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## The tribe Dysoniini part V: The group Paraphidniae, with three new species from Guatemala and Ecuador (Orthoptera: Tettigoniidae: Phaneropterinae)

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### Abstract

The moss-and-lichen mimic katydids of the group treated here are easily recognized by their long and slender wings held upward at an almost 45-degree angle. They live in rainforests of central and northern South America, with one species ranging southward to subtropical forest in NE Argentina. Here the recently introduced subgenus *Anaphidna* is raised to genus beside *Paraphidnia*, and three additional species are described: *P. brevicristata* n. sp. and *P. tunki* n. sp. from Ecuador, the latter along with the relatively complex male calling song, as well as *A. obrieni* n. sp. from Guatemala. *P. gallina* is redescribed. A key for the three species of *Paraphidnia* s. str. is included.

### Resumen

Las esperanzas del grupo Paraphidniae que imitan musgo y líquenes son estudiadas en la presente contribución, estas se reconocen fácilmente por sus alas largas y delgadas que se proyectan hacia arriba en un ángulo cercano a los 40 o 45 grados. Estas son habitantes de las selvas tropicales de América Central y el norte de América del Sur, con una especie que llega hasta el sur, en el bosque subtropical del noreste de Argentina. El subgénero *Anaphidna* es elevado a la categoría de género, junto a *Paraphidnia*. Se redescribe a *P. gallina* y se describen tres nuevas especies: *P. brevicristata* n. sp. y *P. tunki* n. sp. provenientes del Ecuador, y *A. obrieni* n. sp. de Guatemala. También se describe el canto relativamente complejo del macho para *P. tunki* n. sp. Una clave para las actuales tres especies del género *Paraphidnia* es incluida.

### Key words

bioacoustics, camouflage, katydids, lichen, moss, Neotropics

### Palabras clave

bioacústica, camuflaje, esperanzas, líquenes, musgo, Neotrópico

### Introduction

*Paraphidnia* species are delicate phaneropterine katydids of Neotropical rainforest, which mimic in coloration, and partly also in body shape, lichens and moss. Live individuals are dark brown with greenish and bright white spots (Fig. 1). The nodose and twisted antennae complete the picture of a botanical item rather than an insect. On the vertex there are tiny processes and crest-like structures whose shapes vary depending on species. The pronotum can be sculptured to varying degrees. Wings are the most conspicuous character, elongate and narrow, held upward at an angle of almost 45 degrees relative to the small body, with the hind wings projecting well beyond the truncate and dorsally broadened tips of the tegmina. The dorsal contour of the exposed abdomen is zigzag-shaped due

to the medially pointed and elevated tergites. These katydids fly well and probably live in the canopy, perhaps on trunks and mossy branches, where the camouflage should be particularly effective. The geographic distribution comprises southernmost Mexico, Central America and tropical South America, reaching to the Subtropics in the northeastern tip of Argentina.

For a long time only three *Paraphidnia* species were known, until very recent descriptions increased the total number to 17 (Cadena-Castañeda & Gorochoy 2012, Gorochoy 2014). Here three additional species from Guatemala and Ecuador are described. *Anaphidna* Gorochoy & Cadena-Castañeda, 2012, established as subgenus, is treated as full genus with altogether 17 species, while *Paraphidnia* Giglio-Tos, 1898 will comprise three species.

This paper is a continuation of the review of the Neotropical tribe Dysoniini (Cadena-Castañeda 2011, 2013b, 2013c, Cadena-Castañeda & Gorochoy 2012, 2013, Cadena-Castañeda *et al.* 2015).

### Material and methods

This study is based on specimens received from Guatemala (OJCC) and specimens collected during fieldwork in Ecuador (FMB and HB). Additionally, the type specimens of *Paraphidnia gallina* were inspected and photographed (FMB).

**Measurements.**— **Body:** total length excluding wings; **total length:** distance between frons and wing apex; **length of pronotal disk:** midline distance from anterior to posterior margin; **length of tegmina:** distance from humeral sinus to apex; **length of hind femur:** distance from its base to the base of genicular lobe; **length of hind tibia:** distance from its base to the apex; **subgenital plate:** distance base to apex excluding styli.

Sound recordings of *Paraphidnia tunki* n. sp. were made with a Laar Bridge Box XL (BVL von Laar, Klein Görnow) at 400 kHz sampling rate and stored on DAT (digital audio tape) using a Sony Walkman (TCD-D7 and TCD-D100). The two recorded males were accommodated in dome-shaped gauze cages with a square base of 30 cm side length and a height of 15 cm. Sound analysis was done with Avisoft-SASLab Pro (R. Specht, Berlin). Recordings were also stored as WAV files: originally ten times slowed down on DAT, read in with 22.05 kHz in Cool Edit 2000 (Trial Version), and then set to 220.5 kHz. Recordings are available at Orthoptera Species File Online, subsequently abbreviated OSF (Eades *et al.*). The crest, stridulatory file and cerci of *P. tunki* n. sp. were photographed with a Micrometrix digital camera mounted on a Nikon SMZ1000 stereomicroscope, using the focus stacking software Combine Z5. Additional photos are available at OSF.

