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A new genus and species of cricket from the Chapada Diamantina National Park, northeastern Brazil (Grylloidea: Phalangopsidae; Luzarinae)

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Abstract

A new genus and species of Luzarinae cricket (Grylloidea, Phalangopsidae) is described from the Chapada Diamantina National Park, Bahia State, northeast Brazil. *Sishiniheia diamantina*, **n. gen. n. sp.** is described based in characters of external morphology and male genitalia and is characterized by the reduced FWs, absence of stridulatory file, thick longitudinal venation and the thin, pointed and curved pseudepiphallic arms.

Key words: Cricket, New Species, Semi-Deciduus Forest, taxonomy

Resumo

Um novo gênero e espécie de grilo da subfamília Luzarinae (Grylloidea, Phalangopsidae) é descrito do Parque Nacional da Chapada Diamantina, Bahia, nordeste do Brasil. *Sishiniheia diamantina*, **n. gen. n. sp.** é descrito baseado em caracteres de morfologia e genitália masculina e é caracterizado pelas asas reduzidas, ausência de fileira estridulatória, espessa venação longitudinal e braços pseudoepifálicos finos, pontiagudos e curvados.

Palavras-chave: Grilo, Espécie Nova, Mata Semidecídua, Taxonomia

Introduction

The Northeast Region of Brazil is one of the five political regions of the country, representing 18% of the territory, and including nine of 26 States. This large territory encompasses a unique biome, the Caatinga, which, together with the Cerrado, comprises the two Brazilian biomes characterized by open, savanna-like areas. The Caatinga is a remarkable semi-arid biome, exclusive of the northeast, with high mean annual temperatures and solar radiation, scarce and irregular rainfall, and consisting of a thorny shrub mosaic; scattered within the caatinga vegetation domain one finds smaller, localized patches of seasonally dry forests, normally in areas of higher elevations, like the Chapadas (Leal *et al*., 2005; Guedes *et al*., 2014). The other biomes located in the Northeast are: 1—the tropical Atlantic Forest along the coast of the eastern states of Paraíba, Pernambuco, Alagoas, Sergipe and Bahia, and a rather narrow stripe of transitional vegetation known as "Agreste" runs along all those states; 2—the Cerrado, on its northern areas, occurs between the Caatinga and the eastern limits of the Amazon Forest.

Although the Northeast is a large and diverse area, only nine species of Phalangopsidae have been reported from it. Six species are described from the Atlantic Forest: *Marcgraviella muriciensis* Souza-Dias, 2014 (Murici,

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Alagoas State), *Marcgraviella christianae* Desutter-Grandcolas & Souza-Dias, 2014 (São Lourenço da Mata, Pernambuco State) (Souza-Dias & Desutter-Grandcolas, 2014), and *Guabamima lordelloi* de Mello, 1992, *Aracamby mucuriensis* de Mello, 1992, *Izecksohniella aimore* de Mello, 1992, and *Cacruzia bahiana* de Mello, 1992, from Mucuri, State of Bahia (de Mello, 1992a, b). Only one species is described from the Cerrado domain, *Dyscophogryllus castaneus* Bruner, from Rio Sapão (Sapão river, Bahia State), and two from the Caatinga, the species *Endecous ubajarensis* Zefa, 2014 from Ubajara National Park, Ceará State (Zefa *et al*., 2014), and *Endecous apterus* Bolfarini & Souza-Dias, 2014 from caves of Ituaçu, Bahia (Souza-Dias *et al*., 2014). The latter is the first troglobitic cricket reported from Brazil (Souza-Dias *et al*., 2014).

The Chapada Diamantina National Park, with 152,000 ha, located in Bahia State, was created in 1985. The most characteristic vegetation type of Chapada Diamantina is the Campo Rupestre, a savanna-like phytophisiognomy of the Cerrado occurring in high elevations, usually above 800m (Bornschein *et al*., 2007). At low elevations, the Chapada Diamantina National Park is covered by the Cerrado, and mainly the Caatinga, but just on the eastern outskirts of the city of Lençóis, an area covered by sub-montane semi-deciduous seasonal forest is found (Funch *et al.* 2005).

In this study we describe a new genus and species of phalangopsid cricket from the sub-montane semi-deciduous seasonal forest of Chapada Diamantina National Park, Bahia.

Material and methods

The photographs of external body morphology (Fig. 1) were taken with specimens immersed in 85% ethanol using a Discovery V20 Zeiss stereomicroscope with Axio Vision System; the same equipment was used to photograph male and female genitalia (Fig. 2).

The phallic complex was removed and treated with a water solution of 10% KOH for 24 h at room temperature to remove muscular tissues. The specimens were examined, described and compared using a Leica MZ-9.5 and Discovery V8 Zeiss stereomicroscopes. Drawings were made under a *camera lucida* attached to a Discovery V8 Zeiss stereomicroscope.

