



## A new genus of katydid from the Amazon Rainforest (Orthoptera: Tettigoniidae; Phaneropterinae; Steirodontini): Ninth contribution to the suprageneric organization of the Neotropical phaneropterines

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### Abstract

*Emsleyfolium diasae* n. gen. et n. sp., from the Brazilian, Colombian, Ecuadorian and Peruvian Amazon is described in this contribution. This new genus is morphologically very similar to *Stilpnochlora*, but is distinguished from the other Steirodontini genera by its cone-head (similar to some genera of subfamily Conocephalinae, e.g. *Neoconocephalus* and *Bucrates*), modification of the tenth tergite into three lobes and absence of styles on subgenital plate. Thanatosis behavior is described as a defense mechanism.

**Key words:** Phaneropterinae, *Stilpnochlora*, giant katydids, cone-head, thanatosis, distribution

### Resumen

*Emsleyfolium diasae* n. gen. et n. sp., proveniente de la amazonia brasileña, colombiana, ecuatoriana y peruana, es descrito en la presente contribución. Este nuevo género muy similar en apariencia a *Stilpnochlora*, se distingue de los demás géneros de la tribu Steirodontini por la forma de cono del fastigio del vértex (similar a algunos géneros de la subfamilia Conocephalinae como *Neoconocephalus* y *Bucrates*), modificación del décimo terguito en tres lóbulos y ausencia de estilos en la placa subgenital. El comportamiento de tanatosis es descrito como un mecanismo de defensa.

**Palabras clave:** Phaneropterinae, *Stilpnochlora*, esperanzas gigantes, cabeza cónica, tanatosis, distribución

### Resumo

*Emsleyfolium diasae* n. gen. et n. sp., da Amazônia do Brasil, Colômbia, Equador e Peru está descrito na presente contribuição. Este novo género é muito similar na aparência ao *Stilpnochlora*, mas se distingue de outros géneros da tribo Steirodontini, pela forma de cone do fastígio-vértice (semelhante a alguns géneros de subfamília Conocephalinae como *Neoconocephalus* e *Bucrates*), modificação do décimo tergito em três lóbulos e na ausência de estilos na placa subgenital. O comportamento de tanatose é descrito como mecanismo de defesa.

**Palavras chave:** Phaneropterinae, *Stilpnochlora*, esperanças gigantes, cabeça cônica, tanatose, distribuição

## Introduction

The Amazon rainforest covers most of Bolivia, Brazil, Colombia, Ecuador, Guyana, French Guiana, Peru, Suriname and Venezuela, being one of the largest biodiversity hotspots of the world. This region has a great diversity of phaneropterine katydids and that is where the greatest number of genera and species have been reported for the Neotropics (Eades *et al.*, 2016). The tribe Steirodontini, which name refers to the dentate pronotal carinae typical of the group is no exception, since all genera described to date presented highest species number in the Amazon Rainforest (Emsley, 1970; Eades *et al.*, 2016).

Currently there are three genera in this tribe, which are *Steiroidon* Serville, 1831, with 33 species, *Stilpnochlora* Stål, 1873 with 16 species and *Cnemidophyllum* Rehn, 1917 with 7 species, (Eades *et al.*, 2016). Although there is no single character that distinguishes this tribe from others, the morphological similarity of the taxa suggests that the Steirodontini are a monophyletic group (Emsley, 1970).

This paper describes *Emsleyfolium* n. gen., a new monotypic genus belonging to the tribe Steirodontini, which has close similarity to *Stilpnochlora* Stål, 1873 in its general appearance. The specimens were collected in the Amazon rainforest of Brazil, Colombia, Ecuador and Peru.

This is the ninth contribution in a series of publications of the Neotropical Phaneropterinae and related papers (Cadena-Castañeda, 2011, 2012, 2013a, 2013b, 2014a, 2014b, 2014c, 2015a, 2015b, 2015c, 2015d; Cadena-Castañeda & Gorochoy, 2012, 2013; Gorochoy & Cadena-Castañeda, 2015; Sovano & Cadena-Castañeda, 2015; Cadena-Castañeda *et al.*, 2015), which has as its main objective contribute to the organization of Neotropical Phaneropterinae at tribal, generic and at specific level.

