*Proceedings of the Zoological Institute RAS*
*Vol. 318, No. 3, 2014, pp. 226–251*

*УДК 595.729*

# SYSTEMATICS OF THE AMERICAN KATYDIDS (ORTHOPTERA: TETTIGONIIDAE). COMMUNICATION 4

**A.V. Gorochov**

*Zoological Institute of the Russian Academy of Sciences, Universitetskaya Emb. 1, 199034, Saint Petersburg, Russia; e-mail: orthopt@zin.ru*

**ABSTRACT**

This communication contains a correction of the nomenclature of tegminal veins in the genus *Aegimia* Stål, 1874 and a review of new material on the genus *Ceraia* Brunner-Wattenwyl, 1891 (Phaneropterinae). For the latter genus, a new species group (the Dentata group) is established, a composition of the former Capra group is revised, new data on some species distribution are given, as well as *C. viktori* sp. nov., *C. cornutoides separata* subsp. nov., *C. legitima* sp. nov., *C. legitima angulata* subsp. nov., *C. sagittata* sp. nov., *C. propria* sp. nov., *C. capra megacerca* subsp. nov., *C. mollis* sp. nov., *C. colombiana* sp. nov., *C. oaxaca* sp. nov., *C. surinamensis granti* subsp. nov. and *C. woronovi* sp. nov. are described from South America (Ecuador, Peru, Colombia) and Mexico. Two former subspecies, *C. tibialoides panamensis* Emsley et Nickle, 1969 and *C. hemidactyloides stenopa* Emsley et Nickle, 1969, are considered as distinct species: *C. panamensis* stat. nov. and *C. stenopa* stat. nov.

**Key words:** America, *Aegimia*, *Ceraia*, new taxa, Orthoptera, Tettigoniidae, Phaneropterinae

# СИСТЕМАТИКА АМЕРИКАНСКИХ КУЗНЕЧИКОВ (ORTHOPTERA: TETTIGONIIDAE). СООБЩЕНИЕ 4

**А.В. Горохов**

*Зоологический институт Российской академии наук, Университетская наб. 1, 199034, Санкт-Петербург, Россия; e-mail: orthopt@zin.ru*

**РЕЗЮМЕ**

Данное сообщение содержит коррекцию номенклатуры жилок надкрылий для рода *Aegimia* Stål, 1874 и обзор нового материала по роду *Ceraia* Brunner-Wattenwyl, 1891 (Phaneropterinae). Для последнего рода устанавливается новая группа видов (группа Dentata), ревизуется состав бывшей группы Capra, приводятся новые сведения по распространению некоторых видов, а также из Южной Америки (Эквадор, Перу, Колумбия) и Мексики описываются *C. viktori* sp. nov., *C. cornutoides separata* subsp. nov., *C. legitima* sp. nov., *C. legitima angulata* subsp. nov., *C. sagittata* sp. nov., *C. propria* sp. nov., *C. capra megacerca* subsp. nov., *C. mollis* sp. nov., *C. colombiana* sp. nov., *C. oaxaca* sp. nov., *C. surinamensis granti* subsp. nov. и *C. woronovi* sp. nov. Два бывших подвида – *C. tibialoides panamensis* Emsley et Nickle, 1969 и *C. hemidactyloides stenopa* Emsley et Nickle, 1969 – повышаются в ранге до видов: *C. panamensis* stat. nov. и *C. stenopa* stat. nov.

**Ключевые слова:** Америка, *Aegimia*, *Ceraia*, новые таксоны, Orthoptera, Tettigoniidae, Phaneropterinae

## INTRODUCTION

This paper is the fourth communication in the series of publications on the American Tettigoniidae (Gorochov 2012a, 2012b, 2014). There are also some additional papers of the same author on this theme (Gorochov 2006, 2013; Cadena-Castañeda and Gorochov 2012, 2013; Cadena-Castañeda and Gorochov in Cadena-Castañeda 2013). Here, a correction of the tegminal nomenclature in the genus *Aegimia* Stål, 1874 and new data on taxonomy and distribution of species from the genus *Ceraia* Brunner-Wattenwyl, 1891 are given.

## MATERIAL AND METHODS

Most part of the specimens studied was collected in tropical forests or gardens at light, but some specimens were collected during night work with a flash-lamp on leaves of trees and bushes. This material (including types) is deposited at the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg. The specimens are dry and pinned. The photographs of wings and some other morphological structures were made with Canon 40D camera and Leica M216 stereomicroscope.

## SYSTEMATICS

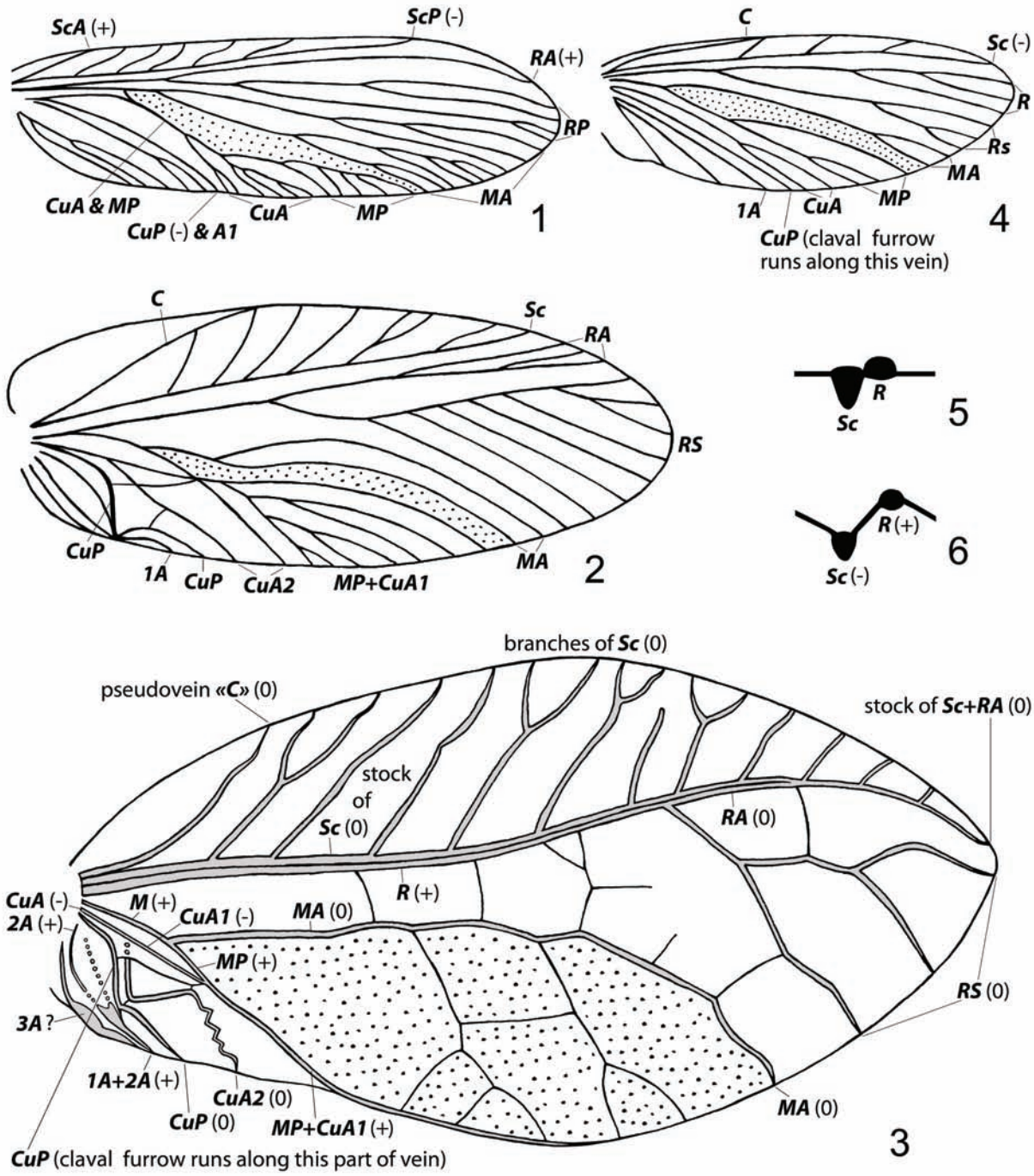
### Subfamily Phaneropterinae Burmeister, 1838

### Genus *Aegimia* Stål, 1874

**Note.** The Neotropical genus *Aegimia* has not any clear systematic position inside of this subfamily: according to the Internet Catalogue of Orhoptera (OSF), it is a single genus of the group Aegimiae not included in any tribe of Phaneropterinae (Eades et al. 2014). Recently, this genus was revised (Dias, Rafael and Naskrecki 2012), but its position is not clarified up to now. Unfortunately, the authors of this useful revision used a very strange nomenclature of veins for the *Aegimia* tegmina. Their nomenclature is not in accordance to the nomenclature which is most widely used by overwhelming majority of old and recent entomologists and paleoentomologists (Zeuner 1930; Ragge 1955; Sharov 1968; Chopard 1969; Otte and Alexander 1983; Gorochov 1995a, 1995b; Rasnitsyn and Quicke 2002; Storozhenko 2004; Nel et al. 2008; Gu et al. 2010; Ingrisch 2011). These entomologists and paleoentomologists have not identical views in relation to homology of some veins, but their opinion about homology of the Subcostal vein (*Sc*), Radial vein (*R*), and main branches of *R* (*RA* and *RS*; the latter branch, traditionally named Radius Sector, is mentioned as *RP* in some authors) in different groups of Orthoptera is practically the same. Moreover, some of the above-mentioned publications (Zeuner; Ragge; Sharov; Gorochov) are monographs containing a detailed analysis of the orthopteran wing venation made on enormous recent and fossil material. Such analysis allowed these authors to find rows of successive changes in the venation from the most ancient, Carboniferous representatives to almost each group of the recent Orthoptera.

The authors of *Aegimia* revision write that their nomenclature is based on papers by Kukalova-Peck (1983) as well as by Desutter-Grandcolas (2003). However, Kukalova-Peck (see Fig. 1) understands *Sc* and *R* (with branches *RA* and *RP*) in tegmina approximately as Sharov and Gorochov (Figs 2, 3), but not at all as Desutter-Grandcolas in the paper cited. The latter paper contains only a brief information about a certain new nomenclature of veins without any substantiation but with some small pictures and a reference to Wootton (1979) who ostensibly grounded this new nomenclature on the base of "axillary sclerites and the claval furrow" (Desutter-Grandcolas 2003). Nevertheless, Wootton's views are also very similar to those of Kukalova-Peck and others (see Fig. 4). Probably, a single author of the above-mentioned new nomenclature is Desutter-Grandcolas who got confused in the interpretation of Wotton's scheme for the complicated ensiferan venation.

Thus, it is reasonable to use the more traditional and much better grounded nomenclature given in Figs 1–3. Also it is necessary to remember that *Sc* and *R* are most simple veins for homologization, because they have different positions in relation to the external (dorsal) surface of the wing: stock of *Sc* is distinctly concave (-), and most part of *R* (i. e. including stock of RA) is distinctly convex (+). But there are a few exceptions. One of them is a partial fusion (or almost fusion) of *Sc* and *R* in the tegmina of many tettigoniids; for example, these veins in *Aegimia, Ceraia* and some other genera have more or less intermediate or neutral (0) position (Figs 3, 5). However, a more primitive structure of these veins (with clearly concave *Sc*) in Tettigoniidae is also usual (*Paraphidnia* Giglio-Tos, 1898 and others; Fig. 6). Another excep-




**Figs 1–6.** Wing venation with nomenclature by different authors: 1 – fore wing of Carboniferous insect related to ancestor of orthopteroids (schematically), after Kukalova-Peck (1983: fig. 17C); 2 – male tegmen of Jurassic representative of Prophalangopsidae related to ancestor of tettigoniids (schematically), after Sharov (1968: fig. 23G); 3 – right male tegmen of *Aegimia cultrifera* Stål (schematically), interpretation in accordance to Gorochov (1995); 4 – general scheme of wing venation, after Wootton (1979: fig. 12A); 5 – scheme of transverse section of tegminal part with *Sc* and *R* in *Aegimia* Stål [distinctly more projected internal (ventral) part of *Sc* is evidence of former concave position of this vein]; 6 – analogous scheme for *Paraphidnia* Giglio-Tos. Area between *MA* and *MP* is dotted; in Fig. 3, main (longitudinal) veins are given by grey color, crossveins and former crossveins are given by black color, lost parts of main veins are given by rows of grey circles.

tion is observed in gryllids: their tegmina are strongly modified, with the main longitudinal bend situated along *R* or *M* and with a flat lateral field having a secondarily neutral stock of *Sc*.

### Genus *Ceraia* Brunner-Wattenwyl, 1891

**Note**. This genus, distributed from the southern part of Mexico to the northern part of Argentina, was twice revised. In the revision by Grant (1964), most part of the diagnostic characters for species of *Ceraia* was mentioned and well pictured. However, he considered distinct differences between similar species in the shape of male copulatory structures as variations of the same species (see also my remarks to species of the genus *Euceraia* Hebard, 1927 in the previous communication: Gorochov 2014). Moreover, he did not describe holotypes, and his pictures are often without geographic data on the pictured specimens. In some cases, it is clear that he did a single (common) description for two or more species, but belonging of his species name to one of these species is unclear. In the revision by Emsley and Nickle (1969), published soon after the one of Grant, these mistakes were corrected but only partly, as these authors also somewhat overrated similarity in the general appearance and underrated dissimilarity in the copulatory structures. They divided this genus into nine species groups used here with some insignificant changes.

### The Tibialis group

**Note.** This group is characterized by darkened hind tibiae, short and simple (with a distal hook only) male cerci, a rounded or almost truncate posteromedian sclerotized lobe of the male last abdominal tergite (without any angular or denticulate median structure at the apex), a pair of thinner semimembranous processes around this lobe, and a notched apical part of the male genital plate. This group includes four species: *C. tibialis* Brunner-Wattenwyl, 1891 (type species of the genus); *C. tibialoides* Emsley et Nickle, 1969; *C. panamensis* Emsley et Nickle, 1969, stat. nov.; *C. viktori* sp. nov. One of these species (*C. panamensis* from Panama) was described as a subspecies of *C. tibialoides* (type locality Costa Rica). However, these species are clearly distinguished from each other by the male last abdominal tergite, male genital plate and sclerites of the male genitalia (Emsley and Nickle 1969: figs 32, 67, 68, 87, 88, 90, 91).