For scanning electron microscopy (SEM) analysis, a male specimen was dissected, having its forewing and thorax (including pronotum, mesonotum and metanotum) removed. The sample was dehydrated in a graded ethanol series until ethanol 100%, critical point dried using CO_2 as intermediate, mounted on stubs and coated with gold. The sample was analyzed using a Scanning Electron Microscope Zeiss SIGMA VP at the Instituto de Biociências da Universidade de São Paulo (Biosciences Institute of the University of São Paulo).

All the specimens studied were collected by means of active searching at night or by means of pitfall traps containing ethanol installed on the leaf litter of the semi-deciduous forest just next to the city of Lençóis, State of Bahia, Brazil.

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

Abbreviations employed for male genitalia. **Arc**—ectophallic arc; **Arm**—pseudepiphallic arm; **EctAp**—ectophallic apodeme; **End Ap**—endophallic apodeme; **End Sc**—endophallic sclerite; **PsP1**—pseudepiphallic paramere 1; **PsP2**—pseudepiphallic paramere 2; **R**—ramus; **V.P.Ec**—ventral projection of ectophallic invagination.

Abbreviations employed for measured structures (mm). AWP—anterior width of pronotum; **HW**—head width; **IOD**—intra-ocular distance; **LFIII**—length of hind femur; **FWL**—forewing length; **PL**—pronotum length; **PW**—pronotum width (at mid-line); **LBt-III**—length of basitarsus III; **LTIII**—length of hind tibia; **OL**—ovipositor length; **PWP**—posterior width of pronotum; **WFIII**—width of hind femur; **FWW**—forewing width (at mid-line).

Repositories. MZSP, Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil; Zoology Department Insect Collection (Coleção de Insetos do Departamento de Zoologia), Instituto de Biociências, Universidade Estadual Paulista—UNESP—São Paulo State University, Botucatu campus; MPEG, Museu Paraense Emílio Goeldi, Belém, Brazil.

Results

Sishiniheia de Mello & Souza-Dias n. gen.

Etymology. Taxon named after Brazilian entomologist Silvio Shigueo Nihei.

Type species. *Sishiniheia diamantina* de Mello & Souza-Dias, n. sp.

Diagnosis. Head and pronotum with few bristles. Metanotum with glandular area composed of two rounded, whitish humps. Male FWs coriaceous, glabrous, somewhat reduced, internal margins of left and right ones touching but not overlapping, distal margins round, bearing a conspicuous yellowish border (Figs. 1A–C), stridulatory file or any specialized veins or areas for sound production and propagation absent; thick longitudinal venation present, perpendicular veinlets weak; glandular thickening under posterior margins absent; hind wings absent. **Male genitalia**. Ventral projection of the pseudepiphallus present, almost reaching the PsP1; pseudepiphallic arms thin, the apex pointed and curved inwards; rami elongated; PsP2 located between the pseudepiphallic arms, highly sclerotized, large and conspicuous, with two projections curved inwards, resembling a "C". **Female**. Larger and more robust than male; FW's even more reduced than those of male.

Description. Occiput and vertex without bristles (Fig. 1B). Fastigium below vertex level, wider than long, slightly narrowed toward the apex, and narrower than scape (Figs. 1B, D, E).Maxillary palpi dark brown, thin, long, specially joints 3 to 5; apical third of joint 5 curved, the apex whitish (Figs. 1D, E, H); antenomeres medium brown, with interspersed light brown antenomeres. Three large, circular ocelli present (Figs. 1D, E, H). Dorsal disk of pronotum wider than long (Figs. 1B, E), its cephalic and caudal margins sub-straight (Fig. 1B); ventro-cephalic angle of lateral lobes rounded, ventro-caudal margin gradually ascendant (Fig. 1E). TIII sub-apical spurs 4/4, with serrulation between and above them; apical spurs 3/3, more developed on inner face; inner apical spurs: dorsal one the longest (iad), median slightly shorter (iam), ventral the smallest (iav) (iad>iam>iav); outer apical spurs: dorsal one the longest (oad), median slightly shorter (oam), ventral the smallest (oav) (oad>oam>oav).

Male. Metanotum with glandular area composed of two rounded projections (Figs. 1F, G; 4 A–D); metanotal structures: a pair of projections, and a pair of fossae (Figs. 4A–D). Male FWs coriaceous, glabrous, reduced, without stridulatory file or specialized veins for sound production (Figs. 1A, B, E); longitudinal venation thick, perpendicular venation weak (Figs. 1B, E); glandular thickening absent. Hind wings absent. Supra-anal plate as in Fig. 1K; shield-shaped. Subgenital plate pubescent, concave, posterior margin as in Fig. 1L.

