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Revision and phylogenetic analysis of *Chilicola sensu stricto* (Hymenoptera: Colletidae) with the description of a new species

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Abstract

The bee subgenus *Chilicola sensu stricto* Spinola (Colletidae: Xeromelissinae) is revised. The male and female of *Chilicola* (*Chilicola*) *luzmarieae* Gibbs and Packer, new species are described based upon material from Chile. New descriptions are also provided for the five additional species of this subgenus. A key to species is provided. A phylogenetic analysis of the subgenus shows that *Chilicola s. str.* and *Chilicola (Chilioediscelis)* are each monophyletic and sister groups to one another.

Key words: *Chilicola, Chilioediscelis,* Xeromelissinae, Colletidae, taxonomy, new species, phylogeny, Chile

Resumen

Se revisó el subgénero de abejas *Chilicola sensu stricto* Spinola (Colletidae: Xeromelissinae). Se describe el macho y la hembra de *Chilicola (Chilicola) luzmarieae* Gibbs y Packer, especie nueva, basado en material de Chile. Nuevas descripciones también se ofrecen para cinco especies adicionales de este subgénero. Se presenta una clave para separar las especies. Se incluye un análisis filogenético del subgénero que apoya monofilia de *Chilicola s. str.*

Palabras clave: *Chilicola, Chilioediscelis,* Xeromelissinae, Colletidae, taxonomia, especie nueva, filogenia, Chile

Introduction

Chilicola is a genus of small (3–9mm), hylaeiform, neotropical bees that are particularly abundant in Chile (Michener 1995, 2000, 2002). Considerable variation among species is seen in the hind leg structure of males. The subgenus *Chilicola s. str.* was known from a single Chilean species, *C. rubriventris* Spinola, until Toro and Moldenke (1979) described three new species in a revision of the Chilean Xeromelissinae. Two of the species, *C. aisenensis* Toro and Moldenke and *C. pangue* Toro and Moldenke, are known from single male specimens. Packer (2004) recently described a fifth species, *C. venticola* Packer, from Santa Cruz Province in Argentina. A revision of the subgenus *Chilicola s. str.* Spinola is presented including a description of a new species from Chile: *Chilicola (Chilicola) luzmarieae* Gibbs and Packer, new species. The subgeneric limits of *Chilicola s. str.* remains the same but additional synapomorphies of its included species are found. Keys for males and females are included.

The subgeneric classification of *Chilicola* has not yet been satisfactorily resolved. Toro and Moldenke (1979) recognized seven subgenera in Chile. The subgenera have since been reclassified by Michener (1995) who retained only four Chilean subgenera, *Chilicola s. str., C. (Anoediscelis), C. (Chilioediscelis)*, and *C. (Oediscelis).* Four additional non-Chilean subgenera have also been documented. (Michener 1995, 2000,

2002; Moure and Urban 2002). Michener (1995) cast doubt on his own classification and suggested the following two possibilities: 1) *C. (Chilioediscelis)* evolved from within *Chilicola s. str.* 2) *C. (Oediscelis)* and *Chilicola s. str.* should be combined. A preliminary phylogenetic analysis of *Chilicola sensu lato* failed to satisfactorily resolve the classification (Michener 2002). We present a phylogeny of *Chilicola s. str.* based on morphological data that suggests *C. (Chilioediscelis)* and *Chilicola s. str.* are indeed both monophyletic. Michener's classification of these two subgenera is retained. More evidence is required to determine the relationship of *Chilicola s. str.* to *Chilicola (Oediscelis)*.

Materials and methods

Descriptions

New descriptions are provided based on the descriptive format of Toro and Moldenke (1979) who revised the Xeromelissinae of Chile and originally described most of the species in this study. The redescriptions are not modifications or translations of Spinola (1851) or Toro and Moldenke (1979) and are based on a thorough examination of all species. The term 'thorax' is used in the strict sense throughout and is not meant to include the propodeum. We use the term corbicula to refer to scopal hairs that surround a bare space in which pollen is carried. Many Xeromelissinae have a sternal corbicula (Packer 2004). The following abbreviations are used: IOC — interocellar distance, OOC — ocellocular distance, UOD — upper interocular distance, LOD — lower interocular distance, i — interspace, d — puncture diameter (these two abbreviations are used in conjunction to give a relative measure of puncture density), and OD — median ocellus diameter (this abbreviation is used primarily as a relative measure of hair length). Individual segments of the metasomal terga and sterna and the antennal flagellomeres are referred to by the letter T, S, and F respectively followed by the appropriate number. Relative size measurements are often given as ratios based upon eyepiece graticule units. This system prevents the use of awkward numbers given in standard units. All measurements were made using a Leica MZ 125 microscope fitted with an ocular micrometer. Unique characteristics are italicized in descriptions.

Phylogenetic analysis

Four taxa from three additional subgenera of *Chilicola* were selected as outgroups based on a higher level phylogenetic analysis (Packer, unpublished data) and a preliminary phylogenetic analysis of *Chilicola s. l.* (Michener 2002). Initially, only *C. (Anoediscelis) herbsti* Toro and Moldenke, *C. (Oediscelis) vernalis* Phillipi, and *C. (Chilioediscelis) patagonica* Toro and Moldenke were selected as outgroups. However, it has been suggested in the past that *C. (Chilioediscelis)* may have evolved from within *Chilicola s. str.* (Michener 1995). For this reason a second species, *C. (Chilioediscelis) araucana* Toro and Moldenke was added to this analysis to better test the relationship of these taxa. The

recent collection of the female of this species (Packer 2004) facilitated this analysis.

The majority of characters were taken from males for two reasons: males of the genus *Chilicola* display many distinctive secondary sexual characteristics and females of two species (*C. pangue* and *C. aisenensis*) are unknown. Since only 10 taxa were examined an exhaustive cladistic search was possible. Uninformative characters (autapomorphies) were removed from the analysis. Data (Table 1) were initially entered into WinClada (Nixon 2002) before being exported to NONA (Goloboff 1993) for analysis. Characters were treated as unordered and weighted equally. Most parsimonious trees were found with command line "rs 0 h 100000 h/20 mu*20;". Bremer support values were subsequently found with the command "bs 10;". Symmetric resampling (Goloboff *et al.* 2003) support values were calculated using TNT (Goloboff *et al.* 2000). A traditional search was used to find most parsimonious trees. Symmetric resampling was then performed with probability set to 10, using groups from the tree found, for 10000 replicates. Frequency differences (GC) and frequency slopes were recorded from separate runs. Characters, states and explanations are included in the Appendix.

Results

Subgenus *Chilicola* Spinola s. str.

Chilicola Spinola, 1851, Hist. Fis. Pol. Chile. Zool. Type Species: *C. rubriventris* Spinola, 1851, designated by Sandhouse, 1943

Diagnosis. The following unique characteristics allow species of the subgenus *Chilicola s. str.* to be differentiated from related subgenera: face slightly concave in lateral view [Fig. 14I; *Chilicola (Chilioediscelis)* has erroneously been reported to also have a concave face (Michener 1995, 2000)], distal margin of clypeus curved around lateral margin of labrum (Fig. 14B), S6 of females with apical spine (Fig. 15L), mesepisternum and S2 of males with dense pubescence (Figs. 12D, 12H respectively), S7 of males with curved, apically oriented dorsal process (Figs. 1–6, 16B), *Chilicola s. str.* and *C. (Chilioediscelis)* share the following: vertex sometimes concave (Fig. 14K), hind tibial spurs robust and curved (Fig. 15F), frons of females with longitudinal striae (Fig. 13D), fore femur of males robust, and spiculum moderately broad and long (Fig. 16D). *Chilicola s. str.* displays the following plesiomorphies that differentiate it from *C. (Chilioediscelis)*: male clypeus with granulose sculpture (Fig. 12K), pronotal lobe entirely black (Fig. 10A), episternal groove extends below scrobal groove (Fig. 13H), inner tooth of hind claw well developed (Fig. 15G), and S2 scopa of females corbiculate (Fig. 12I).

Description. Black-brown; males with variable patterns of yellow on face and legs except anterior surface of male fore tibia always yellow (Figs. 10E) and fore and mid distitarsi always yellow-orange; females often with orange-red on metasoma (Fig. 11H); face slightly concave; distal margin of clypeus curved around lateral margin of labrum;

head broader than long; eyes convergent below; clypeus broader than long; frons with slight depression above antennal sockets; episternal groove extends below scrobal groove; hind femur of males robust with broad concavity on ventral surface continuous with flattened ventral surface of hind trochanter; hind tibial spurs robust and curved; hind tibia of some males expanded with ventral concavity (Figs. 1E, 2C, 4E, 5C); S1 of males with or without ventrally oriented process (Figs. 15I, J); males with dense hairs on S2; females with weak hind leg scopa; S2 of females with corbiculate scopa; microsculpture granular; punctation variable except dense on lower and upper paraocular areas and frons; S6 of females with apical spine; S7 of males with two lateral lobes, dorsal lobes curved, apically oriented (Figs. 1–6); S8 with long, moderately broad spiculum; penis valve with pair of large, dorsal, membranous appendages (Figs. 1–6).

Key to the species of the subgenus *Chilicola s. str.* Spinola

Male

1. Hind tibia with anteroventral margin expanded basal to a preapical concavity and with a distinct apical lamina that is usually transverse (Fig. 1E, 2C, 5C) but may be longitudinal (Fig. 4E) 2
- Hind tibia without preapical concavity, apical lamina, or expanded anteroventral margin (Fig. 3E, 6E) 5
2. Pronotum with apicodorsal tomentum absent or sparse (Fig. 12C); S1 with ventrally oriented process (Fig. 15J) 3
- Pronotum with dense apicodorsal tomentum (Fig. 12D); S1 without ventrally oriented process but may be swollen (Fig. 15I) 4
3. Clypeus with yellow inverted T-shaped mark (Fig. 1C); S7 dorsolateral lobes clavate (Fig. 1G) ..... *C. rubriventris* Spinola
- Clypeus entirely black-brown (Fig. 5A); S7 dorsolateral lobes with tapered apex (Fig. 5E) ..... *C. pangue* Toro and Moldenke
4. Ventral margin of hind tibia with apicoventrally oriented projection (Fig. 4E), apical lamina longitudinal; first flagellomere noticeably longer (~1.2X) than pedicel (Fig. 15B); clypeus almost completely yellow (Figs. 4C) .. *C. luzmarieae* Gibbs and Packer
- Ventral margin of hind tibia without apicoventrally oriented projection (Fig. 2C), apical lamina transverse; first flagellomere shorter (~0.7X) than pedicel (Fig. 15A); clypeus with yellow inverted T-shape (Figs. 2A) .....*C. aisenensis* Toro and Moldenke
5. Hind tibia black-brown (Figs. 3E); face black-brown except thin yellow transverse band on apex of clypeus (Figs. 3C, 9A); clypeus with short medial groove below supraclypeal area (Fig. 14D); S1 with large apical process (Fig. 15J) .... *C. colliguay* Toro and Moldenke
- Hind tibia with extensive yellow marks (Figs. 6E, F); face black-brown with extensive yellow on clypeus and lower paraocular area (Fig. 6C); clypeus with long medial

groove (Fig. 14E); S1 without apical process but moderately swollen (Fig. 15I) .... *C. venticola* Packer

Female

1. Metasoma black (Fig. 11F); base of mandible black (Fig. 9D) .... *C. colliguay* Toro and Moldenke
- Metasoma with extensive orange-red colouration (Fig. 11H); base of mandible with yellow mark (Fig. 9E) 2
2. Metasomal terga with anterior regions of ventrally reflexed portion black; posterior pronotal margin with appressed tomentum (Fig. 12B); apical half of mandible orange-red 3
- Ventrally reflexed portion of metasomal terga orange-red (Fig. 1B); posterior pronotal margins without appressed tomentum (Fig. 12A); mandible mostly black .... *C. rubriventris* Spinola
3. Frontal line carinate below ocelli; T5 black ..... *C. luzmarieae* Gibbs and Packer
- Frontal line flat below ocelli; T5 partially orange-red ..... *C. venticola* Packer

Chilicola (Chilicola) rubriventris Spinola

Chilicola rubriventris Spinola, 1851, Hist. Fis. Pol. Chile. Zool. Female.

Diagnosis: Males of this species can be easily distinguished from other members of the subgenus except *C. pangue* by the structure of the hind tibia (Figs. 1E, F). The anteroventral margin of the hind tibia is greatly expanded, reaching its maximum thickness basal to a deep preapical concavity; the distal margin of the expanded region is broadly concave; the apex forms a transverse lamina. Males of *C. rubriventris* may be most easily distinguished from *C. pangue* by the colour patterns of the face and hind basitarsus. Males of *C. rubriventris* have a yellow inverted T-shaped mark on the clypeus (Fig. 1C) and almost entirely yellow hind basitarsus (Fig. 11E). *Chilicola pangue* has a brown clypeus (Fig. 5A) and hind basitarsus with yellow only basoventrally (Fig. 11D). These two species may also be differentiated by the S7 dorsolateral lobes, which are clavate in *C. rubriventris* (Fig. 1G) but taper to a point in *C. pangue* (Fig. 5E). Genitalia of *C. rubriventris* and *C. pangue* are very similar. Females of *C. rubriventris* are easily distinguished from all other species by their entirely orange-red metasoma (Fig. 1B).

