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# *Zebragryllus* Desutter-Grandcolas & Cadena-Casteñada, n.gen. a new Gryllinae genus from Eastern and Western Amazonia, South America (Orthoptera, Grylloidea, Gryllidae)

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## Abstract

We describe a new genus of grylline cricket, *Zebragryllus* Desutter-Grandcolas & Cadena-Casteñada **n. gen.**, from the Neotropical Region, using characters of morphology and male genitalia; genitalic characters clearly show that *Zebragryllus* **n. gen.** is closely related to *Anurogryllus* Saussure, 1878. Six species are described as new to science, originating from western (Peru, Colombia) and eastern (French Guiana) Amazonia: *Zebragryllus fuscus* Desutter-Grandcolas, **n. sp.**, *Z. guianensis* Desutter-Grandcolas, **n. sp.**, *Z. intermedius* Desutter-Grandcolas, **n. sp.**, *Zebragryllus nauta* Desutter-Grandcolas, **n. sp.**, *Zebragryllus nouragui* Desutter-Grandcolas, **n. sp.**, and *Zebragryllus wittoto* Desutter-Grandcolas and Cadena-Casteñada, **n. sp.**, type species of the genus. They are characterized by their size, coloration (shining black, most often with white patterns of coloration, hence the genus name), and male and female genitalia. The calling songs of *Z. guianensis* Desutter-Grandcolas, **n. sp.**, *Z. intermedius* Desutter-Grandcolas, **n. sp.**, *Z. nouragui* Desutter-Grandcolas, **n. sp.**, and *Z. wittoto* Desutter-Grandcolas and Cadena-Casteñada, **n. sp.** are described. An identification key is proposed for both males and females.

**Key words:** Systematics, New species, Neotropics, Peru, Colombia, French Guiana, Bioacoustics

## Résumé

Nous décrivons un nouveau genre de grillons de la sous-famille des Gryllinae, *Zebragryllus* Desutter-Grandcolas & Cadena-Casteñada **n. gen.**, originaire de la Région néotropicale, sur la base des caractères de morphologie et des genitalia mâles; les genitalia montrent clairement que *Zebragryllus* **n. gen.** est étroitement apparenté à *Anurogryllus* Saussure, 1878. Six espèces nouvelles pour la science sont décrites, originaires d'Amazonie occidentale (Pérou, Colombie) et orientale (Guyane française): *Zebragryllus fuscus* Desutter-Grandcolas, **n. sp.**, *Z. guianensis* Desutter-Grandcolas, **n. sp.**, *Z. intermedius* Desutter-Grandcolas, **n. sp.**, *Zebragryllus nauta* Desutter-Grandcolas, **n. sp.**, *Zebragryllus nouragui* Desutter-Grandcolas, **n. sp.**, et *Zebragryllus wittoto* Desutter-Grandcolas et Cadena-Casteñada, **n. sp.**, espèce type du genre. Elles sont caractérisées par leur taille, leur coloration (noir brillant, avec le plus souvent des bandes blanches spécifiques, d'où le nom du genre), ainsi que les genitalia mâles et femelles. Les chants d'appel de *Z. guianensis* Desutter-Grandcolas, **n. sp.**, *Z. intermedius* Desutter-Grandcolas, **n. sp.**, *Z. nouragui* Desutter-Grandcolas, **n. sp.**, et Z. *wittoto* Desutter-Grandcolas et Cadena-Casteñada, **n. sp.** sont décrits. Une clé d'identification est proposée pour les mâles et les femelles.

**Mots-clés:** Systématique, Espèces nouvelles, Région néotropicale, Pérou, Colombie, Guyane française, Bioacoustique.

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**Resumén**

Se describe a *Zebragryllus* Desutter-Grandcolas & Cadena-Casteñada **n. gen.** proveniente de la región neotrópical, se usaron caracteres de la morfología externa y genitalia masculina, los caracteres genitales que presenta este nuevo género, lo relaciona con *Anurogryllus* Saussure, 1878. Seis especies se describen como nuevas para la ciencia, provenientes de la región occidental (Perú, Colombia) y oriental (Guyana Francesa) de la Amazonia.: *Zebragryllus fuscus* Desutter-Grandcolas, **n. sp.**, *Z. guianensis* Desutter-Grandcolas, **n. sp.**, *Z. intermedius* Desutter-Grandcolas, **n. sp.**, *Zebragryllus nauta* Desutter-Grandcolas, **n. sp.**, *Zebragryllus nouragui* Desutter-Grandcolas, **n. sp.**, y *Zebragryllus wittoto* Desutter-Grandcolas & Cadena-Casteñada, **n. sp.**, esta última, especie tipo del genero. Aquellas especies se caracterizan por su tamaño, coloración (negro brillante, con franjas o manchas blancas, condición del cual se deriva y se propone su nombre), genitalia masculina y femenina. Los cantos de llamado de *Z. guianensis* Desutter-Grandcolas, **n. sp.**, *Z. intermedius* Desutter- Grandcolas, **n. sp.**, *Z. nouragui* Desutter-Grandcolas, **n. sp.**, y *Z. wittoto* Desutter- Grandcolas & Cadena-Casteñada, **n. sp.** son descritos. Se propone una clave de identificación para machos y hembras.

**Palabras clave:** Sistemática, nuevas especies, Perú, Colombia, Guyana Francesa, Bioacústica.

## Introduction

Grylline crickets are but little diversified in South America, compared to other regions of the World. Apart from cosmopolitan genera, i.e. *Gryllus* Linnaeus, 1758, *Acheta* Fabricius, 1775 and *Gryllodes* Saussure, 1874, only eight genera are presently known in South America: *Anurogryllus* Saussure, 1877, *Faguagryllus* Cadena-Casteñeda, 2011, *Geogryllus* Otte & Perez-Gelabert, 2009, *Hispanogryllus* Otte & Perez-Gelabert, 2009, *Kazuemba* de Mello, 1990, *Megalogryllus* Chopard, 1930, *Miogryllus* Saussure, 1877, and *Paranurogryllus* Mesa & Garcia-Novo, 1999 (Eades *et al.* 2013).

Here we describe *Zebragryllus* Desutter-Grandcolas & Cadena-Casteñada, **n. gen.**, a new grylline genus diversified in Amazonian forests, where it is represented by black and white "zebra" species (*Z. guianensis* Desutter-Grandcolas, **n. sp.**, *Z. nouragui* Desutter-Grandcolas, **n. sp.**, *Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.**), but also species with less contrasted coloration, having few or indistinct white patterns (*Z. fuscus* Desutter-Grandcolas, **n. sp.**, *Z. intermedius* Desutter-Grandcolas, **n. sp.**, *Z. nauta* Desutter-Grandcolas, **n. sp.**). This genus lives in forest leaf litter, where it sings during the day, often hidding near / under dead branches (JA, pers. obs.). The calling songs of *Z. guianensis* Desutter-Grandcolas, **n. sp.**, *Z. nouragui* Desutter-Grandcolas, **n. sp.**, *Z. intermedius* Desutter-Grandcolas, **n. sp.** and *Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.** are described, and a key to species is provided.

## Material and methods

**Descriptions.** Forewing venation is named after Desutter-Grandcolas (2003) and Robillard & Desutter-Grandcolas (2004). Male and female genitalia have been dissected on water relaxed specimens and cleaned in cold KOH, and drawn using a stereomicroscope Leica MZx12 with a camera lucida (LDG), or with Carl Ziezz KL 200 (OC). They are preserved in glycerin in a small vial pinned with each examined specimen. Male genitalia are named after Desutter (1987), modified in Desutter-Grandcolas (2003). Spurs are separated from spines by being articulated at their base.

Dotted areas represent membranous parts in male and female genitalia.

Abbreviations

Specimen origin
- fn, field number

General morphology
- c1, c2, d1, d2, first and second cells of rows C and D
- CuP, posterior cubital vein
- FW, forewings
- LL, lateral lobe of pronotum

I, II, III, fore, median, hind (leg, femur, tibia, tarsus, basitarsus)

Male genitalia

arc, ectophallic arc
ec.f., ectophallic fold
en.c., endophallic cavity
l.l., pseudepiphallic lateral lophi
m.l., pseudepiphallic median lophi
ps.a., pseudepiphallic apodeme
ps.p., pseudepiphallic paramere
r., rami.

Measurements (in mm, mean into parentheses)

LFIII, length of hind femur
LFW, maximal length of forewings
Lovip, length of ovipositor
Lpron, median length of pronotum dorsal disc
LTIII, length of hind tibia
Ltar, length of hind basitarsus
wFW, width of forewings at mirror anterior angle
wpron, posterior width (unless noticed) of pronotum

Institutions:

MNHN, Muséum national d'Histoire naturelle, Paris
MUD, Museo de Historia Natural de la Universidad Distrital Francisco José de Caldas, Colección de Entomología y Aracnología, Bogota, Colombia

**Song recording and analysis.** Calling songs have been recorded in the field with a SONY TCD5 recorder and an ECM909A microphone (flat response between 40Hz and 16kHz) (LDG, for *Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.**, *Z. intermedius* Desutter-Grandcolas, **n. sp.** and *Z. guianensis* Desutter-Grandcolas, **n. sp.**), and a Fostex FE-2LE with a sennheiser ME62/K6 Condenser microphone (flat response from from 20 Hz to 25 kHz; JA, for *Z. nouragui* Desutter-Grandcolas, **n. sp.**). When necessary, songs have been digitized at a 96kHz (16 bit).

Song recorded between 23.3 and 27.3°C, as mentioned for each song analysis. Song parameters have not been modified to account for temperature effect, but raw data are given instead. Songs have been analyzed with Avisoft-SASLab Pro Ver. 5.2.07 (Specht, 2013) and partly illustrated with SpectraPlus ver. 3.0. They are described following Ragge & Reynolds (1988). The total duration of analyzed song varies from 1min to 1.5min, with all the syllables and motifs used for statistical analyses of song parameters.

## Results

### *Zebragryllus* Desutter-Grandcolas & Cadena-Casteñada, n. gen.

http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:464243

New genus illustrated in Desutter 1990: 126, Fig. 170.

Included in the molecular phylogeny of Grylloidea produced by Marquier, Legendre *et al.* (submit.) as LDG 094 (*Z. nouragui* Desutter-Grandcolas, **n. sp.**).

**Type species.** *Zebragryllus wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.** (Colombia, Peru)

**Other species included.**

*Zebragryllus fuscus* Desutter-Grandcolas, **n. sp.** (Peru)
*Zebragryllus guianensis* Desutter-Grandcolas, **n. sp.** (French Guiana)
*Zebragryllus intermedius* Desutter-Grandcolas, **n. sp.** (Peru)
*Zebragryllus nauta* Desutter-Grandcolas, **n. sp.** (Peru)
*Zebragryllus nouragui* Desutter-Grandcolas, **n. sp.** (French Guiana)

**Distribution.** Estearn (French Guiana) and western (Peru, Colombia) Amazonia.

**Etymology.** Genus named after the black and white pattern of coloration of most known species. Gender masculine.

**Diagnosis.** Small species, shining, black or brown with distinct white pattern (Fig. 1) on legs (Fig. 3) and tergites (Fig. 5; less distinct in *Z. nauta* Desutter-Grandcolas, **n. sp.**, reduced or lacking in *Z. fuscus* Desutter-Grandcolas, **n. sp.** and *Z. intermedius* Desutter-Grandcolas, **n. sp.**); antennae with long white rings, the base of the antennae (including the scapes) either white (*Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.**, *Z. guianensis* Desutter-Grandcolas, **n. sp.**) or brown (all other species); body and legs highly setose. Ocelli locate almost on a line. Fastigium very wide. Eyes and antennal pits located very low on the face, being separated from epistemal suture by a very short distance. Pronotum transverse, not widened posteriorly. TI with a large outer tympanum; no inner tympanum. TIII not serrulated; with 4–5 pairs of subapical spurs (a sixth outer spur sometimes present in *Z. guianensis* Desutter-Grandcolas, **n. sp.**), clearly articulated. Basitarsomeres III higher than wide, furrowed dorsally; with two rows of strong dorsal spines, getting stronger toward apex. **Male.** FWs covering completely or almost so the abdomen. Stridulum complete (Fig. 2B–E); harp crossed by two, almost transverse veins (four in *Z. guianensis* Desutter-Grandcolas, **n. sp.**); mirror subdivided into several cells, but distinct from apical venation (less so in *Z. guianensis* Desutter-Grandcolas, **n. sp.**); CuP lacking. Lateral field with 4–6 longitudinal, parallel veins. Subgenital plate long and high (Fig. 2F–L), apex not truncated (except in *Z. nouragui* Desutter-Grandcolas, **n. sp.**). **Male genitalia.** Pseudepiphallic sclerite transverse (Fig. 3A–C); two pairs of distal lophi; rami circular; pseudepiphallic parameres having the shape of an elongate plate; ectophallic fold long, wide and sclerotized over its whole length; dorsal cavity well-developed but not very high, half opened. **Female.** FWs very short and hardly or not overlapping, or lacking. Subgenital plate truncated apically, often deeply concave; shape of lateral margins different according to species. Ovipositor very short, shorter than FIII. **Female genitalia.** Copulatory papilla sclerotized and flat, more or less rectangular; distal margin more or less concave.

