



Studies on Neotropical Phasmatodea XIV: Revisions of the Central American Genera *Hypocyrtus* Redtenbacher, 1908 and *Rhynchacris* Redtenbacher, 1908 (Phasmatodea: “Anareolatae”: Xerosomatinae: Hesperophasmatini)

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Studies on neotropical Phasmatodea XIV: revisions of the Central American genera *Hypocyrtus* Redtenbacher, 1908 and *Rhynchacris* Redtenbacher, 1908 (Phasmatodea: "Anareolatae": Xerosomatinae: Hesperophasmatini)

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Abstract

The two Central American genera *Hypocyrtus* Redtenbacher, 1908 and *Rhynchacris* Redtenbacher, 1908 (Xerosomatinae: Hesperophasmatini) are revised at the species level. Extended redescriptions of both genera are presented along with keys to the species contained. Detailed descriptions and illustrations of all seven known species are provided.

Hypocyrtus Redtenbacher, 1908 is here confirmed as a valid genus and now contains three distinct species, all of which are restricted to southern Mexico, Guatemala and Belize. *Ocnophila ornatissima* Brunner v. Wattenwyl, 1907 is removed from *Ocnophila* Brunner v. Wattenwyl, 1907 and transferred to *Hypocyrtus* (n. comb.). *H. postpositus* Redtenbacher, 1908 is removed from *Lamponius* Stål, 1875 and returned to *Hypocyrtus* (rev. stat.). Two new synonyms are established in *Hypocyrtus*: *Anophelepis vittatus* Westwood, 1859 = *Anophelepis scythrus* Westwood, 1859 (n. syn.) and *Hypocyrtus substrumosus* Redtenbacher, 1908 = *Hypocyrtus postpositus* Redtenbacher, 1908 (n. syn.). The male and egg of *H. ornatissimus* (Brunner v. Wattenwyl, 1907) and the egg of *H. scythrus* (Westwood, 1859) are described and illustrated for the first time.

Rhynchacris now contains four known species distributed throughout southern Central America (Nicaragua, Costa Rica and Panama) and northeast Colombia. The monotypic genus *Pseudoceroys* Hebard, 1923 was previously misplaced in Diapheromerinae: Diapheromerini: "Clonistria-group" and is here shown to be a synonym of *Rhynchacris* Redtenbacher, 1908 (n. syn.). The type-species *P. harroweri* Hebard, 1923 automatically becomes a member of *Rhynchacris* (comb. n.). *R. chocoense* n. sp. from the Chocó Province is described from the female and is the first record of the genus from Colombia; the holotype is preserved in the Natural History Museum, London (BMNH). *Ceroys bigibbus* Rehn, 1904 was previously misplaced and is here transferred to *Rhynchacris* (comb. n.). *Hesperophasma lobata* Redtenbacher, 1908 is a synonym of the type species *Rhynchacris ornata* Redtenbacher, 1908 (n. syn.). The male of *R. ornata* Redtenbacher, 1908 is described and illustrated for the first time.

Lectotypes are designated for *Anophelepis scythrus* Westwood, 1859 and *Hypocyrtus substrumosus* Redtenbacher, 1908.

Key words

Phasmatodea, Cladomorphinae, Hesperophasmatini, *Hypocyrtus*, *Rhynchacris*, keys, new species, descriptions, illustrations, new synonyms, revised status, new combinations, eggs, distribution

Introduction

This is the fourteenth part of an ongoing study of the New World Phasmatodea and revises the two Central American Hesperophasmatini genera *Hypocyrtus* Redtenbacher, 1908 and *Rhynchacris* Redtenbacher, 1908. There has been considerable confusion about the identity and generic assignment of species originally described in these genera. *Hypocyrtus* has erroneously been synonymised with the exclusively Antillean genus *Lamponius* Stål, 1875 (Zompro, 2004), which has caused additional confusion and resulted in false generic

assignments of species. *Pseudoceroys* Hebard, 1923 was previously placed in Diapheromerinae: Diapheromerini: "Clonistria-group" (Zompro, 2001), but is shown to be a synonym of *Rhynchacris*. Detailed research on both genera, based on extensive material from various collections, and examination of all necessary type-material, has revealed new synonymies, wrong generic assignments and has also shown the females of all known species to be highly variable and polymorphic.

In order to clarify all the discrepancies that affect these two genera, complete revisions of *Hypocyrtus* and *Rhynchacris* are here presented along with redescriptions of both genera and detailed descriptions, illustrations and keys to all known species. One new species of *Rhynchacris* is described from Colombia.

Material and methods

The present study is based on examination of all necessary type specimens as well as nontype material in various public and private collections, which has received support from all curators of the concerned museums and institutions. All specimens examined were dried and pinned. Measurements were taken using a digital caliper and are given to 0.1 mm. Examination of the insects' genitalia and eggs were carried out using a binocular microscope and an entomological magnifying lens with 4× magnification. Depositories of specimens and type status are abbreviated as follows:

ANSP: Academy of Natural Sciences, Philadelphia / USA.

BMNH: Natural History Museum, London / England.

MHNG: Museum d'Histoire Naturelle, Geneve / Switzerland.

MNHN: Museum d'Histoire Naturelle Paris / France.

MNHU: Museum für Naturkunde der Humboldt-Universität, Berlin / Germany.

NHMMW: Naturhistorisches Museum, Vienna / Austria.

SMNS: Staatliches Museum für Naturkunde, Stuttgart / Germany.

UMMZ: University of Michigan, Museum of Zoology, Ann Arbor, Michigan / USA.

USNM: United States National Museum of Natural History, Washington D.C. / USA.

ZMUH: Zoologisches Museum und Universität Hamburg / Germany.

FH: Private collection of Frank H. Hennemann, Kaiserslautern / Germany.

OC: Private collection of Oskar V. Conle, Bolsterlang / Germany.

HT: Holotype; PT: Paratype; LT: Lectotype; PLT: Paralectotype.

Results

Genus *Hypocyrtus* Redtenbacher, 1908 (Figs 1-35)

Type-species.—*Hypocyrtus substrumosus* Redtenbacher, 1908: 357 (= *Hypocyrtus postpositus*).

Redtenbacher, 1908: 356 n. syn.), by subsequent designation of Zompro, 2000: 95.

Hypocyrtus Redtenbacher, 1908: 355; Shelford, 1909: 357; Zompro, 2000: 95; Bragg, 2001: 634; Zompro, 2004a: 312; Otte & Brock, 2005: 168 [As a synonym of *Lamponius* Stål, 1875]; Eilmus, 2009: 30 [Removed from synonymy with *Lamponius* Stål, 1875 established by Zompro, 2004b: 139].

Anophelepis Westwood, 1859: 68, 69 (in part).

Hesperophasma, Kirby, 1904: 343 (not *Hesperophasma* Rehn, 1901).

Lamponius, Zompro, 2004b: 139 [*Hypocyrtus* synonymised in error]; Eilmus, 2008: 76.

Ocnophila Brunner v. Wattenwyl, 1907: 312 (in part); Shelford, 1909: 346; Brock, 1993: 19; Hennemann & Conle, 2003: 4; Otte & Brock, 2005: 230 (in part).

Phantasis, Saussure, 1870-72: 189, 190.

[Not: *Lamponius* Stål, 1875. *Hypocyrtus* was synonymised with *Lamponius* in error by Zompro, 2004b: 139]

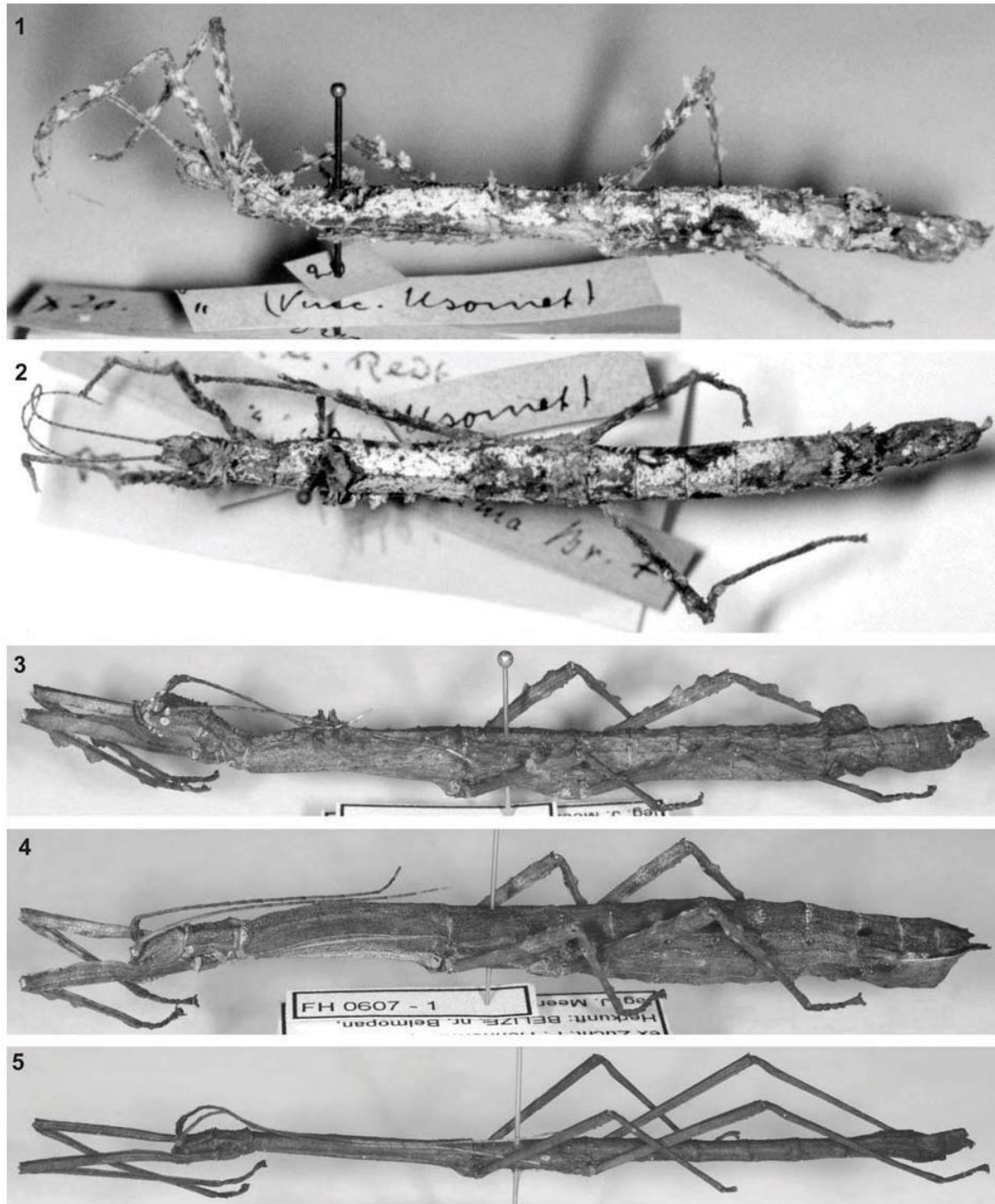
Description.—Moderately sized to large members of Hesperophasmatini (body length 47.2-94.0 mm), body moderately robust (females in particular) and \pm cylindrical ($\sigma\sigma$) or oval ($\omega\omega$) in cross-section. Sexual dimorphism distinct, with males considerably more slender than females. Both sexes with small, rudimentary to scale-like alae (length 0.3-6.0 mm); anal region either not developed, or if developed, red in color. Color mostly various shades of brown, ochre and white, rarely with green moss-like body sculpturing in females. Head longer than wide, slightly dorsoventrally compressed and rectangular in dorsal aspect; vertex flat and irregularly granulose to tuberculose. Antennae of moderate length and consisting of < 35 antennomeres; reaching to metanotum ($\omega\omega$) or median segment ($\sigma\sigma$). Scapus dorsoventrally compressed and with the outer lateral margin \pm roundly expanded. Pedicellus round in cross-section and shorter than scapus, III somewhat longer than pedicellus. Pronotum about as long and broad as head, rectangular to slightly trapezoidal; surface granulose, tuberculose or spinose. Profurcasternite with a large sensory area medially. Mesothorax elongate and at least 3.8 \times longer than pronotum, slender and roughly of uniform width in males, mostly \pm swollen medially in females. Surface of mesonotum sparsely granulose and sometimes with a cluster of short spines anteriorly and a pair of posteromedial spines in males. In females to a variable degree granulose, rugulose or tuberculose and \pm roundly raised medially, mostly with a \pm distinct median protuberance or cluster of spines; lateral margins may be longitudinally carinae, slightly expanded and tuberculose. Metanotum often with a small pair of posteromedial spines. Meso- and metapleurae with a longitudinal marginal row of small granules ($\sigma\sigma$) or tubercles ($\omega\omega$); in males sometimes with one or two blunt spines anteriorly and often with a distinct supracoxal spine posteriorly. Meso- and metasternum sparsely granulose. Median segment slightly shorter than metanotum. Abdominal segments II-VI of males roughly parallel sided and longer than wide; in females abdomen \pm swollen medially and tergites quadrate to transverse. Tergum VII of females \pm strongly expanded and with an entire, or irregularly dentate lateral lobe. Sternites II-VII simple, in females VII with an indistinct praeopercular

organ at best formed by a pair of conical or hump-like swellings near posterior margin. Tergites VIII-X wider ($\sigma\sigma$) or considerably narrower ($\omega\omega$) than previous segments. Anal segment of males tectiform and with a wide triangular posteromedian excavation, posterior margin set with numerous incurving teeth ventrally and occasionally the posteroventral angle expanded. Vomer strongly reduced and hidden underneath poculum. Poculum moderately convex and with a \pm distinct basal projection, posterior margin entire or with a median notch. Anal segment of females with a wide but shallow posteromedian excavation; posterior margin dentate or tuberculate. Supra-anal plate wider than long, broadly rounded and slightly projecting over posterior margin of anal segment. Subgenital plate keeled longitudinally and \pm roundly convex in basal portion, apex flattened, rounded and extending over abdomen by \pm length of anal segment. Cerci small and slightly compressed laterally. Legs of moderate length, the profemora considerably shorter than the mesothorax and the metatibiae at best reaching to apex of abdomen in males. All legs distinctly carinate and \pm trapezoidal in cross-section with the dorsal carinae converging (females in particular); only with a few very small lobules or teeth in males and armed with \pm distinct dentate or foliaceous lobes in females (dorsal carinae of mid and hind legs in particular). Two outer ventral carinae of meso- and metafemora unarmed except for two small subapical spines. Medioventral carina of femora distinct, roughly midways on ventral surface of femur and sometimes with a few small spines subapically. Tarsi short and stout, basitarsi no longer than following two tarsomeres combined; in females the probasitarsus gently rounded dorsally. Females of all three species show extreme variation in the color, sculpturing of the head and body and armature of the legs.

Eggs.—(Figs 34, 35) Capsule elongate, \pm bullet-shaped with the polar area slightly constricted and round in cross-section; up to 2.3 \times longer than wide. Capsule surface minutely granulose or rugulose and covered entirely with a network of hairy ridges. Micropylar plate large, drop-shaped, distinctly longer than wide and more than 1/3 length of capsule. Operculum flat and with a circular rim of long hairy structures in the center.

Differentiation.—(Table 1) Closely related to *Rhynchacris* Redtenbacher, 1908, the second Central American representative of the tribe Hesperophasmatini, and the Antillean *Lamponius* Stål, 1875. The presence of small rudimentary or vestigial alae (length 0.3-6.0 mm) and the elongate micropylar plate of the eggs, which is more than 1/3 the length of the capsule, distinguish it however from both genera. Males are characterised by the tectiform anal segment and strongly reduced vomer, which is almost fully covered by the poculum. For a more detailed differentiation see Table 1.

Comments.—Redtenbacher (1908) originally established *Hypocyrtus* to comprise *Anophelepis vittata* Westwood, 1859, *Anophelepis scythrus* Westwood, 1859 and the two newly described *H. postpositus* Redtenbacher, 1908 and *H. substrumosus* Redtenbacher, 1908. The author stated it to be intermediate between the two Antillean genera *Lamponius* Stål, 1875 and *Phantasis* Saussure, 1870 (= *Hesperophasma* Rehn, 1901) and distinguished it from both by the strongly swollen mesonotum and presence of small, rudimentary or vestigial alae. Redtenbacher did not however recognize the very close relation to the Central American *Rhynchacris* Redtenbacher, 1908. In fact, the geographic distribution, egg morphology, presence of a distinct sensory area on the profurcasternite, as well as the slender metafemora and shape of the thorn pads of the anal segment of males



Figs 1-5. *Hypocyrtus ornatissimus* (Brunner v. Wattenwyl, 1907). 1. HT ♀, lateral view (SMNS). 2. HT ♀, dorsal view (SMNS). 3. ♀ from Belize (coll. FH, No. 0607-1). 4. ♀ from Belize, plain variety (coll. FH, No. 0607-4). 5. ♂ from Belize (coll. FH, No. 0607-2).

suggest *Rhynchacris* to be the closest known relative of *Hypocyrtus*.

Zompro (2004b) erroneously synonymised *Hypocyrtus* with *Lamponius* and stated that both distinguishing features presented by Redtenbacher were within the variation range of the species included in *Lamponius*, despite the fact that *Lamponius* is known to occur only in the northern Lesser Antilles, (Puerto Rico and Mona Island), while *Hypocyrtus* is endemic to northern Central America. This wrong synonymy was obviously based on very superficial morphological examination as can be seen from the differentiation presented (Table 1). The erroneous synonymy was recognized and

invalidated by Eilmus (2009: 30), who transferred the type species *H. vittatus* (Westwood, 1859) (= *H. scythrus* (Westwood, 1859) n. syn.) back to *Hypocyrtus*, but unfortunately did not provide a list of species. Hence, the other species originally included in *Hypocyrtus* by Redtenbacher (1908: 355) need to be restored.

Distribution.—Northeastern Central America (S. Mexico, Guatemala & Belize). According to Morrone (2006: 478, Fig. 2) the distribution is biogeographically restricted to the Mexican Gulf Province of the Caribbean subregion.

Table 1. Comparison of the genera *Hypocyrtus* Redtenbacher, 1908, *Rhynchacris* Redtenbacher, 1908 and *Lamponius* Stål, 1875. Distinguishing features are highlighted by italic letters.

