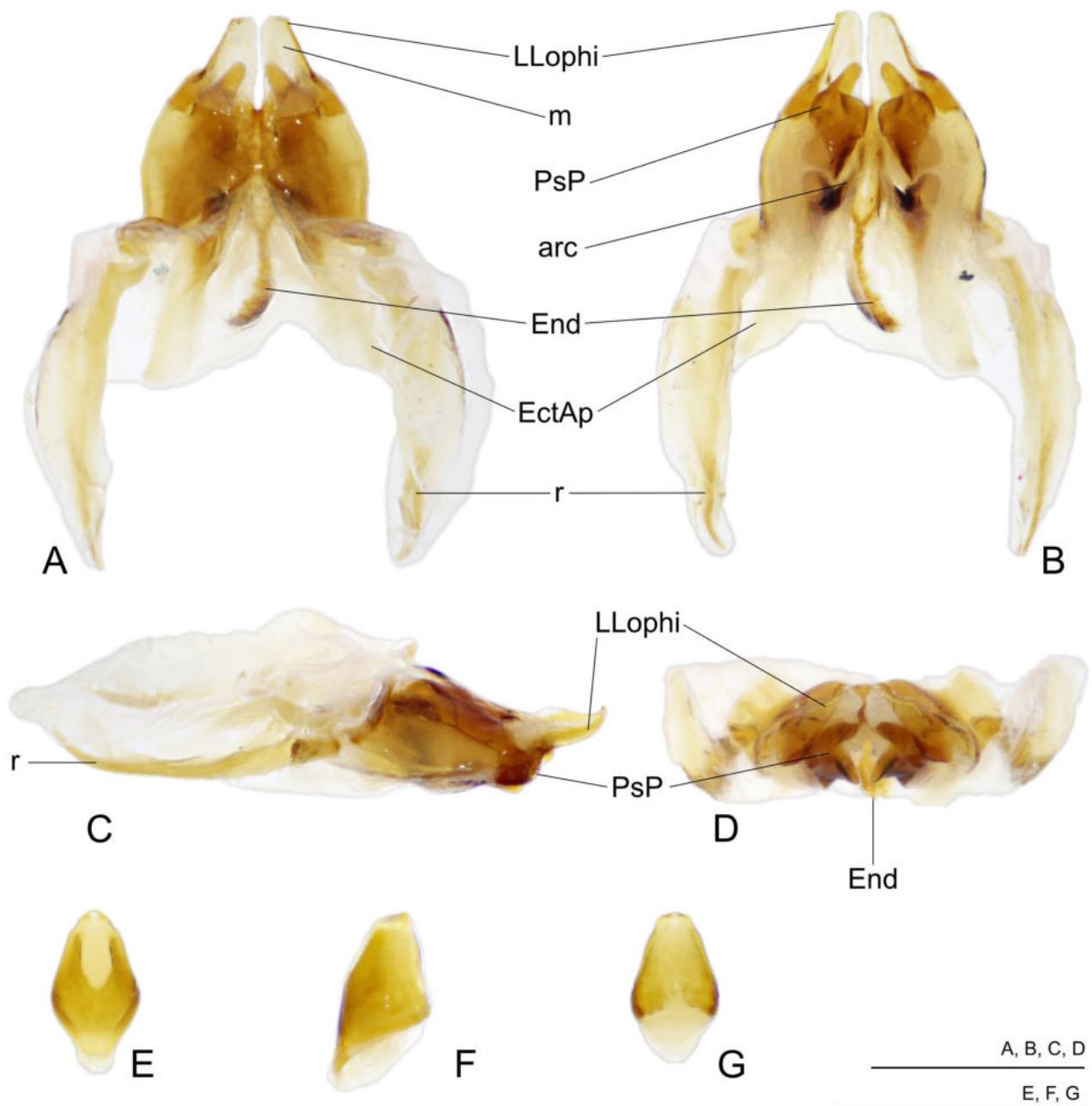
curved inwards; apex of ventral lobe truncated (Fig. 16B). *r* elongate, longer than pseudepiphallic sclerite, flattened laterally (Fig. 16A–C). Ectophallic invagination: EctAp longer than LLOphi, straight, slightly inclined to outwards in dorsal and ventral views (Fig. 16A, B); arc not complete, curved posteriorly; ventral projections of ectophallic invagination short, almost same size as arc (Fig. 16B).

**TABLE 7.** Measurements in mm of *Neometrypus marcelae* n.sp.

	IOD	HW	PL	PW	FWL	LFIII	LTIII	OL
Females	1.5–2	2.5–3.1	3.1–3.7	2.9–3.5	1.1–1.3	8.2–10.5	7.7–9.5	8.1–9.3
Mean (n=5)	1.78	2.8	3.38	3.2	1.1	9.6	8.9	8.7
Males	1.6–1.8	2.7–2.8	3–3.2	2.9–3.1	1.1–1.2	8.1–8.9	7.5–8.1	-
Mean (n=3)	1.7	2.7	3.1	3	1.1	8.5	7.9	-



**FIGURE 15.** *Neometrypus marcelae* n. sp. Male: A—habitus, dorsal; B—habitus, lateral; C—head, frontal; D—metanotum, dorsal; E—supra anal plate; F—subgenital plate and last abdominal sternites. Female: G—habitus, dorsal; H—habitus, lateral; I—supra anal plate and ovipositor, dorsal; J—subgenital plate and ovipositor, ventral. Scales A–B, G–H: 5mm; C–F, I–J: 1mm.



**FIGURE 16.** *Neometrypus marcelae* n. sp. Male genitalia: A—dorsal, B—ventral, C—lateral, D—posterior. Copulatory papilla: E—dorsal, F—lateral, G—ventral. Scales 1mm. Abbreviations see material and methods.

*Female.* Body slightly larger than male (Fig. 15B, H). Subgenital plate wider than long, posterior margin concave on the middle (Fig. 15J). Ovipositor as in fig. 15I, J.

*Female genitalia.* Copulatory papilla (Fig. 16E–G) longer than wide, almost straight in lateral view; posterior margin somewhat prominent in dorsal view, truncated in lateral and ventral views; anterior margin on dorsal face rounded, anterior margin of ventral face concave. Median region on dorsal face depigmented.

*Coloration.* Male and female with similar coloration. Occiput, vertex, pronotum, and abdominal tergites medium brown to yellowish-brown (Fig. 15A, B, G, H). Occiput with two median and two lateral longitudinal stripes reddish (Fig. 15A, G). Face light brown to yellowish-brown with stripes gray forming a triangle centrally (Fig. 15C); antennal scape yellowish-brown, antennomeres light brown. FWs slightly translucent, yellowish; median projection of metanotum brownish-orange (Fig. 15D); abdominal tergites with medium brown spots on posterior margin and a median band dark brown fading on posterior margin, except on the last three tergites (Fig. 15A, G); last abdominal tergite dark brown; sternites light brown almost whitish with thin and short horizontal stripes dark brown



on lateral posterior margins; supra anal (Fig. 15E, I) and subgenital (Fig. 15F) plates dark brown; female subgenital plate light brown (Fig. 15J); cerci anterior margin light brown, middle region medium brown, getting lighter on the apex; ovipositor apex reddish-brown (Fig. 15I, J). FI and FII light brown, medium brown spotted, TI and TII light brown to yellowish-brown with two maculae median brown on dorsal region, one distal and one proximal; FIII yellowish-brown to light brown, medium brown striped, distal apex medium brown to reddish-brown laterally; TIII medium to yellowish-brown, proximal portion medium to dark brown, dark brown spotted on the base of subapical spurs; spurs light brown with apex medium brown; tarsomeres yellowish-brown (Fig. 15B, H).

***Neometrypus mejdalanii* n. sp.**

(Figs 1G, H; 17; 18; 23; 25; Table 8)

**Etymology.** Species named after Gabriel Luis Figueira Mejdalani, hemipterologist (specialist in Cicadellidae), and professor at the Departamento de Entomologia of the Museu Nacional.

