

A new species of *Habralictus* Moure from Dominica, Lesser Antilles (Hymenoptera, Halictidae)

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Abstract

A new species of *Habralictus* Moure (Apoidea, Halictidae) is described from the island of Dominica, *Habralictus gonzalezi* **sp. n.** The species is distinguished from other West Indian *Habralictus* and a key is provided to the West Indian *Habralictus*. Brief comments on the genus *Habralictus* and bee species of Dominica are provided.

Keywords

Habralictus, Caenohalictini, Halictinae, Halictidae, Apoidea, taxonomy, Dominica, Lesser Antilles

Introduction

Habralictus Moure is a genus of small Neotropical bees known from southern Brazil north to the Jalisco province of Mexico (Michener 2007). *Habralictus* is known to form solitary and communal underground nests (Michener and Lange 1958; Michener et al. 1979). Twenty-four species have been described (Moure 2007; Smith-Pardo 2009) but more species undoubtedly occur on the mainland (Smith-Pardo 2009). Only two species have been reported from the Lesser Antilles, *H. claviventris* (Ashmead, 1900) from St. Vincent and the Grenadines and *H. insularis* Smith-Pardo (2009) from Grenada.

Habralictus belongs to the halictid tribe Caenohalictini (or Caenohalictina of Halictini *sensu lato*), which is composed mostly of large-bodied Neotropical genera

(Roberts and Brooks 1987; Michener 2007). *Habralictus* can be distinguished from other halictines by the following combination of characters: size small (4.0–6.5 mm), head and mesosoma bright iridescent green to blackish (usually with metallic tints), fore wing with strong distal veins (i.e. 1rs-m, 2r-sm), female metafemur with scopa, metasoma terga without apical or basal hair bands (females often with yellow maculations), posterior surface of propodeum not enclosed by carinae, inner metatibial spur pectinate (usually ciliate in males), dorsal surface of propodeum (including metapostnotum) with long horizontal portion, eyes bare or with short setae. Male *Habralictus* have metasoma petiolate.

Two subgenera of *Habralictus* have been recognised in the past, *Habralictus sensu stricto* and *Zikaniella* Moure (see Michener 2007). The latter seems to render the former paraphyletic (Gonçalves and Melo 2010) so *Zikaniella* should be considered a junior synonym (*Habralictus* has precedence; Michener 2007). *Habralictus insularis* was reported to have characteristics of both nominal subgenera (Smith-Pardo 2009), but this was apparently an error due to the application of female characters of *H. insularis* (i.e. the pectinate inner metatibial spur) to the subgeneric key, which is based solely on males (Michener 2007).

A new species of *Habralictus* is described from material collected in the Commonwealth of Dominica. This species is the most northern representative of *Habralictus* in the Lesser Antilles and only the fourth halictid bee known from Dominica (Crawford 1914; Eickwort and Stage 1972).

Methods

Descriptions are modified from a format used for other halictid bees (e.g. Gibbs 2010, 2011). Terminology for structures follows that of Engel (2001, 2009), and Michener (2007) and for sculpturing that of Harris (1979). The following abbreviations are used in the descriptions: upper ocular distance (UOD), lower ocular distance (LOD), and lateral ocellar diameter (OD; used as a relative measure for hair length). Flagellomeres and metasomal terga and sterna are referred to by “F”, “T”, and “S” followed by the appropriate number. Specimens examined were deposited at BBSL, Bee Biology and Systematics Laboratory, USDA-ARS, Utah State University, Logan, Utah, USA. Individual paratypes will be deposited at other major bee collections including the AMNH, American Museum of Natural History, New York, New York, USA; CUIC, Cornell University Insect Collection, Ithaca, New York, USA; National Museum of Natural History, Washington D.C., USA; PCYU, Packer Collection York University, Toronto, Ontario, Canada; and SEMC, Snow Entomological Museum, Lawrence, Kansas, USA.

Measurements were taken using an ocular micrometer in a Zeiss Stemi SV 6 microscope (Oberkochen, Germany) and by examining Figs 2, 3, 8 and 9 using Adobe Photoshop CS5 (Adobe Systems Inc.). Measurements of the head were taken in frontal view (as in Figs 2, 8). Head length was measured medially from the vertex to the distal

margin of the clypeus. Head width was measured from the outer margins of the compound eyes. UOD and LOD were taken to be the minimum distance between inner margins of the compound eyes, measured from above and below the eye emargination, respectively. The supraclypeal area was measured from the lower margin of the antennal sockets to the upper margin of the clypeus. The width of the mesosoma was measured between the outer margins of the pronotal lobes in dorsal view. The lengths of the mesoscutellum and dorsal propodeal surface were measured medially in dorsal view.

Systematics

Genus *Habralictus* Moure

Habralictus Moure 1941: 59. Type species: *Habralictus flavopictus* Moure 1941, by original designation.

Zikaniella Moure 1941: 57. Type species: *Zikaniella crassiceps* Moure 1941, by original designation and monotypy.

Habralictus gonzalezi sp. n.

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http://species-id.net/wiki/Habralictus_gonzalezi

Type material. *Holotype* ♀: DOMINICA: Parish of St. Joseph, Springfield Estate, 13.34667°N, 61.3683°W, 430 m, 15–20 Mar. 2003, (M. E. Irwin, M. Shepard), Malaise trap [BBSL]. *Allotype* ♂: topotypical [BBSL]. 10 *paratype* ♀♀: topotypical [AMNH, BBSL (5), CUCI, NMNH, PCYU, SEMC].

Diagnosis. Females of *Habralictus gonzalezi* can be distinguished from *H. insularis* by the following: face mostly green (mostly copper in *H. insularis*), clypeus with few punctures limited to medial area (numerous punctures throughout in *H. insularis*), supraclypeal area virtually impunctate (distinctly punctate in *H. insularis*), pronotal lobe dark brown (yellow-orange in *H. insularis*), and metatibial anterobasal hairs brown (off-white in *H. insularis*).

Males of *H. gonzalezi* can be distinguished from *H. insularis* and *H. claviventris* by the following: supraclypeal area and lower paraocular area imbricate, punctures obscure (smooth, distinctly punctate in *H. claviventris* and *H. insularis*); mesoscutum and mesoscutellum without evident punctuation (punctures present albeit fine in *H. claviventris* and *H. insularis*); head and mesosoma bluish-green (bright green in *H. claviventris* and *H. insularis*).

Description. *Female.* (Figs 1–7). Body length: 3.5–4.3 mm. Head length: 1.04–1.14 mm. Head width: 1.10–1.24 mm. Forewing length: 3.0–3.1 mm.

Structure. Head: Face wider than long (length/width ratio = 0.92–0.94). Eyes weakly convergent below (UOD:LOD = 1.03–1.07). Clypeus shorter than length of

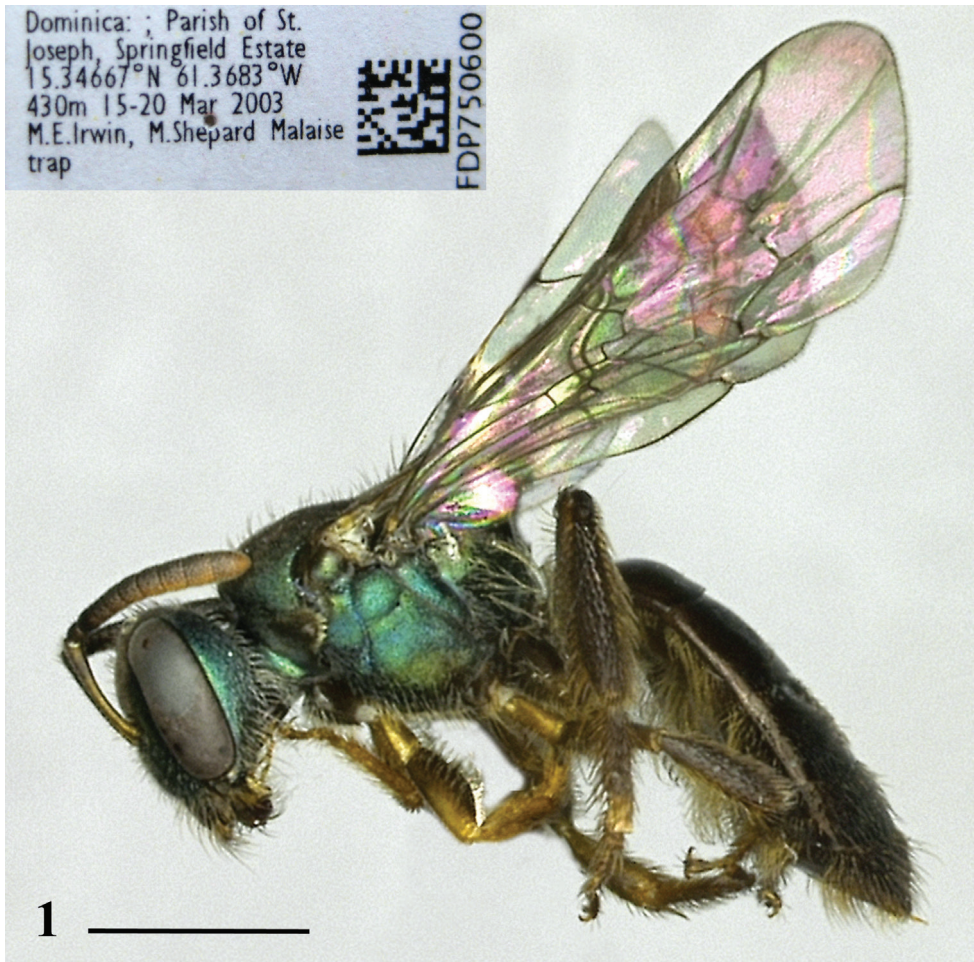
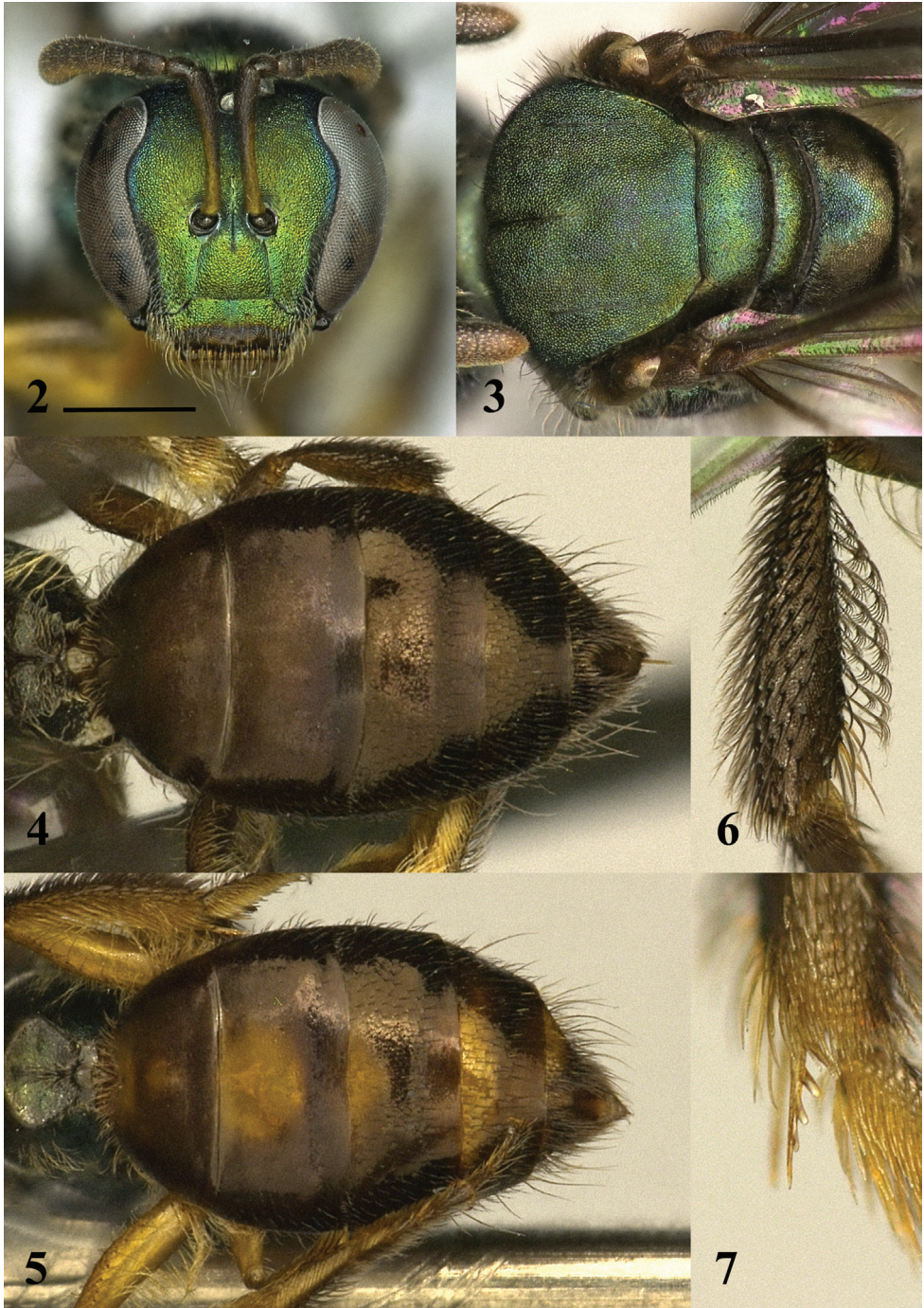


Figure 1. Holotype female of *Habralictus gonzalezi* sp. n. in lateral view with locality label (inset). Scale bar = 1 mm.

supraclypeal area (ratio = 1.06–1.13). Mandible with preapical tooth. Labrum without distinct basal elevation; apical process with dorsoapical keel. Scape slender, weakly clavate; extending above slightly above lateral ocelli. Pedicel subequal to F1 and F2 combined. F1 and F3 both shorter than F2. Flagellum clavate. Preoccipital area rounded. Gena narrower than eye. **Mesosoma:** Pronotum with dorsolateral ridge broadly rounded, interrupted by transverse sulcus; dorsolateral angle low, obtuse, indistinct. Mesoscutum subequal in width to head; anterior margin raised steeply above pronotum; parapsidal line fine, somewhat obscure. Mesoscutellum flat, without medial depression. Episternal groove below scrobe curving sharply and widening towards anterior. Lateral surface of procoxa concave. Inner metatibial spur pectinate with four branches (not including apex of rachis). Tegula ovoid, slightly narrowed anteriorly.



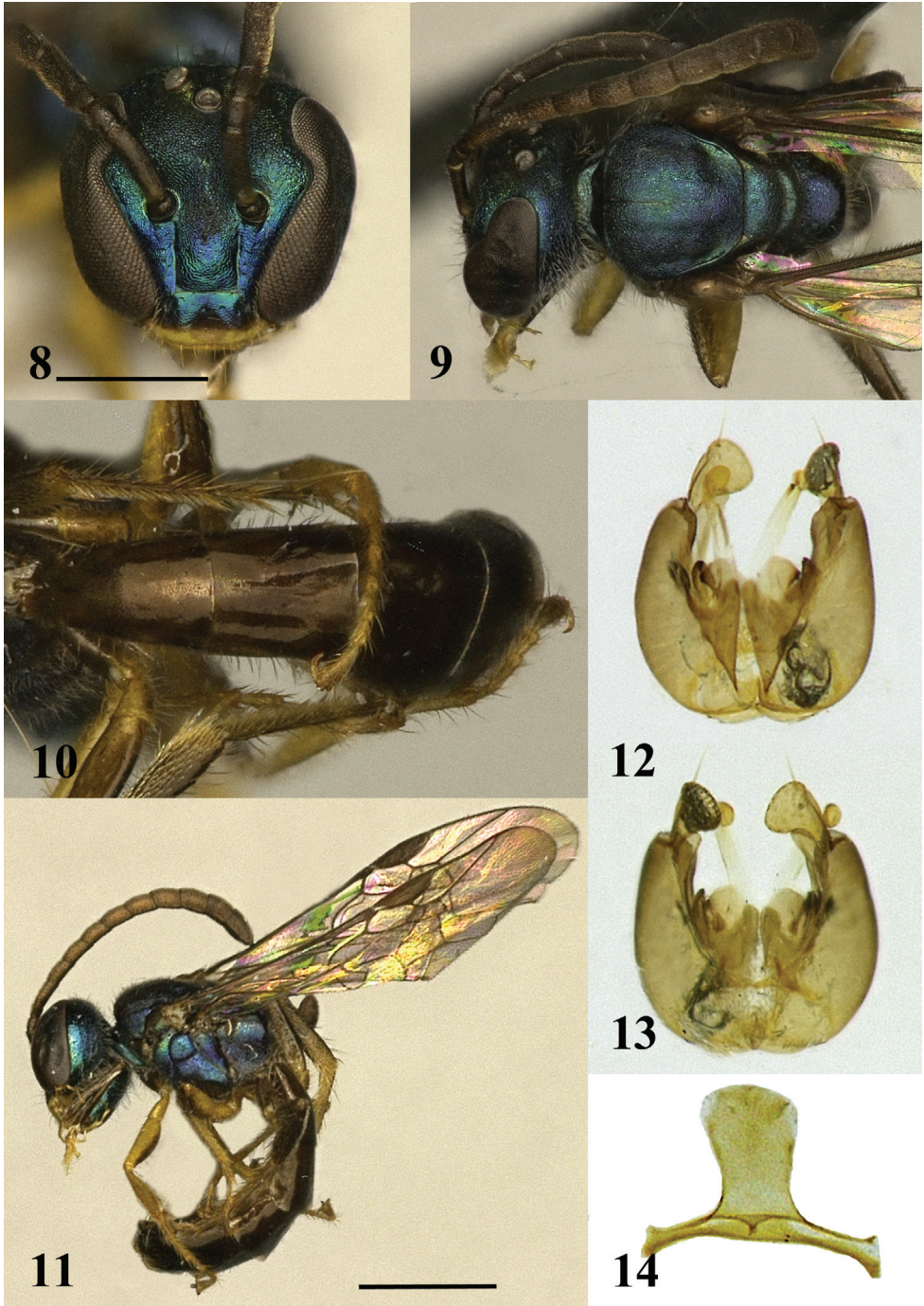
Figures 2–7. Female of *Habralictus gonzalezi* sp. n. **2** Face (holotype), scale bar = 0.5 mm **3** Dorsal view of mesosoma (holotype) **4** dorsal view of metasoma (holotype) **5** dorsal view of metasoma (paratype) **6** anterior view of metatibia (paratype) **7** inner metatibial spur (paratype).

Marginal cell narrow towards apex; free portion 3× length of portion subtended by submarginal cells. Distal hamuli arranged 2-1-2 (approaching 2–3). Dorsal surface of propodeum (including metapostnotum) longer than mesoscutellum (ratio = 1.07–1.09); posterior margin of dorsal surface rounded. Posterior surface of propodeum slightly concave; lateral carina fine, reaching two thirds distance to dorsal surface. **Metasoma:** Ovoid, flat; terga, especially T1–T3 with lateral portions sharply reflexed ventrally. Area beyond premarginal line weakly impressed.

Colour. Head: Mostly green; face with golden and coppery reflections. Labrum and lower half of clypeus dark brown. Mandible brownish yellow except apex red. Antenna dark brown, except lateral surface of scape dull yellow and ventral surface of flagellum orange-yellow. Vertex dark green-blue. **Mesosoma:** Dark green dorsally, lighter ventrally. Pronotal lobe dark brown. Ventral half of mesepisternum golden or brassy. Fore leg yellow, except profemur on dorsal half (sometimes) and ventrally. Mid leg dark brown, except protrochanter and posterior portion of probasitarsus yellowish, in some cases profemur yellow. Hind leg dark brown, except posterior (and sometimes anterior) surface infused with yellow, sometimes entire metatrochanter and metafemur yellow. Tegula light brown, translucent. Pterostigma dark brown. Wings hyaline with dark setae. Dorsal surface of propodeum brown except basomedial triangle of green. **Metasoma:** Terga brown, except sometimes with basomedial patches of yellow. Metasomal sterna light brown to yellow.

Pubescence. Head: Face with dull-white hairs (1–1.5 OD). Clypeus with long preapical fimbriae (2.5–3.5 OD). Gena with sparse, appressed hairs and long erect hairs (2.0–2.5 OD). **Mesosoma:** Pronotal lobe with tomentum on posterior margin. Mesoscutum and mesepisternum with sparse, off-white hairs (≤ 1.5 OD). Metanotum with long, erect hairs (2–3 OD). Mesofemur with sparse basal brush. Mesotibia with dense apical comb. Metafemoral scopa with long, plumose hairs. Metatibia with brown, plumose hairs (off white on posterior surface); basoventral hairs densely pectinate (almost palmate), directed apically. Metabasitarsus with brown hairs on anterior surface. Lateral surface of propodeum with long, sparsely-branched, plumose hairs (2.5–3.5 OD). Posterior surface of propodeum with short, appressed hairs. **Metasoma:** Terga sparsely pubescent; anterior surface of T1 with sparse, erect hairs (1–1.5 OD). Dorsal surface of T1 and T2 largely bare. Dorsal surface of T3–T5 with posteriorly directed hairs (1–2.5 OD), longer on T5 and laterally portions of (up to 3.5 OD). Ventrally reflexed portions of metasomal terga and metasomal sterna with long, sparsely-branched, plumose hairs (3.5–5.5 OD). Ventral hairs of T1–T2 directed medially.

Surface sculpture. Head: Face granular. Clypeus with sparse, coarse punctures. Gena and postgena imbricate, shining. **Mesosoma:** Granular. Dorsal surface of propodeum (including metapostnotum) without raised sculpturing, posterior half smoother, imbricate. Lateral surface of propodeum imbricate, shining. Posterior surface of propodeum imbricate. **Metasoma:** Terga with punctation fine; dorsal surface of T1 and T2 impunctate, except along premarginal line. T1 and T2 dull, finely coriarius, apical impressed area of T2 and remaining tergal segments smooth, shiny.



Figures 8–14. Allotype male of *Habralictus gonzalezi* sp. n. **8** Face, scale bar = 0.5 mm **9** Dorsal view of mesosoma **10** Dorsal view of metasoma **11** Lateral habitus, scale bar = 1 mm **12** Dorsal view of genital capsule **13** Ventral view of genital capsule **14** S7 and S8.

Male. (Figs 8–14) As in female except as follows. Body length: 4.3 mm. Head length: 1.00 mm. Head width: 0.96 mm. Forewing length: 3.2 mm.

Structure. Head: Face longer than wide (length/width ratio = 1.04). Eyes strongly convergent below (UOD:LOD = 1.72). Eye emargination more acute. Clypeus weakly depressed medially. Mandible without preapical tooth. Labrum wider than long, without apical process. Supraclypeal area longer than clypeus (ratio = 1.18). Scape slender, extending to just below median ocellus. Pedicel subequal to F1. F2 and F3 subequal both about 2× length of F1. Flagellum clavate, extending beyond posterior edge of mesosoma. **Mesosoma:** Subequal in width to head (ratio = 1.02). Inner metatibial spur ciliate. Dorsal surface of propodeum (including metapostnotum) longer than mesoscutellum (ratio = 1.1). Lateral carina of propodeum fine, reaching half way to dorsal surface. **Metasoma:** Petiolate, T1 and T2 distinctly longer than wide. Metasomal terga with lateral portions weakly reflexed ventrally. Terminalia as illustrated (Figs 12–14).