Male genitalia. **Pseudepiphallus**: pseudepiphallic sclerite transverse; pseudepiphallic sclerite constricted on its median part, with a small apodeme (Figs. 2A, 3A); pseudepiphallic arms thin, with pointed apex, its distal half curved inwards (Figs. 2A–C, 3A–D). Pseudepiphallic ventral projection present, weak sclerotized, almost reaching the small PsP1, and linked to it by a membrane (Figs. 2B, C, 3B, C). Rami elongated, not directly connected to the pseudepiphallic sclerite, longer than the pseudepiphallic arms and ectophallic apodeme (Figs. A–B, 3A–B). Pseudepiphallic parameres 2 (PsP2) located between the pseudepiphallic arms, well developed, and highly sclerotized (Figs. 2A–B, 3A–C); PsP2 with two projections curved inwards, resembling a "C" (Figs. 2A, C). Pseudepiphallic parameres 1 (PsP1) small, linked to the pseudepiphallic ventral projection by a membrane (Figs. 2B, 3B). **Ectophallic invagination**: ectophallic apodemes short (Figs. 2A, 3A); ectophallic arc straight, located right below the median part of the pseudepiphallic sclerite, in dorsal view (Figs. 2A, 3A); dorsal projections of the ectophallic invagination absent; ventral projections of the ectophallic invagination longer than the ectophallic apodemes (Figs. 2B, 3B); ectophallic fold completely membranous. **Endophallus**: endophallic sclerite and apodeme up-curved (Fig. 2A–C, 3A–C), bearing a small endophallic crest; pair of lamellar apodemes very reduced in comparison to those of related genera (see below) (Figs. 2B, C).

Female. Larger than male; general coloration medium brown, marbled (Fig 1C). Female FWs similar to those of male but even more reduced, also with thick longitudinal venation, internal margins of left and right wings not touching each other (Fig. 1C). Subgenital plate short, distal margin bilobate (Fig. 1J). Supra-anal as in Fig. 1I, its distal margin rounded.

Female genitalia. Copulatory papilla longer than wide, apex and basis rounded as in Figs. 2D–F.

Systematic relationships. *Sishiniheia* **n**. **gen**. was compared to *Guabamima* de Mello, 1992, *Mellopsis* Mews & Sperber, 2010, and *Pizacris* Souza-Dias & Desutter-Grandcolas, 2015. All these genera share similar morphological characters, mainly regarding male genitalia, as the great development of the PsP2, and the elongated