**Type locality.** Brazil, Rio de Janeiro, Teresópolis.

**Type material.** Holotype male. BRASIL, R[io de]J[aneiro], Teresópolis/ P[arque] N[acional] da Serra dos Órgãos/ sede – 992m/ 01–05.V.2019/ Souza-Dias e equipe cols. | MNRJ-ENT6-29509; MNRJ. Allotype female. Same data as for holotype | MNRJ-ENT6-29198; MNRJ. Paratype males. (1) Same data as for holotype | MNRJ-ENT6-29199; MNRJ. (1) Same data as for holotype | MNRJ-ENT6-29196; MNRJ. (1) Brasil, R[io de]J[aneiro], Teresópolis/ P[ar]q[ue] Nac[ional] Serra dos Orgãos/ 22°23'S//42°56'W (mata)/ 21–17.II.1997/ F.A.G. Mello – N.D. Jago, leg.; BOTU. (1) Brasil, R[io de]J[aneiro], Teresópolis/ Faz[enda] Revolta. II-[19]96/ 22°26'78"S//42°56'50"W/ F.A.G. Mello – S.S. Nihei, leg.; MZSP. Paratype females. (1) Same data as for holotype | MNRJ-ENT6-29510; MNRJ. (1) Brasil, R[io de]J[aneiro], Teresópolis/ P[ar]q[ue] Nac[ional] Serra dos Orgãos/ 22°23'S//42°56'W (mata)/ 21–17.II.1997/ F.A.G. Mello – N.D. Jago, leg.; BOTU. (1) Brasil, R[io de]J[aneiro], Teresópolis/ Faz[enda] Revolta. II-[19]96/ 22°26'78"S//42°56'50"W/ F.A.G. Mello – S.S. Nihei, leg.; MZSP.

**Diagnosis.** This species is separated from the other species of *Neometrypus* by the following characters: abdominal tergites with medium brown spots on posterior margin and a median band medium brown fading on posterior margin, except on the last three tergites. Male: anterior margin of median projection of metanotum sub-straight; Male genitalia: apex of ventral lobe of PsP finger-shaped, shorter than dorsal lobe, curved anteriorly; apex of r bifid; apex of EctAp curved laterally. Female genitalia: posterior margin of copulatory papilla truncated.

**Description.** *General morphology.* Head. Fastigium as long as wide, pubescent (Fig. 17A, G). Lateral ocelli rounded, median ocellus absent (Fig. 17C), frons smooth (Fig. 17C). Antennal scape longer than wide, inner margin with bristles. Maxillary palpi articles 3, 4, and 5 almost same-sized, article; article 5 slightly upcurved (Fig. 17B). Thorax. DD longer than wide, covered by bristles. DD cephalic margin straight, caudal margin slightly convex (Fig. 17A, G). LL ventro-cephalic angle rounded; ventro-caudal angle gradually ascendant in lateral view (Fig. 17B, H). FWs not surpassing posterior margin of metanotum (Fig. 17A, G).

Legs. TI with three apical spurs, two ventral, one dorsal. TII with four apical spurs, two ventral, two dorsal. TIII subapical spurs with two (sometimes one) spines between each spur, nine or eight spines above subapical spurs on inner and outer sides. TIII inner apical spurs: iad>iam>iav; outer apical spurs: oam>oav>oad, oav and oad almost same-sized. Basitarsus dorsal spines 3/1 (rarely 2/1); outer and inner apical spurs same-sized.

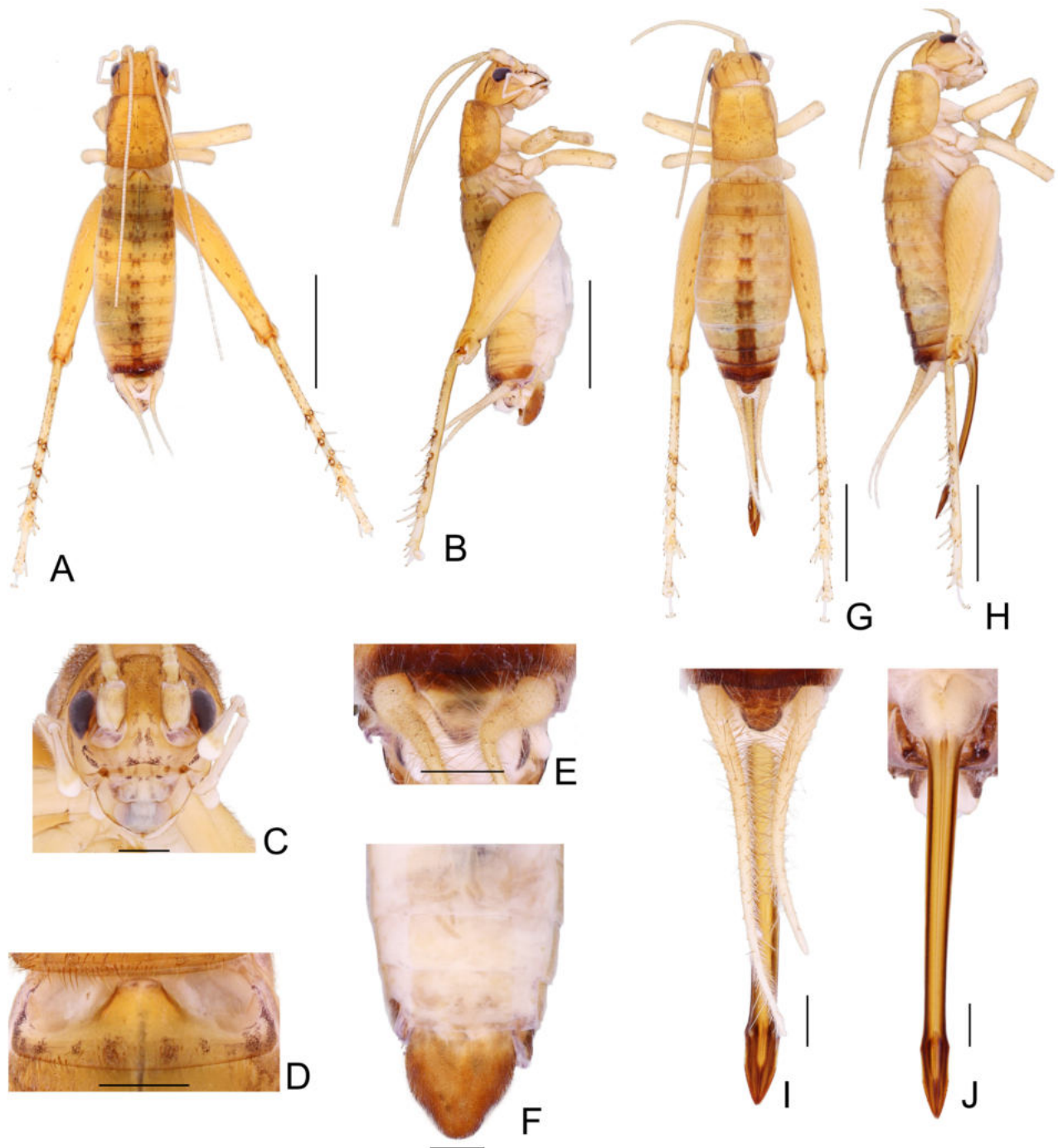
Abdomen. Tergites pubescent (Fig. 17A, G); Supra anal plate posterior margin rounded (Fig. 17E, I).

*Male.* Anterior margin of median projection of metanotum sub-straight; posterior margin wider than anterior margin in dorsal view, trapezoidal (Fig. 17D). Subgenital plate longer than wide, posterior margin rounded (Fig. 17F).