Colour. Head: Mostly blue-green. Labrum, mandible, and lower margin of clypeus yellow. Antenna dark brown, except ventral surface of flagellum orange-brown. Ocellar area pale green. **Mesosoma:** Blue-green, with pale green and purple reflections. Pronotal lobe brown. Fore leg yellow, except ventral surface of profemur brown with slight hint of metallic. Mid leg yellow, except anterior surface of mesofemur, mesotibia, and mesotarsus. Hind leg light brown, infused with yellow, except metatrochanter yellow. Dorsal surface of propodeum purplish. **Metasoma:** Brown, paler ventrally.

Pubescence. Head: Clypeus with sparse, preapical fimbriae (2.5–3.5 OD). Gena with long erect hairs (2.5–3.5 OD). **Mesosoma:** Posterior surface of propodeum without short, appressed hairs. **Metasoma:** Terga sparsely pubescent; anterior surface of T1 with sparse, erect hairs (1–1.5 OD). Dorsal surface of T1 and T2 largely bare. Dorsal surface of T3–T5 with posteriorly directed hairs (1–2.5 OD), longer on T5 and laterally portions of (up to 3.5 OD). Ventrally reflexed portions of metasomal terga and metasomal sterna with long, sparsely-branched, plumose hairs (3.5–5.5 OD). Ventral hairs of T1–T2 directed medially.

Surface sculpture. Head: Face granular. Clypeus with sparse, coarse punctures. Gena and postgena imbricate, shining. **Mesosoma:** Granular. Dorsal surface of propodeum (including metapostnotum) without raised sculpturing, posterior half smoother, imbricate. Lateral surface of propodeum imbricate, shining. Posterior surface of propodeum imbricate. **Metasoma:** Terga with punctation extremely fine, sparse; dorsal surface of T1 and T2 impunctate, except along premarginal line. T1 and T3 finely coriarius basally, apical impressed areas smooth, shiny.

Etymology. The specific epithet is named for Victor H. González-Betancourt for his contributions to bee taxonomy and his encouragement and assistance with this manuscript.

Key to species of *Habralictus* in the Lesser Antilles

- 1 Antenna clavate, flagellomeres 11; metasoma petiolate, terga 7; (males)2
- Antenna not clavate, flagellomeres 10; metasoma ovoid, terga 6; (females) ...4

- 2 Supraclypeal area and lower paraocular area dull due to imbricate microsculpture, punctures obscure to absent (Dominica) *Habralictus gonzalezi* sp. n.
- Supraclypeal area and lower paraocular area polished due to lack of microsculpture, punctures sparse but distinct..... **3**
- 3 Profemur yellow ventrally; clypeal maculation nearly 1/2 clypeal length (Grenada) *Habralictus insularis*
- Profemur testaceous-brown ventrally with hint of metallic; clypeal maculation 1/3 clypeal length (St. Vincent and the Grenadines)
..... *Habralictus claviventris* (female unknown)
- 4 Clypeal punctures few, absent laterally; pronotal lobe brown; metatibia anterobasal hairs brown (Dominica) *Habralictus gonzalezi* sp. n.
- Clypeal punctures numerous, present laterally; pronotal lobe yellow; metatibia anterobasal hairs off-white (Grenada) *Habralictus insularis*

Discussion

The genus *Habralictus* is in need of taxonomic revision. *Habralictus gonzalezi* is only the 25th described species in the genus (Table 1) but more undoubtedly remain to be described (Smith-Pardo 2009). The three species of *Habralictus* known from the Lesser Antilles are presumably derived from the South American species. Although, *Habralictus* is known to be distributed widely through the Neotropics no described species has been recorded from Venezuela, which is the closest area of the mainland (but see Ascher and Pickering 2011). The presence of *Habralictus* on Grenada, St. Vincent and the Grenadines, and Dominica makes it highly probable that the genus occurs on other islands in the Lesser Antilles, especially the islands St. Lucia and Martinique, which lie between Dominica and St. Vincent and the Grenadines.

Table 1. Checklist of world species of *Habralictus* Moure with known geographic distribution

Name	Author	Distribution
<i>H. agraptus</i>	(Vachal 1904)	Bolivia, Peru
<i>H. banghaasi</i>	(Schrottky 1910)	Bolivia
<i>H. beatissimus</i>	(Cockerell 1901)	Brazil (Mato Grosso)
<i>H. bimaculatus</i> ¹	Michener 1979	Colombia (Valle del Cauca)
<i>H. callichroma</i>	(Cockerell 1901)	Brazil (Mato Grosso)
<i>H. canaliculatus</i> ²	Moure 1941	Brazil (Paraná, Rio de Janeiro)
<i>H. chlorobaptus</i>	Moure 1941	Brazil (Goiás)
<i>H. claviventris</i>	(Ashmead 1900)	St. Vincent and the Grenadines
<i>H. crassiceps</i> ³	(Moure 1941)	Brazil (Rio de Janeiro)
<i>H. ephelix</i>	(Vachal 1904)	Bolivia, Peru
<i>H. flavopictus</i> ⁴	Moure 1941	Brazil (São Paulo)
<i>H. grammodes</i>	(Vachal 1904)	Peru (Lima)
<i>H. gonzalezi</i>	Gibbs sp. n.	Dominica

Name	Author	Distribution
<i>H. insularis</i>	Smith-Pardo 2009	Grenada
<i>H. ligeus</i>	(Schrottky 1911)	Bolivia
<i>H. macrospilophorus</i>	Moure 1941	Brazil (Rio de Janeiro)
<i>H. manto</i>	(Schrottky 1911)	Bolivia (La Paz)
<i>H. mapiriensis</i>	(Schrottky 1910)	Bolivia
<i>H. metallicus</i>	(Friese 1916)	Costa Rica (San José)
<i>H. orites</i>	Moure 1941	Brazil (Rio de Janeiro)
<i>H. phacodes</i>	(Vachal 1904)	Bolivia, Peru
<i>H. tradux</i>	(Vachal 1904)	Mexico (Chiapas, Jalisco)
<i>H. trinax</i> ⁵	(Vachal 1904)	Bolivia, Peru
<i>H. xanthinus</i>	(Cockerell 1918)	Panama (Coclé, Panamá)
<i>H. xanthogastris</i>	(Vachal 1911)	Colombia (Cundinamarca)

1. Nesting biology and sociality (Michener et al. 1979)
2. Nesting biology (Michener and Lange 1958)
3. Sole member of sometimes recognised subgenus *Zikaniella*
4. Type species of *Habralictus*
5. Senior synonym of *Augochlora maculiventris* Crawford, 1913

Habralictus gonzalezi is only the 18th described species of bee recorded from the island of Dominica (Table 2). The bee fauna as currently known was almost entirely described by Crawford (1914; see also Moure et al. 2007; Table 2). Nearly twice as many species (31) are known from both St. Vincent and the Grenadines to the south and Puerto Rico to the North (Moure et al. 2007; Genaro and Franz 2008; Ascher and Pickering 2011). Other islands in the Lesser Antilles have even fewer recorded species than Dominica. This includes Grenada which lies between St. Vincent and the Grenadines and mainland South America. It is likely that many more species of bees occur on these islands, particularly in the halictid fauna, for which several new Caribbean species have been described in recent years (Engel 2001, 2011a, 2011b; Genaro 2001). Two species of *Lasioglossum* (*Dialictus*) and one species of *Sphcodes* have also been examined from Dominica but description of these (if appropriate) will be done after a more thorough study of the West Indian species has been completed.

Table 2. Checklist of bee species recorded from the island of Dominica.

Family	Species	Author
APIDAE	<i>Anthophora footi</i>	Crawford 1914
	<i>Apis mellifera</i> ¹	Linnaeus 1758
	<i>Centris versicolor</i>	(Fabricius 1775)
	<i>Exomalopsis similis</i>	Cresson 1865
	<i>Melipona variegatipes</i>	Gribodo 1893
	<i>Melissodes rufodentata</i>	Smith 1854
	<i>Melissodes trifasciata</i>	Cresson 1878
	<i>Mesoplia azurea</i> ²	(Lepeletier and Audinet-Serville 1825)
	<i>Xylocopa caribea</i>	Lepeletier 1841
	<i>Xylocopa transitoria</i>	Pérez 1901

Family	Species	Author
HALICTIDAE	<i>Augochlora ignifera</i>	Crawford 1914
	<i>Habralictus gonzalezi</i>	Gibbs sp. n.
	<i>Lasioglossum punctifrons</i>	(Crawford 1914)
	<i>Lasioglossum</i> spp.	
	<i>Microsphecodes dominicanus</i> ²	Stage 1972
	<i>Sphécodes</i> sp. ²	
MEGACHILIDAE	<i>Coelioxys abdominalis</i> ²	Guérin-Méneville 1844
	<i>Megachile concinna</i> ¹	Smith 1879
	<i>Megachile luctifera</i>	Spinola 1841
	<i>Megachile multidentis</i> ^{1,3}	Fox 1891

1. Exotic

2. Cleptoparasite

3. Possible junior synonym of *Megachile concinna* (see Genaro and Franz 2008).

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Description of a new species of the leafhopper genus *Zyginella* Löw from Southwest China (Hemiptera, Cicadellidae, Typhlocybinæ)

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Abstract

A new species, *Zyginella menghaiensis* sp. n. (Hemiptera: Cicadellidae: Typhlocybinæ: Zyginellini), is described from China and a key to species of *Zyginella* from China is provided.

Keywords

Morphology, taxonomy

Introduction

The leafhopper genus *Zyginella* was established by Löw in 1885. The genus belongs in the tribe Zyginellini of Typhlocybinæ and consists of twenty-two species distributed in the Oriental, Palaearctic and Afrotropical Regions. Members of the genus can be distinguished by the distinct dark spot on the 3rd apical cell of the forewing (Fig. 3) and in the male genitalia by the male pygofer with short ventral caudal process and long macrosetae on the posterodorsal margin (Fig. 5) and style elongate, slender throughout length with truncate base (Fig. 7).

Recent taxonomic work on the genus includes Dworakowska (1969, 1970, 1974, 1977), Chiang, Lee and Knight (1988) and Zhang (1990); up to now, eight species of *Zyginella* have been recorded from China in these studies. In the current work, a new species from Yunnan Province, China is described and illustrated and a key to Chinese species of *Zyginella* is given. All specimens examined are deposited to the collection of the Institute of Entomology, Guizhou University, Guiyang, China (GUGC).

Taxonomy

Zyginella Löw

<http://species-id.net/wiki/Zyginella>

Zyginella Löw, 1885: 346; Dworakowska 1969: 433, 1970: 707, 1974: 161, 1977: 24; Chiang et al. 1988: 109; Zhang 1990: 170. Type species: *Zyginella pulchra* Löw, 1885.

Pyramidotettix Matsumura, 1932: 59; Dworakowska 1970: 707; Chiang et al. 1988: 109; Yang 1965: 197. Type species: *Conometopius citri* Matsumura, 1907. Synonymized by Dworakowska 1970: 707.

Remmia Vilbaste, 1968: 91; Dworakowska 1970: 707; Chiang et al. 1988: 109. Type species: *Remmia orbiger* Vilbaste, 1968. Synonymized by Dworakowska 1970: 707.

Description. Forewing (Fig. 3) with distinct dark spot on 3rd apical cell.

Head (Fig. 1) acutely produced medially, about as wide as greatest width of pronotum; coronal suture prominent. Forewing (Fig. 3) with 1st apical cell short. Hind wing (Fig. 11) with submarginal vein confluent with Cu_1 markedly distad of point of fusion of Cu_1 with M_{3+4} .

Male pygofer (Fig. 5) with short process on lateroventral margin and numerous long macrosetae on posterodorsal surface. Subgenital plate usually forming a pocket-like structure at tip or tapering towards apex (Fig. 6). Style (Fig. 7) broadened and truncate at base. Aedeagal shaft (Figs 8, 9) usually curved dorsally; preatrium long or short; dorsal apodeme narrow. Connective (Fig. 10) V- or Y-shaped; lateral arms long; central lobe absent.

Distribution. Oriental region, Palaearctic region, Afrotropical region.

Key to Chinese species of the genus *Zyginella* (males only couplets 5–7)

- | | | |
|---|---|-----------------------------|
| 1 | Vertex with black stripe between eyes subapically (Fig. 12) | 2 |
| – | Vertex without black stripe between eyes subapically (Fig. 1) | 4 |
| 2 | Pronotum with two black transverse stripes | <i>Z. citri</i> (Matsumura) |
| – | Pronotum without black transverse stripes | 3 |
| 3 | Vertex and pronotum with pair of dark spots respectively | <i>Z. mali</i> (Yang) |
| – | Vertex and pronotum without spots | <i>Z. minuta</i> (Yang) |

4	Forewings without a large rhombus-like patch along inner margin subbasally (Fig. 3).....	5
–	Forewings with a large rhombus-like patch along inner margin subbasally (Figs 12, 13)	7
5	Aedeagus preatrium well developed, about as long as length of aedeagal shaft (Figs 8, 9)	6
–	Aedeagus preatrium vestigial.....	<i>Z. orla</i> Dworakowska
6	Aedeagal shaft with a single short dorsal process subapically (Figs 8, 9).....	<i>Z. menghaiensis</i> sp. n.
–	Aedeagal shaft without a single short dorsal processes subapically	<i>Z. tsauri</i> Chiang, Hsu & Knight
7	Pygofer lobe with a hook-like process caudo-dorsally.....	<i>Z. punctata</i> Zhang
–	Pygofer lobe without hook-like process caudo-dorsally	<i>Z. taiwana</i> Chiang, Lee & Knight

***Zyginella menghaiensis* Song & Li, sp. n.**

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http://species-id.net/wiki/Zyginella_menghaiensis

Figures 1–11

Description. Head and thorax yellowish brown; vertex with lateral margins with soft red tinge; eyes brownish grey; pronotum brownish with two longitudinal darker stripes; scutellum with basal triangles testaceous. Forewing (Fig. 3) reddish brown near base, dark red between 4th apical cell and brochosome-field and light brown around apex; 3rd apical cell with a blackish brown spot.

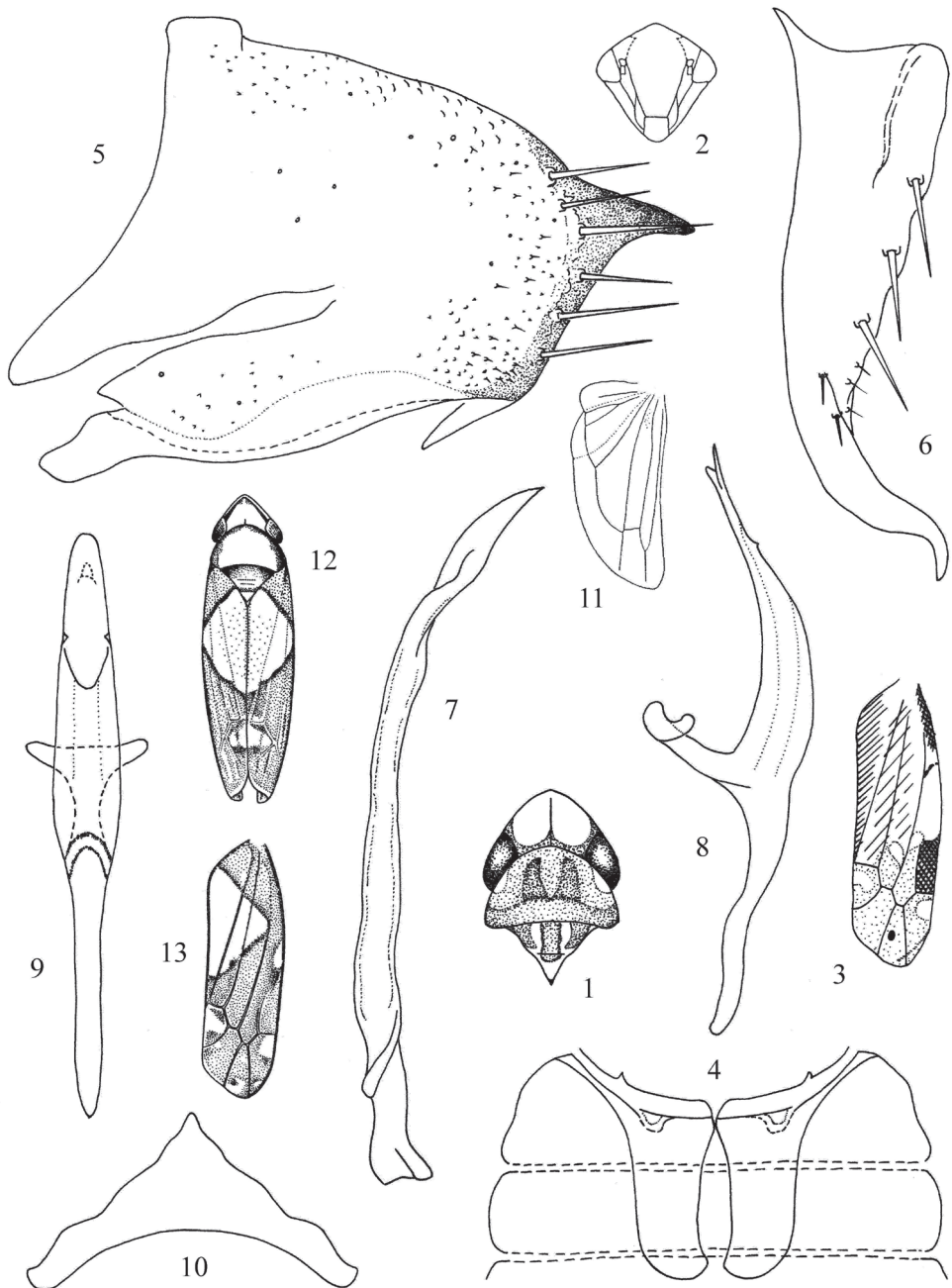
Coronal suture (Fig. 1) extending nearly to anterior margin of vertex. Forewing (Fig. 3) with 3rd apical cell not petiolate at base.

Abdominal apodemes (Fig. 4) slender, slightly extended beyond 4th sternite.

Pygofer lobe (Fig. 5) broad, with a large sclerotized process near dorsal margin and another process arising from about ventro-caudal margin; six long macrosetae distributed along caudal margin and numerous short microsetae scattered on lateral surface. Subgenital plate (Fig. 6) long, gradually tapered towards apex and curved apically, beak-like; with three long macrosetae along upper margin. Style (Fig. 7) elongate, slender throughout length with truncate base. Aedeagal shaft (Figs 8, 9) curved dorsad in lateral view with single small dorsal process subapically; gonopore large, apical on ventral surface with small tooth on each lateral margin; preatrium long, about as long as aedeagal shaft; dorsal apodeme narrow. Connective (Fig. 10) Y-shaped with very short stem and long strongly divergent lateral arms; central lobe absent.

Measurement. Body length males 2.9–3.1 mm.

Type material. *Holotype*, male, China: Yunnan Province, Menghai County, 23 July 2008, coll. YUE-HUA SONG. *Paratypes*: two males, same date as holotype.



Figures 1–13. *Zygynella* species 1–11 *Zygynella menghaiensis* sp. n. 1 Head and thorax, dorsal view 2 Face 3 Forewing 4 Abdominal apodemes 5 Pygofer lobe, lateral view 6 Subgenital plate 7 Style 8 Aedeagus, lateral view 9 Aedeagus, ventral view 10 Connective 11 Hindwing 12–13 *Zygynella minuta* (after Yang, 1965) 12 Adult, dorsal view 13 Forewing.

Remarks. The new species is similar to *Z. tsauri* Chiang, Hsu and Knight (1989), but the forewing has a large dark costal patch (Fig. 3) and the aedeagus has a single short dorsal process subapically and a small tooth on each lateral margin of the gonopore (Figs 8, 9).

Etymology. The new species is named for its type locality: Menghai.

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A new genus of oak gallwasp, *Coffeikokkos* Pujade-Villar & Melika, gen. n., with a description of a new species from Costa Rica (Hymenoptera, Cynipidae)

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Abstract

A new genus of oak gallwasp, *Coffeikokkos* Pujade-Villar & Melika, **gen. n.**, is described from Costa Rica. Diagnostic characters and generic limits of the new genus are discussed in detail. The new genus includes *Coffeikokkos copeyensis* Pujade-Villar & Melika, **sp. n.**, which induces galls on stems of *Quercus bumelioides*, an endemic oak to Costa Rica, Honduras and Panama. The new species and galls are described and illustrated.

Keywords

Cynipini, *Coffeikokkos*, Neotropical Region, *Quercus bumelioides*, taxonomy, morphology, distribution, biology.

Introduction

Nineteen species of oaks are listed for Costa Rica (Govaerts and Frodin 1998), which appear to support quite a high species richness of oak gallwasps (Hymenoptera, Cynipidae, Cynipini). There are probably more than 30 species present in the country (Pujade-Villar and Hanson 2006), but only three species, *Odontocynips hansonii* Pujade-Villar, *Andricus costaricensis* Pujade-Villar & Melika, and *Disbolicaspis costaricensis* Melika & Pujade-Villar have been described thus far (Pujade-Villar 2009; Melika et al. 2009, 2011). The new Cynipini genus and the new species described here, represent the fourth known species and the fourth known genus from Costa Rica.

Coffeikokkos gen. n., closely resembles the genus *Cynips* L.; however, the number of antennal flagellomeres, the shape of the ventral spine of the hypopygium (among other characters), the shape and structure of the gall, differ between these two genera.

Material and methods

Adult gallwasps were reared from galls collected on *Quercus bumelioides* Liebm. (= *Q. copeyensis* C.H.Mull.) by Paul Hanson (details below).

We follow the current terminology for morphological structures in Liljeblad and Ronquist (1998) and Melika (2006). Abbreviations for fore wing venation follow Ronquist and Nordlander (1989), and cuticular surface terminology follows that of Harris (1979). Measurements and abbreviations used here include: F1-F15, 1st and subsequent flagellomeres; POL (post-ocellar distance) is the distance between the inner margins of the posterior ocelli; OOL (ocellar-ocular distance) is the distance from the outer edge of a posterior ocellus to the inner margin of the compound eye; LOL, the distance between lateral and frontal ocelli. The width of the forewing radial cell is measured from the margin of the wing to the Rs vein.

The SEM photographs were taken with a Stereoscan Leica-360 by Palmira Ros-Farré (Universitat de Barcelona) at a low voltage (700V) and without coating, in order to preserve the specimens. Pictures of the adult wasp habitus and wings were taken by a digital camera Canon PowerShot SX210 15 by Juli Pujade-Villar. Gall images were taken by Kenji Nishida. The images will be available from the “morphbank.com” databank.

The type material is deposited in the following institutions:

- UB** Universitat de Barcelona, Spain (J. Pujade-Villar);
- PDL** Pest Diagnostic Laboratory (the former Systematic Parasitoid Laboratory, SPL), Tanakajd, Hungary (G. Melika);
- MZUCR** Museo de Zoología, Universidad de Costa Rica (P. Hanson).