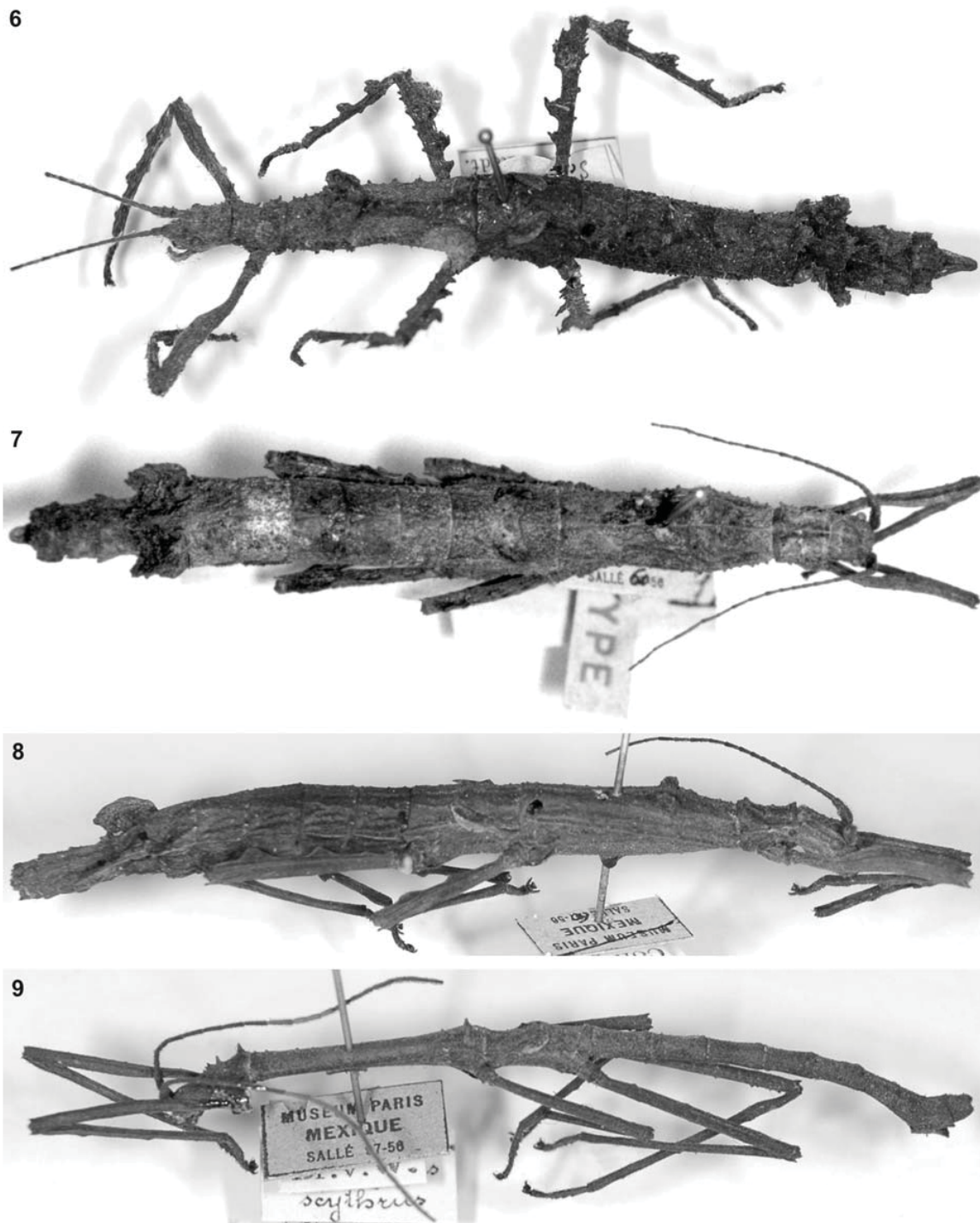
	<i>Lamponius</i>	<i>Hypocyrtus</i>	<i>Rhynchacris</i>
Head (♀♀)	Vertex flat; tuberculose to spinose	Vertex flat; tuberculose to spinose	<i>Vertex conically raised and prominently bicornute / bilobate</i>
Sensory area on profurcasternite	<i>Small or lacking</i>	Covering > ½ of segments surface	Covering about ½ of segments' surface
Alae	No	<i>Small, scale-like or vestigial alae present (0.3-6.0 mm)</i>	No
Anal segment (♂♂)	Flattened; posterior margin with a median pair of thorn pads	<i>Tectiform; posterior margin with a transverse row of teeth ventro-interiorly</i>	Convex longitudinally; thorn pads reduced, only represented by a row of minute ventral teeth on posterior margin
Vomer (♂♂)	Well-developed	<i>Strongly reduced; hidden under poculum</i>	Well-developed
Praeopercular organ (♀♀)	<i>Two distinct diverging carinae, anteriorly connected by a median wart-like tubercle</i>	Very indistinct; represented only by a smooth area near posterior margin of sternum VII	Indistinct, a hump-like posteromedian swelling
Supra-anal plate (♀♀)	Small; much shorter than anal segment	Small; much shorter than anal segment, transverse	<i>Elongated; ± as long as anal segment</i>
Subgenital plate (♀♀)	Scoop-shaped; basal portion slightly convex, apical portion flattened	Scoop-shaped; basal portion strongly convex, apical portion flattened	<i>Distinctly keeled longitudinally; lower margin almost straight or gradually up-curving in lateral aspect</i>
Ovipositor (♀♀)	No	No	<i>Elongated supra-anal and subgenital plate together form a beak-like ovipositor</i>
Metafemora (♂♂)	<i>Conspicuously thickened and broader than meso- and metafemora; either both two outer ventral carinae or medioventral carina with 2-5 prominent spines in apical portion</i>	Slender, not considerably broader than meso- and metafemora; two outer ventral carinae at best with 1-4 minute subapical teeth/lobules; medioventral carina unarmed	Slender, not considerably broader than meso- and metafemora; two outer ventral carinae at best with 1-2 minute subapical teeth; medioventral carina unarmed
Tibiae (♀♀)	<i>Dorsal carinae at best with a few minute teeth</i>	With ± distinct lobes on posterodorsal carina	With ± distinct lobes on posterodorsal carina
Egg capsule	<i>Ovoid; < 1.4× longer than wide</i>	Elongate and ± bullet-shaped; > 1.8× longer than wide	Elongate and bullet shaped; 2× longer than wide
Capsule surface	<i>Hairy structures sparse and very short or lacking</i>	Hairy structures very prominent and long (> 0.6 mm)	Hairy structures of moderate length, very dense and numerous (length < 0.5 mm)
Micropylar plate	< 1/3 length of capsule; shield-shaped and scarcely longer than wide	<i>> 1/3 length of capsule and distinctly longer than wide</i>	< 1/3 of capsule length; oval and indistinctly longer than wide
Distribution	Caribbean (Lesser Antilles, Puerto Rico & Mona Id)	Northern Central America (S. Mexico, Belize & Guatemala)	Southern Central America (Nicaragua, Costa Rica, Panama & NW. Colombia)

Species included.—

- Hypocyrtus ornatissimus* (Brunner v. Wattenwyl, 1907: 312) [*Ocnophila*]. n. comb.
= *Ocnophila strumosa* Brunner v. Wattenwyl, 1907: 312.
[Distribution: Guatemala & Belize]
- Hypocyrtus postpositus* Redtenbacher, 1908: 356. rev. stat.
= *Hypocyrtus substrumosus* Redtenbacher, 1908: 357. n. syn.
[Distribution: S. Mexico & Guatemala]
- Hypocyrtus scythrus* (Westwood, 1859: 68, pl. 2: 3) [*Anophelepis*]. rev. stat.
= *Anophelepis vittata* Westwood, 1859: 69, pl. 3: 3. n. syn.
[Distribution: S-Mexico]

Keys to the species of *Hypocyrtus*

- ♀♀
- Alae developed (length > 2.0 mm); robust insects; mesothorax strongly widened medially 2
 - Alae vestigial (length < 1.0 mm); slender insects; mesothorax almost parallel-sided (Fig. 2) *ornatissimus*
 - Body length > 75.0mm; supra-anal plate distinctly transverse and widely rounded (Fig. 28) *scythrus*
 - Body length < 70.0mm; supra-anal plate roundly triangular and longer than wide (Fig. 26) *postpositus*



Figs 6-9. *Hypocyrtus postpositus* Redtenbacher, 1908. 6. PLT ♀ of synonym *H. substrumosus* Redtenbacher, 1908 (NHMW, No. 719). 7. PLT ♀ of synonym *H. substrumosus* Redtenbacher, 1908 (MNHN). 8. HT ♀ (NHMW, No. 718). 9. ♂ (NHMW, No. 717).

♂♂

1. Alae developed (length > 2.0mm); pronotum spinose; meso- and metanotum with a pair of spines posteromedially 2

- Alae vestigial (length < 0.5 mm); pro-, meso- and metanotum without distinct spines (Fig. 23) *ornatissimus*

2. Body length > 55.0 mm; posterolateral angles of anal segment expanded and acutely triangular; (Fig. 32), tibiae smooth dorsally *scythus*

- Body length < 50.0 mm; posterolateral angles of anal seg-

ment roundly truncate (Fig: 31); tibiae with 2-3 small dorsal teeth *postpositus*

Hypocyrtus ornatissimus (Brunner v. Wattenwyl, 1907) n. comb. (Figs 1-5, 21-23, 29-30, 33-34)

Ocnophila ornatissima Brunner v. Wattenwyl, 1907: 312. LT (designated by Zompro, 2006: 7), ♀: 20, (Vulc. Usomet.), x20; *Libethra ornatissima* Br. [SMNS]; PLT, ♀ (nymph): San Juan, Vera Paz,

Champion; 57; Godman-Salvin coll. 1908-168, B. C. A. Ort. II, *Ocnophila ornatissima* Brunn.; gen. & sp. ? *Phantasis* ? [BMNH]; Shelford, 1909: 346; Brock, 1993: 19; Hennemann & Conle, 2003: 4; Otte & Brock, 2005: 230.

Sermyle ornatissima, Zompro, 2006: 7.

Ocnophila strumosa Brunner v. Wattenwyl, 1907: 312. HT, ♀: 19, *Libethra strumosa* Br., Guatemala; 19. *Libethra strumosa* Br. [SMNS] (Synonymised by Zompro, 2006: 7); Shelford, 1909: 346; Hennemann & Conle, 2003: 4; Otte & Brock, 2005: 230.

Further material.—(38 ♂♂, 44 ♀♀, eggs): BELIZE: 3 ♂♂, 4 ♀♀, 26 eggs: ex Zucht F. Hennemann 2008/09; Herkunft: Belize, nr. Belmopan, leg. J. Meermann 2006, F1-Generation [coll. FH, No's 0607-1 to 7, E & ED]; 2 ♂♂, 4 ♀♀: ex Zucht F. Hennemann 2011, Herkunft: Belize, nr. Belmopan, leg. J. Meermann 2006, PSG No. 307 [coll. FH, No's 0607-8 to 13]; 33 ♂♂, 33 ♀♀, eggs: ex Zucht O. Conle 2008-2009, Zuchtstamm aus Belize, Nähe Belmopan, leg. J. Meermann 2006 [coll. OC].

Differentiation.—At once differing from the other two species in the genus by the more slender body, relatively more elongate body segments and much smaller vestigial alae (<0.5 mm) of both sexes. Females differ by the very bulgy and strongly angular subgenital plate (Fig. 29).

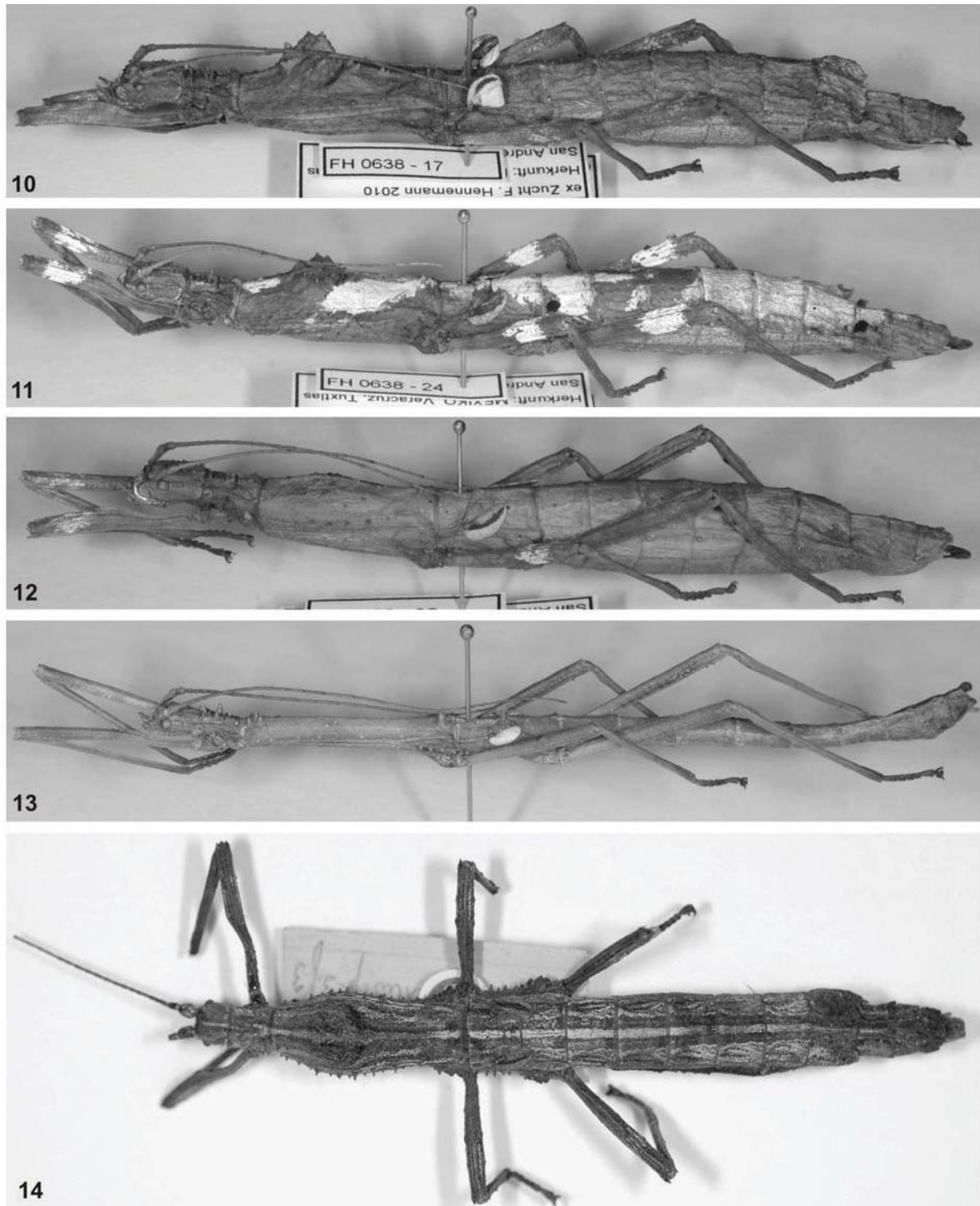
Description.—♀ (Figs 1-4). Moderately sized (body length incl. subgenital plate 62.0-78.0 mm), slender and fairly elongate for the genus with the mesothorax almost parallel sided; highly variable in coloration and sculpturing of the head, body and legs. Body surface dull, granulose, rugulose and to a variable degree tuberculate, more rarely spinose or lobate; the thorax with a distinct longitudinal median carina dorsally, abdominal tergites II-IX with two strongly approaching longitudinal median carinae. Coloration very variable, mostly various shades of brown reaching from dark ochre to almost black, more rarely with a variable degree of white mottling and or markings of moss-like appearance with all body appendages green (e.g., the LT of *H. ornatissimus*, Figs 1, 2). Abdominal tergites VII and/or VIII often with a velvety black anterolateral marking. Three terminal antennomeres pale ochre.

Head: elongate, subcylindrical, roundly rectangular in dorsal aspect with the cheeks parallel-sided and about 1.3× longer than wide. Two diverging tuberculate carinae on vertex and a longitudinal tuberculate carina along cheeks, all terminating in a ± prominent tubercle at posterior margin of head. Posterior portion of head otherwise densely granulose (Figs 21-22). In strongly sculptured specimens the carinae are armed with prominent spiniform projections. Eyes very small circular and projecting hemispherically, their length contained about 4× in that of cheeks. Antennae slightly projecting over posterior margin of mesonotum, consisting of 30-32 antennomeres. Scapus with the outer lateral margin strongly expanded and rounded. Pedicellus oval in cross-section and about 2/3 length of scapus. III and IV slightly compressed dorsoventrally and oval in cross-section.

Thorax: pronotum about as long but scarcely broader than head, roughly rectangular, about 1.2× longer than wide and with anterior margin slightly narrowed. Surface irregularly granulose and tuberculose and with two longitudinal median rows of tubercles, the latter terminating in a ± prominent spine or a cluster of spiniform processes at posterior margin; lateral margins tuberculate. Anterior margin with a pair of smaller rounded tubercles medially. Transverse median sulcus distinct, gently curved and almost reaching to lateral margins of segment; median line distinctly impressed in anterior half

of pronotum. Sensory-area of profurcasternite covering almost entire segment and strongly convex, but divided by a shallow longitudinal median furrow. Mesothorax 3.8-4.0× longer than pronotum and very gently swollen medially. Mesonotum with a pair or cluster of tubercles or crenulate foliaceous lobes in central portion, which vary greatly in size and shape (Figs 21, 22). Surface otherwise sparsely and irregularly supplied with low tubercles and a row of blunt tubercles along lateral margins. In strongly sculptured specimens near posterior margin with a median pair of spiniform or crenulate lobes. Metanotum structured like mesonotum but lacking enlarged tubercles or lobes. Meso- and metasternum rugulose and sparsely subtuberculose. Meso- and metapleurae with a longitudinal row of ± spiniform tubercles which increase in size toward apex of segment. Alae merely represented as minute scale-like structures (ca 0.2 mm). Abdomen: median segment about ¾ length of metanotum, similar in structure and in strongly sculptured specimens with a pair or cluster of tubercles or crenulate lobes near anterior and posterior margin. Segments II-V almost parallel sided, VI very gently widening toward posterior, all roughly equal in length and on average 1.2× wider than long. In strongly sculptured specimens tergites V-VII with a transverse row of spiniform appendages or crenulate lobules at posterior margin, these only represented by a pair of low and short carinae in plain specimens. VII slightly longer than previous tergites, with the lateral margins deflexed and forming a ± prominent and extended, crenulate or dentate lobe; rarely lacking (Fig. 30). Sternites II-VII rugulose, sparsely granulose and with lateral margins slightly carinate, V-VII often with a median pair of tubercles (most prominent on VII). Praeopercular organ very indistinct and only represented by a smooth, blackish area near posterior margin of sternum VII. Tergites VIII-X narrower than previous. VIII slightly narrowed toward posterior, as long as VI and slightly constricted medially, IX somewhat shorter than VIII; both with a pair of ± large spiniform processes at posterior margin in strongly sculptured specimens. Anal segment scarcely shorter than IX, narrowed and rounded in posterior portion and with a wide, gently concave excavation posteromedially; outer angles protuded into a triangular tooth. Dorsal surface with a very fine longitudinal median carina. Supra-anal plate transverse, rounded and slightly projecting over posterior margin of anal segment. Cerci dorsoventrally compressed, roundly rectangular in lateral aspect with the apex truncate; hardly projecting over anal segment. Subgenital plate strongly convex and tub shaped with the posterior portion angled upward roughly at half way along anal segment (Fig. 29). Posterior margin extended into a lobe-like appendage which projects noticeably over the anal segment; apex rounded (Fig. 30). Surface with irregular longitudinal carinae and rugulae.