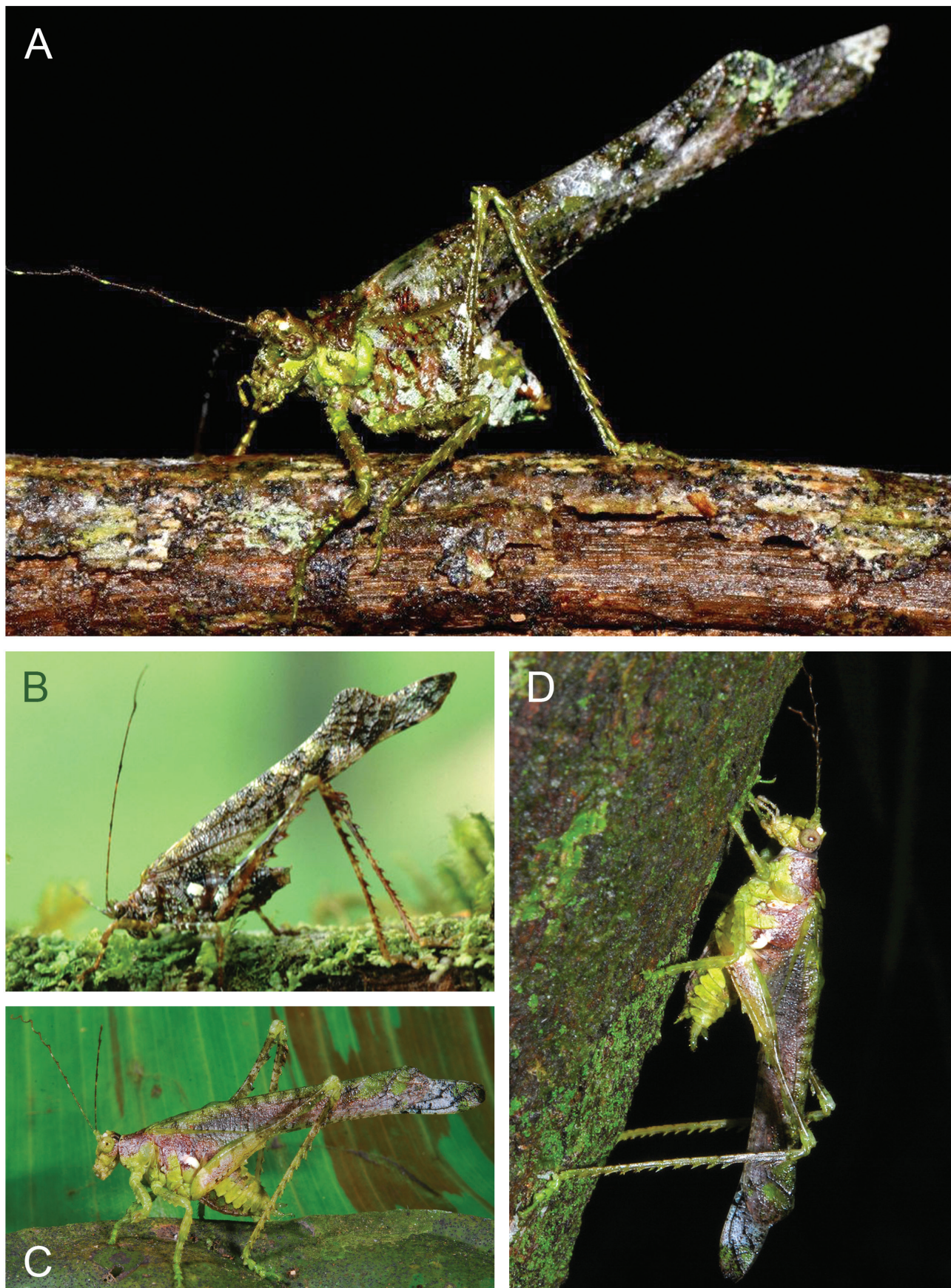


Fig. 1. A. *Anaphidna obrieni* n. sp. (photograph: José Monzón); B. *Paraphidnia tunki* n. sp. (specimen cbt064s01, staged photo during day); C,D. *P. brevicristata* n. sp. (photographs: Arthur Anker, January 2010 at type locality Yasuni).

## Results

*Paraphidniae* Cadena-Castañeda n. group

*Diagnosis*.—Antennae nodose, scapus and sometimes pedicellus armed with a tubercle. Medial structure on frontal portion of vertex consisting of three parts (denticles): anterior denticle small and thin, middle one rounded and distinctly thicker, containing the large lateral ocelli and with narrow median groove, posterior one higher and of diverse shape. Sub-ocular region with cuticular evaginations. Pronotum with meso- and metazona divided by sulcus. Lateral lobes of metasternum expanded and broader than the posterior margin. Wings projecting at an angle of 40-45 degrees upward. Ventral spines of middle tibia lamelliform. Abdominal tergites with produced and pointed dorsal tips. Basic coloration in life dark brown, with greenish and whitish spots, resembling foliose lichens and moss.

*Paraphidnia* Giglio-Tos, 1898

*Diagnosis*.—Vertex with laterally flattened crest. Pronotum smooth and devoid of tubercles. Male cerci with external branch long and curved inward, internal branch of almost similar size or short and developed as small spiniform process.

*Type species*.—*Paraphidnia gallina* Giglio-Tos, 1898 (original monotypy).