### *Ceraia tibialis* Brunner-Wattenwyl, 1891
(Figs 50, 51)

**Material studied.** PERU: 16 males and 1 female, Ucayali Department, Atalaya Prov., ~35 km NWW of Atalaya Town on Rio Ucayali, environs of Sapani Vill., ~300 m, partly primary / partly secondary forest, at light, 26–31 October 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky; 11 males and 1 female, Junin Department, Satipo Prov., ~25 km SE of Satipo Town, environs of Rio Venado Vill., ~1200 m, partly primary / partly secondary forest, at light, 20–23 October 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky; 2 males, same department and province, environs of Satipo Town, ~800 m, secondary forest near waterfall, at light, 4–5 November 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky; 2 males, same department and province, ~40 km NE of Satipo Town, environs of Calabaza Vill., ~2000 m, partly primary / partly secondary forest, at light, 16–17 October 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky; 1 male, Cusco Department, "7 km NE Mandor", 13°18.7´S, 70°49.5´W, 890 m, at light, 1–3 December 2010, V. Sinyaev, V. Sinyaeva, Yu. Bezverkhov. ECUADOR: 1 male, ~75 km SEE of Quito City, environs of El Chaco Vill. on Rio Quijos, 1500 m, secondary forest, on leaf of small tree at night, 18–22 November 2005, A. Gorochov, A Ovtshinnikov; 1 female, Morona Santiago Prov., bank of Rio Morona near border with Peru, environs of Puerto Morona Vill., ~300 m, primary forest, at light, 5–15 January 2010, A. Gorochov; 1 male, Tungurahua Prov., "road Banos–Puyo Rio Verde–Rio Negro", 1°24´26´´S, 78°15´22´´W, 1430 m, 16 November 2011, V. Sinyaev, O. Romanov.

**Note.** This species was originally described from females collected in the western part of Brazil (Brunner-Wattenwyl 1891). The species is also recorded from some other countries of South America: Colombia, Ecuador, Peru, Bolivia (Grant 1964; Emsley and Nickle 1969). The above-listed specimens are rather similar in the external structure but with a certain variability in the genitalia: in males from Satipo Province of Peru, the paired (but fused with each other) genital sclerites are rather short, and the unpaired (smaller) sclerite is with a wide apical part (not narrower than proximal part of this sclerite; Fig. 50); in some other males (Ecuador), these sclerites may be similar to those of the previous males but somewhat

shorter and with a distinctly narrower proximal part of the unpaired sclerite; in males from Atalaya Province of Peru, the paired sclerites are long, and unpaired one is with a distinctly narrower apical part (narrower than its proximal part; Fig. 51); and in a male from Cusco (Peru), these sclerites are similar to the latters but with a somewhat wider proximal part of the unpaired sclerite. Probably, these genital variants belong to 2–4 different subspecies, but absence of any information on the male genitalia from *C. tibialis* type locality does not allow me to clarify this question.

***Ceraia viktori* sp. nov.**
(Figs 8–15, 52, 53)

**Etymology.** The species is named after one of its collectors, Viktor Sinyaev.

**Type material.** *Holotype* – male, ECUADOR: Pinchincha Prov., Rio Pachijal, Los Bancos, 0°4´6´´N, 78°54´17´´W, 928 m, 29 October 2011, V. Sinyaev, O. Romanov. *Paratypes*: 8 males, same data as for holotype.

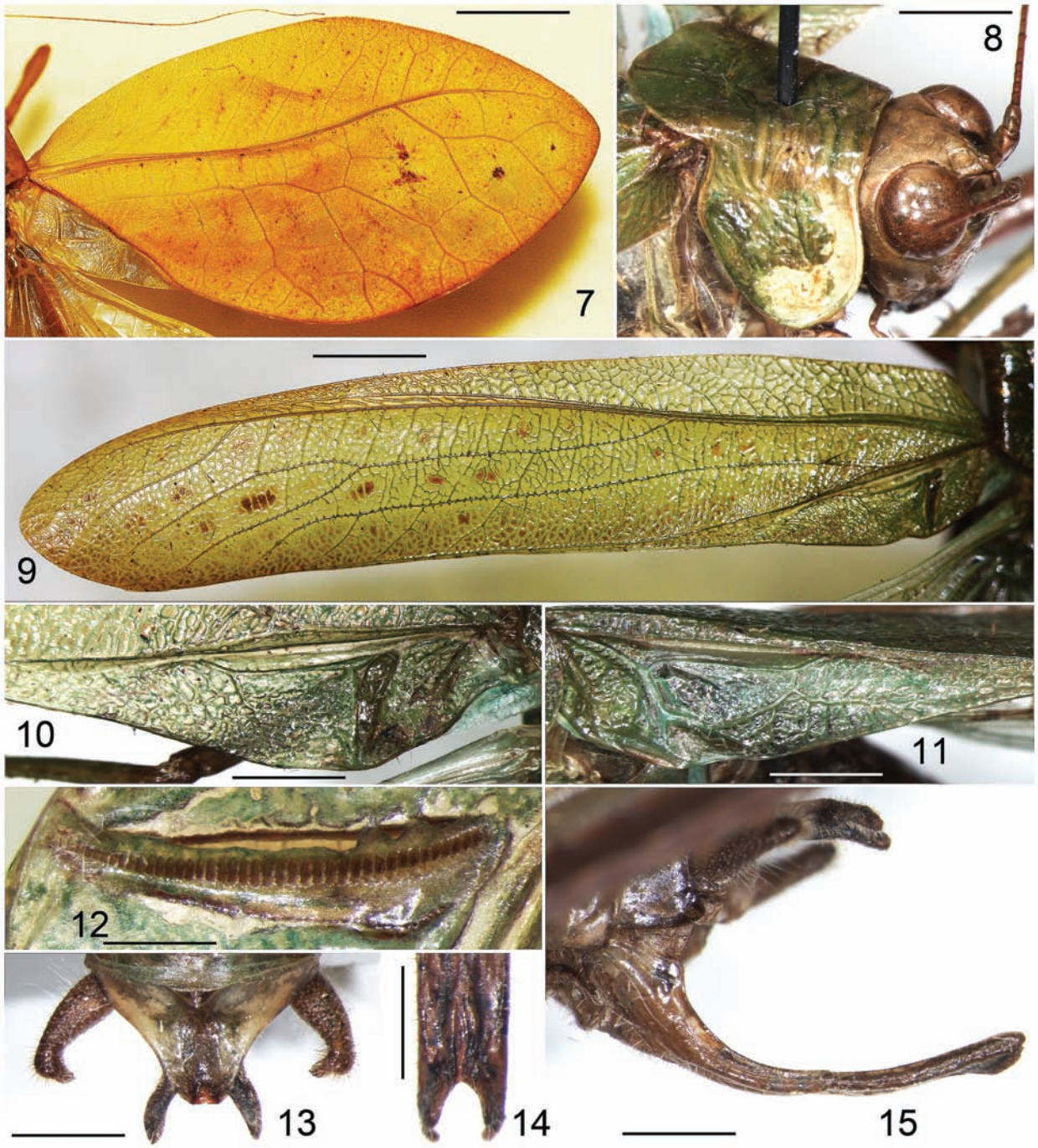
**Description.** *Male* (holotype). General appearance similar to that of *C. tibialis*, but body somewhat smaller. Colouration green with following marks: head light brown (almost yellowish) with brown dorsum (lateral stripes along dorsal edges of eyes lighter) and wide median (vertical) band from median ocellus and antennal cavities to clypeus (these brown areas indistinctly separated from lighter areas of head), with slightly darkened posterior part of genae and most part of scapes, and with almost reddish brown antennal flagellum; pronotum uniformly green but with yellowish tinge on lower part of lateral lobes; tegmina with light brownish tinge along costal and anal edges of distal half, with several small light reddish brown spots between branches of *RS* and between *RS* and *MA*; hind wings with yellowish green distal part of costal lobe, greenish rest of venation, and transparent rest of membranes; legs with light brown femora (hind femora with slightly darker ventral half and almost yellowish dorsal part of proximal half) and proximal part of fore and middle tibiae (this part in middle tibiae very short), with dark brown tympanal membranes, with brown hind tibiae as well as areas on middle part of hind tarsi and on ventral surface of their forth segment, and slightly lighter all other tarsi and rest of hind tarsi; other bodyparts from almost yellowish to light brown (possibly greenish in living specimen) but with brown apical area of posteromedian lobe of last abdominal tergite (including semimembranous paired processes), cerci and distal half of genital plate (apical part of this plate dark brown). Upper rostral tubercle of head with small and rounded dorsal subapical denticle and somewhat convex (in profile) more posterior part having long, narrow and weak dorsomedian groove (Fig. 8); scapes almost as long as distance between their bases. Pronotum (Fig. 8), tegmina and wings typical of *Ceraia* in shape, with stridulatory apparatus as in Figs 10–12, and with two branches on tegminal *RS* only (Fig. 9). Abdomen with rather large posteromedian lobe of last tergite narrowing to short and almost truncate apical lobule, with a pair of elongate and finger-like semimembranous processes located around this lobule and strongly projected behind it (Fig. 13), with cerci somewhat longer than in *C. tibialis* but similar in shape to those of *C. tibialoides* and *C. panamensis* (Fig. 13), with long genital plate having comparatively thin distal part and rather deep posteromedian notch as well as weak (visible in profile) ventral convexity near apex (Figs 14, 15), with a pair of elongate sclerites of genitalia curved in profile and fused with each other in proximal half only (Figs 52, 53), and with semimembranous unpaired genital structure situated near middle part of these sclerites.

Variations. Sometimes dorsum of head lighter (light brown or almost yellowish); some males with anterior part of epicranium almost uniformly light greyish brown; spots between branches of *RS* and between *RS* and *MA* in tegmina sometimes indistinct.

*Female* unknown.

*Length* (mm). Body 24; body with wings 45; pronotum 5.2; tegmina 34; hind femora 27.

**Comparison**. The new species is most similar to *C. panamensis* in the shape of male last tergite and of male genital plate, but it is clearly distinguished from the latter species by a distinctly deeper posteromedian notch of this plate, clearly curved (not straight) paired genital sclerites in profile, and much shorter fused parts of the latter sclerites located only in the proximal half of these sclerites (*vs.* occupying middle and proximal thirds of them) (Emsley and Nickle 1969: figs 68, 91). From *C. tibialis* and *C. tibialoides*, the new species differs in a much thinner distal part of the male genial plate and different structure of the male genital sclerites (Emsley and Nickle 1969: figs 66, 67, 86, 87, 89, 90).




**Figs 7–15.** *Aegimia* Stål and *Ceraia* Br.-W., male: 7 – *Ae. cultrifera* Stål from Mexico (biostation of Mexico University "Los Tuxtlas" in Veracruz State); 8–15 – *C. viktori* sp. nov. Right (7) and left (9) tegmina; head and pronotum from side and slightly from above (8); stridulatory apparatus of left (10) and right (11) tegmina; stridulatory vein of left tegmen from below (12); abdominal apex without genital plate from above (13); distal part of genital plate from below and slightly from behind (14); abdominal apex from side (15). Scale bars: 10 mm for Figs 7, 9; 2 mm for Figs 8, 10, 11; 1 mm for Figs 12, 13, 15; 0.5 mm for Fig. 14.

**The Dentata group**

**Note.** This group is a new one characterized by light (greenish or yelowish) hind tibiae, moderately short male cerci with two spines or hooks (medial and distal ones), a rather diverse posteromedian sclerotized lobe of the male last abdominal tergite having a characteristic angular median structure at the apex (Figs 44–47), a pair of semimembranous processes on this lobe as in the previous group, and a projected (rounded or barely notched) posteromedian lobe at the male genital plate apex (apical part of this plate clearly widened; Figs 30, 34, 38, 42). This group also includes four species: *C. dentata* (Brunner-Wattenwyl, 1878); *C. cornutoides* Caudell, 1906; *C. legitima* sp. nov.; *C. sagittata* sp. nov. Emsley and Nickle (1969) united this group with the Capra group, but the latter group seems to me a separate species group of *Ceraia* not closely related to the Dentata group.

***Ceraia dentata* (Brunner-Wattenwyl, 1878)**

**Material studied.** PERU: 18 males, Junin Department, Satipo Prov., ~25 km SE of Satipo Town, environs of Rio Venado Vill., ~1200 m, partly primary / partly secondary forest, at light, 20–23 October 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky; 2 males, same department and province, environs of Satipo Town, ~800 m, secondary forest near waterfall, at light, 4–5 November 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky; 4 males, same department and province, garden-forest very near Satipo Town, ~600 m, at light, 15 October – 6 November 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky; 6 males, same department and province, ~40 km NE of Satipo Town, environs of Calabaza Vill., ~2000 m, partly primary / partly secondary forest, at light, 16–17 October 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky; 1 male, same department, "9 km SW Sam Ramon", 11°09.9´S, 74°25.3´W, 1150 m, at light, 9 March 2011, V. Sinyaev, A. Poleschuk. ECUADOR: 6 males and 2 females, eastern part of country, ~30 km EES of Tena Town, "Chuva Urcu" on Rio Cusano, lowlying forest, December 2005, A. Ovtshinnikov, D. Smolnikov.