Description. Male: Length 7.6–8.8mm, forewing length 5.1–5.6mm, head width 2.0mm.

Colouration: Black-brown with following parts yellow: dot on labrum (Fig. 9B; absent in some specimens); mandible except ventral margin brown and apical half orange-red; inverted T-shaped mark on clypeus to below transverse portion of epistomal suture (Fig. 1C); lower paraocular area to just below antennal socket medially, to below epistomal suture laterally (Fig. 1C); dot on apicoventral surface of scape (absent in some specimens);

femoral apex and tibial base of all legs, anteroventral surface of fore tibia, fore tarsus suffused with brown; basal and apical rings of mid tibia, apical half of mid basitarsus, mid mediotarsus strongly suffused with brown, mid distitarsus orange; hind tibia except large brown areas on anterior and posterior surfaces connected by dorsal band (Figs. 1E, F); hind basitarsus except apical end and dorsal margin; following parts orange-brown: ventral surface of antenna from apical half of pedicel to terminal flagellomere; apical rings on fore and mid trochanter; narrow testaceous bands on apical impressed areas of T1-T7; tegula testaceous with pale straw anterior spot (spot absent in some specimens); wing venation brown except basal regions of R, M+Cu and V testaceous.

Pubescence: Long and thick on face and gena (2-3OD longest medially; OD~0.18mm) shorter hairs at base of mandible (1.5OD); flagellomeres with short setae and long, sparse setae on dorsal surface; mesoscutum with relatively sparse hairs (1.5OD), denser on lateral margins (~OD); longer on lateral margins of scutellum and metanotum (2-3OD); long on lateral surface of thorax, dense on pronotal lobe and toward ventral surface, and posterior surface of propodeum (2-3OD); short, sparse tomentum (~OD) on apically impressed areas of T1-T4, incomplete on T1, denser and longer laterally; (1.5OD); posteriorly directed lateral tufts on S2 and to a lesser extent S3-4 (1.5OD); tibia and posterior surface of femora and entire outer surface of hind femur, ventral surface of fore and hind coxa with moderately dense hairs (1.5OD)

Surface sculpture: Microsculpture granular, moderately dull except face below antennae somewhat shiny; moderately dense punctures on clypeus densest towards apex (i=1-2d), dense punctures on lower paraocular area, supraclypeal area, upper paraocular area and frons (i~d); very dense punctures on dorsal surface of pronotum, mesoscutum, scutellum and metanotum (i=d); dorsal area of propodeum rugose, punctures on hind femur dense, more sparse on anterior surface (i=1-2d), and punctures on terga uneven apicomedially but generally dense (i=1-2d).

Structure: Head broader than long (103:85); OOC slightly smaller than IOC (18:19); eyes convergent ventrally, UOD:LOD (67:47); clypeus broader than long (34:26); labrum with concave dorsal margin; vertex slightly concave in frontal view behind ocellar triangle; weak, median, longitudinal groove on basal half of clypeus, ratio of lengths of pedicel:F1-F3 — 15:16:21:22 (ratio of pedicel to F1 variable, always less than 1); gena less than half as wide as the eye in lateral view (13:33); ratio of lengths of mesoscutum: scutellum: metanotum: dorsal area of propodeum — 81:31:15:25; hind femur maximum length to maximum depth — 91:40; hind tibia highly modified (Fig. 1E, F), length: width: depth — 68:23:25; anteroventral surface widely expanded, anteroventral margin convex except distinctly concave just before apex; deep, preapical concavity basal to transverse apical lamina; ratio of lengths of hind tibia and hind basitarsus — 55:39; S1 apex with ventrally oriented, apically concave process; S7 ventral lobes broad with apical concavity, dorsal lobes elongate and clavate (Fig. 1G); S8 lateral lobe with small, angular process (Fig. 1H) ; gonoforceps elongate (Fig. 1I).

Female: length 6.0–7.8mm, forewing length 4.0–4.5mm, head width 1.3–1.5mm.

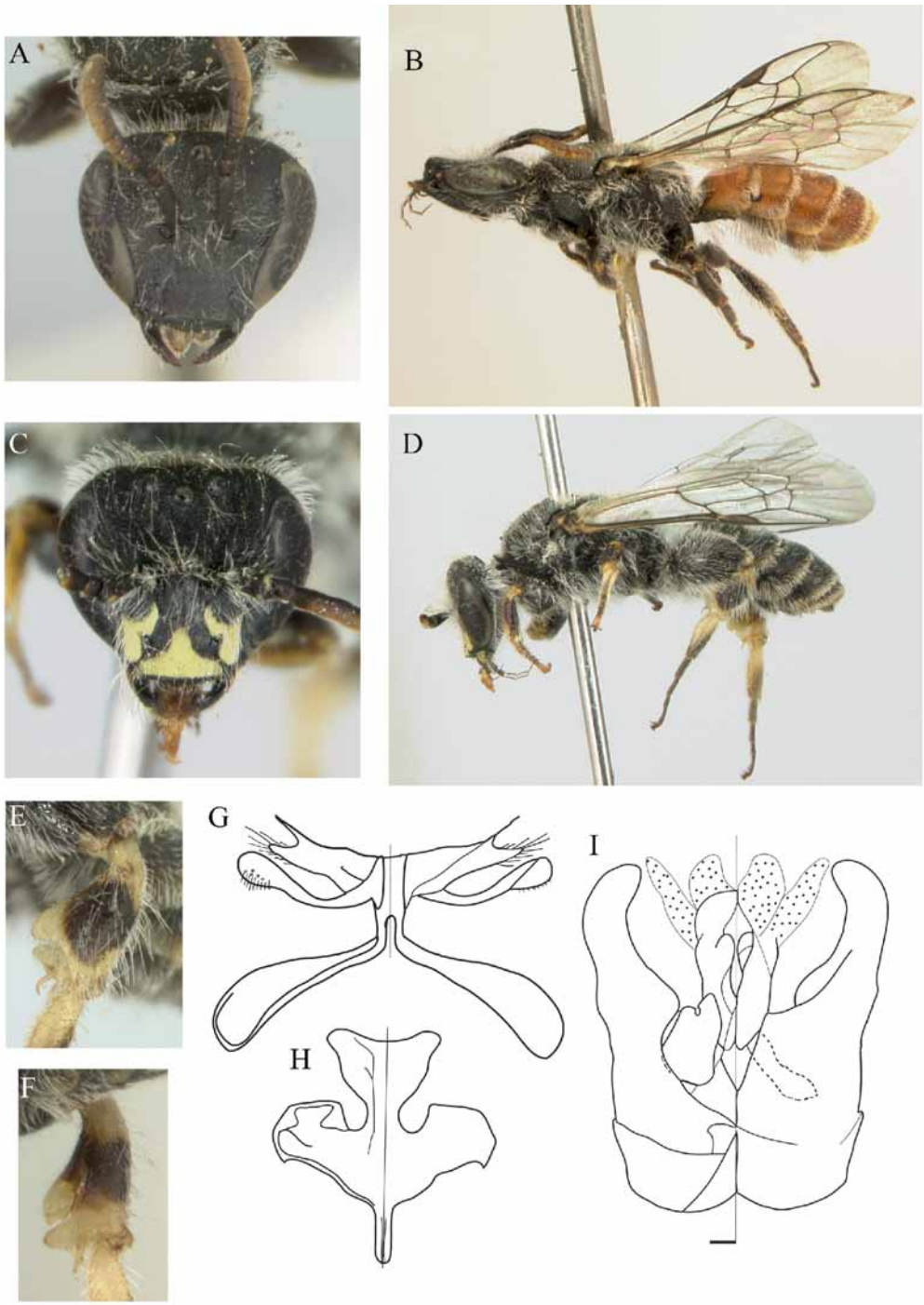

FIGURE 1 A–I. *Chilicola rubriventris*. A. head of female, frontal view, B. female, lateral view, C. head of male, frontal view, D. male, lateral view, E. hind tibia of male, anterior view, F. hind tibia of male, posterior view, G. S7, H. S8, I. genitalia, stippling represents membranous lobes of penis valves. Drawings of terminalia with ventral views to left, dorsal to right. Scale bar (for terminalia) = 0.1mm.

Colouration: Black-brown except for yellow dot on basal region of mandible; following parts yellow-orange: ventral surface of F3-F10; base of fore and tibia, base of hind tibia in one specimen; *metasoma orange-red* with black fovea laterally on T2 and T3.

Pubescence: As in male except OD~0.12mm, generally more sparse, dorsal surface of thorax very sparse; hind leg scopa; apical impressed areas of T1-T4 with posteriorly directed tomentum (~OD) widely separated on T1-T2; S2-S4 with posteroventrally directed scopa (1-2OD), very dense on S2.

Surface sculpture: As in male except punctures finer, clypeal surface more finely granulose with small, sparse punctures (i=2-3d); paraocular area with dense punctures (i~d), frons with punctures situated in longitudinal striae (i~d); mesoscutum with punctures dense anteriorly (i=1-3d); small, relatively dense punctures on scutellum (i=1-2d); dorsal area of propodeum reticulate with longitudinal grooves; moderately sparse punctures on terga (i=3d)

Structure: Head broader than long (87:72); eyes converging below; UOD:LOD (38:27); gena greater than half the width of eye in lateral view (17:24); clypeus flat, broader than long (52:44); IOC slightly greater than OOC (19:16); ratio of lengths of pedicel:F1-F3 — 14:12:7:8; frontal line raised immediately above supraclypeal area; ratio of lengths of scutellum, metanotum, dorsal area of propodeum — 45:22:25.

Material Examined: Specimens examined are from the American Museum of Natural History (AMNH) or if otherwise indicated are from the insect collections of Cornell University (CU), Kansas University (KU) or the junior author's collection housed at York University (YU). CHILE, **Region III**: Atacama, La Junta, ix.1968, Toro, one female**;** region III, 10km N. Vallenar, 18.x.2000. L. Packer, four females, one cleared and stored in glycerine, collected from a low-growing species of *Adesmia*, one male (YU); region III, 5km S. Finca de Chañaral, S. of Diego de Almagro, 12.xi.2001, L. Packer, one male (YU); **Region IV**: Los Chiches, Coquimbo, 22.viii, Wagenknecht, one male; Coquimbo, 5 miles N. of Laguna Dam, 8000ft, 6.xii.1950, Ross and Michelbacher, one male; Rio Laguna, Coquimbo, 3.xii.1964, Wagenknecht, one male; Coquimbo, Incahuasi, ix.1968, H. Toro, one female; Coquimbo, Incahuasi, ix.1968, L. Ruz, one male; Coquimbo, Vicuña, ix.1968, H.Toro, one female; Rio Laguna, 3000m, i.1970, De La Hoz, one female (CU); Coquimbo, El Pangue, collected on *Adesmia melanthes* (Fabaceae), x.1972, V. Cabezas, three males (CU, one male); same date and locality, L. Ruz, one female; Coquimbo, el Pangue x.1972, L. Ruz, one female collected on *Stachys serrata* (Lamiaceae); El Pangue, x.1972, one female; El Tofo, x.1972, Ruz, 2 females collected on *Adesmia* sp.; Coquimbo, el Pangue x.1972, A. Martinez, one female; Coquimbo El Pangue, x.1972, V. Cabezas, one male collected on *Adesmia melanthes*; Coquimbo El Pangue, x.1972, H. Toro, two males; El Pangue, Coquimbo, 13.x.1977, Magunacelaya, one male; Coquimbo, El Pangue, 13.x.1977, Magunocelaya and De La Hoz, 3 females; Fray Jorge, x.1977, De La Hoz, Ione female, collected on *Adesmia* sp.; Las Breas, xii.1978, Ruz, two females; Coquimbo, Las Breas, 17.x.1979, Magunocelaya, Toro and

Ruz, 6 males, 13 females; Coquimbo, Balala, 18.x.1979, Magunocelaya, Ruz, and Toro, 13 males, 3 females; Incahuasi, 10.x.1981, Toro, one female; Coquimbo, Chañaras, 12.ix.1984, Toro, one female; Elqui, El Pangue, 21:x:1991, J Rozen, one male; Elqui: El Pangue, 24.x.1992, Rozen, Sharkov, Snyder, one male; Elqui, El Pangue, 24km S Vicuña, 31.x.1992, Snyder and Sharkov, one male; Elqui, 26km S. Vicuña, 5.x.1994, Rozen, Quinter and Ascher, two females; Elqui, 19km S. Pisco Elqui, 6.x.1994, Rozen, Quinter and Ascher, one female; Elqui, 7km S. Vicuña, 29.ix.1997, J.G. Rozen and H. Navarrete, one female; region IV, 2–4km S. Vicuña, HWY 41, 9.x.2001, Packer and Fraser, one female (YU); Elqui, El Pangue, 13.x.2001, J. Rozen, A. Ugarte and C. Espina, one female; **Region V**: La Laguna, 5.ix.1938, one male; Colliguay, 17.ix.1976, H. Toro, one male; **Region Metropolitana de Santiago:** Santiago Prov. Camino a Farrelones 1975, leg. A.R. Moldenke, det: H. Toro, one female.