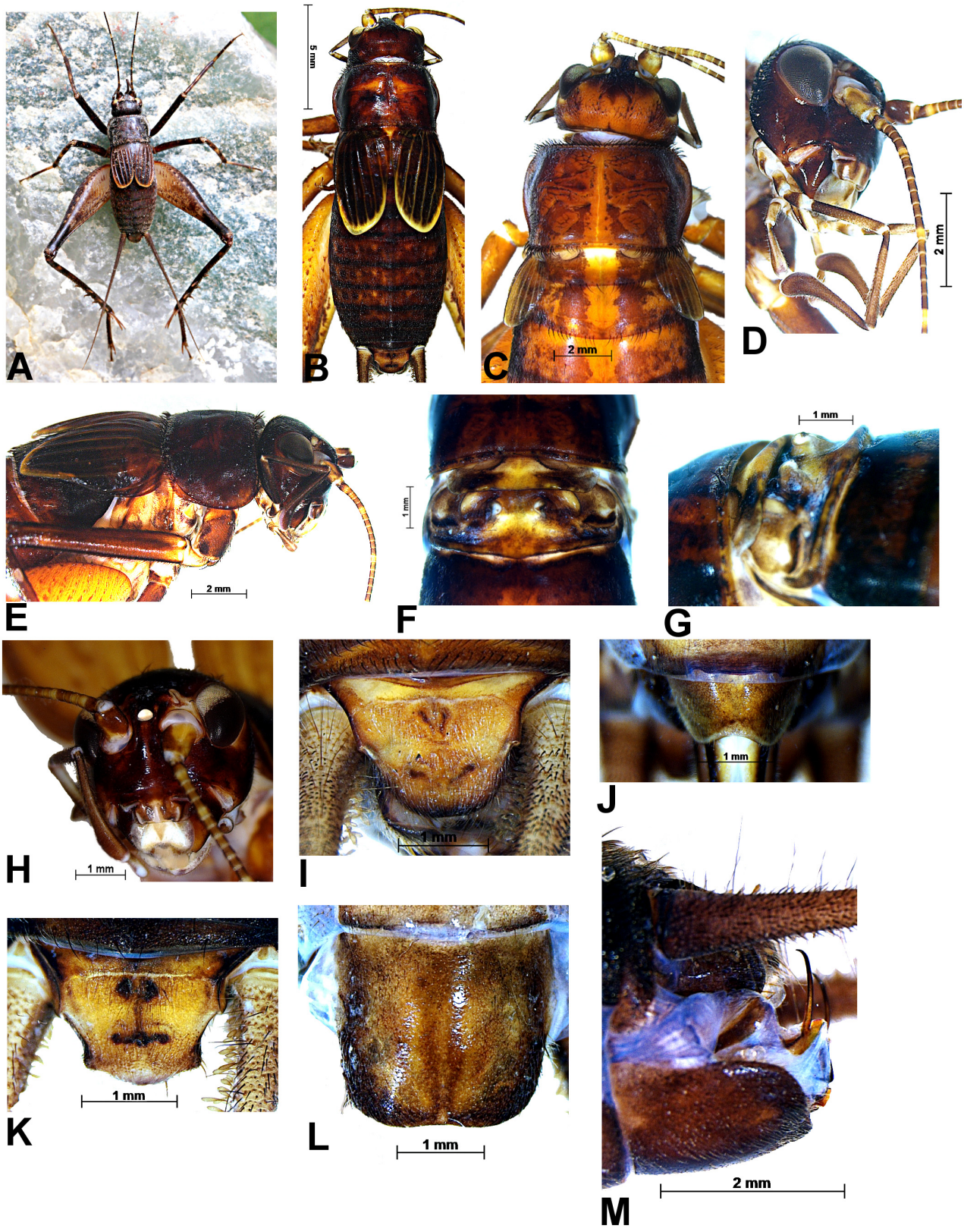

FIGURE 1. *Sishiniheia diamantina*, **n. gen. n. sp**. General morphology. A—male habitus (living individual), dorsal; B—holotype (male) habitus, dorsal; C—female head and pronotum, dorsal; D—male head and palpus; E—male head, pronotum and FW, lateral; F—male metanotum, dorsal; G—male metanotum, lateral; H—male head, frontal; I—female supra-anal plate; J—female subgenital plate; K—male supra-anal plate; L—male subgenital plate; M—male terminalia, lateral.