Legs: profemora about ¾ length of mesothorax, mesofemora slightly longer than metathorax, metafemora slightly projecting over posterior margin of abdominal segment IV and metatibiae roughly reaching to abdominal segment VIII. Profemora unarmed except for a few small tooth-like lobules in apical half of posterodorsal carina in strongly sculptured specimens. Posterodorsal carina of protibiae with three small lobes, these rounded to be prominently triangular and dentate, which slightly decrease in size toward apex of tibia; in strongly sculptured specimens these may be accompanied by a smaller basal tooth. Meso- and metafemora with two outer ventral carinae gently undulate or with about 6 small lobules, dorsal carinae with three rounded lobules to foliaceous dentate lobes, which decrease in size towards base of femur. Posterodorsal carina of meso- and metatibiae with three rounded lobules to dentate lobes which decrease in size towards apex of tibia. Basitarsi about as long as following two tarsomeres combined; probasitarsus with



Figs 10-14. *Hypocyrthus scythrus* (Westwood, 1859). 10. ♀ (coll. FH, No. 0638-17). 11. ♀ (coll. FH, No. 0638-24). 12. ♀ (coll. FH, No. 0638-29). 13. ♂ (coll. FH, No. 0638-38). 14. HT ♀ of synonym *A. vittata* Westwood, 1859 (BMNH).

the dorsal carina very gently rounded.

♂ (Fig. 5). Of moderate size (body length 59.5-67.0 mm), slender and elongate for the genus. Body surface dull and very sparsely tuberculose. Entire dorsal body surface very indistinctly tectinate. Coloration plain middle brown to blackish brown, lateral surfaces of mesonotum red. Scales of alae whitish. Apical half of antennae of distinctly paler color than basal half.

Head: shape generally as in females but cheeks very slightly nar-

rowing towards posterior, broadest at the eyes. With four carinae in posterior portion, each of which terminate in a spiniform tubercle at posterior margin of head, the median pair larger; surface otherwise sparsely set with granules (Fig. 23). Eyes of moderate size, subcircular and projecting hemispherically; their length contained about 3× in that of cheeks. Antennae roughly reaching to median segment; otherwise as in females.

Thorax: pronotum generally as in females but armature less decided;

anterolateral angles with a fairly well-decided exteriorly directed spine. Mesothorax elongate and about 5.8× longer than pronotum, widened posteriorly and surface very sparsely set with low white tubercles, in particular along lateral margins. Metanotum structured like mesonotum. Meso- and metapleurae with a few small, rounded white granules arranged in a longitudinal row. Mesosternum set with a few white granules, metasternum smooth. Alae only represented by small, oval scale-like structures (0.2-0.5 mm).

Abdomen: median segment rectangular, roughly 1.2× longer than wide and smooth; about half the length of metanotum. Segments II-V roughly of equal length, about 2.2× longer than wide and roughly rectangular. VI scarcely shorter than previous. VII flattened, longer than previous and gradually widened towards the posterior; dorsal surface with a blunt longitudinal median carina. Tergites II and III usually with a pair of rounded white granules; tergites otherwise very sparsely granulate. Sternites II-V sparsely granulate, VI with II and VII with four longitudinal carinae. Tergum VIII widest, slightly shorter than VII, gently widened toward posterior and with a blunt longitudinal median keel and an additional lateral longitudinal carina. IX scarcely shorter than VIII, wider than long and narrowed toward posterior. Anal segment shorter and narrower than IX, widened in medial portion, slightly tectinate and the posterior margin very slightly excavated; outer angles acutely triangular (Fig. 33). Supra-anal plate small, rounded and projecting over posterior margin of anal segment. Cerci slightly compressed dorsoventrally in the basal portion with the apex rounded and slightly club-shaped; hardly projecting over anal segment. Poculum strongly convex and cup-like, carinate longitudinally and with a blunt hump at the base; posterior margin narrowed and ± decidedly notched medially, roughly reaching to posterior margin of abdominal tergum IX (Fig. 33).

Legs: all of moderate length, slender and destitute of lobes or teeth, excepting two small subapical teeth on the two outer ventral carinae of the femora. Profemora roughly ¾ length of mesothorax, mesofemora reaching halfway along abdominal segment II, metafemora reaching about halfway along segment V and metatibiae almost reaching apex of abdomen. Probasitarsus a little longer, meso- and metabasitarsus about equal in length to following two tarsomeres.

Eggs.—(Fig. 34). Capsule elongate, some 2.3× longer than wide. Capsule surface densely granulate. Hairy structures very long (length ca 0.8 mm) and mushroom-like with the apex thickened. Micropylar plate large, oval, about 2× longer than wide and almost half as long as capsule. Surrounded by a rim of hairy structures and with an oval rim of tubercles in center. Micropylar cup distinct and drop-shaped with the anterior end pointed. Median line broad and convex. Operculum flat in center and on outer margin with a rim of hairy structures, those of the interior rim very long (ca 0.9 mm). Color plain middle to dark brown, the hairy structures of a slightly paler color.

Measurements.—Excluding hairy structures [mm]: length 4.5-4.6 mm, width 2.0 mm, height 2.1 mm, length of micropylar plate 2.3 mm.

Comments.—*Ocnophila strumosa* Brunner v. Wattenwyl, 1907 was correctly synonymized with *O. ornatissima* Brunner v. Wattenwyl, 1907, the LT of the latter representing a very strongly furnished specimen presumably from a mountainous locality. The extreme intraspecific variation of females in the coloration, sculpturing and armature of the head and body and armature of the legs, is confirmed by captive breeding of stock originating in Belize. However, strikingly furnished and moss-like specimens with green spiniform appendages (e.g.,

the LT of *H. ornatissimus*, Figs 1, 2) are believed to be restricted to moist mountainous habitats with plenty of ferns and coverage of lichens and mosses in Guatemala. The immature female PLT of *H. ornatissimus* in BMNH measures a body length of 43.0 mm and is a specimen of the more common less strongly sculptured, variety. The male and eggs have previously been unknown.

Although *H. ornatissimus* exhibits features such as a large, bulgy and conspicuously elongated subgenital plate, laterally expanded abdominal tergum VII, a distinct sensory area on the profurcasternite, a median segment that is just slightly shorter than the metanotum, vestigial alae and a subcylindrical head, Zompro (2006) placed this species in *Sermyle* Stål, 1875, a genus of Diapheromerinae: Diapheromerini: "*Sermyle*-group" or "*Eusermyleformia*" (Bradler, 2009) respectively.

Live specimens of *H. ornatissimus* were collected near Belmopan in Central Belize by Jan Meermann (Belize) during 2006 and eggs sent to Bruno Kneubühler (Luzern, Switzerland), who successfully reared it in captivity. Nymphs of the F1 generation were kindly forwarded to the authors for examination and eggs laid by these specimens distributed among European breeders. The culture soon became established and has recently been included on the Phasmid Study Group culture-list as culture No. 307. In captivity in Europe it accepts various Rosaceae (e.g., *Rubus fruticosus*, *R. idaeus*, *Rosa* spp. or *Fragaria vesca*), oaks (*Quercus robur*, *Q. petraea* and *Q. ilex*, Fagaceae) and Salal (*Gaultheria shallon*, Ericaceae) as alternative food plants and is fairly easy to rear in moderately humid conditions.

Distribution.—Guatemala (Vera Paz, San Juan; Volcano Usomet.) and Belize (near Belmopan).

Hypocyrtus postpositus Redtenbacher, 1908 rev. stat.
(Figs 6-9, 25-26, 31)

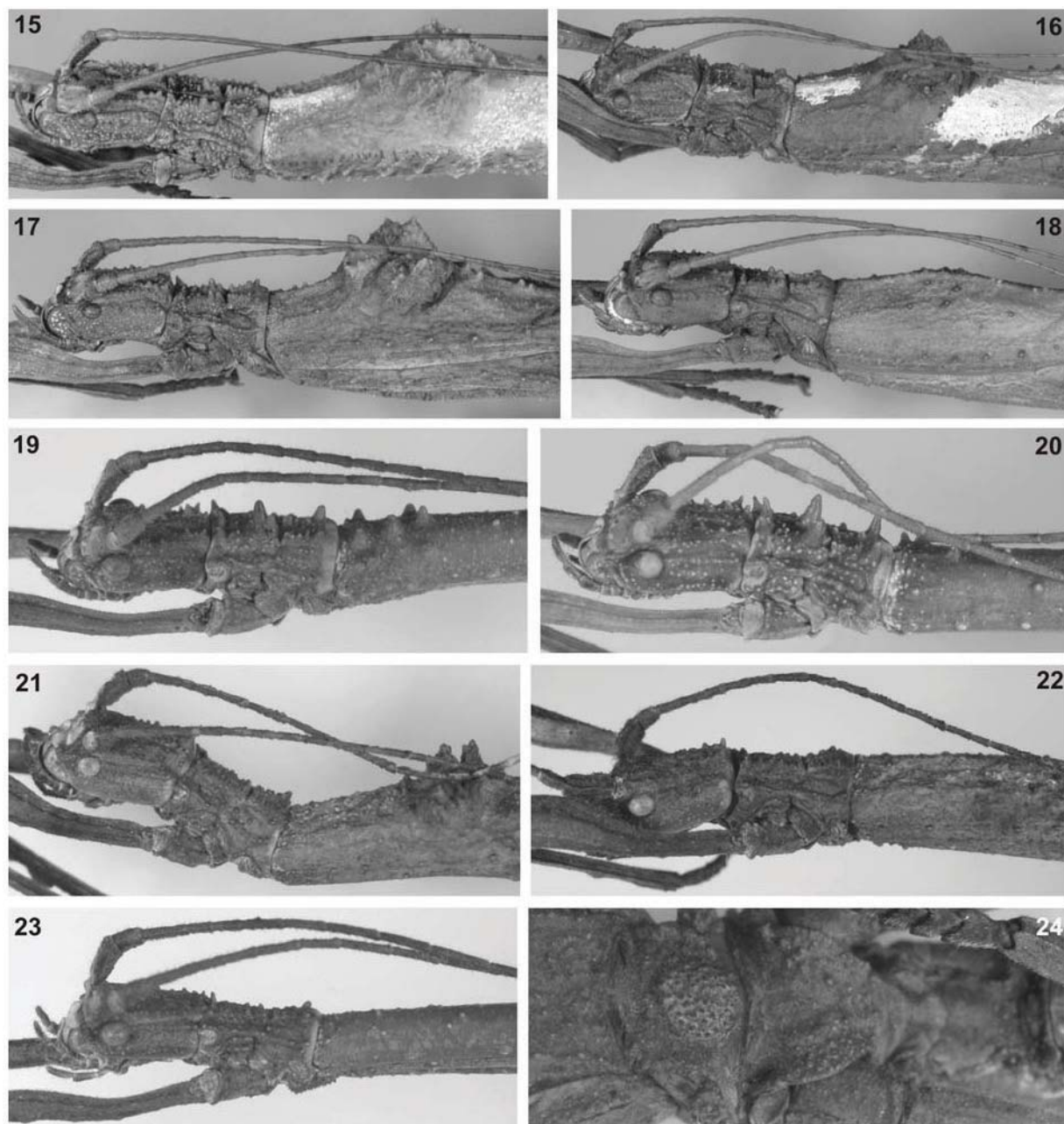
Hypocyrtus postpositus Redtenbacher, 1908: 356. HT, ♀: Museum Paris, Mexique, Sallé, 60-58; Collectio Br. v. W.; det. Br. v. W. *Hypocyrtus postpositus*; 23.548 [NHMW, No. 718]; Shelford, 1909: 358; Brock, 1998: 50.

Lamponius postpositus, Otte & Brock, 2005: 169.

Hypocyrtus substrumosus Redtenbacher, 1908: 357. LT (by present designation), ♀: Museum Paris, Mexique, Sallé, 60-58; Collectio Br. v. W.; det. Br. v. W. *Hypocyrtus substrumosus*; 23.329 [NHMW, No. 719]; PLT, ♀: Coll. Br. v. W., Jalapa, Mus. Hamburg; det. Br. v. W. *Hypocyrtus substrumosus*; 23.051 [NHMW, No. 719]; PLT, ♀ (nymph): M. B. e., 141; Mus. Caes Vind., Patria ?, det. Redt. *Hypocyrtus substrumosus* [NHMW, No. 719]; PLT, ♀: Museum Paris, Mexique, Sallé, 60-56; Type; *Hypocyrtus substrumosus* Br. type [MNHN]; PLT, ♂: Museum Paris, Mexique, Sallé, 97-56; *Hypocyrtus incertus* Br. Type (MNHN); PLT, ♀: Binconada, Mexico, Schaus; Godman-Salvin coll. 1908-168, B. C. A. Ort. II, *Hypocyrtus substrumosus*, Redt. [BMNH]; PLT, ♀ (nymph): Cordova, Mexico, Hoege; Godman-Salvin coll. 1908-168, B. C. A. Ort. II, *Hypocyrtus substrumosus*, Redt.; gen. & sp. ? *Phantasis* ? [BMNH]; PLT, ♂: O 72 ♂ Jalapa Salas & Morales 1882; *Hypocyrtus substrumosus* Br. * ♂ Cotype C. Brunner v. W. determ. 1899, public. 1906-08. Bestimm.-Verz. 37* public. *Hypoc. substrum.* Redt. N. sp. 10.XII.1899 ♀ gleicher Fundort an Br. v. W. im Tausch [ZMUH]. n. syn.; Shelford, 1909: 358, pl. 7: 2a (♂), 2b (♀); Weidner, 1966: 239; Brock, 1993: 22; Brock, 1998: 61; Zompro, 2000: 95; Zompro, 2002: 97.

Lamponius substrumosus, Otte & Brock, 2005: 169.

Hypocyrtus incertus Brunner v. Wattenwyl, in litt. [*nomen nudum*].



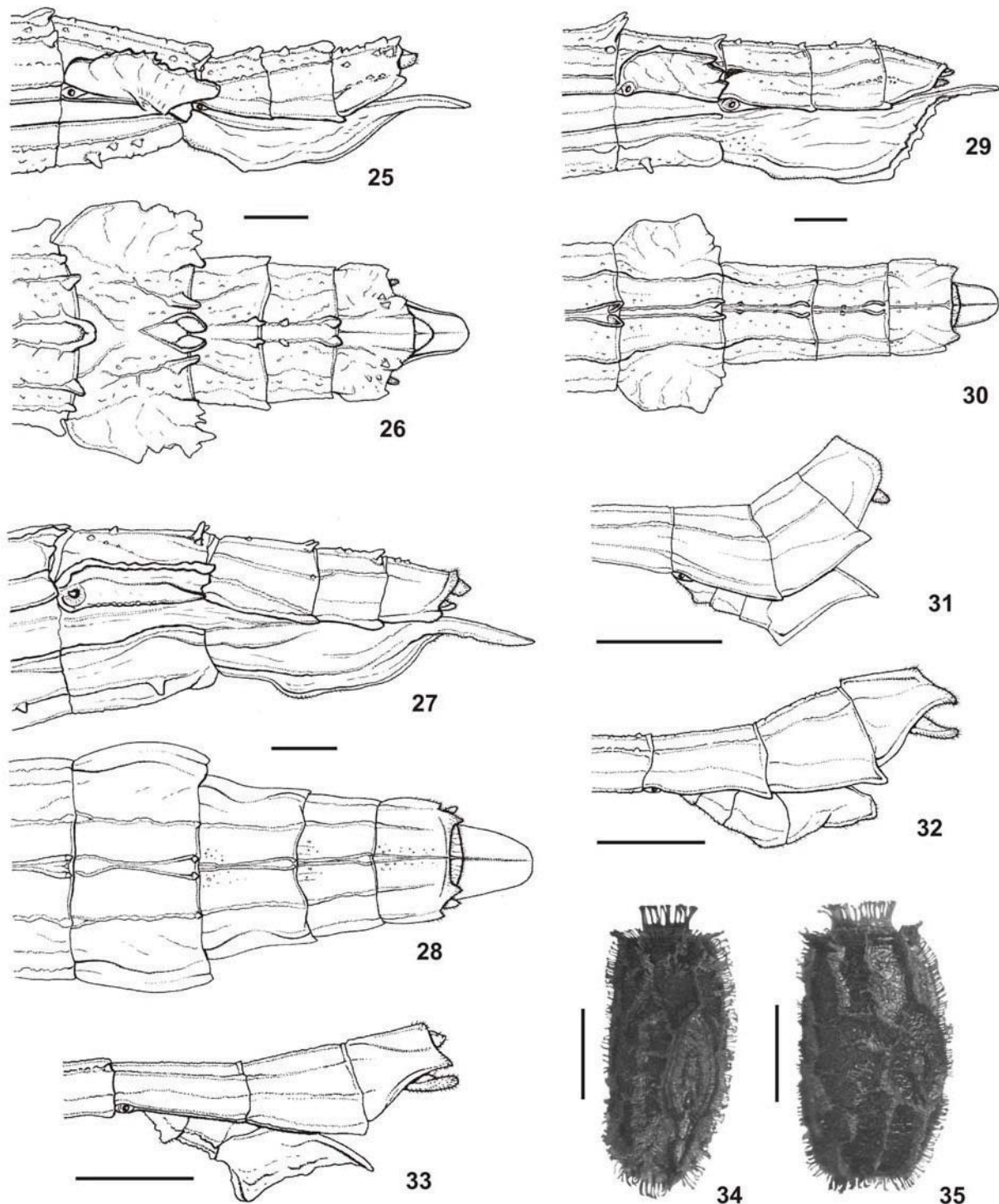
Figs 15-24. Head and thorax of *Hypocyrtus* spp. 15-18. *H. scythrus* (Westwood, 1859) ♀♀ (coll. FH). 19, 20. *H. scythrus* (Westwood, 1859) ♂♂. 21, 22. *H. ornatissimus* (Brunner v. Wattenwyl, 1907) ♀♀ (coll. FH). 23. *H. ornatissimus* (Brunner v. Wattenwyl, 1907) ♂ (coll. FH). 24. *H. scythrus* (Westwood, 1859) ♀, prosternum and probasisternum showing the sensory area (coll. FH).