**Description.** Size small. Head as wide as pronotum, or slightly wider; wider than high in front view; epistemal suture concave, especially in Peruvian species. Vertex flat but convex. Eyes large, not protruding (except in Guianese species). Ocelli locate almost on a line, median ocellus only slightly ahead of lateral ocelli; median ocellus far from fastigium rounded apex; lateral ocelli twice as wide as median ocellus; distance between lateral ocelli twice the distance between one lateral and the median ocelli. Fastigium very wide, 1.5 times as wide as the scape. Eyes and antennal pits located very low on the face, very close to epistemal suture, and almost at the same level, the antennal pits slightly more dorsal than the eyes lower margins. Maxillary palpi very short; joints 3 and 4 subequal; joint 5 the longest, regularly widened from its base, obliquely truncated in apical third (Fig. 2A). Pronotum transverse; anterior margin concave, posterior margin straight; LL ventral margin straight. Prosternum unarmed with the posterior margin constricted, hence the coxae close together; mesosternum rectangular with posterior margin curled-angled; metasternum broader than mesosternum, slightly expanded and the pentagonal form, posterior margin convex. TI with a large outer tympanum only; 3 apical spurs, inner dorsal spur lacking, inner ventral spur the longest. TII with 4 apical spurs, the inners the longest. TIII with 4–5 pairs of subapical spurs, the inners subequal to the outers; 3 apical spurs on each side; median and dorsal inner spurs subequal, the longest; median outer spur twice as long as ventral and dorsal outer spurs; TIII not serrulated. Basitarsomeres III higher than wide, furrowed dorsally; with two rows of strong dorsal spines, getting larger toward tarsomere apex, apical spines the biggest.

**Coloration.** Body and FWs shining, brown to black with white marks on antennae, legs (Fig. 3D–H) and tergites (Fig. 5; less distinct in: *Z. nauta* Desutter-Grandcolas, **n. sp.**, light brown in coloration; *Z. fuscus* Desutter-Grandcolas, **n. sp.**, black brown with white marks on antennae and a very faint lighter brown longitudinal band on lower margin of FIII outer side; and *Z. intermedius* Desutter-Grandcolas, **n. sp.** black with white marks on FIII and antennae). Abdomen coloration contrasted especially in females (Fig. 5), with a white half ring on meso and metanotum, in addition to white transverse band on 1–3 tergites, or part of tergites (except in females of *Z. intermedius* Desutter-Grandcolas, **n. sp.** and *Z. fuscus* Desutter-Grandcolas, **n. sp.**).

**Male.** Metanotum without glandular pits. FWs covering all or most of abdomen. Stridulum complete (Figs 1, 2B–E): harp crossed by two almost transverse veins (up to four in *Z. guianensis* Desutter-Grandcolas, n. sp); mirror wider than long (except in *Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.**), asymmetrical, clearly delimited from surrounding venation, but always subdivided into several distal cells. Other venation: chords 1 and 2 elongated, close to each other, well-separate from chord 3 and fusing more distally; apical field reduced. Lateral field with 4–6 longitudinal, parallel veins. Subgenital plate long and high.

**Male genitalia.** Pseudepiphallic sclerite transverse (Fig. 3), with two pairs of distal lophi, the median pair longer than the lateral one, except in *Z. guianensis* Desutter-Grandcolas, **n. sp.** (lateral lophi very reduced in *Z. nauta* Desutter-Grandcolas, **n. sp.**); pseudepiphallic apodemes short; rami not separated from each other anteriorly, but well separated from pseudepiphallic sclerite; pseudepiphallic parameres as a long, undivided plate (shorter in *Z. nauta* Desutter-Grandcolas, **n. sp.**). Ectophallic fold long, wide and sclerotized over its whole length. Ectophallic apodemes quite long for a grylline cricket, making a pair of plates over the dorsal cavity. Dorsal cavity well-developed, but not very high and half open, its ventral margin at the level of the arc in lateral view. A short endophallic sclerite at the base of the cavity, but a long apodeme on the dorsal part of the cavity, below the arc (reduced in *Z. nouragui* Desutter-Grandcolas, **n. sp.**).

**Female.** FWs either very short and slightly overlapping (*Z. nauta* Desutter-Grandcolas, **n. sp.**, *Z. nouragui* Desutter-Grandcolas, **n. sp.**), or flap-like and not overlapping (*Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.**), or lacking (*Z. guianensis* Desutter-Grandcolas, **n. sp.**, *Z. intermedius* Desutter-Grandcolas, **n. sp.**). When FWs present, venation made of not very strong longitudinal veins, and faint, irregular transverse veins. Subgenital plate transverse, its distal margin variably concave, its lateral margins often long and covering part of ovipositor base (see the different species). Ovipositor shorter than FIII.

**Female genitalia.** Copulatory papilla as a flat, round to rectangular sclerite, ventrally more or less membranous; apex more or less concave (Figs 6, 7).

**Remark.** Other specimens characterized with wholly dark antennae, ocelli settled in a flat triangle (i.e., not aligned), 4 pairs of subapical spurs on TIII and a short subgenital plate in males, have so modified male genitalia that it could be reasonable to describe them as a new genus, close to *Zebragryllus* Desutter-Grandcolas & Cadena-Casteñada, **n. gen.** These will be studied in another paper.

**Songs.** Of the six species of *Zebragryllus* described here, calling songs of four have been recorded. Syllable duration, syllable period, syllable duty cycle, echeme duration, echeme period, duty cycle of each echeme, number of syllables per echeme and the peak/dominant frequency of the recorded calling songs are measured. All four species produce series of echemes but they vary greatly in terms of number of syllables per echeme. Mean dominant frequency ranges from 3 to 6.1 kHz.

**Habitat.** *Zebragryllus* Desutter-Grandcolas & Cadena-Casteñada, **n. gen.** forages in forest leaf litter, where it can be heared singing during the day.

**Relationships.** By the shape of its male genitalia, *Zebragryllus* Desutter-Grandcolas & Cadena-Casteñada, **n. gen.** is close to *Anurogryllus* Saussure, 1878: both genera present similar rami (connected anteriorly), pseudepiphallic sclerite (2 pairs of lophi), pseudepiphallic parameres (elongate plate), ectophallic fold (long, wide and sclerotized), ectophallic apodemes (long over dorsal cavity top) and dorsal cavity (simple, open). This relationship is supported by molecular analysis of Grylloidea phylogeny (Marquier, Legendre *et al.* submit.).
The structure of pseudepiphallus in *Z. nauta* Desutter-Grandcolas, **n. sp.**, with reduced lateral lophi and elongate pseudepiphallic sclerite, actually supports homologies between *Anurogryllus* and other "classical" Gryllinae (Jaiswara *et al.* in prep.).

## Key to species

1. Species with black and white legs (Figs 1, 3D, E). Females with black and white abdomen (little contrasted in the light brown *Z. nauta* Desutter-Grandcolas, **n. sp.**, see Fig. 5A–C). . . . . 3
- Species without contrasted coloration, the females without distinct white tergite (Fig. 5D, E). . . . . 2
2. Legs all blackish, FIII without white marks on outer side, even though the outer margin of FIII is sometimes lighter brown (Fig. 3F). . . . . *Z. fuscus* Desutter-Grandcolas, **n. sp.**
- Species black with only some whitish bands on FIII, along its outer margin and close to its base, but without white transverse band (Fig. 3G). . . . . *Z. intermedius* Desutter-Grandcolas, **n. sp.**
3. Very small species with light ochre hindlegs, making the contrasted coloration less clear. Male genitalia with lateral lophi hidden under pseudepiphallic sclerite (Fig. 4K, L). Female with FWs quite long for the genus, overlapping, with many cells between longitudinal veins (Fig. 5F); tergites 3 and to a less extent 4 lighter, but not constrastingly white (Fig. 5E). Species originating from Amazonian Peru. . . . . *Z. nauta* Desutter-Grandcolas, **n. sp.**
- Black and white "zebra" species (Fig. 1). . . . . 4
4. Base of antennae brown (scape + about 30 antennomeres), followed by a short white ring of about 10 antennomeres. Maxillary palpi dark brown, joint 4 white. Female (Fig. 5C) with short, slightly overlapping FWs; abdomen black brown, metanotum and tergite 3 with a wide transverse, continuous white stripe . . . . . *Z. nouragui* Desutter-Grandcolas, **n. sp.**

- Base of antennae white. Maxillary palpi dark brown, joint 4 lighter only dorso-basally. Female apterous or with shorter FWs; abdomen coloration different . . . . . 5

5. Male harp with 2–4 veins (Fig. 2B); genitalia: lophi "foliaceous" (Fig. 4C, D). Female apterous (Fig. 5B). . . . . *Z. guianensis* Desutter-Grandcolas, **n. sp.**

- Male harp with 2 veins (Fig. 1). Female with short, not overlapping Fws (Fig. 5A) . . . . . *Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.**

### *Zebragryllus wittoto* Desutter-Grandcolas and Cadena-Castañeda, n. sp.

(Figs 1, 2A, F, 3A–C, 4A, B, 5A, 6A–E, 8A)

http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:464244

**Type locality.** Peru, Loreto, région de l'Ampiyacu, en aval du confluent des rios Zumun et Yahuasyacu, Brillo Nuevo.

**Type material. Holotype:** Peru, Loreto, région de l'Ampiyacu, en aval du confluent des rios Zumun et Yahuasyacu, Brillo Nuevo, 1 male, 29.x.1985, parcelle L (Santiago, 13 ans, 10 ans après abandon), jour, L. Desutter (MNHN-EO-ENSIF3278). **Allotype:** Same data as holotype, 1 female, 30.x.1985 (MNHN-EO-ENSIF3363). **Paratypes, 2 males, 2 females:** Same data and collector as the holotype, 1 male, 11.xi.1985, parcelle S (10 ans après abandon) piège détergent, nuit; 1 female, 2.xi.1985, parcelle N (17 ans après abandon), jour, L. Desutter (MNHN-EO-ENSIF3364, 3365). Colombia, Amazonas, Parque Nacional Natural Amacayacu, 1 male, 1 female, 20.xi.2010., C. Rodríguez (MUD).

**Additional specimens examined.** Peru, Region de l'Ampiyacu, Iquitos, route de Nauta, km5, 30.viii.1985, jour, 1 male (specimen recorded, figured in Desutter 1990 and in Fig. 1), MNHN-EO-ENSIF3366; same data, 1 juvenile; same locality and collector, 31.viii.1985, 1 male. MNHN.