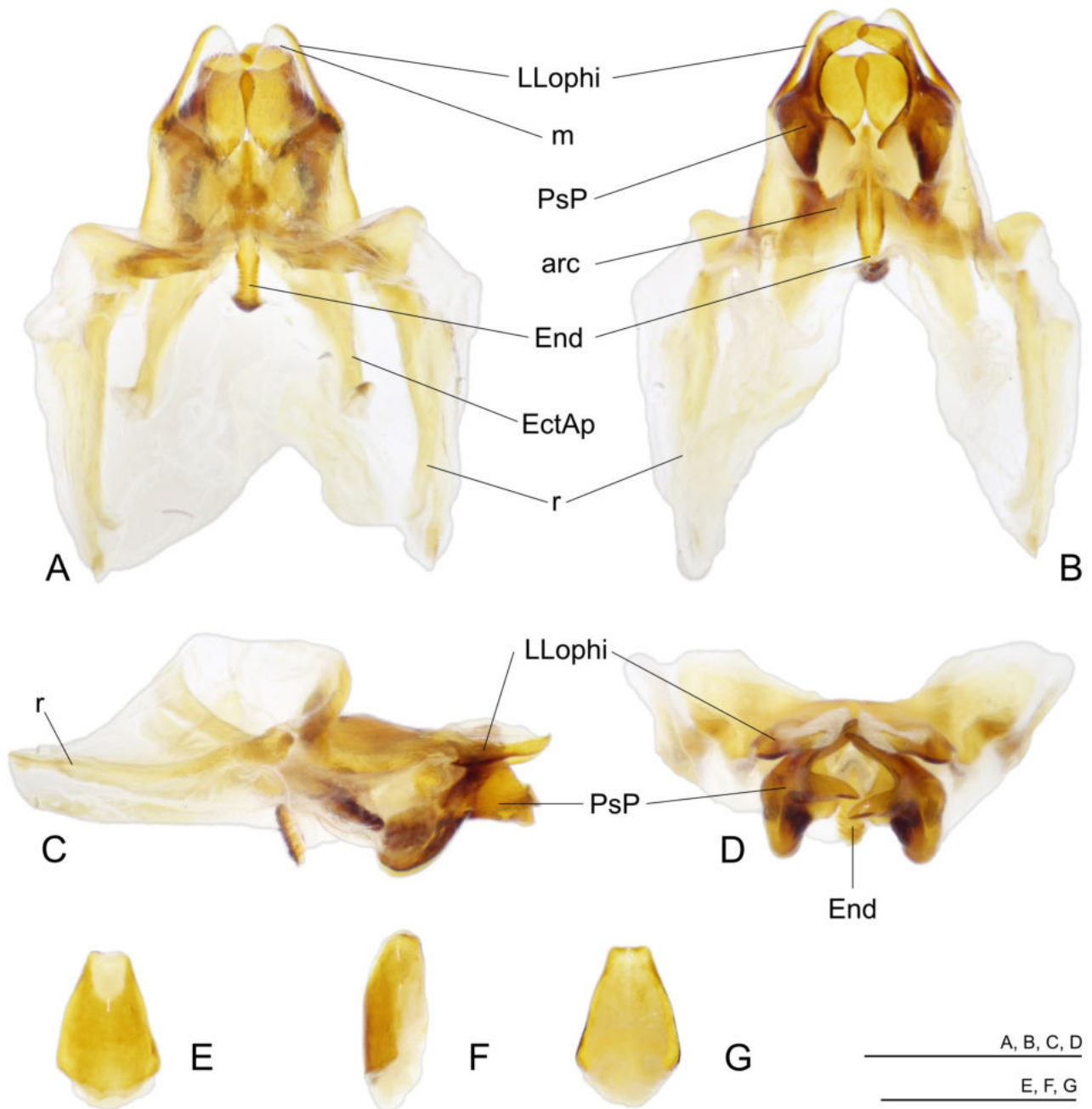
*Male genitalia* (Fig. 18A–D). Pseudepiphallus: pseudepiphallic sclerite straight in lateral view, anterior margin concave on median region, lateral region upcurved in lateral view (Fig. 18A–C). LLOphi curved inwards, posterior margin rounded in dorsal and ventral views; inner margin membranous, outer margin sclerotized, thin (Fig. 18A). PsP same-sized as LLOphi, posterior margin divided into two lobes, reaching posterior margin of pseudepiphallic sclerite in dorsal and ventral views (Fig. 18A, B); apex of dorsal lobe finger-shaped, curved inwards; apex of ventral lobe finger-shaped, shorter than dorsal lobe, curved anteriorly (Fig. 18B). r elongate, longer than pseudepiphallic sclerite, flattened laterally, apex bifid (Fig. 18A–C). Ectophallic invagination: EctAp longer than LLOphi, straight, inclined to outwards in dorsal and ventral views, apex curved laterally (Fig. 18A–C); arc not complete, curved posteriorly; ventral projections of ectophallic invagination short, same size as arc (Fig. 18B).

**TABLE 8.** Measurements in mm of *Neometrypus mejdalanii* n.sp.

	IOD	HW	PL	PW	FWL	LFIII	LTIII	OL
Females	1.9–2	3.2–3.3	4–4.2	3.8–4	1.2–1.4	10.3–11.3	9.2–9.7	8.2–8.8
Mean (n=4)	1.9	3.2	4.1	3.9	1.2	10.9	9.4	8.4
Males	1.7–2	2.7–2.9	3.4–3.6	3.2	1.2–1.3	8.8–9.2	7.7–8	-
Mean (n=3)	1.8	2.8	3.4	3.2	1.2	9	7.8	-



**FIGURE 17.** *Neometrypus mejdalanii* n. sp. Male: A—habitus, dorsal; B—habitus, lateral, C—head, frontal; D—metanotum, dorsal; E—supra anal plate; F—subgenital plate and last abdominal sternites. Female: G—habitus, dorsal; H—habitus, lateral; I—supra anal plate and ovipositor, dorsal; J—subgenital plate and ovipositor, ventral. Scales A–B, G–H: 5mm; C–F, I–J: 1mm.



**FIGURE 18.** *Neometrypus mejdalanii* n. sp. Male genitalia: A—dorsal, B—ventral, C—lateral, D—posterior. Copulatory papilla: E—dorsal, F—lateral, G—ventral. Scales 1mm. Abbreviations see material and methods.

*Female.* Body larger than male (Fig. 17G, H). Subgenital plate wider than long, posterior margin concave on the middle (Fig. 17J). Ovipositor as in fig. 17I, J.

*Female genitalia.* Copulatory papilla (Fig. 18E–G) longer than wide, straight in lateral view; distal margin truncated; proximal margin of dorsal and ventral faces rounded. Anterior region of dorsal face depigmented.

*Coloration.* Male and female with similar coloration. Occiput, vertex, pronotum, and abdominal tergites light brown to yellowish-brown (Fig. 17A, G). Occiput with two median and two lateral longitudinal stripes medium brown (Fig. 17A, G). Face light brown with stripes medium brown on the middle and under antennal scapes in frontal view (Fig. 17C); antennal scape light brown, antennomeres light brown. FWs slightly translucent, light brown; median projection of metanotum yellow, anterior margin whitish (Fig. 17D); abdominal tergites with medium brown spots on posterior margin and a median band medium brown fading on posterior margin, except on the last three tergites (Fig. 17A, G), last abdominal tergite dark brown; sternites light brown almost whitish; supra

anal plate anterior portion medium brown, posterior portion light brown (Fig. 17E); subgenital plate ocher, anterior margin lighter (Fig. 17F); female subgenital plate light brown (Fig. 17J); cerci light brown; ovipositor apex reddish-brown (Fig. 17I, J). FI and FII light brown, medium brown spotted, TI and TII light brown median brown spotted; FIII yellowish-brown to light brown, slightly medium brown striped, distal apex slightly darker; TIII light brown, dark brown spotted on the base of subapical spurs; spurs light brown with apex medium brown; tarsomeres light brown (Fig. 17B, H).

***Neometrypus mendoncae* n. sp.**

(Figs 2, 19, 20, 23; Table 9)

**Etymology.** Species named after Maria Cleide de Mendonça, specialist in Collembola, and professor at the Departamento de Entomologia (Entomology Department) of the Museu Nacional – UFRJ (Universidade Federal do Rio de Janeiro).

**Type locality.** Brazil, Bahia, Itamarajú.

**Type material.** Holotype male. BR[azil], BA[hia], Itamaraju/ Par[que]Na[cional] Monte Pascoal/ 08–11.III.2012/ Dias, P.G.B.S. *et al. col.*; MZSP. Allotype female. Same data as for holotype | PSD102; MZSP. Paratype females. (1) Same data as for holotype | PSD103; MZSP. (1) Same data as for holotype; MZSP. (2) Same data as for holotype; MNRJ. (1) BR[azil], BA[hia], Una; R[eserva]P[articular]P[atrimônio]N[atural] EcoParque; 10.III.2012; Dias, P.G.B.S. *col.*; MZSP. (1) Same data as for previous paratype; MNRJ.

**Diagnosis.** This species is separated from the other species of *Neometrypus* by the following characters: general coloration medium brown to reddish-brown, abdominal tergites without median band, sternites medium brown. First abdominal sternite prominent, apex rounded. Male genitalia: anterior margin of pseudepiphallic sclerite V-shaped on median region, posterior margin of LLOphi rounded. Female genitalia: copulatory papilla posterior margin somewhat prominent, anterior margin on dorsal face sub-triangular.

**Description.** *General morphology.* Head. Fastigium as long as wide, pubescent (Fig. 19A, F). Three ocelli, the median reduced, slightly under lateral ones in frontal view (Fig. 19C); lateral ocelli rounded. Frons smooth (Fig. 19C). Antennal scape longer than wide, inner margin with bristles. Maxillary palpi articles 4 and 5 almost same-sized, article 3 slightly shorter; article 5 slightly upcurved (Fig. 19B).

Thorax. DD longer than wide, covered by bristles. DD cephalic margin sub-straight, caudal margin slightly convex (Fig. 19A, F). LL ventro-cephalic angle rounded; ventro-caudal angle gradually ascendant in lateral view (Fig. 19B, G). FWs not surpassing posterior margin of metanotum (Fig. 19A, F).

Legs. TI with three apical spurs, two ventral, one dorsal. TII with four apical spurs, two ventral and two dorsal. TIII subapical spurs with two spines between each spur, ten or more spines above subapical spurs on inner and outer sides. TIII inner apical spurs: iad>iam>iav; outer apical spurs: oam>oav>oad, oav and oad almost same-sized (Fig. 2). Basitarsus dorsal spines 2/1; outer and inner apical spurs same-sized.