## Material and methods

The studied specimens are deposited in the Colección de Artrópodos y otros Invertebrados de la Universidad Distrital Francisco José de Caldas, Bogotá, Colombia (CAUD) and Coleção de Invertebrados of Instituto Nacional de Pesquisas da Amazônia, Amazonas, Brazil (INPA). The side view photographs of the specimens have been taken using a Nikon D3000 and Sony  $\alpha$ -300 digital cameras, with an 18–65 mm macro lens. The other images were taken with a Leica DFC295 attached on a stereoscopic microscope M205.

The measurements are defined as follows: *Body Length* (BL), distance from the front to the abdominal apex, excluding ovipositor; *pronotum dorsal length* (Pr), maximal distance from the anterior to posterior pronotal margins; *tegmina length* (Teg), distance from the humeral sinus to apex; *hind femur length* (HF), from the base to the genicular lobes; *hind tibiae length* (HT), *subgenital plate length* (SP), distance from its base to its apex.

## Results and discussion

### *Emsleyfolium* n. gen.

**Diagnosis.** Fastigium of vertex conical, extending considerably forward. Lateral margins of the pronotal disc finely serrated, lateral lobes of pronotum wider than long. Male macropteris, tegmina lanceolate. Tympanum of the foretibiae mostly covered, both inside and outside. Mid and hind femora latero-laterally flattened, basal half portion dilated. Tenth tergite modified into three lobes that covers the epiproctus and paraproctus. Cerci simple and curving inward. Subgenital plate without styli.

**Type species:** *Emsleyfolium diasae* n. sp., described below.

**Description.** *Head* (Fig. 1B–D). Head more or less elongated. Fastigium of vertex conical, longer than scapus and pedicellus together, being prolonged towards the front, moderately flattened latero-laterally and frontally ovoid (longer than wide), partially covered by the lower edge of the apex of the fastigium frontis (the fastigium of vertex is similar to the species of some genera of the subfamily Conocephalinae as *Neoconocephalus* Karny, 1907 and *Bucrates* Burmeister, 1838). Antennae filiform, longer than the body, scapus 2.5 times longer than the pedicellus. Ocelli rounded and conspicuous, lateral ocelli placed at the base of the fastigium of vertex; frontal ocellus in the middle of the lower margin of the antennal sockets, well defined and comparatively large. Eyes globose and middle sized relative to size of the head. Face longer than wide, frons slightly pronounced and smooth, genae delimited from the frons by the genal carinae; mandibles and clypeus symmetrical. *Thorax* (Fig. 1C–E).

Pronotum smooth; pronotal disc flat, metazona wider than prozona and mesozona; anterior margin of pronotal disc concave and posterior margin rounded; lateral carinae finely denticulate; principal transverse sulcus present and straight, across from the anterior to the posterior edge. Lateral lobes of pronotum slightly wider than width with a sulcus delimited the prozona and metazona. Humeral sinus developed. Thoracic auditory spiracle oval, covered in lateral view by the lateral lobe of pronotum. Prosternum unarmed, meso and metasternal lobes triangular and elongated, with lateral edges slightly elevated; meso and metasternal medial plate wider than high without tubercles. *Wings* (Fig. 1A). In male fully developed. Tegmina coriaceous, elongate, lanceolate, surpassing apices of hind femora; hindwings slightly protruding from the apex of tegmina. *Legs* (Fig. 1F–H). Coxal spine of the forelegs reduced, mid and hind coxae without tubercles or spines. Fore, mid and hind femora armed ventrally only on inner margin with small serrated denticulations; mid and hind tibiae laterally compressed and dilated in basal half. Tympanic opening of foretibia mostly covered on inner and outer sides with a narrow, straight slit. *Abdomen* (Fig. 1I–K). Dorsal surface of abdominal tergites smooth and unmodified.