Geographic Distribution: Chile, from the northern Atacama region to Farellones near Santiago (Fig. 7). Type locality: CHILE, southern provinces.

Comments: *C. rubriventris* is the most widespread species of the subgenus. The type specimen could not be located for this revision. The type is believed to be at the Museo de Instituto di Zoologia Sistematica, Universitá di Torino, Italy (Moure and Urban 2002). However, Dr. Guido Pagliano could not locate it in the collection and it is not listed in Casolari and Casolari Moreno (1980).

Chilicola (Chilicola) aisenensis Toro and Moldenke

Chilicola (Chilicola) aisenensis Toro and Moldenke, 1979. An. Mus. Hist. Nat. Valparaíso 12:102. Male

Diagnosis: *C. aisenensis* males have a clypeus with an inverted T-shape mark similar to that of *C. rubriventris* (Fig. 2B). The hind tibia of *C. aisenensis* has the expanded ventral margin, preapical concavity, and apical transverse lamina common to most other members of the subgenus. The hind tibia can be differentiated from those of *C. rubriventris, C pangue*, and *C. luzmarieae* by the expanded ventral margin that forms a smooth convex curve, thickest at midlength and gradually tapers to the preapical concavity (Fig. 2C). The male of *C. aisenensis* also lacks the process on S1 that is present in *C. colliguay, C. pangue*, and *C. rubriventris* but is somewhat swollen as in *C. luzmarieae* and *C. venticola*. Females are unknown.

Description: Male: Length 5.9mm, forewing length 3.8mm, head width 1.6mm.

Colouration: Black-brown with following parts yellow: labrum; base of mandible; inverted T-shape on clypeus (Fig. 2B); lower paraocular area to just below antennal socket medially, to below epistomal suture laterally (Fig. 2B); dot on apicoventral surface of scape; anterior spot on tegula (remainder pale straw); apex of fore and mid femur; fore tibia except ventral surface suffused with brown; fore tarsus; apex and base of mid tibia

and ventral surface suffused with brown; basoventral surface of mid basitarsus; base and apex of hind tibia and along anteroventral margin (Figs. 2C, D); base of hind basitarsus; dorsal surface of fore and mid trochanter with yellow-orange apex; ventral surface of antenna orange-brown from apical half of pedicel to terminal flagellomere; anterior margin of apical impressed areas of T1-T7 testaceous; wing venation brown except for testaceous basal regions of R, M+Cu, and V.

Pubescence: Long and thick on face and gena (1-3OD, longest medially; OD~0.14mm), with dense, short hairs on vertex (~1.5OD); flagellomeres with short setae; pronotum with short (<OD), laterally directed tomentum on posterodorsal margin; short and woolly on pronotum and lateral margin of mesoscutum (OD); relatively sparse and fine on dorsal surface of thorax (1-2OD) except long on lateral margins of scutellum and metanotum (2-3OD); long and coarse on posterior surface of propodeum and lateral surface of thorax except posterior mesepisternum (2-3OD); coarse on posterodorsal surface of fore femur, ventral surface of mid femur, and anterodorsal surface of hind femur (1-2OD); apical impressed portions of T1-T5 with posteriorly directed hairs, longest laterally (1-2OD); short apical tufts on S1-S4 (<OD).

Surface sculpture: Microsculpture granular; surface moderately dull except face below antenna somewhat shiny; clypeus unevenly punctate (i=1-3d), punctures densest apicolaterally (i~d), as on lower and upper paraocular areas and frons; surface of frons irregularly striate; gena striate with sparse punctures (i=1-3d); dorsal and lateral surfaces of thorax with dense punctures (i~d); dorsal area of propodeum rugose with few, coarse longitudinal striae; dense punctures on terga and S2-S6 apicolaterally (i=d).

Structure: Head broader than long (81:67); IOC less than half OOC (10:26); eyes convergent below, UOD:LOD (50:39); clypeus broader than long (31:21); vertex concave behind ocellar triangle in frontal view; ratio of lengths of pedicel:F1-F3 — 12:8:11:11; gena half as wide as compound eye in lateral view (11:22); relative lengths of scutellum: metanotum: dorsal area of propodeum — 42:22:25; maximum length to maximum depth of hind femur — 85:45; hind tibia with anteroventral margin convex basal to preapical concavity (Fig. 2C), maximum length, width, depth of hind tibia — 34:10:14; apex of hind tibia with transverse apical lamina; relative lengths of hind tibia and hind basitarsus — 34:22; S1 swollen apically forming an acute angle in profile; S7 with moderately long lateral lobe, ventrolateral lobe somewhat broad (Fig. 2E); apex of S8 with broad concavity (Fig. 2F); gonoforceps broad preapically with acute apex (Fig. 2G).

Material Examined: CHILE, Region XI: Aisén (Chile Chico), 250m, 46°33'S, 71°43'W 21.xi.1966, E. I. Schlinger and M. E. Irwin, holotype male (AMNH).

Geographic Distribution: This species is known only from the type locality and type specimen above (Fig. 7).

Comment: The junior author collected near the type locality in Argentinean Patagonia in November 2003 but failed to find any *C. aisenensis.*

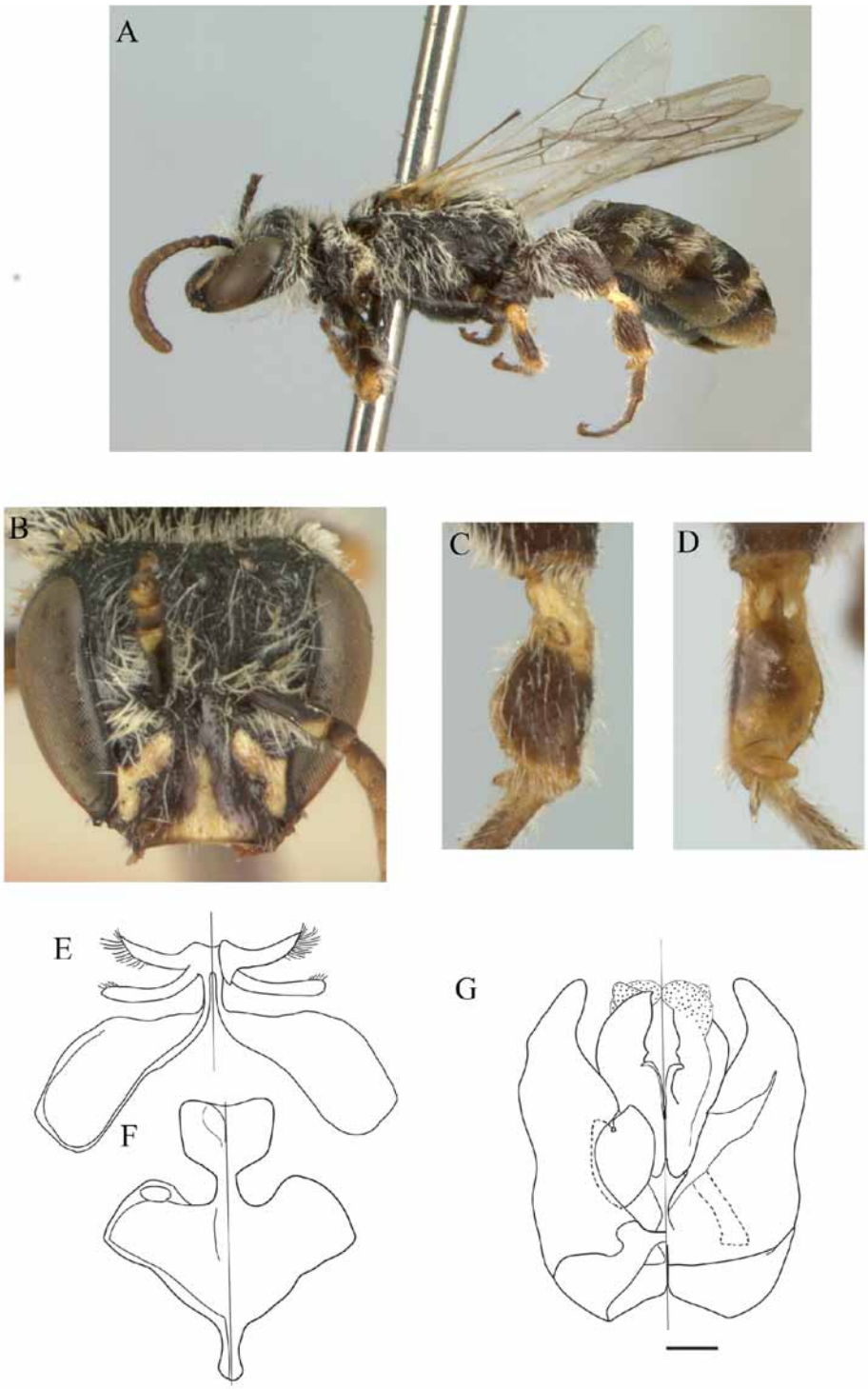

FIGURE 2 A–G. *Chilicola aisenensis*. A. head of male, frontal view, B. male, lateral view, C. hind tibia of male, anterior view, D. hind tibia of male, posterior view, E. S7, F. S8, G. genitalia, stippling represents membranous lobes of penis valves. Drawings of terminalia with ventral views to left, dorsal to right. Scale bar (for terminalia) = 0.1mm.

Chilicola (Chilicola) colliguay Toro and Moldenke, 1979. An. Mus. Hist. Nat. Valparaíso 12:100. Male and female.

Diagnosis: Males of *C. colliguay* do not have the extensive yellow colouration on the face and legs common to most species of the subgenus; it is black-brown except for a distal band on the clypeus (Fig. 3C) and the yellow to yellow-orange markings on the fore tibia and fore and mid distitarsi common to all males of this subgenus. *Chilicola pangue* also lacks extensive facial markings but has yellow on the lower paraocular area. The hind tibia of males is robust but lacks the preapical concavity seen in all other members of the subgenus except *C. venticola* (Fig. 3E, F). The hind tibia of *C. colliguay* is widest at midlength while the hind tibia of *C. venticola* is widest apically. The S1 of males bears a ventrally oriented process, as in *C. pangue* and *C. rubriventris* (Fig. 15J). Females of *C. colliguay* are entirely black-brown. Known females of other species all have extensively orange-red colouration on the metasomal terga.

Description. Male: Length 7.1mm, forewing length 5.0mm, head width 2.0mm.

Colouration: Black-brown with following parts yellow: *narrow transverse band on apex of clypeus* (Fig. 3C), anterior surface of fore tibia, fore and mid distitarsus orange-yellow; ventral surface of flagellomeres brown; tegula brown; wing venation brown.

Pubescence: Long and coarse hairs on face and gena (1.5-3OD longest medially; OD~0.15mm); shorter hairs at base of mandible (1.5OD); flagellomeres with short setae; mesoscutum with relatively dense hairs (2OD), denser on lateral margins of dorsal sclerites; long on lateral surface of thorax (2-3OD), dense on pronotal lobe and toward ventral surface; posterior surface of propodeum (2-3OD); short, sparse (~OD) on lateral apical impressed areas of T2-T4, posteriorly directed lateral tufts on S1 and S2 (1.5OD); medium length hairs on femora, tibiae and hind coxa (1.5OD), dense on anterior surface of mid tibia.

Surface sculpture: Microsculpture granular, sparse punctures on clypeus denser towards apicolateral margin (i=1-2d), supraclypeal area striate with unevenly spaced punctures (i=1-3d), dense punctures on lower and upper paraocular areas and frons (i~d); thoracic punctures large and dense (i~d) except punctures above scrobal groove absent; dorsal area of propodeum rugose; T1-T4 with fine, uneven punctation (i=1-3d).