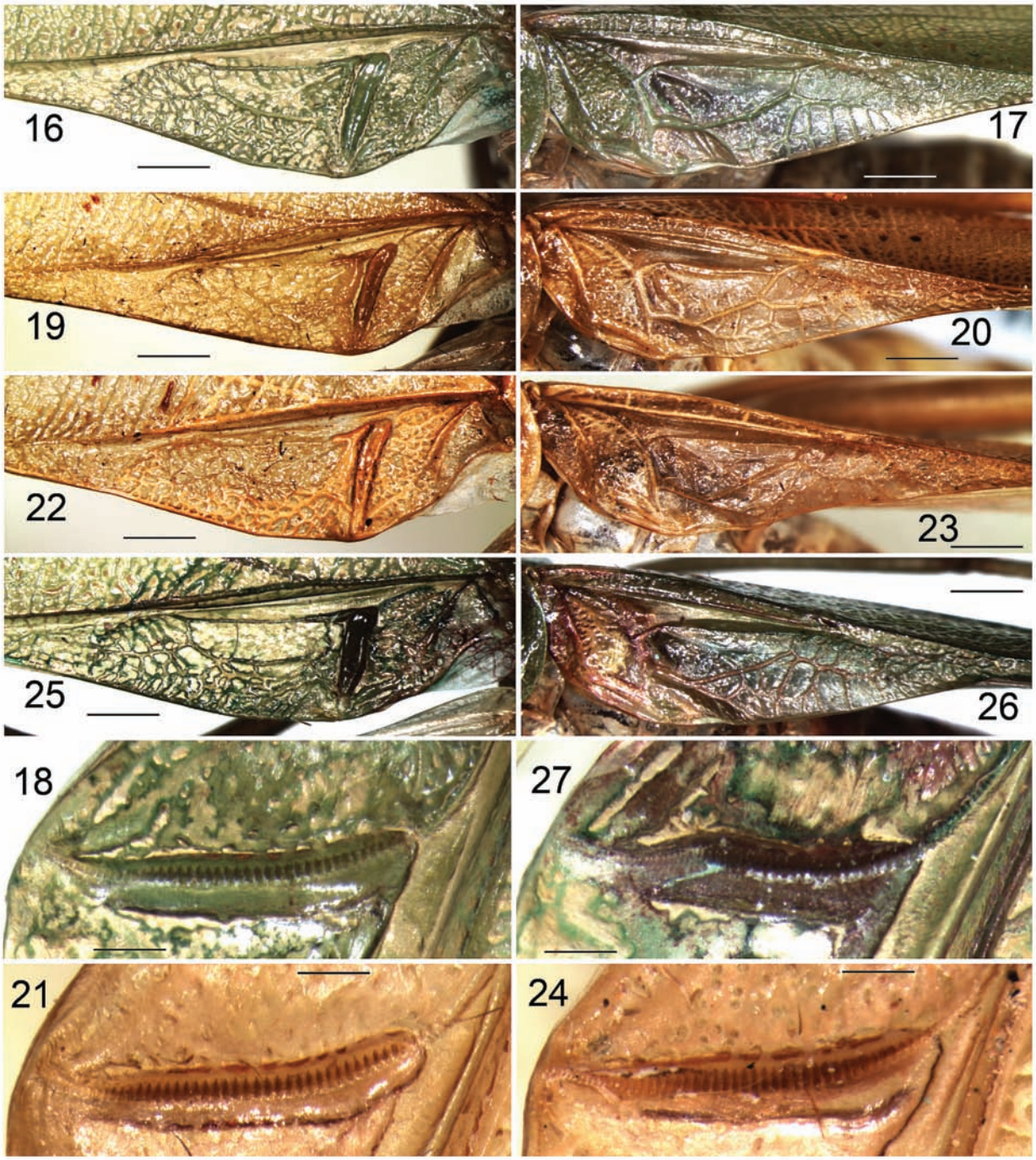
**Note.** This species, originally described from "Peru" (Brunner-Wattenwyl 1878), was later recorded also from Colombia, Ecuador and Bolivia (Grant 1964). The latter author and Emsley and Nickle (1969) wrote that *C. dentata* has a little variability in the male copulatory structures. The above-mentioned specimens are more or less uniform in the general appearance and shape of these structures also. In the paper cited, Grant synonymised this species with *C. festa* Giglio-Tos, 1898 described from Ecuador. Examination of the photographs of *C. festae* holotype (Eades et al. 2014) shows its significant similarity to my males in the cercal structure as well as in the other visible characters. Thus, this synonymy is possibly correct.

***Ceraia cornutoides separata* subsp. nov.**
(Figs 16–18, 28–31, 46, 54)

**Etymology.** The species name is the Latin word "separata" (separate).

**Type material.** *Holotype* – male, PERU: San Martin Department, Uchiza, 08°26.6´S,76°26.6´W, 542 m, at light, 18–19 February 2011, V. Sinyaev, A. Poleschuk.

**Description.** *Male* (holotype). Size, colouration and structure of body similar to that of *C. viktori* but with following differences: head yellow with slightly lighter mouthparts having brown lower half of clypeus and greenish grey distal part of labrum, with indistinct light brown marks on scape, and with greyish brown pedicel (antennal flagellum missing); pronotum with less distinct yellowish tinge on lateral lobes; tegmina almost without brownish tinge and with somewhat more numerous small light reddish brown spots in all areas between *R* and *MP+CuA1* (including interradial areas); fore and middle tibiae almost completely greenish but with dark brown tympanal membranes and yellowish areas near them; hind femora and tibiae greenish with small and slight brownish rose spots at base of femoral spines; tarsi greenish with light brown tinge and with brown area in middle part of hind tarsi; abdominal apex completely light yellowish brown but with dark both cercal medial spine and cercal apical hook; tegminal stridulatory apparatus as in Figs 16–18; last abdominal tergite with shorter (almost undeveloped) but wider and more or less truncate apical lobule of posteromedian lobe (having strongly transversal angular median structure at apex well visible only from behind; Fig. 46), and with slightly shorter paired semimembranous processes around this lobule (Fig. 28); cerci with long, straight and




**Figs 16–27.** *Ceraia* Br.-W.: 16–18 – *C. cornutoides separata* subsp. nov.; 19–21 – *C. legitima legitima* subsp. nov.; 22–24 – *C. l. angulata* subsp. nov.; 25–27 – *C. sagittata* sp. nov. Stridulatory apparatus of left (16, 19, 22, 25) and right (17, 20, 23, 26) tegmina; stridulatory vein of left tegmen from below (18, 21, 24, 27). Scale bars: 2 mm for Figs 16, 17, 19, 20, 22, 23, 25, 26; 1 mm for Figs 18, 21, 24, 27.

strong medial spine, and with small and almost angularly curved apical hook (Fig. 29); distal half of genital plate moderately narrow, with slightly widened apical part having rather short and clearly rounded posteromedian (apical) semimembranous lobe (Figs 30, 31); genitalia with a pair of sclerites having distal (narrow) part not very long and characteristically sinuate (Fig. 54).

*Female* unknown.

*Length* (mm). Body 24; body with wings 47; pronotum 5.3; tegmina 36; hind femora 25.

**Comparison.** The new subspecies is distinguished from *C. cornutoides cornutoides* Caudell, 1906, stat. nov. by a longer and straight medial spine of the male cerci, a smaller apical hook of these cerci, a somewhat narrower proximal (widened) part of the male genital sclerites, and clearly shorter distal (narrow) part of these sclerites (Grant 1964: fig. 147). From *C. laminata* Piza, 1950 (synonymised with *C. cornutoides* but possibly a separate subspecies), the new subspecies differs in a distinctly smaller apical hook of the male cerci (Piza 1950: fig. 6).

**Remarks.** So, *C. cornutoides* may consist of three subspecies (or closely-related species): the nominotypical one distributed from Paraguay (type locality) to nearest part of Argentina (Emsley and Nickle 1969: fig. 83); *C. c. separata* from Peru recorded from this country by Emsley and Nickle (1969: fig. 82) as a variation of *C. cornutoides*; and possibly *C. c. laminata* from environs of Sao Paulo City in Brazil.

### *Ceraia legitima* sp. nov.

(Figs 19–21, 32–35, 44, 55, 60, 61)

**Etymology**. The species name is the Latin word "legitima" (legitimate).

**Type material.** *Holotype* – male, ECUADOR: Morona Santiago Prov., bank of Rio Morona near border with Peru, environs of Puerto Morona Vill., ~300 m, primary forest, at light, 5–15 January 2010, A. Gorochov. *Paratypes*: 5 males and 1 female, same data as for holotype.

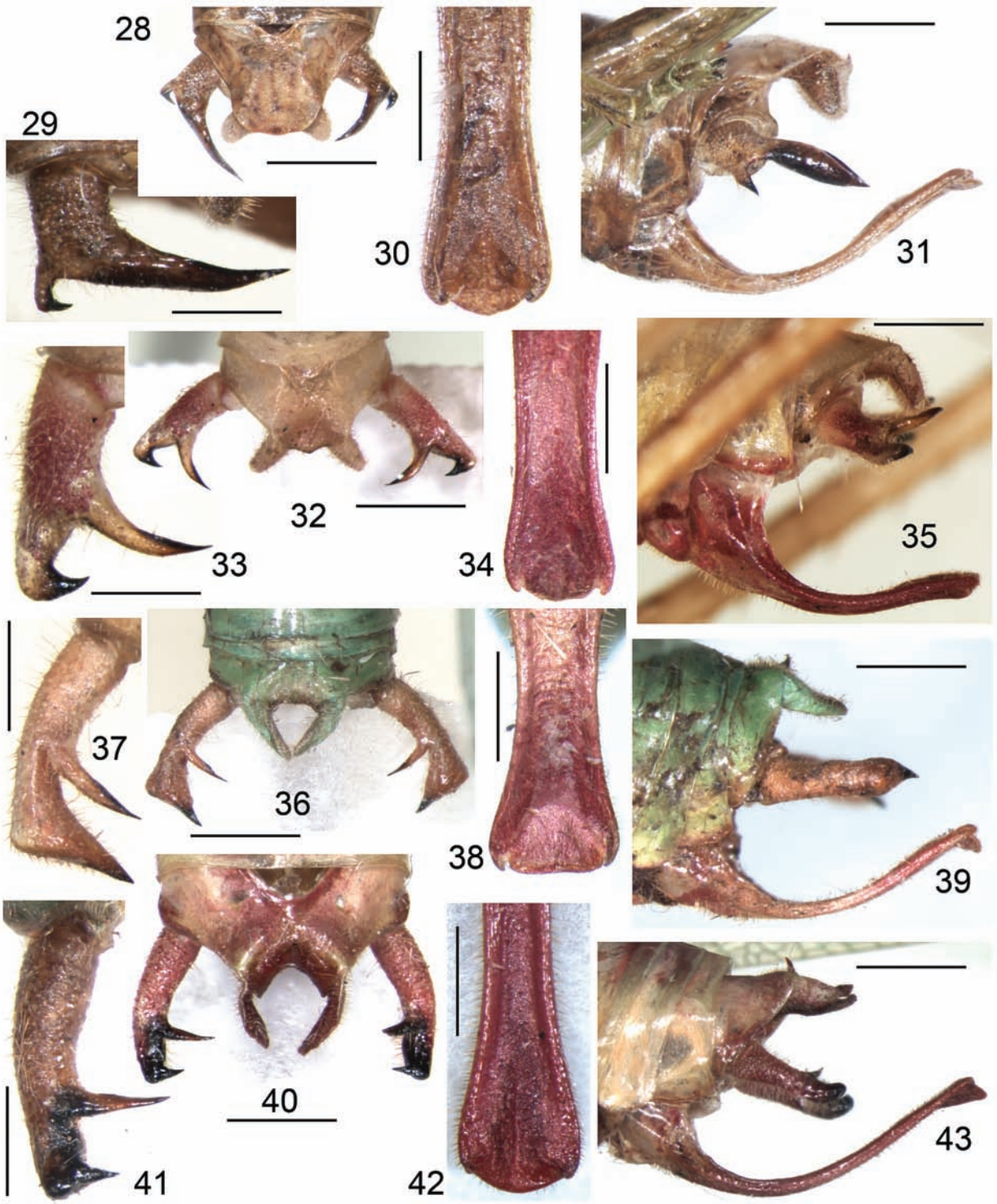
**Description.** *Male* (holotype). Size, colouration and structure of body similar to those of *C. viktori* but with following differences: colouration almost completely yellowish (greenish in living specimen) with numerous small brown spots on proximal part of antennal flagellum, light brown to brown rest of this flagellum, brownish almost ring-like area on labrum, dark brown tympanal membranes, several small light reddish brown spots on tegmina between *R* and proximal half of *MP+CuA1* as well as between proximal branch of *RA* and distal half of *MA*, transparent membranes of hind wings as in *C. viktori* and *C. cornutoides separata*, darkened apical part of all palpi as well as distal part of hind tibia spines and of cercal hooks, and rose rest of apical segment in all palpi, ventral area of fore coxae, all sternites and genital plate (distal part of this plate darker, almost reddish brown); upper rostral tubercle of head without distinct dorsal subapical denticle; tegminal stridulatory apparatus as in Figs 19–21; last abdominal tergite (Figs 32, 35) similar to that of *C. c. separata* but with almost spine-like posteromedian denticle at apex of posteromedian lobe (Fig. 44); cerci with medial hook moderately long, thin and slightly arcuate (spine-like), and with apical hook strong and distinctly longer (larger) than in *C. c. separata* but clearly shorter than in *C. c. cornutoides* (Fig. 33); genital plate with roundly truncate posteromedian (apical) semimembranous lobe and a pair of slightly more distinct small lateral lobules around it (Fig. 34); sclerites of genitalia similar to those of *C. cornutoides* but with slightly arcuate (not sinuate) distal halves (Fig. 55).

Variations. One male without brownish area on labrum; some others with thoracic sternites yellowish, with abdominal sternites partly yellowish, and with posteromedian semimembranous lobe of genital plate barely notched.

*Female*. General appearance similar to that of male. However, size of body slightly larger, dorsal field of tegmina with traces of venation only, last tergite with posteromedian lobe much smaller (shorter) as well as without any spine-like denticle at apex and semimembranous processes around it, and cerci smaller and simple (elongate, conical and without hooks). Genital plate and ovipositor as in Figs 60 and 61.

*Length* (mm). Body: male 20–24, female 25; body with wings: male 44–47, female 50; pronotum: male 5–5.3, female 5.6; tegmina: male 32–34, female 36; hind femora: male 23–24, female 26; ovipositor 10.