*Included species*.—Type species, *Paraphidnia tunki* Braun & Buzzetti n. sp. and *P. brevicristata* Cadena-Castañeda & Buzzetti n. sp.

*Comparison with Anaphidna n. stat.*—*Paraphidnia* lacks the digitiform process on the pedicellus of the antenna, which is diagnostic of the other genus, and the distal tubercle on the scapus is less developed compared to species of *Anaphidna*. In *Paraphidnia* the anterior denticle on the vertex is little developed and the posterior part is sometimes broad and developed as a laterally flattened crest (*P. gallina* and *P. tunki* n. sp.). The pronotum is smooth, without tubercles (present in *Anaphidna*). Male cerci are long, curving inward, and uniformly pointed, with a shorter internal spine-like process, while in *Anaphidna* they are divided into two lobes of almost equal length that are movable in relation to each other.

Key to species of *Paraphidnia*

1. Head round in frontal view, in lateral view eyes occupy dorsal half of the head, crest little elevated, ocellar tubercle little developed (Fig. 2D,E) ..... *Paraphidnia brevicristata* Cadena-Castañeda & Buzzetti n. sp.

Head higher than wide in frontal view, in lateral view eyes occupying more than half of the top of the head, crest and ocellar tubercle well developed (Fig. 2A-C) ..... 2

2. Male cerci with small internal spine on the basal portion, distally of it tapering, bent inward, with almost straight distal portion (Fig. 2I) ..... *Paraphidnia gallina* Giglio-Tos, 1898.

Male cerci bifurcate, external part longer and uniformly curved inward, internal branch equally robust but shorter (Fig. 2H) . . . . . *Paraphidnia tunki* Braun & Buzzetti n. sp.

*Paraphidnia gallina* Giglio-Tos, 1898.

(Figs 2B, I)

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*Diagnosis*.—Crest on vertex with two apical lobes. Pronotum smooth with the posterior margin of disk gradually rising and slightly expanded sideways on the humeral sinus (Fig. 2B). Male cerci with the external branch elongated, cylindrical and gradually tapering to the apex, curving inward. Internal branch as a small spine (Fig. 2I). Subgenital plate rectangular with cylindrical styli.

*Syntypes*.—2 ♂♂ from Ecuador: "Valle del Santiago" (Río Santiago valley, Provincia de Morona Santiago) and "S. José" (probably San José de Morona), in the Museo Regionale di Scienze Naturali di Torino (Italy) (photos in OSF).

*Redescription*.—

**Male:** Median ocellus subcircular, higher than wide; crest of vertex with two apical lobes. Pronotum with metazona elevated and expanded slightly sideways, lateral lobe subpentagonal, humeral sinus concave but not as developed (Fig. 2B) as in *P. tunki* n. sp. Cubital vein with slightly curved basal portion. Fore femur armed with four ventral spinules on inner margin of distal portion, fore tibia with four spines on each ventral margin, a spur on the dorsal edge near the apex of the tympanum, and two lamellar spines on mesal region of the dorsal edge; middle femur with three lamellar spines on the ventral outer margin, middle tibia with three lamellar spines on the dorsal margin from proximal to the mesal portion, hind femur with five triangular ventral spines on inner margin and an additional thorn with sharp apex most longer than the other spines placed on the antero-apical portion. Cerci with the external branch elongated, cylindrical and gradually tapering to the apex, rather abruptly bent inward and distally straight. Internal branch developed as a small spine (Fig. 2I). Subgenital plate rectangular with cylindrical styli.

**Female:** Unknown.

*Measurements*.— (in mm) Body 14, total length 43, pronotum 3.5, tegmina 26, hind femora 17, hind tibiae 18.

*Paraphidnia tunki* Braun & Buzzetti n. sp.

(Figs 1B, 2A, C, E, G, H, 3)

urn:lsid:Orthoptera.speciesfile.org:TaxonName:470683

Braun 2002, 87: *Paraphidnia* sp. 1, Braun 2008, 218: *Paraphidnia* cf. *gallina*.

*Etymology*.—The epithet (noun in apposition) is the Quechua name of the Andean cock-of-the-rock (*Rupicola peruvianus*), Spanish *gal-lito de las rocas*. The male of this bird has on the forehead a large crest formed by fluffy feathers. Both *P. gallina* and the new species sport a conspicuous crest on the vertex, and in the area where the latter was found, individuals of the cock-of-the-rock were seen and frequently heard.

*Diagnosis*.—Very similar to *P. gallina*, including shape of crest, whose shape is variable (Fig. 2C, E, 3F). But male cerci distinctly different: horizontally bifurcate, with internal branch also well developed (more than a simple spine); main external branch laterally flattened, internally concave, slightly up-curved and sickle-shaped (not elongate and cylindrical with distinct inward bend); internal