Hymenopteran parasitoids reared from the galls are deposited in MZUCR.

Results

Coffeikokkos Pujade-Villar & Melika, gen. n.

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<http://species-id.net/wiki/Coffeikokkos>

Type species. *Coffeikokkos copeyensis* Pujade-Villar & Melika, sp. n., by present designation.

Diagnosis. *Coffeikokkos* is the only known genus of Cynipini with 14–15 antennal flagellomeres in females (in some paratypes the suture between F14 and F15 is weakly indicated, but in one female it is absent and the antennae therefore has 14 distinctly visible flagellomeres). Adults of *Coffeikokkos* most closely resemble the parthenogenetic forms of *Cynips* Linnaeus species in the morphology and surface sculpture of the head, mesosoma and the shape of the ventral spine of the hypopygium. Among all known *Cynips* species, the western Palaearctic *Cy. korsakovi* Belizin most closely resembles *Co. copeyensis*: this is the only *Cynips* species which has the mesoscutum without dense setae (present only along notauli) and the sides of the ventral spine of the hypopygium parallel, not broadened at the apex. In *Coffeikokkos* the antennae have 14–15 flagellomeres; the clypeus is small, rounded, not emarginate ventrally; the tarsal claws are simple, with a rounded basal lobe; the lateral propodeal carinae are incomplete, not reaching the nucha, subparallel in the anterior half and strongly curved outwards in the posterior half of the propodeum; the ventral impressed area is higher than the height of the metascutellum; and the 2nd metasomal tergite has very few white setae anterolaterally. In the asexual females of *Cynips* species (and particularly in *Cy. korsakovi*), the antennae have 12 flagellomeres; the tarsal claws have a narrow, acute basal lobe; the clypeus is widely emarginate ventrally and overhanging the mandibles; the lateral propodeal carinae are complete, reaching the nucha, nearly subparallel, slightly curved outwards in the middle; the ventral impressed area is 2.0 times shorter than the height of the metascutellum; the 2nd metasomal tergite has numerous white setae anterolaterally. Galls of all known *Cynips* species are located mostly on the underside of leaves, while in *Coffeikokkos* they are located on stems.

Description. Asexual female with robust and glabrous body. Head broadened behind eye in anterior view, malar sulcus absent. Antenna with 14–15 flagellomeres. Mesoscutum smooth and shiny, notauli deep, complete, reaching pronotum. Mesoscutellum dull rugose with transverse depression anteriorly, scutellar foveae present but always indistinctly delimited posteriorly (in some paratypes foveae separated by weak median carina). Propodeum with incomplete lateral propodeal carinae, subparallel in anterior half and strongly divergent posteriorly. Tarsal claws simple with broad and rounded basal part. Metasoma without punctures, shiny; 2nd metasomal tergite with sparse white setae laterally. Projecting part of ventral spine of hypopygium broad, longer than wide, rounded apically, with long dense subapical setae forming tuft directed backwards and reaching beyond apex of spine.

Etymology. The name reflects the shape and the colour of the growing galls which are similar to the shape of a coffee berry and the Greek *kokkos* (κόκκος) means “berry”.

Gender. Masculine.

***Coffeikokkos copeyensis* Pujade-Villar & Melika, sp. n.**

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http://species-id.net/wiki/Coffeikokkos_copeyensis

Type material. HOLOTYPE female (deposited in the collection J.P-V, UB): "COSTA RICA, San José, Cerro de la Muerte, Est. Biol. Cuericí, 2600 m, ix-1997, P. Hanson" (white label), *Quercus copeyensis*, red detachable stem gall" (white label), "HOLOTYPE *Coffeikokkos copeyensis* agam ♀ n. gen & n. sp. design. J.P-V 2011" (red label). PARATYPES (12♀): 6♀ with the same data as the holotype (3♀ UB, 2♀ PDL, 1♀ MZUCR); 2♀: "COSTA RICA San José Prov., Parque Nacional Chirripó, Llano Bonito, 2600 m, 09°27'16"N 83°32'41"W, (10.VII.2010) late ix-x-2010, *Q. copeyensis*, Red berry gall" (1♀ UB, 1♀ MZUCR); 3♀: COSTA RICA, Cartago, 4 Km NE Canón Genesis II, 2300m, i.1995, P. Hanson", "*Quercus copeyensis*, red detachable stem gall" (2♀ PDL, 1♀ MZUCR); 1♀: "COSTA RICA San José, Cerro Muerte, 6 Km N San Gerardo, 2800m, xii.1992, Hanson & Godoy (MZUCR).

Diagnosis. Head with piliferous punctures; antennae 16–17 segmented with F1 longer than F2; the body smooth and shiny; notauli complete, deep; propodeal carinae incomplete, not reaching the nucha; the prominent part of the ventral spine of the hypopygium longer than broad, with parallel sides for the entire length, rounded distally, with a tuft of long subapical setae.

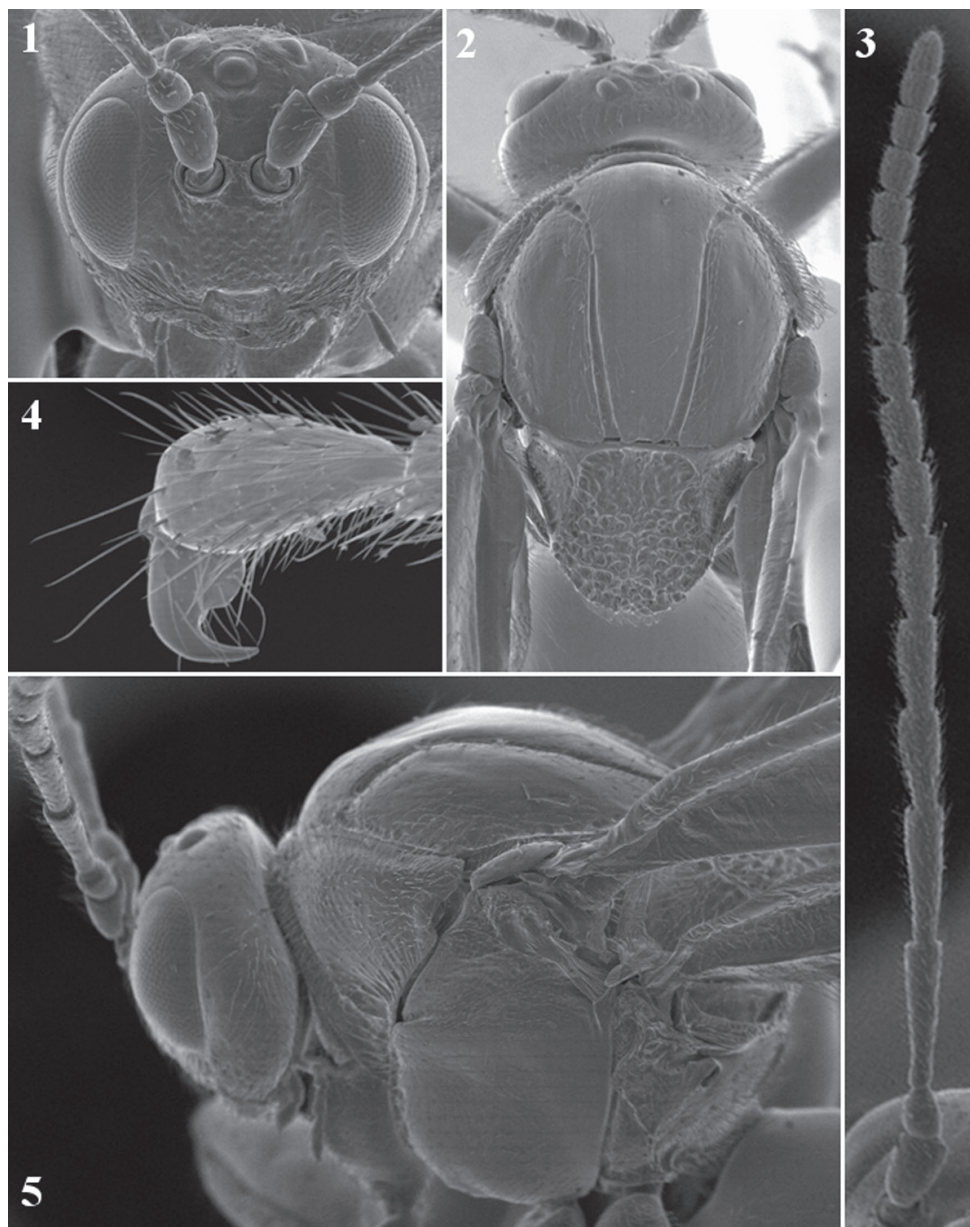
Description. (Figs 1–13). Asexual form.

Length. Female 4.1–5.1 mm (n = 12).

Coloration. (Fig. 13). Body predominantly uniformly brown; following areas dark brown to black: postocciput, postgena and postgenal bridge; propleura and anterior rim of pronotum; mesonotum ventrally, mesoscutellum, subaxillular bar, metascutellum with ventral impressed area, metanotum, metanotal trough, propodeum and nucha. Scape and pedicel always brown, flagellomeres from brown to black. Coxae and femora yellowish white, tibiae and tarsi dark brown to black. 2nd metasomal tergite always brown, subsequent tergites brown, in some paratypes lighter. Forewing with smoky areas; veins dark brown.

Head. (Figs 1–2, 5). Narrower than mesosoma, with white sparse setae. Head ovate, 1.3–1.4 times as broad as high in anterior view and 3.7–3.8 times as broad as long in dorsal view; gena slightly broadened behind eye, smooth and shiny, punctured basally; malar space without sulcus, 0.25 times as long as eye height, with striae radiating from clypeus and nearly reaching eye margin. Lower face shiny, with deep punctures, without elevated area medially. Clypeus impressed, setose, alutaceous, rounded and slightly emarginate ventrally, medially not incised, anterior tentorial pits small, indistinct; epistomal sulcus and clypeo-pleurostomal line distinct, broad, impressed. POL:OOL:LOL=8:4:3, diameter of lateral ocellus equal OOL; frons smooth and shiny. Vertex and occiput coriaceous, with piliferous points.

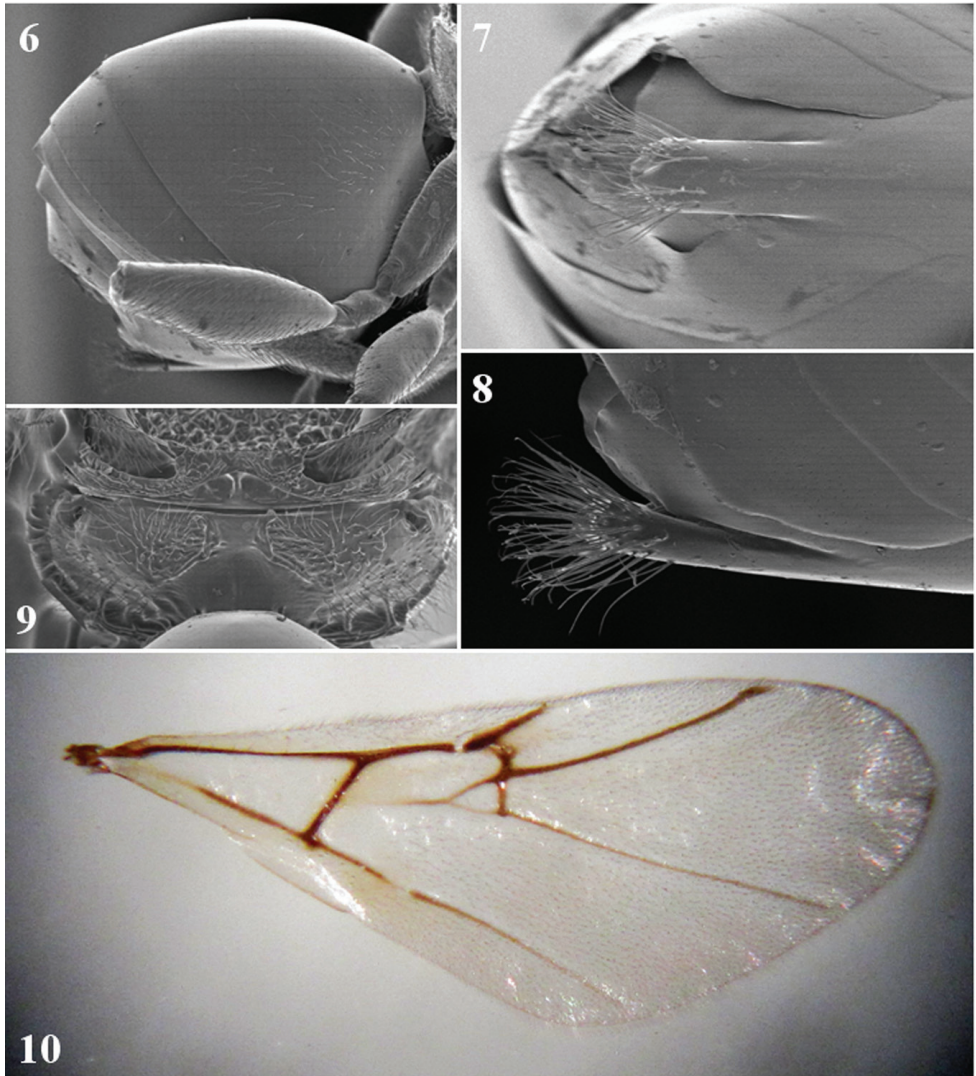
Antenna. (Fig. 3). 15 flagellomeres (rarely 14); F1 longer than F2, broader distally; subsequent flagellomeres progressively shorter, F15 longer than F14. Antennal



Figures 1–5. *Coffeikokkos copeyensis*, asexual female **1** head (anterior view) **2** head and mesosoma (dorsal view) **3** antenna **4** hind tarsal claw **5** head and mesosoma (lateral view).

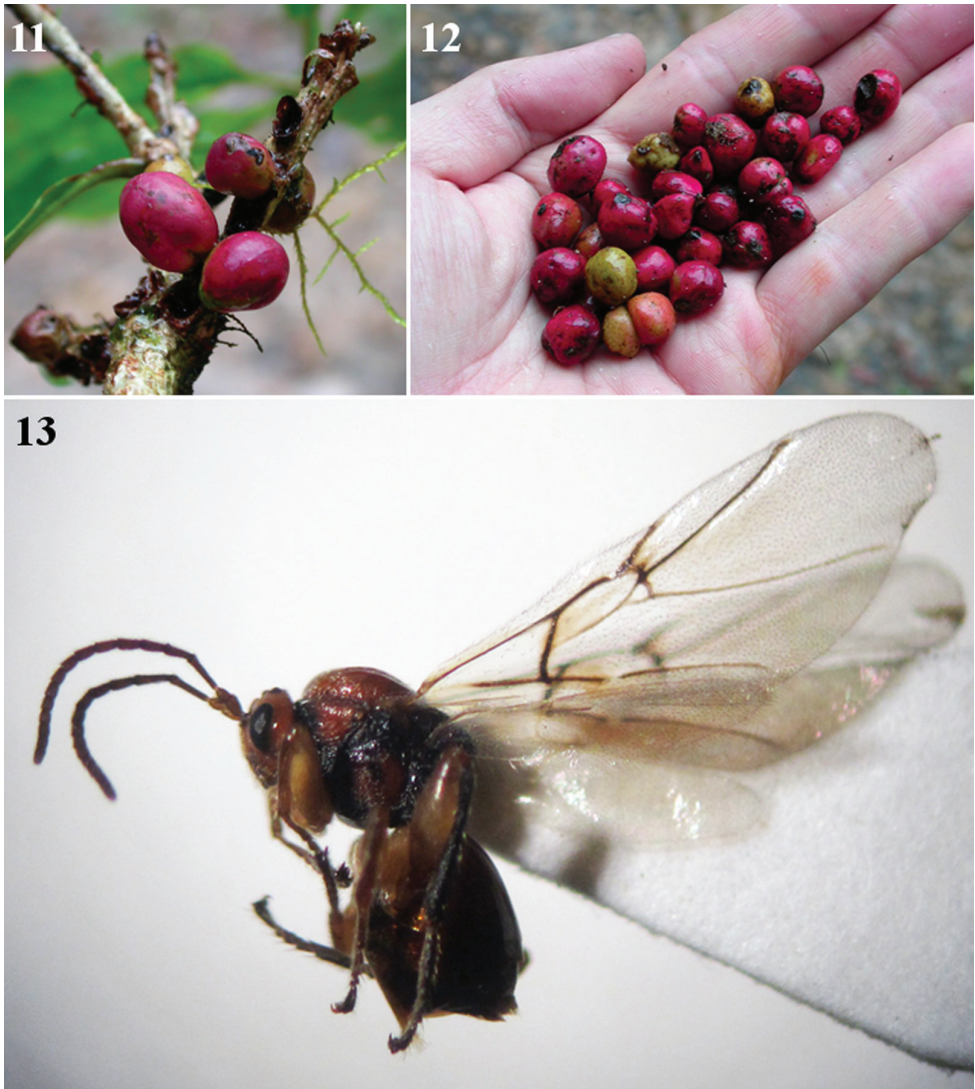
formula: 6: 3.5(×2.5): 13(×2.5): 10(×3): 8: 7: 6.5: 5.5: 5: 4.5: 4: 4: 3: 3: 3: 3: 4.5.
Placodeal sensilla on F3–F15.

Mesosoma. (Figs 2, 5, 9). Longer than high, dorsally concave in lateral view. Pronotum setose, with coriaceous sides and few weak carinae posterolaterally, anterolateral rim of pronotum strongly carinate, with deep invagination along side. Mesoscutum



Figures 6–10. *Coffeikokkos copeyensis*, asexual female **6** metasoma (lateral view) **7** ventral spine of hypopygium (ventral view) **8** ventral spine of hypopygium (lateral view) **9** propodeum **10** forewing.

slightly broader than long in dorsal view, smooth, shiny, with sparse setae laterally and along notauli; notauli complete and deep, median mesoscutal line indistinct, absent or very short and superficial; parapsidal lines indistinct, anterior parallel lines differentiated by delicate sculpture. Mesopleuron smooth and shiny, with delicate setae. Mesoscutellum longer than broad in dorsal view, setose, uniformly dull rugose; scutellar foveae superficial, rugose, indistinctly delimited, almost confluent, with delicately rugose and shiny bottom; median (central) carina absent or present but inconspicuous. Propodeum alutaceous and setose; lateral propodeal carinae incomplete, not reaching nuca, nearly parallel and straight in anterior half and strongly divergent in posterior



Figures 11–13. *Coffeikokkos copeyensis*, asexual female **11–12** galls (photos by K. Nishida) **13** habitus, asexual female (lateral view).

half, central propodeal area glabrous, smooth and shiny. Metascutellum subrectangular, ventrally concave, strongly coriaceous. Metanotal trough coriaceous, setose, ventral bar of metanotal trough coriaceous, higher than height of metascutellum.

Forewing. (Fig. 10). 1.35 times longer than body, weakly brown-infuscated, pubescent, with cilia on margins; radial cell open, around 3.5 times as long as broad; veins dark brown; areolet large, triangular, closed.

Legs. Tarsal claws simple, with broad, rounded basal part (Fig. 4).

Metasoma. (Figs 6–8, 13). As long as head and mesosoma together, longer than high; all metasomal tergites smooth and shiny; 2nd metasomal tergite sparsely setose

laterally. Prominent part of ventral spine of hypopygium 2.5 times as long as wide, uniformly broad, with parallel sides, rounded distally, with tuft of long subapical setae, reaching far beyond apex of spine.

Gall. (Figs 11–12). A spherical, slightly ovate stem gall, easily detachable when mature, about 10 mm in diameter; outer surface smooth, shiny, red; with one central larval chamber. Young galls are slightly flattened laterally, yellowish green in colour, and often found in rows along the branch, emerging from an elongated scar in the bark. Mature galls become easily detachable and fall to the leaf litter, where they resemble red coffee fruits before they fall. Adult wasps normally emerge from the galls on the ground.

Host plant. *Quercus bumelioides* Liebm. (Section *Quercus* of *Quercus*; white oaks), distributed from Mexico to Panama (Govaerts and Frodin 1998).

Distribution. Currently known only from Costa Rica. Very common species in the Talamanca mountain range of Costa Rica (P. Hanson, personal observation).

Biology. Only the asexual (parthenogenetic) females are known. Mature galls were collected in September–January, and adults emerged soon after the galls were collected. Further study is necessary to determine the phenology of this species. *Eurytoma* sp., *Sycophila* sp. (both Eurytomidae), and *Torymus* sp. (Torymidae) have been reared from these galls, but no comparisons of parasitization rates have been made with other, sympatric species of Cynipini.

Etymology. The species is named after the junior synonym of the host plant, *Q. copeyensis*, on which it induces galls and which name is still in use between the scientists of the given region.

Discussion

It is essential to make a detailed examination of *Coffeikokkos* diagnostic characters and compare with morphologically similar *Cynips* L. complex-*Atrusca* Kinsey, *Biorhiza* Westwood (particularly with species previously placed in the now synonymized *Sphaeroteris* Ashmead) and *Trigonaspis* Hartig (particularly with species previously placed in the now synonymized *Xanthoteris* Ashmead) –because of one ambiguous character: the state of the tarsal claw. For the newly described genus, we mentioned that the tarsal claws possess a rounded basal lobe. However, this character can be interpreted in two ways: (i) the tarsal claw with a broad rounded basal lobe or (ii) the tarsal claw is simple, with a broad basal part of the claw. It is difficult to define exactly whether a basal lobe is present or the basal part of the claw is just broad (Fig. 4). In all other known Cynipini genera the basal lobe, when present, is acute and a distinct “tooth” is present, while in others the tarsal claw is narrow, without a lobe or (as *Coffeikokkos*) a broadened basal part.

Coffeikokkos differs from all known Cynipini genera by antennae that have 14–15 flagellomeres, instead of the usual 11–12. In the diagnosis, we mentioned that *Coffeikokkos* resembles *Cynips* and particularly *Cy. korsakovi*, a species known from Trans-

caucasus, Azerbaijan (Belizin 1961, Maisuradze 1962) and Iran (G. Melika, personal observation) (see Diagnosis to the genus *Coffeikokkos* above).

All asexual representatives of the entire *Cynips* complex (including synonymised *Antron* Kinsey and *Besbicus* Kinsey; Melika and Abrahamson 2002) have a ligulate, saddle-shaped, 2nd metasomal tergite, the height of the ventral impressed area of the metanotum always shorter than the height of the metascutellum, and the tarsal claws have an acute, distinct basal lobe. There are some species within this complex that resemble *Coffeikokkos*, but in known *Antron* species the mesoscutum is delicately coriaceous or microreticulate, never smooth, glabrous; in many species the prominent part of the ventral spine of the hypopygium is broadened at the apex, and all tergites are laterally densely setose. All *Antron* species are known to induce detachable, usually rounded, leaf galls; galls are never on twigs. Also the *Antron* species known to associate with only white oak species.