**Comparison.** The new species is most similar to *C. cornutoides* but distinguished from it by the posteromedian lobe of the male last tergite with a somewhat more distinct dorsal spine-like denticle, a clearly thinner medial hook (spine) of the male cerci, and slightly arcuate (not sinuate) distal halves of the paired male genital sclerites. From *C. dentata*, the new species differs in a much smaller apical hook of




**Figs 28–43.** *Ceraia* Br.-W., male: 28–31 – *C. cornutoides separata* subsp. nov.; 32–35 – *C. legitima legitima* subsp. nov.; 36–39 – *C. l. angulata* subsp. nov.; 40–43 – *C. sagittata* sp. nov. Abdominal apex without genital plate from above (28, 32, 36, 40); left cercus from above and slightly posterolaterally (29, 33, 37, 41); distal part of genital plate from below and slightly from behind (30, 34, 38, 42); abdominal apex from side (31, 35, 39, 43). Scale bars: 1 mm for Figs 28, 31, 32, 35, 36, 39, 40, 43; 0.5 mm for 29, 30, 33, 34, 37, 38, 41, 42.

the male cerci and distinctly longer paired sclerites of the male genitalia.

**Remarks.** This species, judging by the shape of male cerci, was probably recorded from northern part of Peru (not very far from the type locality of *C. legitima*) as a variation of *C. cornutoides* (Emsley and Nickle 1969: fig. 81).

***Ceraia legitima angulata* subsp. nov.**
(Figs 22–24, 36–39, 45, 56)

**Etymology.** The species name is the Latin word "angulata" (angular) given in connection with a clearly angular shape of the apical part of the male last tergite posteromedian lobe (posterior view).

**Type material.** *Holotype* – male, PERU: Ucayali Department, Atalaya Prov., ~35 km NWW of Atalaya Town on Rio Ucayali, environs of Sapani Vill., ~300 m, partly primary / partly secondary forest, at light, 26–31 October 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky. *Paratypes*. PERU: 1 male, same data as for holotype; 1 male, Cusco Department, "7 km NE Mandor", 13°18.7´S, 70°49.5´W, 890 m, at light, 1–3 December 2010, V. Sinyaev, S. Sinyaeva, Ju. Bezverkhov.

**Description.** *Male* (holotype). Size of body slightly larger than in *C. legitima legitima* stat. nov. Colouration of structure of bodyparts very similar to those of holotype of this species but with following differences: labrum uniformly yellowish; most part of antennal flagellum (excepting its proximal part) slightly lighter, brownish yellow to light brown; tegmina with two additional small light reddish brown spots in middle part of area between *MA* and *MP+CuA1*; all sternites, cerci and genital plate yellowish, but with distal part of cercal hooks darkened and distal half of genital plate light brownish rose; stridulatory apparatus of tegmina as in Figs 22–24; apical part of postromedian lobe of last tergite more angular in posterior view (Fig. 45); cerci slightly longer, with straight and slightly shorter medial hook (spine), with thicker and slightly longer apical hook, and with distinct inflation at base of latter hook (Figs 36, 37); genital plate (Fig. 39) with distal part somewhat wider (Fig. 38); sclerites of genitalia with slightly wider distal part (Fig. 56).

Variations. Male from Cusco Department with almost light brown pronotum and with clearly greenish general colouration of tegmina, venation of hind wings and most part of legs and of abdominal tergites; paratype from Ucayali Department with middle and distal parts of genital plate somewhat narrower (almost as in nominotypical subspecies).

*Female* unknown.

*Length* (mm). Body 24–26; body with wings 48–50; pronotum 5.2–5.4; tegmina 37–39; hind femora 26–27.

**Comparison.** The new subspecies, having the general appearance and sclerites of male genitalia (Figs 55, 56) almost indistinguishable from those of *C. l. legitima*, differs from the latter subspecies in a somewhat more angular apical part of the male last tergite posteromedian lobe (in the posterior view) as well as in a different shape of the male cerci (especially of their hooks; see the description above).

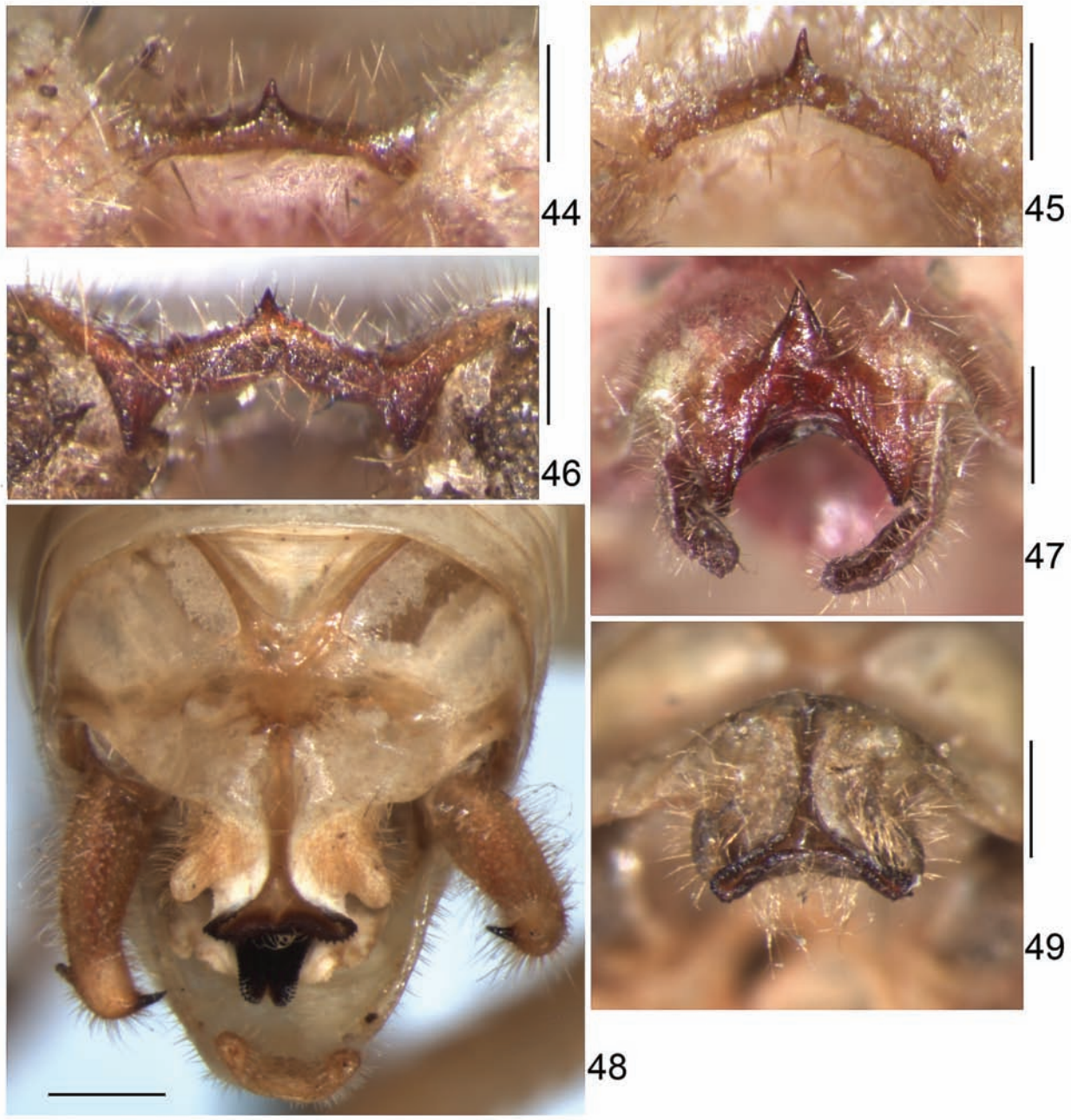
**Remarks.** This subspecies is probably distributed in the middle part of Peru; judging by its male cerci, it was recorded from Cusco Depatment as another variation of *C. cornutoides* (Emsley and Nickle 1969: fig. 79). Thus, *C. legitima* probably consists of two subspecies (northern subspecies from Ecuador and northern part of Peru, and southern one from middle part of Peru) which preserve stability in the shape of male cerci in different provinces of Peru and Ecuador.

***Ceraia sagittata* sp. nov.**
(Figs 25–27, 40–43, 47, 57)

**Etymology.** The species name is the Latin word "sagittata" (arrowy) given in connection with an arrowhead-like apical part of the male last tergite posteromedian lobe (dorsoposterior view).

**Type material.** *Holotype* – male, PERU: Junin Department, "near Mariposa Vill.", 11°24.9´S, 74°43.7´W, 1637 m, at light, 14–16 December 2010, V. Sinyaev, S. Sinyaeva, V. Izersky. *Paratype* – male, same department as for holotype, but "18 km on 55° from Satipo", 11°30.4´S, 74°51.7´W, 588 m, at light, 21 January 2010, V. Sinyaev, S. Sinyaeva, V. Izersky.

**Description.** *Male* (holotype). Body as in *C. dentata* in size and slightly larger than in *C. cornutoides* and *C. legitima*. Colouration light green, but most part of head and of pronotum light brown (however: labrum, visible part of mandibles, and genae greenish; median part of face, pedicel, and antennal flagellum brown; lower and middle parts of lateral pronotal lobes greenish), lateral field of tegmina (excepting costal area) with several very small light reddish brown spots, stridulatory vein in dorsal field of left tegmen brownish grey, transparent membranes of




**Figs 44–49.** *Ceraia* Br.-W.: 44 – *C. legitima legitima* subsp. nov.; 45 – *C. l. angulata* subsp. nov.; 46 – *C. cornutoides separata* subsp. nov.; 47 – *C. sagittata* sp. nov.; 48 – *C. intermedia* (Marquez); 49 – *C. oaxaca* sp. nov. Median part of posteromedian lobe of male last tergite from behind (44–47); male abdominal apex from above and slightly from behind (48); posteromedian lobe of male last tergite from behind (49). Scale bars: 0.5 mm for Figs 44–47, 49; 0.7 mm for Fig. 48.

hind wings as in all previous species described here, fore and middle legs with brownish areas near tympana and dark brown tympanal membranes, hind legs with distal part of femur and dorsal surface of tibia brownish green as well as with tarsi light brown but having a few darker (brown) areas, rest of thorax yellowish with rose sternites, abdomen yellowish green with reddish areas on dorsal half of tergites as well as with light reddish brown sternites and genital plate (apical part of posteromedian lobe of last tergite and a pair of semimembranous processes around it also reddish brown), and cerci with reddish tinge and darkened distal part (Fig. 40). Structure of body similar to that of *C. cornutoides* and *C. legitima*, but stridulatory apparatus as in Figs 25–27, apical part of posteromedian lobe of last tergite somewhat notched (this notch outlined by arrowhead-like sclerite having acute apical spine; in profile, this sclerite obliquely situated; Figs 40, 43, 47), semimembranous processes around this apical part thinner, cerci slightly arcuate and with two rather small hooks (medial hook comparatively long, straight and thin, spine-like; apical hook shorter and angularly curved; medial edge of cercus between these hooks weakly convex; Fig. 41), genital plate somewhat longer and with distal part more or less similar to that of *C. c. separata* (Figs 42, 43), and genitalia with paired sclerites having strongly widened distal part (Fig. 57).

Variations. Paratype with light areas under eyes distinctly smaller, most part of labrum darkened, and stridulatory vein of left tegmen slightly lighter, greenish grey.

*Female* unknown.

*Length* (mm). Body 27; body with wings 54–57; pronotum 5.7–6; tegmina 41–43; hind femora 26–28.

**Comparison.** The new species is well distinguished from all the other species of the Dentata group by a characteristic shape of the male last tergite and of the male cerci as well as a strongly widened apical part of the male paired genital sclerites (this part is much wider than in all the other species of this group).

### The Capra group

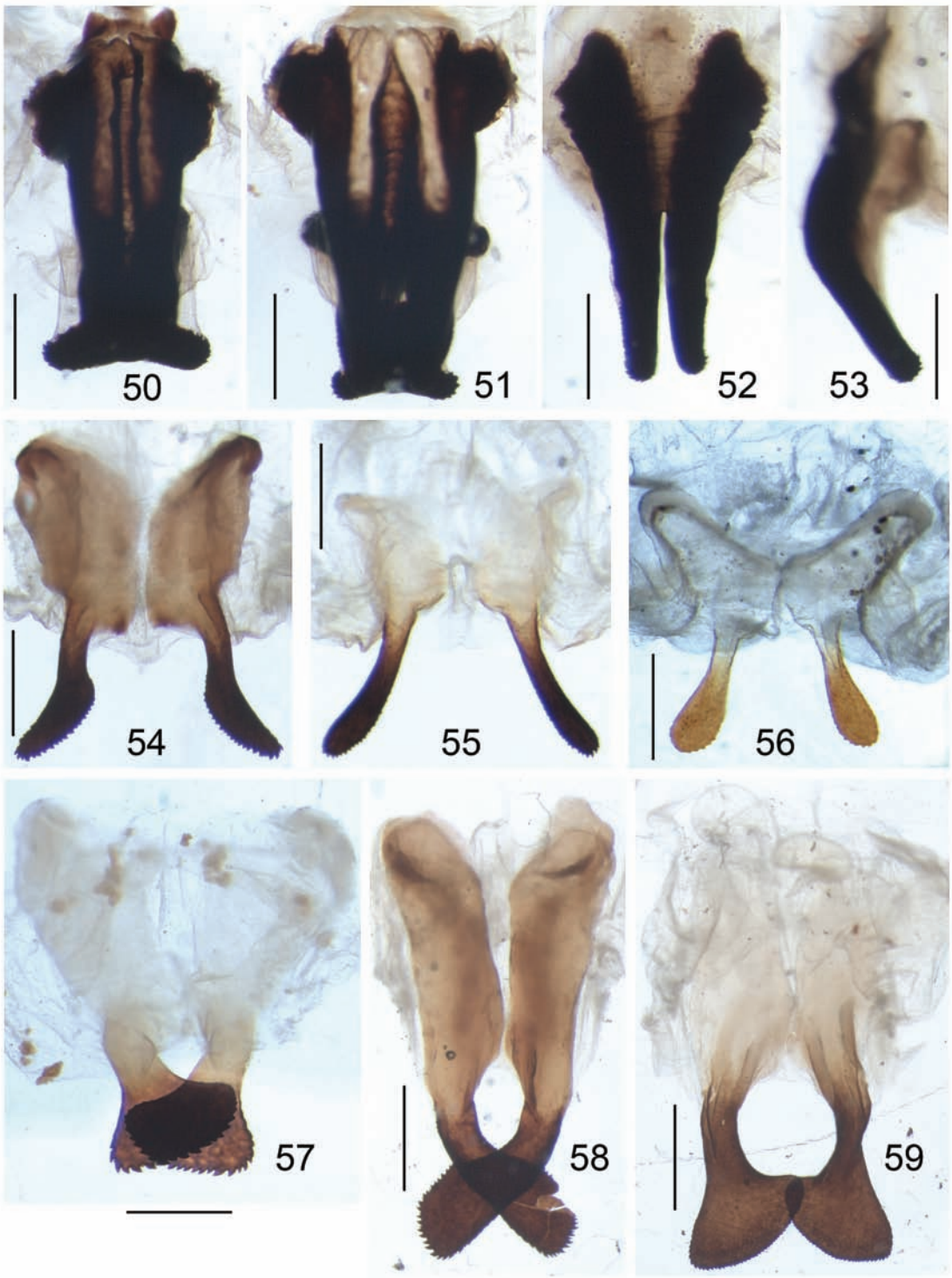
**Note.** This group consists of two species (*C. capra* Rehn, 1918; *C. propria* sp. nov.) having light hind tibiae, comparatively long male cerci without medial spines or hooks, a rather wide (approximately as in the Dentata group) and deeply notched posteromedian sclerotized lobe of the male last tergite (with elongate and almost spine-like lateral lobules, as well as with an poorly developed angular structure between them or without this structure; Figs 67, 73), a pair of semimembranous processes situated under the above-mentioned lobules and exposed behind them, and a more or less narrow (not widened) apical part of the male genital plate without any distinctly projected posteromedian lobe; Figs 68, 74).