**Distribution.** Western Amazonia, Colombia and Peru (dept. Loreto).

**Etymology.** Species named after the Indian people Wittoto. Noun in apposition.

**Diagnosis.** Within the genus, species with black and white pattern of coloration on antennae, legs and tergites (this visible mostly in females). Antennae white basally, and alternatively white and brown. **Male:** FWs with a wide mirror, divided into two cells, the distal cells quite large (Fig. 1); stridulatory file with 68–71 teeth (n=3, mean 69.3). **Male genitalia:** median lophi long and thick (Fig. 4A), their lower angles marked but not spine-like (Fig. 4B); lateral lophi short and thick; pseudepiphallic parameres going beyond lateral lophi (Fig. 4A, B); apodeme on dorsal cavity long. **Female:** FWs very short, widely separate; body black, with a white half ring on metanotum, and a pair of faint, whitish band on tergites 4 and 5 (Fig. 5A); subgenital plate (Fig. 6A, B) short, transverse, with slightly concave distal margin and not produced distal angles, white, except for black median part; ovipositor very short. **Female genitalia.** Somewhat triangular in shape, distal margin wider and slightly bisinuated (Fig. 6C–E).

**Description.** In addition of the characters of the genus: Species quite large for the genus. TIII with 5 inner, and 5–6 (females, mean 5.3) and 4–5 (males, mean 4.8) outer subapical spurs, the 5th inner and the 5th–6th outer usually much smaller when present. Basitarsomeres III with 4 (females) and 4–5 (males, mean 4.5) inner, and 5–6 (females, mean 5.3) and 6–7 (males, mean 6.5) outer dorsal spines in addition to apical spines.

**Coloration.** Scapes and first antenomere whitish brown, followed by a short white basal ring with 5–7 in males (mean 6.5) and 6–8 in females (mean 7) white antennomeres (about 20 white antenomeres, including scape and pedicellus in Colombian paratypes); then a long dark brown ring of 22–27 in males (mean 24.8) and 28 in females dark antennomeres (25 in Colombian paratypes), followed again by a white ring (14–15 white antennomeres in males, mean 14.8; not documented in observed females and Colombian paratypes, which antennae are broken); antennae dark brown thereafter. Head brown, the face yellowish above epistemal suture; maxillary palpi brown, joint 4 somewhat lighter dorso-basally. Pronotum black brown, not shining. TI, TII dark brown. FI white, with brown apex and ventral margin. FII dark brown with a well-delimited whitish spot. FIII with a longitudinal white band along ventral margin and two transverse white bands, in addition to a basal, oblique band clearly separate from the ventral one (Fig. 1).

**Male.** FWs (Fig. 1) as in *Z. nouragui* Desutter-Grandcolas, **n. sp.** (Fig. 2C), but distal cell of mirror twice as large; cellules c2, c3, d1 and d2 separated by a I-shaped vein. Stridulatory vein with 68–71 teeth (mean 69.3, n=3). Subgenital plate as on Fig. 2F.

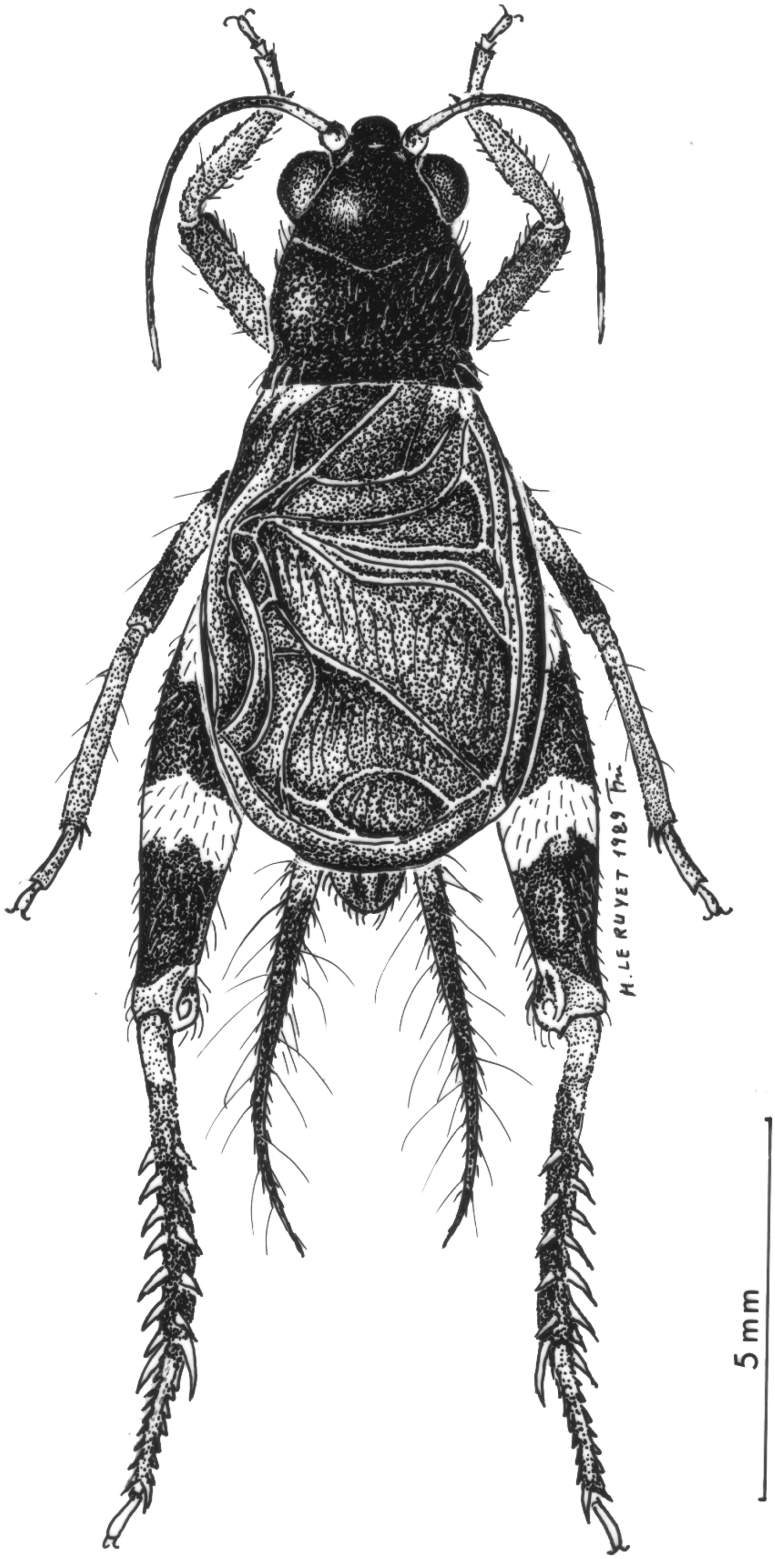


**FIGURE 1.** *Zebragryllus wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.**, habitus, male MNHN-EO-ENSIF3366 from Peru, route de Nauta.

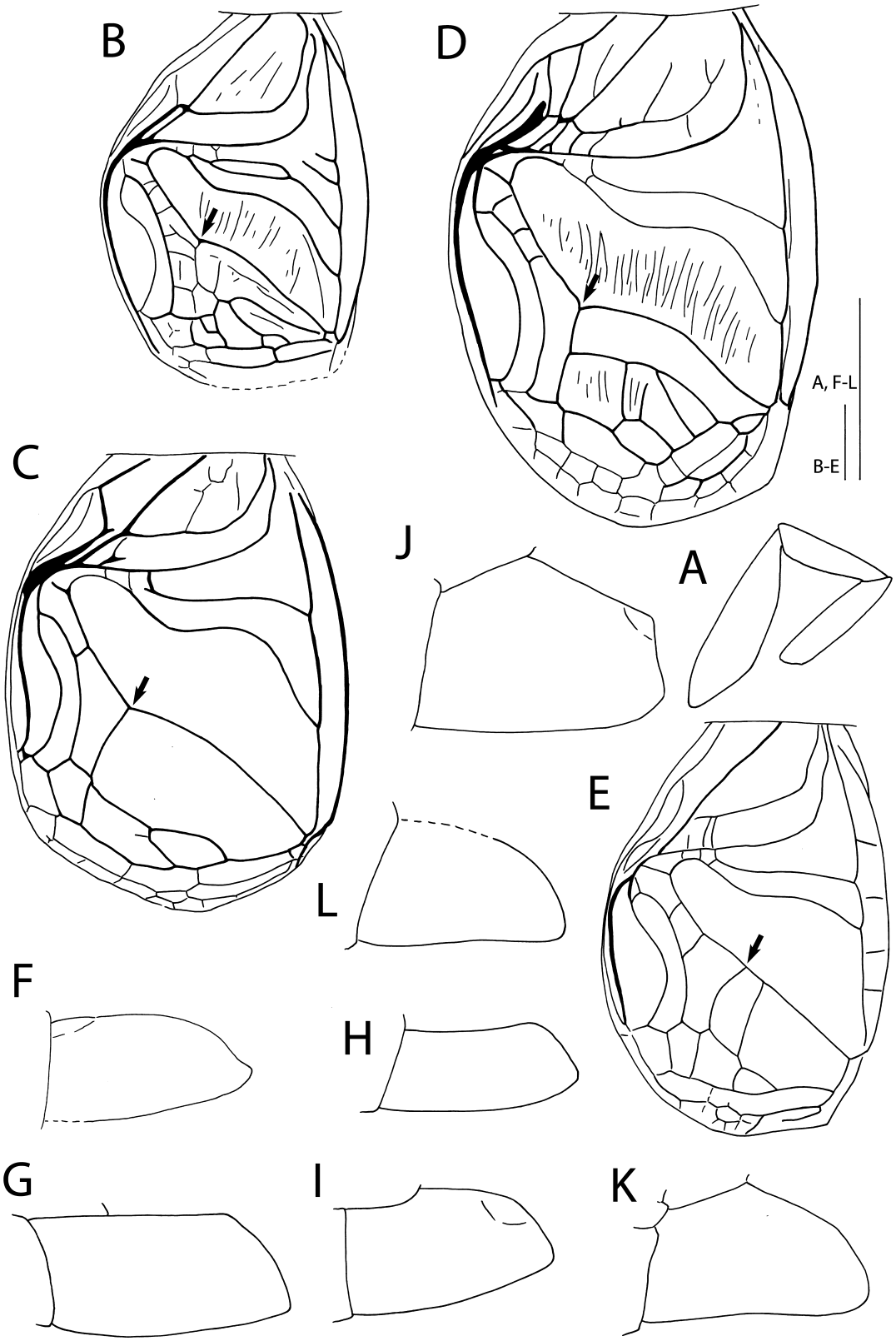


**FIGURE 2.** *Zebragryllus* Desutter-Grandcolas and Cadena-Castañeda, **n. gen.**: *Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.**, maxillary palpus (A), male subgenital plate (F); *Z. guianensis* Desutter-Grandcolas, **n. sp.**, male FW (B) and subgenital plate (G); *Z. nouragui* Desutter-Grandcolas, **n. sp.** male FW (C) and subgenital plate (H), idem, one male from Arataye (I); *Z. fuscus* Desutter-Grandcolas, **n. sp.**, male FW (D) and subgenital plate (J); *Z. intermedius* Desutter-Grandcolas, **n. sp.**, male subgenital plate (K); *Z. nauta* Desutter-Grandcolas, **n. sp.**, male FW (E) and subgenital plate (L). Symbol: Arrow (B–E), anterior angle of FW mirror. Scales 1 mm.