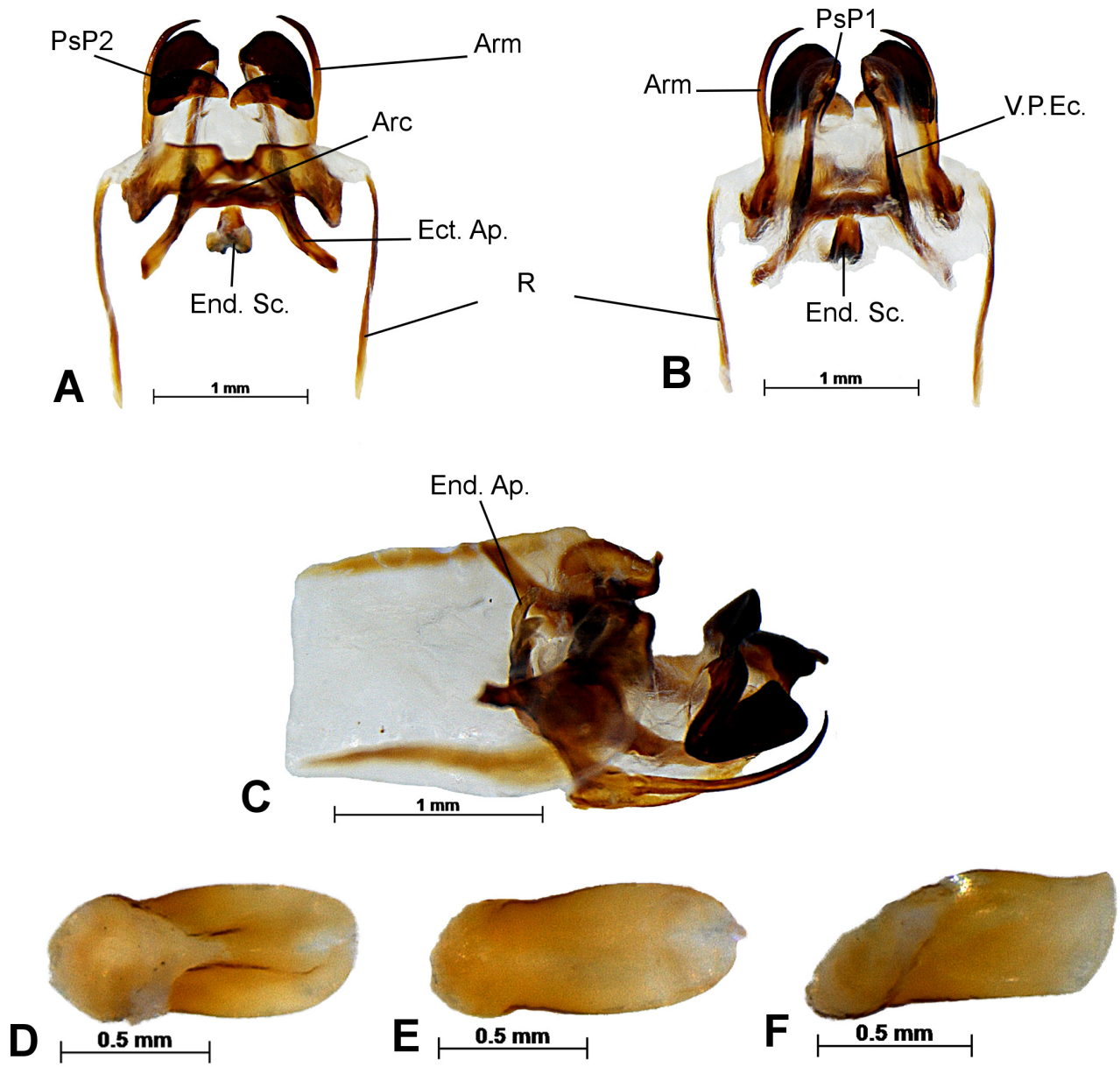

FIGURE 2. *Sishiniheia diamantina*, **n. gen. n. sp.** Male genitalia in dorsal (A), ventral (B) and lateral (C) view. Female copulatory papilla in dorsal (D), ventral (E) and lateral (F) view.

rami. In *Guabamima* and *Sishiniheia* **n. gen**. the pseudepiphallic arms are lateral, pointed, not tubular; in *Pizacris* and *Mellopsis*, the pseudepiphallic arms are ventrally-oriented. The phylogenetic relationships among these genera, however, are unknown; a cladistic analysis of Neotropical Luzarinae, with the inclusion of *Sishiniheia* **n. gen.**, are being performed. For more information about the male genitalia of these genera see Souza-Dias *et al*. (2015).

***Sishiniheia diamantina* de Mello & Souza-Dias n. sp.**
Figures 1–4
http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:477668

Type locality. Brazil, Bahia State, Lençóis, Parque Nacional da Chapada Diamantina. 12°35'16"S, 41°24'35"W.

Etymology. The specific epithet refers to the Chapada Diamantina, type locality of this species.

Type material. Holotype, allotype, 20 male paratypes, 8 female paratypes. **Holotype** : BRASIL, BA [Bahia], Lençóis, Pq. Nac. [National Park] da Chapada Diamantina. 12º35'16"S 41º24'35"W. Alt.: 600–900m. 13-

19.ii.2013. de Mello *leg*. CNPq-SISBIOTA (MZSP). **Allotype** (copulatory papilla removed and kept with the allotype): same data as the holotype (MZSP). **Paratypes**: 7 males, 4 females paratypes, same data as the holotype (MZSP); 1 male paratype, same data of the holotype, labeled 'GRYLLO/CDI/NB0FG', with complex phallic removed and kept with the specimen (MZSP); 1 male paratype, same data of the holotype, labeled 'GRYLLO/CDI/9B918', with thorax removed for SEM analysis (MZSP); 1 male, 1 female paratypes, same data as the holotype (MPEG); 10 males, 3 females paratypes, same data as the holotype (Departamento de Zoologia, Instituto de Biociências, Universidade Estadual Paulista, Botucatu).