**Male.** Tegmina longer than wide. MA vein extending a little more than half the total length of tegmina; Rs vein originating on half of the length of the tegmina, R vein with two additional branches near the apex. Tenth tergite modified with two lateral lobes of similar shapes and one additional central lobe, thinner and a little more pronounced than the other ones; the tenth tergite covers the epiproctus. Cerci simple, curved upwards and inwards, covered by numerous bristles. Epiproctus triangular, slightly longer than wide, with a rounded apex. Subgenital plate rectangular, longer than wide and without styles, instead has two pseudo-styli prolongations.

**Female.** Unknown.

**Distribution.** Distributed in amazon region from Ecuador, Peru, Colombia and Brazil (Fig. 3).

**Etymology.** The genus name is dedicated to Michael G. Emsley, in recognition of his valuable contribution in the study of the tribe Steirodiontini and other Phaneropterinae groups. The Latin word: *-folium* is added (as termination), which refers to the leaf shape of the tegmina of the species here described.

**Comparison.** *Emsleyfolium* n. gen. differs from other Steirodiontini (except most *Stilpnochlora* species and the subgenus *Steirodon* (*Frontinus*), lacking the well-developed spines or teeth in the pronotal disk, in addition of the conical shape of the fastigium of vertex (not present in the other Steirodiontini genera). In general appearance it resembles *Stilpnochlora*. Besides that, the new genus has underdeveloped coxal spine of the forelegs, and differs in not having the whitish band across its face (common in *Stilpnochlora* species). Also the new genus is distinguished by having a more covered tibial auditory tympanum than *Stilpnochlora* species. In addition the tenth tergite is modified and the subgenital plate does not bear styles.

As to the modification of the terminalia, *Emsleyfolium* n. gen., has resembles *Cnemidophyllum* Rehn, 1917 species; but the new genus has pseudo-styli prolongation on its subgenital plate and the tenth tergite modified into three lobes, covering the epiproctus. In contrast, *Cnemidophyllum* species has only one species without styles on the subgenital plate, and the other species have the tenth tergite modified into a single prolongation.