Structure: Head broader than long (102:87); OOC slightly larger than IOC (23:21); eyes convergent below, UOD:LOD (70:56); clypeus broader than long (42:24); frontal line above supraclypeal area carinate; vertex slightly concave in frontal view behind ocellar triangle; weak, median, longitudinal groove on basal half of clypeus, ratio of antennal segment lengths, pedicel:F1-F3 — 16:24:30:32; gena more than half as broad as compound eye in lateral view (16:29); relative lengths of scutellum: metanotum: dorsal area of propodeum — 48:25:33; hind femur maximum length to maximum depth — 56:27; *hind tibia swollen and broadest subapically* (Figs. 3E, F), maximum length, width,

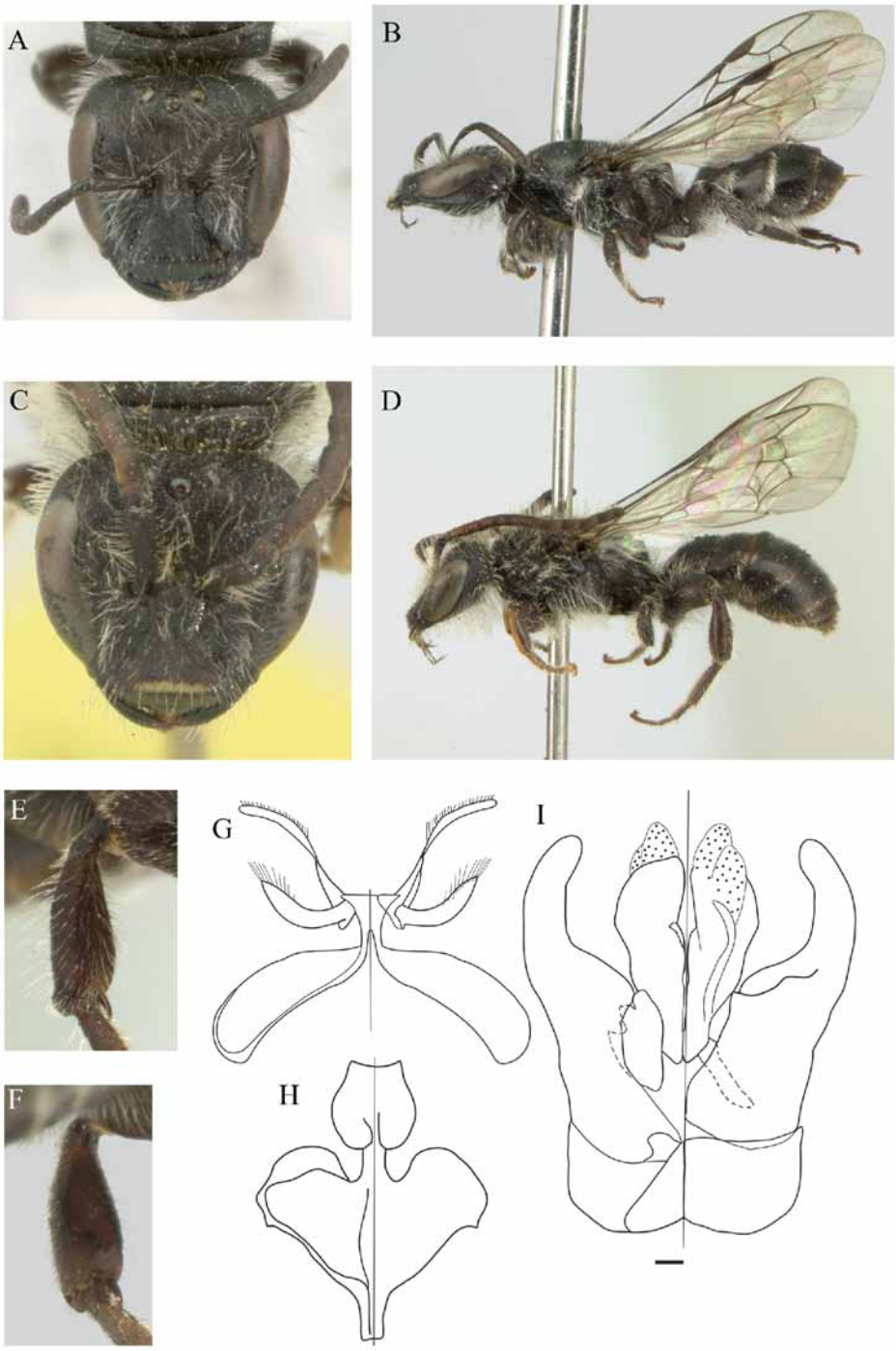

FIGURE 3 A–I. *Chilicola colliguay.* A. head of female, frontal view, B. female, lateral view, C. head of male, frontal view, D. male, lateral view, E. hind tibia of male, anterior view, F. hind tibia of male, posterior view, G. S7, H. S8, I. genitalia, stippling represents membranous lobes of penis valves. Drawings of terminalia with ventral views to left, dorsal to right. Scale bar (for terminalia) = 0.1mm.

depth — 45:13:17, with two carinae on ventral surface arising at midlength and ending basal to tibial spurs; hind tibia: hind basitarsus — 56:42; S1 with long, ventrally oriented, apical process; S7 with long, narrow ventrolateral lobe (Fig. 3G); S8 with apical lobe distinctly rounded with concave apex (Fig. 3H); gonoforceps elongate (Fig. 3I).

Female: length 6.5–7mm, forewing length 4.5–4.7mm, head width 1.9 mm

Colouration: Entirely black-brown.

Pubescence: As in male except sparser on face, gena, and mesoscutum; legs with moderately sparse hairs except fore tarsus with moderately long, curved hairs and hind leg scopa; T1-T4 apical impressed areas with widely separated appressed tomentum; S2-S4 with posteroventrally directed scopa, very dense on S2.

Surface sculpture: Punctures finer than on male; clypeus with small, sparse punctures (i=2-3d) dense near lateral margins (i=d); denser punctures in paraocular area (i~d), frons with punctures situated in longitudinal striae (i~d); pronotum with dense punctures (i~d); punctures on mesoscutum unevenly spaced, densest near margins (i=1-3d), scutellum with surface smooth and uneven punctures (i=1-2d); mesepisternum with somewhat sparse punctures (1~2d); dorsal area of propodeum reticulate; terga with very fine punctures (i=1-3d).

Structure: Head broader than long (94:80); eyes convergent below, UOD:LOD (72:55); gena nearly as wide as compound eye in lateral view (20:22), clypeus flat, much broader than long (49:22); IOC smaller than OOC (15:17); frontal line carinate immediately above supraclypeal area; relative lengths of pedicel:F1-3 — 15:14:10:12; relative lengths of scutellum, metanotum, dorsal area of propodeum — 46:24:28; all femora and mid and hind tibia somewhat robust.

Material Examined: CHILE, **Region V**: Valparaíso, Colliguay, 18.ix.1969, H. Toro, holotype male and allotype female, also two paratype males, one paratype female and an additional male (AMNH); Valparaíso, Colliguay, 18.ix.1969, de la Hoz, one female; Peñuelas, 1.xi.1963, E. Cruzat P, female paratype (AMNH); **Region Metropolitana de Santiago**: Santiago, Cuesta La Dormida, NW of Tiltil. 23.xii.1984, L. Peña, one female (AMNH); **Region VII**: Los Queñes, 31.x.1983, H. Toro, one male; **Region VIII**: Nuble, Las Trancas, SE Recinto in Chillan area, 1200m, i.1984, L. Peña, one female (AMNH); Nuble province, Pte. Marchant, xii.1998, A. Ugarte P, one female (AMNH).

Geographic Distribution: Chile, from Valparaíso in the north to Nuble province in the south (Fig. 7).

Comments: *C. colliguay* has not been commonly collected. This species appears to be active over five months (September-January) and appears earlier in the north.

Chilicola (Chilicola) luzmarieae new species

Diagnosis: Males can be distinguished from all other species of the subgenus by the laterally compressed hind tibia (Figs. 4E, F). As in some other species of the subgenus

there is an apical lamina and a preapical concavity, but unique to *C. luzmarieae* is the sinuate anteroventral margin with a preapical projection (Fig. 4E) basal to the concavity and the apical lamina is longitudinal only in *C. luzmarieae*. Additionally, males have a swollen S1 that is expanded towards the apex similar to that of *C. aisenensis* and *C. venticola*. Males of *C. colliguay, C. pangue*, and *C. rubriventris* have an S1 with a ventrally oriented apical process. The colouration of the female metasoma is distinct from other known species in the subgenus. T1-T4 orange-red except for black anterolateral quarters, orange red colouration extends onto posterolateral regions of terga, ventrally reflexed portion with testaceous hue, T5-T6 brown. Metasomal terga of *C. colliguay* are entirely dark and in *C. rubriventris* T1-T6 are entirely orange-red. *Chilicola venticola* has orange-red colouration on T1-T5 with dark brown lateral areas. In addition, females of the new species are unique in the subgenus in having a frontal line that is carinate immediately below the ocelli. The frontal lines of other species are raised but only near the supraclypeal area. No female specimens are known for *C. pangue* or *C. aisenensis*.

Description: Male (Holotype): Length 6.5mm, forewing length 4.5mm, head width 1.6mm.

Colouration: Black-brown with following parts yellow: labrum; mandible except for ventral margin brown and apical half orange-red; clypeus except for dark brown along epistomal suture (Fig. 4C); lower paraocular area to below antennal socket (Fig. 4C); dot on apicoventral surface of scape; anteroapical region of fore and hind femur; femoral apex and tibial base all legs; fore tibia except for posteroventral surface; apical and basal rings of mid tibia, anterior surface suffused with brown; hind tibia except for apical two thirds of anterodorsal surface brown-black and ventral surface suffused with brown (Figs. 4E, F); all tarsi except hind basitarsus apicodorsally and dorsal surface of hind mediotarsus brown-black; following parts orange-brown: ventral surface of antenna from apical half of pedicel to terminal flagellomere; apex of dorsal surface of fore and mid trochanter; anterior margin of apical impressed areas of T1-T7 and tegula testaceous; wing venation brown except for testaceous basal regions of R, M+Cu, and V.

Pubescence: Long and thick on face and gena (1-3OD longest medially; OD~0.15mm), with sparse finer hairs on vertex; flagellomeres with short setae; short (<OD) tomentum on posterodorsal margin of pronotum; posterior surface of propodeum and lateral surface of thorax except metepisternum with long hairs (3OD); sparser, finer hairs (2OD) on dorsal surface of thorax except thicker and denser near wing base; thick, long hairs on anterior surface of mid tibia and dorsal surfaces of hind coxa and hind femur (2OD); apical impressed portions of T1-T5 with posterolaterally directed white tomentum (<1.5OD); long, dense, ventrally oriented hairs on S2-S3 (<2OD); short posteriorly directed apical rows of hair S4 and S5 (<OD).

Surface sculpture: Microsculpture granular; surface moderately dull except face below antennae somewhat shiny; clypeus with sparse punctures (i=2-3d), denser apicolaterally (i~d); dense punctures on lower and upper paraocular areas and frons (i~d); surface of

frons irregularly striate; punctures uneven on mesoscutum (i=1-3d); those of scutellum smaller and denser (i~d); dorsal area of propodeum with coarse longitudinal striae; punctures on terga dense anteriorly (i=d) and moderately sparse posteriorly (i=1-3d).

Structure: Head broader than long (81:73); IOC slightly larger than OOC (16:15); eyes convergent below, UOD:LOD (54:41); clypeus broader than long (33:23); vertex flat behind ocellar triangle in frontal view; weak, median, longitudinal groove on clypeus, ratio of lengths of pedicel:F1-F3 — 11:14:15:15; gena approximately half as wide as compound eye in lateral view (11:21); relative lengths of scutellum: metanotum: dorsal area of propodeum — 41:20:29; hind femur maximum length to maximum depth — 29:13; *hind tibia laterally compressed* (Fig. 4F), length: width: depth — 23:5:11; anteroventral margin sinuate with *a distinct preapical projection* (Fig. 4E) basal to strong preapical concavity; apical lamina of hind tibia oriented longitudinally in line with inner hind tibial spur; hind tibia, hind basitarsus — 38:23; S1 swollen apically, acutely angular in profile, semicircular in posterior view; S7 ventrolateral lobes small, dorsolateral lobe broadly expanded with filamentous apex (Fig. 4G); S8 apex broadly concave, spiculum slightly wider at apex (Fig. 4H); volsella broad, gonoforceps elongate (Fig. 4I).

Female (Allotype): length 5.6mm, forewing length 4.2mm, head width 1.8mm

Colouration: Black-brown except for yellow dot on mandible base (remainder orange-red); following parts yellow-orange: ventral surface of antennal flagellum; narrow apical rings on all trochanters; apex of fore and mid femora; apical and basal thirds of fore tibia with dorsal surface suffused with brown; mid tibial base and apex; fore tarsus (except posterior fore basi- and fore mediotarsi suffused with brown); mid distitarsus; wing venation brown except testaceous basal regions of R, M+Cu, and V; T1-T4 orange, with black anterolateral marks, T1 with anterior declivous surface suffused with brown; S1-S4 testaceous.