Further material.—(8 ♀♀, 11 ♂♂, 2 nymphs): S-MEXICO: 1 ♀: 58.135, Mex., (Oajaca) [BMNH]; 1 ♂: Museum Paris, Mexique, Sallé, 97-56; Coll. Br. v. W.; det. Br. v. W. *Hypocyrtus scythrus*; 23.388 [NHMW, No. 717]; 1 ♀, 1 ♂ (in copula), 5 ♀♀, 9 ♂♂, 2 ♀♀ (nymphs): Mexico, Oaxaca, Valle Nacional on Highway +175 at km. 85.5), 3-4. Nov. 1961, T. J. Cohn & S. P. Hubbell [UMMZ]. GUATEMALA: 1 ♀: ♀, Guatemala, Mr. H. de Saussure; Genre versin de *Hypocyrtus* Redtb. et *Lamponius* Stål; *Rhynchacris* spec. det. O. Zompro [MHNG].

Differentiation.—Distinguished from *H. scythrus* (Westwood, 1859) by the smaller size of both sexes. Females also differ by the less distinctly expanded mesothorax and more prominently lobed abdominal tergum VII, which is considerably broader than II-VI. ♂♂ can also be distinguished by the roundly truncate posterior

margin of the anal segment (Fig. 31) and presence of 2-3 dorsal teeth on the tibiae.

Description.—♀ (Figs 6-8). Of moderate size (body length incl. subgenital plate 56.0-68.0 mm) and moderately robust for the genus; highly variable in coloration and sculpturing of the head, body and legs. Body surface dull, granulose and rugulose and to a variable degree tuberculate, more rarely spinose or lobate; the thorax with a distinct longitudinal median carina dorsally, abdominal tergites II-IX with two strongly approaching then posteriorly diverging longitudinal median carinae. General coloration mostly various shades of pale to dark brown, often to a variable degree furnished with bold blackish or whitish markings on the entire body and legs; sometimes with all body appendages pale ochre (*e.g.*, female from Guatemala in



Figs 25-35. Apex of abdomen and eggs of *Hypocyrtus* spp. [scale = 2 mm] 25. *H. postpositus* Redtenbacher, 1908 ♀, lateral view. 26. *H. postpositus* Redtenbacher, 1908 ♀, dorsal view. 27. *H. scythrus* (Westwood, 1859) ♀, lateral view. 28. *H. scythrus* (Westwood, 1859) ♀, dorsal view. 29. *H. ornatissimus* (Brunner v. Wattenwyl, 1907) ♀, lateral view. 30. *H. ornatissimus* (Brunner v. Wattenwyl, 1907) ♀, dorsal view. 31. *H. postpositus* Redtenbacher, 1908 ♂, lateral view. 32. *H. scythrus* (Westwood, 1859) ♂, lateral view. 33. *H. ornatissimus* (Brunner v. Wattenwyl, 1907) ♂, lateral view. 34. Egg of *H. ornatissimus* (Brunner v. Wattenwyl, 1907), dorsolateral view (coll. FH). 35. Egg of *H. scythrus* (Westwood, 1859), dorsolateral view (coll. FH).

MHNG). Abdominal tergites VII and/or VIII often with a velvety black patch on each side at anterior margin; occasionally also present on II. Alae with anal region bright red; costal region pale brown or grey with a ± decidedly bold longitudinal black stripe.

Head: elongate, subcylindrical and roundly rectangular in dorsal aspect with the cheeks parallel-sided, about 1.2× longer than wide.

Two diverging tuberculate carinae on vertex and a longitudinal tuberculate carina along cheeks, the two interior ones terminating in a conical tubercle at posterior margin of head and in strongly armed specimens armed with several prominent spiniform projections. Posterior portion of head otherwise densely granulose. Eyes of moderate size, circular and projecting hemispherically, their length

contained about 3× in that of cheeks. Antennae slightly projecting over posterior margin of mesonotum. Scapus with the inner lateral margin roundly expanded. Pedicellus oval in cross-section and roughly half length of scapus. III and IV scarcely compressed dorsoventrally and oval in cross-section.

Thorax: pronotum about as long but slightly broader than head, the posterior portion slightly wider than the anterior, about 1.2× longer than wide. Surface irregularly granulose and tuberculose and with two longitudinal median rows of tubercles, both terminating in a ± prominent spiniform process at posterior margin; in strongly armed specimens set with a comb-like cluster of long spiniform processes, some of which may have the apex bifid. Lateral margins tuberculate, anterior margin with a pair of smaller conical tubercles medially and each outer angle with a spiniform tubercle. Transverse median sulcus distinct, gently curved and almost reaching to lateral margins of segment; median line distinctly impressed in anterior half of pronotum. Sensory area of profurcasternite small and only covering anteromedian portion of segment, strongly convex. Mesothorax 3.5-3.7× longer than pronotum and moderately swollen and widened medially. Mesonotum with central portion slightly raised, rounded and set with a pair or cluster of crenulate transverse carinae, wart-like struma, ± prominent crenulate or dentate lobes or long spiniform processes, some of which may be bifid. Surface otherwise irregularly granulose, supplied with low tubercles and a pair of short median spines near posterior margin; lateral margins with a row of ± prominent tubercles or blunt spines. Metanotum structured like mesonotum, often lacking enlarged tubercles or lobes but in strongly armed specimens with a transverse row of spiniform tubercles at posterior margin; transverse. Meso- and metasternum rugulose and irregularly subtuberculose. Meso- and metapleurae with an irregularly longitudinal row of ± spiniform tubercles which increase in size towards the apex of segment. Alae with a developed but not veinose anal region and projecting over posterior margin of metanotum (length 2.4-4.6 mm).

Abdomen: median segment slightly longer than metanotum, similar in structure and in strongly sculptured specimens with a pair or cluster of long, spiniform and sometimes bifid processes near posterior margin and a variable number of blunt spiniform tubercles. Segments II-VI very gently widening towards posterior, roughly equal in length and 1.2-1.3× wider than long. In strongly armed specimens tergites II-IX with a variable number of spiniform appendages or crenulate lobules arranged in a transverse row along posterior margin; these only represented by a pair of low and short carinae in plain specimens. VII slightly longer than previous tergites with the lateral margins deflexed and forming a ± prominent and extended, entire, crenulate or dentate lobe, which may project by as much as 2/3 the body width (Fig. 26). Sternites II-VII rugulose, sparsely granulose and with lateral margins slightly carinate, each with a median pair of tubercles or lobules (most prominent on VII). Praeopercular organ very indistinct and only represented by a smooth area near posterior margin of sternum VII. Tergites VIII-X distinctly narrower than previous. VIII slightly narrowed basally, with lateral margins ± concave and posterior portion widened; posterolateral angles terminating in a triangular tooth. IX somewhat shorter than VIII. Anal segment with lateral margins noticeably deflexed basally and before base of cerci angled inward; posterior portion much narrower and roundly rectangular, the posterior margin almost straight; dorsal surface with a very fine longitudinal median carina. Supra-anal plate roundly triangular, somewhat longer than wide and noticeably projecting over posterior margin of anal segment (Fig. 26). Cerci dorsoventrally compressed with the apex narrowed and roundly truncate; not projecting over anal segment. Subgenital

plate projecting over apex of abdomen by about the length of anal segment. Shape moderately convex and tub shaped in basal portion, but increasingly flattened and gradually narrowed towards a rounded apex in apical half (Fig. 25). Surface with irregular longitudinal carinae.

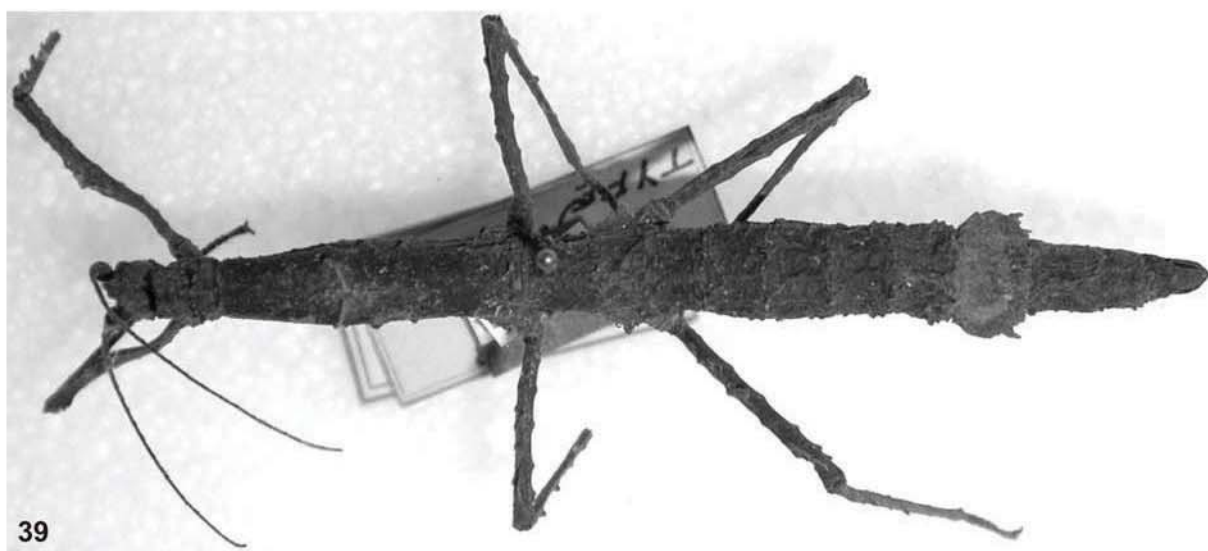
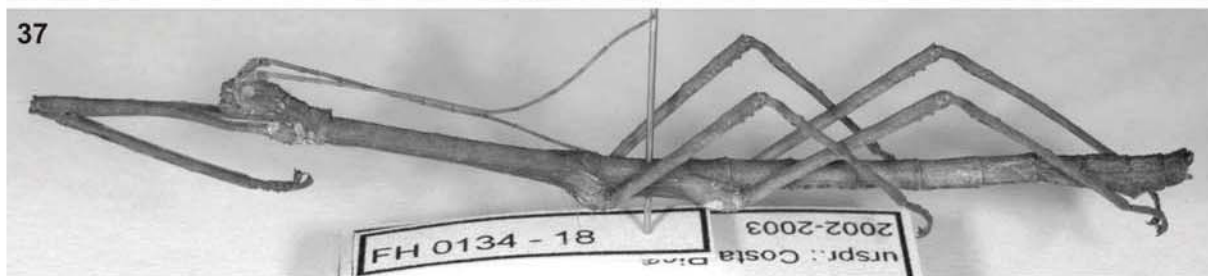
Legs: profemora about 4/5 the length of mesothorax, mesofemora slightly longer than metathorax, metafemora reaching about 2/3 the way along abdominal segment IV and metatibiae almost reaching apex of abdomen. Profemora unarmed in plain specimens, but with a variable number of rounded lobules on posteroventral carina and a few rounded lobes in apical portion of anterodorsal carina in strongly armed specimens. Posterodorsal carina of protibiae with three small and rounded to prominent triangular and dentate lobes, which slightly decrease in size towards the apex of tibia; in strongly sculptured specimens these may be accompanied by single considerably smaller intercalated tooth. Meso- and metafemora with two outer ventral carinae unarmed in plain specimens, but with a variable number of rounded lobules on posteroventral carina and a few rounded lobes in apical portion of anterodorsal carina in strongly armed specimens. Posterodorsal carina with three ± large, roundly triangular, sometimes dentate lobes, which increase in size towards apex of femur. Posterodorsal carina of meso- and metatibiae with three rounded lobules to dentate lobes which decrease in size towards apex of tibia; may be dentate in strongly armed specimens. Basitarsi about as long as following two tarsomeres combined; probasitarsus with the dorsal carina very gently rounded.

♂ (Fig. 9). Small (body length 47.2 mm) and moderately robust for the genus. Body surface dull and granulose, the head, pronotum tuberculose/spinose. Entire dorsal body surface slightly tectinate. Coloration plain middle brown to dark brown. Alae as in females but no black stripe on costal region; sometimes the inner portion of costal region dark grey to black. Antennae as in females.

Head: shape generally as in females but cheeks very slightly narrowing towards posterior, broadest at eyes. Armature similar to females but tubercles more prominent and posterior margin of head armed with several conical tubercles. Between the antennae with an oval, convex and faintly bituberculate swelling. Eyes of moderate size, subcircular and projecting hemispherically; their length contained about 2.3× in that of cheeks. Antennae roughly reaching to median segment; otherwise as in females.

Thorax: pronotum generally as in females but armature rather more prominent. All four angles marked by a distinct but short spine, anterior margin with a median pair of distinct pointed spines and the posteromedian pair of spines very prominent and longer than anteromedian spines; premedial pair of spines shorter than anterior and posterior ones. Mesothorax elongate and about 4.5× longer than pronotum, widened posteriorly and surface of mesonotum very sparsely set with low tubercles and a row of conical tubercles along lateral margins these being enlarged to spiniform tubercles in anterior portion of mesothorax. Mesonotum in anterior portion armed with one to three pairs of small, blunt spines and a further pair of much larger spines near posterior margin. Metanotum structured like mesonotum but the posteromedian pair of spines smaller. Meso- and metapleurae set with a few granules arranged in a longitudinal row and one or two blunt but strong tubercles over the mesocoxae. Meso- and metasternum minutely granulose. Alae slightly projecting over posterior margin of metanotum; otherwise as in females (length 2.0 mm).

Abdomen: median segment rectangular roughly 1.2× longer than wide and smooth; about 3/4 length of metanotum. Segments II-IV roughly of equal length, about 2× longer than wide and roughly rectangular; V and VI slightly shorter than previous but of equal



Figs 36-39. *Rhynchacris* spp. 36. *R. ornata* Redtenbacher, 1908 ♀ from Costa Rica (coll. FH, No. 0134-1). 37. *R. ornata* Redtenbacher, 1908 ♂ from Costa Rica (coll. FH, No. 0134-18). 38. *R. ornata* Redtenbacher, 1908 HT ♀ (BMNH). 39. *R. bigibbus* (Rehn, 1904) HT ♀ (USNM).

width. Tergites otherwise very sparsely granulose and with a pair of blunt tubercles posteromedially. VII flattened, as long as VI and gradually widened towards posterior; dorsal surface with three longitudinal carinae. Sternites II-VI set with a few small granules. Tergum VIII widest, slightly shorter than VII, gradually widened towards the posterior; dorsal surface tricarinate. IX about as long as VIII and narrowed towards posterior; surface like VIII and posterolateral angles protruded into a small triangular tooth. Anal segment shorter and narrower than IX, longitudinally tectinate, the lateral margins almost parallel-sided and the posterior margin with a shallow triangular median excavation and the outer angles rounded; apex roundly truncate in lateral aspect (Fig. 31). Lower surface of posterior margin armed with several minute, incurving black teeth. Supra-anal plate small, rounded and hidden under anal segment. Cerci very short, dorsoventrally compressed at the base, with the apical portion narrowed and almost round in cross-section. Poculum moderately convex and cup-like in basal portion, the apical half gradually flattened and longitudinally carinate and the posterior margin narrowed and entire; roughly reaching to posterior margin of abdominal tergum IX (Fig. 31).

Legs: all of moderate length and slender. Profemora slightly shorter than mesothorax, mesofemora reaching to posterior margin of abdominal segment II, metafemora almost reaching posterior margin of segment V and metatibiae projecting over apex of abdomen. Posterodorsal carina of meso- and metafemora with three small lobules which increase in size towards apex of femur. Two outer ventral carinae with 1-4 small teeth subapically. All tibiae with three small roundly triangular teeth on posterodorsal carina which decrease in size towards apex of tibia. Probasitarsus roughly equal, meso- and metabasitarsus slightly shorter than following two tarsomeres combined.

Comments.—Examination of the type specimens of *H. postpositus* Redtenbacher, 1908 and *H. substrumosus* Redtenbacher, 1908 leaves no doubt they all represent variations of the same species, which was confirmed by a nice series of both sexes all from the same locality in UMMZ. As a result *H. substrumosus* falls as a synonym of *H. postpositus* due to page priority (n. syn.). From the material now at hand this appears to be the most variable species in the genus. A lectotype is designated for *H. postpositus* in order to fix this taxon and the synonymy here established. Eggs unknown.

Distribution.—S-Mexico (Province Chiapas, Jalapa; Province Oaxaca, Binconada; Province Oaxaca, Valle Nacional; Province Oaxaca, Cordova) and Guatemala.

Hypocyrtus scythrus (Westwood, 1859) rev. stat.
(Figs 10-20, 24, 27-28, 32, 35)

Anophelepis scythrus Westwood, 1859: 68, pl. 2: 3 (♂). LT (by present designation), ♂: Holotype; Mexiko 48-11; *Anophelepis scythrus* Westw., Mexico; BMNH(E) #845320 [BMNH]; PLT, ♂: Mexico 48-11; *scythrus* Westw. [BMNH].

Phantasia scythrus, Saussure, 1870-71: 190.

Hesperophasma scythrus, Kirby, 1904: 343.

Hypocyrtus scythrus, Redtenbacher, 1908: 356; Shelford, 1909: 358, pl. 7: 1 (♀).

Lamponius scythrus, Otte & Brock, 2005: 169.

Anophelepis vittata Westwood, 1859: 69, pl. 3: 3 (♀). HT, ♀: Mexico 48-11; *Anophelepis vittata* Westw. pl. 3, fig. 3, albio *vittatum* [BMNH]. n. syn.

Phantasia vittata, Saussure, 1870-71: 189.

Hesperophasma vittata, Kirby, 1904: 343.

Hypocyrtus vittatus, Redtenbacher, 1908: 356; Shelford, 1909: 359; Eilmus, 2009: 30.