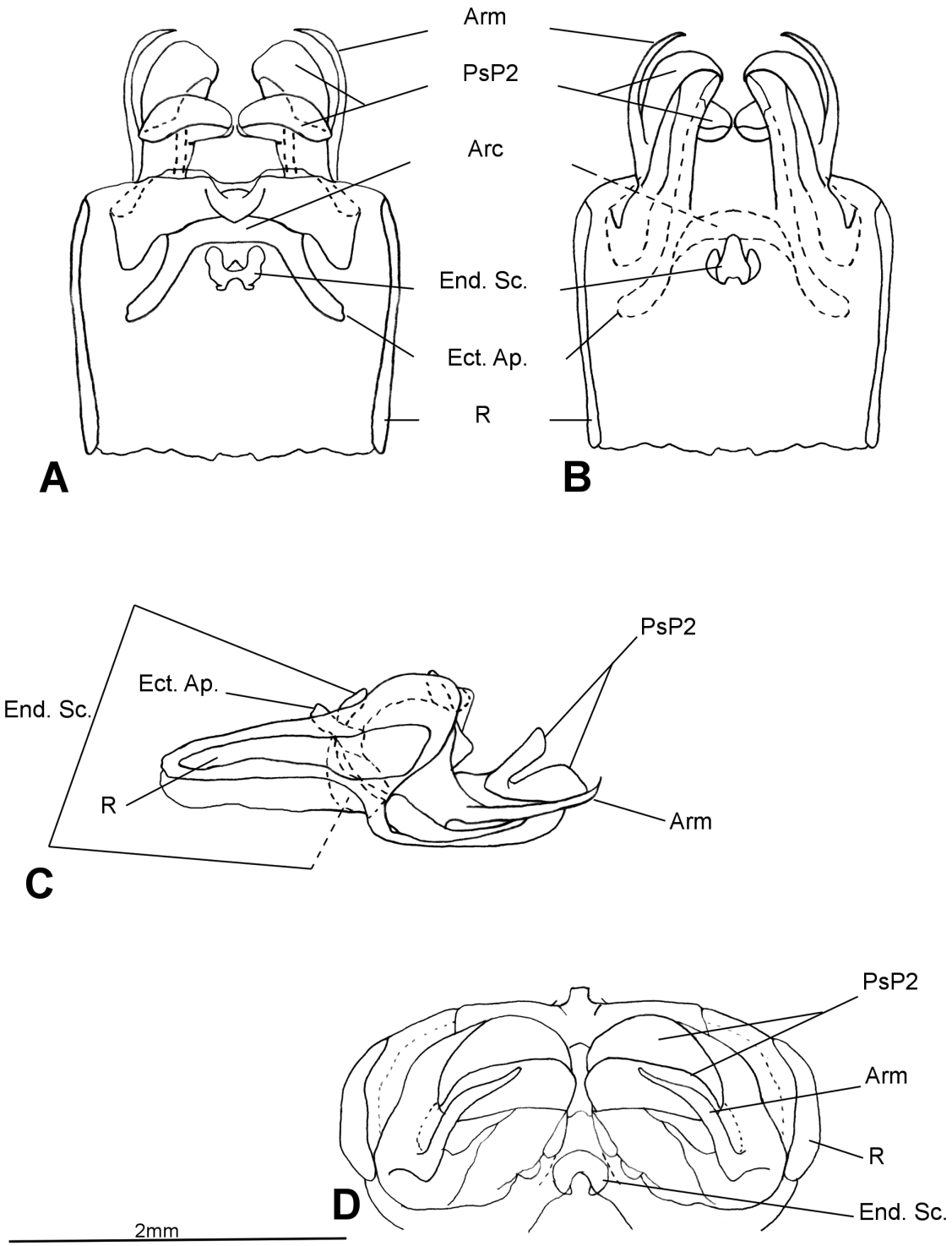

FIGURE 3. *Sishiniheia diamantina*, **n. gen. n. sp. .** Genitalia. Male genitalia in dorsal (A), ventral (B), lateral (C) and superior (D) view.