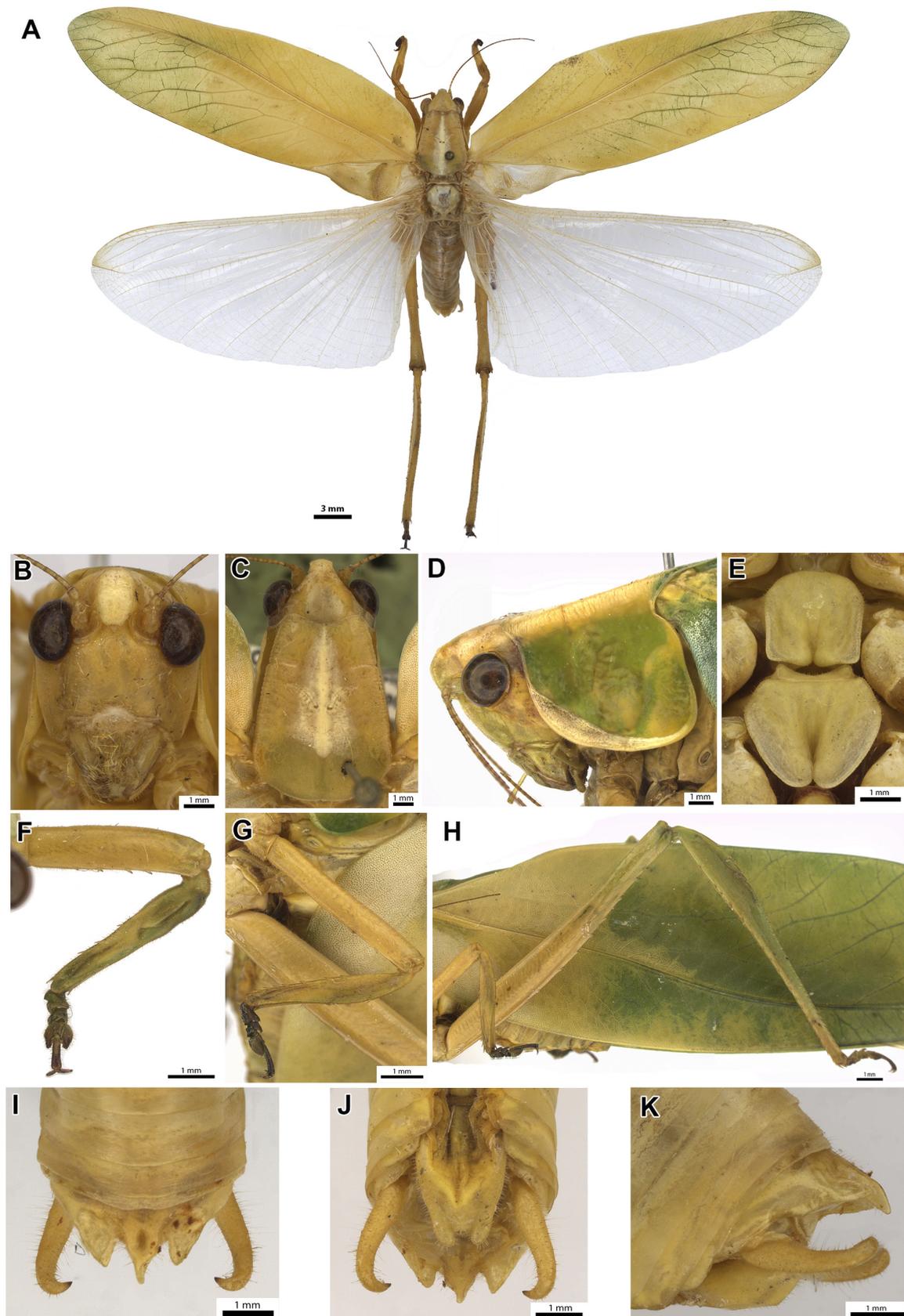
**Commentaries.** This genus is distinguished by the characters provided in the diagnosis and description, but being a genus with only one known species, it is possible the discovery of new species, in which case the description and diagnosis should be amended or supplemented; for example, the shape of the tenth tergite of males and basal dilatation of the mid and hind tibiae, which may vary in size and shape, as in *Cnemidophyllum* species.