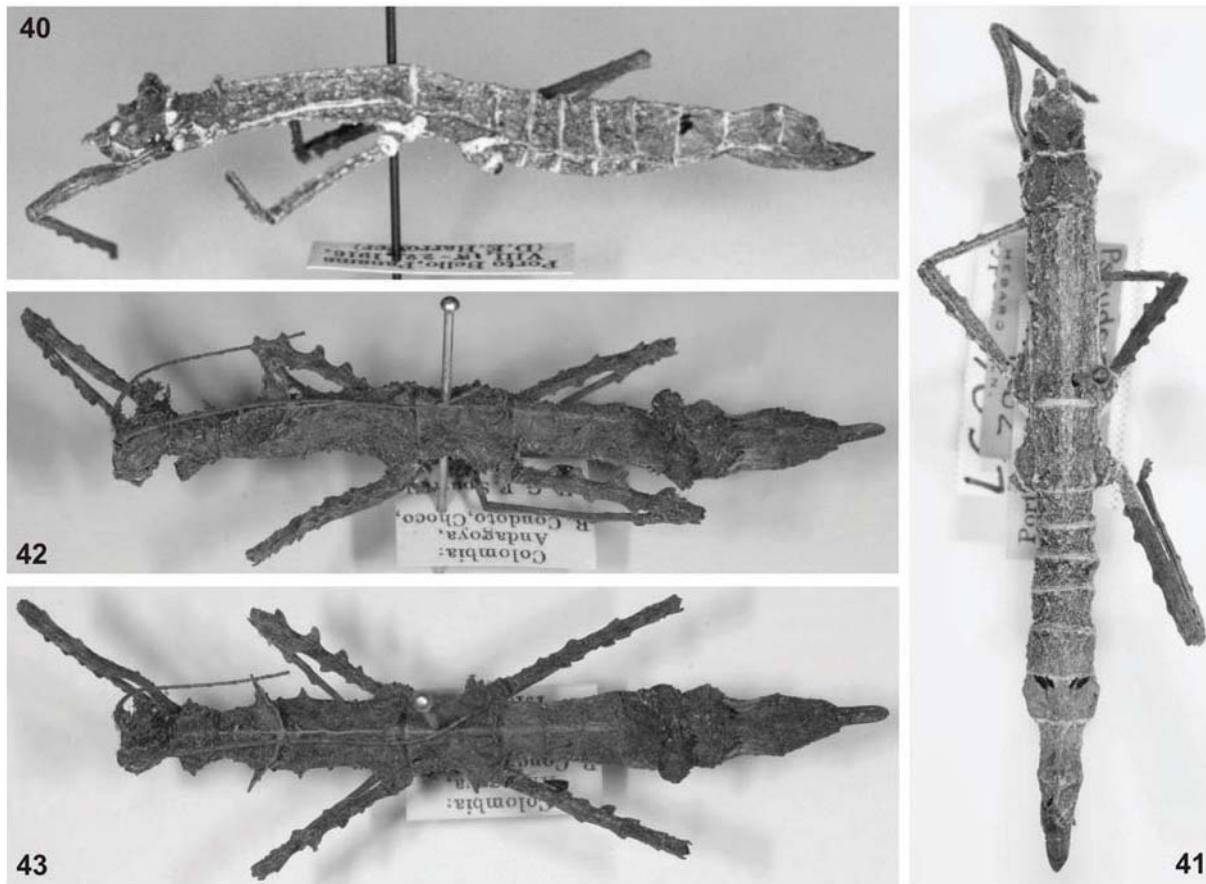
Lamponius vittatus, Otte & Brock, 2005: 169; Eilmus, 2008: 76, figs. 4-5.

Further material.—(59 ♂♂, 84 ♀♀, 1 nymph, eggs): S-MEXICO: 1 ♀: 99.260, Oaxaca, Mexico, Reckers [BMNH]; 1 ♀: Coll. Br. v. W., Mexico, Oajaca, Sallé; det. Br. v. W. *Hypocyrtus scythrus*; 1856 [NHMW, No. 717]; 1 ♂, 6 ♀♀: ex Zucht F. Hennemann 2009-2011, Herkunft: Mexiko, Veracruz, Tuxtlas, San Andres, leg. S. Eilmus; ex coll. F. Hennemann [MNHU]; 5 ♂♂, 14 ♀♀, eggs: ex Zucht F. Hennemann 2008/09, Herkunft: Mexico, Veracruz, Tuxtlas, Volcano San Andres, leg. S. Eilmus VIII-X.2007, F1-Generation [coll. FH, No's 0638-1 to 15, 39 to 43 & E1]; 17 ♂♂, 18 ♀♀, 1 ♀ (penultimate instar), eggs: ex Zucht F. Hennemann 2010, Herkunft: Mexico, Veracruz, Tuxtlas, Volcano San Andres, leg. S. Eilmus VIII-X.2007 [coll. FH, No's 0638-16 to 38, 44 to 56 & E2]; 35 ♂♂, 40 ♀♀, eggs: ex Zucht O. Conle 2007, Zuchstamm aus: Mexico, Veracruz, Est. Biol Los Tuxtlas, N18°35'04" W095°04'25", 100m, 10.-11.XIII.2006, leg. P. Fontana [coll.OC]; 1 ♂: ex Zucht O. Conle 2009, Zuchstamm aus: Mexico, Veracruz, Tuxtlas, Volcano San Andres, leg. S. Eilmus VIII-X.2007 [coll.OC].

Differentiation.—Similar to *H. postpositus* Redtenbacher, 1908, but at once differing by the larger size of both sexes. Females also differ by the strongly medially expanded mesothorax, differently shaped anal segment and much wider, distinctly transverse and rounded supra-anal plate (Fig. 28). Males can be easily distinguished from those of *H. postpositus* by the acutely triangularly protruded posterolateral angles of the anal segment (Fig. 32) and dorsally smooth tibiae.

Description.—♀ (Figs 10-12, 14). Large (body length incl. subgenital plate 77.5-98.0 mm) and robust for the genus; strongly variable in color but showing on average less variability concerning the sculpturing and armature of the head, body and legs than the other two species in the genus. Body surface dull, granulose and to a variable degree tuberculose and rugulose; thorax with a distinct longitudinal median carina dorsally, abdominal tergites II-IX irregularly multicarinate. General coloration various shades of ochre and brown, either plain (Figs 10, 12), with various distinct bold white markings on the head, body and legs (Fig. 11), or the body furnished with dark brown longitudinal stripes (e.g., the HT of *H. vittatus*, Fig. 14). Plain brown specimens often have abdominal tergum VII paler in color than rest of body. Tergites II and VIII sometimes with a pair of velvety black lateral patches at anterior margin. Commonly specimens of all three color varieties exhibit a ± decidedly white, transverse subapical band on the femora. Alae with anal region bright red and costal region pale pink to reddish middle brown with a bold longitudinal black stripe. Three terminal antennomeres paler than rest of antennae.

Head: elongate, subcylindrical and roundly rectangular in dorsal aspect with the cheeks parallel-sided, about 1.2× longer than wide. Vertex with 4 longitudinal rows of blunt tubercles, the 2 outer ones starting at the bases of the antennae and terminating in a fairly distinct conical tubercle at posterior margin of head, the shorter inner carinae diverging (Figs 15-18). Spaces in between very minutely granulose. Cheeks with a row of about three rounded tubercles in posterior portion. Eyes very small subcircular and moderately projecting, their length contained about 2.6× in that of cheeks. Antennae ± reaching to posterior margin of mesonotum, consisting of 29-31 antennomeres. Scapus with the outer lateral margin strongly, and the inner margin moderately, deflexed and rounded. Pedicellus oval

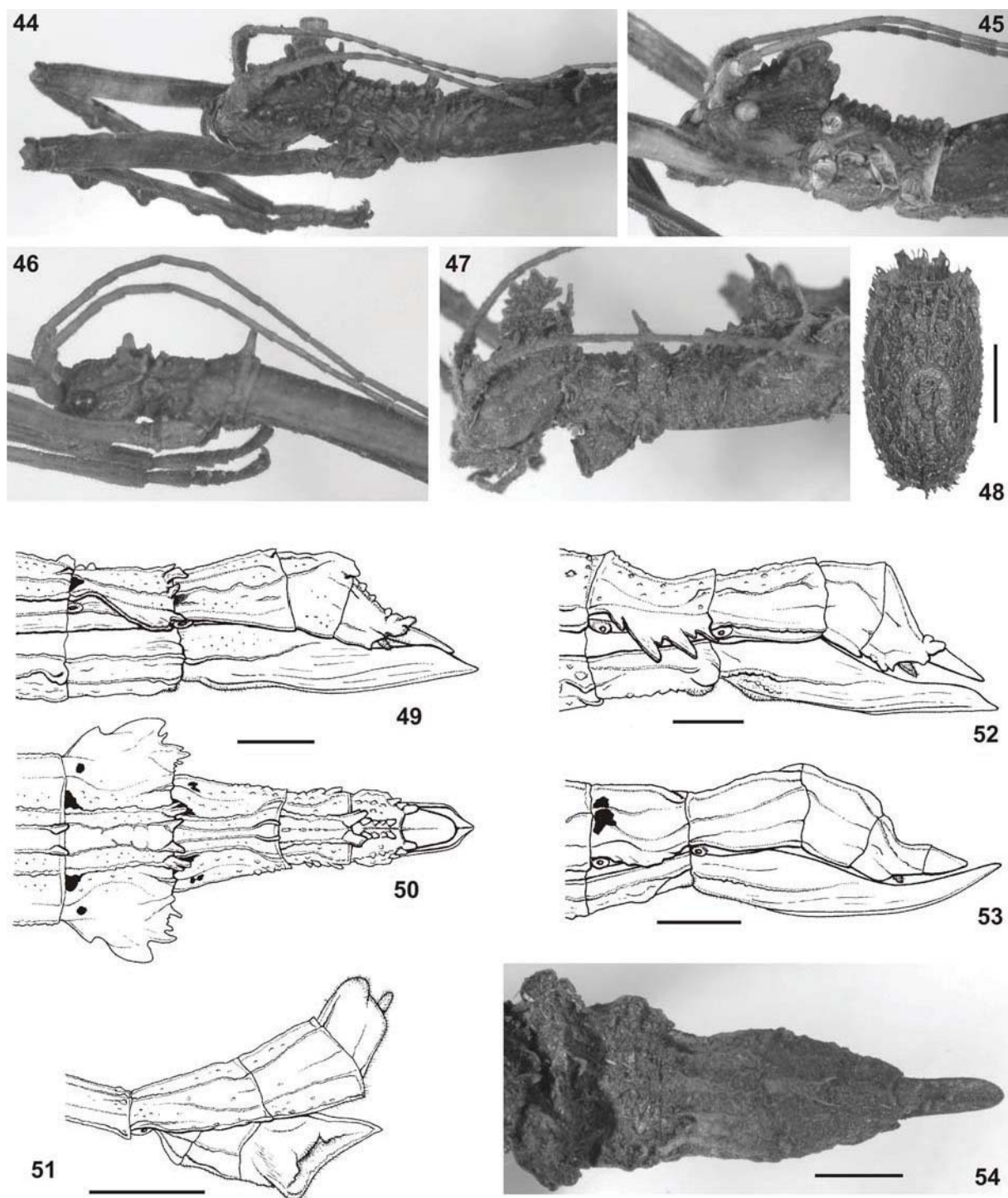


Figs 40-43. *Rhynchacris* spp. 40. *R. harroweri* (Hebard, 1923) HT ♀, lateral view (ANSP). 41. *R. harroweri* (Hebard, 1923) HT ♀, dorsal view (ANSP). 42. *R. chocoense* n. sp. HT ♀, dorsolateral view (BMNH). 43. *R. chocoense* n. sp. HT ♀, dorsal view (BMNH).

in cross-section and about half the length of scapus.

Thorax: pronotum about as long and anteriorly as broad, as head, scarcely widened towards the posterior, only 1.1× longer than wide. Surface irregularly granulate and tuberculate with the lateral margins tuberculate and each with a distinct spiniform tubercle posteriorly. Dorsal surface with two subparallel longitudinal median rows of tubercles, more prominent in posterior half of segment and each terminating in a distinct conical tubercle. Shortly before transverse median sulcus are a pair of rather prominent blunt spines. Transverse median sulcus distinct, very gently curved and almost reaching to lateral margins of segment. Sensory area of profurcasternite large, covering median half of segment, gently convex and usually of darker color than rest of body (Fig. 24). Mesothorax about 3.8× longer than pronotum and distinctly swollen and widened medially. Mesonotum with central portion roundly raised and set with a few enlarged granules or two clusters of tubercles, which vary greatly in size and shape (Figs 15-18). Surface otherwise minutely granulate, in particular on lateral surfaces very sparsely and irregularly supplied with low tubercles; near posterior margin with a pair of moderate blunt spines. Lateral margins slightly carinate and with two longitudinal rows of tubercles, the tubercles of the outer marginal row smaller and more numerous. Metanotum structured like mesonotum but with only a pair of rather small tubercles near posterior margin. Meso- and metasternum rugulose and sparsely tuberculate. Meso- and metapleurae with a longitudinal row of ± spiniform tubercles which increase in size toward apex of segment. Alae with a developed but not veinose, anal region and projecting over posterior margin of metanotum (length 4.2-6.0 mm).

Abdomen: median segment about $\frac{3}{4}$ length of metanotum, similar in structure but without enlarged tubercles. Segments II-V roughly of equal length, III-VI very gently gradually widening towards posterior, II about 1.3×, VI 1.4× wider than long. All tergites with two strongly approaching longitudinal median carinae and two irregularly curved, rugulose carinae laterally. VII slightly longer than previous tergites with the lateral margins ± deflexed and forming either a narrow and entire or fairly prominent, dentate lobe (Fig. 28); posterior margin often with 2-4 tubercles. Sternites II-VII rugulose, sparsely granulate and with lateral margins slightly crenulate, VII with a mediolateral pair of spiniform tubercles. Praeopercular organ very indistinct and represented by two low, converging carinae at posterior margin of sternum VII. Tergites VIII-X distinctly narrower than previous and gradually narrowing towards apex of abdomen; two dorsomedian carinae united and forming a single longitudinal keel which often terminates in a pair of tubercles on VIII and IX. VIII as long as VI with posterolateral angles extended into a slender triangular tooth-like appendage. IX somewhat shorter than VIII and equal in length to anal segment. Anal segment with lateral margins slightly expanded and before base of cerci with a narrow, triangular lateral tooth; posterior margin with a shallow but wide excavation and the outer angles protruded into a short, triangular tooth; dorsal surface with a very fine longitudinal median carina. Supra-anal plate distinctly transverse, widely rounded and slightly projecting over posterior margin of anal segment. Cerci dorsoventrally compressed with the apex acutely triangular and slightly projecting over anal segment; longitudinally carinate ventrally. Subgenital plate projecting over apex of abdomen by about length of anal segment. Shape convex



Figs 44-54. Details of *Rhynchacris* spp. [scale = 2 mm] 44. Head and thorax of *R. ornata* Redtenbacher, 1908 ♀ (coll. FH). 45. Head and pronotum of *R. ornata* Redtenbacher, 1908 ♀ (coll. FH). 46. Head and pronotum of *R. ornata* Redtenbacher, 1908 ♂ (coll. FH). 47. Head and thorax of *R. chocoense* n. sp. HT ♀ (BMNH). 48. Egg of *R. ornata* Redtenbacher, 1908, dorsolateral view (coll. FH). 49. Apex of abdomen of *R. ornata* Redtenbacher, 1908 ♀, lateral view. 50. Apex of abdomen of *R. ornata* Redtenbacher, 1908 ♀, dorsal view. 51. Apex of abdomen of *R. ornata* Redtenbacher, 1908 ♂, lateral view. 52. Apex of abdomen of *R. bigibbus* (Rehn, 1904) HT ♀, lateral view. 53. Apex of abdomen of *R. harroweri* (Hebard, 1923) HT ♀, lateral view. 54. Apex of abdomen of *R. chocoense* n. sp. HT ♀, dorsal view.

and tub shaped in basal portion, but increasingly flattened and in apical half gradually narrowed towards a ± rounded apex (Figs 27, 28); surface with irregular longitudinal carinae and rugulae.

Legs: Profemora about $\frac{3}{4}$ the length of mesothorax, mesofemora slightly longer than metathorax, metafemora slightly projecting over posterior margin of abdominal segment IV and metatibiae roughly

reaching to abdominal segment VIII. Profemora unarmed except for a few small tooth-like lobules in apical half of posterodorsal carina. Posterodorsal carina of protibiae with one or two small lobes, the basal one larger. Two outer ventral carinae of meso- and metafemora with two small subapical teeth, otherwise at best with two or three minute teeth in apical half. Dorsal carinae with four small undula-

tions or roundly triangular lobes which decrease in size towards base of femur. Posterodorsal carina of meso- and metatibiae with three roundly triangular lobules which decrease in size towards apex of tibia. Basitarsi about 1.5× longer than tarsomere II; probasitarsus with the dorsal carina very gently rounded.

♂ (Fig. 13). Large (body length 52.5-75.0 mm) and rather robust for the genus. Body surface dull and sparsely granulose, the head and pronotum distinctly tuberculose/spinose. Entire dorsal body surface indistinctly tectinate. Coloration plain middle brown to dark brown; rarely with faint pale markings and a pale subapical transverse band on femora. Alae as in females but no black stripe on costal region; sometimes the inner portion of costal region darker than outer. Antennae as in females. Variation much less decided than in females and mostly restricted to the size and armature of the head, pronotum and anterior portion of the mesonotum.

Head: shape generally as in females but cheeks very slightly narrowing toward posterior, broadest at the eyes. Armature similar to females but tubercles more prominent and posterior margin of head armed with a variable number of blunt spines (Figs 19, 20). Between the antennae with an oval, convex swelling. Eyes of moderate size, subcircular and moderately projecting; their length contained about 2.3× in that of cheeks. Antennae roughly reaching to median segment; otherwise as in females.

Thorax: pronotum generally as in females but armature much more prominent; armature variable. All four angles marked by a distinct spine, the premedial pair of spines very prominent and the posteromedian pair of spines slender and about as long as premedial spines (Figs 19-20). Mesothorax elongate and about 5.3-5.5× longer than pronotum, widened posteriorly and surface of mesonotum very sparsely set with low tubercles and a row of rounded nodes along lateral margins, which are enlarged to spiniform tubercles in anterior portion of mesothorax. Mesonotum in anterior portion armed with a cluster of prominent blunt spines (Figs 19, 20) and a further pair of distinct spines near posterior margin; number and size of spines variable. Metanotum structured like mesonotum but the posteromedian pair of spines smaller. Meso- and metapleurae set with a few granules arranged in a longitudinal row and one or two blunt but strong tubercles over the mesocoxae. Meso- and metasternum smooth. Alae roughly reaching to posterior margin of metanotum; otherwise as in females.