In *Atrusca* the antennae have 12 flagellomeres, the mesoscutum is coriaceous or microreticulate, the tarsal claws have an acute basal lobe, the radial cell of the forewing is very short, with Rs strongly curved toward the wing margin and the prominent part of the ventral spine of the hypopygium is very short and broadest at the apex, or long and narrowing toward the apex. The central propodeal area is like that in *Coffeikokkos*, but the lateral propodeal carinae are complete, reaching the nucha, and in the posterior half they are parallel, or only slightly curved outwards; the ventral impressed area is always shorter, sometimes much shorter, than the height of the metascutellum. There are some species of *Atrusca*, e.g., *Atrusca clavuloides* (Kinsey), with a smooth mesoscutum, dull rugose mesoscutellum and the same shape and form of the prominent part of the ventral spine of the hypopygium as in *Coffeikokkos*; however, the antennae have 12 flagellomeres, the mesoscutum is more densely setose, the fore wings have distinct dark spots, and the lateral propodeal carinae are complete, being only slightly curved outwards in the middle, and located much closer to one another. Another species, *Atrusca pulchripennes* (Ashmead), is also similar to *Coffeikokkos* in the polished mesoscutum, the shape of scutellar foveae, and the ventral impressed area of the pronotum is higher than the height of the metascutellum. However, in *A. pulchripenne*, the lower face in anterior view is more transverse, the clypeus is broadly emarginate ventrally (much larger compared to the height of the lower face) and overhangs the mandibles, the radial cell in the forewing is short, with Rs strongly curved backward at the wing margin and the lateral propodeal carinae are complete and much closer to one another in the posterior half; the prominent part of the ventral spine of the hypopygium is needle-like, without a tuft of subapical setae. Moreover, all known species of *Atrusca* (like all asexual forms in the *Cynips* complex) induce galls exclusively on leaves of white oaks.

Coffeikokkos also partially resembles another Nearctic genus, the former *Sphaeroterax* (synonymised with *Biorhiza* by Melika and Abrahamson 2002), particularly *B. rydbergiana* (Cockerell), which has a smooth, sparsely setose mesoscutum along the notauli; it is also similar in the habitus of the mesoscutellum with scutellar foveae, the short, broad, parallel-sided ventral spine of the hypopygium, and the metasoma with sparse setae only on lateral parts of the 2nd metasomal tergite. However, in *B. rydbergiana*

the antennae have 12 flagellomeres; the tarsal claw is simple, without a basal lobe; the ventral impressed area of the metanotum is much shorter than the height of the metascutellum; and the sides of the pronotum, mesopleuron, metascutellum and propodeum have more dense setae. The shape of the central propodeal area somewhat resembles that of *Coffeikokkos* in that the lateral propodeal carinae are parallel and curved outwards in the posterior part of the propodeum; however, they are complete, reaching the nucha, and are slightly less divergent in the posterior half. Galls of *B. rydbergiana* are induced on leaves.

Coffeikokkos also partially resembles yet another Nearctic genus, the former *Xanthoteras* Ashmead (some of the species were synonymised with *Trigonaspis* and others with *Biorhiza* (Melika and Abrahamson 2002)). Some of these species are similar to *Coffeikokkos*, but all have antennae with 12 flagellomeres, tarsal claws with an acute basal lobe, and the malar sulcus is present. In particular, the habitus of *Biorhiza eburnea* (Bassett) and *B. polita* (Bassett) somewhat resembles that of *Coffeikokkos*: the mesoscutum is polished, with rows of setae along the complete notauli, the mesoscutellum and scutellar foveae are similar in shape and surface sculpture, the shape of the 2nd metasomal tergite, with few lateral setae, is also similar. However, the tarsal claws have an acute basal lobe, the antennae have only 12 flagellomeres, the malar sulcus is present, the lateral propodeal carinae are slightly curved outwards posteriorly, and the ventral impressed area of the metanotum is shorter than the height of the metascutellum, the prominent part of the ventral spine of the hypopygium narrows toward the apex (it is thus more needle-like) and has few subapical setae reaching beyond the apex of the spine, not forming a tuft of setae. Both species of *Biorhiza* induce detachable, spherical leaf galls on white oaks.

There is one distinct feature of *Coffeikokkos*, on the basis of which it is easy to separate this newly described genus from all other known genera: the antennae have 14–15 flagellomeres, while in all other Cynipini only 11–12 are present. Moreover, the very peculiar galls resemble red coffee fruits.

The discovery of the new genus supports the idea about the American radiation centre of Cynipini (Kinsey 1936). Further research and collecting are necessary to decide whether *Coffeikokkos* is an evolutionary novelty distributed only in the Neotropics or the genus representatives are distributed also further northward, into the Nearctic region.

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A new species of Andean semiaquatic lizard of the genus *Potamites* (Sauria, Gymnophthalmidae) from southern Peru

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Abstract

We describe a new lizard species of the genus *Potamites* from the montane forests of the Cordillera de Vilcabamba (Cusco region) and Apurímac River valley (Ayacucho region), between 1500 and 2000 meters of elevation, in southern Peru. The new species is distinguishable from all other species of the genus mainly by having highly keeled scattered scales on dorsum and females lacking femoral pores.

Resumen

Describimos una nueva especie de lagartija del género *Potamites* de los bosques montaños de la Cordillera de Vilcabamba y del Valle del río Apurímac, entre los 1500 y 2000 metros de elevación, en las regiones de Cusco y Ayacucho respectivamente, del sur de Perú. La nueva especie es distinguible de todas las otras especies del género principalmente por tener escamas altamente quilladas y desordenadas en el dorso y por no presentar poros femorales en las hembras.

Keywords

Potamites, Cusco, Ayacucho, Peru

Palabras clave

Potamites, Cusco, Ayacucho, Peru

Introduction

The semi aquatic lizards of the genus *Potamites* were considered as *Neusticurus* for many years, this genus included eleven species, however *Neusticurus* is currently represented only by five species and the other six are included in the genus *Potamites* (Doan and Castoe 2005). Two species of *Potamites* occur formerly in Peru: *P. ecpleopus* and *P. strangulatus*; *P. strangulatus* has two recognized subspecies: *P. s. strangulatus* and *P. s. trachodus*, recorded in the Amazonian lowlands between 100 and 800 m elevations in the centre and the north respectively (Uzell 1966) and easily distinguishable by the absence or presence of tubercles on the flanks. Additionally another species of the genus, *P. juruazensis*, was described from rio Juruá, Acre state, at southwestern Brazil (Avila-Pires and Vitt 1998), but even though it has never been recorded in Peru, its occurrence there is expected due to the proximity of the type locality to the borderline with the Ucayali Region. *Potamites ocellatus* (Sinitsin 1930) was described with a holotype from Rurrenabaque (Beni region, Bolivia) and 54 paratypes from Chanchamayo and Perené valleys (Junin, Peru). However, the variation in the paratypes was not included in the description, and given the distance between both sites (approximately 1000 km airline), they were questioned to belong to the same species. Sinitsin in a footnote explains that the new form would be analyzed by Charles E. Burt in another paper. In the new publication, Burt and Burt (1931) conclude that *P. ocellatus* is a subspecies of *P. ecpleopus* because the scutellation and measurements are similar to *P. ecpleopus*. Some years later, Uzell (1966) proposed the subspecies *P. ecpleopus ocellatus* to be a synonym of *P. ecpleopus* and later on Vanzolini (1995) resurrected *P. ocellatus* and elevated it to the species level (but in reference to the Bolivian holotype only). Even though, the genus *Potamites* still presents several taxonomic uncertainties, it also proves that its diversity is also underestimated and poorly studied. Recent surveys carried out during 2010 gave as a result the discovery of a new species of *Potamites* from southern Peru, which is described herein.

Material and methods

The description format for the new species generally follows that of Uzell (1966), Vanzolini (1995) and Avila-Pires and Vitt (1998). For the comparisons, we used the descriptions from all *Neusticurus* and *Potamites* species known in the literature: data for most *Neusticurus* and *Potamites* were taken from Uzell (1966), data for *P. juruazensis* was taken from Avila-Pires and Vitt (1998), for *P. ocellatus* from Vanzolini (1995), data of *N. tatei* from Barrio-Amorós and Brewer-Carias (2008) (for a detailed list of specimens reviewed see Appendix 1). Nomenclature of scale characters follows that of Uzell (1966) and Köhler and Lehr (2004). Scale sizes were measured using precision calipers and were rounded to the nearest 0.1 mm. For characters recorded on both sides, the condition on the right side is presented first. Everted hemipenes were fixed with formalin 3.7%. The abbreviation for the museum collection is CORBIDI (Cen-

tro de Ornitología y Biodiversidad) and GPS coordinates were taken using the geodetic datum WGS84.

Results

Potamites montanicola sp. n.

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http://species-id.net/wiki/Potamites_montanicola

Figures 1–4

Holotype. (Fig. 1a; 2a–b; 3a,d) Adult male (CORBIDI 08322), Peru, Cusco Region, La Convención Province, 4.8 km E of Alto Shimá Native Community (12°34'16.4"S, 73°09'42.3"W), 1577 m elevation, collected by Germán Chávez and Diego Vasquez on 3 December 2010.

Paratypes. (Fig. 1b, d; 3b, c; 4a) CORBIDI 08324–27, 08335 (all adult males), 08328, 08334, 08336, (all adult females), same data as holotype, CORBIDI 06957 (adult male), Peru, Ayacucho Region, La Mar Province, Cajadela Community (12°57'27.8"S, 73°36'22.4"W), 2098 m elevation, collected by Karla García on 23 August 2010.

Diagnosis. Assigned to *Potamites* sensu stricto by having a tongue with imbricate scale-like papillae, movable eyelids, external ear and heterogeneous dorsal scalation. 1) Head acuminate from dorsal and lateral views, frontonasal length usually equal or slightly shorter than frontal length; (2) nasoloreal suture present; (3) supraoculars four, anteriormost supraocular not fused with anteriormost superciliary, all supraoculars separated from superciliaries; (4) superciliary series complete, usually four; (5) supralabial-subocular fusion absent; (6) postoculars three; (7) postparietals three; (8) genials in two pairs, transverse sutures perpendicular with respect to midline of body; (9) dorsal scales rectangular, juxtaposed, granular and keeled; (10) transverse dorsal count (enlarged rows at midbody) at midbody 36–42 in both sexes; (11) longitudinal dorsal keeled scales count 32–37 in both sexes; (12) longitudinal ventral count 21 – 23 in both sexes; (13) femoral pores in males 19–21, absent in females; two scales between femoral pores; (14) subdigital scales on 4th finger 13–17, on 4th toe 22–27; (15) forelimb reaching anteriorly to fourth supralabial; (16) Tail slightly compressed with two rows of lateral scales per two ventral caudal scales; (17) hemipenis acapitate; flounces lacking calcified spines and forming two chevrons on distal half of hemipenis while basal half is covered with 5 transverse flounces; some asulcate flounces separated by a small expansion pleat; sulcate flounces about as wide as asulcate flounces; sulcus spermaticus single, flanked by a broad naked expansion pleat widened distally; (18) dorsum dark brown; lateral ocelli present in two or three pairs in males, usually absent in females; ventral color pattern pale blue or yellow with black blotches in males and creamy white in females; (19) transparent lower palpebral disc an undivided oval; (20) prefrontals present.



Figure 1. *Potamites montanicola*, new species from southern Peru. Holotype male (CORBIDI 08322) **A** female (CORBIDI 08328) **B** uncollected juvenile **C** ventral view of males of the type series, from left to right: CORBIDI 08324, CORBIDI 08322 (holotype), CORBIDI 08325, CORBIDI 08326, CORBIDI 08335 **D**

Potamites montanicola is easily distinguished of all other *Potamites* and *Neusticurus* species by having highly keeled scales scattered all over the dorsum (all species have either tubercles or keeled scales forming longitudinal rows from neck to the insertion of the hind limbs, or lack of them) and by females lacking femoral pores (only some female specimens of the type series in *P. juruazensis* lack femoral pores). Of all *Potamites* species, *P. montanicola* best resembles *P. ecpleopus*, *P. juruazensis* and *P. ocellatus*. It differs from *P. ecpleopus* by having a lower number of keeled scales on dorsum (see specimens reviewed in Appendix 1): 32–37 (vs 36–45), a higher number of scales around midbody: 43–50 (vs 34–46), frenocular scale pentagonal (vs triangular) and a lower number of femoral pores bearing 19–21 in males and lacking in females (vs 25–48 in males and 1–15 in females). Differs from *P. juruazensis* by having a higher number of scales around midbody: 42–50 (vs 31–40), bearing scattered dorsal highly keeled scales (vs bearing four longitudinal rows of dorsal tubercles), a higher number of lamellae of fourth toe: 22–27 (vs 16–22), a higher number of femoral pores in males: 19–21 (vs 10–16) and by lacking femoral pores in females (vs 0–2 femoral pores). Differs from *P. ocellatus* by its smaller size: 68.6 mm as maximum SVL in males (vs 75 mm in *P. ocellatus*), dorsal highly keeled scales present (vs flat dorsal tubercles present), temporal region covered by medium size polygonal scales (vs covered by large scales interspersed with granules) and has a lower number of femoral pores in males: 19–21 (vs 41).

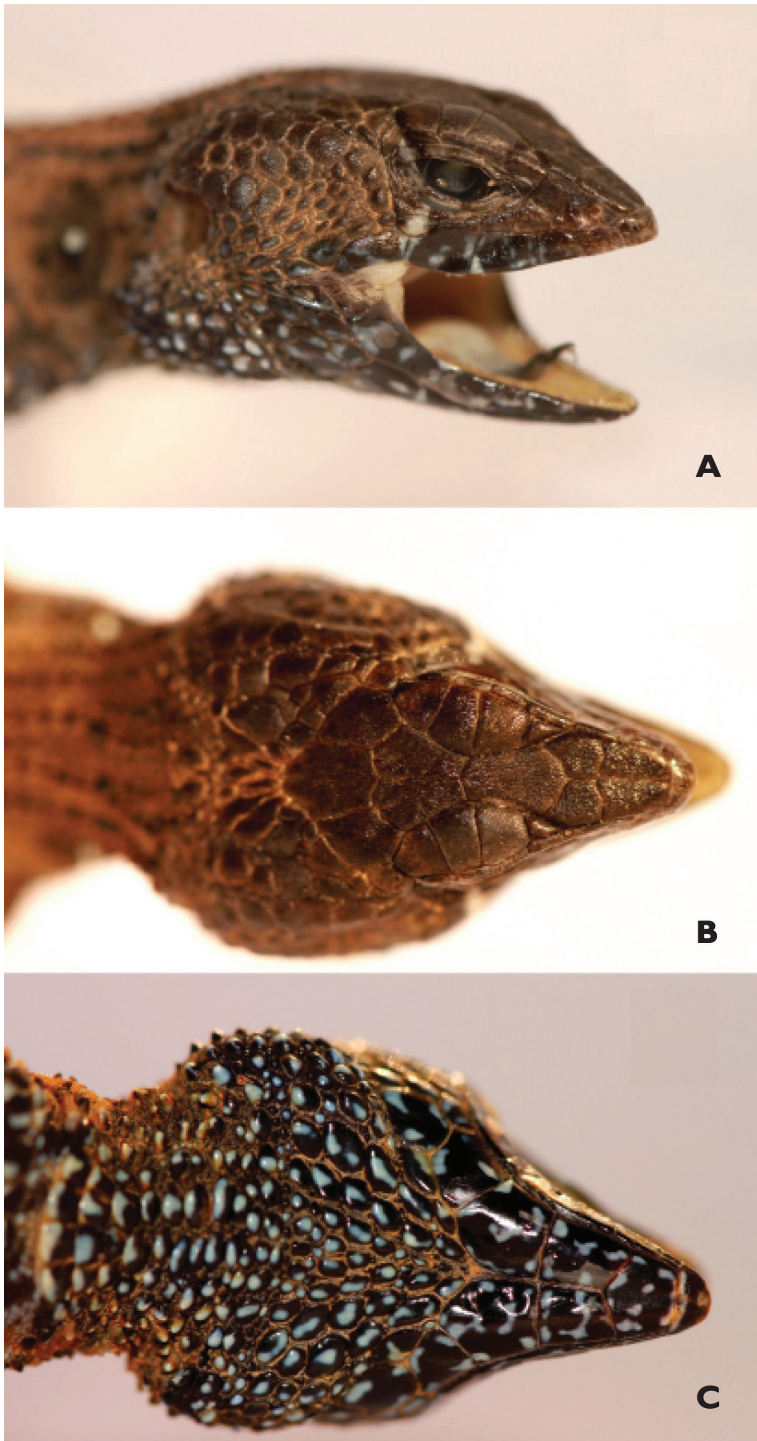


Figure 2. Lateral **A** dorsal **B** and ventral **C** views of the head of *Potamites montanicola* holotype (COR-BIDI 08322)

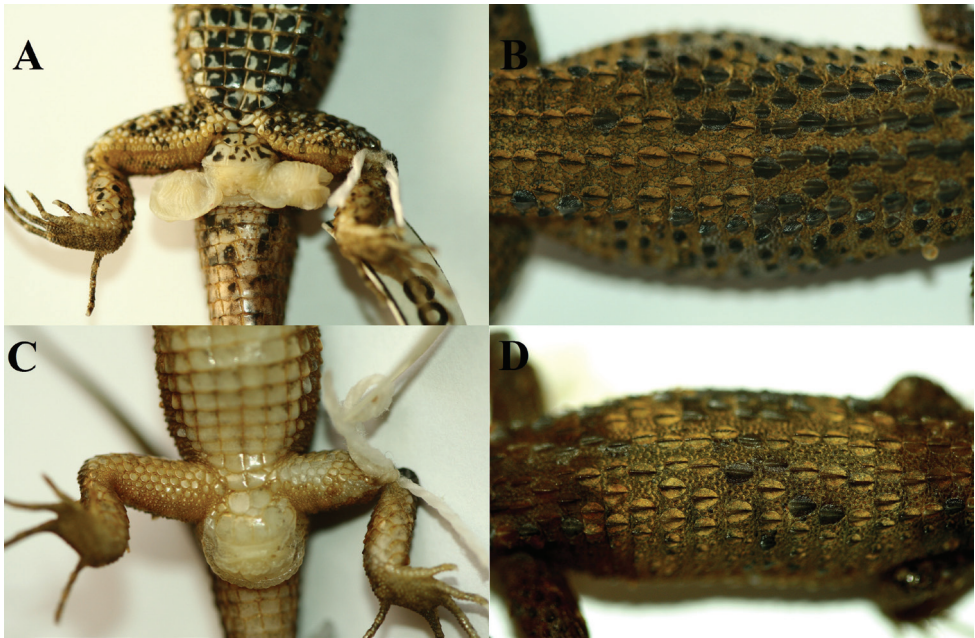


Figure 3. Distinguishable characters of *Potamites montanicola*. Femoral pores and dorsal scutellation in the holotype (CORBIDI 08322) **A–B** absence of femoral pores and dorsal scutellation in female (CORBIDI 08328) **C–D**

Furthermore, *P. montanicola* differs from other *Potamites* and *Neusticurus* species in its smaller size, having a maximum SVL of 68.6 mm in males (vs 117 mm in *N. bicarinatus*, 121 mm in *N. medemi*, 104 mm in *N. racenisi*, 94 mm in *N. rudis*, 87 mm in *P. strangulatus* and 94 mm in *N. tatei*) and 56.1 mm in females (vs 96 mm in *N. bicarinatus*, 79 mm in *P. cochranae*, 107 mm in *N. medemi*, 94 mm in *N. racenisi*, 89 mm in *N. rudis*, 76 mm in *P. strangulatus* and 85 mm in *N. tatei*), bearing dorsal crests (absent in *N. racenisi*, *N. rudis* and *P. strangulatus*), bearing tubercles on flanks (absent in *P. cochranae*, *N. medemi*, *N. racenisi*, *P. strangulatus* and *N. tatei*), having a superficial tympanum (deep in *N. bicarinatus*, *N. medemi*, *N. racenisi* and shallow in *P. cochranae* and *N. rudis*), having a low number of femoral pores in males: 19–21 (vs 26–30 in *P. apodemus*, 40–62 in *N. bicarinatus*, 58–64 in *N. medemi*, 62–72 in *N. racenisi*, 32–46 in *N. rudis*, 45–59 in *P. strangulatus* and 60–61 in *N. tatei*) and lacking femoral pores in females (femoral pores present in all *Potamites* and *Neusticurus* excepting some individuals of *P. juruazensis*).