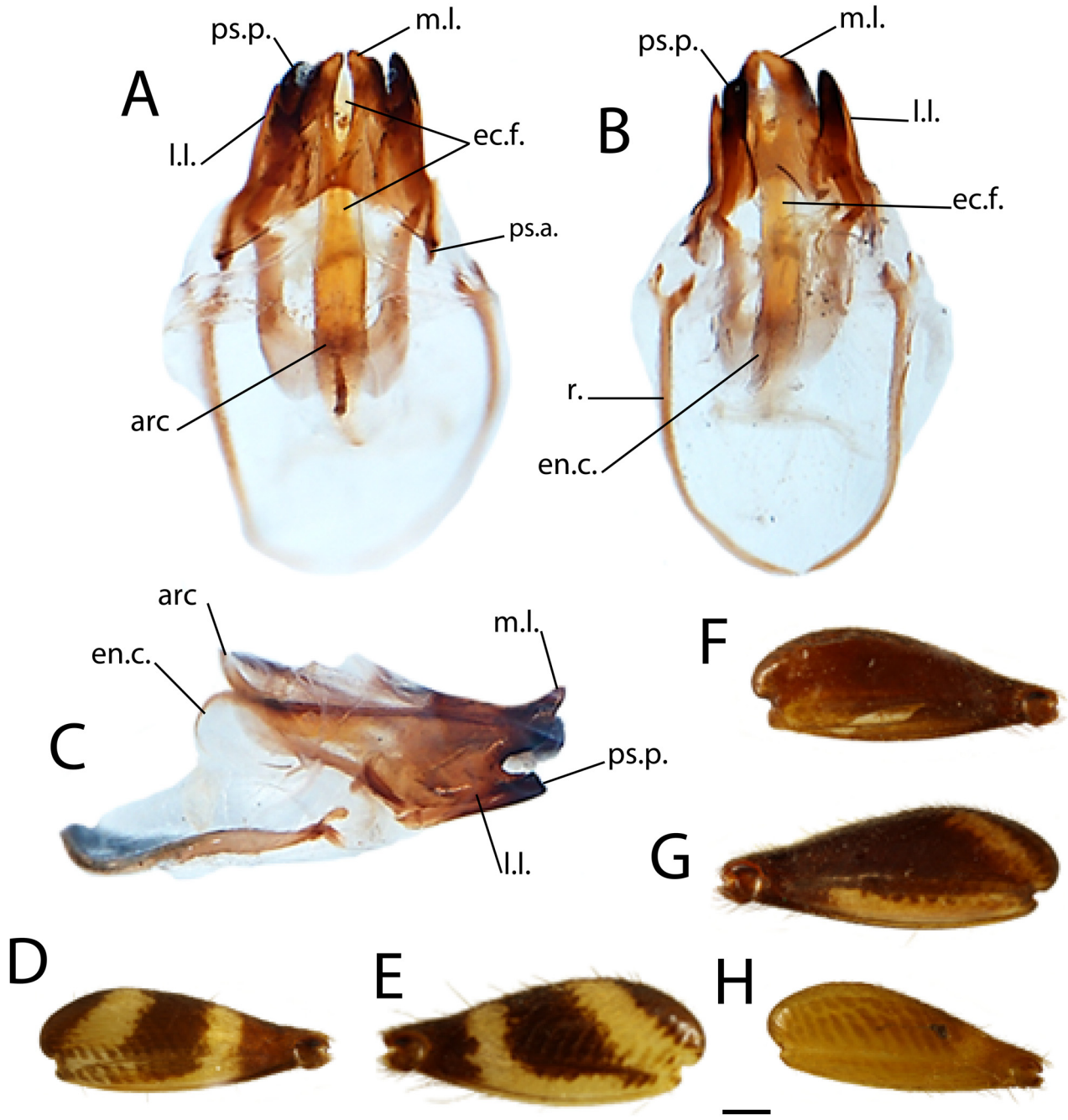


**FIGURE 3.** *Zebragryllus* Desutter-Grandcolas and Cadena-Castañeda, **n. gen.** A–C, *Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.**, male genitalia, dorsal (A), ventral (B), lateral (C). D–H, FIII patterns of coloration, lateral, in *Z. guianensis* Desutter-Grandcolas, **n. sp.** (D), *Z. nouragui* Desutter-Grandcolas, **n. sp.** (E), *Z. fuscus* Desutter-Grandcolas, **n. sp.** (F), *Z. intermedius* Desutter-Grandcolas, **n. sp.** (G), *Z. nauta* Desutter-Grandcolas, **n. sp.** (H). Scale D–H, 0.5 mm. Abbreviations, see Material & Method.

**Male genitalia.** Pseudepiphallic sclerite very short (Fig. 4A); median lophi short, but largely separate dorsally, wide and like truncate in lateral view, with acute dorsal tip (Fig. 4B); lateral lophi very short, thick. Pseudepiphallic parameres short, slightly longer than pseudepiphallic lophi in lateral view (Fig. 4B). Ectophallic fold longer than main body of pseudepiphallus and pseudepiphallic parameres, visible dorsally between median lophi.

**Female.** FWs very short, hardly going beyond tergite 2 distal margin (Fig. 5A); separate by a distance bigger than their own length; some faint longitudinal veins. Mesonotum white; metanotum whitish with a lighter band along distal margin; tergites 4 and 5 (Fig. 5A) with a faint whitish band, interrupted on median line, close to anterior margin dorsally, oriented toward distal margin of tergite laterally; tergite 4 pattern stronger than tergite 5.

Subgenital plate short, transverse; distal margin slightly concave; distal angles not produced (Fig. 6A, B). Ovipositor very short.

**Female genitalia.** Copulatory papilla resembling that of *Z. guianensis* Desutter-Grandcolas, **n. sp.**, being broadly triangular in shape, with a thin anterior part, and a broader distal part; distal margin bisinuate (Fig. 6C–E).

**Measurements (in mm).**

| | Lpron | wpron | LFW | wFW | LFIII | wFIII | LTIII | File |
|---|---|---|---|---|---|---|---|---|
| Holotype | 1.7 | 2.7 | 6 | 4.2 | 6.6 | 2,2 | 4.5 | 69 teeth |
| Paratypes | 1.7–2 | 2.7 (n=1) | 6.7–7 | 4.5 (n=1) | 6.6–7.4 | 2.3 (n=1) | 4.6–5 | 68–71 teeth |
| mean (n=3) | 1.8 | 2.7 (n=2) | 6.4 | 4.4 (n=2) | 6.9 | 2.3 (n=2) | 4.7 | 69.3 teeth |

continued.

| | Lpron | wpron | LFW | LFIII | wFIII | LTIII | Lovip |
|---|---|---|---|---|---|---|---|
| Allotype | 1.8 | 2.5 | 0.4 | 6.8 | 2.6 | 4.3 | 3.5 |
| Paratypes | 1.8–2 | 2.3 (n=1) | 0.3 | 6.7–6.9 | 2.5 (n=1) | 4.9 | 3 |
| mean (n=3) | 1.9 | 2.4 (n=2) | 0.3 | 6.8 | 2.6 (n=2) | 4.6 | 3.2 |

**Remark.** The males originating from Iquitos are very similar to the specimens from Brillo Nuevo, by their general coloration, size, FW venation and stridulatory file (72 teeth, n=1). Their genitalia are however slightly different (median and lateral lophi similar to those of *Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.**, but pseudepiphallic parameres slightler thinner and longer ventrally).

**Calling song.** One male from Iquitos (MNHN-EO-ENSIF3366) has been recorded in the field at a temperature of 27°C. The calling song is composed of series of echemes (Fig. 8A) where each echeme is 0.37±0.1 ms in duration, echeme period is 0.58±0.1 ms and the echeme duty cycle is 65%. Each echeme is made up of 15±5 syllables where the syllable duration is 0.02±0.002 ms, syllable period is 0.04±0.005 ms and syllable duty cycle is 40%. The dominant frequency is 3.5 kHz.

### *Zebragryllus guianensis* Desutter-Grandcolas, n. sp.

(Figs 2B, G, 3D, 4C, D, 5B, 6F–J, 8B)

http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:464246

**Type locality.** French Guiana, Arataye, Affl. Approuagues, 8 km NE pied saut Parare, Réserve des Nouragues.

**Type material. Holotype:** French Guiana, Arataye, Affl. Approuagues, 8 km NE pied saut Parare, 1 male, 15.v.1988, jour, L. Desutter (MNHN-EO-ENSIF3173). **Allotype:** same data as holotype, 1 female, 14.v.1988 (MNHN-EO-ENSIF3174). **Paratypes, 2 males:** Same data as the holotype, 1 male, 15.v.1988, jour (recorded); 1 male, 18.v.1988, jour (MNHN-EO-ENSIF3114, 3175).

**Distribution.** Eastern Amazonia, French Guiana, Arataye.

**Etymology.** Species named after its distribution.

**Diagnosis.** Small, black and white species; base of antennae (including scape) white; a white ring at cerci base; white band along outer margin of FIII narrow (Fig. 3D). **Male.** FWs not covering the whole abdomen; harp with two to four transverse veins; mirror still distinct even though subdivided into many small cells. **Male genitalia.** Pseudepiphallic sclerite deeply emarginate (Fig. 4C); median lophi with a long and thin dorsal process, rounded ventrally (Fig. 4D); lateral lophi short and thick (Fig. 4D); acute apex of ectophallic fold pointing between pseudepiphallic median lophi; ectophallic apodemes long; apodeme on dorsal cavity slightly longer than ectophallic apodemes. **Female.** Apterous; posterior margin of metanotum with a white semi circular band, covering part of tergite 1 anterior margin; abdomen black with tergites 4 to 6 white in their anterior two/third, except on a short medio dorsal line, black (Fig. 5B). Subgenital plate light brown; last sternite whitish distally.

**Description.** Very small species for the genus, with slightly protruding eyes. Head wider than pronotum. Pronotum more narrow distally. TIII with 4–5 (female) and 5 (males) inner, and 5 (female) and 5–6 (males, mean 5.5) outer subapical spurs, the 5th inner and the 6th outer sometimes much smaller when present. Basitarsomeres

III with 3 inner, and 5 outer dorsal spines in addition to apical spines, in both males and female; spines smaller than in other species.

**Coloration.** Head black brown; lower part of the face above epistemal suture black brown or dark reddish brown; maxillary palpi dark brown, joint 4 slightly lighter dorso-basally. Antennae with a white basal ring (scape + 7–8 antennomeres in males (mean 7.5); scape very light brown on margins, first antennomere very light brown + 7 white antennomeres in female), followed by a brown ring (26–31 brown antennomeres in males (mean 28.8), 27–31 brown antennomeres in female), a second white ring (11–15 white antennomeres in males (mean 13.3), 13–15 white antennomeres in female), then dark brown (antennae broken at that level in all observed specimens). TI, TII light brown. FI, FII dark brown with a large white dorsal patch covering part of inner and outer sides. TIII and basitarsomeres III light brown with lighter spurs. FIII (Fig. 4A) dark brown, lower margin white, this longitudinal band narrow on outer side, wider on inner side, and connected to a transverse wide band at about three fourth of FIII length; an additional white oblique band close to FIII base. Cerci black brown with a white basal ring.

**Male.** FWs covering the base of cerci, but not the subgenital plate. Stridulatory apparatus (Fig. 2B): harp with two to four veins (sometimes incomplete), mirror divided into many cells, stridulatory file with about 93 teeth (n=1). Subgenital plate long and truncate apically (Fig. 2G).

**Male genitalia.** Pseudepiphallic sclerite short and not very wide; median lophi acute and "foliaceous" dorsally (Fig. 4C), rounded ventrally (Fig. 4D); lateral lophi short and wide. Pseudepiphallic parameres going beyond median lophi. Pseudepiphallic apodemes very short. Ectophallic fold narrow and very long, visible dorsally between median lophi (Fig. 4C). Ectophallic apodemes and apodeme on top of dorsal cavity all very long and about equal in size.

**Female.** Apterous. Coloration pattern (Fig. 5B): Mesonotum (hardly visible) and distal margin of metanotum whitish, the white pattern of metanotum making a wide half-circular band, prolonged mediodorsally on tergite 1; tergites 4, 5 and 6 (and to a less extent tergite 3) with a pair of white bands, separated along mid dorsum by a narrow black area; these bands located along tergite anterior margin dorsally, more lateral at tergite mid length, and reaching the tergite posterior limit laterally; white band on tergite 4 brightest and widest laterally. Subgenital plate wider than long, truncate distally, distal margin hardly concave (Fig. 6F, G). Sternite before subgenital plate light brown, with a whitish, crescent-shaped spot along distal margin. Ovipositor very short, much shorter than TIII.