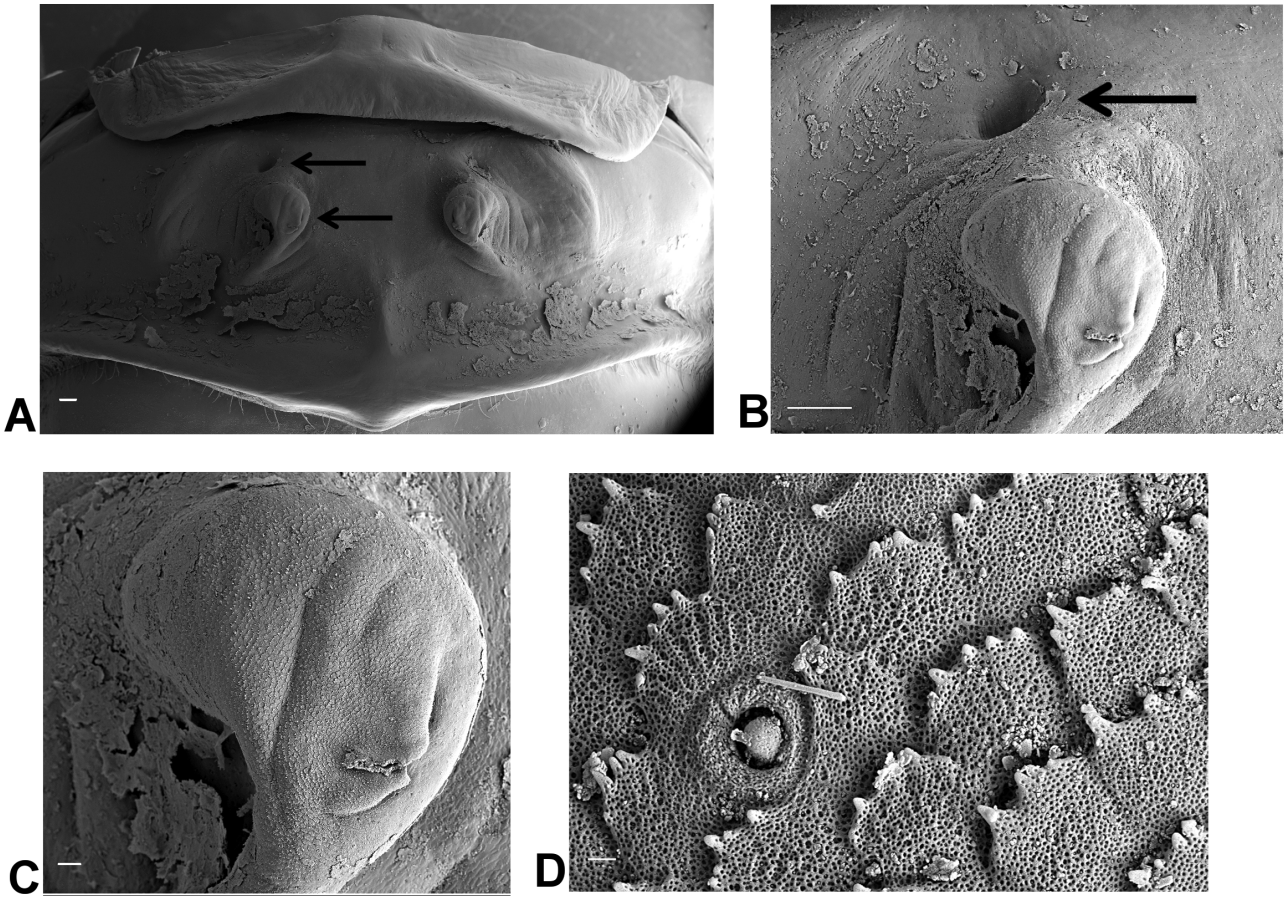

FIGURE 4. *Sishiniheia diamantina*, **n. gen. n. sp.** Male metanotum. A—general morphology of male metanotum, showing the metanotal structures (arrows); B—metanotal projection, the arrow indicates the fossa; C—detail of the metanotal projection; D—detail of the epithelium of the metanotal projection.

Diagnosis. General coloration dark brown, almost uniform. Occiput, vertex and fastigium dark brown, with small bristles; frons and gena dark brown. Pronotum dark brown; metanotum with glandular area composed of two rounded, whitish humps. Male FWs dark brown, coriaceous, glabrous, reduced, not surpassing the third tergite; longitudinal venation yellowish and connected to the rounded apex of the FW; glandular thickening absent; hind wings absent. Tergites dark brown, with medium brown spots; without tergal glands. Male and female genitalia as described for the genus.

Description. In addition to the characters of the genus:

Head. Occiput and vertex dark brown, without bristles (Fig. 1B). Fastigium dark brown, with small bristles (Figs. 1B, D, E). Antennal scape medium brown, dark brown on inner face (Figs. 1B, D, H). Frons and gena dark brown; frons with a thin, medium brown, vertical stripe (Figs. 1D, E, H).

Thorax. Pronotum DD dark brown, with short bristles restricted to the cephalic and caudal margins (Figs. 1B, E); DD cephalic and caudal margins sub-straight (Fig. 1B); LL ventro-cephalic angle rounded, ventro-caudal margin gradually ascendant (Fig. 1E).

Legs. TI bearing a large tympanum on both sides; FI and FII dark brown, not annulated (Fig. 1A); TI and TII dark brown annulated with medium brown (Fig. 1A); TI with two same-sized ventral apical spurs; TII with two inner and two outer apical spurs. Posterior legs not annulated (Fig. 1A). FIII medium to light brown, with medium brown diagonal, thin stripes on outer face, apical third medium brown. TIII dark brown. Basitarsus III yellowish brown, with a double row of spines.

Abdomen. Abdomen pubescent; tergites dark brown, with medium brown spots (Figs. 1A, B); without tergal glands. Sternites medium brown. Cerci dark brown. Supra-anal plate pubescent, medium brown; with dark brown maculae in the center (Fig. 1K); proximal margin slightly concave; distal margin rounded, with very short extended angles(Fig. 1K). Subgenital plate pubescent, medium brown (Fig. 1L).

Male. Male FWs dark brown with longitudinal veins yellowish and connected to the apex (Figs. 1A, B). FWs covering part of the abdomen, not surpassing the third tergite (Figs. 1A, B); posterior part of internal margin and apex yellowish (Figs. 1A, B, E); internal margins well separated over its length or touching at the median part (Fig. 1B); apex rounded, not truncated distally.

Male genitalia as described for the genus.

Female. Larger than male; general coloration medium brown, marbled (Fig 1C). Female FWs similar to those of male, even more reduced, also bearing yellowish longitudinal veins (Fig. 1C). Subgenital plate short, distal margin bilobate (Fig. 1J). Supra-anal plate similar to male, distal margin rounded (Fig. 1I).

Female genitalia as described for the genus.