Description of the holotype. Adult male (CORBIDI 08322), body long, laterally compressed, SVL 68.64 mm; tail (complete) length 107.01 mm, axilla to groin distance 32.90 mm; head length 16.40 mm; head width 10.29 mm; shank length 10.27 mm. Head scales smooth; rostral scale wider (2.57 mm) than long (1.28 mm), higher than adjacent supralabials, in contact with frontonasal, nasoloreal, and first supralabials posteriorly; frontonasal almost squarish, slightly longer (2.57 mm) than

wider (2.27 mm), widest posteriorly, in contact with nasoloreal and frenocular laterally, prefrontals posteriorly; nasoloreal almost triangular, apex in contact with rostral, nasoloreal suture present; prefrontals present, in contact with each other medially, in contact with anteriormost superciliary and anteriormost supraocular, frontal posteriorly; frontal longer (3.79 mm) than wider (2.31 mm), anterior suture angular with point directed anteriorly, lateral sutures straight, posterior suture angular with point slightly directed posteriorly, in contact with first and second supraocular laterally, frontoparietals posteriorly; frontoparietals pentagonal, in contact with third and fourth supraocular, parietals and interparietal posteriorly; supraoculars four, none in contact with ciliaries; superciliary series complete, generally four, anteriormost superciliary not fused with anteriormost supraocular; interparietal pentagonal, longer (3.63 mm) than wider (2.80 mm), in contact with parietals laterally, postparietals posteriorly; parietals pentagonal, in contact with fourth supraocular anterolaterally, temporal scales laterally, dorsalmost postocular, postparietals posteriorly; postparietals ten, polygonal, bordering parietals and interparietal; palpebral disc an undivided oval, unpigmented; frenocular pentagonal, in contact with nasoloreal anteriorly; postoculars three; temporals polygonals, of a medium size; supralabials five; infralabials six; mental wider (2.40 mm) than long (1.10 mm), in contact with first infralabials, postmental posteriorly; postmental single, pentagonal, posterior suture angular, point directed posteriorly, in contact with first and second infralabials; genials in two pairs, anterior pair subquadrangular, in contact with second and third infralabials; posterior genials pentagonal, in contact with fourth infralabials laterally; scale rows between genials and collar fold (along midventral line) 17; posteriormost gular row enfolded posteriorly, concealing two granular scale rows; lateral neck scales rounded, conical. Dorsal scales granular laterally and dorsally, scattered conical tubercles on both flanks of body are posteriorly projected, dorsal keeled scales 33 in a longitudinal count, forming four rows from the post occipital region to the insertion of the forelimbs, scattered at the rest of dorsum and becoming four rows again at the insertion of hind limbs, separated by granular scales; transverse dorsal count (enlarged rows at midbody) at fifth transverse ventral scale row 48, at 10th transverse ventral scale row 40, at 15th transverse ventral scale row 38; lateral scales on body near insertion of forelimb small, conical dorsally, mostly granular; ventrals squarish and juxtaposed; complete longitudinal ventral count 23; longitudinal ventral scale rows at midbody 7; 47 scales around midbody; anterior preanal plate scales two; posterior preanal plate scales three; dorsal and dorsolateral surface of tail with at least 62 whorls of enlarged keeled scales; midventral subcaudals squarish, smooth. Limbs pentadactyl; digits clawed; forelimb reaching anteriorly to fifth infralabial; anterolateral and dorsal brachial scales keeled, imbricate; midbrachial anterodorsal scale at least twice as large as adjacent scales, slightly keeled; anteroventral, ventral, and posteroventral scales granular, imbricate, conical; antebrachial scales polygonal, keeled; medial antebrachial scales small, polygonal, smooth; dorsal manus scales polygonal, imbricate, smooth; palmar scales small, polygonal, smooth; dorsal scales on fingers smooth, quadrangular, covering dorsal half of digit, overhanging supradigital scales, two on I, seven on II, ten on III, twelve on IV, 9/8 on V; subdigital scales 6/5 on

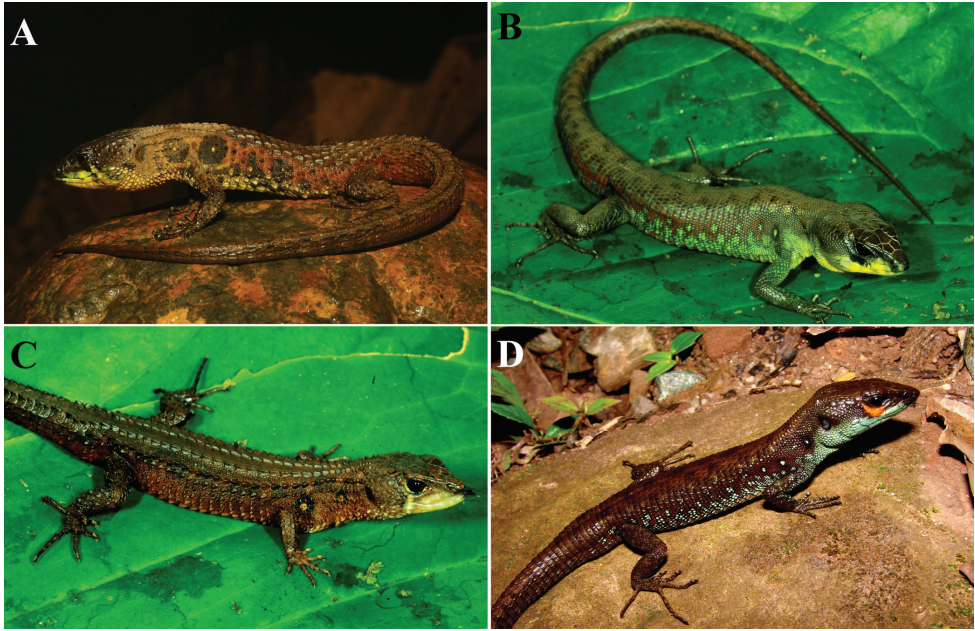


Figure 4. *Potamites* species from Peru. *Potamites montanicola* (CORBIDI, 08324) **A** *Potamites strangulatus strangulatus* from Cordillera de Kampankis, Amazonas, northern Peru (not collected individual) **B** photo by Alessandro Catenazzi; *Potamites ecleopus* from Cordillera de Kampankis, Amazonas, northern Peru (CORBIDI 09516) **C** photo by Alessandro Catenazzi; *Potamites strangulatus trachodus* from Cordillera Escalera, San Martín, northern Peru (CORBIDI 06368) **D** photo by Pablo J. Venegas.

I, 9/10 on II, 15/14 on III, seventeen on IV, 11/10 on V; dorsal thigh scales granular, some scales bearing conical tubercles, anterodorsal thigh scales polygonal, largest than adjacent scales, slightly keeled; posterodorsal thigh scales small, granular, dorsalmost scales tuberculate, arranged irregularly, ventral thigh scales rounded, smooth, several times smaller than anterodorsal thigh scales; anterior and anteromedial shank scales granular, juxtaposed, some scales bearing conical tubercles, anteriormost scales at the same size than lateral, posterolateral, and posteromedial shank scales; lateral, posterolateral, and posteromedial shank scales granular, juxtaposed, some bearing conical tubercle; scales on dorsal surface of digits single, quadrangular, smooth, overhanging supradigital scales, four on I, 8/9 on II, thirteen on III, 18/19 on IV, 10/9 on V; subdigital scales single or double, 9/8 on I, 10/11 on II, 18/17 on III, 26/23 on IV, 13/14 on V; femoral pores 20–21.

The completely everted hemipenis is an acapitate organ without a medial welt; apex with two large protrusions separated by the distal end of the sulcus spermaticus; sulcus spermaticus single, flosses lacking calcified spines and forming two chevrons on distal half of hemipenis; sulcate flosses about as wide as asulcate flosses; asulcate flosses becoming shorter distally, five in the basal half and thirteen in each protru-

sion, distal chevrons separated by a small expansion pleat; sulcus spermaticus single, flanked by a broad naked expansion pleat widened distally.

Coloration in preservative. Dorsal surface of head, dorsal surface of body, tail, limbs, hands and feet dark brown; lateral ocelli present in two pairs with a white rounded center; labial region, throat, chest and venter pale blue with scattered black blotches. Ventral surfaces of forelimbs pale yellow with black blotches; ventral surfaces of thighs pale brown with black blotches above position of femoral pores; ventral surfaces of hands and feet pale brown becoming darker at fingers III, IV and V; ventral surface of tail pinkish brown with diffuse black blotches.

Coloration in life (Fig. 1a–d). Dorsal and lateral surfaces, of the head dark brown; rostral and first supralabial scale same color as head; superior labium is bluish with dark spots from second supralabial; iris reddish gold; ventral surface of head, preangular and angular region black with pale blue irregular blotches. Dorsal surface of body same color as head, darker than flanks; lateral surface of body brown with a pair of black ocelli on both sides, before and after insertion of forelimbs, each ocelli bearing a white center, coinciding with a conical tubercle; tuberculate scales darker than granular scales; ventral surface of body same color as ventral surface of head. Limbs, similar to body, ventral surface of arms yellowish brown, ventral surface of legs creamy brown. Coloration of dorsal surface of tail like that of body, ventral surface of tail reddish brown, only red at the base and.

Variation (Fig. 1, d). In the type series, azygous scales (between frontonasal and prefrontal scales) are present in six specimens (CORBIDI 08324–28, 08335) including males and females, and are absent in five specimens (CORBIDI 06957, 08322, 08334, 08336, 08338); infralabials usually five, four present in CORBIDI 06957, 08324, 08327 and six in CORBIDI 08322, 08325; lateral ocelli are present in two pairs, first pair located anteriorly to the insertion of forelimbs and the second one posteriorly, the white spot at the middle of the ocelli includes usually one conical tubercle; with two conical tubercles at the right side in CORBIDI 08327 and at both sides in CORBIDI 08338. CORBIDI 06957, 08324, 08327, 08334–35 have more than two pairs of lateral ocelli and CORBIDI 08336, 08338 lack of lateral ocelli; in life, ventral coloration in males is usually pale blue, with black blotches in CORBIDI 08322, and yellow with black blotches in CORBIDI 08324, in females the throat and chest can be creamy white or dark brown, belly creamy white or darker bearing or lacking dark blotches. Sexual dimorphism is evident in females, because all of them are lacking femoral pores, furthermore other differences between females and males are the SVL (maximum SVL in females 56 mm, maximum SVL in males 68 mm) and the head width (Maximum head width in females 3.2 mm and maximum head width in males 13.23 mm). See Table 1 for variation in selected morphometric and squamation characters in the specimens examined.

Etymology. The specific epithet ‘montanicola’ is a compound from the spanish word “montano”, adjective to describe something from a mountain, and the latin suffix “-icola” for “inhabitant” and refers to the montane forests where this species lives.

Table 1. Morphometric and pholidosis characters in *P. montanicola*. Individuals measured include: seven males and three females, all adults. Range is followed by mean value and standard deviation in parenthesis.

		<i>a</i> (n=10) <i>Potamites montanicola</i>
Max SVL (mm)	males	68.6
	females	56.1
Head length/Head width	males	1.4-1.6 (1.53±0.06)
	females	3-4.6 (3.59±0.87)
Number of femoral pores	males	19-21 (20.28±0.75)
	females	0 (0.00±0.00)
Azygous scales		0-1 (0.60±0.51)
Number of genials		3 (3.00±0.00)
Number of postparietals		10-11 (10.30±0.48)
Number of scales around midbody		42-50 (46.10±2.84)
Longitudinal dorsal count		32-37 (33.80±1.81)
Number of longitudinal ventral scale rows		21-23 (21.70±0.67)
Number of transversal ventral scale rows		6-8 (0.90±0.99)
Lamellae under 4th finger		13-17 (16.20±1.31)
Lamellae under 4th toe		22-27 (24.80±1.54)

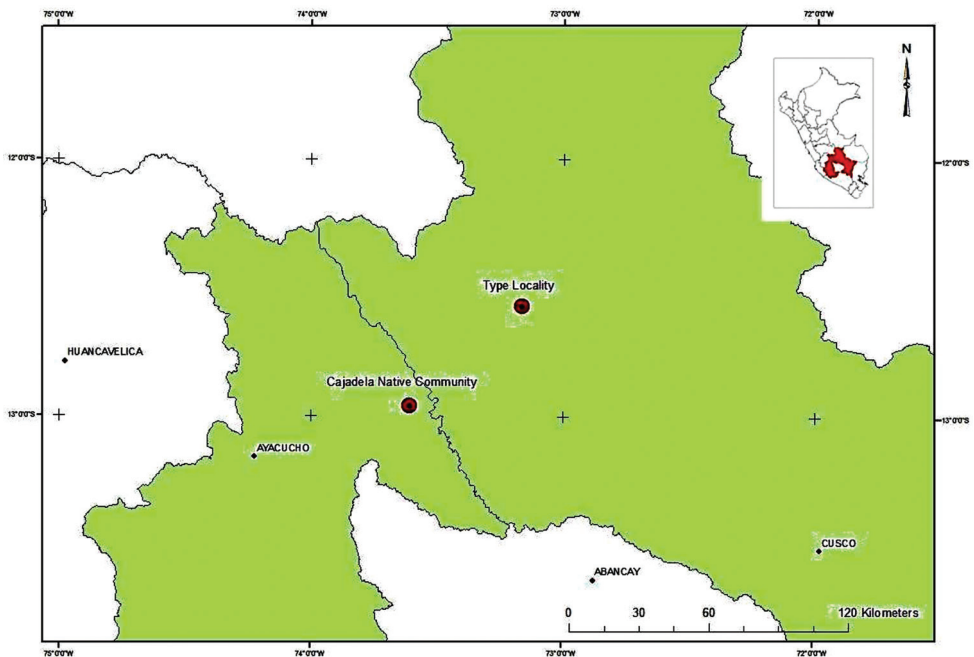


Figure 5. Map showing the type locality and the second site of occurrence (Cajadela Native Community) for *Potamites montanicola*.

Distribution and natural history. *Potamites montanicola* is known from two localities in the Andes in southern Peru (Fig 5), both separated by 64 km air line and located at the Cordillera de Vilcabamba and Apurimac river valley, the known altitudinal

range is between elevations 1570 and 2100 m. The holotype and most of the specimens of the type series were found on the sides of a stream, which were 3 meters wide with stones and rocks as substrate. The vegetation in the area was riverside vegetation mainly composed of: *Miconia* sp., *Gordonia* sp. and *Guarea* sp. and herbs from the family Rubiaceae and Melastomataceae. Climbers (vines and lianas) were diverse and relatively common and include species of the family Celatraceae, Polygalaceae and Campanulaceae. All individuals were found perching on rocks and stones at sides of the stream at night. In some cases, individuals were observed swimming in the middle of the stream, or using the stream to escape. No other lizard species were recorded at the type locality, but on the same stream we observed the vipers *Bothriopsis taeniata* and *Lachesis muta*. Amphibians also reported here include *Hypsiboas balzani*, *Hyalinobatrachium bergeri*, *Osteocephalus mimeticus*, *Pristimantis rhabdolaemus* and *Pristimantis mendax*. The second locality where *P. montanicola* was collected (specimen CORBIDI 06957) is a secondary forest, close to the Chiquintirca – Cajadela road. In this site, arboreal vegetation includes species of *Cecropia* sp., and abundant bushes. The specimen CORBIDI 06957 was found during the day near a creek with substrate mainly composed of leaf litter and fallen trunks. In this locality, *P. montanicola* is sympatric with the tropidurid lizard *Stenocercus torquatus* and the anurans *Hyalinobatrachium bergeri*, *Hypsiboas balzani*, *Pristimantis mendax* and *Pristimantis rhabdolaemus*. No snakes were reported.

Remarks. The genus *Potamites* is composed of species that are primarily lowland distributed. One of these, *P. ecpleopus*, has the largest distribution range in *Potamites* (despite its unclear taxonomy). Sinitzin (1930) assigned the populations of *Potamites* in Perené and Chanchamayo valleys, central Peru, as paratypes of *P. ocellatus*, but later, Vanzolini (1995) assigned them as part of the *Potamites ecpleopus* complex and not as *P. ocellatus* sensu stricto. *P. ocellatus* was then validated and redescribed from only one specimen from El Beni, Bolivia (Vanzolini 1995). These taxonomic uncertainties render the species assignment of the populations from Chanchamayo and Perené unclear. Several surveys to Chanchamayo and Perené from 2008 to 2010 by the senior author resulted in unsuccessful efforts to find the populations mentioned by Sinitzin (1930). Even though *P. montanicola* most northern locality (Cajadela Community) is 250 Km air line from Chanchamayo and Perené valleys, *P. montanicola* has a higher vertical distribution range than those populations (by 1000 m). This evidence, along with morphological characteristics, distinguish and validate *P. monticola* as distinct. Furthermore, *P. montanicola* is the only species described for Peru that occurs above 2000 meters of elevation and to be reported as exclusive from montane forests. Further studies on the taxonomic identity and the populations of *P. ecpleopus* would help to clarify their status and to determine if they belong to a described or undescribed species.

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Appendix I

Specimens examined:

Potamites ecleopus.- PERU: AMAZONAS: Condorcanqui, Cordillera de Kampankis, CORBIDI 09436, 09509, 09516, 09563-67, 09576-78; CUSCO: La Convencion, Comunidad Nativa Tangoshiari CORBIDI 0311-13; Pongo de Mainique – Santuario Nacional Megantoni CORBIDI 05519; Campamento Kinteroni CORBIDI 06992-93, 06997; Comunidad Nativa Monte Carmelo CORBIDI 08331.33; Comunidad Nativa Chokoriari CORBIDI 08498-99; LORETO: Datem del Marañón, Andoas CORBIDI 01077, 04637, 04641-43, 04746, 04751, 04981, 05056; Loreto, San Jacinto CORBIDI 01208-09; Singasapa CORBIDI 06529; Rio Corrientes

CORBIDI 02731; Río Yanayacu CORBIDI 05989; Maynas, Aguas Negras CORBIDI 0280; Redondococha CORBIDI 0286; Requena, Sierra del Divisor CORBIDI 02246-48, 02585, 04138, 04144, SAN MARTIN: Moyobamba, Comunidad Morro de Calzada CORBIDI 01360; Picota, Chambrillo CORBIDI 08834, Lamas, Pongo de Cainarachi CORBIDI 09059.

Potamites strangulatus strangulatus.- PERU: AMAZONAS: Condorcanqui, Cordillera de Kampankis, CORBIDI 09352, 09397, 09399, 09411, 09523-24.

Potamites strangulatus trachodus.- PERU: AMAZONAS: Bagua, Chonza Alta CORBIDI 0739-0744; CAJAMARCA: San Ignacio, Alto Ihuamaca CORBIDI 0878-80; SAN MARTIN: Moyobamba, Comunidad Nativa Paitoja CORBIDI 01237-41, 01262-63, 03145, 03147, 03192; Fundo Pabloyacu CORBIDI 01392; Rioja, Zona Reservada Miskiyacu CORBIDI 01429-30, 01434, 01437, 01441, 03274-75; Tarpoto, Cordillera Escalera CORBIDI 06366-69, 06383, 06773.

Two new and rare mountain door-snails (Gastropoda, Pulmonata, Clausiliidae) from high mountain areas in Macedonia

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Abstract

Two species of Clausiliidae are described as new to science. *Euxinella alpinella* **sp. n.** is the fourth species within genus *Euxinella* Nordsieck, 1973, and *Vestia lazarovii* **sp. n.** is the second species of genus *Vestia* recorded from the Republic of Macedonia. In both species, the clausilium apparatus shows a high degree of variation.

Keywords

new species, *Euxinella alpinella* sp. n., *Vestia lazarovii* sp. n., variation of clausilium, Republic of Macedonia

Introduction

Until recently, only one species of the genus *Euxinella* with its locus typicus in the Bistra Mountains in Republic of Macedonia was known: *Euxinella radikae radikae* Nordsieck, 1973. Dedov and Neubert (2009) expanded the known distribution of the nominotypical subspecies to the Jablanitsa Mountains (Republic of Macedonia) and published a new subspecies, *E. radikae hristovskii* Dedov & Neubert, 2009 from the Gyonovitsa Cave, Bukovich Hill (Republic of Macedonia). They also described a new species *E. subaii* Dedov & Neubert, 2009, from the Mihailovo Mountain Resort in the Kozhuf Mountains (Republic of Macedonia). *E. subaii* shows some shell morphological characters that are not conform to the generic definition of *Euxinella* (Nordsieck,

1973) as for example a very long lamella subcolumellaris. It would be desirable to investigate the morphology of the genital system of all meanwhile known representatives of *Euxinella* in order to improve the generic diagnosis (cf. Dedov and Neubert 2009). *E. alpinella* sp. n. is the second species within the genus with a long subcolumellaris, and thus is probably close to *E. subaii*.

The genus *Vestia* was mentioned for the first time from the Republic of Macedonia by Urbanski (1960) from Osogovo Mountains, Kalin Kamen area, 1560 m a.s.l. with *Vestia (Brabenecia) ranojevici ranojevici* (Pavlovic 1912), which was later confirmed by H. Nordsieck (1974). Dedov (2010) added another record of this subspecies from a new site in the Osogovo Mountains (particularly from the Bulgarian part of the mountains).

Material and methods

Most of the material was collected by the author in 2009 and 2010 from the Nidzhe and Baba Mountains, Republic of Macedonia. The first specimens of *Vestia lazarovii* sp. n. were collected by Dr. Stoyan Lazarov in 2002, Baba Mountains. All the snails were hand-collected. The material is deposited in the private collection of the author (coll. DED.), in the National Museum of Natural History, Sofia (NMNHS), and in the Senckenberg Museum, Frankfurt am Main (SMF). The morphological examinations were carried out with a stereomicroscope.

Results

Euxinella alpinella sp. n.

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http://species-id.net/wiki/Euxinella_alpinella

Fig. 1

Locus typicus. Republic of Macedonia, Nidzhe Mountains, Belo Grotlo peak, 40°59'17.9"N, 21°49'10.7"E, 2164 m a.s.l., limestone, under stones, 07. June 2010, leg. I. K. Dedov (43 specimens, collected alive, dried). Until now, the new species is known only from the type locality.

Type material. holotype SMF 336340; paratypes: SMF 336341/2 specimens, NMNHS/2 specimens, DED/MK 635/38 specimens.

Differential diagnosis. The new species differs from the two subspecies of *Euxinella radikae* – *E. r. radikae* and *E. r. bristovskii* – by occasional presence of a short basalis and the long subcolumellaris, which is visible from outside the aperture. *E. alpinella* sp. n. differs from *E. subaii* by its pale or missing palatal callus, the much shorter or missing basalis, and its shorter palatal plicae.

Description of type series: shell small, spindle-shaped; shell colour brownish; suture deep; teleoconch striated, finely ribbed on the last whorls of the shell; neck

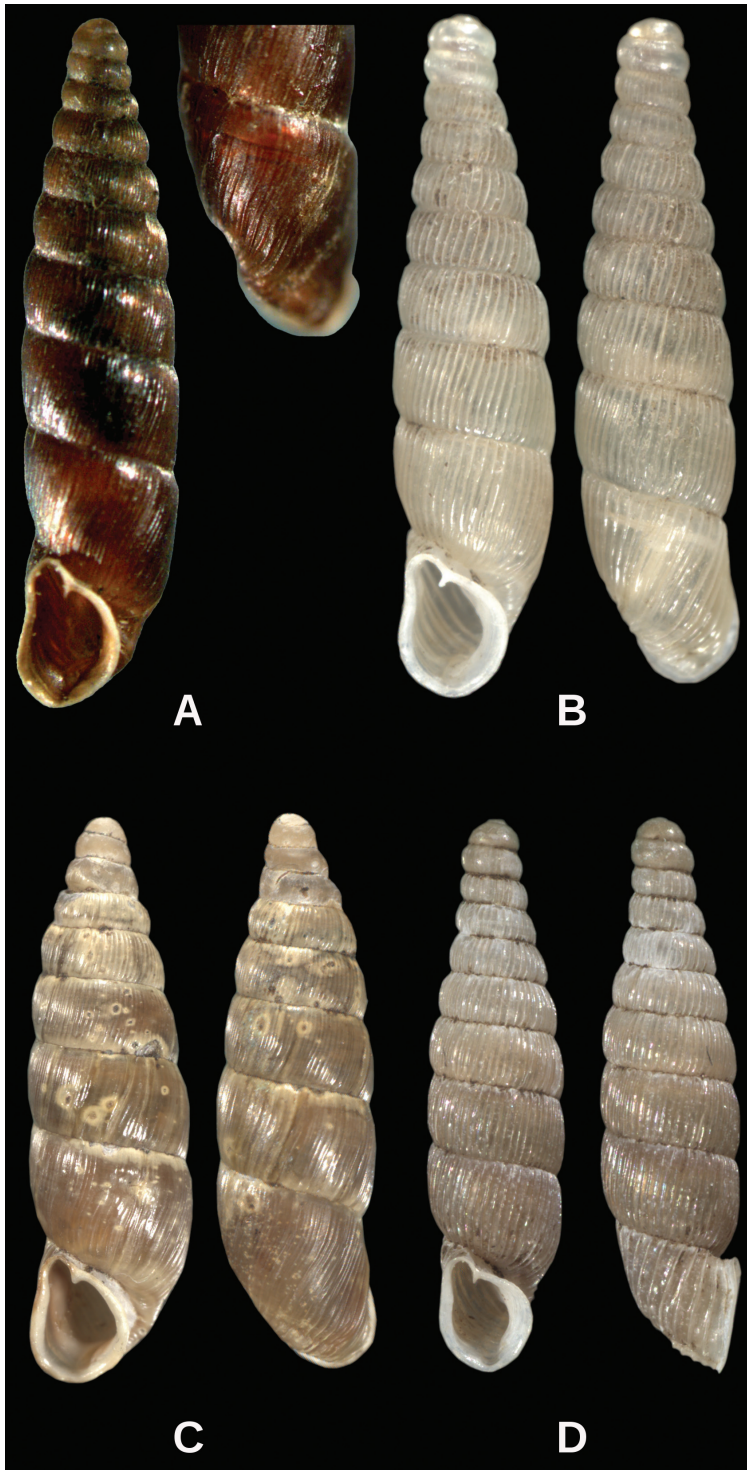


Figure 1. Genus *Euxinella*. **A** *E. alpinella* sp. n. **B** *E. r. radikae* **C** *E. subatii*; **D** *E. r. hristovskii*



Figure 2. Republic of Macedonia, Nidzhe Mountains, Belo Grotlo peak, type locality of *E. alpinella* sp. n.

with pronounced basal keel; aperture pear-shaped, in some specimens a slight palatal thickening present situated in parallel to its edge; well developed basal canal, often with a short basalis on its left margin; superior lamella connected with spiralis through a slight depression in the contact zone (or both situated very close, not connected); inferior lamella (columellaris) well developed running steeply nearby parietal side; lunella in dorsal position, sometimes reduced to a pale thickening or short straight plica; principal plica well developed; upper palatalis present, very short; subcolumellar lamella long and visible from outside the aperture, often forming part of the right margin of the basal canal; clausilium partly visible from outside the aperture, oval-orthogonal, distally with a weak edge.