### *Ceraia propria* sp. nov.
(Figs 58, 64–69)

**Etymology.** The species name is the Latin word "propria" (particular).

**Type material.** *Holotype* – male, FRENCH GUIANA: "Guiane Fr., 22 km NW Régina, pk 79 Route Nle 2", 4°25´N, 52°19´W, 100 m, 28 June 1995, V. Gusarov.

**Description**. *Male* (holotype). Body medium-sized for this genus. Coloration greenish with following marks: most part of head and proximal parts of legs (coxae and base of femora) yellowish; clypeus, labrum, proximal part of antennal flagellum (this part having numerous small brown marks; rest of antennae missing), and thoracic sternites light brown; rather numerous large dots between two proximal branches of *RS* and between *RS* and *MA* in tegmina as well as spines of hind legs brown; sparse dots on tegmina near these areas brownish; majority of membranes in hind wings transparent; tympanal membranes dark brown; abdominal tergites and cerci yellowish to light brown; abdominal sternites, areas between them and abdominal tergites, genital plate, and epiproct with nearest areas reddish brown. Upper rostral tubercle of head with low and rounded (convexity-like) apical denticle; pronotum and wings similar to those of *C. viktori* in structure but with stridulatory apparatus as in Figs 64–66; legs similar to those of Dentata group. Last abdominal tergite with moderately large posteromedian sclerotized lobe having moderately deep apical notch and small median denticle directed backwards and slightly upwards (Fig. 67); paired semimembranous processes of this lobe small and directed backwards (Figs 67, 69); cerci elongate, almost cylindrical, and straight but with moderately curved distal part (this part almost straight and gradually narrowing to small apical hook; Figs 67, 69); narrow part of genital plate long and insignificantly arcuate in profile (Fig. 69), and with apical part as in Fig. 68; sclerites of genitalia similar to those of *C. sagittata*




**Figs 50–59.** *Ceraia* Br.-W., sclerites of male genitalia from above (50–52, 54–59) and from side (53): 50, 51 – *C. tibialis* Br.-W. (50, environs of Satipo Town in Junin Department; 51, environs of Atalaya Town in Ucayali Department); 52, 53 – *C. viktori* sp. nov.; 54 – *C. cornutoides separata* subsp. nov.; 55 – *C. legitima legitima* subsp. nov.; 56 – *C. legitima angulata* subsp. nov.; 57 – *C. sagittata* sp. nov.; 58 – *C. propria* sp. nov.; 59 – *C. capra megacerca* subsp. nov. Scale bars: 0.5 mm for Figs 50–56; 0.7 mm for Figs 57, 58, 59.

but longer and with much narrower posterior (heavily sclerotized) parts (Fig. 58).

*Female* unknown.

*Length* (mm). Body 29; body with wings 53; pronotum 6.1; tegmina 39; hind femora 27.

**Comparison.** The new species differs from *C. capra* sensu Grant (1964) in a shorter posteromedian lobe of the male last tergite having a median denticle at the apex, longer cerci, an arcuate (in profile) male genital plate, and distinctly narrower distal parts of the male genital sclerites. General appearance of *C. nigropunctata* Chopard, 1918 (another species from French Guiana with unclear position in *Ceraia*) is also somewhat similar, but its body much smaller (pronotum and hind femur are 4.5 and 18 mm in length, respectively), pronotum with a pair of narrow darkened stripes, and male genital plate with elongate styles (styles are absent in the new species).

### *Ceraia capra megacerca* subsp. nov.
(Figs 59, 70–75)

**Etymology.** This name consists of the prefix "mega" and morphological term "cerca (=cercus)" originated from Greek words meaning big tail.

**Type material.** *Holotype* – male, PERU: Ucayali Department, Atalaya Prov., ~35 km NWW of Atalaya Town on Rio Ucayali, environs of Sapani Vill., ~300 m, partly primary / partly secondary forest, at light, 26–31 October 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky. *Paratype* – male, same data as for holotype.

**Description.** *Male* (holotype). General appearance similar to that of *C. propria*, but with following differences: coloration uniformly yellowish (probably greenish in living condition) with antennal flagellum having proximal part as in *C. propria* and more distal parts brown, with pattern of wings also as in *C. propria* (but dots on tegmina brownish and weakly distinct), with tympanal membranes dark brown, and with spines of hind legs as well as apical part of cerci somewhat darkened; stridulatory vein slightly more S-shaped (Fig. 72); tegminal mirror with slightly more acute distal part (Figs 70, 71); last tergite with distinctly larger (wider and longer) posteromedian sclerotized lobe having clearly deeper posteromedian notch, distinctly larger lateral lobules of this lobe, and wider semimembranous processes under these lobules, as well as lacking any posteromedian denticle between latter lobules (Fig. 73); cerci also larger (Fig. 73); narrow part of genital plate more straight in profile and with distinctly shorter and wider posteromedian notch (Figs 74, 75); and sclerites of genitalia with distal parts very similar to those of *C. sagittata* in shape but longer and with much smaller marginal denticles (Fig. 59).

Variations. Paratype with dots on tegmina clearly darker (as in *C. propria*) and more numerous, mirror in male tegmina practically indistinguishable from that of *C. propria* holotype, and distal part of genital plate slightly narrower and with somewhat more distinct posteromedian notch.

*Female* unknown.

*Length* (mm). Body 29–34; body with wings 54–59; pronotum 6.1–6.7; tegmina 40–44; hind femora 27–29.

**Comparison.** The new subspecies differs from *C. capra capra* stat. nov. (distributed in the eastern part of Brazil) in a somewhat larger posteromedian lobe of the male last tergite, clearly longer male cerci, a slightly shorter genital plate, and somewhat more widened distal parts of the male genital sclerites. From *C. propria*, the new subspecies differs in the same characters as the nominotypical subspecies (especially in much wider distal parts of the male genital sclerites and distinctly smaller denticles on these parts).

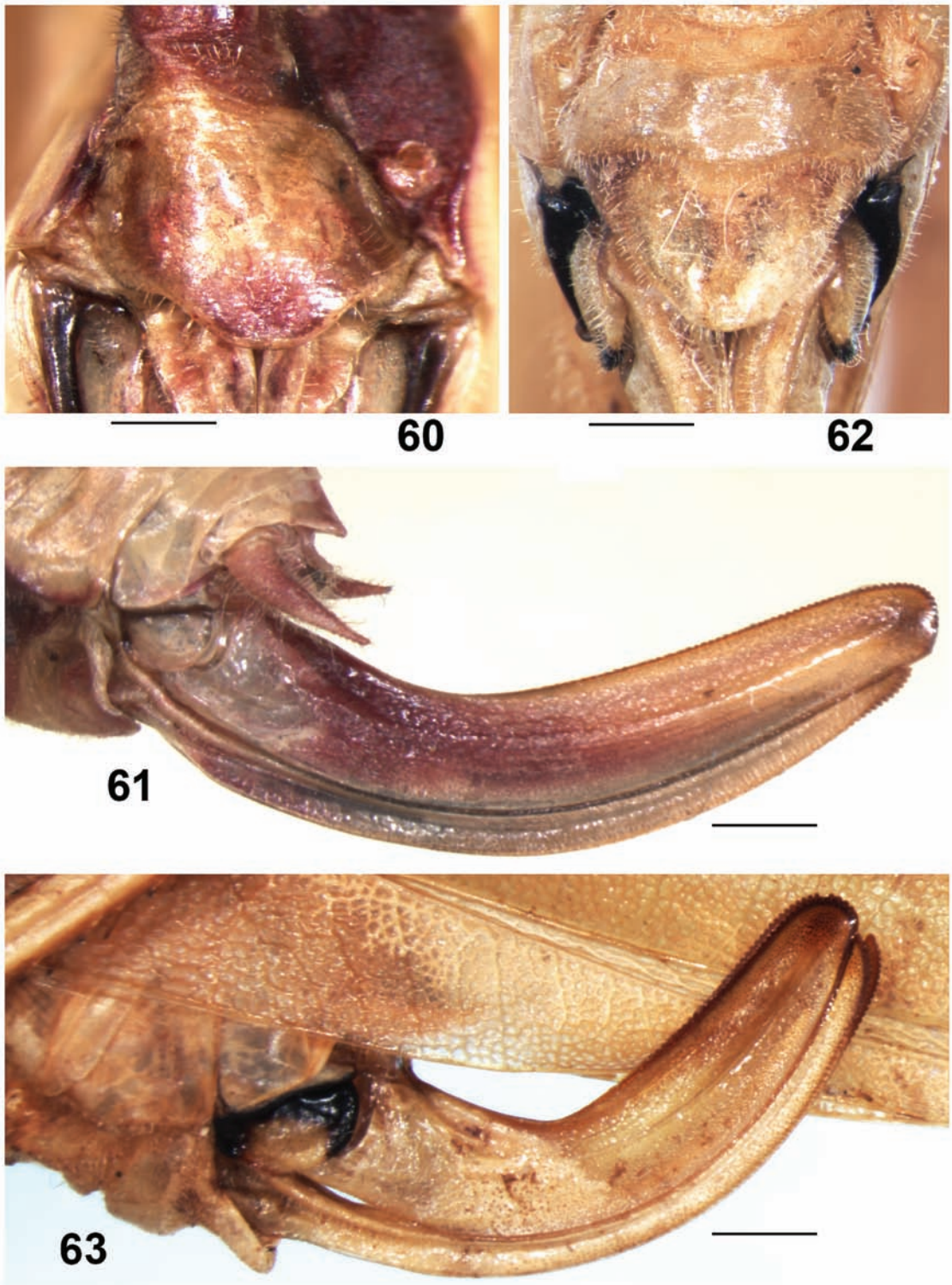
## The Piracicabensis group

**Note**. This group differs from all the other species groups of *Ceraia* in the absence (loss) of distinct sclerites in the male genitalia (Fig. 91). It consists of four species: *C. piracicabensis* (Piza, 1950); *C. cotti* Grant, 1964; *C. para* Grant, 1964; *C. mollis* sp. nov.

### *Ceraia mollis* sp. nov.
(Figs 76–78, 88–91)

**Etymology**. The species name is the Latin word "mollis" (soft), as this species lacks sclerites in the male genitalia.

**Material examined**. *Holotype* – male, PERU: Junin Department, Satipo Prov., garden–forest very near Satipo Town, ~600 m, at light, 15 October – 6 November 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky. *Paratype* – male, same department and province, ~25 km SE of Satipo Town, environs of Rio Venado Vill., ~1200 m, partly primary / partly secondary forest, at light, 20–23 Oc-




**Figs 60–63**. *Ceraia* Br.-W., female: 60, 61 – *C. legitima legitima* subsp. nov.; 62, 63 – *C. surinamensis granti* subsp. nov. Genital plate from below (60, 62); ovipositor from side (61, 63). Scale bars: 0.5 mm for Figs 60, 62; 2 mm for Figs 61, 63.

tober 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky.

**Description**. *Male* (holotype). General appearance similar to that of *C. capra megacerca* but with following differences: proximal part of antennal flagellum more uniformly light brown; median ocellus somewhat darkened; tegmina without dark and darkish marks; tegminal stridulatory apparatus with distal part of mirror narrowly truncate and stridulatory vein straighter (Figs 76–78); last abdominal tergite with moderately wide and rather long posteromedian lobe having apical part distinctly angular (but with narrowly truncate apex) and curved downwards and slightly forwards (Figs 88, 90); semimembranous processes of this lobe reduced and looking as indistinct low convexities on its ventral surface; cerci very short and strongly hooked but with distal part almost straight (spine-like; Fig 88); and narrow half of genital plate moderately long, almost not widened in apical part, with comparatively deep and rather narrow posteromedian notch, and without distinct styles (Figs 89, 90).

Variations. Paratype with light median ocellus, one branch on RS in left tegmen (second branch of RS transferred to RA), and very small styles of genital plate.

*Female* unknown.

*Length* (mm). Body 23–26; body with wings 50–52; pronotum 5.4–5.9; tegmina 36–39; hind femora 26.5–29.

**Comparison**. The new species is most similar to *C. piracicabensis* from the environs of Sao Paulo City in Brazil but distinguished by a distinctly shorter posteromedian lobe of the male last tergite [apical width of this lobe is 1.1–1.2 times as great as median length of this tergite; *vs*. this width is more than twice as great as the latter length (Eades et al. 2014: photograph of one of *C. piracicabensis* syntypes)], almost angular apical part of this lobe lacking additional lobules near the apex of this part [this part is more or less similar to that pictured by Grant (1964: fig. 52) for a male from Bolivia], and possibly shorter male cerci [if the cercus pictured by Grant (1964: fig. 50) belongs to his male from Sao Paulo]. From *C. para* and *C. cotti*, the new species differs in a much longer posteromedian lobe of the male last tergite and different shape of the male cerci.