**Female genitalia.** Copulatory papilla asymmetrical, wide and well sclerotized distally, much narrow and less sclerotized anteriorly (Fig. 6H–J).

**Measurements (in mm).**

| | Lpron | wpron | LFW | wFW | LFIII | wFIII | LTIII | File |
|---|---|---|---|---|---|---|---|---|
| Holotype | 1.5 | 2.1 | 5 | 3.5 | 6 | 2,2 | 4,4 | |
| Paratypes | 1.5–1.6 | 2.4 | 4.9–5.1 | 3.6 | 5.8–6.1 | 2.1–2.2 | 4–4.4 | 93 teeth (n=1) |
| mean (n=3) | 1.5 | 2.3 | 5 | 3.6 | 6 | 2.2 | 4.3 | |

| | Lpron | wpron | LFIII | wFIII | LTIII | Lovip |
|---|---|---|---|---|---|---|
| Allotype | 1.9 | 2.3 | 6.7 | 2.4 | 4.5 | 3.4 |

**Calling song.** One male has been recorded in the field (MNHN-EO-ENSIF3114; recording temperature not documented). This species produces series of echemes (Fig. 8B) where the echeme duration is 0.24±0.03 ms, echeme period is 1.22±0.4 ms and the duty cycle is 19%. Each echeme contains 8±1 syllables where duration of a syllable is 0.02±0.002 ms, period is 0.03±0.003 ms and the duty cycle is 62%; the dominant frequency is 3 kHz.

### *Zebragryllus nouragui* Desutter-Grandcolas, n. sp.

(Figs 2C, H, I, 3E, 4E, F, 5C, 6K–D', 8C, Table 1)

http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:464249

**Type locality.** French Guiana, Arataye, 8 km NE pied du saut Parare, Réserve des Nouragues.

**Type material. Holotype:** French Guiana, Arataye, 8 km NE pied du saut Parare, 1 male, pinotière, 4.vi.1988, jour, L. Desutter & P. Grandcolas (MNHN-EO-ENSIF3176).

**Allotype**: Same data as holotype, 1 female (MNHN-EO-ENSIF3177). **Paratypes, 5 males, 1 female:** Same locality as the holotype; 1 male, pinotière, 4.vi.1988, jour, L. Desutter & P. Grandcolas (MNHN-EO-ENSIF3182); 1 male, 4.iv.1988, jour, L. Desutter (MNHN-EO-ENSIF3181); 13.vi.1988, 1 female, piège détergent, nuit, L. Desutter & P. Grandcolas (MNHN-EO-ENSIF3178); 15.vi.1988, 1 male, piège détergent, jour, L. Desutter & P. Grandcolas (MNHN-EO-ENSIF3179); 19.vi.1988, 1 male, nuit, L. Desutter & P. Grandcolas (MNHN-EO-ENSIF3180); 15.vii.2011, 1 male, jour, parcelle P8, fn16, L. Desutter-Grandcolas & J. Anso (MNHN-EO-ENSIF3183).

**Additional material examined.** Same locality as the holotype, 6.vii.2011, 1 male, jour, Parcelle 6, fn5, recorded (L. Desutter-Grandcolas and J. Anso, MNHN-EO-ENSIF3184). French Guiana, Arataye, affluent Approuagues, aval du saut Parare, 1 male, 3.vii.1988, nuit; 1 male, 8.vii.1988, nuit; 1 male, 1 female, 9.vii.1988, jour; 2 males, 14.vii.1988, jour; 1 male, 20.vii.1988, nuit, L. Desutter & P. Grandcolas, MNHN. French Guiana, Sentier Limonade, forêt sur pente, 1 female, 15.viii.1988, nuit; forêt inondable, remblais d'orpaillage, 1 female, 16.viii.19888, jour, L. Desutter & P. Grandcolas, MNHN. French Guiana, île de Cayenne, Montagne de Mahury, 1 female, 20.vii.1991, forêt, litière, nuit, P. Grandcolas. MNHN.

**Distribution.** Eastern Amazonia, French Guiana.

**Etymology.** Species named after its type locality in French Guiana.

**Diagnosis.** Large, black and white species, with antennae black brown basally. Maxillary palpi dark brown, except for white joint 4. **Male.** FWs covering almost the whole abdomen; mirror much wider than long, including few distal cells (Fig. 2C); stridulatory file with 96 teeth (n=1). **Male genitalia.** Median lophi short and thick, rounded dorsally (Fig. 4E); dorsal and ventral angles acute, distal margin concave (Fig. 4F); lateral lophi quite long, abruptly narrowed before apex; pseudepiphallic parameres club-shaped, longer than lateral and median lophi (Fig. 4F). **Female.** FWs present. Body dark brown; mesonotum and tergite 3 white (Fig. 5C), the former often hidden by the FWs. Subgenital plate distal angles acute (Fig. 6K, L). **Female genitalia.** Copulatory papilla having the shape of a small, sclerotized ring (Fig. 6S–U).

**Description.** In addition to the characters of the genus: Head dark brown. Large "zebra" species, with dark antenna base. TIII with 4–5 (mean 4.3 in females, 4.4 in males) inner, and 5 outer subapical spurs, the 5th inner most often much smaller when present. Basitarsomeres III with 3–4 (females, mean 3.3) and 3–5 (males, mean 4) inner, and 5 (females) and 4–6 (males, mean 5) outer dorsal spines in addition to apical spines.

**Coloration.** Head and pronotum black brown. Antennae brown, with a short white ring far from basis (17–18 white antennomeres in females (mean 17.5) and 9–17 in males (mean 14.3), after 23–30 in females (mean 27) and 29–34 in males (mean 31.8) dark brown antennomeres; scapes yellowish brown and dark brown. Maxillary palpi dark brown, joint 4 and sometimes tip of joint 5 white. TI, TII dark brown. FI, FII dark brown with a large white patch on inner and outer sides. TIII and basitarsomeres III dark brown with lighter spurs. FIII dark brown (Fig. 3E), lower margin white, this longitudinal band wide on both inner and outer sides, interrupted before TIII apical fourth, and connected to the white transverse band at about three fourth of FIII length, and to the white oblique band close to FIII base. Cerci black brown, lighter at base.

**Male.** FWs covering almost the whole abdomen, only the tip of subgenital plate visible dorsally; harp crossed by two transverse, almost parallel veins; mirror clearly delimited and separated from apical field (Fig. 2C). Subgenital plate short and truncate (Fig. 2H).

**Male genitalia.** Pseudepiphallic sclerite very transverse, the distance between the base of median lophi and the anterior margin of the sclerite very short (Fig. 4E). Median lophi (Fig. 4E, F) short and quite thick in dorsal view, their inner margins rounded; in lateral view, median lophi with dorsal and aventral angles acute, the dorsal angle curved, not straight, and thin, not thumb like. Lateral lophi abruptly thinner well before apex (Fig. 4F). Pseudepiphallic parameres longer than median and lateral lophi in lateral view. Pseudepiphallic apodemes not as short as in other species of the genus. Ectophallic apodemes long and partly fused dorsally; apodeme on top of dorsal cavity short between ectophallic apodemes.

**Female.** FWs present, covering about half metanotum, partly overlapping; dorsal and lateral fields with several parallel, longitudinal veins; transverse veins sparse. Body dark brown; mesonotum and tergite 3 with a wide, uninterrupted white band (Fig. 5C), the former often hidden by FWs. Ovipositor quite long for the genus. Subgenital plate transverse; distal margin truncate and deeply emaginate; distal angles acute (Fig. 6K, L).

**Female genitalia.** Copulatory papilla resembling that of *Z. nauta* Desutter-Grandcolas, **n. sp.** from Peru, having the shape of a small, wide ring (Fig. 6S–U).

**Measurements (in mm).**

| | Lpron | wpron | LFW | wFW | LFIII | wFIII | LTIII | File |
|---|---|---|---|---|---|---|---|---|
| Holotype | 1.9 | 3.1 | 5.9 | 4.5 | 6.8 | 2,6 | 4,7 | |
| Paratypes | 1.7–1.9 | 2.5–2.9 | 5.8–6.3 | 4.2–4.5 | 6.2–7.2 | 2.3–2.6 | 4.2–4.9 | 96 teeth (n=1) |
| mean (n=5) | 1.8 | 2.8 | 6 | 4.4 | 6.6 | 2.5 | 4.5 | |

| | Lpron | wpron | LFW | LFIII | wFIII | LTIII | Lovip |
|---|---|---|---|---|---|---|---|
| Allotype | 1.8 | 2.5 | 0.8 | 6.8 | 2.6 | 4.5 | 5.1 |
| Paratype | 1.9 | 2.6 | 1 | 6.7 | 2.5 | 4.6 | 5.7 |
| Mean (n=2) | 1.9 | 2.6 | 0.9 | 6.8 | 2.6 | 4.6 | 5.4 |

**Calling song.** Seven calling songs of *Z. nouragui* Desutter-Grandcolas, **n. sp.** have been recorded in the field (MNHN-EO-ENSIF3183, 3184). Members of this species produce long echemes (Fig. 8C), i.e. composed of 114–200 syllables. Towards the end of each echeme there is a distinct increase in the amplitude of syllables making each echeme appear like a trumpet. Measured calling song features are listed in Table 1.

**TABLE 1.** Calling song of *Zebragryllus nouragui* Desutter-Grandcolas, **n. sp.** Call characteristics from seven recordings in the field, with time and temperature of recording.

| No. of records | Time | Temp. (°C) | Syllable duration (ms) | Syllable period (ms) | Syllable duty cycle (%) |
|---|---|---|---|---|---|
| *Z. nouragui_003* | 11h00 | 24.8 | 0.01 | 0.02 | 50 |
| *Z. nouragui_006* | 09h10 | 23.7 | 0.01±0.001 | 0.05±0.66 | 14 |
| *Z. nouragui_009* | 16h45 | 27.3 | 0.01±0.001 | 0.02 | 50 |
| *Z. nouragui_014* | 11h20 | 25.1 | 0.01±0.001 | 0.02±0.003 | 50 |
| *Z. nouragui_024* | 10h55 | 24.3 | 0.01±0.004 | 0.03±0.02 | 44 |
| *Z. nouragui_025* | 11h20 | 24.8 | 0.01±0.001 | 0.02±0.03 | 48 |
| *Z. nouragui_027* | 08h00 | 23.3 | 0.01±0.002 | 0.02±0.02 | 47 |

continued.

| No. of records | No. of syllables/ echeme | Echeme duration (ms) | Echeme period (ms) | Echeme duty cycle | Dominant frequency (kHZ) |
|---|---|---|---|---|---|
| *Z. nouragui_003* | 138±26 | 2.99±0.6 | 3.71±0.9 | 80 | 4.8±0.1 |
| *Z. nouragui_006* | 164±41 | 6.48±0.8 | 16.2±0.8 | 23 | 4.7±0.1 |
| *Z. nouragui_009* | 167±9 | 3.32±0.2 | 3.66±0.2 | 91 | 5±0.1 |
| *Z. nouragui_014* | 230±46 | 5.72±0.88 | 5.92±0.77 | 97 | 5.1±0.2 |
| *Z. nouragui_024* | 200±40 | 6.43±0.9 | 7.64±4.9 | 84 | 4.8±0.3 |
| *Z. nouragui_025* | 144±24 | 3.2±0.6 | 3.65±0.7 | 85 | 5±0.2 |
| *Z. nouragui_027* | 114±14 | 2.62±0.3 | 2.81±1 | 93 | 4.7±0.4 |

**Variation.** In one very small male from the type locality, the ectophallic fold is largely visible between the median lophi of pseudepiphallus. The shape of the other parts of the genitalia are otherwise similar to that of the other males.