Etymology. This species is named “*alpinella*” because of its isolated type locality in the alpine area.

Distribution. *Euxinella alpinella* sp. n. occurs in open alpine terrains on limestone, up to 2000 m a.s.l. Until now, the species is known only from its type locality, Nidzhe Mountains, in the southern part of the Republic of Macedonia.

Ecology. This species occurs on rocky alpine meadows above the timber line, on limestone rocks and in their crevices and under stones.

Comments. *Euxinella alpinella* sp. n. is now the fourth representative of the genus *Euxinella*. It shows shell morphological characters more similar to the forest species

Table 1. Measurements (in mm) of *Euxinella alpinella* sp. n. and variation of the clausilium apparatus. Abbreviation: H – height of shell, D – diameter of shell, W – number of whorls, We - number of whorls of the protoconch, H_p – height of peristome, D_p – diameter of aperture, R₁ – ribs on 1mm of the last whorl. Holotype - №4.

	H	D	W	We	H _p	D _p	R ₁	superior+spiralis	basalis
1	10.56	2.64	9	2.5	2.4	1.68	12	connected	lack
2	9.36	2.52	8.5	2	2.28	1.68	10	separated	present
3	9.48	2.64	9	2	2.52	1.56	9	separated	lack
4	10.44	2.64	10	2.5	2.4	1.56	8	connected	present
5	9.84	2.52	9	2	2.4	1.68	9	connected	present
6	9.12	2.4	9	2	2.04	1.56	8	separated	lack
7	9.36	2.64	8.5	2.5	2.52	1.56	11	connected	lack
8	9.6	2.52	9	2.5	2.4	1.68	9	connected	present
9	8.88	2.52	9	2	2.16	1.44	8	separated	lack
10	9	2.52	9	2	2.28	1.56	6	connected	lack
Average	9.56	2.56	9	2.2	2.34	1.6	9	--	--
Variance	0.32	0.01	0.17	0.07	0.02	0.01	2.89	--	--

E. subaii, than to the petrophilous species *E. radikae* (trace of palatal callus, long subcolumellar lamella, basalis present). In *E. radikae*, the subcolumellaris ends at the level of the lunellar system, which this forms part of the definition of the genus (see also Dedov and Neubert 2009). However, *E. alpinella* sp. n. is the second species which shows differences in this character. As an „alpine form“ (for this term cf. Nordsieck 2008), *Euxinella alpinella* sp. n. shows the highest shell morphological variation among all species of the genus *Euxinella* (different level of reduction of the clausilium apparatus – present or missing of basalis, upper palatal plicae and palatal callus; different intensity of development of lunella – pale thickening or short straight plicae; connected or separated lamella superior and spiralis). The morphological similarity between *E. subaii* and *E. alpinella* indicates some affinities between both taxa, and their particular distribution ranges, the Kozhuf and Nidzhe mountain, are quite close. Probably, both species originate from a parent taxon whose populations have been isolated ecologically (*Euxinella subaii* in deciduous forests, *Euxinella alpinella* sp. n. in alpine mountain meadows and on as well as under rocks). A similar distribution pattern of related species from the Kozhuf and Nidzhe Mountains can even be observed in more mobile organisms such as *Tapinopterus heyrovskii* Jedlicka, 1939 and *Tapinopterus purkynei* Jedlicka, 1928 (Coleoptera: Carabidae), and *Dorcadion heyrovskii* Breuning, 1943 and *Dorcadion purkynei* Heirovsky, 1925 (Coleoptera: Cerambycidae) (Hristovski pers. comm.).

Key for determination of the species and subspecies of the genus *Euxinella*.

- 1(4) Subcolumellaris ends at the level of the lunellar system. Palatal callus missing.
 2(3) Colour of the shells more yellowish-greenish, basal keel finer, R2 7–18
*E. radikae radikae*

- 3(2) Colour of the shells deeper brown, basal keel stronger, R2 21
 *E. radikae bristovskii*
- 4(1) Subcolumellaris running parallel to basal canal. Palatal callus present.
- 5(6) Palatal callus pale or often missing in some extreme forms, basalis shorter or
 missing *E. alpinella*
- 6(5) Palatal callus well developed, basalis longer *E. subaii*

***Vestia lazarovii* sp. n.**

urn:lsid:zoobank.org:act:3338D8CD-0D44-4C78-8511-0198A58E3A10

http://species-id.net/wiki/Vestia_lazarovii

Fig. 3

Locus typicu. Republic of Macedonia, Baba (= Pelister) Mountains near Kopanke hut, 41°01'59.7"N, 21°13'09.0"E, 1639 m a.s.l., *Pinus peuce* forest ecotone, under logs of dead wood and fallen trunks, 03. September 2002, leg. S. Lazarov, (2 empty shells); from the same site, 16. June 2009, leg. I. K. Dedov (12 specimens, collected alive, dried).

Additional material. Republic of Macedonia, Pelister (= Baba) Mountains, Palisnojpe area, 1450 m a.s.l., *Pinus peuce* forest ecotone, under logs and fallen trunks, 16. June 2009, leg. T. Mitev, (2 empty shells).

Type material. holotype SMF 336343, paratypes (n = 13 specimens) SMF 336344/2 specimens; NMNHS/2 specimens; DED/MK 453/2 specimens; DED/MK 636/9 specimens; Pelister Mountains, Palisnojpe area, 1450 m. a.s.l., DED/MK637/2 specimens).

Differential diagnosis. This species differs from *Vestia roschitzi* (Brancsik, 1890) and *V. ranojevici* (Pavlovic, 1912) by the wide spiral turn of its inferior lamella; from *V. elata* (Rossmässler, 1836), *V. gulo* (E. Bielz, 1859) and *V. turgida* (Rossmässler, 1836) by the missing lunella.

Description of type series. shell relatively small, spindle shaped, yellow-brownish coloured; whorls 8.5–9.5, including 2–2.5 smooth protoconch whorls; teleoconch ribbed (R = 38–54); aperture oval pear-shaped with a whitish, weakly reflected lip; a pale palatal callus present in some specimens; basal canal and keel missing; sinulus wide, not inclined to the shell axis; superior lamella connected with spiralis or close to it; inferior lamella turning widely-spirally; lunella and basalis missing; principal and upper palatal plica usually present; principal plica very short to about 1/3 of the last whorl; upper palatal plica short or missing; clausilium plate varying from hook-shaped in its end as is typical for *Vestia*, or with a weak hook and thin clausilium plate.

Etymology. This species is named after the Bulgarian arachnologist Dr. Stoyan Lazarov-Panagyrsky, B. A. S., Institute of Zoology, who was the first to collect this species.

Distribution. *V. lazarovii* sp. n. is currently only known from two sites at 1450 and 1650 m a.s.l. from the Pelister (= Baba) Mountains, Republic of Macedonia.



Figure 3. *Vestia lazarovii* sp. n.

Ecology. This species occurs in the *Pinus peuce* forest ecotone, under logs of dead wood near Kapanke hut, as well as in the *Pinus peuce* forest ecotone in the Palisnopje area, under logs and fallen trunks.

Comments. The first species of genus *Vestia* to be reported from Macedonia (Urbanski 1960) was *V. ranojevici*. Nordsieck (1974) reported it from the Osogovo Mountains, Kalin Kamen area, 1560 m a.s.l., Kriva Palanka district, near to the border with Bulgaria. *V. lazarovii* sp. n. is the second representative of the genus from the Republic of Macedonia and occurs relatively high up in the mountains (in coniferous forests and its ecotone) and is characterized by a quite strong reduction of the clausilium apparatus (reduced lunella, short principal and short or missing upper palatal plicae, missing basalis, sometimes very fine and thin clausilium plate with weakly developed hook at its end). A connection between superior and spiral lamellae is typical for the

Table 2. Measurements (mm) of the *Vestia lazarovii* sp. n. and variation of the clausilium apparatus. Abbreviation: H – height of shell, D – diameter of shell, W – number of whorls, We - number of whorls of the protoconch, H_p – height of peristome, D_p – diameter of aperture, R – ribs on the last whorl. Holotype - №6.

	H	D	W	We	H _p	D _p	R	superior+spiralis	hook shape of clausilium
1	9.94	3.00	9	2.5	2.8	2.2	38	connected	prominent
2	9.45	3.1	9	2.5	2.6	2.2	44	separated	broken off
3	10.43	3.2	9	2.5	2.95	2.45	48	separated	not visible
4	9.03	3.1	8	2	2.85	2.05	54	separated	weakly prominent
5	10.43	3.15	9	2.5	2.85	2.35	48	connected	broken off
6	10.64	3.2	9.5	2.5	2.9	2.2	45	connected	prominent
7	10.99	3.25	9.5	2.5	3	2.2	44	separated	weakly prominent
8	10.07	3.05	9	2	2.95	2.1	46	separated	broken off
9	9.73	3.3	9	2	3	2.3	45	separated	prominent
10	9.24	2.95	8.5	2.5	2.9	2.1	42	separated	weakly prominent
Average	10	3.13	8.95	2.35	2.88	2.22	45.4	--	
Variance	0.41	0.01	0.19	0.06	0.01	0.02	17.6	--	

genus *Vestia*, so the specimens with disconnected superior and spiral lamellae could be also interpreted as showing initial reduction in this part of the clausilium apparatus.

Acknowledgments

I want to thank Dr. Stoyan Lazarov, BAS, Institute of Zoology, who collected the first specimens of *Vestia lazarovii* and forwarded them to me for research, and also to Ulrich Schnepf and Ivailo Stoyanov for checking English of the text. I also thank Dr. Eike Neubert, Naturhistorisches Museum der Burgergemeinde, Bern, Switzerland, for taking most of the photographs. I am also indebted to Hartmut Nordsieck, as he was the first to recognize the specimens of *Vestia lazarovii* sp. n. as being members of an undescribed species.

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On the spider genus *Amaurobius* (Araneae, Amaurobiidae) in India and Nepal

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Abstract

A new species, *Amaurobius koponeni* **sp. n.**, is described from Himachal Pradesh on the basis of a male specimen. A key to all five genera of Amaurobiidae that occur in Asia is provided. Four species from India and Nepal incorrectly assigned to *Amaurobius* are transferred to three genera of Titanocidae: *Anuvinda milloti* (Hubert, 1973), **comb. n.**, *Pandava andhraca* (Patel & Reddy, 1990), **comb. n.**, *P. nathabharii* (Patel & Patel, 1975), **comb. n.**, and *Titanoeca sharmai* (Bastawade, 2008), **comb. n.**

Keywords

Amaurobiidae, Titanocidae, India, Asia, key, new combination

Introduction

Amaurobius C.L. Koch, 1837, is a rather large genus with 68 valid species names (Platnick 2011). It has a primarily Holarctic distribution. Only six species of this genus have been recorded outside of this region: *A. andhracus* Patel & Reddy, 1990, *A. nathabharii*

Patel & Patel, 1975, *A. sharmai* Bastawade, 2008 (all in India), *A. thoracicus* Mello-Leitão, 1945 (Argentina), *A. tristis* L. Koch, 1875 (Eritrea) and *A. yanoianus* Nakatsudi, 1943 (Micronesia). Only the first two of these are known from both sexes. The other species are known either from female or by juvenile (*A. thoracicus*) specimens and appear to have been incorrectly assigned to the genus and even possibly to the family.

Recently, we found a specimen belonging to *Amaurobius* from northern India and whilst trying to identify it, we checked all species (descriptions) known from India and Nepal. The study of these descriptions revealed that all the so-called amaurobiid species were misplaced and actually belong to Titanoecidae, and at least *Amaurobius sharmai* is likely to belong to *Titanoeca* Thorell, 1870. Another *Amaurobius*, *A. milloti* Hubert, 1973, known from Nepal also seems to have been misplaced and belongs to the titanoecid genus *Anuvinda* Lehtinen, 1967.

The aims of this paper are to describe a new species of *Amaurobius*, to provide a key to the amaurobiid genera that occur in Asia, and to transfer the misplaced species to Titanoecidae.

Material and methods

Microphotographs were made with an Olympus Camedia E-520 camera attached to an Olympus SZX16 stereomicroscope at the Zoological Museum, University of Turku. Digital images were montaged using “CombineZP” image stacking software. Photographs were taken in paraffin-based dishes using different sized holes to keep the samples in the required position. The holotype of the new species is preserved in the collections of the Museo Civico di Storia Naturale di Verona, Italy (MSNV). Comparative specimens illustrated are from Russia, Kunashir Island (*Cybaeopsis* and *Callobius*) and Magadan Area (*Arctobius*) and from Finland (female of *Amaurobius fenestralis*).

All measurements are in millimetres.

Taxonomic survey

To date, five genera of amaurobiid spiders have been recorded from Asia east of the Caucasus: *Amaurobius* C.L. Koch, 1837 (India), *Arctobius* Lehtinen, 1967 (the whole of Siberia south to Mongolia), *Callobius* Chamberlin, 1947 (Far East), *Cybaeopsis* Strand, 1907 (Far East) and *Taira* Lehtinen, 1967 (Far East and South East). All genera except *Arctobius* (subfamily Arctobiinae) belong to the nominative subfamily Amaurobiinae. *Arctobius* differs distinctly from all other amaurobiids by colour, markings and eye arrangement. Amaurobiinae genera can be relatively easily distinguished by the structure of the palp in males and the epigyne in females. *Taira* has a reduced or absent retrolateral tibial apophysis (cf. Zhang et al. 2008; Wang et al. 2010). *Callobius* and *Cybaeopsis* differ from other genera by possessing a strong and long dorsal tibial

apophysis, and in having the epigyne divided into two lobes. In *Callobius* the epigyne has a median lobe which is absent in *Cybaeopsis* (Ubick 2005). *Amaurobius* has a dorsal tibial apophysis without long extensions and the epigyne is transverse and undivided.

Key to the genera of Amaurobiidae found in Asia

Females of *Amaurobius* and *Taira* have no distinct morphological differences (cf. Zhang et al. 2008)

- 1 Anterior median eyes equidistant from each other and anterior lateral eyes; abdomen with dark median band (*Mb*, Fig. 9), male palpal tibia without dorsal apophysis (Fig. 11), epigyne with strongly sclerotized median part of median plate (Fig. 10). Occurs in the whole of Siberia south to Mongolia....
.....*Arctobius agelenoides* (Emerton, 1919)
- Anterior median eyes closer to each other than to lateral eyes; median band not developed or developed only in anterior half (Fig. 1), male palpal tibia with distinct dorsal apophysis (Figs 2, 4–8, 13, 15), epigyne bilobate (Figs 12, 14) or with weakly sclerotized median plate (Fig. 16) **2**
- 2 Dorsal tibial apophysis long, partly overlying cymbium (Figs 13, 15), epigyne bilobate (Figs 12, 14)..... **3**
- Dorsal tibial apophysis massive (Figs 2, 4–8), but not long, not overlying cymbium, epigyne with median plate, not bilobate (Fig. 16) **4**
- 3 Dorsal tibial apophysis with three branches (*Bd*), retrolateral tibial apophysis (*Ra*) bilobate on the top (Fig. 13), epigyne without median lobe (Fig. 12). Occurs in Far East Asia. *Cybaeopsis typicus* Strand, 1907
- Dorsal tibial apophysis not subdivided (Fig. 15), retrolateral tibial apophysis (*Ra*) elongate dorsally; epigyne with median lobe (Fig. 14). Occurs in Far East Asia *Callobius*
- 4 Retrolateral tibial apophysis large (Figs 2–5, 8); tegular apophysis located near the base of median apophysis. Epigyne with transverse lobe or fovea (Fig. 16). Occurs in northern India..... *Amaurobius*
- Retrolateral tibial apophysis small (knob-like) or absent; tegular apophysis originates near base of embolus. Occurs in Japan and China..... *Taira*

Comments. *Cybaeopsis* Strand, 1907 is a relatively small genus with 11 species, of which only one, *C. typica* Strand, 1907, occurs in Japan and the Russian Far East (Sakhalin, South and Middle Kuril Islands (Platnick 2011)). The remaining 10 species are restricted to the Nearctic. *Callobius* Chamberlin, 1947 is a rather large genus with 30 species distributed in the Western Palaearctic, Far East Asia (Japan, Korea and Kunashir Island) and the Nearctic. Only three species are known from Asia: *C. hokkaido* Leech, 1971 (Hokkaido and Kunashir Islands), *C. koreanus* (Paik, 1966) (Korea) and

C. akushimensis Okumura, 2010 (Japan) (cf. Platnick 2011; Marusik and Kovblyuk 2011). *Taira* Lehtinen, 1967 is a relatively small genus with 11 species restricted to China and Japan (Platnick 2011).

***Amaurobius koponeni* sp. n.**

urn:lsid:zoobank.org:author:36297992-069D-47FC-9B60-9B26EB2C7698

http://species-id.net/wiki/Amaurobius_koponeni

Figs 1–8

Type material. Holotype ♂ (MSNV), India, Uttar Pradesh, Farrukhabad District, Kaimganj City [=27.550°N, 79.332°E], 23.03.2003 (F. Abrescia).

Etymology. The species is named after our friend and colleague Seppo Koponen (Turku, Finland).

Diagnosis. The new species differs distinctly from other congeners by the shape of the tibial apophysis and the median apophysis.

Description. Total length 9.8. Carapace length 4.95, width 3.4. Habitus as in Fig. 1. Carapace light brown with dorsal darker radiating strips, fovea and eye region dark brown. Chelicerae dark, swollen in front with four posterior and five anterior teeth.

Legs light brownish without rings, tarsi with three claws, scopula and claws tufts absent. Calamistrum about 1/3 of metatarsus length.

Length of leg segments:

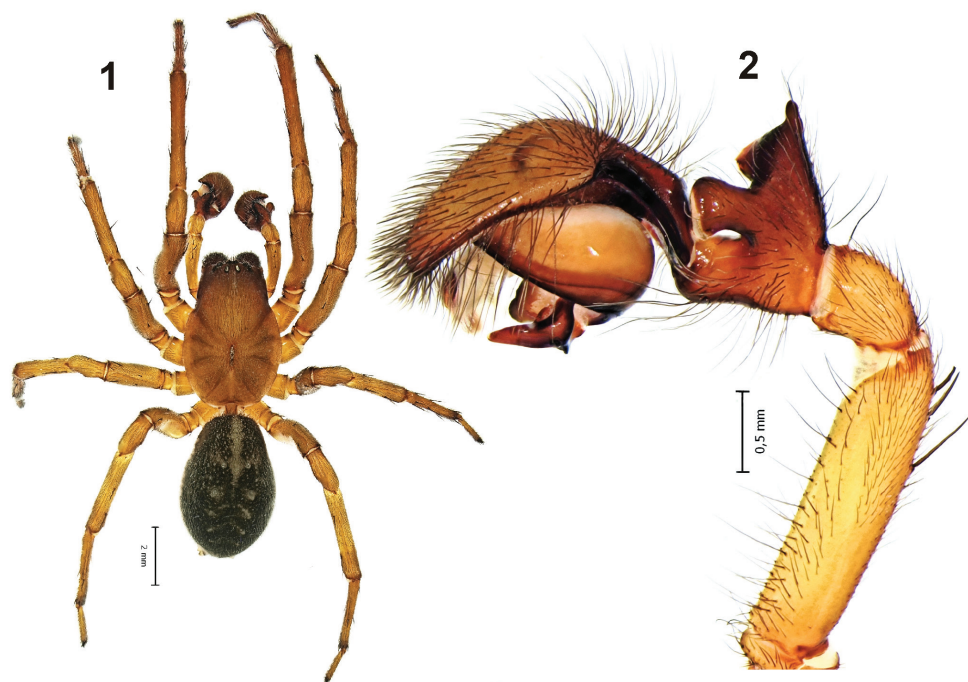
Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
I	4.20	1.70	4.03	4.23	1.93	16.09
II	3.60	1.68	2.83	2.93	1.50	12.54
III	3.10	1.38	2.18	2.48	1.30	10.44
IV	3.78	1.53	3.13	3.28	1.48	13.20

Leg spination:

Leg	Femur	Patella	Tibia	Metatarsus
I	d1 r1 p1	r1 p0	r2p3 v2-2-2	r3 p5 v2-2-1
II	d1 r1 p1	r1 p1	r2p3 v2-2-2	r3 p5 v2-2-1
III	d1/2 r2 p1	r1 p1	r2/3 p2 v2-2-2	d2 r5 p6 v2-2-1
IV	d1 r1 p0	r1 p0	r2 p0/1 v1-1-2	d1 r3 p4 v2-1-1

Sternum without pattern, same colour as carapace. Abdomen dark grey with dorsal and ventral pattern, cribellum clearly visible.

Palp as in Figs 2–8, tibia with large square-shaped retrolateral tibial apophysis (*Ra*) originating near the base of the tibia and almost as long as the tibia In ventral view the tibia and *Ra* have a V-shape; dorsal tibial apophysis (*Da*) large and massive, its length almost twice as long as the diameter of the tibia; intermediate apophysis not developed



Figures 1–2. Male of *Amaurobius koponeni* sp. n. **1** habitus **2** left palp, retrolateral.