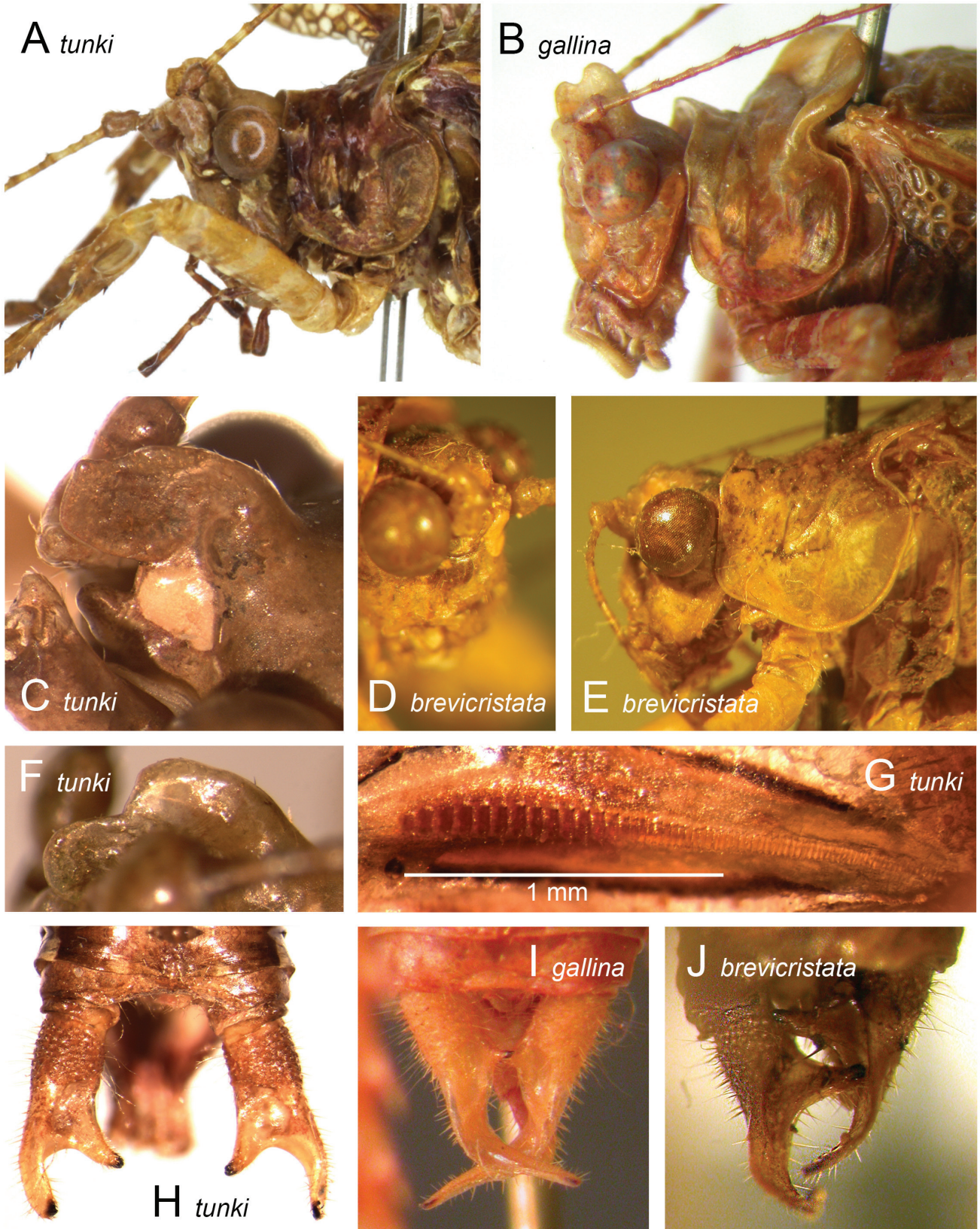


Fig. 2. Details of males of *Paraphidnia* s. str., species as indicated: A. holotype (mirror image to facilitate comparison); B. syntype; C,D. crest of holotypes; E. holotype; F. crest of paratype; G. stridulatory file of holotype (basal end to left); H. cerci of holotype (styli missing); I. cerci of syntype; J. cerci of holotype.

branch originating ventrally near the base, both branches with dark sclerotized tip (Fig. 2H, 3G).

**Holotype:** ♂ cbt064s03 (sound recordings): Ecuador, Zamora-Chinchipe, Río San Francisco valley north of Parque Nacional Podocarpus, 1970 m, 11 October 1999, G. Brehm leg. (light trapping), deposited in the Museo de La Plata (Argentina).

**Paratypes:** 3♂♂, same locality as holotype: cbt064s01 (sound recordings), 1850 m, attracted to light of Estación Científica San Francisco (ECSF), 6 December 1997, H. Braun leg.; cbt064s02, 2250 m, 3 November 1999, G. Brehm leg. (light trapping); cbt064s04, 1850 m, ECSF, 1999, H. Braun leg., currently in collection of HB; ♂, Zamora Chinchipe, Sabanilla, 1500 m (this is a few km from type locality), 17-28 November 1998, V. Maly leg. (attracted to light), in collection of FMB.

*Description.*—

**Male:** Median ocellus occupying all of fastigium of frons except very tip, higher than wide; crest on vertex very similar to *P. gallina* and of variable shape (Fig. 2C,F); antennae blackish in distal portion, some segments distally widened, hirsute, with a few narrow whitish rings. Pronotum with elevated metazona, humeral sinus well developed, lateral lobe concealing large auditory spiracle. Cubital vein on base of left tegmen short and straight, stridulatory file with around 15 fairly large and well-sclerotized teeth at the base and then tapering toward the distal end with very small and probably not functional teeth, altogether about 60 teeth; length of file almost 2 mm (Fig. 2G). Mirror region on base of right tegmen translucent. Fore femur with three spines on inner ventral margin; fore tibia with a pair of dorsal spinules right at distal end of the broadened ear region, and a spinule on outer dorsal margin; middle femur with three lamelliform spines on outer ventral margin, middle tibia dorsally with two pairs of spinules and on distal portion a single spinule on inner margin; hind femora ventrally with 8 triangular spines on outer margin, increasing in size from basal to distal end with 6<sup>th</sup> and 7<sup>th</sup> particularly large and projecting sideways, the last one smaller, on inner ventral margin with four spines in distal portion. First abdominal tergite with conspicuous white lateral spot on each side, the other tergites with smaller spots and whitish ventral margins. Cerci as described above (Fig. 2H), subgenital plate distally square with slightly emarginate apex, styli digitiform.