Measurements (mm). Males (n=10): HW—3.42 (3.25–3.75); IOD—1.54 (1.35–1.80); PL—2.72 (2.20–3.10); AWP—3.61 (3.50–4); PWP—4.05 (3.50–4.50); PW—4.66 (4.25–5.00); FWL—4.66 (3.80–5.55); FWW—2.67 (2.30–3.25); LFIII—14.71 (12.90–17.55); WFIII—3.77 (3.50–4.20); LTIII—13.27 (12.15–15); LBt-III—4.19 (3.70–5).

Females (n=5): HW—3.81 (3.60–4); IOD—1.77 (1.70–1.85); PL—2.68 (2.25–3); AWP—4.14 (3.95–4.45); PWP—4.91 (4.55–5.20); PW—5.32 (4.85–5.55); FWL—2.65 (2.25–3); FWW—1.77 (1.35–1.95); LFIII—15.66 (13.50–15.15); WFIII—4.12 (4–4.50); LTIII—15.51 (14.55–17.25); LBt-III—4.16 (3.70–4.70); OL—16.32 (15–17.25). .

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References

Bornschein, M.R., Mauricio, G.N., Belmonte-Lopes, R. & Bonatto, S.L. (2007) Diamantina Tapaculo, a new *Scytalopus* endemic to the Chapada Diamantina, northeastern Brazil (Passeriformes: Rhinocryptidae). *Revista Brasileira de Ornitologia*, 15 (2), 151–174.

De Mello, F.A.G. (1992a) *Aracamby*, *Cacruzia* and *Izecksohniella*: Three new Genera of Phalangopsid Crickets from the Brazilian Coastal Forests (Orthoptera: Grylloidea). *Journal of Orthoptera Research*, 1, 50–58. http://dx.doi.org/10.2307/3503560

De Mello, F.A.G. (1992b) A new genus of long-legged crickets from the forests of eastern Brazil (Orhoptera: Grylloidea: Phalangopsidae). *Revista de Agricultura,* 67 (2), 125–131.

Funch, L.S., Funch, R.C., Harley, R., Giulietti, A.M., Queiroz, L.P., França, F., Melo, E., Gonçalves, C.N. & Santos, T. (2005) Florestas Estacionais Semidecíduas. *In:* Juncá, F.A., Funch, L. & Rocha, W. (Orgs.), *Biodiversidade e Conservação da Chapada Diamantina*, Ministério do Meio Ambiente, Série Biodiversidade No. 13, pp. 191–193.

Guedes, T.B., Sawaya, R.J. & Nogueira, C.C. (2014) Biogeography, vicariance and conservation of snakes of the neglected and endangered Caatinga region, north-eastern Brazil. *Journal of Biogeography*, 41 (5), 919–931. http://dx.doi.org/10.1111/jbi.12272

Leal, I.R., Silva, J.M.C., Tabarelli, M. & Lacher, T.E. Jr. (2005) Changing the course of biodiversity conservation in the Caatinga of northeastern Brazil. Conservation Biology, 19 (3), 701–706. http://dx.doi.org/10.1111/j.1523-1739.2005.00703.x

Souza-Dias, P.G.B., Bolfarini, M.P., Nihei, S.S. & De Mello, F.A.G. (2014) *Endecous apterus*: a new species of cave cricket from northeast Brazil, with comments on the use of subterranean habitats by Luzarinae crickets (Orthoptera: Grylloidea: Phalangopsidae: Luzarinae). *Zootaxa*, 3784 (2), 120–130. http://dx.doi.org/10.11646/zootaxa.3784.2.2

Souza-Dias, P.G.B. & Desutter-Grandcolas, L. (2014) A new genus and two new species of Luzarinae cricket from the Atlantic Forest of Northeast Brazil (Orthoptera, Grylloidea).*Zootaxa*, 3872 (5), 498–512. http://dx.doi.org/10.11646/zootaxa.3872.5.4

Souza-Dias, P.G.B., Desutter-Grandcolas, L. & Pereira, M.R. (2015b) *Pizacris*: a new genus and two new species of Luzarinae cricket close to *Guabamima* de Mello, 1992 and *Mellopsis* Mews & Sperber, 2010 (Orthoptera: Grylloidea: Luzarinae). *Zootaxa*, 3956 (3), 374–388.

http://dx.doi.org/10.11646/zootaxa.3956.3.3
Zefa, E., Redu, D.R., Costa, M.K.M., Fontanetti, C.S., Gottschalk, M.S., Padilha, G.B., Silva, A.F. & Martins, L.P. (2014) A new species of *Endecous* Saussure, 1878 (Orthoptera, Gryllidae) from northeast Brazil with the first X_1X_20 chromosomal sex system in Gryllidae. *Zootaxa*, 3847 (1), 125–132.
http://dx.doi.org/10.11646/zootaxa.3847.1.7