**Remarks**. Possibly, this species was recorded by Grant (1964) from Bolivia as a variation of *C. piracicabensis*.

**The Hemidactyla group**

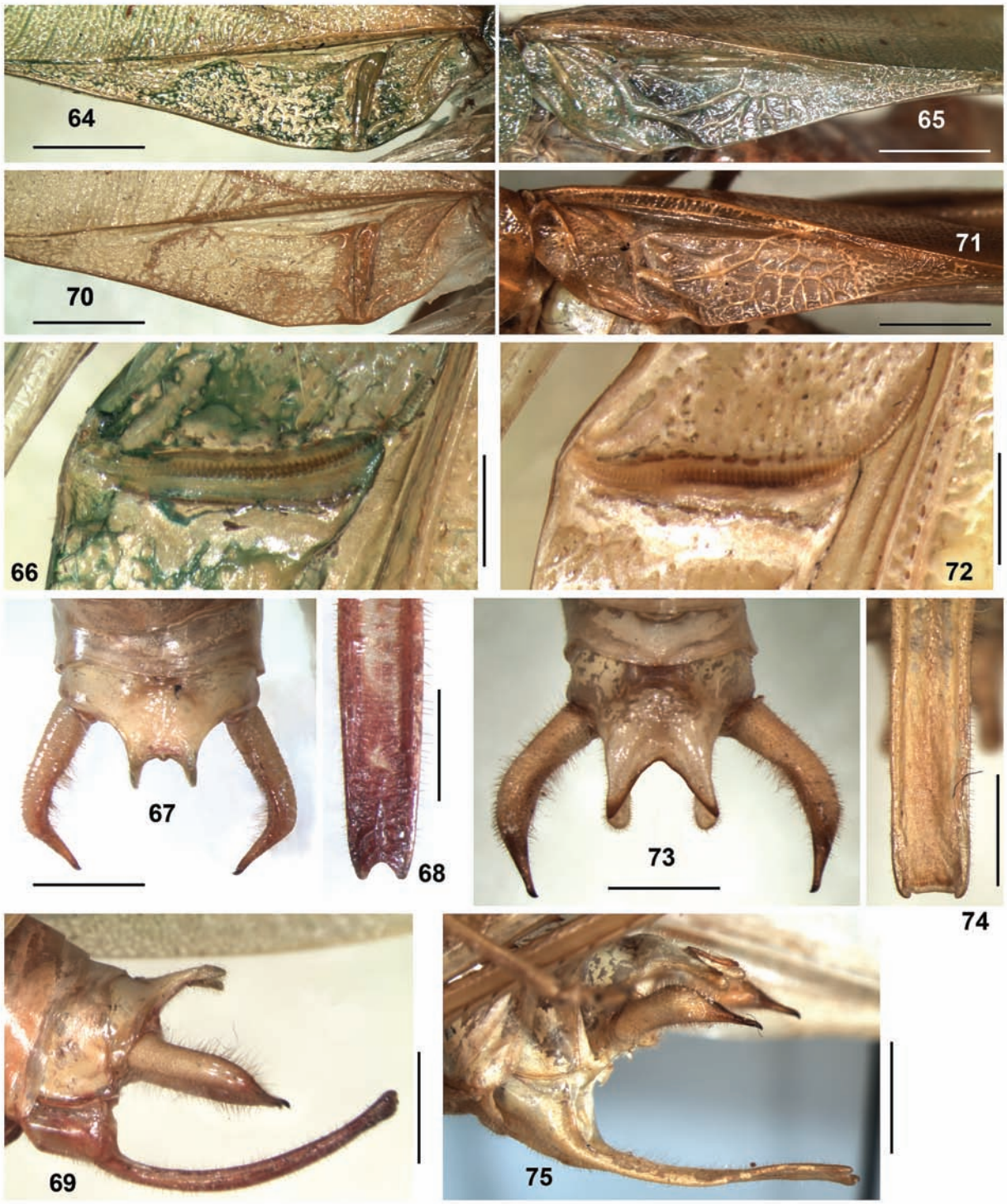
**Note**. Emsley and Nickle (1969) separate this group from all the other congeners on the base of "small size", "pronotal shape" and "extreme similarity of the male tenth tergite". However, they did not indicate concrete pronotal and abdominal characters. It seems to me that its pronotum is practically indistinguishable from that of some species belonging to the other groups. But its male abdomen is characterized by the following characters: posteromedian lobe of the last tergite is with a more or less narrow and usually slightly bifurcate distal part; a pair of semimembranous processes are situated under this lobe and looking as rounded or angular keels directed downwards; cerci are simple, with apical hooks and without additional spines; apical part of genital plate is not widened and with a distinct posteromedian notch (Figs 92–94). This group includes *Scudderia hemidactyla* Rehn et Hebard, 1914, *C. stenopa* Emsley et Nickle, 1969, stat. nov. (this species, originally described as a subspecies of *C. hemidactyla*, is a distinct species distinguished from *C. hemidactyla* by a much narrower posteromedian lobe of the male last tergite), *C. hemidactyloides* Emsley et Nickle, 1969, *C. columbiana* sp. nov., and possibly *C. striata* Emsley et Nickle, 1969.

***Ceraia columbiana* sp. nov.**
(Figs 79–81, 92–95)

**Etymology**. The species is named after Colombia.

**Type material**. *Holotype* – male, COLOMBIA: "Presidio, Rio Magdalena, Columb.", 8 May 1926, Yu. Woronov.

**Description.** *Male* (holotype). Body rather small for this genus. Coloration yellowish grey (possibly greenish in living condition) with brown eyes, lower half of clypeus, membrane of antennal cavity and middle part of antennal flagellum (rest of antennae missing), as well as with rather numerous brownish dots on tegmina (between *RA* and anal edge, and between *R* and *MP+CuA1*), dark brown tympanal membranes and light brown most part of abdomen. Rostrum of head similar to that of *C. mollis*; pronotum with lower two thirds of posterior edge of lateral lobes somewhat more oblique than in all previous species described here; tegmina with stridulatory apparatus as in Figs 79–81; posteromedian lobe of last abdominal tergite




**Figs 64–75.** *Ceraia* Br.-W., male: 64–69 – *C. propria* sp. nov.; 70–75 – *C. capra megacerca* subsp. nov. Stridulatory apparatus of left (64, 70) and right (65, 71) tegmina; stridulatory vein of left tegmen from below (66, 72); abdominal apex from above (67, 73) and from side (69, 75); distal part of genital plate from below (68, 74). Scale bars: 2 mm for Figs 64, 65, 70, 71; 1 mm for Figs 67, 69, 73, 75; 0.5 mm for Figs 68, 74.

with rather strongly narrowed subapical part, barely widened and slightly bifurcate apical part (this part rounded in profile and with elongate median concavity dorsally), and with widely angular semimembranous processes under latter part fused with rather large semimembranous areas on lateral sides of this lobe (Figs 92, 94); cerci and genital plate as in Figs 92–94; genitalia with a pair of elongate triangular sclerites almost completely covered with very small spinules and denticles, and with a few semisclerotized folds situated near bases of these sclerites (Fig. 95).

*Female* unknown.

*Length* (mm). Body 21; body with wings 39; pronotum 4.7; tegmina 28; hind femora 24.

**Comparison.** The new species is most similar to *C. hemidactyla* in the structure of male genitalia, especially in the presence of semisclerotized transverse folds near the bases of the paired sclerites (Fig. 95; Grant 1964: fig. 159). However, the new species is well distinguished from the latter congener by the male genital sclerites completely covered with spinules and denticles (*vs.* such spinules and denticles are developed on the distal parts of these sclerites only), and a clearly narrower subapical part of the male last tergite posteromedian lobe. From *C. stenopa*, the new species differs in the same characters of male genitalia as from *C. hemidactyla*, and a distinctly wider apical and subapical parts of the male last tergite posteromedian lobe; from *C. hemidactyloides*, in the male genitalia with a pair of distinct sclerites (*vs.* with a single unpaired sclerite somewhat bifurcate distally); and from *C. striata*, in the male last tergite with a posteromedian lobe distinctly shorter and slightly bifurcate at the apex, male cerci somewhat longer, and male genitalia having only two (but not three) distinct sclerites.

## The Intermedia group

**Note**. This group differs from the other congeners in a very characteristic structure of the distal part of the male last tergite posteromedian lobe: this part is with lateral folds curved upwards and medially; anterior halves of these lateral folds semimembranous and rather large (only narrow median sclerotized stripe is preserved between them); posterior halves of these lateral folds narrower and partly sclerotized (the above-mentioned sclerotized stripe is strongly widening to slightly notched apex having very small denticles; Figs 48, 49). The group includes *Scudderia intermedia* Marquez, 1958, *C. oaxaca* sp. nov., and possibly *C. tuxtlaensis* Marquez, 1964. All these species are from Mexico.

### *Ceraia intermedia* (Marquez, 1958)
(Figs 48, 85–87, 100–103)

**Material studied**. MEXICO: 7 males and 2 females, Chiapas State, environs of Tuxtla Gutierrez City near El Ocote Reserve, 600–1000 m, partly primary / partly secondary forest, at light, 19–24 May 2006, A. Gorochov, M. Berezin; 1 male, same state, environs of Palenque Town near Maya Archaeological Centre, ~200 m, primary forest, on leaf of tree at night, 18–20 November 2006, A. Gorochov, A. Ovtshinnikov; 1 male, 7 females, Veracruz State, 15–20 km NE of Catemaco Town, Los Tuxtlas (biostation of Mexico University) in 2 km from Mexican Gulf, primary forest on hills, at light, 6–17 November 2006, A. Gorochov, A. Ovtshinnikov.

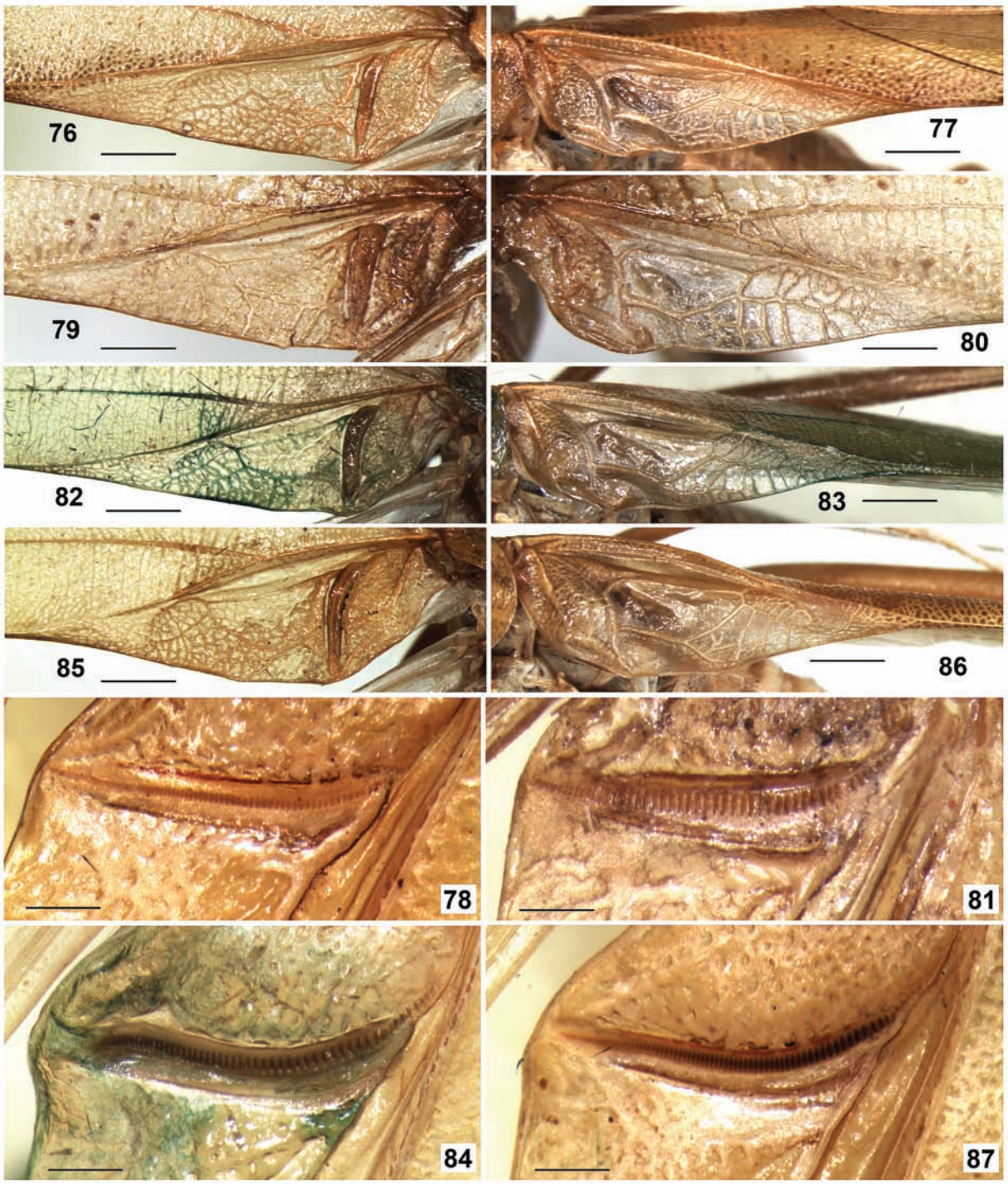
**Notes**. These specimens are similar to each other in relation to the structure of male copulatory device as well as to all the other morphological characters. This species is probably most common and widely distributed in the southern part of Mexico.

### *Ceraia oaxaca* sp. nov.
(Figs 49, 82–84, 96–99)

**Etymology**. The species is named after Oaxaca State of Mexico.

**Type material**. *Holotype* – male, MEXICO: Oaxaca State, 35 km NNE of Santa Cruz Huatulco (10 km N of Xadani Vill.), 900–1000 m, secondary forest, on leaf of bush at night, 7–11 May 2006, A. Gorochov, M. Berezin.