**Female:** Unknown.

*Measurements.*— (in mm) Body 14-15, total length 35-40, pronotum 3.3-3.5, tegmina 25-30; hind wings 33-35, hind femora 16-17.

*Calling song.*—The two recorded males produced at night 1.5-2 sec long audible calls with a very distinctive pattern: Two loud double syllables, separated by an interval of more than 0.5 sec, followed by a train of 8-12 more irregular syllables (Fig. 3A,B). The length of this syllable train seems to be specific to a particular male, and varies only a little bit between calls of the same male. The syllables toward the end are shorter, consisting of fewer rapidly-decaying impulses, that correspond to individual tooth-scraper contacts (Fig. 3C,D). Syllables in the second half of this irregular train sometimes consist of only one impulse. Indicated by the higher impulse rate in the initial double syllables compared to the following single ones, the movement of the scraper along the stridulatory file must be faster there; and apparently all the large teeth at the base of the file are used. The carrier frequency spectrum shows a broad peak between

13 and 19 kHz (Fig. 3E), and very little energy at harmonically-related ranges around 30-35 kHz and 45-52 kHz.

***Paraphidnia brevicristata* Cadena-Castañeda & Buzzetti n. sp.**  
(Figs 1C, D, 2D, E, J)

urn:lsid:Orthoptera.speciesfile.org:TaxonName:470684

*Etymology.*—Referring to the poor development of the crest on the vertex.

*Diagnosis.*—Crest reduced, superficially elevated, but overall not as spine or tubercle (Fig. 2D). Pronotum smooth, not raised or expanded (Fig. 2E). Male cerci with the external branch longer than internal, slightly flattened dorso-ventrally towards the meso-distal portion, apex slightly sclerotized. Internal branch as long as a quarter of the external branch, conical and with the apex sclerotized (Fig. 2J). Subgenital plate square with slightly emarginate apex, styles finger-like.

**Holotype:** ♂, Ecuador, Provincia de Orellana, Parque Nacional Yasuní, May 2002. F.M. Buzzetti leg., depository: Naturhistorisches Museum Wien (Austria).

**Paratype:** ♂, same locality as holotype, May 2013. A. Garzón leg., Museo de Historia Natural de la Universidad Distrital Francisco José de Caldas, Colección Artrópodos y otros Invertebrados (Colombia).

*Description.*—

**Male (holotype):** Eyes occupying top half of the head (in lateral view), median ocellus circular, as high as wide; base of the crest straight and undeveloped; crest slightly elevated, but not in the form of spine or tubercle (Fig. 2D). Pronotal disk flat and not elevated in the posterior region, lateral lobes rectangular and not expanded (Fig. 2E). Cubital vein slightly curved, thickening slightly from the basal edge to apical margin; stridulatory file with 30 teeth. Fore femur with three ventral spinules on inner margin of the distal portion, fore tibia with four spines on each ventral margin and without any very developed spine on the dorsal margin near the apex of the tympanum; middle femur with three lamelliform spines on the outer ventral margin, middle tibia with three lamelliform spines on the dorsal margin in basal half, hind femur with four triangular spines on inner ventral margin and a more prominent spine on the antero-apical portion, with obtuse apex. Male cerci with the external branch longer than internal branch, gently flattened, apex slightly sclerotized. Internal branch as long as a quarter of the external branch, triangular with sclerotized apex (Fig. 2J). Subgenital plate square with slightly emarginate apex and digitiform styli.

**Female:** Unknown.

*Measurements.*— (in mm) Body 14-14.5, total length 41-42, pronotum 3.3-3.5, tegmina 24, hind femora 15-16, hind tibiae 17.

***Anaphidna* Gorochov & Cadena-Castañeda, 2012 n. stat.**

*Diagnosis.*—Structure on vertex variable, may be reduced and tubercle-shaped or elongated and cylindrical; median ocellus conspicuous, genae tuberculate. Pronotum usually tuberculate with four or six emarginations on lateral margins of pronotal disk. Male cerci with external branch rather long and spine-shaped, curved upward and with acute apex; inner branch longer, partially lamelliform and with two lobes, the upper one hook-shaped, the lower one smaller and armed with very small apical hooks.