Abdomen. Tergites and sternites pubescent (Fig. 19A, B, E); first abdominal sternite prominent, apex rounded (Fig. 19J, K; red arrow). Supra anal plate posterior margin rounded (Fig. 19D).

**TABLE 9.** Measurements in mm of *Neometrypus mendoncae* n.sp.

	IOD	HW	PL	PW	FWL	LFIII	LTIII	OL
Females	1.6–2	3.7–4	4.6–5	4.2–4.6	1.3–1.9	12.4–13.1	10.7–12.2	9.9–11
Mean (n=5)	1.84	3.82	4.88	4.38	1.62	12.78	11.32	10.44
Male (n=1)	1.5	3.3	4.1	3.6	0.9	11.1	9.8	-

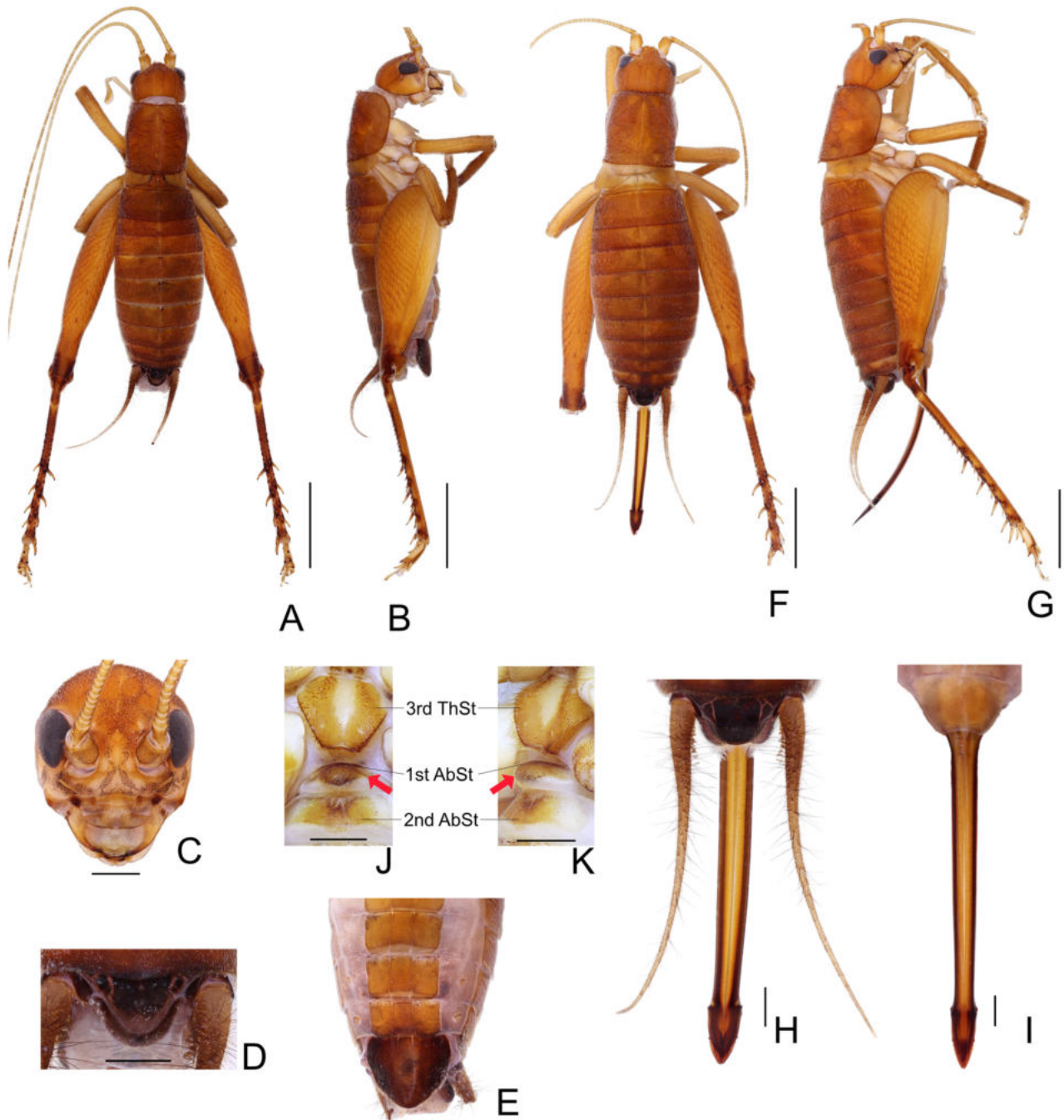
*Male.* Anterior margin of median projection of metanotum slightly rounded, posterior margin wider than anterior margin in dorsal view (Fig. 19A). Subgenital plate wider than long, posterior margin convex (Fig. 19E).

*Male genitalia* (Fig. 20A–D). Pseudepiphallus: pseudepiphallic sclerite almost straight in lateral view, anterior margin V-shaped on median region, lateral region upcurved in lateral view (Fig. 20A–C). LLOphi curved inwards, posterior margin rounded in dorsal and ventral views (Fig. 20A, B); inner margin membranous, outer margin sclerotized, thin. PsP almost same-sized as LLOphi, posterior margin divided into two lobes, not surpassing posterior margin of pseudepiphallic sclerite in dorsal and ventral views (Fig. 20B); apex of dorsal lobe finger-shaped, slightly

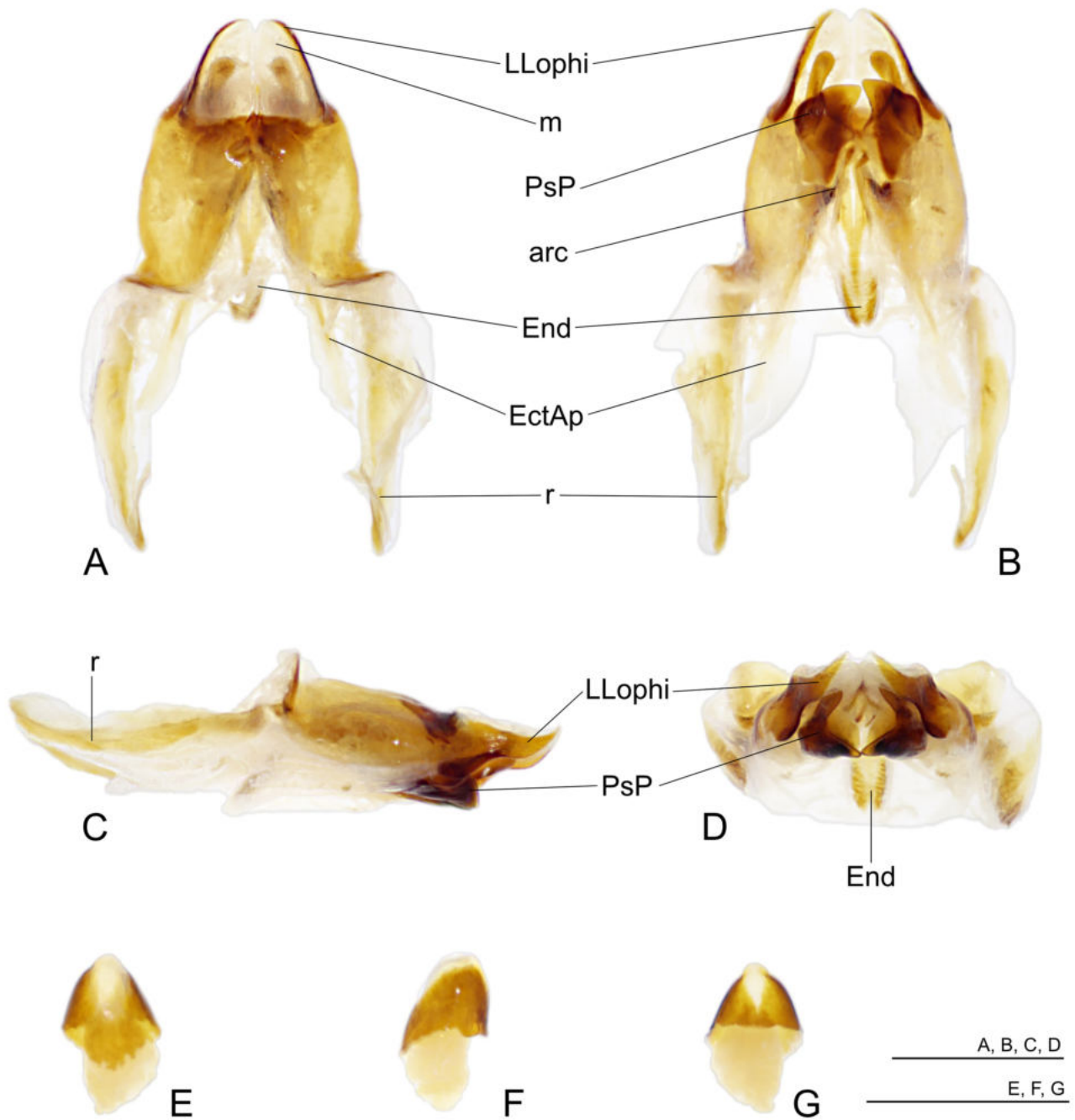
curved inwards; apex of ventral lobe pointed, directed inwards (Fig. 20B). *r* elongate, slightly longer than pseudopiphallic sclerite, flattened laterally (Fig. 20A–C). Ectopiphallic invagination: EctAp longer than LLophi, straight, inclined to outwards in dorsal and ventral views (Fig. 20A, B); arc not complete, curved posteriorly; ventral projections of ectopiphallic invagination very short, shorter than arc (Fig. 20B).