### ***Emsleyfolium diasae* n. sp.**

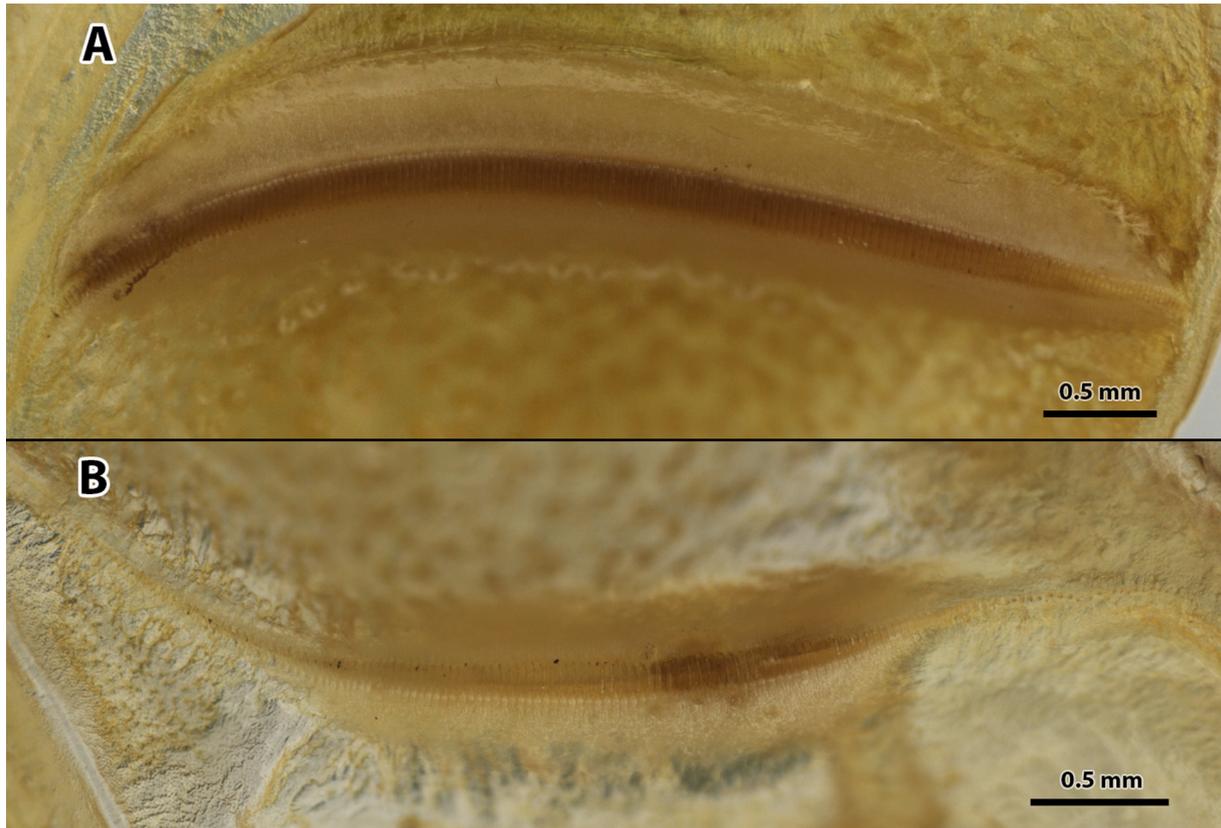
<http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:479184>

**Holotype:** ♂. Colombia, Amazonas, PNN Amacayacu, ~170 m. 3°20'29.44"S, 70°12'24.69"W. 9 Nov. 2014. C. Rodríguez *leg.* (CAUD).