**Description.** *Male* (holotype). Body somewhat smaller than in majority of *Ceraia* species. Coloration yellowish (probably greenish in living specimen) with following marks: head with light brown eyes and brown most part of labrum (antennal flagellum missing); pronotum with reddish stripe on anterior half of each lateral lobe along dorsal edge, and with barely darker (distinctly greenish) posterior part of disc; tegmina uniformly greenish with yellowish stridulatory vein in left tegmen and most part of dorsal field in right tegmen (but with transparent membranes of stridulatory apparatus); legs with dark brown membranes of tympana, brownish grey spines




**Figs 76–87.** *Ceraia* Br.-W., male: 76–78 – *C. mollis* sp. nov.; 79–81 – *C. columbiana* sp. nov.; 82–84 – *C. oaxaca* sp. nov.; 85–87 – *C. intermedia* (Marquez). Stridulatory apparatus of left (76, 79, 82, 85) and right (77, 80, 83, 86) tegmina; stridulatory vein of left tegmen from below (78, 81, 84, 87). Scale bars: 2 mm for Figs 76, 77, 79, 80, 82, 83; 1 mm for Figs 78, 81, 84, 87.

of middle and hind femora, and somewhat darkened areas on tarsi; abdomen with light greyish brown distal part of posteromedian lobe of last tergite (but sclerotized distal area of this lobe darker, brown), light brown distal part of genital plate and most part of cerci, and dark brown cercal apices. Structure of body typical of *Ceraia* but with following differences: head and pronotum similar to those of *C. viktori* (see Fig. 8) but with slightly longer lateral pronotal lobes; tegmina with stridulatory apparatus as in Figs 82–84; posteromedian lobe of last abdominal tergite rather long and with distal part strongly curved downwards (Figs 96, 98); structure of this distal part similar to that of *C. intermedia*, but a pair of lateral semimembranous processes on this part somewhat smaller and less distinct (for comparison see Figs 48 and 49); cerci rather short and simple (with small apical hook curved medially; Figs 96, 98); genital plate not very long, with posterior half moderately narrow and slightly widened to apex, and with rather wide (but not deep) posteromedian notch (Figs 97, 98); genitalia with a pair of almost conical sclerites having numerous and very small denticles as well as distinctly narrowed part not far from base of these sclerites (Fig. 99).

*Female* unknown.

*Length* (mm). Body 20; body with wings 46; pronotum 5.3; tegmina 34; hind femora 25.5.

**Comparison.** The new species is most similar and closely related to *C. intermedia* but distinguished by slightly shorter wings, a shorter and somewhat more S-shaped stridulatory vein of the left tegmen (Figs 82, 84), a narrower mirror of the both tegmina (Figs 82, 83), a longer and more strongly curved posteromedian lobe of the male last tergite, shorter male cerci, a wider distal part of the male genital plate having a wider and slightly less deep posteromedian notch, and a somewhat different shape of sclerites in the male genitalia (for comparison see Figs 96–99 and 100–103). From *C. tuxtlaensis* described insufficiently understandable, the new species differs in a distinctly longer posteromedian lobe of the male last tergite and a very different shape of the lateral processes of the above-mentioned lobe.

### The Pristina group

**Note**. This group, according to Emsley and Nickle (1969), contains 12 species with a rather diverse structure of the male abdominal apex (including genital sclerites). Possibly, this group must be divided into a few smaller groups. But such work requests additional material, as the relationship of many of these species with *C. pristina* Grant, 1964, having three sclerites in the male genitalia, is not clear. For this reason all these species are considered as members of this group only tentatively.

### *Ceraia cottica* Grant, 1964

**Material studied**. FRENCH GUIANA: 1 male, “22 km NW Régina, pk 79 Route Nle 2”, 4°25´N, 52°19´W, 100 m, 28 June 1995, V. Gusarov.

**Note**. This distinct species is described from Surinam and recorded here from French Guiana. The male studied is very similar to the original description but with a somewhat shorter genital plate (Grant 1964: fig. 54), and with the genitalia slightly different from those pictured by Emsley and Nickle (1969: fig. 69).

### *Ceraia maxima* Brunner-Wattenwyl, 1891

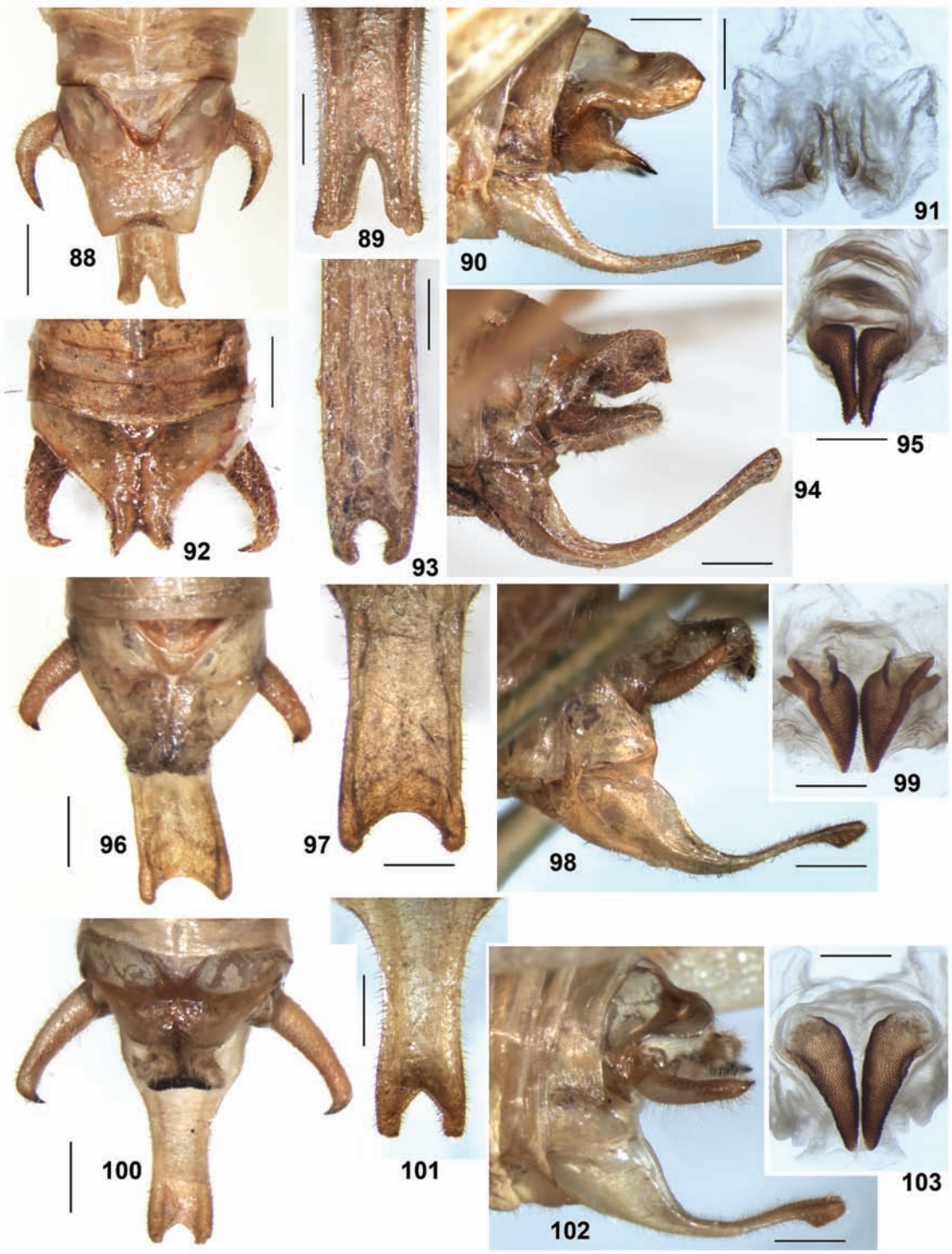
**Material studied**. PERU: 18 males, Ucayali Department, Atalaya Prov., ~35 km NWW of Atalaya Town on Rio Ucayali, environs of Sapani Vill., ~300 m, partly primary / partly secondary forest, at light, 26–31 October 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky; 5 males, Junin Department, Satipo Prov., ~25 km SE of Satipo Town, environs of Rio Venado Vill., ~1200 m, partly primary / partly secondary forest, at light, 20–23 October 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky.

**Note**. This large species is described from Bolivia and indicated for Brazil (Para) and Peru by Grant (1964) and Emsley and Nickle (1969). Here, it is recorded from some other localities of Peru. All the above-listed specimens are very similar to each other and to the redesciption by Grant (1964).

### *Ceraia surinamensis granti* subsp. nov.
(Figs 62, 63, 104–109, 118, 119)

**Etymology**. The new subspecies is named in honor of H.J. Grant, the author of a first revision of the genus *Ceraia*.

**Type material**. *Holotype* – male, PERU: Junin Department, Satipo Prov., ~25 km SE of Satipo Town, environs of Rio Venado Vill., ~1200 m, partly




**Figs 88–103.** *Ceraia* Br.-W., male: 88–91 – *C. mollis* sp. nov.; 92–95 – *C. columbiana* sp. nov.; 96–99 – *C. oaxaca* sp. nov.; 100–103 – *C. intermedia* (Marquez). Abdominal apex from above (88, 96, 100) and from side (90, 94, 98, 102); distal part of genital plate from below and slightly from behind (89, 93, 97, 101); sclerites of genitalia from above (91, 95, 99, 103); abdominal apex without genital plate from above (92). Scale bars: 1 mm for Figs 88, 90, 92, 94, 96, 98, 100, 102; 0.5 mm for Figs 89, 91, 93, 95, 97, 99, 101, 103.

primary / partly secondary forest, at light, 20–23 October 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky. *Paratypes*. PERU: 7 males and 1 female, same data as for holotype; 3 males, same department and province, environs of Satipo Town, ~800 m, secondary forest near waterfall, at light, 4–5 November 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky; 1 female, same department and province, garden–forest very near Satipo Town, ~600 m, at light, 15 October – 6 November 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky; 6 males, Ucayali Department, Atalaya Prov., ~35 km NWW of Atalaya Town on Rio Ucayali, environs of Sapani Vill., ~300 m, partly primary / partly secondary forest, at light, 26–31 October 2008, A. Gorochov, M. Berezin, L. Anisyutkin, E. Tkatsheva, V. Izersky; 1 male, Cusco Department, "7 km NE Mandor", 13°18.7´S, 70°49.5´W, 890 m, at light, 1–3 December 2010, V. Sinyaev, V. Sinyaeva, Yu. Bezverkhov.

**Description**. *Male* (holotype). General appearance similar to that of *C. mollis* but with following differences: posterior edge of pronotal lateral lobes clearly or slightly more rounded than in all other previous congeners described here; tegminal stridulatory apparatus as in Figs 104–106; posteromedian lobe of last abdominal tergite medium-sized, and with moderately narrow distal part consisting of two pairs of rounded lobules (medial lobules somewhat longer than lateral ones, rather narrow, and separated from each other by small posteromedian notch and by dorsal median groove almost reaching proximal edge of tergite; Fig. 107); cerci short, flattened, and with widely rounded and slightly curved apical part having short dorsomedial spine (Figs 107, 108); and genital plate strongly curved upwards, with distal part comparatively thin but having rather deep posteromedian notch (lateral lobules around this notch directed upwards and slightly laterally; Figs 108, 109). Genitalia with three sclerites characteristic in shape (Figs 118, 119).

Variations. Sometimes, tegmina with weakly distinct darkish dots along median part of lateral field, or with a single branch on *RS* (second branch of *RS* transferred to *RA* as in paratype of *C. mollis*).

*Female*. General appearance very similar to that of male, but dorsal tegminal field almost as in female of *C. legitima*, and abdomen with a pair of characteristic dark brown spots near base of ovipositor. Genital plate approximately triangular, with rounded apex and distinct transverse fold (Fig. 62); ovipositor as in Fig. 63.

*Length* (mm). Body: male 23–27, female 26–28; body with wings: 53–58, female 56–59; pronotum: male 5.9–6.3, female 6.1–6.4; tegmina: male 41–44, female 43–45; hind femora: male 26–28, female 29–31; ovipositor 9–9.5.

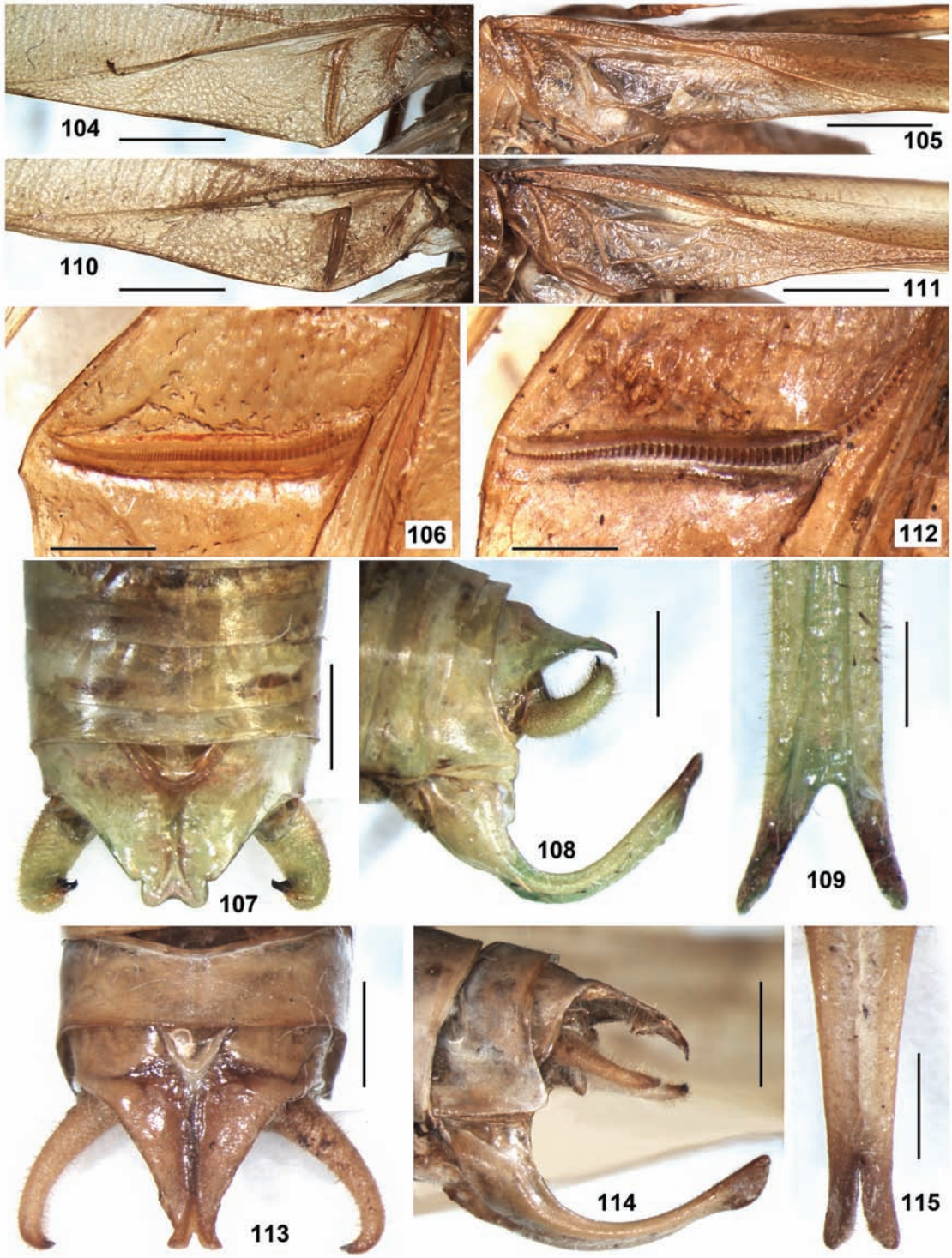
**Comparison**. The new subspecies differs from *C. s. surinamensis* Brunner-Wattenwyl, 1891, stat. nov. in a distinctly narrower distal part of the male last tergite posteromedian lobe. From all the other congeners, the new subspecies differs in the same characters as the nominotypical subspecies.