Pubescence: As in male except as follows (OD~0.12mm), denser on lateral surface of thorax; posterior margin of pronotum with appressed tomentum; posterior surface of fore femur, outer surface of hind femur that forms scopa (1-2OD), hind tibia (2OD), widely separated bands on apical impressed area of T1-T3; S2-S4 with posteroventrally directed scopa (>1OD).

Surface sculpture: As in male except punctures finer, clypeal surface finely granulose with small, sparse punctures (i=2-3d); denser punctures on paraocular area (i~d), frons with punctures situated in longitudinal striae (i~d); punctures on mesoscutum (2-3d) denser between pronotal lobe and notaulus (i=d); small, relatively dense punctures on scutellum (i=1-2d); dorsal area of propodeum reticulate with longitudinal carinulae, terga with sparse punctures (i=3d).

Structure: Head broader than long (89:78); eyes convergent ventrally, UOD:LOD — 29:25; gena broader than half the width of eye in lateral view — 17:24; clypeus broader than long (20:13); IOC slightly greater than OOC (17:16); *frontal line carinate immediately below ocellus*; relative lengths of pedicel:F1-F3 — 13:11:8:10; relative lengths of scutellum, metanotum, dorsal area of propodeum — 22:11:16.

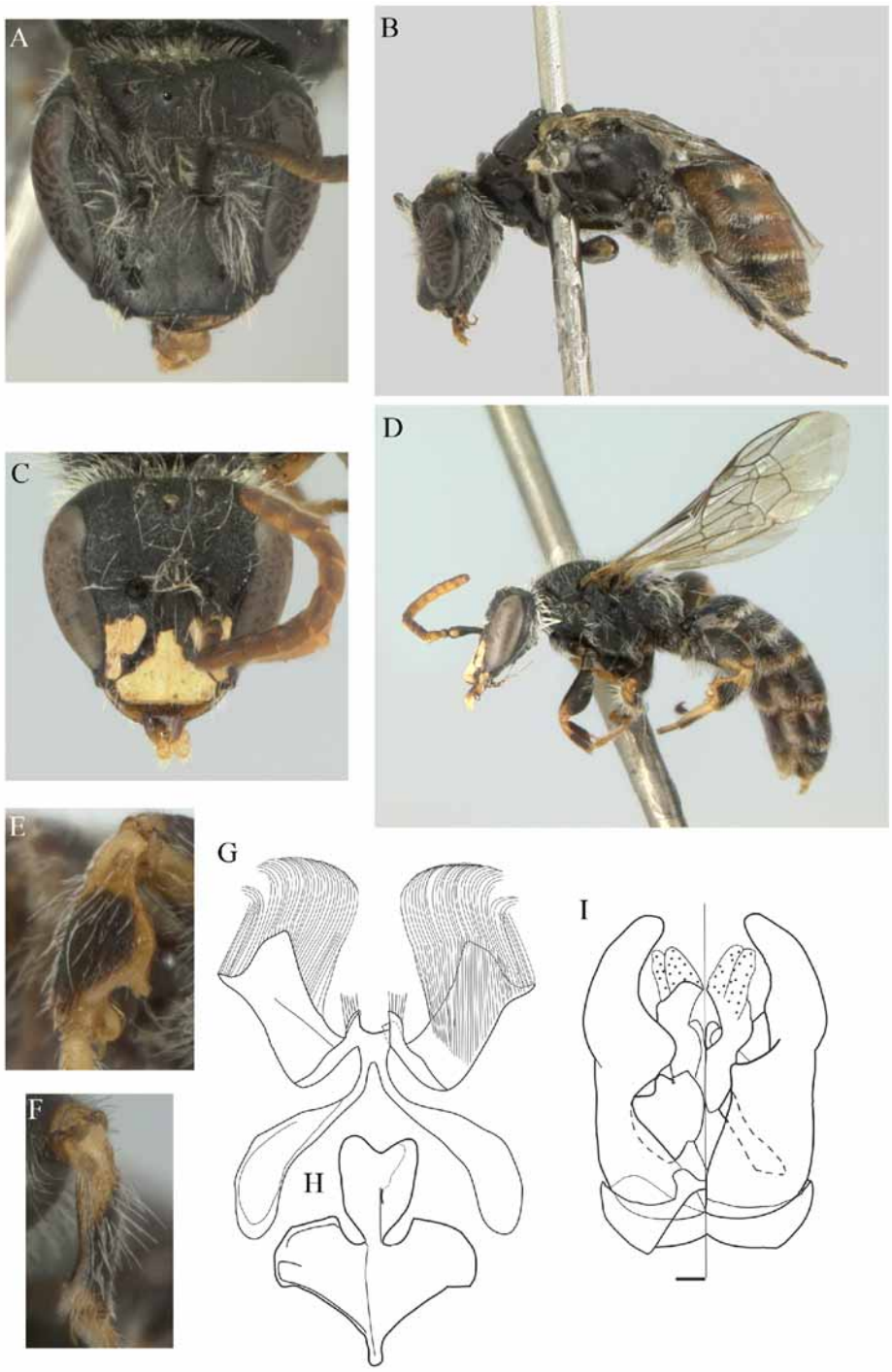

FIGURE 4 A–I. *Chilicola luzmarieae*. A. head of female, frontal view, B. female, lateral view, C. head of male, frontal view, D. male, lateral view, E. hind tibia of male, anterior view, F. hind tibia of male, posterior view, G. S7, H. S8, I. genitalia, stippling represents membranous lobes of penis valves. Drawings of terminalia with ventral views to left, dorsal to right. Scale bar (for terminalia) = 0.1mm.

Material Examined: CHILE, region VII, Laguna del Teno, ii.2003, A. Ugarte P., holotype male and allotype female (YU).

Geographic Distribution: This species is known only from the type locality (Fig. 7).

Etymology: This species is named in honour of the collector's wife: Luzmarie Ugarte.

Chilicola (Chilicola) pangue Toro and Moldenke

Chilicola (Chilicola) pangue Toro and Moldenke, 1979. An. Mus. Hist. Nat. Valparaíso 12:103. Male.

Diagnosis: The male of *C. pangue* is the only member of this subgenus to have a clypeus that completely lacks yellow colouration (Fig. 5A). This species is very similar to *C. rubriventris* but can be differentiated by clypeal colouration and S7, the dorsolateral lobe of which has a tapered apex in *C. pangue* (Fig. 5E) but is clavate in *C. rubriventris* (Fig. 1G). Females of *C. pangue* are unknown.

Description: Male: Length 8mm, forewing length 5.0mm, head width 1.9mm.

Colouration: Black-brown with following parts yellow: mandible dorsally for basal half, apex orange-red; lower paraocular area proximal to epistomal suture with small spot (Fig. 5A); femoral apex and tibial base of all legs; anterodorsal surface of fore tibia; mid trochanter with yellow-orange apex; fore and mid distitarsi; apicoventral surface of hind tibia; basoventral surface of hind basitarsus; ventral surface of flagellomeres orange-brown; apical impressed areas of T1-T3 testaceous; tegula brown; wing venation brown except for testaceous basal regions of R, M+Cu, and V.

Pubescence: Long and coarse on mandible, face, gena (longest medially), and vertex (1-3OD, OD=0.165mm); flagellomeres with short setae and long, sparse setae on dorsal surface; sparse dorsally on thorax except near lateral margins (2OD); long on lateral surface of thorax especially ventrally and on posterior surface of propodeum (2-3OD); apical impressed portions of T1-T5 with sparse hairs, denser laterally (<1.5OD); dense ventrally oriented hairs on S1, laterally on S2-S3 (<2OD); moderately dense hairs on fore and hind coxa and hind femur (1-2OD); curved hairs on fore tarsus (~1.5OD).

Surface sculpture: Microsculpture granular, surface moderately dull except face below antennae moderately shiny; clypeus granulose with fine, sparse punctures except laterally (i=1-3d); dense punctures on lower and upper paraocular areas and frons (i~d); surface of frons irregularly striate; punctures very dense on dorsal surface of thorax (i<d); moderately dense on lateral thoracic surface (i=1-2d); dorsal area of propodeum reticulate anteriorly with coarse, longitudinal striae posteriorly; punctures on terga moderately dense (i=1-2d).

Structure: Head broader than long (95:75); IOC slightly larger than OOC (19:17); eyes convergent below, UOD:LOD (62:45); clypeus broader than long (68:46); dorsal margin

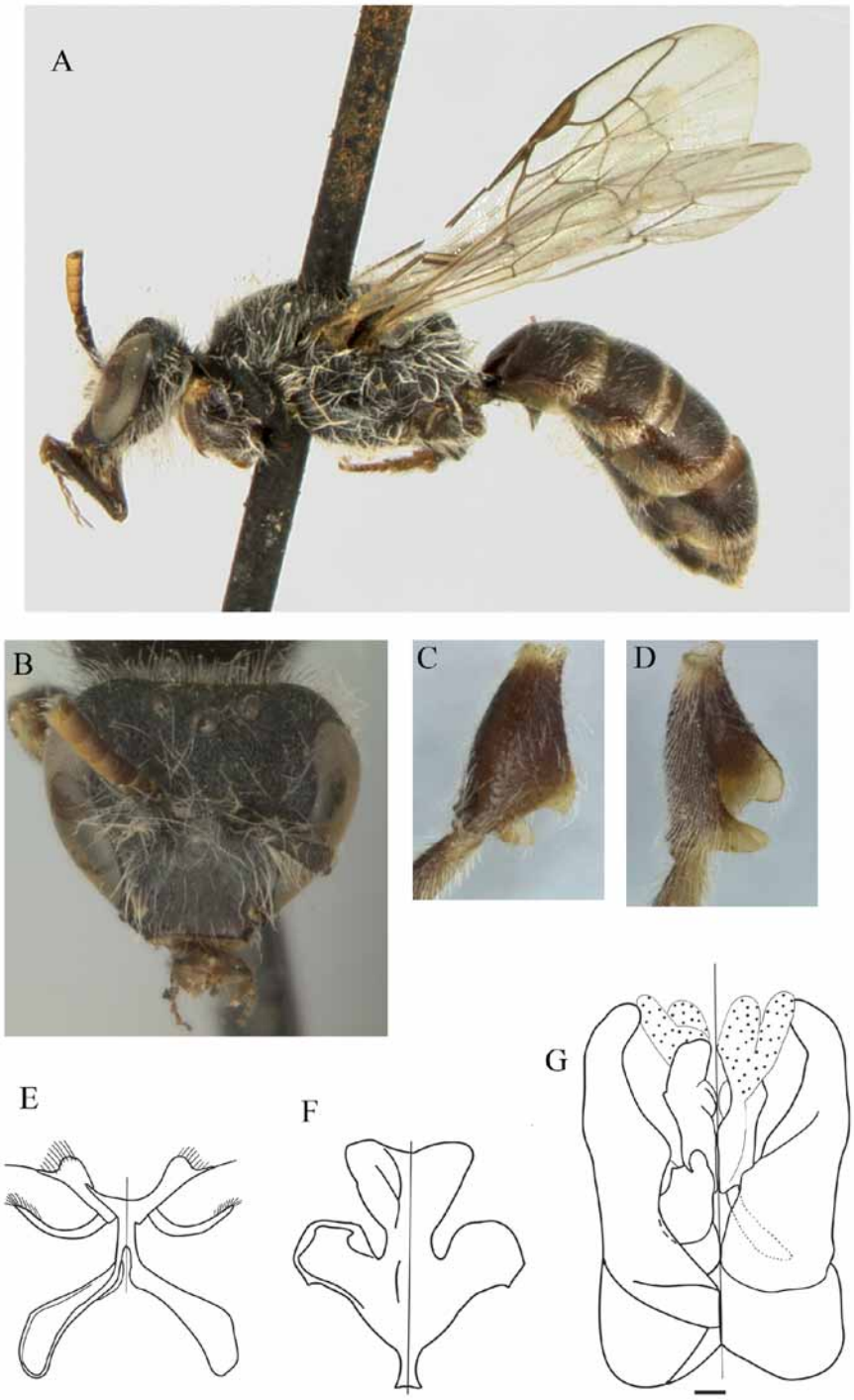

FIGURE 5 A–G. *Chilicola pangue*. A. head of male, frontal view, B. male, lateral view, C. hind tibia of male, anterior view, D. hind tibia of male, posterior view, E. S7, F. S8, G. genitalia, stippling represents membranous lobes of penis valves. Drawings of terminalia with ventral views to left, dorsal to right. Scale bar (for terminalia) = 0.1mm.

of labrum broadly concave; vertex slightly convex behind ocellar triangle in frontal view; frontal line above supraclypeal area carinate; weak, median, longitudinal groove on clypeus; ratio of lengths of pedicel:F1-F3 — 13:13:16:18; gena more than half as wide as compound eye in lateral view (14:24); relative lengths of scutellum: metanotum: dorsal area of propodeum — 25:13:16; maximum length to maximum depth of hind femur — 63:35; hind tibia with anteroventral margin expanded (Figs. 5C, D), maximum length, width, depth — 45:15:22, maximum depth immediately basal to strong preapical concavity; apex of hind tibia with transverse lamina; length of hind tibia, hind basitarsus — 34:21; S1 with apically concave process; S7 ventrolateral lobes moderately broad with apical concavity, dorsolateral lobes moderately long, tapered apically (Fig. 5E); S8 lateral lobes with basally oriented spines, spiculum with bifurcate apex (Fig. 5F); gonoforceps elongate (Fig 5G).