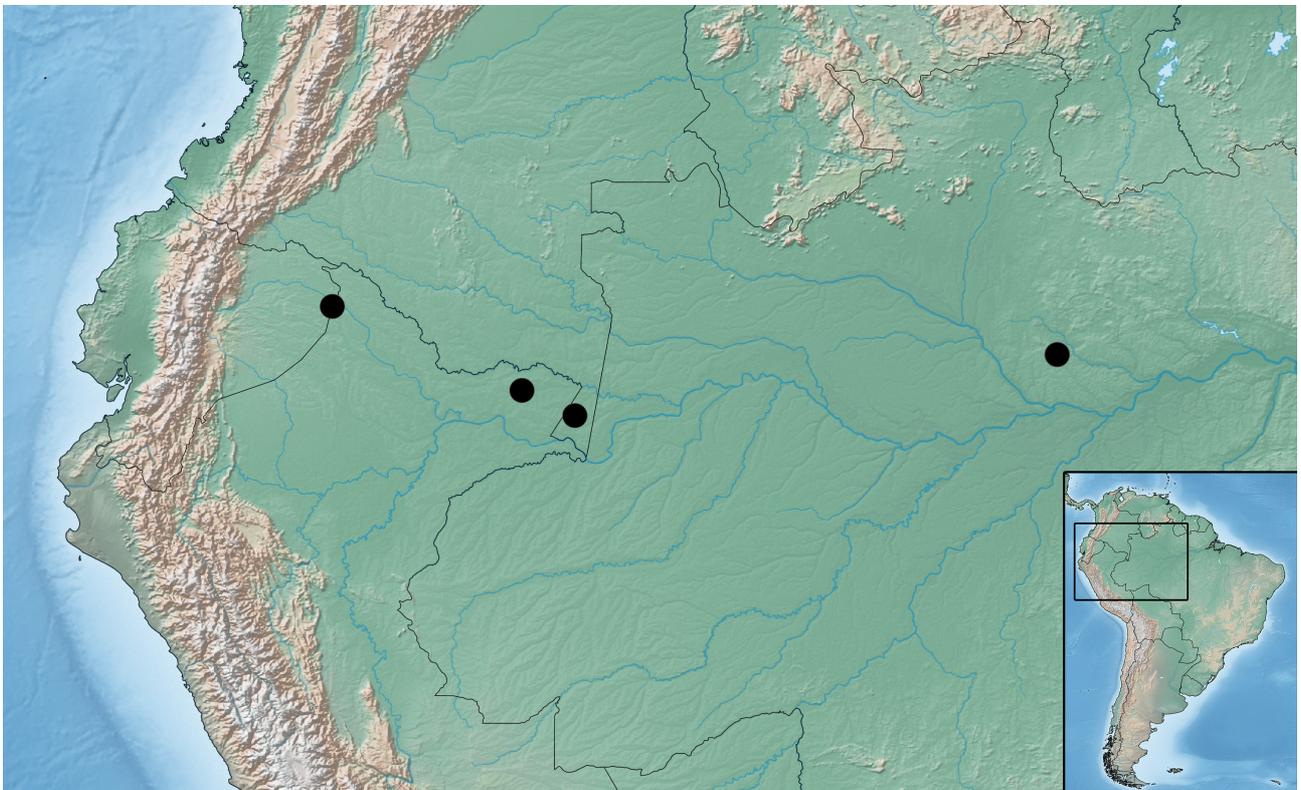
**Paratypes:** ♂. Peru, Loreto, Puerto Agustín, Zona Reservada “Yaguas” ~120 m. 2°47'56.29"S, 71°20'56.11"W. 6 Nov. 2014. C. Rodríguez *leg.* ♂. Ecuador, Orellana, Puerto Ventura, ~190 m. 0°58'38.53"S, 75°25'35.07"W. 22 Feb. 2015. M. González. (CAUD). ♂. Brasil, AM, Presidente Figueiredo, Estrada de Balbina, km 24, Comunidade São Francisco. 02° 01' 05'' S / 59° 49' 59'' W. 26.vii–03.viii.2005. F. F. Xavier F°, G. Lourido, R. J. P. Machado *leg.* ♂. Brasil, AM, Presidente Figueiredo, AM – 240, km 24, ramal São Francisco. 02° 00' 55'' S / 59° 49' 40'' W .01–04.viii.2013. Arm. Lençol luz Mista + BLB. F. F. Xavier F°, A. Agudelo, C. Maldaner & D. M. M. Mendes *leg. Idem.* ♂. Brasil, AM, Presidente Figueiredo, AM – 240, km 24, ramal São Francisco. 29–31.x.2008. Arm. Luz solo. J. A. Rafael, F. F. Xavier F°, G. Lourido, R. J. P. Machado & E. Amat *leg.*



**FIGURE 1.** Male *Emsleyfolium diasae* sp. nov. (holotype). A: *habitus* in dorsal view; B: head in frontal view; C: Head and pronotum in dorsal view; D: Head and pronotum in lateral view; E: Thoracic sternites in ventral view; F: Fore leg in lateral view; G: Mid leg in lateral view; H: Hind leg in lateral view; I–K: Terminalia in dorsal, ventral and lateral view respectively.



**FIGURE 2.** Stridulatory file *Emsleyfolium diasae* **sp. nov.**. A: left file; B: right file.



**FIGURE 3.** Map of *Emsleyfolium diasae* **sp. nov.** geographical record.



**FIGURE 4.** Live male *Emsleyfolium diasae* **sp. nov. habitus**, from Presidente Figueiredo, Amazonas, Brazil. A: In natural stance. B: In camouflage stance.