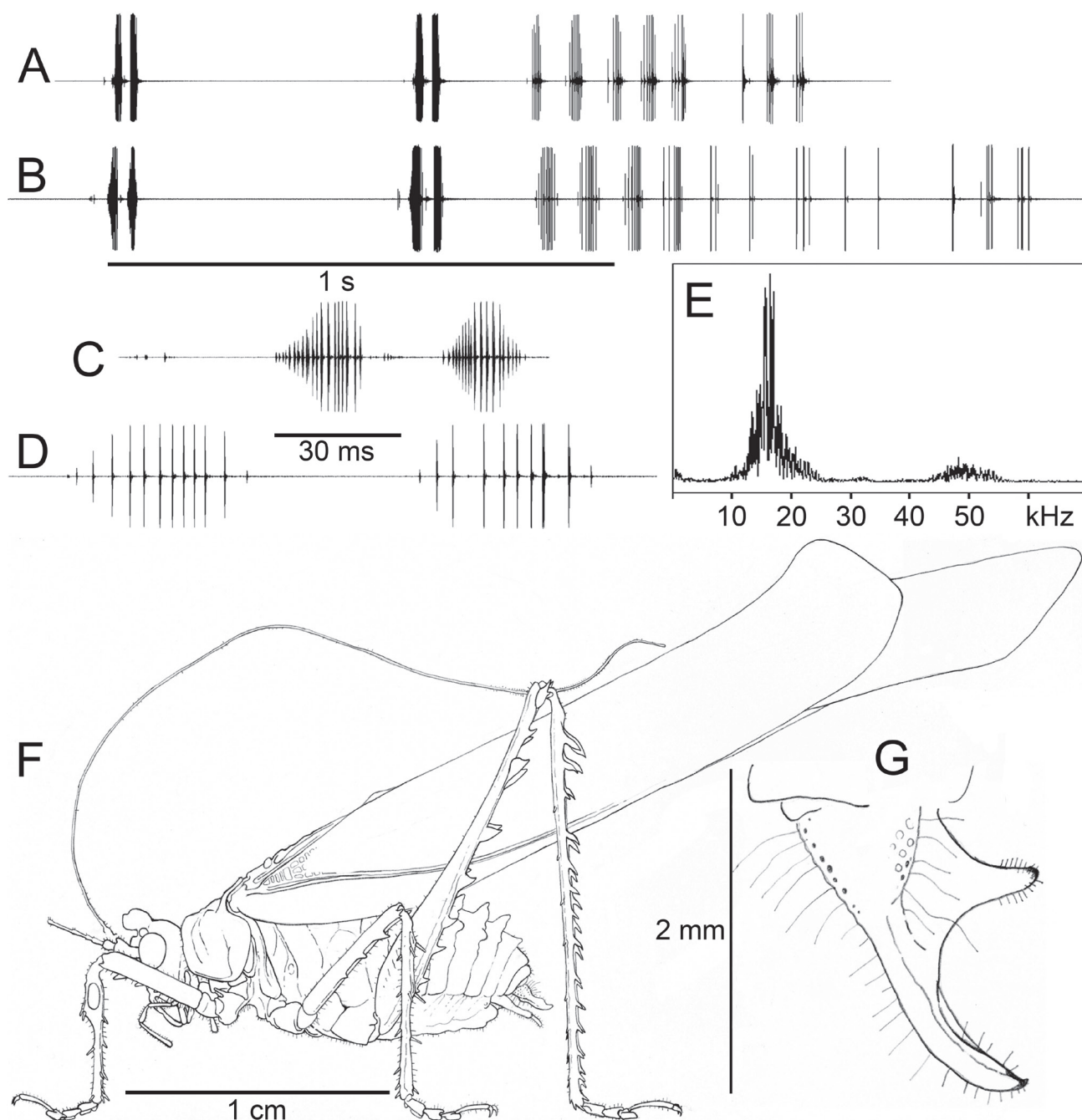


Fig. 3. Song of *Paraphidnia tunki* n. sp.: A. oscillogram of complete call, 21°C (recording cbt064s01r01); B. complete call of different male, 17°C (holotype, cbt064s03r02); C. first double syllable from B; D. first two syllables of second part from B (after the two double syllables, same scale as C); E. linear spectrogram taken from B; F. habitus (wing venation missing); G. left cercus in dorsal view (drawings after freshly dead holotype).

*Type species.*—*Anaphidna mexicana* Gorocho, 2012.

***Anaphidna obrieni* Cadena-Castañeda n. sp.**

(Figs 1A, 4)

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*Etymology.*—Dedicated to Mark O'Brien, always helpful collection manager of the Insect Division at the University of Michigan Museum of Zoology (UMMZ).

*Diagnosis.*—Posterior denticle, spine-like and slightly curved forward, lateral ocelli ovoid (Fig. 4C). Pronotal disk armed with six tubercles on lateral margins (Fig. 4D,E). Ventral lobe of male cerci armed with four small spines (Fig. 4G), external branch curved moderately and with apex sclerotized. Notch of subgenital plate quadrangular and slightly undulated on medial portion, styles conical and thin (Fig. 4I).

**Holotype:** ♂ Guatemala, Petén, Santa Elena, Ixpanpajul, 250 m (16.872964° N, 89.81478° W), 28 July 2012, J. Monzón leg., de-

posited in the Museo de Historia Natural de la Universidad Distrital Francisco José de Caldas, Colección Artrópodos y otros Invertebrados (CAUD), Bogotá, Colombia.

**Paratypes:** 9♂♂ same data as holotype (7 in CAUD and 2 in UMMZ); 4♂♂ Guatemala, Izabal, Morales, Finca Firmeza del Banco, Sierra de Caral, 600 m (15.407148° N, 88.696255° W), 14-16 July 2015, J. Monzón leg. [1 CAUD, 3 Colección de Artrópodos de la Universidad del Valle de Guatemala (UVGC)].