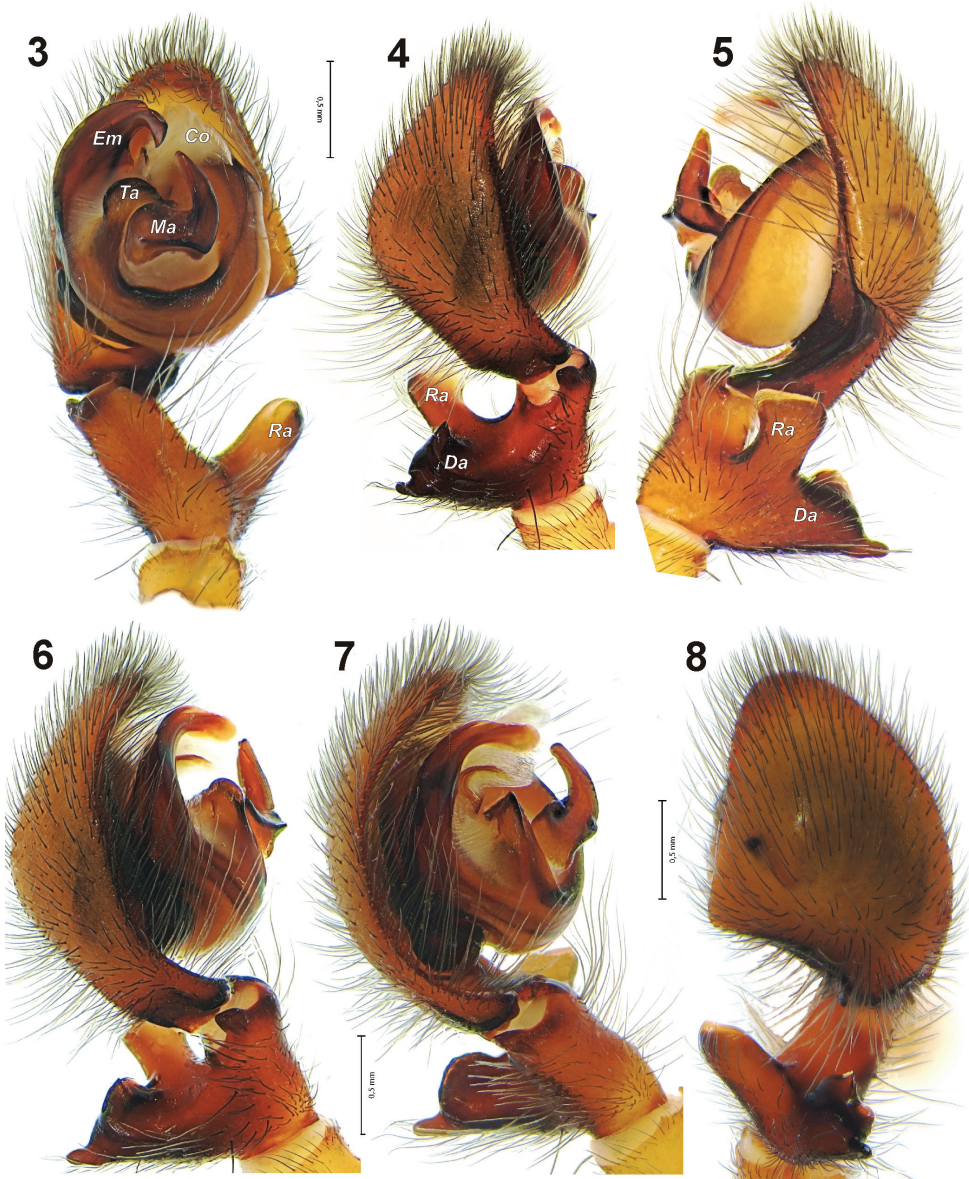
(or fused with *Da*). Retrobasal part of cymbium with long fold of about $\frac{1}{2}$ of the cymbium. Median apophysis (*Ma*) massive, located in the center of the tegulum, basal half of it horizontal and terminal part almost vertical; conductor wide, as wide as basal half of *Ma*; embolus (*Em*) sharply pointed.

Distribution. The new species is known from the type locality only, the area near the city of Kaimganj in Uttar Pradesh, India.

Notes on species misplaced in *Amaurobius*

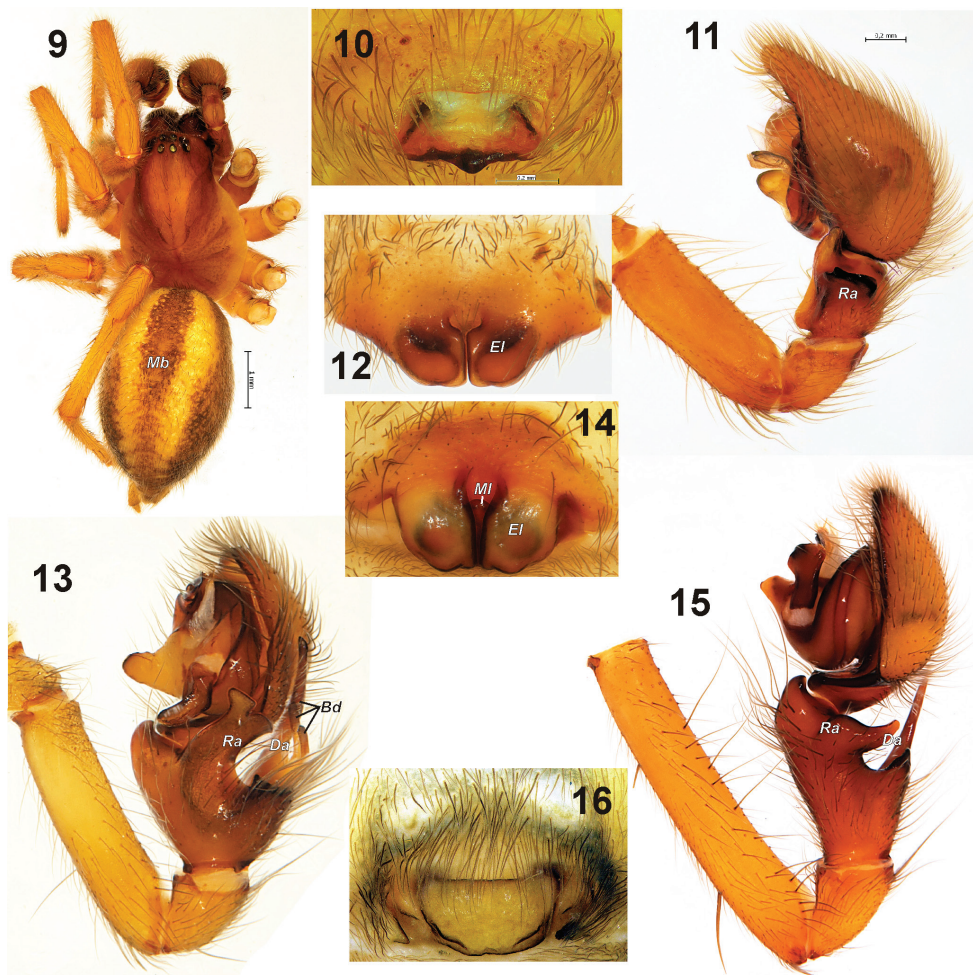
As mentioned above, three species of *Amaurobius* (*A. andhracus* Patel & Reddy, 1990, *A. nathabhahi* Patel & Patel, 1975 and *A. sharmai* Bastawade, 2008) have been recorded from India (Platnick 2011) and one more species is known from Nepal (*A. milloti* Hubert, 1973). All these species were misplaced in Amaurobiidae and actually belong in Titanocidae. It is worth mentioning that recently one more species, *A. indicus* Bastawade, 2002 was described in the genus. Again, this was misplaced and it actually belongs in Corinnidae. It would appear that the Indian authors have an incorrect concept of the genus and of the family in general.

The genus *Pandava* was revised by Almeida-Silva et al. (2010) and five species were described as new to science. Of these, four species were described from India: *P. shiva*



Figures 3–8. Left palp of *Amaurobius koponeni* sp. n. **3** ventral **4, 6–7** prolateral, different aspects showing the shape of the complex dorsal tibial apophysis **5** prolateral **8** dorsal. Abbreviations: *Da* dorsal tibial apophysis, *Em* embolus, *Ma* median apophysis, *Ra* retrolateral tibial apophysis, *Ta* tegular apophysis.

Almeida-Silva et al., 2010, *P. ganga* Almeida-Silva et al., 2010, *P. kama* Almeida-Silva et al., 2010 and *P. ganesh* Almeida-Silva et al., 2010 (Fig. 17). Therefore, it is possible that some of their new names may be synonyms of Indian “*Amaurobius*”.



Figures 9–16. Habitus and copulatory organs of *Arctobius agelenoides* (9–11, from Magadan Area), *Cybaeopsis typicus* (12–13, from Kunashir Island), *Callobius hokkaido* (14–15, from Kunashir Island) and *Amaurobius fenestralis* (16, from South Finland). **9** habitus **10, 12, 14, 16** epigyne, ventral **11, 13, 15** left palp retrolateral. Abbreviations: **Bd** branches of dorsal tibial apophysis, **Da** dorsal tibial apophysis, **El** lateral lobe of epigyne, **MI** median lobe of epigyne **Ra** retrolateral tibial apophysis.

***Anuvinda milloti* (Hubert, 1973), comb. n.**

http://species-id.net/wiki/Anuvinda_milloti

Amaurobius milloti Hubert, 1973a: 676, f. 1-6 (♂♀).

Comments. This species is perfectly described from central and eastern Nepal (Fig. 17). Judging from the structure of the male palp, and particularly the modified patella, it undoubtedly belongs to *Anuvinda* Lehntinen, 1967, the type species of which, *A. es-*

cheri (Reimoser, 1934) was recently well redescribed on the basis of both sexes by Almeida-Silva et al. (2009). Judging from the diagnosis and figures of the copulatory organs of *A. escheri* (Reimoser, 1934), it is very likely that the two names should be synonymized. An additional argument which supports their probable synonymy is the distribution of both species. *A. escheri* is known from central India (type locality), Thailand, Laos and southern China (Yunnan) and *A. milloti* has been recorded from several localities in central and eastern Nepal.

***Pandava andhraca* (Patel & Reddy, 1990), comb. n.**

http://species-id.net/wiki/Pandava_andhraca

Amaurobius andhracus Patel & Reddy, 1990: 41, f. 1a–h (♂♀).

Comments. This species was described on the basis of both sexes from Andhra Pradesh (Fig. 17), but the description and figures are of poor quality. Judging from the figures of the male palp this species belongs in Titanoecidae. Judging from the colour, shape of the epigyne and its distribution, the species belongs to *Pandava*, a titanoeid genus restricted to India, Sri Lanka, southern China, Myanmar and Thailand. The type species of the genus has a broader distribution. Judging from the shape of the epigyne, this species may be a junior synonym of *P. laminata* (Thorell, 1878), the type species of the genus, known from East Africa to the Philippines and Marquesas Islands.

***Pandava nathabhahi* (Patel & Patel, 1975), comb. n.**

http://species-id.net/wiki/Pandava_nathabhahi

Amaurobius nathabhahi Patel & Patel, 1975: 801, f. 1a–c (♀).

Comments. This species was described on the basis of the female sex from Gujarat (Fig. 17), but the description and figures are of very poor quality. This species is placed in Titanoecidae because the other Indian species placed in *Amaurobius* belong to Titanoecidae. It is transferred to *Pandava* because of its southern distribution.

***Titanoeca sharmai* (Bastawade, 2008), comb.n.**

http://species-id.net/wiki/Titanoeca_sharmai

Amaurobius sharmai Bastawade, 2008: 40, f. 1–12 (♂♀).

Comments. This species was described from the northeastern region of Himachal Pradesh, India (Fig. 17) on the basis of both sexes, but the figures and description are of rather poorly quality. The figures provided by the author, namely the tibial and



Figure 17. Distribution of *Amaurobius kaponeni* sp. n. (square), four species transferred here into Titanoecidae: *Pandava andhraca* 1 *P. nathabhaiti* 2 *Titanoeca sharmai* 3 *Anuwinda milloti* 4 and four *Pandava* species recently described from India: *P. shiva* 5 *P. ganga* 6 *P. kama* 7 and *P. ganasha* 8.

metatarsal spines on the legs in males and the structure of the palp, leaves no doubt that the species belongs in Titanoecidae. Although there are three titanoeid genera in India, judging from the locality, high elevation, and the unmodified male palpal patella, *A. sharmai* must be placed in *Titanoeca*. It is worth mentioning that this species may be a junior synonym of *T. intermedia* Caporiacco, 1934 (species incorrectly synonymized with *T. flavicoma* L. Koch, 1872), which was described from territories now belonging to northeastern Pakistan and from northern India (Jammu & Kashmir).

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A pair of new sister species of *Loneura* (Psocodea, 'Psocoptera', Ptiloneuridae) from Valle del Cauca, Colombia, representing a new infrageneric group

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Abstract

Two sister species of *Loneura*, from Valle del Cauca, Colombia, are here described and illustrated. They constitute a new species group that modifies the scheme of classification, proposed earlier for the genus by García Aldrete et al. (2011b). The new group is characterized by having the central sclerite of the male hypandrium with four posterior projections. A key to the males of Group II is included. The types are deposited in the Entomological Museum of the Universidad del Valle. Colombia may prove to be the most species rich area for *Loneura*.

Keywords

South America, classification of *Loneura*, species richness

Introduction

Recently, García Aldrete et al. (2011b), proposed a classification of *Loneura*, based on the structure of the male hypandrium and phallosome; in it, they recognized three groups of species and assigned the known species in them. A pair of undescribed sister species of *Loneura*, from Valle del Cauca, Colombia, have come since to our attention; they are remarkable in that they constitute a new species group in the genus, and our purpose in this paper is to describe them, and modify the scheme of classification originally presented, to include the new group they represent. The types are deposited in the Entomological Museum of the Universidad del Valle, Santiago de Cali, Colombia (MUSENUV).

Material and methods

Eight specimens were available for study, three of them were dissected in 80% ethyl alcohol, and their parts (head, right wings, right legs and genitalia), were processed in 100% ethyl alcohol, xilol, clove oil, and mounted on slides in Canada balsam (see González et al. 2011). Before dissection, color was recorded from whole specimens in 80 % ethyl alcohol, observed under a dissecting microscope illuminated with cold white light at 80×. Measurements (given in microns) of parts on the slides were taken with an ocular micrometer, mounted in a Nikon Eclipse 200 microscope. Abbreviation of parts measured are as follows: FW and HW: lengths of right forewing and hindwing, F, T, t1 and t2: lengths of femur, tibia and tarsomeres of right hind leg, ctt1: number of ctenidobothria on t1, Mx4: length of fourth segment of right maxillary palp, fl...fn: lengths of flagellomeres 1...n, of right antenna, IO, D and d, respectively: minimum distance between compound eyes, antero-posterior diameter and transverse diameter of right compound eye, all in dorsal view of head, PO: d/D. The illustrations were made from photographs, taken with a Nikon Coolpix 4500 digital camera, processed in a vector graphics editor CorelDRAW.

Taxonomy

Loneura andina sp. n. (Male)

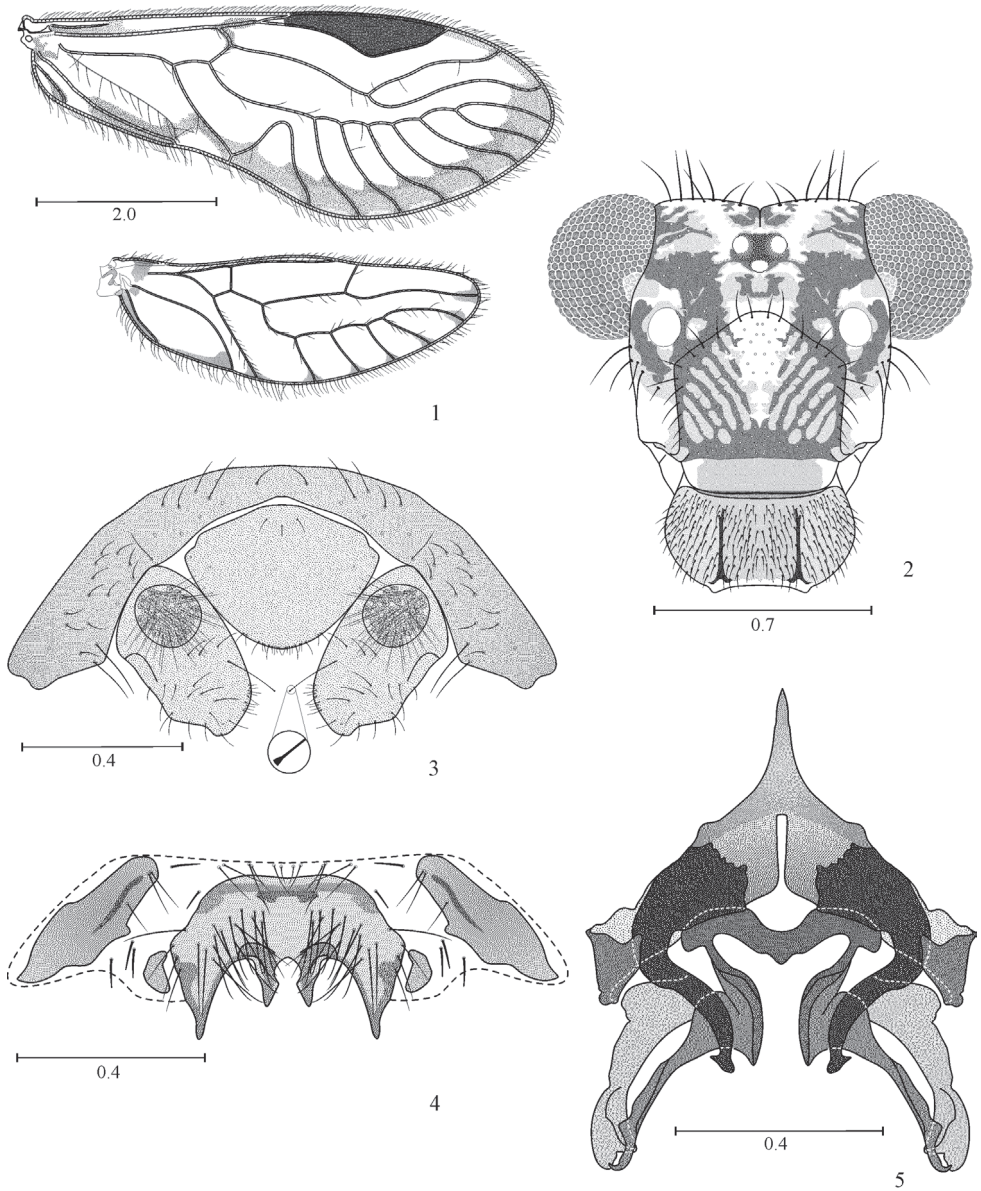
urn:lsid:zoobank.org:act:7039984F-EE31-4FF4-A0B7-A4F9D1968AC1

http://species-id.net/wiki/Loneura_andina

Figures 1–5

Type locality. COLOMBIA. Valle del Cauca. Santiago de Cali. Los Andes, Finca Montserrat, 1682 m., 3°25'57.3"N, 76°37'15.4"W.

Type material. Holotype male, 7.IX.2011. On tree trunk covered with mosses, R. González. Deposited in Entomological Museum, Universidad del Valle, Santiago de Cali, Colombia (MUSENUV, slide No. 25548).



Figures 1–5. *Loneura andina* sp. n. male **1** Forewing and Hindwing **2** Front view of head **3** Paraprocts and epiproct **4** Hypandrium **5** Phallosome. Scales in mm.

Etymology. The specific name refers to the type locality, Los Andes.

Diagnosis. Hypandrium of five sclerites, two side pairs flanking a large central sclerite, this with two large, lateral posterior projections, and two smaller median posterior projections (Fig. 4); phallosome (Fig. 5) Y-shaped anteriorly, external parameres stout, distally rounded, bearing pores; anterior pair of endophallic sclerites stout, bow-shaped, wide anteriorly, pointed posteriorly, with an acuminate projection on outer

edge; posterior pair of endophallic sclerites connected anteriorly by a curved bridge, each sclerite long, slender, wide proximally, hooked distally.

Color (in 80% ethyl alcohol). Body dark brown, with some creamy areas as indicated below. Head with a dark brown oblique band from each compound eye to epistomal sulcus, enclosing the antennal fossae (Fig. 2). Compound eyes black, ocelli hyaline, with ochre centripetal crescents, forming a triangular ocellar group. Vertex creamy white, with a brown spot on each side of the epicranial suture and irregular spots next to each compound eye. Postclypeus with diagonal brown striae. Anteclypeus and labrum brown. Genae creamy white. Antennae: scape brown, pedicel and flagellum pale brown. Mx 1–2 creamy white, Mx 3 brown and Mx 4 brown, with apical third dark brown. Tergal lobes of meso- and metathorax dark brown, thoracic pleura brown, except the metapleura, creamy white. Legs: coxa and trochanter of fore- and mid legs brown; coxa and trochanter of hind leg creamy white, femur of fore- and mid legs with proximal halves brown, distally creamy white; femur of hind leg creamy white, with a subapical brown band; tibiae of all legs brown, distally darker; tarsomere 1 brown, tarsomeres 2–3 dark brown (all legs). Forewings (Fig. 1) hyaline, veins brown, a brown marginal band from R4+5 to distal half of 1A, a brown spot distally on R 2+3, pterostigma dark brown. Hindwings with brown spots distally on the veins (Fig. 1). Abdomen creamy white, with irregular brown spots. Hypandrium yellowish, with sides dark brown; anterior side sclerites dark brown, posterior side sclerites pale brown. Paraprocts and epiproct creamy, with brown spots.

Morphology. As in diagnosis, plus the following: outer cusp of lacinial tip broad, with eight denticles. Forewing pterostigma elongate, widest in the middle; vein M with seven branches; areola postica tall, apically rounded (Fig. 1). Hindwing with M five branched. Paraprocts elongate, setose, each with a macroseta apically dilated, on inner edge, near the apex (Fig. 3); sensory fields with 30 trichobothria on basal rosettes (Fig. 3). Epiproct broadly triangular, wide based, anteriorly convex, posteriorly rounded, with setae as illustrated (Fig. 3).

Measurements. FW: 6025, HW: 4075, F: 1400, T: 2525, t1: 1012, t2: 87, t3: 150, ctt1: 30, fl: 1000, f2: 1075, f3: 950, Mx4: 350, IO: 685, D: 360, d: 495, IO/d: 1.38, PO: 1.3.

***Loneura tuluensis* sp. n.**

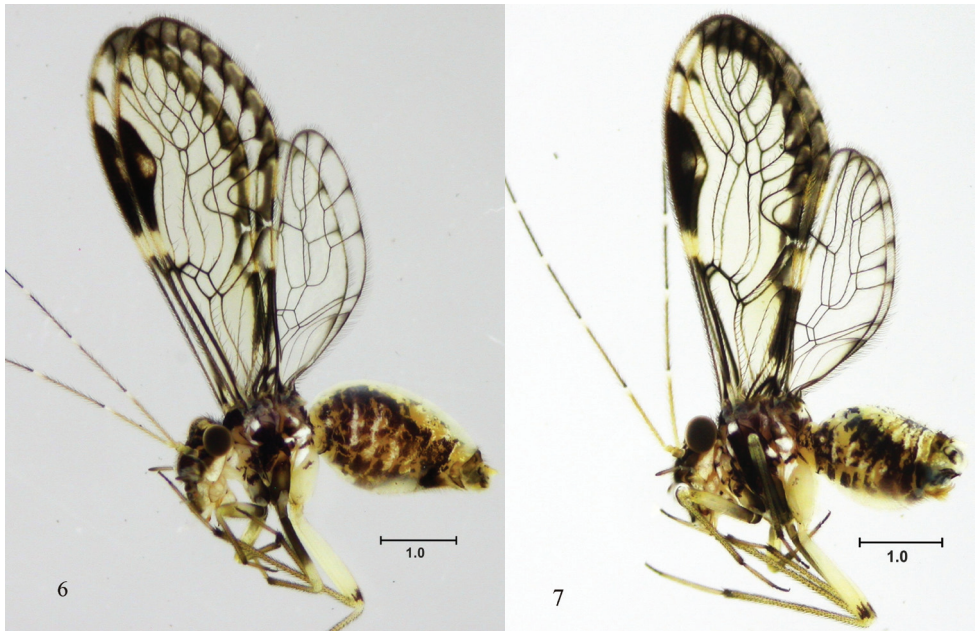
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http://species-id.net/wiki/Loneura_tuluensis

Figures 6–17

Type locality. COLOMBIA. Valle del Cauca. Tuluá, Mateguadua, Jardín Botánico Juan María Céspedes, 1127 m, 4°01'29.5"N, 76°09'45.4"W.