Abdomen: median segment rectangular roughly 1.2× longer than wide and smooth; about ¾ the length of metanotum. Segments II-VI roughly of equal length, about 2.4× longer than wide and rectangular; tergites otherwise very sparsely granulose and with a longitudinal row of node-like granules along lateral margins. VII flattened, gradually widened in posterior half; dorsal surface with three short longitudinal carinae in posterior portion. Sternites II-V set with a few small granules. Tergum VIII widest, slightly shorter than VII, gradually widened towards the posterior, trapezoidal and transverse; dorsal surface with a prominent longitudinal median keel and a small lateral longitudinal carina. IX scarcely shorter than VIII, about as wide as long and narrowed towards posterior; surface like VIII and posterolateral angles protruded into a triangular tooth. Anal segment shorter and narrower than IX, constricted at anterior margin and strongly tectinate; posterior margin excavated medially and with the outer lateral angles triangularly expanded to form a short, incurving process (Fig. 32). Lower surface of posterior margin armed with a row of distinct, incurving black teeth. Supra-anal plate small, rounded and hidden under anal segment. Cerci slightly compressed dorsoventrally at the base with the apical portion almost round in cross-section and slightly club-like. Vomer very small, pointed apically and hardly reaching to posterior

margin of poculum. Poculum moderately convex and cup-like in basal portion, the apical half flattened and carinate longitudinally, the posterior margin narrowly rounded with a very small median indentation and roughly reaching to posterior margin of abdominal tergum IX (Fig. 32).

Legs: all of moderate length, slender and destitute of lobes or teeth, except for 2-4 small subapical teeth on the two outer ventral carinae of the femora. Profemora about 3/5 the length of mesothorax, mesofemora reaching ¾ the way along abdominal segment II, metafemora slightly projecting over posterior margin of segment IV and metatibiae roughly reaching to abdominal segment VIII. Probasitarsus a little longer, meso- and metabasitarsus about equal in length to following two tarsomeres.

Eggs.— (Fig. 35). Capsule moderately elongate, only about 1.8× longer than wide. Capsule surface densely rugulose. Hairy structures of moderate length (*ca* 0.6 mm) and mushroom-like with the apex thickened. Micropylar plate broadly oval, about 1.8× longer than wide and about 2/5 length of capsule. Surrounded by a rim of hairy structures and with an oval rim of very short hairs in center. Micropylar cup distinct, roughly circular. Median line rather slender and very short. Operculum flat, in center and along outer margin with a rim of long hairy structures. Color plain middle to dark brown, the hairy structures of a slightly paler color.

Measurements excluding hairy structures [mm]: length 4.0-4.3 mm, width 2.1-2.2 mm, height 2.2-2.3 mm, length of micropylar plate 1.6-1.7 mm.

Comments.—The availability of captive reared males and females has shown *Anophelepis vittata* Westwood, 1859 to represent the female sex of *H. scythrus* (Westwood, 1859), hence to be a junior synonym (*n. syn.*). A lectotype is designated for *H. scythrus* (Westwood, 1859) to guarantee stability of the name. This, the largest species in the genus is less variable than the other two congeners and does not produce strongly furnished, moss-like specimens with green appendages, spines or lobes on the head body and legs. Variation is mainly restricted to the size, coloration, size and number of median mesonotal tubercles, size and shape of abdominal tergum VII and degree of leg armature.

Eilmus (2008) provided information on the natural habitat and host plants of *H. scythrus* (as "*Lamponius vittatus*") in Veracruz Province, Mexico, where it seems to be peculiar to lower regions of tropical or subtropical primary and secondary rainforests. The insects may hide under bark or dead leaves on the forest-floor during the day and only leave their hiding places for feeding at night. It is known to feed on *Heliocarpus americanus* (Malvaceae), but is apparently polyphagous and hence certainly also feeds on various other plants. In captivity in Europe it accepts various Rosaceae (*e.g.*, *Rubus fruticosus*, *R. idaeus*, *Rosa* spp. or *Fragaria vesca*), oaks (*Quercus robur*, *Q. petraea* and *Q. ilex*, Fagaceae) and Salal (*Gaultheria shallon*, Ericaceae) as alternative food plants.

Two culture stocks were introduced to Europe and collected at nearby localities near Los Tuxtlas in the Veracruz Province of SE-Mexico. The first stock was collected by Paolo Fontana (Italy) in 2006 and the second by Sascha Eilmus (Germany) in 2007. Both have recently been included on the Phasmid Study Group culture-list as culture No. 297 "*Hypocyrtus vittatus*". Detailed information on the biology, defensive behavior and captive breeding of *H. scythrus* is presented by Eilmus (2009). In danger both sexes readily flash their small red wings. Nymphs are very slow growing and take up to twelve months to reach maturity. Adult females are very long lived and easily reach one year or more of age. An average of three eggs

is produced per day per female, these being simply dropped to the ground. Hatching takes about 4-6 months at average temperatures. Rearing in captivity is straightforward in moderately humid but ventilated conditions.

Distribution.— S. Mexico (Province Veracruz, Los Tuxtlas, Volcáno San Martín; Province Oaxaca, Santa María; Province Chiapas, Teapa).

Genus *Rhynchacris* Redtenbacher, 1908
(Figs 36-54)

Type-species.—*Rhynchacris ornata* Redtenbacher, 1908: 354, by monotypy.

Rhynchacris Redtenbacher, 1908: 354; Shelford, 1909: 356; Robinson, 1969: 290; Brock, 1993: 21; Bragg, 2001: 643; Zompro, 2004a: 321; Zompro, 2004b: 139; Otte & Brock, 2005: 310.

Hesperophasma, Brock, 1993: 21 (not Rehn, 1901); Lipinski et al., 1999: 60; Otte & Brock, 2005: 156.

Phantasia, Redtenbacher, 1908: 355 (in part); Shelford, 1909: 357.

Pseudoceroys Hebard, 1923: 354, pl. 15: 1-2. (Type-species: *Pseudoceroys harroweri* Hebard, 1923: 354, by original designation) n. syn.; Zompro, 2001: 228 [In Diapheromerinae: Diapheromerini: "Clonistria-group"]; Zompro, 2004a: 320; Zompro, 2004b: 142; Otte & Brock, 2005: 286.

Description.—Moderately sized members of Hesperophasmatini (body length 44.0-78.0 mm), body moderately robust (females in particular) and \pm cylindrical. Sexual dimorphism distinct with males considerably more slender than females. Both sexes apterous. Color mostly various shades of brown, more rarely green and with moss-like sculpturing of the body surface in females. Head indistinctly longer than wide; in males vertex gently rounded posteriorly and sparsely tuberculate, in females roundly convex, tuberculate and with a pair of distinct auriform or foliaceous, laterally compressed lobes. Antennae rather short and consisting of no more than 28 antennomeres; in females not reaching posterior margin of mesonotum, in males roughly reaching median segment. Scapus dorsoventrally compressed and with the outer lateral margin \pm roundly expanded. Pedicellus round in cross-section and distinctly shorter than scapus. Segment III considerably longer than pedicellus and following antennomeres. Pronotum about as long but slightly narrower than head, surface granulose or tuberculose. Lateral margins of prosternum each with a small, rounded sensory area, profurcasternite with a large sensory area medially. Mesothorax elongate and 3-4 \times longer than pronotum, slender and roughly of uniform width in males, \pm swollen medially in females. Surface of mesonotum very sparsely granulose in males, granulose or rugulose and with a median pair of \pm distinct, foliaceous, crenulate or spiniform protuberances in females. Meso- and metapleurae and sterna simple and unevenly granulose, coriaceous or rugulose. Median segment distinctly shorter than metanotum, in females transverse. Abdominal segments II-VI of males roughly parallel sided and longer than wide; in females abdomen \pm swollen medially and tergites wider than long. Tergite VII of females \pm strongly expanded and with an irregularly dentate lateral lobe; VI may be expanded also. Sternites II-VII simple, in females VII with a praepercular organ formed by an irregular hump-like median swelling near posterior margin. Tergites VIII-X wider ($\sigma\sigma$) or considerably narrower (♀♀) than previous segments. Anal segment in males widened towards posterior and with a small median indentation at posterior margin. Vomer well developed, sclerotised and roughly triangular with a single terminal hook. Poculum

moderately convex and with a conical basal projection, posterior margin entire. Anal segment of females notched posteromedially. In females supra-anal plate and subgenital plate elongated and forming a beak-like ovipositor; supra-anal plate longer than anal segment and almost reaching apex of elongated subgenital plate, the latter keeled longitudinally and with the apex \pm acute. Cerci small and slightly compressed laterally. Legs of moderate length, the profemora shorter than the mesothorax and the metatibiae at best slightly projecting over apex of abdomen in males. All legs distinctly carinate and \pm trapezoidal in cross-section with the dorsal carinae nearing (females in particular); only with a few very small lobules or teeth in males and armed with \pm distinct dentate or foliaceous lobes in females (dorsal carinae of middle and hind legs in particular). Medioventral carina of femora very faint, unarmed and roughly midways on ventral surface of femur. Tarsi short and stout, basitarsi no longer than following two tarsomeres combined; in females the probasitarsus gently rounded dorsally.

Eggs.— (Fig. 48). Capsule elongate, bullet-shaped with the polar area slightly constricted and round in cross-section; about 2 \times longer than wide. Capsule surface minutely but densely rugulose and covered all over with a network of hairy ridges. Micropylar plate small, oval, indistinctly longer than wide and less than 1/3 the length of capsule; slightly displaced toward polar area. Operculum flat and in center with a circular rim of long hairy structures.

Differentiation.—(Table 1). This genus is apparently very close to *Hypocyrtus* Redtenbacher, 1908, the second Central American representative of the tribe Hesperophasmatini, but differs by the following characteristic features: antennae of both sexes only about 1/2 as long as body; head of females convex and with a pair of auriform or foliaceous cephalic lobes; poculum of males without a posteromedian notch, and females with a beak-like ovipositor formed by an elongated subgenital and supra-anal plate. While all these morphological features are unique amongst Hesperophasmatini, the beak-like ovipositor of females is only shared with the Antillean *Agamemnon* Moxey, 1971. The eggs differ from those of *Hypocyrtus* by the more elongate, bullet-shaped egg capsule and smaller, relatively shorter micropylar plate. For a more detailed differentiation see Table 1 above.

Comments.—Redtenbacher (1908) established *Rhynchacris* merely to contain the newly described *R. ornata* from Costa Rica; he distinguished it from related genera by the presence of a beak-like ovipositor in the females. Hebard (1923) described the genus *Pseudoceroys* for the newly described *P. harroweri* from Panama as well as *Ceroys bigibbus* Rehn, 1904 from Nicaragua and placed it in close relation to *Parapygihynchus* Brunner v. Wattenwyl, 1907, a genus of Diapheromerinae: Ocnophilini. Careful examination of the type species *P. harroweri* Hebard, 1923 has shown this to belong in *Rhynchacris*, hence the genus must be regarded a junior synonym and is here synonymised with *Rhynchacris* (n. syn.). Although *Pseudoceroys* is clearly a member of the tribe Hesperophasmatini, Zompro (2001) surprisingly placed it in the "Clonistria-group" of Diapheromerinae: Diapheromerini.

Distribution.— Eastern Central America (Nicaragua, Costa Rica & Panama) and NW Colombia (Province Chocó). According to Morrone (2006, Fig. 2) the distribution is biogeographically restricted to the Eastern Central America Province and Chocó Province of the Caribbean subregion.

Species included.—

1. *Rhynchacris bigibbus* (Rehn, 1904: 48) [*Ceroys*]. n. comb.
2. *Rhynchacris chocoense* n. sp.
3. *Rhynchacris harroweri* (Hebard, 1923: 354, pl. 15: 1-2) [*Pseudoceroys*]. n. comb.
4. *Rhynchacris ornata* Redtenbacher, 1908: 354.
= *Phantasia lobata* Redtenbacher, 1908: 355. n. syn.

Key to ♀♀ of *Rhynchacris*

1. Mesothorax ± swollen medially; meso- and metafemora with a distinct subapical dorsal lobe 2
- Mesothorax ± parallel-sided; femora without an enlarged subapical dorsal lobe. *harroweri*
2. Abdominal tergum VI narrower than VII; median projections of mesonotum crenulate or foliaceous; not Colombia 3
- Abdominal tergum VI distinctly expanded laterally, wider than VII; median projections of mesonotum protruding into a large laterally extended spine; NW Colombia *chocoense* n. sp.
3. Body length < 70 mm; mesothorax < 3.5× longer than wide; abdominal segments II-V > 2× wider than long; Costa Rica & Panama *ornata*
- Body length 78 mm; mesothorax 4× longer than wide; abdominal segments II-V < 1.6× wider than long; Nicaragua *bigibbus*

Rhynchacris bigibbus (Rehn, 1904) n. comb.
(Figs 39, 52)

Ceroys bigibbus Rehn, 1904: 48. HT, ♀: U.S.N.M. Acc. 22720; Nicaragua; Type No. U.S.N.M.; No. 6973 *Ceroys bigibbus* Rehn Type; Don't wrong here: has no tibial arolae [USNM]; Redtenbacher, 1906: 61; Shelford, 1909: 366.
Pseudoceroys bigibbus, Hebard, 1923: 354; Otte & Brock, 2005: 286.
Caulonia bigibbus, Kirby, 1904: 344.

Differentiation.—Very close to *R. ornata* Redtenbacher, 1908 but ♀♀ (the only sex known) differ by: the larger size; more slender body and legs; relatively longer mesonotum which is about 4× longer than the pronotum (< 3.5× in *ornata*); relatively more slender abdominal segments II-VI which are at best 1.6× longer than wide (> 2× in *ornata*); deeper medial incision of the anal segment and more slender supra-anal plate (Fig. 52).

Description.—♀ (Fig. 39). Rather large (body length 78.0 mm), elongate and slender for the genus. Body surface dull, rugulose and tuberculate, the thorax with a blunt longitudinal median carina dorsally. General coloration dark brown. Abdominal tergum VII ochraceous and median segment with a bold triangular ochraceous marking. Three terminal antennomeres pale ochraceous.

Head: globose with the cheeks almost parallel sided. Frons with a pair of small, horn-like spines between the eyes. Vertex with the auriform lobes irregular rounded, about as high as wide, crenulate and dentate; close to posterior margin with a pair of blunt spiniform processes. Cheeks with several small tubercles in posterior portion. Eyes small, slightly oval and their length contained about 2.5× in that of cheeks. Antennae reaching about ¾ the way along mesonotum. Scapus with the outer lateral margin strongly expanded and rounded in apical half. Pedicellus cylindrical and a little more than 1/3 the length of scapus.

Thorax: pronotum a little longer but slightly narrower than head, roughly rectangular and saddle shaped. Surface with two moderately divergent longitudinal median rows of tubercles, each terminating

in a very prominent, blunt, conical projection at posterior margin. A pair of small, rounded tubercles at anterior margin. Transverse median sulcus very indistinct. Mesothorax about 4× longer than pronotum and very gently swollen medially. Mesonotum with a pair of low transverse carinate lobes in central portion and two pairs of small rounded lobes near posterior margin. Lateral margins slightly carinate, irregularly undulate and each set with three blunt, dorsoventrally compressed, triangular projections. Metanotum structured like mesonotum but only with one pair of small lobe-like projections close to posterior margin and an anterior spine-like process on lateral margins. Meso- and metasternum rugulose and sparsely subtuberculate. Metapleurae with a longitudinal saw-like series of rounded lobules, the precoxal one largest.

Abdomen: median segment slightly shorter than metanotum, similar in structure. Segment III-IV gently widening, V-VI very slightly narrowing. II narrower than II-VII, about as long as median segment and roughly 1.5× wider than long. III-VI roughly of equal length and longer than II, on average 1.5× wider than long. Tergites sparsely tuberculate and with three irregularly tuberculate longitudinal carinae, the median carina dividing just before posterior margin; all terminating in a lobule at posterior margin, the outer ones larger. VII flattened, longer than previous segments and the lateral margins with a rounded, foliaceous and irregularly dentate lobe, which laterally extends by almost 1/3 the width of segment (Fig. 39). Sternites II-VII rugulose, the praeopercular organ on VII formed by a rough posteromedian hump-like structure. Tergites VIII-X narrower than previous. VIII about equal in length to VII, constricted medially, with a blunt longitudinal median bulge and the lateral surfaces impressed in the median portion. IX considerably shorter than VIII and tectiform; both with the posterior margin irregularly sinuate and tuberculate. Anal segment strongly declivent with the posterior margin narrowed produced in a rounded tubercle on each side of the deep, roundly triangular median indentation. Supra-anal plate roundly tectiform, a little shorter than anal segment and gradually narrowed towards a rounded apex. Subgenital plate elongate, boat-shaped, longitudinally carinate basally and constricted towards an acutely triangular apex; slightly projecting over apex of supra-anal plate (Fig. 52).

Legs: pro- and mesofemora shorter than mesothorax, metafemora reaching to abdominal segment V and metatibiae just not attaining apex of abdomen. Profemora with the posterodorsal carina near apex supplied with a dentate foliaceous lobe; posteroventral carina with a few very low dentations. Posterodorsal carina of protibiae with four rounded lobes which decrease in size towards the apex of tibia. Mesofemora with all carinae irregularly lobulate, the posterodorsal carina armed with a large, bidentate apical lobe. Metafemora with three enlarged, roughly triangular lobes on the posterodorsal carina, the apical largest and bidentate. All carinae otherwise set with small lobules. Posterodorsal carina of meso- and metatibiae with three rounded lobules, decreasing in size towards apex of tibia. Basitarsi about as long as following two tarsomeres combined. For measurements see Table 5.

Comments.—This large species is known only from the unique female HT in USNM, with no more precise locality than "Nicaragua". Males and eggs unknown.

Distribution.—Nicaragua [unspecified type-locality].

Rhynchacris chochoense n. sp.
(Figs 42-43, 47, 54)

HT, ♀: Colombia: Andagoya, R. Condoto, Choco, H. G. F. Spurrell 1916-273 [BMNH].

Differentiation.—Very close to the variable *R. ornata* Redtenbacher, 1908, but females (the only sex known) differing by: the very acute longitudinal median keel of the dorsal body surface; very large and spiniform median projections of the mesonotum (foliaceous or crenulate in *ornata*); relatively more elongate abdominal segments II-V; strongly laterally expanded abdominal tergum VI; very small supra-anal plate, and long, slender apex of the subgenital plate, which extends over the abdomen by considerably more than the length of the anal segment (Fig. 54).

Etymology.—Named after its distribution and type-locality, the Chocó Province in northwestern Colombia.

Description.—♀ (Figs 42-43). Fairly small (body length 55.0 mm) but robust for the genus. Body surface dull, irregularly rugulose and tuberculate, the thorax with a distinct and acute longitudinal median carina dorsally, which extends upon the four basal abdominal tergites. General coloration greyish brown, the median keel of the dorsal body surface and outer margins of the mesonotal projections dull ochre.