**Description. Male.** Lower edge and lower half of anterior edge outline of creamy white and slightly expanded sideways (Fig. 1D); anterior and lower edge of the side lobes gently curved, posterior edge straight until the humeral sinus (Fig. 1D). Stridulatory vein (CuP vein in dorsal view) as long as two thirds of the posterior edge of the pronotal disk, slightly curved from the anal to distal border; triangular mirror with a central area ovoid and membranous. Left stridulatory file convex, 5.3 mm long, its maximum width 0.9 mm. 171 teeth. Basal and apical teeth small, increasing in size towards central region of file. Teeth from central region of file thick, similar and

close spaced (Fig 2A). Right stridulatory file concave, 4.5 mm long, its maximum width 0.5 mm. 139 teeth. Basal and apical teeth small, almost quadrangular and widely spaced. Teeth from central region of file thick and close spaced (Fig 2B). MA vein distally forked and with two additional branches on half of its length, that go to anal edge. Tympanum covered by 90–95% on both sides, fore femur armed with three spines, fore tibiae with five spinules in each ventral margin (Fig. 1F); mid femur with four spines (Fig. 1G), hind femur with a ventral lamina that has ten spines (Fig. 1H); dorsal margin of the mid and hind tibiae slightly serrate. Tenth tergite covering the epiproctus and distally divided into three lobes, the central lobe a little longer and thinner than lateral lobes. Cerci cylindrical, curved upwards and inwards in distal half section. Subgenital plate with cylindrical and robust pseudo-styli prolongations, neckline of the subgenital plate square with straight distal margin (Fig. 1 I–K).

**Female.** Unknown.

**Coloration** (Fig. 4A–B). General coloration green with creamy white stripes and some purple spots. Green white head. Lateral carinae of the pronotal disc and lower edge of the lateral lobe of pronotum outlined by a thick and creamy white stripe, midline of pronotal disk slightly delineated in creamy white, in the same way that the Sc, R, M and MP veins. Eyes, post-ocular stripe, last tarsomere of all legs and inferior edge of metapleura purple. Basal portion of the tegmina, between Sc vein and costal edge, pigmented in blurred whitish green.

**Etymology.** Dedicated to our orthopterist colleague Priscila Guimarães Dias.

**Measurements (mm)** ♂: **BL:** 57–63; **Pr:** 8.8–9.1; **Teg:** 52–54; **HF:** 25.5–26; **HT:** 22–24.3; **SP:** 1.8–2.5.

**Distribution.** *Emsleyfolium diasae* sp. nov. seems to be widely distributed in Amazonian Rainforest, being present at four countries: Brazil, Colombia, Ecuador and Peru (Fig. 3).

**Behavior notes.** The Brazilian specimens were collected at night time, using a sheet light by a 250W white lamp, in Terra Firme dense ombrophilous forest. *E. diasae* were attracted between the 00:00 till 04:00am interval. They display a camouflage behavior, in which they lean their heads on the substrate, usually twigs and branches, elevating the rest of the body with their hind legs, at an approximately 45 degree angle. In this manner, they camouflage themselves as leaves. The tegmina resemble a leaf blade and the fastigium of vertex a leaf petiole (Figs. 4A–B). This behavior is similar to that shown by the Phaneropterinae genera *Aegimia* (Dias *et al.*, 2012) and *Agaurella* (Mendes & Alves-Oliveira, 2015). *Emsleyfolium* differs from *Aegimia* by its fastigium of vertex conical rather than flattened and from *Agaurella* for not having the laminar projections on the fore and mid legs that assists the individual to conceal the head while in camouflage stance.

When touched, the katydids moved away from the stimulus either walking or jumping, commonly flying shortly after. After being captured, they loudly stridulate at a high frequency. This defense behavior, displayed when the individual is restrained is called a distress or disturbance call, and it is common in several insect orders. In Orthoptera, it is recorded for several families, as Anostomatidae, Gryllacrididae, Gryllidae and Tettigoniidae, (Robinson & Hall, 2002). Other Steirodontini, such as *Steirodon careovirgulatum* Emsley, 1970 also stridulates loudly when disturbed (Belwood, 1990).

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