Material Examined: CHILE, Region IV, Coquimbo (El Pangue), 1400m, 24.viii.1956, collector not known, holotype male (AMNH).

Geographic Distribution: This species is known only from the type locality and type specimen above (Fig. 7).

Comments: This species is apparently very rare and is only known from the holotype. The type locality is frequently visited by collectors, although usually not so early as late August. The correct area was visited by A. Ugarte P. in early September, 2004 and although bees were collected from *Adesmia* bushes, no *C. pangue* were found. The holotype was collected almost 50 years before this revision and no new specimens are known to have been collected since.

Chilicola (Chilicola) venticola Packer

Chilicola (Chilicola) venticola Packer, 2004, J. Kans. Ent. Soc. 77:806. Male and female.

Diagnosis: Males of *C. venticola* lack the hind tibial modifications common to most of the subgenus. The only other species lacking the expansion and concavity is *C. colliguay* but the hind tibia of *C. venticola* is widest at the apex (Fig. 6E) while that of *C. colliguay* is widest at midlength. Unlike the latter species, *C. venticola* males have extensive yellow markings on the face and legs. Females of *C. venticola* are most similar to *C. luzmarieae.* Both have extensive orange-red colouration on the metasomal terga but lack the entirely red metasoma of *C. rubriventris*. In *C. venticola*, but not *C. luzmarieae*, the orange-red colouration extends to T5. Also, *C. venticola* lacks the carinate frontal line below the ocellus unique to the female of *C. luzmarieae.*

Description: Male: Length 5.5mm, forewing length 4.1mm, head width 1.5mm.

Colouration: Black-brown with following parts yellow: labrum; mandible except apical half orange-red; clypeus except for dark brown along epistomal suture (Fig. 6C); lower paraocular area to below (<OD) antennal socket (Fig. 6C); dot on apicoventral

surface of scape; anterior spot on tegula, remainder pale straw; anteroapical region of all femora; fore tibia except ventral area at midlength brown; fore tarsus; mid tibia with apical and basal rings and anteroventral surface (Figs. 6E, F); mid tarsus except suffused with brown apically; hind tibia with broad apical and basal rings and anteroventral margin; hind basitarsus except dorsal apex brown; medioapical areas of S2-S6; narrow, posterodorsal band on apex of fore and mid trochanter yellow-orange; apicoventral bands of hind coxa and trochanter yellow-orange; ventral surface of antenna orange-brown from apical half of pedicel to terminal flagellomere; apical impressed areas of T1-T7 testaceous; wing venation brown except basal portions of R, M+Cu, and V testaceous.

Pubescence: Long and thick on face and gena (1-3OD longest medially; OD~0.12mm), dense on vertex (2OD); flagellomeres with short setae; short, appressed (<OD) tomentum on posterodorsal margin of pronotum and lateral margins of mesoscutum; posterior surface of propodeum and lateral surface of thorax except metepisternum with long hairs (2-4OD); sparser, finer hairs (2OD) on dorsal surface of thorax except for coarse, dense hairs on lateral margins of scutellum and metanotum; apical impressed portions of T1-T5 with posterolaterally directed, appressed tomentum (<2OD); short posteriorly directed apicolateral tufts on S2-S5 (~OD); coarse moderately long hairs on posterodorsal surface of fore tibia and basodorsal surface of hind femur (2OD).

Surface sculpture: Microsculpture granular; surface moderately dull except face below antennae somewhat shiny; clypeus and supraclypeal area with sparse punctures (i=2-3d); dense punctures on lower and upper paraocular areas and frons (i~d); gena with sparse punctation distally (i=1-3d); uneven punctation on pronotum, mesoscutum and scutellum (i=1-3d); metanotum and dorsal area of propodeum rugose; thorax with moderately dense punctation laterally (i=1-2d); metasomal terga with dense punctation anteriorly (i=d), moderately dense posteriorly (i=1-2d).

Structure: Head broader than long (73:66); IOC slightly larger than OOC (15:12); eyes convergent below, UOD:LOD (50:36); clypeus broader than long (30:24); vertex concave behind ocellar triangle in frontal view; median, longitudinal groove on clypeus; ratio of antennal segment lengths, pedicel:F1-F3 — 12:14:12:14; gena greater than half as wide as compound eye in lateral view — 12:20; scutellum: metanotum: dorsal area of propodeum — 41:19:25; hind femur maximum length to maximum depth — 41:22; hind tibia nearly cylindrical (Figs. 6E, F), expanded somewhat ventrally and dorsally, *maximally broad at apex*, maximum length, width, depth — 34:11:12, ventral surface with two carinae delimiting an approximately semicircular area apically, strong carina on the posteroventral side begins at midlength curving towards anteroventral surface, weaker carina extends between two ends of strong carina; hind tibia, hind basitarsus — 34:21; S1 swollen slightly, lacking process; S7 with moderately long lateral lobe (Fig. 6G); apex of S8 with broad concavity, spiculum bifurcate at apex (Fig. 6H); gonoforceps elongate (Fig. 6I).

Female: length 5.5mm, forewing length 3.5mm, head width 1.5mm.

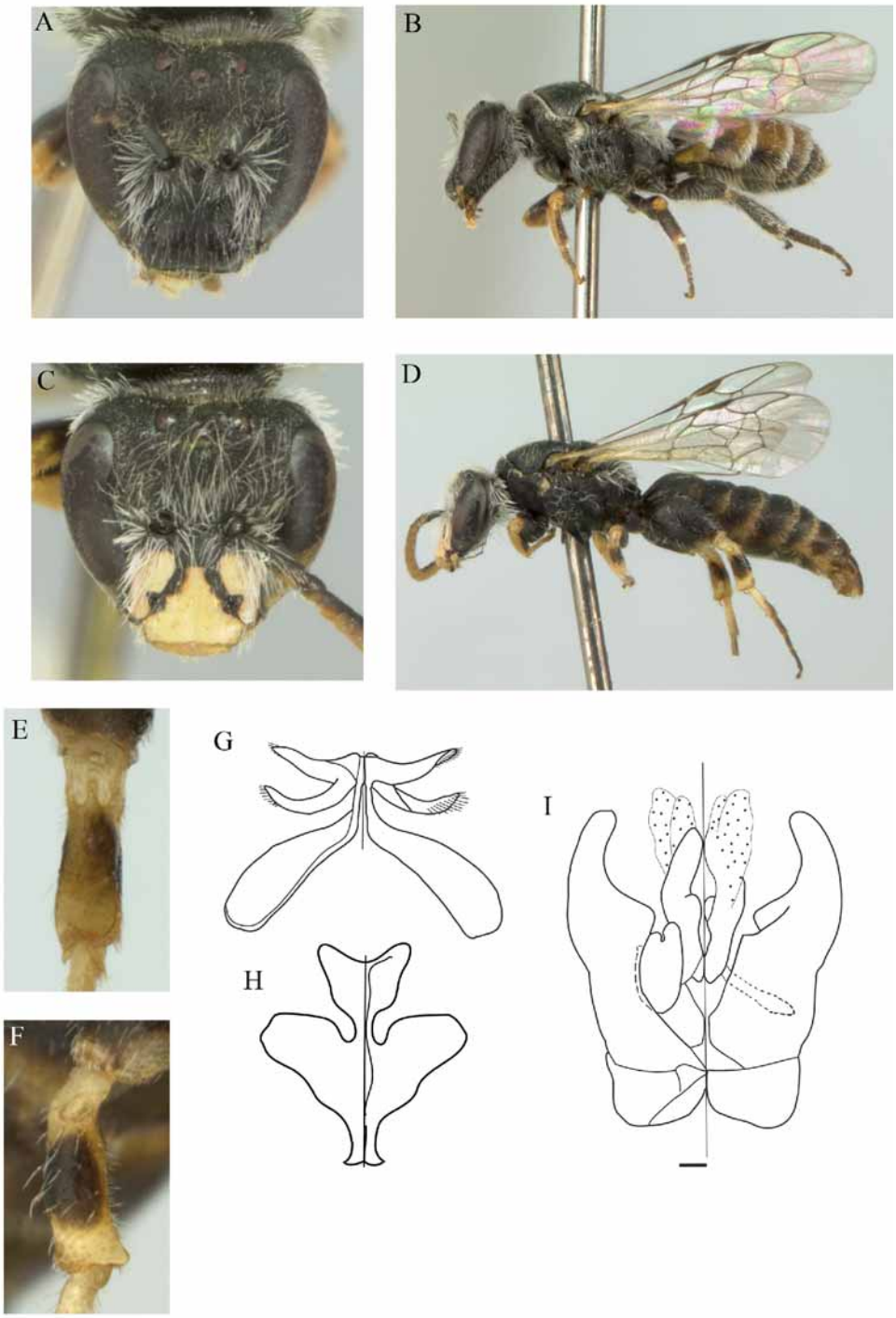

FIGURE 6 A–I. *Chilicola venticola*. A. head of female, frontal view, B. female, lateral view, C. head of male, frontal view, D. male, lateral view, E. hind tibia of male, anterior view, F. hind tibia of male, posterior view, G. S7, H. S8, I. genitalia, stippling represents membranous lobes of penis valves. Drawings of terminalia with ventral views to left, dorsal to right. Scale bar (for terminalia) = 0.1mm.

FIGURE 7. Partial map of South America showing Chile divided into regions (numbered from II to XI at left of land contour; Region Metropolitana de Santiago labelled MS), and Argentina showing known distribution of *Chilicola s. str.*. Markers indicate the location of the specimens examined. In some cases, multiple specimens may be represented by a single marker. *Chilicola aisenensis* = a, *C. colliguay* = c, *C. luzmarieae* = l, *C. pangue* = p, *C. rubriventris* = r, *C. venticola*, = v.

Colouration: Black-brown except basal region of mandible yellow (remainder orange-red); following parts yellow-orange: ventral surface of flagellum; narrow apical rings on all trochanters; apex of fore and mid femur; apical and basal rings of fore and mid tibia and dorsal surface of fore tibia; fore tarsus; mid distitarsus; wing venation brown except testaceous basal regions of R, M+Cu, and V; metasomal terga orange-red except brown-black anterior declivous surface of T1, anterolateral areas of T1-T4, majority of T5, and T6.

Pubescence: As in male except sparse hairs on face, dense on lower paraocular area, posterior pronotal margin with appressed tomentum; mesoscutum with sparse, short hairs (<OD), coarse, dense hairs near lateral margin; dense hairs on ventral surface of hind femur and tibia that form scopa (2OD); T1-T4 with widely separated apical bands of short, woolly hairs; S2-S5 with posteroventrally directed scopa (2OD).

Surface sculpture: As in male except punctation generally fine; frons longitudinally striate; metanotum less rugose with dense punctation (i=d); dorsal area of propodeum with irregular, longitudinal striae; metasomal terga with sparse punctation (i=2-3d).

Structure: Head broader than long (77:68); eyes convergent ventrally, UOD:LOD (48:38); gena more than half as wide as compound eye in lateral view (12:22); clypeus broader than long (31:22); IOC slightly greater than OOC (15:12); relative lengths of pedicel:F1-F3 — 10:10:6:8; relative lengths of scutellum, metanotum, dorsal area of propodeum — 21:9:13.

Material Examined: ARGENTINA, Chubut, Hwy 26 E. of Valle Hermosa, S45º46'789" W068º14'636", 657m, 27.xi.2003, L. Packer, one paratype male and one paratype female and one cleared male and cleared female stored in glycerine from a nest in a stem of *Sisymbrium altissimum* L. (Cruciferae) lodged in spiny bushes of *Adesmia* spp. (Fabaceae) (YU). The holotype and allotype were deposited in the Museo Nacional De Ciencias Naturales “Bernardino Rividavia”, Buenos Aires, Argentina by the junior author.

Geographic Distribution: This species is known only from the type locality (Fig. 7).

Comment: Packer (2004) described a nest of this species in a stem of *Sisymbrium altissimum* L. (Cruciferae).