*Description.*—

**Male (holotype):** Median ocellus almost as wide as long; apex of anterior denticle on vertex narrow and bifurcate; middle denticle widely oval in profile; posterior denticle high, spine-like, and with apical part rather thin and directed upward (Fig. 4B,C). Pronotal disk with a pair of moderately high tubercles near anterior edge, a pair of similarly high tubercles on middle part, and a pair of thick and rounded but not high tubercles on latero-proximal parts of hind lobe; outer surface of lateral lobes granulated along ventral edge (Fig. 4D,E). Tegmina with main part of Rs slightly longer than its longest branch. Stridulatory file with 31 teeth (Fig. 4F). Fore femur with four short inner ventral spines in distal half, two inner apical spinules; fore tibia with a pair of small dorsal spinules near distal edges of tympanum, four pairs of short and thin ventral spines; middle femur with three short outer ventral lamellar spines, two outer apical spinules; middle tibia with three outer and five inner dorsal spines similar to ventral spines of hind femur, hind femur with six outer ventral spines, similar to the ones on middle femur but longer, and most distal spine strongly widened, first and second inner ventral spines similar to outer ones but not large and restricted to distal part of femur, and two pairs of apical spinules, upper spinules distinctly longer and slightly protruding behind femoral apex; one thin and inarticulate inner dorsal subapical spine, one inner dorso-apical spur, seven pairs of thin ventral spines; hind tibia with 15 dorsal spines on each margin. Cerci with lower projection of inner lobe wide and with four small apical hooks (Fig. 4G); subgenital plate with anterior edge of postero-median notch, styli cylindrical with coniform apex (Fig. 4I).

**Female:** Unknown.

*Measurements.*— (in mm): Body 15-16, total length 43-44, pronotum 3.3-3.5, tegmina 25-26, hind femora 16-17, hind tibiae 18.

*Comments.*—This species is similar to *A. hernandezi* Cadena-Castañeda, 2012 and *A. mexicana* Gorochoy, 2012 in shape of denticles of the vertex. In all three species the anterior denticle is slightly divided. In *A. obrieni* n. sp. the middle denticle (the part containing the ocelli) is frontally gently truncated, whereas in the two other species it is rounded. In the new species the crest is more slender and elongated compared to *A. mexicana*, curving gradually forward. The male subgenital plate is terminally transverse, while in *A. mexicana* it has a v-shaped emargination. In male cerci of *A. obrieni* n. sp. there is variation in the number of denticulations on the lower lobe of the internal branch: Usually there are 5 on the left cercus and 3-4 on the right one (Fig. 4G,H); in the holotype both cerci have 4.

## Discussion

With the increase in the number of described species of *Paraphidnia* and *Anaphidna*, from only three to now twenty, certain identification difficulties became apparent. *Paraphidnia gallina*, the type

species of the genus, is known only from two male syntypes and was never reported again. *P. tunki* n. sp. looks almost identical, except for the morphologically very different cerci. The type localities of the two species in south Ecuador are only 200 km apart. The *P. gallina* specimens were collected on the expedition of the Italian naturalist Enrico Festa (most likely in 1896), close to Río Santiago and Río Morona, probably below 500 m, whereas the new species was found further southwest in an interconnected river valley between 1500 and 2250 m on the Amazon slope of the cordillera. At all events, it seems unlikely the male cerci would evolve within 100 years to become so different morphologically, whereby *P. tunki* has to be considered a distinct species.

However, the shape of the conspicuous crest can be variable within a species: While in at least three specimens of *P. tunki* (including the holotype, Fig. 2C) it is quite different from the *P. gallina* specimens, in another male it is similarly bilobate (Fig. 2F). Intraspecific variation in the shape of the crest occurs also in *Anaphidna hernandezi* Cadena-Castañeda 2012, where in some specimens it is very similar to *A. lankesteri* Rehn, 1918. Within species of *Anaphidna* the number of the small apical hooks on male cerci is also variable, sometimes even between both cerci of the same specimen, like in *A. obrieni* n. sp. Several species do not show notable differences in copulatory structures (Cadena-Castañeda & Gorochoy 2012; Cadena-Castañeda 2013a).

A character that does not vary within species of *Anaphidna* is shape and surface of the pronotum. In some species it lacks tubercles or has only poorly developed ones (*A. bezverkhovi*, *A. fasciata*, *A. polestshuki*, *A. tarsalis*, and *A. verrucosa*), whereas in others it bears conspicuous tubercles (all other known species including *A. obrieni* n. sp.). The shape of the emargination of the male subgenital plate is also stable within species with variation in shape of the crest (third denticle) and number of apical hooks on male cerci. The diversity of very similar species suggests a rapid adaptive radiation (Cadena-Castañeda & Gorochoy 2012, Cadena-Castañeda 2013a).