The specimens originating from Saut Parare are very similar to the specimens from the Nourague by their male genitalia, size and ovipositor length; coloration is also very similar, but with smaller white spots on FI, II. The female copulatory papilla and subgenital plate are however slightly different: the subgenital plate of Saut Parare female has acute lateral angles (Fig. 6M, N), and the copulatory papilla is shorter and higher (Fig. 6V–X). The identification of these specimens as *Z. nouragui* Desutter-Grandcolas, **n. sp.** will have to be checked, especially

with the recording of the male calling song. In the same way, one male from Arataye shows a slightly different subgenital plate (Fig. 2I), higher and with a more rounded dorsal margin than the Nouragues males (Fig. 2H).
Finally, the females from Saül on one hand, and Montagne Mahury on the other are very similar to the females of *Z. nouragui* Desutter-Grandcolas, **n. sp.**, but present some differences in the shape of copulatory papilla (see Fig. 6Y–D') and subgenital plate (Fig. 6O–R), in addition to a longer white antennal ring (more than 20 white antennomeres).

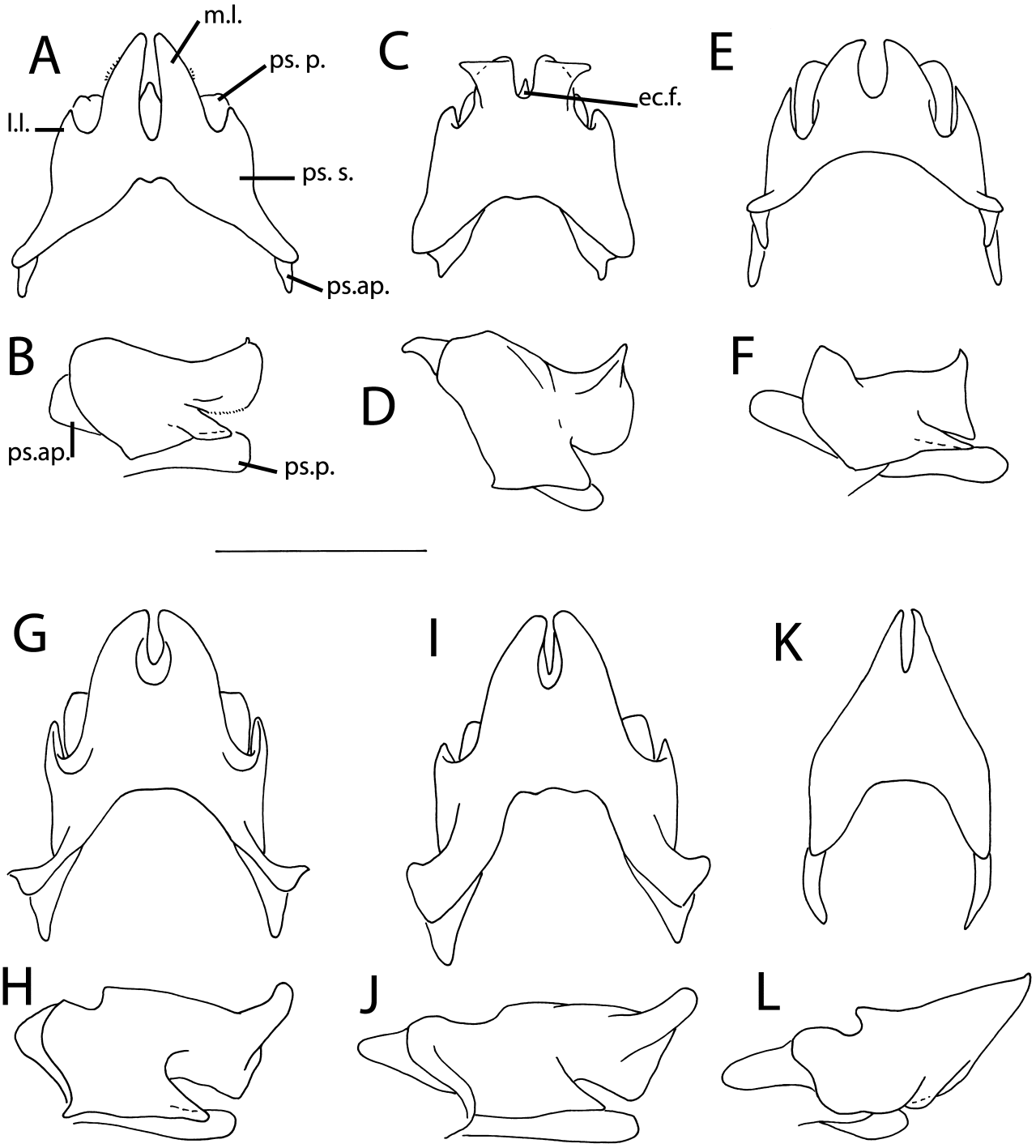


**FIGURE 4.** *Zebragryllus* Desutter-Grandcolas and Cadena-Castañeda, **n. gen.**: Male genitalia, apical sclerites, dorsal and lateral views, in *Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.** (A, B), *Z. guianensis* Desutter-Grandcolas, **n. sp.** (C, D), *Z. nouragui* Desutter-Grandcolas, **n. sp.** (E, F), *Z. fuscus* Desutter-Grandcolas, **n. sp.** (G, H), *Z. intermedius* Desutter-Grandcolas, **n. sp.** (I, J) and *Z. nauta* Desutter-Grandcolas, **n. sp.** (K, L). Abbreviations, see Material & Method. Scale 0.5 mm.

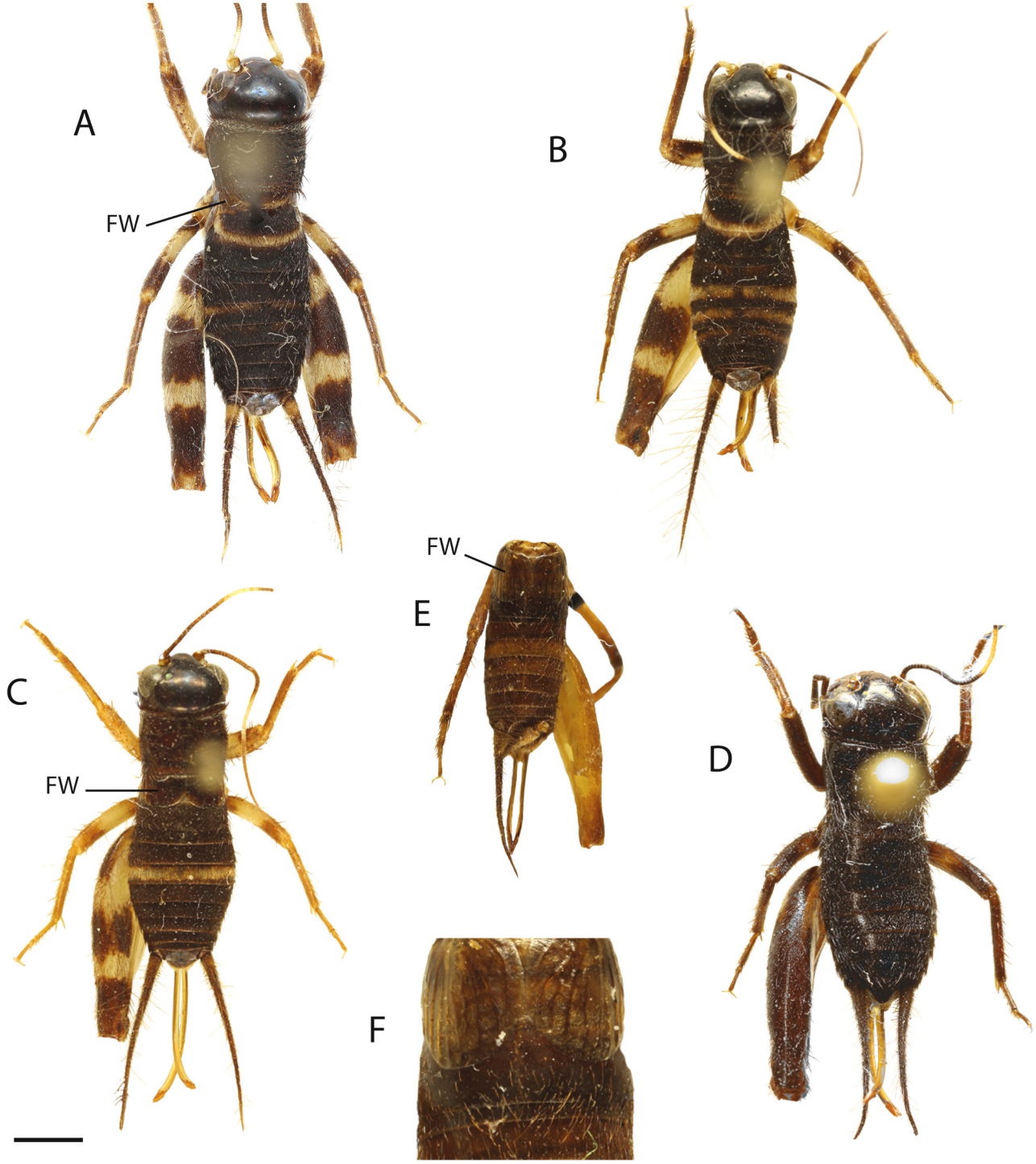


**FIGURE 5.** *Zebragryllus* Desutter-Grandcolas and Cadena-Castañeda, **n. gen.**, female abdomen coloration and FWs, in *Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.** (A), *Z. guianensis* Desutter-Grandcolas, **n. sp.** (B), *Z. nouragui* Desutter-Grandcolas, **n. sp.** (C), *Z. intermedius* Desutter-Grandcolas, **n. sp.** (D); *Z. nauta* Desutter-Grandcolas, **n. sp.** (E, F). Scale 2 mm (A–E). Abbreviations: See Material and Methods.