Phylogenetic analysis

An exhaustive search with NONA (Goloboff 1999) produced a single most parsimonious tree (Fig. 8; length: 100 steps, consistency index (ci): 0.62, retention index (ri): 0.67). The monophyly of *Chilicola s. str.* is supported in this analysis (Bremer support 2; GC value 69; frequency slope -1.45). The two species of *C. (Chilioediscelis)* are also resolved as monophyletic (Bremer support 5; GC value 100; frequency slope 0.00) and as a sister group to *Chilicola s. str.* (Bremer support 3; GC value 90; frequency slope -0.60).Within *Chilicola s. str.* the species are divided into two equal clades. In one clade, *C. venticola* appears as the sister taxon of *C. aisenensis* and *C. luzmarieae.* In the remaining clade, *C. colliguay* is the sister taxon of *C. rubriventris* and *C. pangue*.

TABLE 1. Data matrix used in the phylogenetic analysis.

Character											1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
number	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
A. herbsti	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	?	0	0	0	0	0	0	0	0
O. vernalis	1	1	1	2	1	1	1	0	0	0	0	1	1	1	0	0	2	0	0	0	0	0	0	0	0	0
Ch. patagonica	1	1	0	2	1	0	1	1	1	1	1	2	1	1	0	1	0	0	1	0	0	0	1	1	1	1
Ch. araucana	1	1	0	2	1	0	1	1	1	1	1	2	1	1	2	1	0	0	1	0	0	0	1	1	1	0
C. colliguay	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	1	0	0	1	1
C. rubriventris	*	1	0	1	1	*	1	0	1	1	0	1	1	1	2	2	2	1	0	1	1	1	0	0	0	1
C. aisenensis	1	1	?	1	1	1	1	0	1	1	1	2	?	1	1	?	1	0	1	1	2	1	0	0	0	0
C. pangue	0	1	?	0	1	0	1	0	0	0	0	1	?	1	1	?	2	1	0	1	1	1	0	0	0	0
C. venticola	1	1	1	2	1	1	1	0	1	1	1	2	2	1	2	2	1	0	1	1	2	1	0	0	0	0
C. luzmarieae	1	1	1	2	1	1	1	0	1	1	1	1	2	1	2	2	1	0	1	1	2	1	0	0	0	0

(continued).

Character	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	5
number	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
A. herbsti	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O. vernalis	0	0	0	1	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0
Ch. patagonica	1	0	0	1	1	0	0	2	1	0	1	0	1	0	1	1	0	0	0	0	1	0	1	0	0
Ch. araucana	1	1	0	0	1	0	0	2	1	0	1	0	1	0	1	1	0	0	0	0	1	0	1	0	0
C. colliguay	1	0	0	0	0	0	1	1	0	1	1	1	0	0	1	0	1	1	1	1	1	1	3	0	1
C. rubriventris	1	0	1	0	1	1	1	1	0	1	1	*	0	2	1	0	1	1	1	1	1	1	1	0	1
C. aisenensis	?	1	0	1	?	0	1	0	?	1	1	0	0	2	1	0	0	?	1	1	1	0	2	1	1
C. pangue	?	0	1	0	?	1	1	1	?	1	1	0	0	2	1	0	1	?	1	1	1	1	1	0	1
C. venticola	1	1	0	0	1	0	1	2	1	1	1	1	0	0	1	0	0	1	1	1	1	0	2	0	1
C. luzmarieae	1	1	0	1	0	0	1	2	1	1	1	1	0	2	1	0	0	1	0	1	1	0	2	1	1

Note: For a list of characters and character states see the Appendix. Missing or unavailable data is denoted by a ?. Polymorphisms are indicated with an *. The abbreviations *A., O., Ch.* and *C.* refer to the subgenera *Anoediscelis, Oediscelis, Chilioediscelis* and *Chilicola s. str.* respectively.

It was noted that *C. rubriventris* is polymorphic for two colouration characters in males. Variability in colouration patterns of other species in this subgenus was not detected. However, half of the species of this group are known only from a single male specimen. To prevent potentially unreliable characters from skewing our results, colouration characters were removed and the data reanalysed. An exhaustive search produced a single most parsimonious tree (length: 59 steps, ci: 0.69, ri: 0.77) with an identical topology to our original analysis. The monophyly of *Chilicola s. str.* was more strongly supported (Bremer support 7; GC value 100; frequency slope 0.00) in this

analysis.

Based on the phylogeny, the greatly expanded hind tibia present in *C. (Oediscelis) vernalis* and most members of *Chilicola s. str.* has evolved multiple times. The highly modified tibia has two independent origins in *Chilicola s. str.* and another in *C. (Oediscelis)* (Fig. 8).

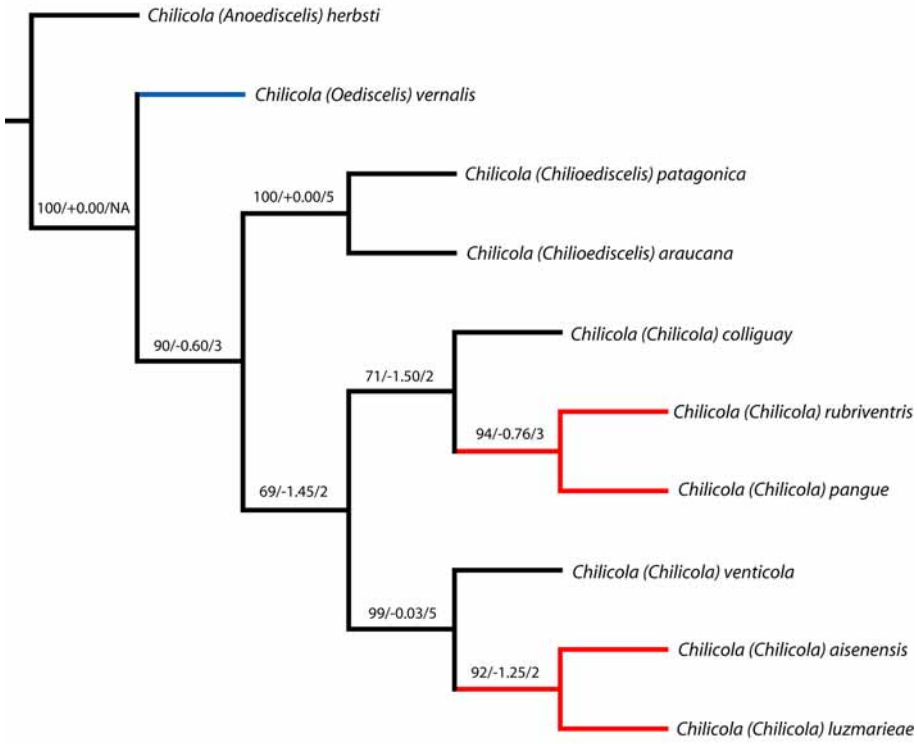

FIGURE 8. Single most parsimonious tree obtained for *Chilicola s. str.* Support values are shown (GC value/frequency slope/Bremer support). Length: 100, CI: 62, RI: 67. The secondary sexual expansion of the male hind tibia has been mapped onto the phylogeny (blue branch without preapical concavity; red branches with preapical concavity).

Discussion

The hind legs of *Chilicola s. l.* males often show a variety of unusual secondary sexual characteristics. In *Chilicola s. str.*, *C. (Chilioediscelis)*, *C. (Oroediscelis)* and *C. (Oediscelis)* the hind femora are often very robust and the hind tibiae display various degrees of modification. Presumably, these modifications are used to grasp the female during copulation (Toro and Magunacelaya 1987). However, observations of the mating behaviour of these bees have not been reported. Based on the phylogeny presented here, the greatly expanded hind tibia of males has evolved separately twice in *Chilicola s. str.* and at least once in *C. (Oediscelis)*. Michener's (2002) phylogenetic analysis of *Chilicola s. l.* shows the subgenus *C. (Oroediscelis)* basal to *C. (Anoediscelis)*. Modified hind tibiae

likely evolved separately in *C. (Oroediscelis)*.

Our phylogeny strongly suggests that *C. (Chilioediscelis)* is a sister group to *Chilicola s. str.* and that both are monophyletic. A robust phylogenetic analysis that encompasses the entire Xeromelissinae with numerous exemplars from each subgenus is required to resolve the classification of this group.

Acknowledgements

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References

Casolari, C. & Casolari Moreno, R. (1980) *Catgaloghi I — Collezione Imenotterologica di Massimiliano Spinola*. Museo Regionale di Scienze Naturali. Torino, Italy. 165[+3] pp.

Goloboff, P. (1999) *NONA (NO NAME) version 2.0*. Published by the author. Tucumán, Argentina.

Goloboff, P., Farris, J.S. & Nixon, K.C. (2000) *TNT: Tree Analysis Using New Technology version 1.0*. Published by the author.

Goloboff, P.A., Farris, J.S., Källersjö, M., Oxelman, B., Ramírez, M.J. & Szumik, C.A. (2003) Improvements to resampling measures of group support. *Cladistics* 19, 324–332.

Michener, C.D. (1995) A Classification of the Bees of the Subfamily Xeromelissinae (Hymenoptera: Colletidae). *Journal of the Kansas Entomological Society* 68, 332–245.

Michener, C.D. (2000) *The Bees of the World*. Johns Hopkins University Press, Baltimore, Maryland. 913 pp.

Michener, C.D. (2002) The Bee Genus *Chilicola* in the Tropical Andes, with Observations on Nesting Biology and a Phylogenetic Analysis of the Subgenera (Hymenoptera: Colletidae, Xeromelissinae). *Scientific Papers of the Natural History Museum, University of Kansas* 26, 1–47.

Moure, J.S. & Urban, D. (2002) Catálogo de Apoidea da Região Neotropical (Hymenoptera, Colletidae). V. Xeromelissinae. *Revista Brasileira de Zoologia.* 19 (Supl. 1), 1–25.

Nixon, K.C. (2002) *WinClada version 1.00.08*. Published by the author. Ithaca, NY, USA.

Packer, L. (2004) Taxonomic and behavioural notes on Patagonian Xeromelissinae with the description of a new species (Hymenoptera: Colletidae). *Journal of the Kansas Entomological Society* 77, 805–820.

Sandhouse, G.A. (1943) The type species of the genera and subgenera of bees. *Proceedings of the United States National Museum* 92, 519–619.

Spinola, M. (1851). Hymenópteros. pp 153–569. *In* C. Gay. *Historia Fisica y Politica de Chile. Zoologia*. 6: Paris. 569+[3] pp.

Toro, H., & Moldenke, A. (1979) Revision de los Xeromelissinae Chilenos (Hymenoptera — Colletidae). *Anales del Museo de Historia Natural de Valparaiso*, 12, 95–182

Toro, H. & Magunacelaya, J.C. (1987) Estructura muscular femoral de Xeromelissinae. *Acta Entomologica Chilena* 14, 13–24.

Appendix

Characters used in the phylogenetic analysis (Figs. 9–16). In many cases, characters are presented separately for males and females. When possible, characters for both sexes were merged.