*Female*. Body larger than male (Fig. 19F, G). Subgenital plate wider than long, posterior margin concave on the middle (Fig. 19I). Ovipositor as in fig. 19H, I.

*Female genitalia*. Copulatory papilla (Fig. 20E–G), as long as wide, somewhat triangular, slightly curved downwards in lateral view; posterior margin somewhat prominent; anterior margin on dorsal face sub-triangular, anterior margin on ventral face straight. Median region on dorsal and ventral faces depigmented.



**FIGURE 19.** *Neometrypus mendoncae* n. sp. Male: A—habitus, dorsal; B—habitus, lateral, C—head, frontal; D—supra anal plate; E—subgenital plate and last abdominal sternites. Female: F—habitus, dorsal; G—habitus, lateral; H—supra anal plate and ovipositor, dorsal; I—subgenital plate and ovipositor, ventral. Sternites: J—ventral view, K—lateral view. Scales A–B, F–G: 5mm; C–E, H–K: 1mm. Abbreviations: ThSt – thoracic sternite, AbSt – abdominal sternite.



**FIGURE 20.** *Neometrypus mendoncae* n. sp. Male genitalia: A—dorsal, B—ventral, C—lateral, D—posterior. Copulatory papilla: E—dorsal, F—lateral, G—ventral. Scales 1mm. Abbreviations see material and methods.

*Coloration.* Male and female with similar coloration. Occiput, vertex, pronotum, and abdominal tergites medium brown to reddish-brown (Fig. 19A, B, F, G). Face medium to light brown with stripes grey forming a triangle centrally (Fig. 19C); antennal scape and antennomeres light brown. FWs somewhat translucent, yellowish; median projection of metanotum reddish-brown (Fig. 19A); abdominal tergites sometimes with a dark brown spot on median region of anterior margin, sometimes without spots; sternites medium brown to brownish-orange, supra anal (Fig. 19D, H) and subgenital (Fig. 19E) plates dark brown; female subgenital plate light brown (Fig. 19I); cerci anterior half medium brown, posterior half light brown; ovipositor apex dark brown (Fig. 19A, F). FI and FII yellowish-brown, TI and TII medium brown; FIII yellowish brown to light brown, distal apex medium to dark brown; TIII medium to dark brown, spurs yellowish with basis medium to dark brown; tarsomeres yellowish-brown.

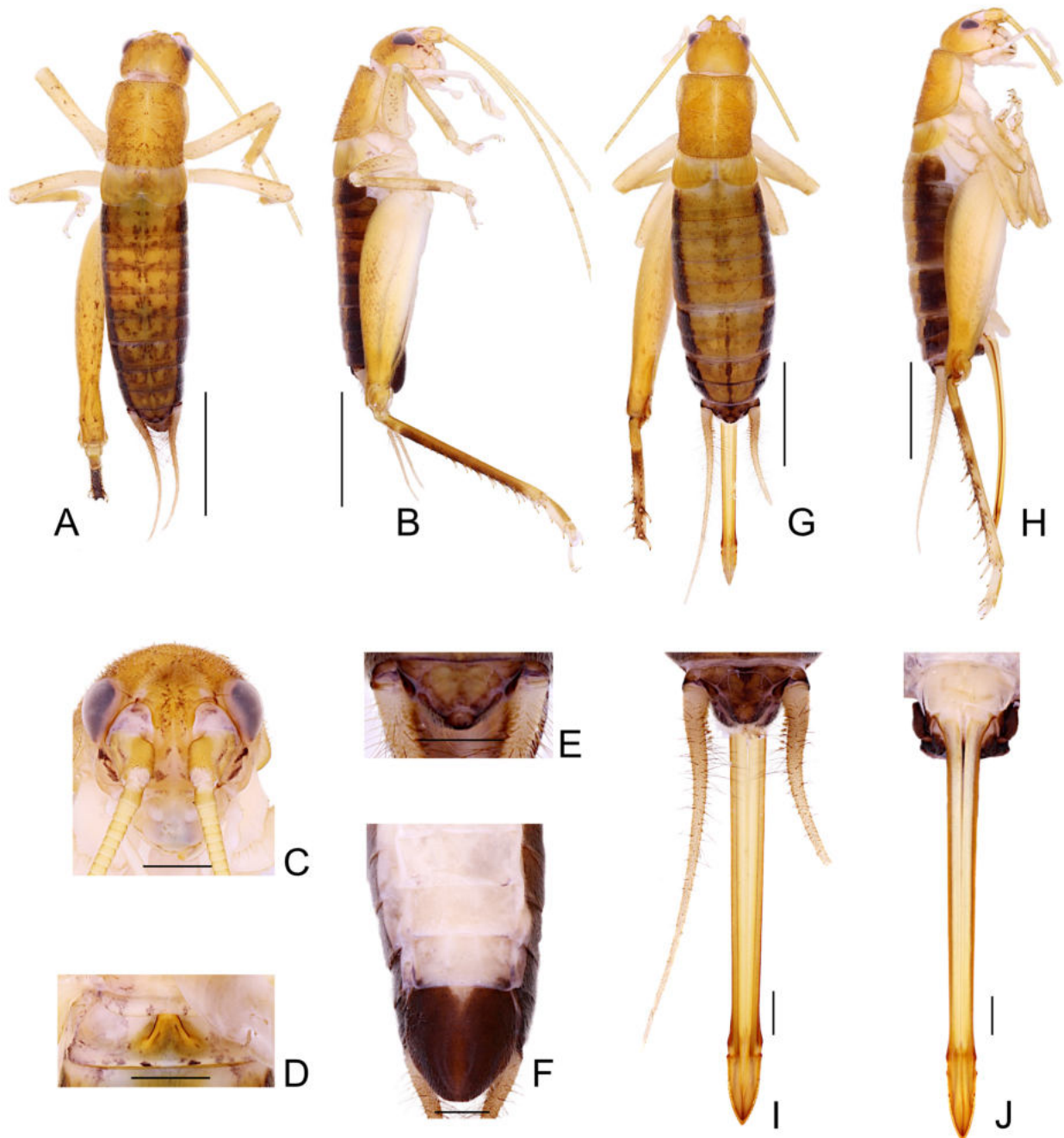
*Neometrypus monnei* n. sp.

(Figs 21, 22, 23; Table 10)

**Etymology.** Species named after Miguel A. Monné, coleopterologist, specialist in Cerambycidae, professor emeritus of the Departamento de Entomologia (Entomology Department) of the Museu Nacional – UFRJ.

**Type locality.** Brazil, Rio de Janeiro, Teresópolis.

**Type material.** Holotype male. BR[asil], R[io de] J[aneiro]/ P [arque]N [acional] da Serra dos Orgãos/ sede – 992m/ 09–11.V.2019/ Souza-Dias e equipe cols | MNRJ-ENT6-29189 | PSD 484; MNRJ. Allotype female. BR[asil], R[io de] J[aneiro]/ P [arque]N [acional] da Serra dos Orgãos/ sede – 992m/ 01–05.VIII.2019/ Souza-Dias, Siqueira & Lima cols. | MNRJ-ENT6-29195 | PSD 414; MNRJ.