*Paraphidnia tunki* is only the second member of Dysoniini whose calling song is known. It is fairly complex with a distinctive temporal pattern, as in *Lichenodraculus matti* Braun, 2011. While this latter species calls very continuously and also during the day, the new species is nocturnal and produces isolated calls. Perhaps other species of *Paraphidnia* and *Anaphidna* have distinctive male calling songs as well, that would facilitate the identification, perhaps being easily recognizable even if documented with audio-limited recording equipment. Females of only a very few species are known (*A. hernandezi*, *A. osae*, and *A. verrucosa*). Possibly they respond to the song of males, as is common among species of Phaneropterinae (e.g. Heller *et al.* 2015), wait, rarely fly around, and so never end up at artificial light sources.

## Acknowledgements

OJCC thanks José Monzón Sierra, the Consejo Nacional de Areas Protegidas (CONAP), and the Arthropod Collection at Universidad del Valle de Guatemala (UVGC), for making available specimens of *Anaphidna obrieni*. José also sent the photo of a live individual. In addition OJCC thanks Professor Alexander García for his help, advice and support, as well as Andrea Garay and Didier Castañeda for photographic assistance. Arthur Anker kindly provided permission to reproduce his photos of *Paraphidnia brevicristata*. Finally, we thank the reviewers for useful suggestions that improved the original manuscript, and are especially grateful to Glenn Morris for thoroughly revising the text.



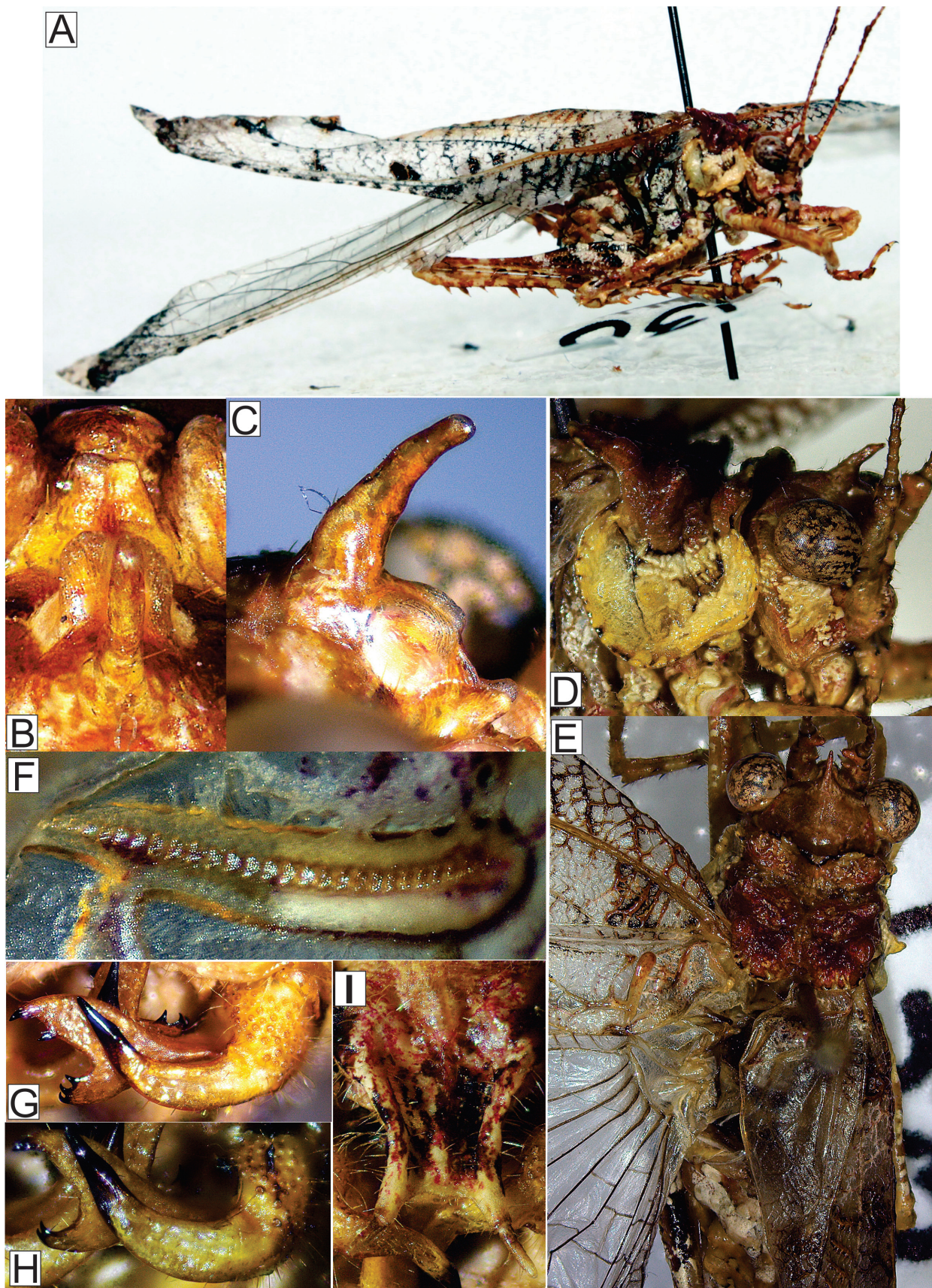


Fig. 4. *Anaphidna obrieni* n. sp.: A. male in lateral view; B. crest in dorsal view; C. same in lateral view; D. head and pronotum, lateral view; E. head, pronotum and stridulatory area, dorsal view; F. stridulatory file; G. male cerci; H. male cerci, variation (paratype); I. male subgenital plate (all photos of holotype except H).

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