### ***Ceraia woronovi* sp. nov.**
(Figs 110–117)

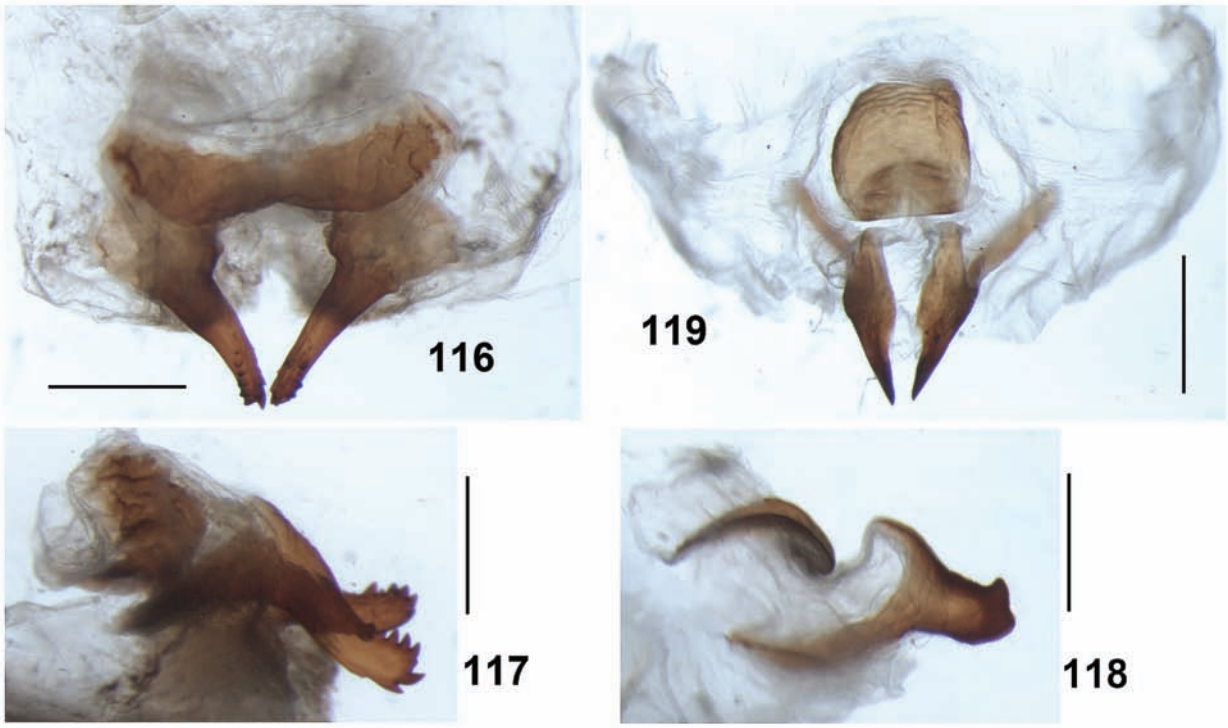
**Etymology.** The species is named after its collector.

**Type material.** *Holotype* – male, COLOMBIA: "Penas Blancos, Rio Magdalena, Colum.", 3 May 1926, Yu. Woronov.

**Description.** *Male* (holotype). General appearance more or less as in *C. mollis* and *C. surinamensis granti*. However, coloration of body similar to that of *C. columbiana* but with light brown eyes, almost brown proximal part of antennal flagellum (rest of antennae missing), slightly darkened hind tibiae and hind tarsi, and without dark and darkish marks on tegmina. Upper tubercle of head rostrum practically without small convexity at apex; pronotum approximately as in *C. viktori* in shape; tegminal stridulatory apparatus as in Figs 110–112. Abdominal apex with following features: posteromedian lobe of last tergite rather long, dorsoventrally flattened, gradually narrowing to narrow subapical part, slightly widened in apical part, and with a pair of small apical lobules separated from each other by distinct posteromedian notch; dorsum of this lobe with median groove running from latter notch to proximal edge of tergite (Fig. 113); semimembranous processes of this lobe reduced and looking as a pair of small tubercles on its ventral surface (Fig. 114); cerci elongate, rather thin, not flattened, and with distal part roundly hooked (Figs 113, 114); genital plate moderately curved in profile, with apical part somewhat widened in profile (Fig. 114), and with narrow and rather deep posteromedian notch (Fig. 115); genitalia with sclerites similar to those of *C. s. granti* but consisting of much more transverse unpaired plate and longer distal (narrow in profile) part of paired sclerites (lat-




**Figs 104–115.** *Ceraia* Br.-W., male: 104–109 – *C. surinamensis granti* subsp. nov.; 110–115 – *C. woronovi* sp. nov. Stridulatory apparatus of left (104, 110) and right (105, 111) tegmina; stridulatory vein of left tegmen from below (106, 112); abdominal apex from above (107, 113) and from side (108, 114); distal part of genital plate from below and slightly from behind (109, 115). Scale bars: 2 mm for Fig. 104, 105, 110, 111; 1 mm for Figs 106–108, 112–114; 0.5 mm for Figs 109, 115.




**Figs 116–119.** *Ceraia* Br.-W., male: 116, 117 – *C. woronovi* sp. nov.; 118, 119 – *C. surinamensis granti* subsp. nov. Sclerites of genitalia from above (116, 119) and from side (117, 118). Scale bars: 0.7 mm for Fig. 116, 117; 0.5 mm for Figs 118, 119.

ter sclerites having also widely separated bases and rather large denticles on apical part; Figs 116, 117).

*Female* unknown.

*Length* (mm). Body 33; body with wings 54; pronotum 6.5; tegmina 40; hind femora 31.

*Comparison*. The new species is similar to *C. surinamensis*, *C. pristina*, *C. mytra* Grant, 1964 and *C. vicina* Chopard, 1918 in the structure of male genitalia (especially in the presence of an unpaired plate near the bases of the paired sclerites) but distinguished from them by a longer and narrower posteromedian lobe of the male last tergite (from *C. surinamensis* and *C. vicina*) or by the paired sclerites of male genitalia with more widely separated bases and distinctly longer denticles on the apical parts (from *C. pristina* and *C. mytra*).

## ACKNOWLEDGMENTS

The author is thankful to the collectors of these interesting insects. The study is supported by the Presidium of the Russian Academy of Sciences (Program "Biosphere Origin and Evolution of geo-biological systems").

## REFERENCES

**Brunner-Wattenwyl C. 1878.** Monographie der Phaneropteriden. F.A. Brockhaus, Wien, 401 p.

**Brunner-Wattenwyl C. 1891.** Additamenta zur Monographie der Phaneropteriden. *Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien*, **41**: 1–196.

**Cadena-Castañeda O.J. 2013.** The tribe Dysoniini part II: The genus *Markia* (Orthoptera: Tettigoniidae; Phaneropterinae), new species and some clarifications. *Zootaxa*, 3599(6): 501–518.

**Cadena-Castañeda O.J. and Gorochov A.V. 2012.** Review of the Neotropical genus *Paraphidnia* (Orthoptera: Tettigoniidae: Phaneropterinae). *Zoosystematica Rossica*, **21**(2): 204–233.

**Cadena-Castañeda O.J. and Gorochov A.V. 2013.** Review of the Neotropical genera *Quiva* and *Yungasacris* (Orthoptera: Tettigoniidae: Phaneropterinae). *Zoosystematica Rossica*, **22**(2): 189–203.

**Chopard L. 1969.** Grylloidea. The fauna of India and the adjacent countries. Orthoptera. Vol. 2. Calcuttam, Baptist Mission Press, 421 p.

**Desutter-Grandcolas L. 2003.** Phylogeny and the evolution of acoustic communication in extant Ensifera (Insecta, Orthoptera). *Zoologica Scripta*, **32**(6): 525–561.

**Dias P., Rafael J.A. and Naskrecki P. 2012.** A taxonomic revision of the Neotropical genus *Aegimia* Stål, 1874 (Orthoptera, Tettigoniidae, Phaneropterinae). *Journal of Orthoptera Research*, **21**(1): 109–132.

**Eades D.C., Otte D., Cigliano M.M. and Braun H. 2014.** *Orthoptera Species File Online. Version 5.0/5.0*. Visited 12 December 2014. Available from: < http://Orthoptera.SpeciesFile.org>

**Emsley M.G. and Nickle D.A. 1969.** The systematics of *Ceraia* (Orthoptera: Tettigoniidae: Phaneropterinae). *Proceedings of the Academy of Natural Sciences of Philadelphia*, **121**: 25–77.

**Gorochov A.V. 1995a.** System and evolution of the suborder Ensifera (Orthoptera). Part 1. *Proceedings of the Zoological Institute of RAS*, **260**: 1–224. [In Russian]

**Gorochov A.V. 1995b.** System and evolution of the suborder Ensifera (Orthoptera). Part 2. *Proceedings of the Zoological Institute of RAS*, **260**: 1–212. [In Russian]

**Gorochov A.V. 2006.** A new katydid genus of unclear systematic position from Ecuador (Orthoptera: Tettigoniidae). *Zoosystematica Rossica*, **15**(1): 47–50.

**Gorochov A.V. 2012a.** Systematics of the American katydids (Orthoptera: Tettigoniidae). Communication 1. *Proceedings of the Zoological Institute RAS*, **316**(1): 3–21.

**Gorochov A.V. 2012b.** Systematics of the American katydids (Orthoptera: Tettigoniidae). Communication 2. *Proceedings of the Zoological Institute RAS*, **316**(4): 285–306.

**Gorochov A.V. 2013.** A new subtribe of the tribe Phisidini from America and remarks on the genus *Arachnoscelis* (Orthoptera: Tettigoniidae: Meconematinae). *Zoosystematica Rossica*, **22**(1): 59–62.

**Gorochov A.V. 2014.** Systematics of the American katydids (Orthoptera: Tettigoniidae). Communication 3. *Proceedings of the Zoological Institute RAS*, **318**(2): 109–147.

**Grant H.J. 1964.** A revision of the genera *Ceraia* and *Euceraia*, with notes on their relationship to *Scudderia* (Orthoptera; Tettigoniidae; Phaneropterinae). *Proceedings of the Academy of Natural Sciences of Philadelphia*, **116**(2): 29–117.

**Gu J.-J., Qiao G.-X. and Ren D. 2010.** Revision and new taxa of fossil Prophalangopsidae (Orthoptera: Ensifera). *Journal of Orthoptera Research*, **19**(1): 41–56.

**Ingrisch S. 2011.** New taxa of Elimaeini (Orthoptera: Tettigoniidae: Phaneropterinae) from South East Asia. *Zootaxa*, 2935: 1–25.

**Kukalova-Peck J. 1983.** Origin of the insect wing and wing articulation from the arthropodan leg. *Canadian Journal of Zoology*, **61**: 1618–1669.

**Nel A., Prokop J. and Ross A.J. 2008.** New genus of leaf-mimicking katydids (Orthoptera: Tettigoniidae) from the Late Eocene–Early Oligocene of France and England. *Comptes Rendus Palevol*, **7**: 211–216.

**Otte D. and Alexander R.D. 1983.** The Australian crickets (Orthoptera: Gryllidae). The Academy of Natural Sciences of Philadelphia. Monograph 22., Allen Press, Philadelphia, 477 p.

**Piza S.deT. 1950.** Novos Phaneropteridae do Brasil. *Anais da Escola Superior de Agricultura "Luiz de Queiroz"*, **7**: 89–98.

**Ragge D.R. 1955.** The wing-venation of the Orthoptera Saltatoria with notes on dictyopteran wing-venation. The British Museum, London, 159 p.

**Rasnitsyn A.P. and Quicke D.L.J. (Eds). 2002.** History of Insects. Kluwer Academic Publishers, Dordrecht, Boston, London, 517 p.

**Sharov A.G. 1968.** Phylogeny of orthopteroid insects. *Proceedings of the Paleontological Institute, USSR Academy of Sciences*, **118**: 1–217.

**Storozhenko S.Ju. 2004.** Long-horned orthopterans (Orthoptera: Ensifera) of the Asiatic part of *Russia*. Dal'nauka, Vladivostok, 279 p. [In Russian]

**Wootton R.J. 1979.** Function, homology and terminology in insect wings. *Systematic Entomology*, **4**: 81–93.

**Zeuner F.E. 1930.** Fossil Orthoptera Ensifera. The British Museum, London, 321 p.

*Submitted January 21, 2014; accepted August 25, 2014.*