Type material. Holotype male. 27.VIII.2011. On tree trunk. Paratypes: 4 females, 2 males, same data as the holotype, on tree and palm trunks. All specimens collected by



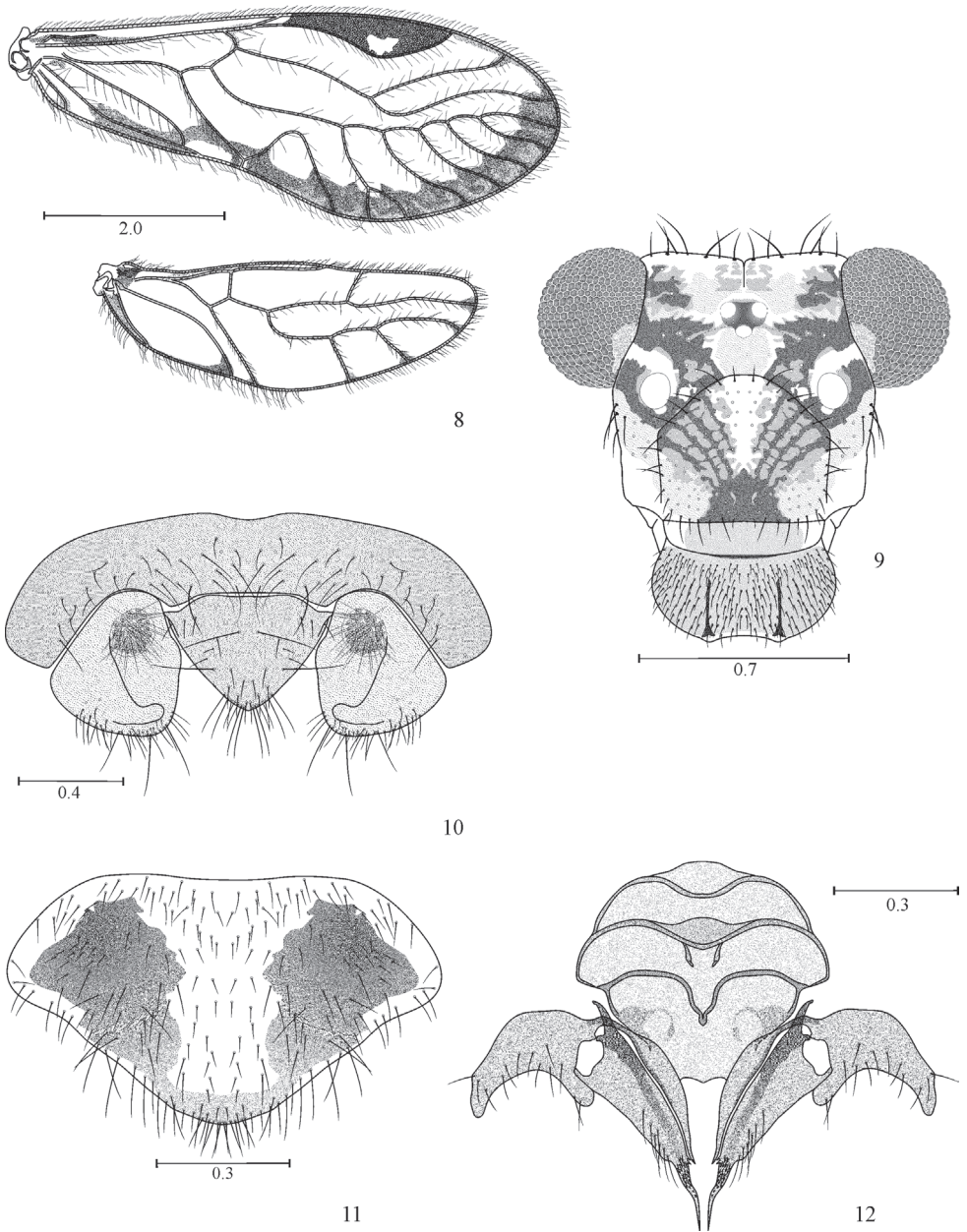
Figures 6–7. *Loneura tuluaensis* sp. n. Side view **6** female **7** male. Scale in mm.

R. González. Deposited in Entomological Museum, Universidad del Valle, Santiago de Cali, Colombia (MUSENUV, slides 25549-50, vial 25551).

Etymology. The specific name refers to the type locality, Tuluá.

Diagnosis. Male hypandrium of five sclerites, two side pairs, flanking a large central sclerite, this with two large, lateral posterior projections, and two small median posterior projections (Fig. 16). Phallosome (Fig. 17) Y-shaped anteriorly, external parameres elongate, rounded posteriorly, bearing pores; anterior endophallic sclerites bow-shaped, wide anteriorly, slender posteriorly; posterior endophallic sclerites long, slender, distally hooked, wide at base, connected by a broad, triangular bridge. Female ninth sternum (Fig. 12) well sclerotized, with three distinct areas.

Female. Color (in 80% ethyl alcohol). Body creamy with brown areas as indicated below (Fig. 6). Head with a wide brown band from each compound eye to epistomal sulcus, enclosing the antennal fossae (Fig. 9). Compound eyes black, ocelli hyaline, with ochre centripetal crescents, forming a triangular ocellar group. Vertex creamy, with brown irregular spots on both sides of epicranial suture and next to each compound eye. Postclypeus with diagonal slender striae. Anteclypeus and labrum pale brown. Genae creamy. Antennae: scape brown, pedicel and first flagellomere pale brown, rest of flagellomeres brown. Mx 1–2 creamy white, Mx 3 brown, Mx 4 brown, with apical third dark brown. Tergal lobes of meso- and metathorax brown, mesothoracic pleura dark brown, pro- and metathoracic pleura creamy white, with brown spots. Legs: coxa and trochanter of fore- and mid legs brown; coxa and trochanter of



Figures 8–12. *Loneura tuluaensis* sp. n. female **8** Forewing and Hindwing **9** Front view of head **10** Para- and epiproct **11** Subgenital plate **12** Gonapophyses and ninth sternum. Scales in mm.

hind leg creamy white, femur of fore- and mid legs with proximal halves brown, distal halves creamy white; femur of hind leg creamy white, with a brown apical band; tibiae of all legs brown, distally darker; tarsomere 1 of all legs brown, tarsomeres 2–3 of all legs dark brown. Forewings hyaline, with a marginal brown band as illustrated (Fig. 8);

pterostigma dark brown, except for a hyaline central area, with brown specks. Hindwings almost hyaline (Fig. 8), vein R 2+3 and branches of M with a brown distal spot. Abdomen creamy (Fig. 6), with brown irregular spots, subgenital plate creamy, middle area hyaline, sides pale brown; gonapophyses brown, IX sternum brown, epiproct and paraprocts creamy white.

Morphology. As in diagnosis, plus the following: outer cusp of lacinial tip broad, with 8–9 denticles. Forewings with pterostigma elongate, widest in the middle; vein M with six branches, the last one distally forked; areola postica tall, apically rounded (Fig. 8). Hindwing M with 3–4 branches (Fig. 8). Subgenital plate broad, posteriorly rounded, setae as illustrated (Fig. 11). Gonapophyses (Fig. 12): v1 long, slender, with inner edge more sclerotized, distally acuminate; v2+3 anteriorly heeled, with a group of 6–8 setae on side lobe; distal process long, sinuous, distally acuminate, with a field of minute setae. IX sternum well sclerotized, broadly nut shaped, with three transverse lobes, and well defined borders, as illustrated (Fig. 12). Paraprocts oval, with setae as illustrated (without distally dilated macrosetae); sensory fields with 28 trichobothria on basal rosettes (Fig. 10). Epiproct wide based, broadly triangular, posteriorly rounded, setose as illustrated (Fig. 10).

Measurements. FW: 6025, HW: 4100, F: 1400, T: 2375, t1: 1000, t2: 112, t3: 150, ctt1: 29, f1: 1100, f2: 1125, f3: 975, f4: 962, Mx4: 350, IO: 650, D: 370, d: 480, IO/d: 1.35, PO: 1.29.

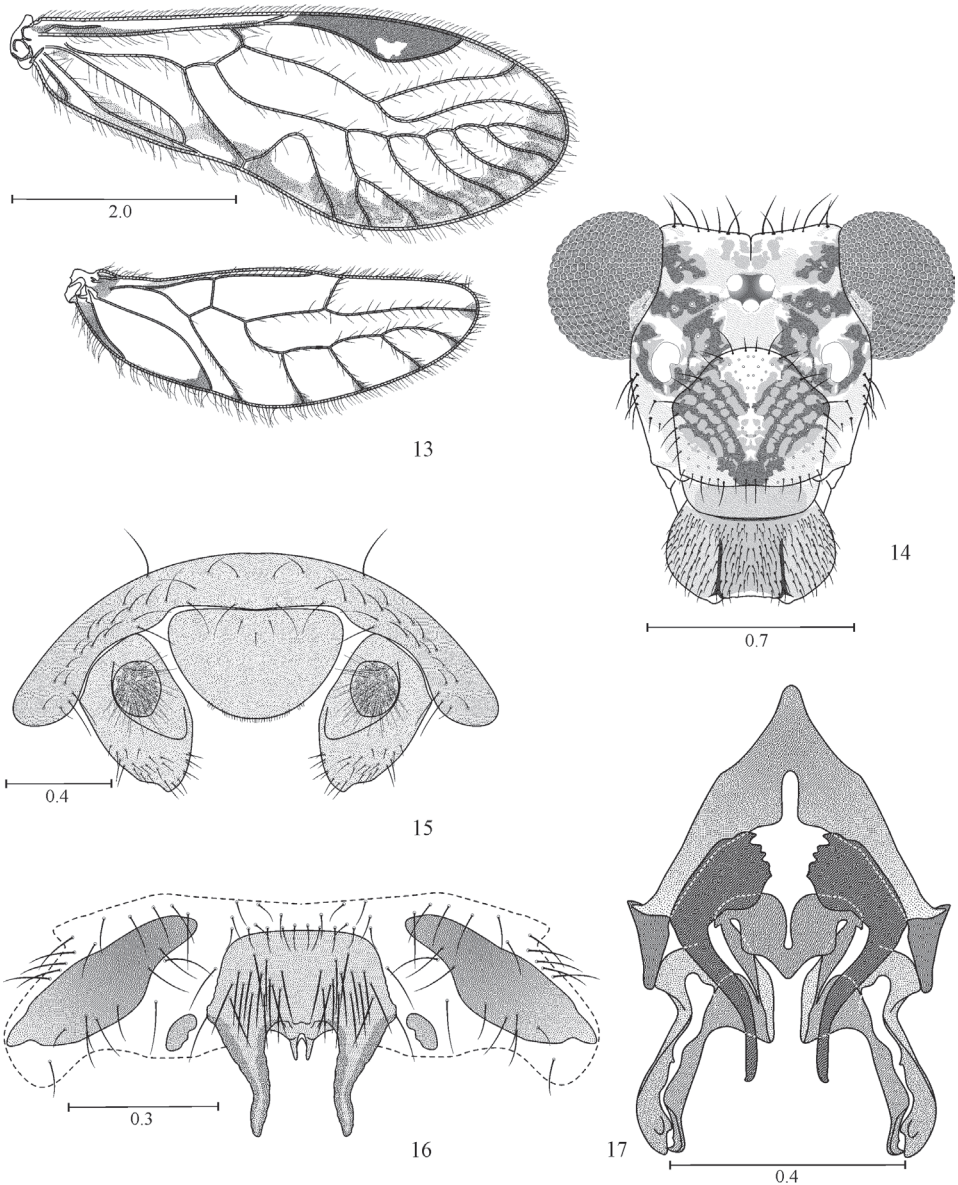
Male. Color. (in 80% ethyl alcohol). As in the female (Fig. 7), hypandrium yellowish.

Morphology. As in diagnosis, plus the following: outer cusp of lacinial tip broad, with nine denticles. Forewings as in the female (Fig. 13). Vein M mostly with six branches, often asymmetrical as in the females (6–6, 6–5, 5–6, or 6–7, for right and left forewings respectively), the last branch forked. Hindwing M four branched, often asymmetrical (4–3, 4–4, 5–4, for right and left hindwings respectively). Paraprocts broadly triangular, setae as illustrated (Fig. 15), sensory fields with 30 trichobothria on basal rosettes (Fig. 15). Epiproct broadly triangular, wide based, rounded posteriorly, with setae as illustrated (Fig. 15).

Measurements. FW: 5350, HW: 3675, F: 1350, T: 2300, t1: 962, t2: 100, t3: 150, ctt1: 31, f1: 1050, f2: 1100, f3: 950, f4: 800, Mx4: 337, IO: 590, D: 400, d: 530, IO/d: 1.11, PO: 1.3.

Discussion. The two species here described are regarded as sister species based on their similarities in forewing pigmentation pattern, shape of the pterostigma, structure of the hypandrium (constituted of five sclerites, the large central one with two pairs of posterior projections), and on the phallosomes built on the same structural plan (Y-shaped anteriorly, anterior pair of endophallic sclerites bow-shaped, basally wide, and posterior pair of endophallic sclerites slender, distally hooked, anteriorly connected by a broadly triangular bridge).

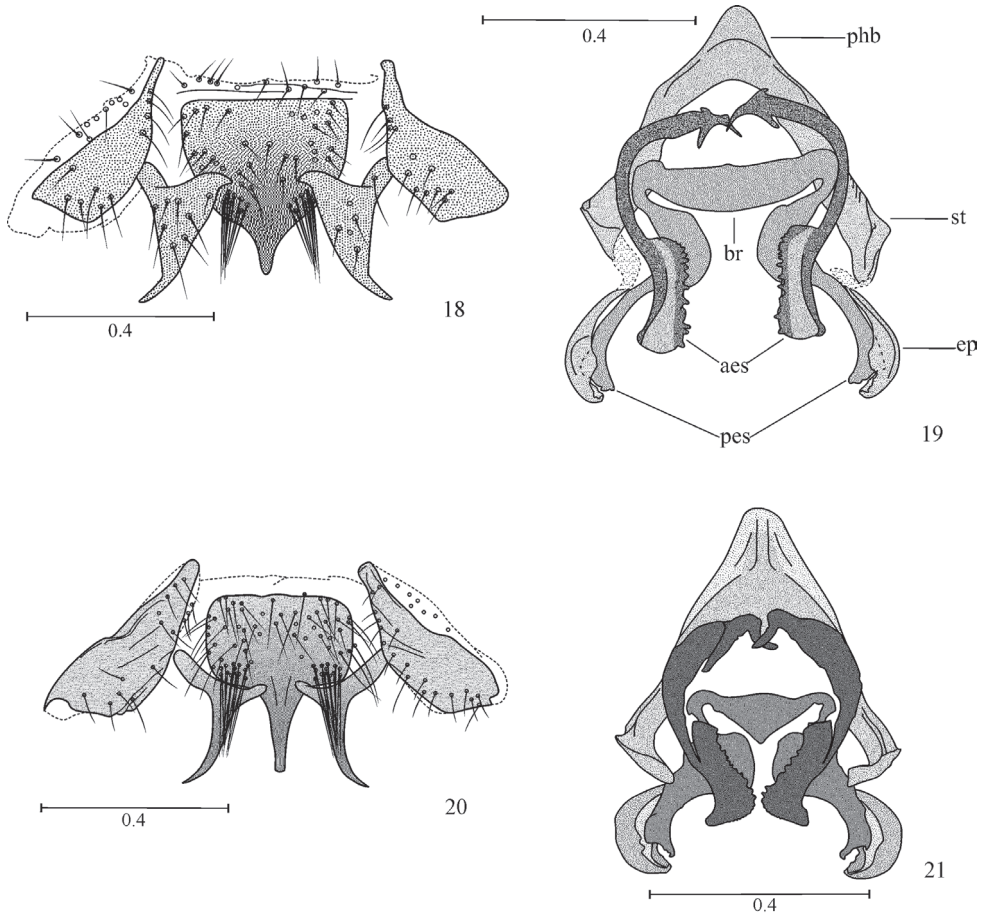
The morphology of the hypandrium and phallosome outlined above impose modifications on Group II, of the infrageneric groups within *Loneura*, proposed by García Aldrete et al. 2011b, as follows:



Figures 13–17. *Loneura tuluaensis* sp. n. male **13** Forewing and Hindwing **14** Front view of head **15** Paraprocts and epiproct **16** Hypandrium. **17** Phallosome. Scales in mm.

Group II. Hypandrium consisting of five sclerites, an anterior and a posterior pair, flanking a large central sclerite (Figs 4, 16, 18, 20). Phallosome with external parameres elongate, distally rounded, bearing pores; two pairs of endophallic sclerites, the posterior pair joined proximally by a sclerotized bridge.

Subgroup II a. Anterior side sclerites of hypandrium elongate, posterior side sclerites wide based, elongate, distally acuminate (Figs 18, 20); central sclerite with



Figures 18–21. Hypandrium and phallosome **18, 19** *L. jinotegaensis* García Aldrete **20, 21** *L. mirandaensis* García Aldrete. Scales in mm. (Abbreviations: ep, external parameres; aes, anterior endophallic sclerites; pes, posterior endophallic sclerites; br, bridge; st, side struts; phb, phallobase).

a median posterior projection, flanked by tufts of macrosetae. Phallosome with external parameres stout, distinctly curved, spoon-shaped; posterior pair of endophallic sclerites curved, acuminate; anterior pair of endophallic sclerites with proximal halves slender, curved, distal halves stout, quadrangular, with a row of blunt teeth along inner edge (Figs 19, 21). Species included: *L. jinotegaensis* García Aldrete (Nicaragua), *L. mirandaensis* García Aldrete (Venezuela).

Subgroup II b. Anterior side sclerites of hypandrium elongate, posterior side sclerites small, rounded (Figs 4, 16). Central sclerite with four posterior projections, two large on sides, and two small median ones (Figs 4, 16). Phallosome Y-shaped anteriorly, external parameres elongate, distally rounded; anterior pair of endophallic sclerites wide based, bow-shaped, posterior pair of endophallic sclerites slender, distally hooked (Figs 5, 17). Species included: *L. andina* García, Mendivil & González (Colombia), *L. tuluaensis* García, Mendivil & González (Colombia).

Key to males of *Loneura* Group II species

- 1 Central sclerite of hypandrium with one median posterior projection; posterior side sclerites large, wide at base, distally acuminate (Figs 18, 20); posterior endophallic sclerites joined proximally by a stout bridge (Figs 19, 21); Forewing pterostigma with large unpigmented area **[Subgroup II a] 2**
- Central sclerite of hypandrium with four posterior projections, two large lateral ones and two small median ones; posterior side sclerites small, rounded (Figs 4, 16); posterior endophallic sclerites joined proximally by a more slender bridge than above (Figs 5, 17); forewing pterostigma pigmented throughout, at most with small unpigmented area on lower apex **[Subgroup II b] 3**
- 2 Central sclerite of hypandrium with short, pointed median projection (Fig. 18), posterior side sclerites stout, broadly triangular; posterior endophallic sclerites distally slender, bridge straight anteriorly, slightly convex posteriorly (Fig. 19) ***L. jinotegaensis* García Aldrete**
- Central sclerite of hypandrium with long, distally truncate median projection, posterior side sclerites wide based, with median projection slender, acuminate (Fig. 20); posterior endophallic sclerites distally stout, bridge triangular (Fig. 21) ***L. mirandaensis* García Aldrete**
- 3 Central sclerite of hypandrium with lateral posterior projections wide based, of medium length, acuminate (Fig. 4); median projections long, stout; anterior endophallic sclerites apically with a pointed projection on outer edge (Fig. 5); forewing pterostigma pigmented throughout (Fig. 1) ***L. andina* García, Mendivil & González**
- Central sclerite of hypandrium with lateral posterior projections wide based, long, stout, blunt ended; median projections short, slender (Fig. 16); anterior endophallic sclerites apically blunt, without projection as above (Fig. 17); forewing pterostigma with a hyaline area on lower apex (Fig. 13) ***L. tuluensis* García, Mendivil & González**

Loneura presently includes 46 species, 22 of them undescribed; 21 of the undescribed species are available for study in our collections. Examination of 40 species of *Loneura*, allows us to assert that the following characters are important in distinguishing among the species in the genus:

1. Head pigmentation pattern.
2. Fourth segment of maxillary palps: unpigmented, pigmented throughout or only distally pigmented.
3. Forewings: pattern of pigmentation, number of branches of vein M, branches of M simple or forked.
4. Forewing pterostigma: general shape, pattern of pigmentation or absence of it.
5. Forewing areola postica: general shape.

6. Hindwing: pattern of pigmentation, number of branches of vein M.
7. Legs: pigmentation.
8. Hypandrium: number of sclerites, shape of side sclerites, shape of central sclerite, presence or absence of distinct groups of setae in it, number, position, shape and size of posterior projections.
9. Phallosome: Shape of anterior half, shape and size of external parameres, structure of the anterior and posterior pairs of endophallic sclerites.
10. Female subgenital plate: general shape, setal field, size and shape of side pigmented areas.
11. Ninth sternum: general shape, texture, pigmentation.
12. Gonapophyses: general shape of v1 and v2+3, number and position of setae on v2 lobe, size and shape of v2+3 heel, shape of v2+3 posterior process.

Table 1 presents the geographic distribution of the species known in *Loneura*. The species display a high level of endemism: of the eight Central American species, only two are shared with Mexico and none are shared with South America; of the 28 South American species, one is shared between Bolivia and Argentina, one is shared by Ecuador and Peru, and one is shared by Colombia and Venezuela, the rest are only known in their respective countries, probably a result of insufficient collecting in some areas.

The species here described raise to 11 the species of *Loneura* known in Colombia, four of them still undescribed (cf. García Aldrete et al. 2011a, b. Ten of the Colombian species are known only from Valle del Cauca (7 species) and from Gorgona Island (3 species), which account for less than 2% of the Colombian territory. Species richness

Table 1. Geographic distribution of *Loneura* species.

Area	Country	No. of species	Endemics
North America	USA	1	1
	Mexico	9	7
	Total	10	8
Central America	Belize	1	0
	Guatemala	1	0
	Nicaragua	4	2
	Costa Rica	3	2
	Panamá	1	1
	Total	9	5
South America	Argentina	1	0
	Bolivia	3	2
	Brazil	10	10
	Colombia	11	10
	Ecuador	1	0
	Peru	3	2
	Venezuela	2	1
	Total	28	25

of Colombian *Loneura* is likely much greater than currently documented. Ten additional species are known to occur in Brazil (Moreira de Castro 2007).

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