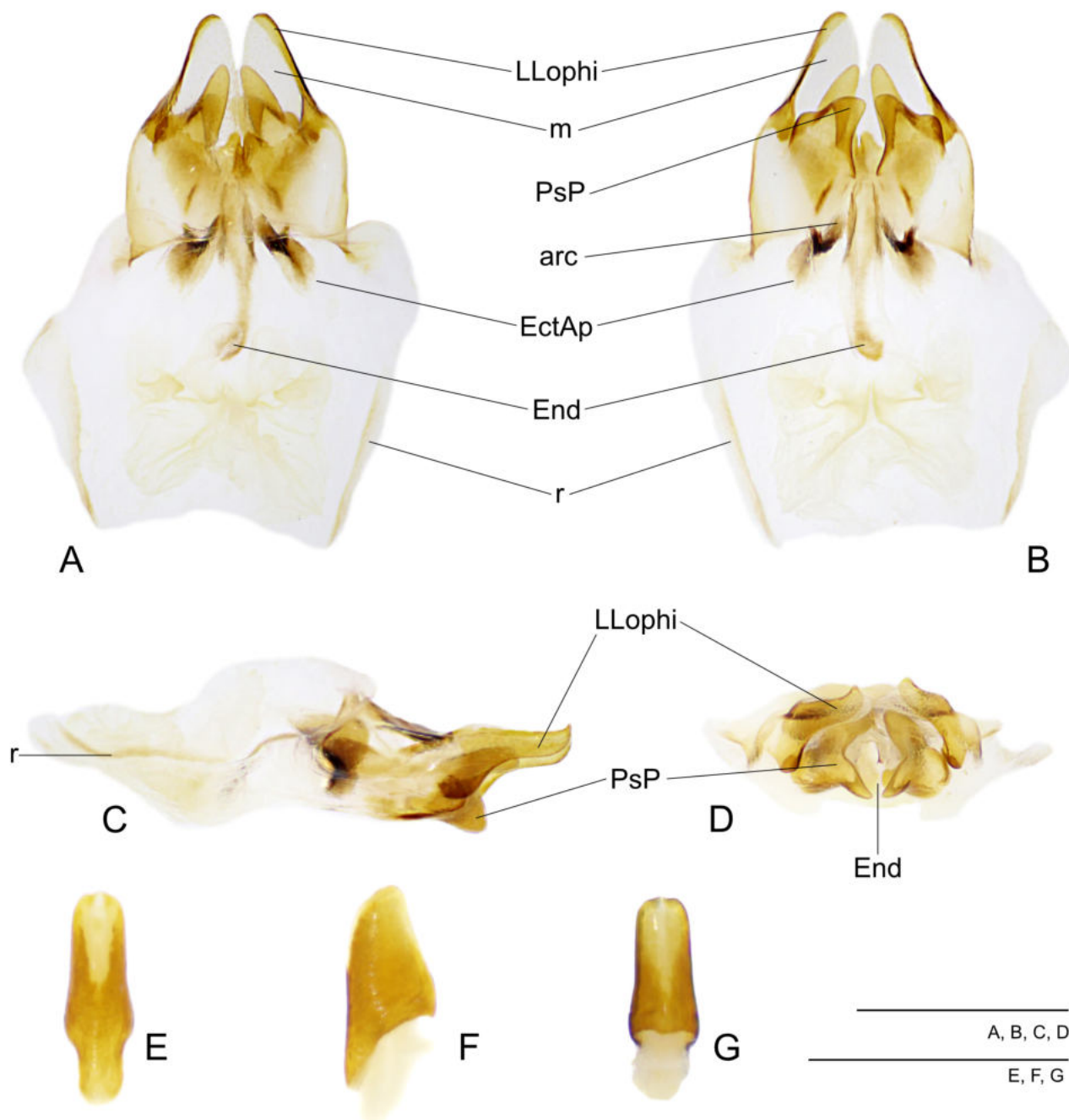


**FIGURE 21.** *Neometrypus monnei* n. sp. Male: A—habitus, dorsal; B—habitus, lateral, C—head, frontal; D—metanotum, dorsal; E—supra anal plate; F—subgenital plate and last abdominal sternites. Female: G—habitus, dorsal; H—habitus, lateral; I—supra anal plate and ovipositor, dorsal; J—subgenital plate and ovipositor, ventral. Scales A–B, G–H: 5mm; C–F, I–J: 1mm.

**Diagnosis.** This species is separated from the other species of *Neometrypus* by the following characters: median projection of metanotum almost triangular, yellow; abdominal tergites with median stripes dark brown, lateral bands dark brown. Male genitalia: EctAp very short, shorter than PsP.

**Description.** *General morphology.* Head. Fastigium as long as wide, slightly pubescent (Fig. 21A, G). Two lateral ocelli rounded, median ocellus absent (Fig. 21C). Frons smooth (Fig. 21C). Antennal scape longer than wide, inner margin with bristles. Maxillary palpi articles 4 and 5 almost same-sized, article 3 the longest (Fig. 21B).

Thorax. DD longer than wide, covered by bristles. DD cephalic margin straight, caudal margin slightly convex (Fig. 21A, G). LL ventro-cephalic angle rounded; ventro-caudal angle gradually ascendant in lateral view (Fig. 21B, H). FWs surpassing posterior margin of metanotum (Fig. 21A, G).



**FIGURE 22.** *Neometrypus monnei* n. sp. Male genitalia: A—dorsal, B—ventral, C—lateral, D—posterior. Copulatory papilla: E—dorsal, F—lateral, G—ventral. Scales 1mm. Abbreviations see material and methods.

Legs. TI with three apical spurs, two ventral, one dorsal. TII with three apical spurs, two ventral, one dorsal. TIII subapical spurs with two spines between each spur (rarely one), six or eight spines above subapical spurs on



inner and outer sides. TIII inner apical spurs: iad>iam>iav; outer apical spurs: oam>oav>oad, oav and oad almost same-sized. Basitarsus dorsal spines 2/1; outer and inner apical spurs same-sized.

Abdomen. Tergites pubescent (Fig. 21A, G); first abdominal sternite not prominent. Supra anal plate posterior margin rounded (Fig. 21E, I).

**TABLE 10.** Measurements in mm of *Neometrypus monnei* n.sp.

	IOD	HW	PL	PW	LFIII	LTIII	OL
Female (n=1)	1.8	3.2	3.9	4	11	10	11.5
Male (n=1)	1.6	2.7	3.5	3	1.6	9	-

*Male.* Anterior margin of median projection of metanotum slightly rounded, posterior margin slightly wider than anterior margin in dorsal view (Fig. 21D). Subgenital plate as long as wide, posterior margin convex (Fig. 21F).

*Male genitalia* (Fig. 22A–D). Pseudepiphallus: pseudepiphallic sclerite almost straight in lateral view, anterior margin somewhat concave, lateral region upcurved in lateral view (Fig 22A–C). LLOphi straight, posterior margin rounded in dorsal and ventral views (Fig. 22A, B); inner margin membranous, outer margin sclerotized, thin. PsP same-sized as LLOphi, posterior margin divided into two lobes, dorsal lobe slightly longer than ventral lobe, not surpassing posterior margin of pseudepiphallic sclerite in dorsal and ventral views (Fig. 22A, B); apex of dorsal and ventral lobes finger-shaped, inclined inwards (Fig. 22B). r thin, elongate, as long as pseudepiphallic sclerite, flattened laterally, apex single (Fig. 22A–C). Ectophallic invagination: EctAp very short, shorter than PsP, inclined to outwards in dorsal and ventral views; arc not complete, curved posteriorly; ventral projections of ectophallic invagination very short, shorter than arc (Fig. 22B).

*Female.* Body larger than male (Fig. 21G, H). Subgenital plate wider than long, posterior margin concave on the middle (Fig. 21J). Ovipositor as in fig. 21I, J.

*Female genitalia.* Copulatory papilla (Fig. 22E–F), cylindrical, somewhat curved downwards in lateral view; posterior margin rounded; anterior margin convex on dorsal face, anterior margin slightly concave on ventral face, shorter than anterior margin of dorsal face. Median region of posterior margin depigmented.

*Coloration.* Male and female with similar coloration. Occiput, vertex, and pronotum yellowish-brown, abdominal tergites dark yellow (Fig. 21A, G). Face yellowish-brown to light brown with stripes medium to dark brown under antennal scapes in frontal view (Fig. 21C); antennal scape yellowish-brown, antennomeres light brown with a single antennomere medium brown every ten antennomeres. FWs slightly translucent, medium to light brown; median projection of metanotum dark yellow (Fig. 21D); abdominal tergites with median stripes dark brown, lateral bands dark brown (Fig. 21B, H); sternites whitish (Fig. 21F); supra anal plate anterior margin medium to dark brown, posterior portion pale yellow (Fig. 21E); subgenital plate dark brown (Fig. 21F); female subgenital plate light brown (Fig. 21J); cerci yellowish-brown; ovipositor apex dark yellow (Fig. 21I, J). FI, FII, TI, and TII light brown, medium brown spotted; FIII yellowish-brown, slightly medium brown striped; TIII medium to dark brown; spurs light brown with apex and base medium brown; tarsomeres light brown (Fig. 21B, H).