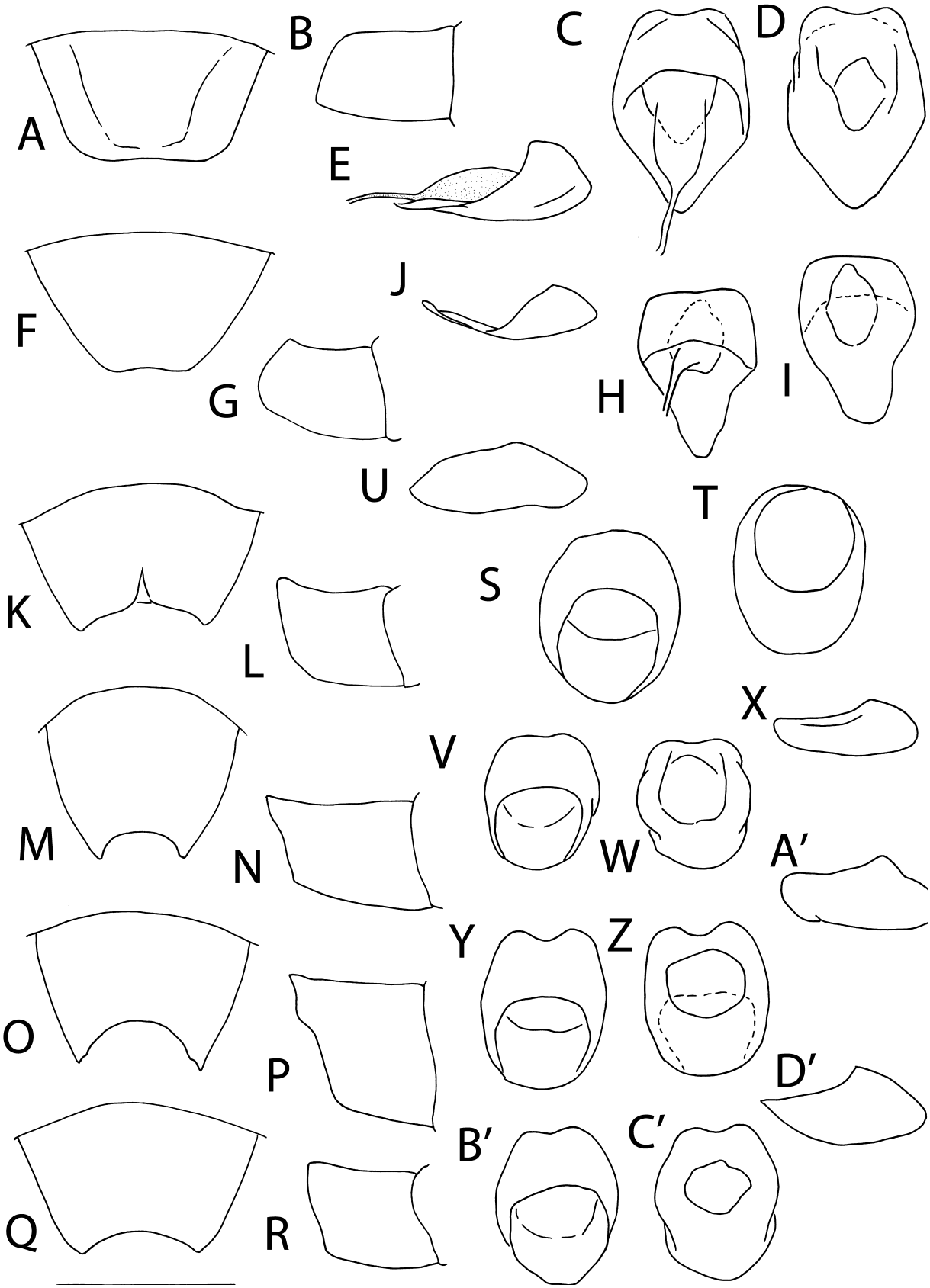


**FIGURE 6.** *Zebragryllus* Desutter-Grandcolas and Cadena-Castañeda, **n. gen.**: Female subgenital plate (ventral, lateral) and copulatory papilla (dorsal, ventral, lateral) in: *Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.** (A–E), *Z. guianensis* Desutter-Grandcolas, **n. sp.** (F–J), *Z. nouragui* Desutter-Grandcolas, **n. sp.** (K, L, S–U); idem, one female from Arataye, saut Parare (M, N, V–X); idem, one female from Saül (O, P, Y–A'); idem, one female from Cayenne, Mahury mountain (Q, R, B'–D'). Scales 1 mm.

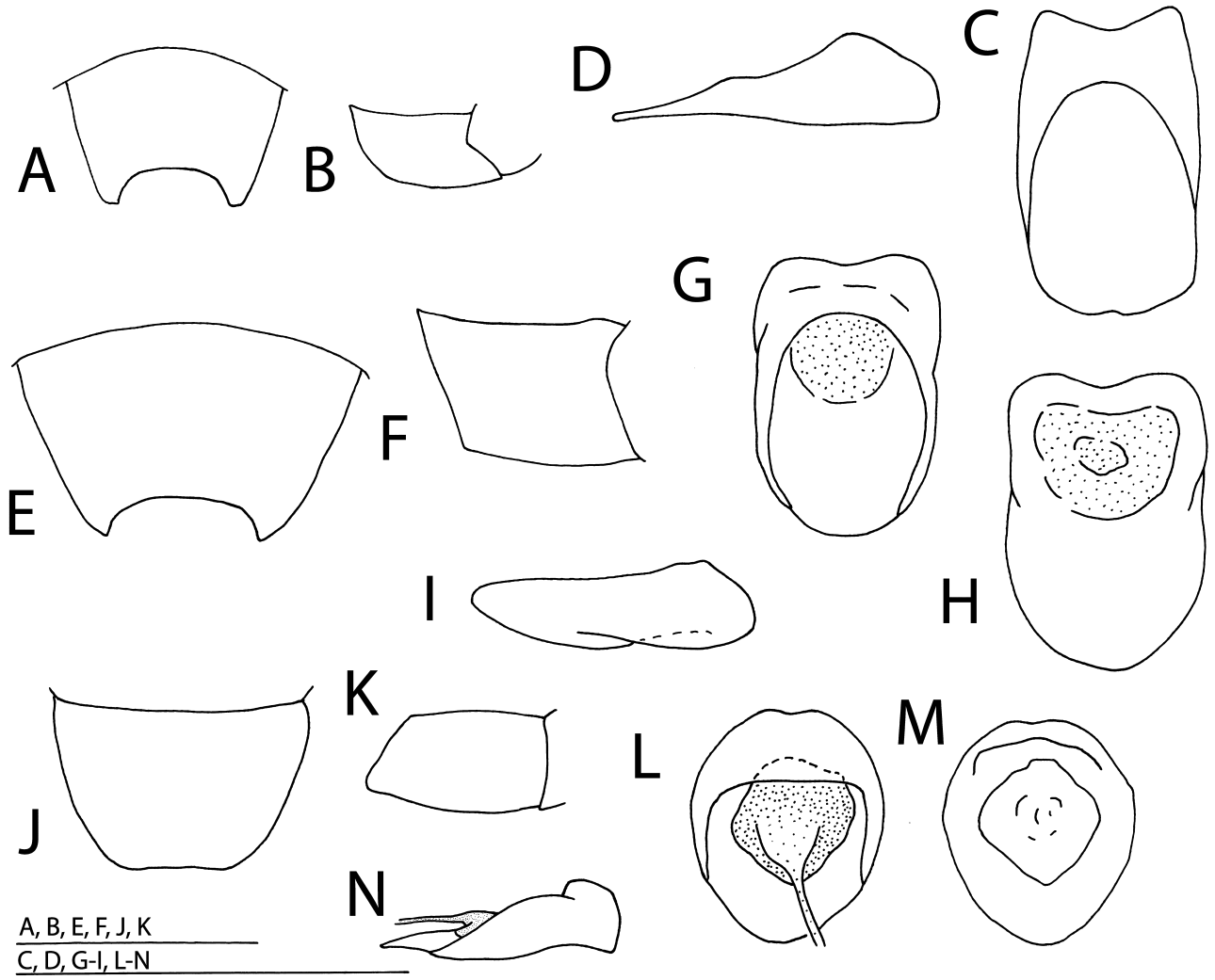


**FIGURE 7.** *Zebragryllus* Desutter-Grandcolas and Cadena-Castañeda, **n. gen.**: Female subgenital plate (ventral, lateral) and copulatory papilla (dorsal, ventral, lateral) in: *Zebragryllus* sp. affinis *fuscus* Desutter-Grandcolas, **n. sp.** (A–D), *Z. intermedius* Desutter-Grandcolas, **n. sp.** (E–I); *Z. nauta* Desutter-Grandcolas, **n. sp.** (J–N). Scales 1 mm.

### *Zebragryllus fuscus* Desutter-Grandcolas, n. sp.

(Figs 2D, J, 3F, 4G, H, 7A–D).

http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:464245

**Type locality.** Peru, Ampiyacu, Brillo Nuevo.

**Type material. Holotype:** Peru, Région de l'Ampiyacu, en aval du confluent des rios Zumun et Yahuasyacu, Brillo Nuevo, 1 male, 28.x.1985, parcelle K 13 ans (10 ans après abandon, chasse jour, L. Desutter, MNHN-EO-ENSIF3185. **Paratype:** 1 male. Same data as the holotype, 1 male, 26.x.1985, MNHN-EO-ENSIF3186.

**Diagnosis.** Wholly dark species, with a faint lighter band (never whitish and contrasted) along the outer, lower margin of hindfemora (Fig. 3F). **Male:** FW mirror wider than long, distinct although divided into several distal cells (Fig. 2D); stridulatory file with about 112 teeth (n=1). **Male genitalia:** Pseudepiphallic sclerite more elongate and narrow than in "zebra" species (Fig. 4G), its anterior margin deeply concave, the median lophi short and the lateral lophi dejected laterally (Fig. 4H); pseudepiphallic parameres going beyond lateral lophi; ectophallic fold short, not reaching the paramere distal margin; ectophallic apodemes not very long; endophallic apodeme almost vertical between ectophallic apodemes.

**Distribution.** Western Amazonia, Peru (dept. Loreto).

**Etymology.** Species named after its dark pattern of coloration.

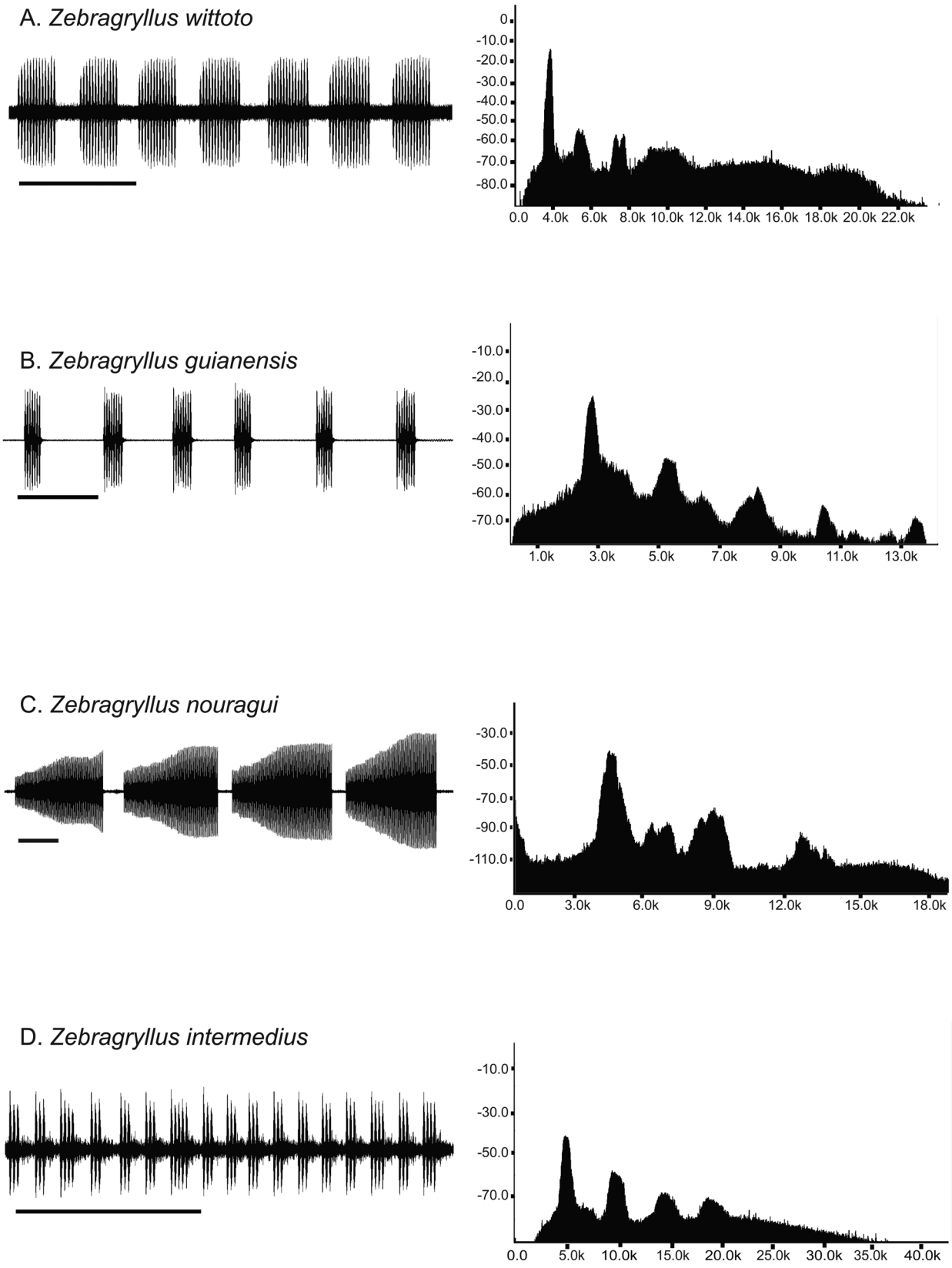


**FIGURE 8.** *Zebragryllus* Desutter-Grandcolas and Cadena-Castañeda, **n. gen.**, calling song oscillogram and frequency spectrum in: *Z. wittoto* Desutter-Grandcolas and Cadena-Castañeda, **n. sp.** (A), *Z. guianensis* Desutter-Grandcolas, **n. sp.** (B), *Z. nouragui* Desutter-Grandcolas, **n. sp.** (C), *Z. intermedius* Desutter-Grandcolas, **n. sp.** (D). Scale 1sec.