Head: globose with the cheeks slightly narrowing towards the posterior. Frons with a pair of blunt tubercles between the eyes. Vertex with the auriform lobes very large, higher than wide, irregularly crenulate and dentate and extending by almost 2/3 the height of head capsule; close to posterior margin with a pair of long, slender and irregularly bifid projections (Fig. 47). Central portion of vertex set with several spiniform tubercles. Cheeks with several small tubercles and a blunt longitudinal carina in posterior portion. Eyes small, slightly oval and their length contained about 2.3× in that of cheeks. Antennae at least reaching to median segment (apex broken in the HT). Scapus with the outer lateral margin considerably expanded and rounded. Pedicellus cylindrical and almost half the length of scapus.

Thorax: pronotum a little longer but somewhat narrower than head, slightly widening towards the posterior and saddle-shaped. Surface with two moderately divergent longitudinal median rows of tubercles, each terminating in a very prominent, spiniform and slightly cephalad directed projection at posterior margin (Fig. 47). A pair of slightly enlarged tubercles directly in front of the transverse median sulcus; the latter fairly indistinct. Mesothorax about 4× longer than pronotum, narrowed anteriorly and gently swollen medially. Mesonotum over complete length with a very distinct and acute longitudinal median carina and in the central portion armed with a pair of large and acute, roughly triangular and laterally directed processes, which have the apex acutely pointed and laterally project considerably over the lateral margins of mesonotum; surface otherwise irregularly set with rugulae and blunt tubercles and with a pair of low, diverging lobes near posterior margin. Lateral margins slightly carinulate, irregularly undulate and each set with about four blunt, dorsoventrally compressed, triangular projections (the third being the most prominent). Mesopleurae set with a longitudinal row of fairly distinct, rounded tubercles and with a distinct but blunt supracoxal protuberance posteriorly. Metanotum structured like mesonotum but with only one pair of small tubercles close to posterior margin. Metapleurae with several tooth-like tubercles and a large bluntly bidentate posterior protuberance. Meso- and

metasternum rugulose, the mesosternum with several blunt tubercles of various sizes in the median portion of the anterior 2/3, the metasternum sparsely subtuberculose.

Abdomen: median segment less than 3/4 length of metanotum, similar in structure; near posterior margin with a pair of distinct, transverse, scale-like projections. Segment II roughly square and hardly wider than long, III-V gently widening and considerably wider than long, VI widest and with the tergum laterally expanded into an irregularly rounded lobe, which extends by almost 1/3 the width of segment (Fig. 54). Tergites II-IV with a blunt longitudinal median carina, which becomes increasingly obsolete and finally terminates shortly before posterior margin of IV. II-V all with a fine, lateral carina, which on V terminates in two narrow, rounded lobes posteromedially; surface otherwise irregularly rugulose. Tergum VI with a pair of irregular, low lobes posteromedially. VII flattened with the lateral margins irregular and gently rounded. Sternites II-VII rugulose, irregularly tuberculose, the praepopular organ on VII very obsolete and only represented by a small median tubercle near posterior margin. Tergum VIII almost as long as VII, about as wide as III, a little longer than wide and gently narrowed medially; dorsal surface with four irregular and slightly subparallel carinae. VIII-X narrower than previous. IX considerably shorter than VIII, narrowed towards the posterior, tectiform and with a very blunt longitudinal median bulge, which diverges in the posterior half and terminates in two low, rounded lobes near posterior margin of segment. Anal segment moderately declivent, slightly tectinate and narrowing towards the posterior, the posterior margin with a semicircular median excavation and the outer angles fairly acute. Supra-anal plate short, slightly tectiform with the apex notched medially and only 1/3 the length of anal segment (Fig. 54). Subgenital plate very elongate, boat shaped and longitudinally carinate basally and almost parallel sided in the posterior half, with the apex narrowly rounded; projecting over apex of abdomen by more than length of anal segment (Fig. 54).

Legs: profemora almost equal in length and mesofemora shorter than mesothorax, metafemora reaching to abdominal segment VII and metatibiae considerably projecting over apex of abdomen. Profemora with both dorsal carinae lobulate, the posteroventral carina supplied with several narrow, roundly dentiform lobules in the basal half. Posterodorsal carina of protibiae with two enlarged, rounded lobes in the basal half, the anterodorsal carinae densely but irregularly lobulate. All four outer carinae of mesofemora with four lobes, which increase in size towards apex of femur; those of the posterodorsal carina largest. Armature of metafemora similar, but the lobes more prominent and the apical one on the posterodorsal carina dentate. Posterodorsal carina of meso- and metatibiae with three rounded lobules, which decrease in size towards apex of tibia. Basitarsi about as long as following two tarsomeres combined. For measurements see Table 5.

Comments.—This, the only Colombian species in the genus, is known only from the unique ♀ HT in BMNH. ♂♂ and eggs unknown.

Distribution.—NW-Colombia (Province Chocó: Andagoya, Río Condoto). Lowland rainforest.

Rhynchacris harroweri (Hebard, 1923) n. comb.
(Figs 40-41, 53)

Pseudoceroids harroweri Hebard, 1923: 354, pl. 15: 1-2 (♀). HT, ♀: Porto Bello, Panama, VIII. 18.-22. 1916 (D. E. Harrower); *Pseudoceroids harroweri* Hebard, Type 862, Hebard CLN. [ANSP]; Otte, 1978: 78; Zompro, 2001: 228; Otte & Brock, 2005: 286.

Differentiation.— Females (the only sex known) of this small and slender species, differ from all others in the genus by: the ± parallel-sided mesothorax (swollen medially in all other species); lack of distinct median projections on the mesonotum; pair of blunt spines on the frons; just gently widened tergum VII (Fig. 41), and lack of a prominent subapical dorsal lobe on the femora.

Description.—The following description is based on the unique female HT in ANSP.

♀ (Figs 40-41). Fairly small (body length 53.8 mm) and slender for the genus, with a parallel-sided mesothorax and without distinct median protuberances on the mesonotum. Body surface dull, weakly rugose and subtuberculate, the thorax with a distinct and blunt longitudinal median carina dorsally. General coloration dark brown with a slight reddish wash, abdominal tergite VI on each side with a velvety black patch at anterior margin.

Head: slightly widened from eyes toward posterior. Frons with a pair of small, horn-like spines between the eyes. Vertex with the auriform lobes irregular and bluntly rounded, wider than high and crenulate; close to posterior margin with a pair of smaller, blunt spiniform processes. Cheeks with a short longitudinal row of small tubercles in posterior portion. Eyes small, slightly oval and their length contained a little more than 2× in that of cheeks. Antennae broken and missing in the HT, scapus with the outer lateral margin strongly expanded in basal portion.

Thorax: pronotum about as long as head and trapezoidal with the posterior margin decidedly wider than anterior margin. Surface with two moderately divergent longitudinal median rows of tubercles, each terminating in a large, blunt, conical projection at posterior margin. Lateral margins irregularly tuberculate. Transverse median sulcus rather indistinct and short. Mesothorax about 3.4× longer than pronotum; mesonotum parallel sided, the blunt longitudinal median carina distinct and lateral surfaces each set with three blunt conical projections. Lateral margins of mesonotum slightly carinate, angled and set with a few small tubercles. Metanotum structured like mesonotum but lacking projections. Meso- and metasternum sparsely rugulose and subtuberculose.

Abdomen: median segment slightly shorter than metanotum, similar in structure. Segments II-VI roughly of uniform width and each constricted medially. II about as long as median segment, III considerably shorter and III-VI increasing in length, with VI about 1.3× longer than II. II about 1.5×, III almost 2× and VI just indistinctly wider than long. Tergites sparsely tuberculose and with a faint longitudinal median carina. VII flattened, about equal in length to VI, wider than previous and with the lateral margins roundly convex. Sternites II-VII rugulose and each with a blunt, curved lateral carina. Praeopercular organ on VII formed by a pair of smooth converging carinae near posterior margin, which are marked by a glossy ochraceous brown spot; a granulate hump between these. Tergites VIII-X considerably narrower than previous, VIII and IX minutely bilobate posterolaterally and with a distinct longitudinal median carina. VIII longer than VII, almost 1.5× longer than wide and gently constricted medially. IX about half the length of VIII and slightly tectiform. Anal segment strongly declivent with the

posterior margin narrowed and produced in two small rounded projections on each side of the base of the supra-anal plate, the latter tectiform, shorter than anal segment and gradually narrowed towards a bluntly rounded apex. Subgenital plate elongate, boat-shaped, longitudinally tricarinate basally and constricted towards a rather acutely rounded apex; clearly projecting over apex of supra-anal plate (Fig. 53).

Legs: pro- and mesofemora shorter than mesothorax, metafemora reaching to abdominal segment VII and metatibiae slightly projecting over apex of abdomen. Profemora with the anterodorsal carina and apical portion of the posteroventral carina supplied with a few very small, stout lobes. Meso- and metafemora with all carinae set with about four moderately sized, rounded lobes; anterodorsal carina of protibiae with four small lobes of variable sizes, of meso- and metatibiae with only two small, rounded lobes in basal half. All tarsi broken in the HT. For measurements see Table 5.

Comments.—Known only from the unique ♀ HT in ANSP. ♂♂ and eggs unknown.

Distribution.—Panama (Porto Bello).

Rhynchacris ornata Redtenbacher, 1908
(Figs 36-38, 44-46, 48-51)

Rhynchacris ornata Redtenbacher, 1908: 354. HT, ♀: Holotype; R. Susio, Costa Rica, H. Rogers; 10; Godman-Salvin coll. 1908-168, *Rhynchacris ornata*; Godman No 10; B. C. A. Orth. II, *Rhynchacris ornata*, Redt. [BMNH]. Shelford, 1909: 356, pl. 6: 6 (♀); Robinson, 1969: 290; Brock, 1993: 21; Otte & Brock, 2005: 310.

Phantasia lobata Redtenbacher, 1908: 355. HT, ♀: Holotype; V. de Chiriqui, below 4,000 ft., Champion; 71; Godman-Salvin coll. 1908-168, B. C. A. Orth. II, *Phantasia lobata*, Redt. [BMNH]. n. syn.; Shelford, 1909: 357; Brock, 1993: 21.

Hesperophasma lobata, Lipinski et al., 1999: 60, figs (REM-study of egg). *Hesperophasma lobatum*, Otte & Brock, 2005: 156.

Further material.—(39 ♂♂, 31 ♀♀, 1 nymph, eggs): COSTA RICA: 1 ♂, 1 ♀: ex Zucht: D. Schulten XII.1994, Herkunft: S-Costa Rica, Limón, leg. Wanders 1993, F1-Generation [coll. FH, No's 0134-1 & 2]; 3 ♂♂, 6 ♀♀: ex Zucht F. Hennemann 1995/1996, urspr. Costa Rica; Herkunft: S-Costa Rica, Limón near border to Panama, 1993, PSG No. 171 [coll. FH, No's 0134-3 to 11]; 5 ♂♂, 5 ♀♀, 1 ♀ (penultimate instar), 15 eggs: ex Zucht F. Hennemann, urspr.: Costa Rica, 2002-2003; Herkunft: S-Costa Rica, Limón near border to Panama, 1993, PSG No. 171 [coll. FH, No's 0134-12 to 21, E & ED]; 8 ♂♂, 3 ♀♀: ex Zucht R. Krijns (Maastricht) IX.2008; Herkunft: S-Costa Rica, Limón, PSG 171 [coll. FH, No's 0134-22 to 32]; 17 ♂♂, 19 ♀♀, eggs: ex Zucht O. Conle 2002, Zuchtstamm aus: S-Costa Rica, Limón near border to Panama, 1993, PSG No. 171 [coll. OC]; 5 ♂♂, 2 ♀♀: Costa Rica, Monteverde, Trail to Cerro Amigos, 1400-1700m, 26.9.-03.10.2005, N10° 18'91" W084° 48'65" [coll. OC].

Differentiation.— Females of this highly variable species differ from those of all other known species by the robust body and strongly transverse abdominal segments II-V, the latter being as much as 2× wider than long. From *R. bigibbus* Rehn, 1904 they furthermore differ by: the smaller size; more robust legs; relatively shorter mesonotum which is < 3.5× longer than the pronotum (4× in *bigibbus*) and broader supra-anal plate. From the Colombian *R. chocoense* n. sp. they can also be distinguished by: the much less distinct longitudinal median carina of the dorsal body surface; smaller, often foliaceous

or crenulate median projections of the mesonotum (spiniform in *chocoense* n. sp.); lacking the considerably expanded abdominal tergite VI; much larger supra-anal plate, and shorter, broader apex of the subgenital plate, which extends over the abdomen by hardly more than the length of the anal segment (Fig. 50). Finally, the larger size, medially swollen mesothorax; median projection of the mesonotum; widely expanded abdominal segment VII and distinct subapical dorsal lobe of the meso- and metafemora clearly distinguish it from *R. harroweri* (Hebard, 1923).

Description.— ♀ (Figs 36, 38). Moderately sized (body length 56.5–67.0 mm) and robust for the genus; highly variable in coloration and sculpturing of the head, body and legs. Body surface dull, rugulose and to a variable degree tuberculate or lobate, the thorax with a distinct and blunt longitudinal median carina dorsally. General coloration mostly various shades of brown reaching from dark ochraceous to almost black, more rarely of moss-like appearance with greenish mottling and all the body appendages green (e.g., the HT of *ornata*). Abdominal tergum VII mostly of noticeably paler color than rest of body, ranging from ochraceous to pale cream; VII and VIII often with a velvety black patch on each side at anterior margin. Brown specimens occasionally with the basal portion of the femora pale cream to ochraceous and tubercles along lateral margins of mesosternum often of paler color than rest of body. Three terminal antennomeres pale ochraceous.

Head: globose with the cheeks almost parallel sided. Frons with a pair of small, horn-like spines between the eyes. Vertex with the auriform lobes prominent, irregularly rounded, mostly higher than wide and to a variable degree crenulate and/or dentate (Figs 44, 45). Posterior margin with a prominent pair of blunt spiniform processes. Cheeks with a longitudinal cluster of small tubercles in posterior portion. Eyes small and circular, their length contained more than 2.5× in that of cheeks. Antennae reaching about 4/5 the way along mesonotum, consisting of 24 antennomeres. Scapus with the outer lateral margin strongly expanded and rounded. Pedicellus cylindrical and a little less than half the length of scapus.

Thorax: pronotum longer and about equal in width to head, roughly rectangular and slightly saddle-shaped with the posterior portion slightly wider than anterior portion. Surface with two moderately divergent and irregular longitudinal median double rows of tubercles, each terminating in a very prominent, blunt, conical projection at posterior margin (Fig. 44); these rarely obsolete (Fig. 45). Anterior margin with a pair of smaller rounded tubercles. Transverse median sulcus distinct, gently curved and reaching to lateral margins of segment. Mesothorax about 3.4× longer than pronotum and ± swollen medially. Mesonotum with a pair of low transverse carinulate lobes in central portion, which vary greatly in size and shape. In strongly sculptured specimens this is accompanied by several further short, transverse carinae. Near posterior margin with a median pair of small lobules or crenulate lobes. Surface otherwise set with a variable number of low tubercles. Lateral margins slightly carinulate and often with a variable number of dorsoventrally compressed, folds or tooth-like projections. Metanotum structured like mesonotum and with a pair of small tubercles or lobe-like projections close to posterior margin; lateral margins as in mesonotum. Meso- and metasternum rugulose and sparsely subtuberculose, the lateral margins of mesosternum slightly carinate and with a variable number of low fold-like projections. Meso- and metapleurae with a longitudinal row of spiniform tubercles which increase in size toward apex of segment.

Abdomen: median segment slightly shorter than metanotum, similar in structure and often with two pairs of diverging carinae near

posterior margin. Segments III–V gently widening, VI very slightly narrowing. II narrower than II–VII, about as long as median segment and roughly 1.7× wider than long. III–VI roughly of equal length and very scarcely shorter than II, on average 1.8–2.0× wider than long. Tergites sparsely tuberculose and with irregular, subparallel longitudinal carinae, the posterior margin with a small median and much larger outer pair of tubercles, the outer ones sometimes enlarged into dentate lobes. IV–VI in strongly sculptured specimens sometimes with a foliaceous, bidentate lobe posterolaterally, which is smallest on IV and largest on VI (Fig. 38). VII flattened, longer than previous segments and the lateral margins with a rounded, foliaceous and irregularly dentate lobe, which may laterally extend by more than half the width of segment (Fig. 50). Sternites II–VII rugulose and with a longitudinal carina on each side, the praeopercular organ on VII formed by a rough posteromedian hump-like structure. Tergites VIII–X narrower than previous. VIII gradually narrowed towards the posterior, a little longer than VII, constricted medially, with a blunt longitudinal median bulge and the lateral surfaces impressed in the median portion. IX considerably shorter than VIII, tectiform and with a pair of ± large lobes. Anal segment strongly declivent with the posterior margin narrowed and produced in a rounded tubercle or spine-like process on each side of the rounded median indentation (Fig. 50). Supra-anal plate tectiform, roughly equal in length to anal segment and gradually narrowed towards a rounded apex. Subgenital plate elongate, boat-shaped, longitudinally carinate and constricted towards an acutely triangular apex; projecting over apex of supra-anal plate (Fig. 51).

Legs: profemora very slightly, mesofemora noticeably, shorter than mesothorax, metafemora reaching about half way along abdominal segment VI and metatibiae just not reaching apex of abdomen. Profemora with the posterodorsal carina near apex usually supplied with a roundly triangular lobe, this very variable in size and rarely lacking; a further much smaller, rounded lobe roughly medially. Posteroventral carina with a few very low lobules. Posterodorsal carina of protibiae with four rounded (sometimes minutely dentate) lobes which slightly decrease in size towards the apex of tibia. Meso- and metafemora with all carinae irregularly lobulate, the posterodorsal carina armed with a large, often bidentate apical lobe and two further much smaller, triangular lobes, which decrease in size towards base of femur. Two outer ventral carinae with three lobules or tooth-like lobes which decrease in size towards base of femur, and a small bidentate subapical lobe. All carinae otherwise set with small lobules. Posterodorsal carina of meso- and metatibiae with two rounded lobes in basal portion, the basal one larger (size very variable). In strongly sculptured specimens there may be a third lobe in the apical half and a few small intercalated lobules between the larger ones. Basitarsi about as long as following two tarsomeres combined. Probasitarsus with the dorsal carina rounded. ♂ (Fig. 37). Small (body length 44.0–58.0 mm), fairly robust but still stick-like insects (maximum body width 2.0–2.2 mm), the body surface dull and very sparsely granulose. Coloration plain middle to dark brown, more rarely with a greenish wash. Occasionally with the dorsal body surface noticeably darker than rest of body and head with the cheeks and frons pale brown to ochraceous. Antennae becoming gradually paler toward apex and the terminal three antennomeres slightly paler than previous.