### Key to species of *Neometrypus* Desutter, 1988

1. FWs absent, median projection of metanotum absent ..... 2
- FWs present, median projection of metanotum present ..... 3
2. Antennomeres banded, base of subapical spurs of TIII dark brown; apex of basitarsomere of TIII dark brown; apex of LLOphi rounded ..... *Neometrypus amazonus* Desutter, 1988
- Antennomeres not banded, base of subapical spurs of TIII same colour as tibia; apex of basitarsomere of TIII with uniform coloration; apex of LLOphi truncated ..... *Neometrypus couriae* n. sp.
3. First abdominal sternite prominent (Fig. 19J, K) ..... 4
- First abdominal sternite not prominent ..... 6
4. Abdominal tergites with similar coloration ..... *Neometrypus mendoncae* n. sp.
- Abdominal tergites medium to dark brown on the last three or five tergites (Fig. 13A, G) ..... 5
5. Abdominal tergites with median longitudinal bands (Fig. 13A, G); FWs not reaching posterior margin of metanotum; LLOphi shorter than PsP; PsP without inner projection on inner face in ventral view ..... *Neometrypus maiae* n. sp.
- Abdominal tergites without bands; FWs reaching posterior margin of metanotum; LLOphi same size or longer than PsP; PsP bearing an inner projection on inner face in ventral view ..... *Neometrypus badius* Mesa & García-Novo 2001

6. Abdominal tergites without delimited longitudinal band, dark brown, uniform (Fig. 11A, G) . . . . . *Neometrypus lopesae* **n. sp.**  
 - Abdominal tergites crossed by a median, well delimited, longitudinal band, generally dark brown (Figs 3A; 5A; 7A, G; 15A, G; 17A, G; 21A, G) . . . . . 7
7. Last abdominal tergite with similar coloration of others tergites (Figs 3A, 21A) . . . . . 8  
 - Last abdominal tergite dark brown, different from other tergites (Figs 5A, 7A, 15A, 17A) . . . . . 9
8. Pronotum DD brownish orange, median projection of metanotum reddish (Fig. 3D); median band of abdominal tergites well-delimited, dark brown (Fig. 3A); abdominal sternites totally or partially dark brown (Fig. 3F) . . . *Neometrypus azevedoi* **n. sp.**  
 - Pronotum dorsal disk yellowish-brown, median projection of metanotum yellowish (Fig. 21A, G); median band of abdominal tergites not well-delimited (Fig. 21A, G); abdominal sternites whitish (Fig. 21F) . . . . . *Neometrypus monnei* **n. sp.**
9. Pronotum and abdominal tergites dark brown laterally, not spotted . . . . . 10  
 - Pronotum and abdominal tergites not dark brown laterally, spotted (Figs 7A, 15A, 17A) . . . . . 11
10. Pronotum medium brown to yellowish-brown; FWs inner margins overlapped . . . . . *Neometrypus aculeatus* (Saussure, 1878)  
 - Pronotum entirely dark brown except median longitudinal band brownish orange (Fig. 5A), FWs inner margins not touching each other . . . . . *Neometrypus carvalhoi* **n. sp.**
11. Supra anal plate dark brown (Fig. 15E); sternites with thin and short horizontal stripes dark brown on latero-posterior margins (Fig. 15F) . . . . . *Neometrypus marcelae* **n. sp.**  
 - Supra anal plate anterior margin dark brown, posterior margin light brown or yellowish-brown (Figs 7E, 17E); sternites without horizontal stripes on latero-posterior margins . . . . . 12
12. Median projection of metanotum same color as pronotum and abdominal tergites, anterior margin almost straight (Fig. 17D); median band abdominal tergites fading distally; posterior margin of supra anal plate rounded (Fig. 17E); LLOphi posterior margin rounded; PsP longer than LLOphi (Fig. 18A, B); copulatory papilla flattened dorso-ventrally, not fended ventrally (Fig. 18F) . . . . . *Neometrypus mejdalanii* **n. sp.**  
 - Median projection of metanotum darker than pronotum and abdominal tergites, its anterior margin rounded (Fig. 7D); median band abdominal tergites well delimited through entire abdomen (Fig. 7A, G); posterior margin of supra anal plate straight (Fig. 7E); LLOphi posterior margin truncated; PsP same size or shorter than LLOphi (Fig. 8A, B); copulatory papilla cylindrical, fended ventrally (Fig. 8E-G) . . . . . *Neometrypus catiae* **n. sp.**

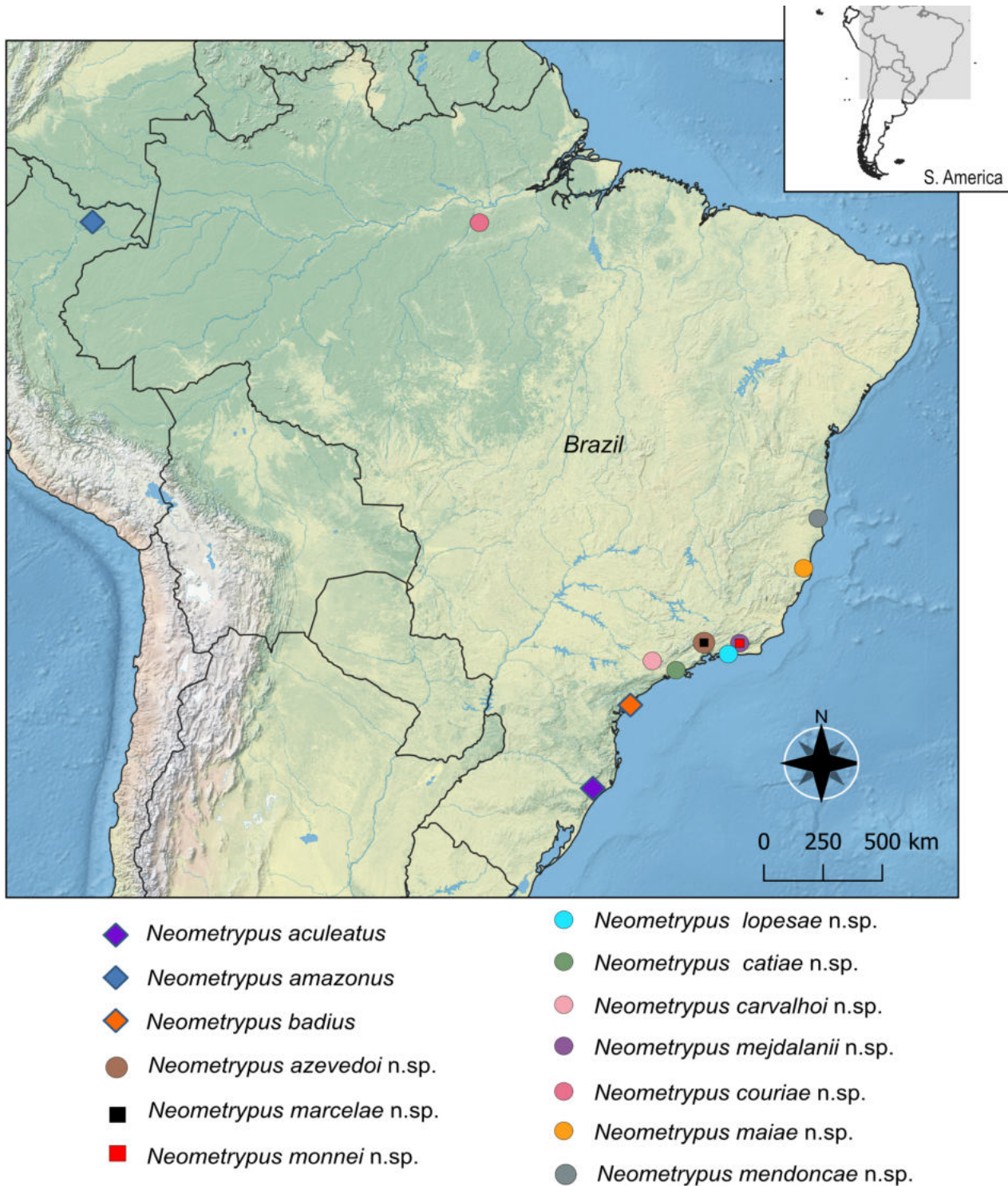
## Discussion

Here we describe ten new species of *Neometrypus* n. status, increasing more than four times the total number of species for this taxon. These crickets are recorded only in the South American continent (Fig. 23). Except for *N. amazonus* and *N. couriae* **n. sp.**, reported for Amazonia, the remaining species occur in the Atlantic Forest. Besides being morphologically similar, the species of *Neometrypus* n. status have different color patterns that are particularly useful for descriptions and identifications. There are probably other new species to be described in this genus, yet these crickets are challenging to find due to the lack of acoustic communication. Furthermore, adults of these species are often ignored due to their similarity to nymphs.