**Description.** In addition to the characters of the genus. Scapes and base of antennae (30–33 antennomeres) light brown, before a short white ring (9–10 antennomeres). Basitarsomeres III with 4–5 inner (mean 5) and 6–7 outer (mean 6) dorsal spines, in addition to apical ones. Coloration wholly dark brown to black, the pronotum the darkest; legs a little lighter, with a lighter, reddish brown, band along FIII outer margin (Fig. 3F); head dark reddish brown (HT) or black (PT), with a lighter area above epistemal suture; maxillary palpi wholly brown.

**Male.** FWs covering subgenital plate tip. Mirror distinct, subdivided into several cells (Fig. 2D). Subgenital plate shorter and higher than in other species of the genus (Fig. 2J).

**Male genitalia**. Pseudepiphallic sclerite wider than long; distance between the inner base of median lophi and their connection to lateral lophi more than twice their own length (Fig. 4G); median lophi about as long as lateral lophi; in lateral view, median lophi with a thumb-like upper process, and a squared lower process (Fig. 4H); lateral lophi acute, much shorter than the pseudepiphallic parameres (Fig. 4H); ectophallic fold regularly narrowed toward apex.

**Female.** Unknown.

**Measurements (in mm).**

| | Lpron | wpron | LFW | wFW | LFIII | wFIII | LTIII | File |
|---|---|---|---|---|---|---|---|---|
| Holotype | 1.9 | 3 | 7 | 4.9 | 6.9 | 2.7 | 4.6 | 112 |
| Paratype | 2.1 | 3.2 | 6.8 | 4.9 | 7.3 | 2.8 | 5 | - |
| mean (n=2) | 2 | 3.1 | 6.9 | 4.9 | 7.1 | 2.8 | 4.8 | |

**Remark.** Males taken in the same area as the holotype but in an older cultivated plot (23 years old after being abandoned) or in mature forest (Monte alta) show distinct genitalia, with shorter median lophi, and a more contrasted pattern of coloration, which could justify describing them as a distinct species. Females from the same plots have a short subgenital plate with acute distal angles (Fig. 7A, B) and a very distinct copulatory papilla, subrectangular with concave distal margin (Fig. 7C, D).

**Specimens examined.** Same data as the holotype, but: parcelle I, 23 ans (20 ans après abandon), 1 male, 23.x.1985, piège détergent, nuit; parcelle J, 53 ans (50 ans après abandon), 1 female, 23.x.1985, jour, 1 female, 25.x.1985, piège détergent nuit; 1 female, 12.xi.1985, parcelle R, 18 ans (15 ans après abandon), piège détergent nuit; monte alta [parcelle] E, 1 male, 1 female, 10.x.1985, jour, 1 female, 11.x.1985, jour, L. Desutter. MNHN.

### *Zebragryllus intermedius* Desutter-Grandcolas, n. sp.

(Figs 2K, 3G, 4I, J, 5D, 7E–I, 8D)

http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:464247

**Type locality.** Peru, Loreto, Iquitos.

**Type material. Holotype:** Peru, Loreto, Iquitos, Route de Nauta, km 9, 1 male, 29.viii.1985, jour, L. Desutter (MNHN-EO-ENSIF3187). **Allotype:** same data as the holotype, 1 female, jour (MNHN-EO-ENSIF3188). **Paratypes. 2 males, 2 females:** Same data as the holotype, 1 male, 1 female (MNHN-EO-ENSIF3189, 3190); same locality as the holotype, 1 female, 30.viii.1985, jour, L. Desutter (MNHN-EO-ENSIF3191). Peru, Route de Nauta, km 5, 1 male, 30.viii.1985, jour, L. Desutter (MNHN-EO-ENSIF3281).

**Additional specimens examined.** Same data as the holotype, 1 juvenile female, 27.viii.1985, jour, L. Desutter. MNHN.

**Distribution.** Western Amazonia, Peru (dept. Loreto).

**Etymology.** Species named after its pattern of coloration, intermediate between dark species and ”zebra” species.

**Diagnosis.** Species very close to *Z. fuscus* Desutter-Grandcolas, **n. sp.**, from which it can be separated by its bigger size and its white pattern of FIII outer side (Fig. 3G). It can be separated from other ”zebra” species by the lack of transverse white band on FIII, and white tergite in females (Fig. 5D). Male genitalia only slightly different from *Z. fuscus* Desutter-Grandcolas, **n. sp.** Female copulatory papilla short, its distal margin distinctly concave and distal angles acute (Fig. 7E, F).

**Description.** In addition to the characters of the genus. Base of antennae (30–36 antennomeres, mean 33 in males and females) and the scape dark brown, before a short white white ring (14–16 antennomeres). Basitarsomeres III with 4–5 inner, and 5–7 in males (mean 6.2) and 5–6 in females (mean 5.8) outer dorsal spines, in addition to apical ones. Head and body coloration shining black; maxillary palpi black brown; cerci black, somewhat lighter at base, but without a distinct clear basal ring; FI and FII black, with sometimes an indistinct lighter area on outer side; TI and TII somewhat reddish; FIII with a whitish band along outer margin, and an oblique one near outer basis; TIII dark reddish brown, with lighter spurs.

**Male:** FW not covering the tip of subgenital plate; mirror as in *Z. fuscus* Desutter-Grandcolas **n. sp.**; stridulatory file with about 106 teeth (n=1). Subgenital plate as on Fig. 2K.

**Male genitalia:** Very close to that of *Z. fuscus* Desutter-Grandcolas, **n. sp.** (compare Fig. 4G, H and 3I, J), but distal margin of pseudepiphallic parameres more straight, and median lophi slightly longer and less curved dorsally.

**Female:** Apterous. Abdomen shining black without white pattern (Fig. 5D). Subgenital plate wider than long, deeply concave distally; with acute and protruding lateral angles (Fig. 7E, F).

**Female genitalia.** Copulatory papilla short, subquadrangular, and somewhat thick; apex slightly concave (Fig. 7G–I).

**Measurements (in mm).**

| | Lpron | wpron | LFW | wFW | LFIII | wFIII | LTIII | File |
|---|---|---|---|---|---|---|---|---|
| Holotype | 2.1 | 3.2 | 6.8 | 5 | 7.3 | 2,9 | 4,9 | |
| Paratypes | 2,1 | 3,2–3.3 | 7.4 | 4,8–5 | 7,5–7.6 | 2.7–2.8 | 4.9 | 116 (n=1) |
| mean (n=3) | 2,1 | 3,2 | 7.2 | 4,9 | 7,5 | 2,8 | 4,9 | |

| | Lpron | wpron | LFIII | wFIII | LTIII | Lovip |
|---|---|---|---|---|---|---|
| Allotype | 2.3 | 2.9 | 7.4 | 2.8 | 4.9 | 5.2 |
| Paratypes | 2–2.2 | 2.9–3.1 | 7.4–7.7 | 2.8 | 4.8–4.9 | 4.6–4.9 |
| mean (n=3) | 2.2 | 3 | 7.5 | 2.8 | 4.9 | 4.9 |

**Calling song.** One male has been recorded in the field at 27°C (MNHN-EO-ENSIF3187). The calling song (Fig. 8D) is comprised of series of short echemes. Echeme duration is 0.05 ms, echeme period is 0.12±0.01 ms and duty cycle is 41%. Each echeme is composed of 3 syllables each with the duration of 0.01 ms, period 0.02 and the duty cycle is 50%; the dominant frequency of the calling song is 6.1 kHz.

### *Zebragryllus nauta* Desutter-Grandcolas, n. sp.

(Figs 2E, L, 3H, 4K, L, 5E, F, 7J–N)

http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:464248

**Type locality.** Peru, Loreto, Iquitos.

**Type material. Holotype:** Peru, Loreto, Iquitos, route de Nauta km 9, 1 male, 24.viii.1985, chasse de jour, L. Desutter (MNHN-EO-ENSIF3280). **Allotype:** Same locality and collector as the holotype, 1 female, 29.viii.1985, piège détergent (MNHN-EO-ENSIF3279).

**Distribution.** Western Amazonia, Peru, dept. Loreto.

**Etymology.** Species named after its type locality. Noun in apposition.

**Diagnosis.** Within the genus, very small species easily recognized by its coloration (head and pronotum shining dark brown, antennae brown, legs light yellowish brown without white marks, including FIII, Fig. 3H; female pattern little contrasted). **Male.** FWs entirely covering the abdomen, going slightly beyond subgenital plate; coloration light yellowish brown, translucent, with yellowish or brown veins. Stridulatory file with 65 teeth (n=1). **Male genitalia.** Pseudepiphallic sclerite long and triangular; lateral lophi dejected ventrally and not visible dorsally (Fig. 4K, L). **Female.** FWs long, reaching tergite 2 mid length, slightly overlapping (Fig. 5F); venation reticulate. Abdomen brown, tergite 3 yellowish (Fig. 5E). **Female genitalia.** Copulatory papilla rounded, with a ventral subapical, transverse crest (Fig. 7L–N).

**Description.** In addition of the characters of the genus: General coloration shining brown; head dark brown, area above epistemal suture, a thin line around the eyes and the area below antennal pits yellow, antennae light brown (no white ring before 70 antennomeres, where antennae are cut in the specimens at hand); maxillary palpi: joints 3 and 4 light brown, joint 5 light brown basally, otherwise black brown with yellowish distal margin; pronotum dark brown; legs light yellowish brown; cerci brown, their bases lighter. Basitarsomeres III with 4–5 (male) and 3 (female) inner, and 5–6 in male and 4–5 in female outer dorsal spines, in addition to apical ones.

**Male.** FWs entirely covering the abdomen, going slightly beyond subgenital plate; coloration light yellowish brown, translucent, with yellowish or brown veins. Mirror wider than long, subdivided into several cells (Fig. 2E); stridulatory file with 65 teeth (n=1). Subgenital plate as on Fig. 2L.

**Male genitalia.** Pseudepiphallic sclerite long and triangular (Fig. 4K, L); median lophi regularly narrowed toward apex; lateral lophi very short and completely dejected ventrally (thus no more visible dorsally, Fig. 4K); pseudepiphallic anterior margin deeply concave, but squared; pseudepiphallic parameres very short, in very anterior location; ectophallic apodemes long, making a kind of half cylinder around the endophallic sclerite; ectophallic fold narrow over its whole length, truncated apically.

**Female.** FWs quite long for the genus, reaching tergite 2 mid length, slightly overlapping (Fig. 5F); venation reticulate; FWs whitish brown, translucid, the lateral part of dorsal field lighter, veins brown. Abdomen brown, tergite 3 yellowish (Fig. 5E). Subgenital plate wider than long; distal margin slightly concave (Fig. 7J–K).

**Female genitalia.** Copulatory papilla having the shape of a thick almost circular sclerite, with a transverse preapical carina on ventral side (Fig. 7L–N); spermathecal duct widened basally.

**Measurements (in mm).**

| | Lpron | wpron | LFW | wFW | LFIII | wFIII | LTIII | File |
|---|---|---|---|---|---|---|---|---|
| Holotype | 1.6 | 2.5 | 5.6 | 3.8 | 5.7 | 2,2 | 3.8 | 65 |

| | Lpron | wpron | LFW | LFIII | wFIII | LTIII | Lovip |
|---|---|---|---|---|---|---|---|
| Allotype | 1.6 | 2.3 | 1.2 | 6 | 2.2 | 3.8 | 3.7 |


## Acknowledgments

We thank Hélène Le Ruyet (MNHN) for drawing the habitus of *Zebragryllus wittoto* Desutter-Grandcolas and Cadena-Casteñada, **n. sp.** JA and LDG field work in French Guiana was supported by CNRS Guyane, réserve des Nouragues, and by the Société des Amis du Muséum (MNHN).


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