Head: about 1.3× longer than wide, broadest at the eyes and slightly narrowing towards the posterior. Vertex very gently rounded in posterior portion and there supplied with a few small tubercles; posterior margin with three conical tubercles (Fig. 46). Between the eyes with a pair of low converging carinae, cheeks with a longitudinal row of small granules in posterior portion. Eyes of moderate size, circular

Table 2. Measurements [mm] of *Hypocyrthus ornatissimus* (Brunner v. Wattenwyl, 1907).

	♀, HT (SMNS)	♀, HT of <i>strumosus</i> (SMNS)	♀♀ (captive reared)	♂♂ (captive reared)
Body (incl. subgen. pl.)	70.0	62.0	70.0-78.0	59.5-67.0
Body	67.0	60.3	66.8-75.4	-
Pronotum	4.2	4.0	4.1-4.5	2.8-3.0
Mesonotum	16.0	15.7	15.9-18.9	15.4-18.2
Metanotum	4.9	4.7	5.0-5.2	4.8-5.3
Median segment	3.7	3.6	3.7-3.9	2.9-3.1
Alae	0.2	0.2	0.2	0.2-0.5
Profemora	14.5	13.0	12.7-14.8	14.7-15.4
Mesofemora	12.1	11.2	10.0-11.2	11.8-12.1
Metafemora	14.9	12.8	13.3-14.4	13.9-14.8
Protibiae	13.9	11.7	10.8-14.1	15.0-16.2
Mesotibiae	10.1	11.0	9.2-10.8	11.2-12.6
Metatibiae	15.1	13.1	12.2-16.0	15.3-17.0
Antennae	> 20.0	> 18.0	27.5-30.0	32.0-37.0

* apex of subgenital plate broken off.

Table 3. Measurements [mm] of *Hypocyrthus postpositus* Redtenbacher, 1908.

	♀, HT (NHMW)	♀, PLT of <i>substrumosus</i> (BMNH)	♀♀	♂ (NHMW)
Body (incl. subgen. pl.)	-*	61.5	56.0-68.0	-
Body	58.0	58.0	53.5-65.3	47.2
Pronotum	4.2	4.1	3.7-4.5	2.6
Mesonotum	14.3	14.3	13.8-15.8	13.4
Metanotum	4.1	4.1	4.8-5.2	3.8
Median segment	3.6	3.8	3.3-4.5	2.9
Alae	3.0	4.6	2.4-3.0	2.0
Profemora	12.1	12.7	11.1-13.8	11.7
Mesofemora	10.2	10.2	9.0-11.0	9.9
Metafemora	13.2	12.8	11.9-15.1	13.3
Protibiae	11.5	12.0	10.5-13.5	12.7
Mesotibiae	10.0	9.5	8.3-10.2	10.3
Metatibiae	13.1	13.2	10.7-14.2	14.0
Antennae	> 15.0	> 10.0	> 25.0	> 20.0

Table 4. Measurements [mm] of *Hypocyrthus scythrus* Redtenbacher, 1908.

	♂, LT (BMNH)	♀, HT of <i>vittatus</i> (BMNH)	♀♀	♂♂
Body (incl. subgen. pl.)	-	77.5	78.5-98.0	-
Body	52.5	75.6	76.0-95.5	62.0-75.0
Pronotum	2.9	4.9	5.0-5.7	3.0-4.0
Mesonotum	14.4	18.8	17.0-23.2	14.5-19.0
Metanotum	3.4	5.0	5.0-6.0	4.3-5.1
Median segment	3.7	4.8	4.8-5.1	3.0-3.9
Alae	2.0	4.2	4.2-6.0	2.7-3.0
Profemora	11.2	16.2	15.4-18.0	13.0-16.7
Mesofemora	9.4	12.6	12.7-14.8	9.9-14.4
Metafemora	11.8	15.9	16.5-18.5	13.0-18.8
Protibiae	11.5	13.8	15.1-17.6	13.3-17.1
Mesotibiae	7.8	11.2	12.2-12.8	8.6-13.2
Metatibiae	10.9	15.8	16.6-20.0	14.4-20.0
Antennae	> 15.0	> 20.0	34.0-39.0	37.0-40.0

Table 5. Measurements [mm] of *Rhynchacris* spp. ♀♀.

	<i>R. bigibbus</i> ♀, HT (USNM)	<i>R. chocoense</i> n. sp. ♀, HT (BMNH)	<i>R. harroweri</i> ♀, HT (ANSP)
Body (incl. subgen. pl.)	78.0	55.0	53.8
Pronotum	5.5	3.4	3.9
Mesonotum	22.0	13.8	13.1
Metanotum	9.5	3.9	3.0
Median segment	1.9	2.7	2.7
Profemora	14.8	13.6	10.2
Mesofemora	12.5	11.0	9.2
Metafemora	16.0	14.0	12.4
Protibiae	15.5	13.8	9.5
Mesotibiae	13.0	10.8	8.7
Metatibiae	19.8	17.0	12.1
Antennae	ca. 24.0	> 26.0	-

Table 6. Measurements [mm] of *Rhynchacris ornata* Redtenbacher, 1908.

	♀, HT of <i>ornata</i> (BMNH)	♀, HT of <i>lobata</i> (BMNH)	♀♀	♂♂
Body (incl. subgen. pl.)	61.7	56.5	60.0-67.0	-
Body	-	-	-	44.0-58.0
Pronotum	4.4	4.0	4.2-4.4	2.8-3.0
Mesonotum	14.8	13.4	14.3-16.7	11.2-14.5
Metanotum	4.6	4.2	3.9-4.6	3.1-4.8
Median segment	3.3	3.0	2.9-3.3	2.3-2.6
Profemora	13.9	11.4	10.8-13.3	11.4-13.5
Mesofemora	12.1	10.2	9.0-11.2	9.8-11.1
Metafemora	14.8	12.5	12.2-14.3	11.4-14.0
Protibiae	13.5	11.9	10.6-12.4	11.8-13.4
Mesotibiae	12.2	10.2	9.1-10.8	8.6-10.8
Metatibiae	16.4	14.3	12.5-14.3	12.2-14.2
Antennae	> 18.0	> 10.0	18.0-21.0	25.0-27.0

and projecting hemispherically; their length contained about 2.5× in that of cheeks. Antennae roughly reaching to median segment; otherwise as in females.

Thorax: pronotum a little longer but slightly narrower than head, constricted medially. Transverse median sulcus distinct, but not reaching lateral margins of segment. Surface irregularly granulose and posterior margin supplied with a pair of prominent and spine-like, blunt tubercles (Fig. 46). Mesothorax elongate and about 5.3× longer than pronotum, widened posteriorly and surface very sparsely set with low granules. Metanotum with a very faint longitudinal median line, otherwise smooth. Meso- and metapleurae with a few small, rounded granules arranged in a longitudinal row. Meso- and metasternum smooth.

Abdomen: median segment rectangular, roughly 1.3× longer than wide and smooth; about half length of metanotum. Segment II almost 1.5× longer than median segment, II-VI very slightly decreasing in length, II 2× and VI only 1.5× longer than wide; all parallel sided. Tergites very sparsely granulose and with a longitudinal carina along lateral margins. VII as long as IV and gently widening towards the posterior; surface rugulose and irregularly multicarinate. Sternites II-VII sparsely granulose and each with a small pair of median and posterior tubercles, VI and VII irregularly multicarinate. Tergum VIII scarcely shorter than VII, hardly wider than long and rectangular; surface with a blunt longitudinal median keel, rugulose and irregularly multicarinate. IX shorter than VIII, narrowed towards the posterior, wider than long and sculptured like VIII. Anal segment only 2/3 length of IX and 1.5× wider than long, narrowed

at anterior margin with posterior portion noticeably wider than IX; surface with a fine longitudinal median carina and posterior margin with a shallow median indentation. Outer angles armed with a few small teeth ventrally. Supra-anal plate small, transverse and slightly notched medially. Vomer triangular and with a single, straight terminal hook, hardly longer than wide. Cerci small and hardly projecting over posterior margin of anal segment, laterally compressed basally and gradually narrowed towards a rounded tip. Poculum strongly convex and cup-like, posterior margin gently excavated and slightly projecting over posterior margin of tergum IX (Fig. 51); basal portion with an angular transverse carina, posterior portion longitudinally keeled.

Legs: all of moderate length and slender without any large lobes as in females. Profemora much shorter than mesothorax, mesofemora roughly reaching to posterior margin of abdominal segment II, metafemora almost reaching posterior margin of segment V and metatibiae projecting over apex of abdomen. Protibiae with three very small lobules dorsally, which decrease in size towards apex of tibia (may be completely reduced). Dorsal carinae of meso- and metafemora with 3-5 very narrow, rounded lobules; two outer lower carinae with two rounded lobes subapically. Posterodorsal carina of meso- and metatibiae with two small lobules in basal half. Basitarsi a little longer than following two tarsomeres combined, probasitarsus with dorsal carina very slightly raised.

Eggs.—(Fig. 48). Capsule about 2× longer than wide, surface densely granulose and rugulose. Dorsal surface slightly more convex than

ventral surface. Hairy structures fairly short (length *ca* 0.5 mm). Micropylar plate broadly oval, about 1.3× longer than wide and its length contained about 3.5× in that of capsule. Micropylar cup small and positioned subcentrally. Median line long, covered by a row of long hairy structures and almost reaching to polar area. Operculum very gently convex, in center and along outer margin with a circular rim of long hairy structures. Color plain mid to dark brown, the hairy structures of a slightly paler color.

Measurements excluding hairy structures [mm]: length 4.9-5.5 mm, width 2.6-2.9 mm, height 2.6-3.0 mm, length of micropylar plate 1.3-1.8 mm.

Comments.—The HT of *R. ornata* is a strongly sculptured, moss-like ♀ (Fig. 38), while the HT of *Phantasis lobata* Redtenbacher, 1908 is a very sombre specimen that has the sculpturing of the body and lobes of the extremities very weakly developed. Detailed examination of both specimens and comparison with a goodly number of wild-caught specimens from Monteverde (Costa Rica), as well as captive reared material in the authors' collections show these to represent merely the two opposite extremes of the variation range of the same species. Hence, *Phantasis lobata* is here synonymised (n. syn.).

While the more common less sculptured and mostly brown varieties of *R. ornata* are found throughout the lowland regions of its distribution, the greenish, moss-like and strongly furnished varieties appear to be restricted exceptionally to the humid mountainous habitats settled by this species, e.g., Monteverde in Costa Rica. These latter habitats are characteristic for a rich moss coverage of the lower forest vegetation which allows remarkably good camouflage, hence the more prominent sculpturing of the body surface and extremities are adaptations to the natural habitats of certain populations. The same is, e.g., seen in the related *Lamponius guerini* (Saussure, 1868) on Guadeloupe in the Lesser Antilles (Langlois & Lelong 1997).

Culture stock of *R. ornata*, collected by H. Wanders in the Limón Province of SE. Costa Rica close to the Panamanian border, was imported to Germany in 1993. It was first reared in the Löbbecke Museum & Aquazoo in Düsseldorf (Germany) by Dieter Schulten and stock from the F1 generation was first distributed amongst European breeders in 1994. Subsequently it was included on the Phasmid Study Group (PSG) culture list as PSG No. 171 "*Hesperophasma lobata*". Captive breeding in Europe has since proven it is fairly easy to culture if warm and humid conditions and an egg laying substrate are provided. Alternative food plants accepted in Europe include bramble (*Rubus fruticosus*, Rosaceae), raspberry (*Rubus idaeus*, Rosaceae), rose (*Rosa* spp., Rosaceae) and oak (*Quercus robur*, Fagaceae).

Distribution.—Costa Rica (Province Heredia, Rio Sucio; Province Limón; Province Monteverde, Monteverde) and Panama (Province Chiriquí, Valle de Chiriquí). Habitats include semihumid to tropical lowland and submontane rainforests as well as mountainous cloudforests up to an altitude of 1500 m.

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References

- Bradler S. 2009. Die Phylogenie der Stab- und Gespenstschrecken (Insecta: Phasmatodea). *Species, Phylogeny and Evolution* 2: 3-139.
- Bragg P.E. 2001. Phasmids of Borneo. Natural History Publications (Borneo), Kota Kinabalu, 772 pp.
- Brock P.D. 1993. List of stick and leaf-insects (Phasmatodea = Phasmida) type material in the Natural History Museum, published since Kirby's 1904 Catalogue. *Phasmid Studies* 2: 17-24.
- Brock P.D. 1998. Catalogue of type specimens of stick & leaf-insects in the Naturhistorisches Museum Wien (Insecta: Phasmida). *Kataloge der wissenschaftlichen Sammlungen des Naturhistorischen Museums in Wien* 13: 1-75.
- Brunner v. Wattenwyl K. 1907. Die Insektenfamilie der Phasmiden. II. Phasmidae Anareolatae (Clitumnini, Lonchodini, Bacunculini). Verlag W. Engelmann, Leipzig. pp. 181-340, pls. 7-15.
- Conle O., Hennemann F., Gutierréz Y. 2011. The Stick Insects of Colombia. A Catalogue and Bibliography with the Descriptions of Four New Genera and 74 New Species. Books on Demand, Norderstedt, Vol. 1, 412 pp.
- Eilmus S. 2008. Beobachtungen zur Biologie einiger Vertreter der Phasmatodea aus Süd-México (Phasmatodea). *Entomologische Zeitschrift* 118: 75-80.
- Eilmus S. 2009. *Hypocyrtus vittatus* (Westwood, 1859) – Biologie, Haltung und Zucht. *Arthropoda* 17: 30-33.
- Hebard M. 1923. Studies in the Mantidae and Phasmidae of Panama. *Transactions American Entomological Society*, 48: 327-362, pls. 14-15.
- Hennemann F.H., Conle O.V. 2003. Catalogue of type specimens of Phasmatodea (Insecta) deposited in the Staatliche Museum für Naturkunde in Stuttgart. *Stuttgarter Beiträge zur Naturkunde, Serie A (Biologie)*, 651: 1-8.
- Kirby W.F. 1904. A Synonymic Catalogue of Orthoptera. 1. Orthoptera Euplexoptera, Cursoria et Gressoria. (Forficulidae, Hemimeridae, Blattidae, Mantidae, Phasmidae). British Museum, London. 501 pp.
- Langlois F., Lelong P. 1997. Phasmatodea de Guadeloupe. Asper Publishing, 88 pp.
- Lipinski et al. 1999. Die Struktur der Eihüllen von 48 Phasmatodea-Arten aus der Sammlung des Löbbecke-Museum und Aquazoo Düsseldorf. *Entomologische Mitteilungen aus dem Löbbecke-Museum und Aquazoo, Beiheft* 5, pp. 1-125.
- Otte D. 1978. The primary types of Orthoptera (Saltatoria, Mantodea, Phasmatodea and Blattodea) at the Academy of Natural Sciences of Philadelphia. *Proceedings Academy of Natural Sciences, Philadelphia* 130: 26-87.
- Otte D., Brock P. 2005. Phasmid Species File. Catalog of Stick and Leaf Insects of the World, 2nd Edition. The Insect Diversity Association and the Academy of Natural Sciences, Philadelphia. CafePress.com, 414 pp.
- Redtenbacher J. 1906. Insektenfamilie der Phasmiden, I. Phasmidae Areolatae. Leipzig. pp. 1-180, pls. 1-6.
- Redtenbacher J. 1908. Die Insektenfamilie der Phasmiden. III. Phasmidae, Anareolatae (Phibalosomini, Acrophyllini, Necrosiini). Verlag W. Engelmann, Leipzig, pp. 341-589, pls. 16-27.
- Rehn J.A.G. 1904. Studies in the orthopterous family Phasmidae. *Proceedings Academy of Natural Sciences Philadelphia* 56: 38-107.

- Robinson M.H. 1969. The defensive behaviour of some orthopteroid insects from Panama. Transactions Royal Entomological Society, London 121: 281-303.
- Saussure H. de 1870-72. Études sur les insectes Orthoptères. Famille de Phasmides. In: Edwards, Mission Scientifique au Mexique et dans L'Amérique Centrale, Recherches Zoologiques. Partie 6, Études sur les Myriapodes et le Insectes. Paris.
- Shelford R. 1909. Family Phasmidae. In: Biologia Centrali-Americano. Insecta. Orthoptera, 2: 343-377, pls. 5-8.
- Stål C. 1875. Recensio Orthopterorum, 3. Revue critique des Orthoptères décrits par Linné, de Geer et Thunberg. P.A. Norstedt & Söner, Stockholm. 105 pp.
- Weidner H. 1966. Die Entomologischen Sammlungen des Zoologischen Staatsinstituts und Zoologischen Museums, Hamburg. Insecta III. Mitteilungen des Hamburger Zoologischen Museums und Institutes 63: 209-264.
- Westwood J.O. 1859. Catalogue of Orthopterous insects in the Collection of the British Museum. Part 1, Phasmidae. British Museum, London. 195 pp., 40 plates.
- Zompro O. 2000. Designation of type species of 13 Stick-Insect genera described by J. Redtenbacher (Insecta: Orthoptera: Phasmatodea). Annalen des Naturhistorischen Museums, Wien, 102B: 93-96.
- Zompro O. 2001. A generic revision of the insect order Phasmatodea: the New World genera of the stick insect subfamily Diapheromeridae: Diapheromerinae = Heteronemiidae: Heteronemiinae sensu Bradley & Galil, 1977. Revue Suisse de Zoologie 108: 129-255.
- Zompro O. 2002. Catalogue of type material of the insect order Phasmatodea at the Zoologisches Museum der Universität Hamburg (Insecta: Orthoptera: Phasmatodea). Mitteilungen aus dem Hamburger Zoologischen Museum und Institut 99: 179-201.
- Zompro O. 2004a. Revision of the genera of the Areolatae, including the status of *Timema* and *Agathemera* (Insecta, Phasmatodea). Abhandlungen des Naturwissenschaftlichen Vereins Hamburg, (NF) 37: 1-327.
- Zompro O. 2004b. A key to the stick-insect genera of the "Anareolatae" of the New World, with descriptions of several new taxa (Insecta: Phasmatodea). Studies on Neotropical Fauna and Environment, 39: 133-144.
- Zompro O. 2006. Katalog des Typen-Materials der Insektenordnung Phasmatodea im Staatlichen Museum für Naturkunde in Stuttgart. Arthropoda 13: 2-15.