Paedomorphic characters are well-known in hemimetabolous insects, as in termites (Nalepa & Bandi 2000), and holometabolous insects, as in Strepsiptera (Kathirithamby 1989) and Coleoptera (Wong 1996). In adults of *Neometrypus* n. status (hemimetabolous insects), brachyptery is present in almost all species, except the apterous *N. amazonus* and *N. couriae* **n. sp.** Adult males and females of *Neometrypus* n. status are morphologically similar to their nymphs and the nymphs of other taxa of Tafiliscina, e.g., *Brazitrypa* (Fig. 24). They are alike in coloration patterns, short forewings frequently covering only the metanotum, and median ocellus remarkably reduced or absent. The longitudinal band in the dorsum of the abdomen in several species of *Neometrypus* n. status (*Neometrypus aculeatus*, *N. marcelae* **n. sp.**, *N. azevedoi* **n. sp.**, *N. catiae* **n. sp.**, *N. carvalhoi* **n. sp.**, *N. mejdalanii* **n. sp.**, *N. maiae* **n. sp.**, *N. monnei* **n. sp.**) is also observed in juveniles of other crickets, as the gryllids *Eneoptera surinamensis* (De Geer, 1773) (Eneopterinae) and *Brazitrypa* species (Paroecanthini) (Fig. 22), and the phalangopsid *Lerneca* sp. (Luzarinae).

Paedomorphic traits are usually associated with resource availability (Harrison 1980) or reproduction (McMahon & Hayward 2016). There are no studies about paedomorphic metamorphosis and no hypothesis about the importance of paedomorphic characters in crickets. However, this condition in *Neometrypus* n. status species could be related to the absence of sound production due to the reduced or absent forewings. Crickets with acoustic communication are more susceptible to acoustic-oriented predators (Burk 1982; Gwynne 2001). Found over large leaves, mainly during the night (LDC pers. obs.), *Neometrypus* n. status crickets could be easily found by bats and parasitoids (e.g., tachinid flies) if they emit sounds, as occur in calling crickets (Adamo *et al.* 1995; Lehmann & Heller 1998). The loss-singing condition caused by parasitoids was already documented for a field crickets' population of *Teleogryllus oceanicus* (Zuk *et al.* 2006), indicating the possibility that similar mechanisms of diversification could

have acted in *Neometrypus* n. status. Nonetheless, phylogenetic and evolutionary studies are necessary to test this hypothesis.



**FIGURE 23.** Distribution map of the type localities of *Neometrypus* n. status species.

The loss of acoustic calling could be associated with increased costs (*e.g.*, energy and predation) or reduction of reproductive benefits (Walker & Masaki 1989). However, not producing sounds suggests another communication system between these insects (Campos & Desutter-Grandcolas 2020). As already documented for other crickets, metanotal structures (also named as “metanotal gland”) play a notable role in mating behavior (Bell 1980; Campos *et al.* 2021; Prado 2006). The well-developed median projection of the metanotum in *Neometrypus* n. status has similar functions. One of these functions is providing a nutritious secretion to entertain females while the male connects the

spermatophore tube in the female's copulatory papilla (Alexander & Otte 1967). It is possible to observe the remaining secretion in the median projection of *N. carvalhoi* n. sp. (Fig. 5D, red arrow). The figure 25 showing *N. maiae* n. sp. (25A, B) and *N. mejdalanii* n. sp. (25C) confirm the hypothesis that the female is stimulated in the region of the male's metanotum (Fig. 25A) while the male transfers the spermatophore (Fig. 25B, C). These photographs are the first record of *Neometrypus* n. status mating behavior in the field (Fig. 25A–C). A second hypothesis, not excluding the first one, is that structures like metanotal projections release pheromones to attract females. This type of chemical communication also occurs in different groups of Orthoptera like *Oecanthus* crickets (Grylloidea, Gryllidae) (Bell 1980) and raphidophorids (Raphidophoridae) (Stritih 2014). Another probable scenario of *Neometrypus* n. status communication is through substrate drumming on the surface of leaves. Vibrational signaling on leaves is already documented for singing crickets (Bell 1980; Huber *et al.* 1989) and non-singing crickets (Campos *et al.* 2020; Gwynne 2001). There are no records of vibrational signaling in *Neometrypus* n. status so far.



FIGURE 24. A—*Neometrypus catiae* n. sp., adult male; B—*Brazitrypa* sp., nymph male.

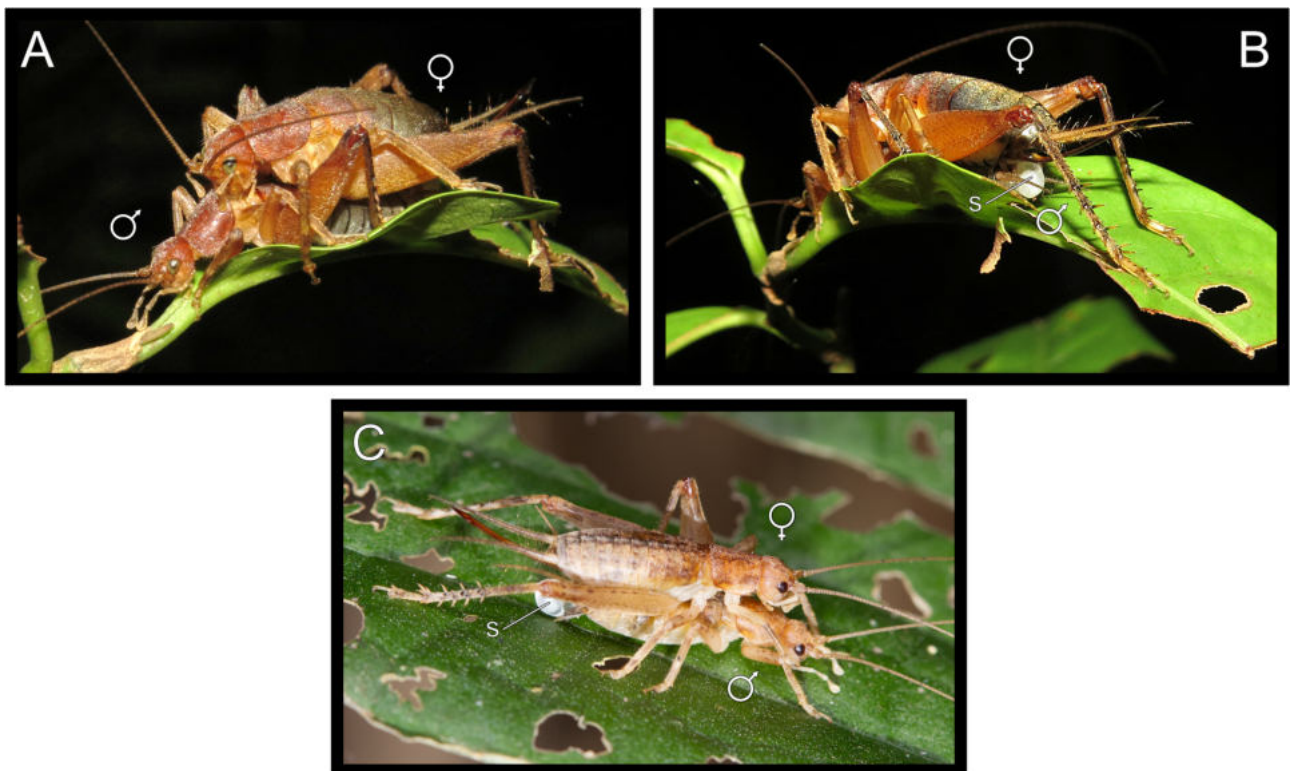


FIGURE 25. A—*N. maiae* n. sp., female and male copulating anterior view (photo: © Darlan Rutz Redü); B—*N. maiae* n. sp., female and male copulating posterior view (photo: © Darlan Rutz Redü); C—*N. mejdalanii* n. sp., female and male copulating in lateral view. Legend: s—spermatophore.

Even with recent papers on Paroecanthini crickets (Campos *et al.* 2020; Campos & Desutter-Grandcolas 2020), taxonomic and natural history knowledge about this Neotropical tribe is still incipient, and many taxa await to be described. *Neometrypus* n. status, now with 13 species, is the second most diverse genus of Tafaliscina, only behind *Tafalisca* Walker, 1869 (27 species) (Cigliano *et al.* 2021) and the only one with an identification key for all its species. This South American genus, widely distributed through the Amazonia and Atlantic Forest, is a potential model for biogeographical and evolutionary studies. Moreover, there are no records about the behavior of these crickets, representing an unexplored field of study.

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