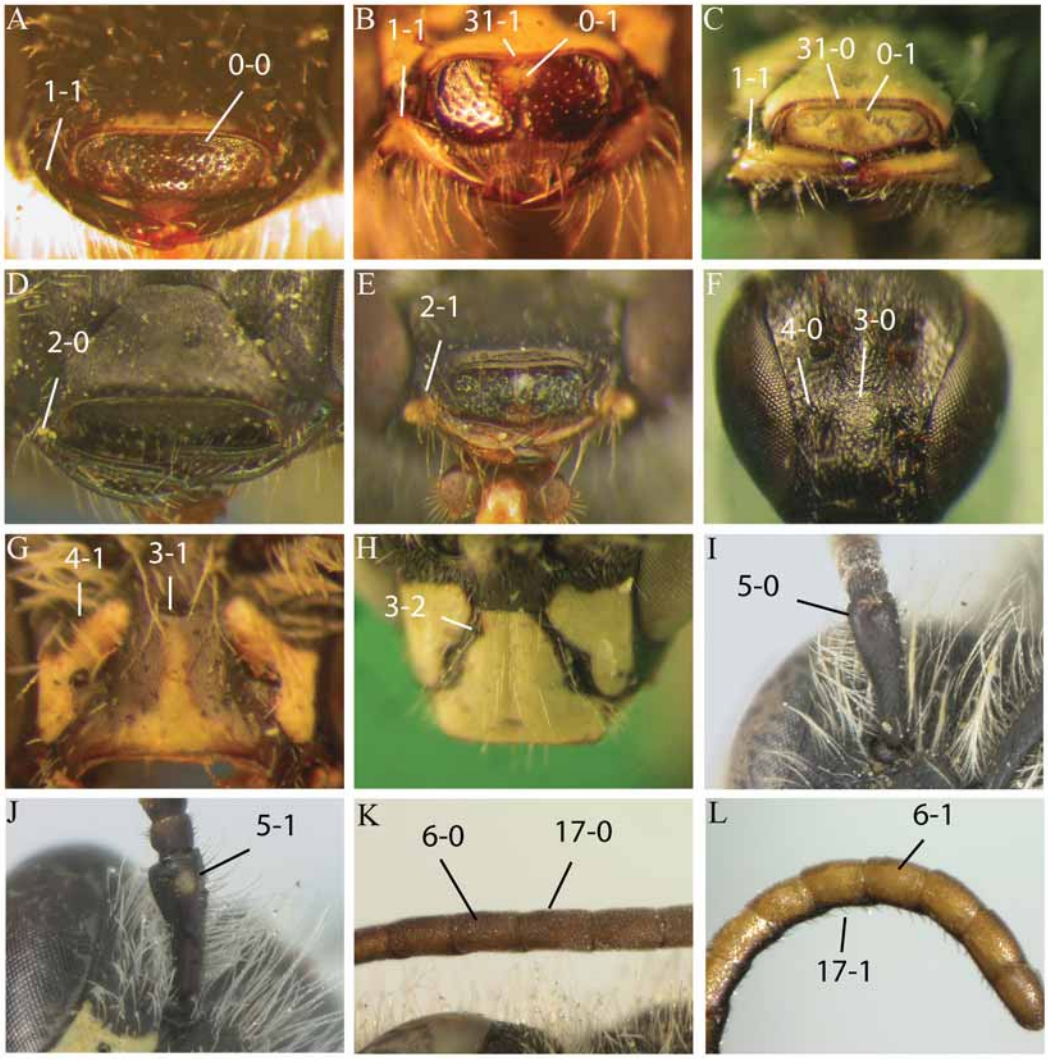

FIGURE 9 A–L. Morphological structures described as character states for the phylogenetic analysis (refer to the Appendix for complete list of characters). A. labrum and mandibles of male *Chilicola colliguay,* B. labrum and mandibles of male *C. rubriventris,* C. labrum and mandibles of male *C. (Chilioediscelis) patagonica,* D. mandibles of female *C. colliguay,* E. mandibles of female *C. rubriventris,* F. clypeus of male *C. (Anoediscelis) herbsti,* G. clypeus of *C. aisenensis,* H. clypeus of male *C. (Chilioediscelis) patagonica,* I. scape of male *C. colliguay,* J. scape of male *C. rubriventris,* K. flagellomeres of male *C. colliguay,* L. flagellomeres of male *C. rubriventris.*

0. *Male, colour of labrum*: (0) entirely black (Fig. 9A); (1) yellow (Fig. 9C) or black with yellow spot (Fig. 9B).

1. *Male, colour of mandible base*: (0) entirely black (Fig. 9A); (1) yellow marked (Fig. 9B, C).

2. *Female, colour of mandible base*: (0) entirely black (Fig. 9D); (1) yellow marked (Fig. 9E).
3. *Male, colour of clypeus*: (0) black (Fig. 9F); (1) black with yellow distal band (Fig. 3C, 9A) or inverted T-shape not reaching transverse portion of epistomal suture (Fig. 9G); (2) entirely yellow or yellow with black along longitudinal portions of epistomal suture (Fig. 9H).
4. *Male, colour of lower paraocular area*: (0) black (Fig. 9F); (1) yellow (Figs. 9G, H).
5. *Male, yellow dot on apex of scape*: (0) absent (Fig. 9I); (1) present (Fig. 9J).
6. *Male and female, colour of ventral surface of flagellomeres*: (0) brown (Fig. 9K); (1) orange to yellow (Fig. 9L).

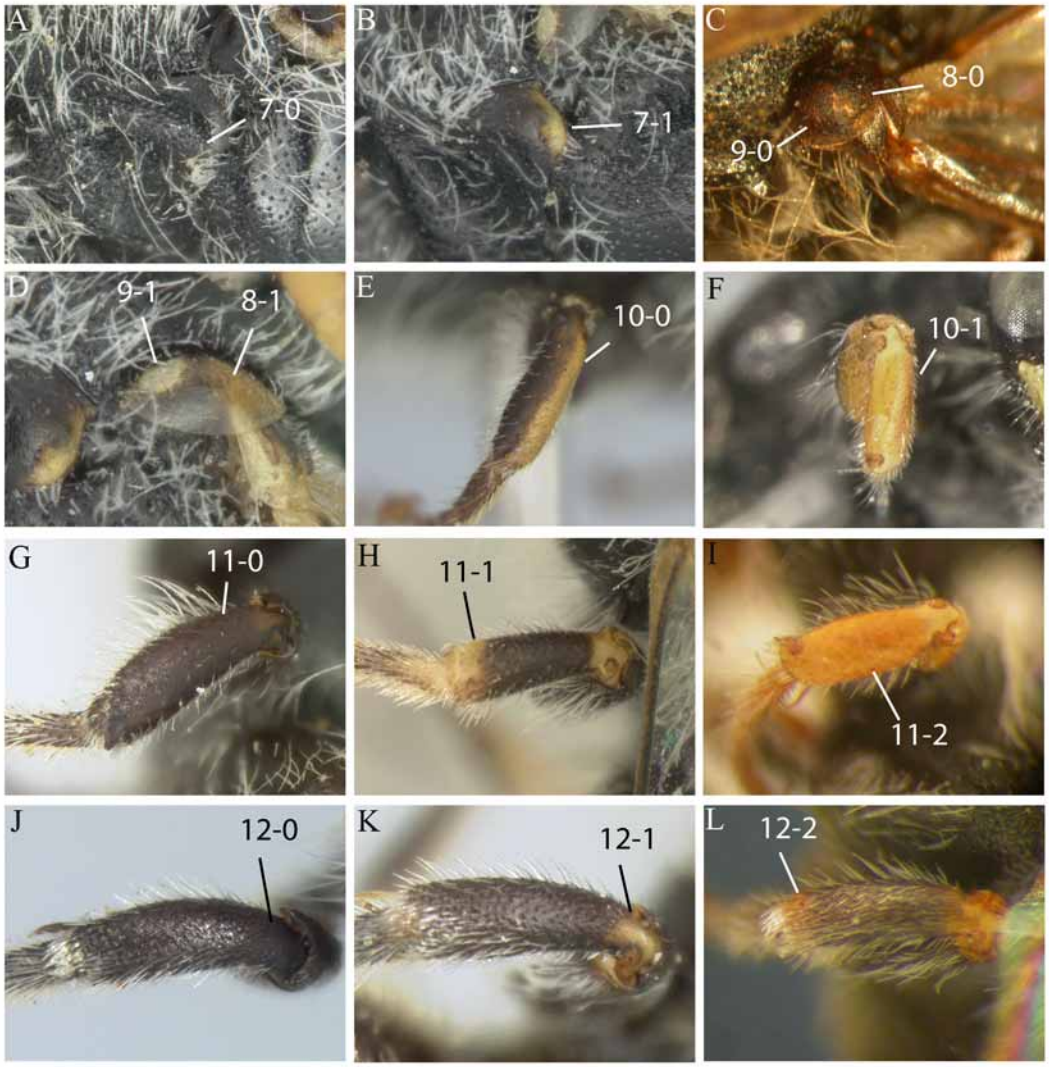

FIGURE 10 A–L. Morphological structures described as character states for the phylogenetic analysis (refer to the Appendix for complete list of characters). A. pronotal lobe of male *C. rubriventris*, B. pronotal lobe of *C. (Chilioediscelis) araucana*, C. tegula of male *C. colliguay*, D. tegula of male *C. (Chilioediscelis) araucana*, E. fore tibia of male *C. colliguay*, F. fore tibia of male *C. (Chilioediscelis) araucana*, G. mid tibia of male *C. colliguay*, H. mid tibia of male *C. rubriventris*, I. mid tibia of male *Ch, patagonica*, J. mid tibia of female *C. colliguay*, K. mid tibia of female *C. rubriventris*, L. mid tibia of female *C. venticola*.

7. *Male and female, colour of pronotal lobe*: (0) entirely black (Fig. 10A); (1) black with yellow posterior margin (Fig. 10B).
8. *Male and female, colour of tegula*: (0) brown to black (Fig. 10C); (1) entirely pale straw (Fig. 10D).
9. *Male and female, yellow to pale straw spot on tegula*: (0) absent (Fig. 10C); (1) present (Fig. 10D).

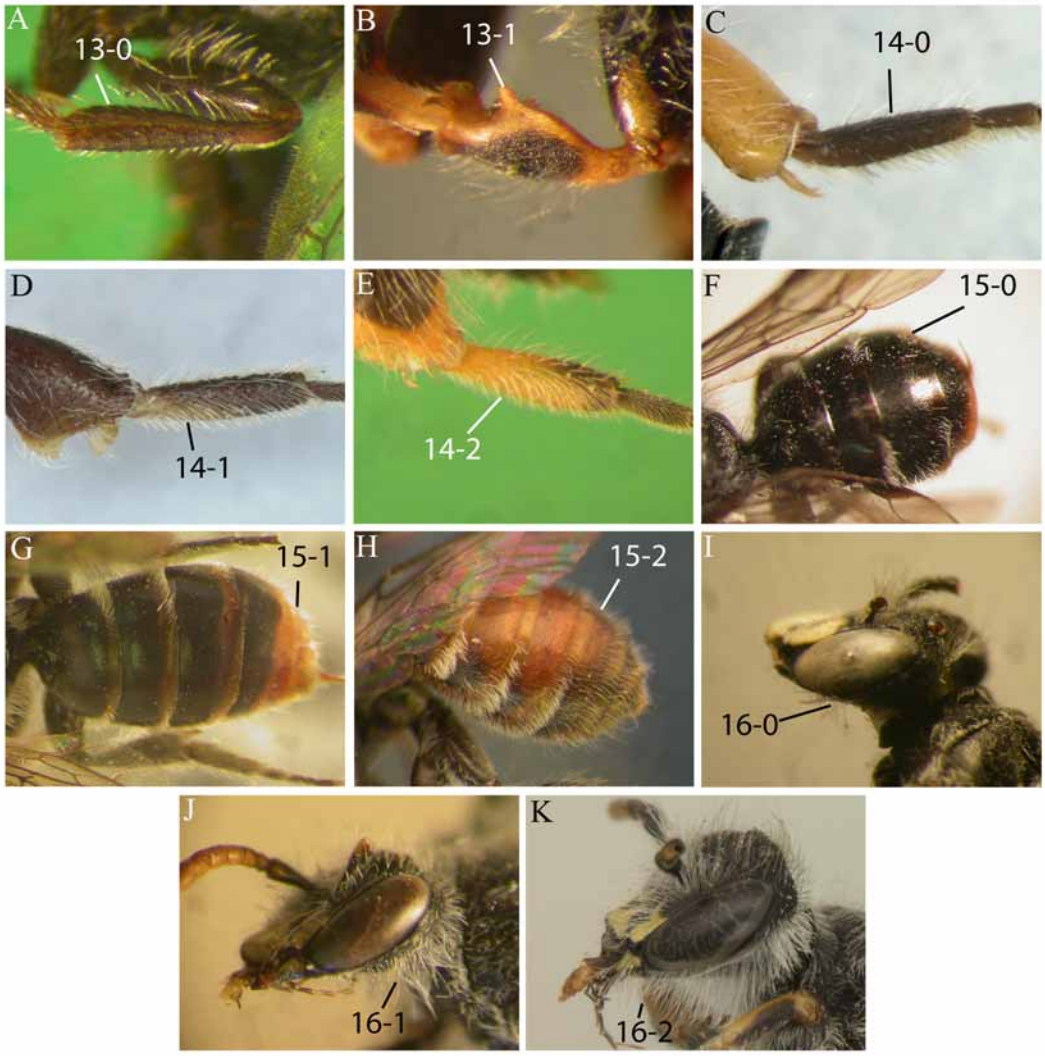

FIGURE 11 A–K. Morphological structures described as character states for the phylogenetic analysis (refer to the Appendix for complete list of characters). A. hind leg of male *C. (Anoediscelis) herbsti*, B. hind tibia of male *C. luzmarieae*, C. hind basitarsus of male *C. (Chilioediscelis) patagonica*, D. hind basitarsus of male *C. pangue*, E. hind basitarsus of male *C. rubriventris*, F. metasoma of female *C. colliguay*, G. metasoma of female *C. (Chilioediscelis) patagonica*, H. metasoma of female *C. luzmarieae*, I. genal pubescence of male *C. patagonica*, J. genal beard of male *C. luzmarieae*, K. genal beard of male *C. rubriventris.*

10. Male, yellow on fore tibia: (0) anterior surface only (Fig. 10E); (1) most of tibia (Fig. 10F).

11. Male, colour of mid tibia: (0) black (Fig. 10G); (1) black with yellow base and apex (Fig. 10H); (2) black with anterior surface yellow (Fig. 10I).

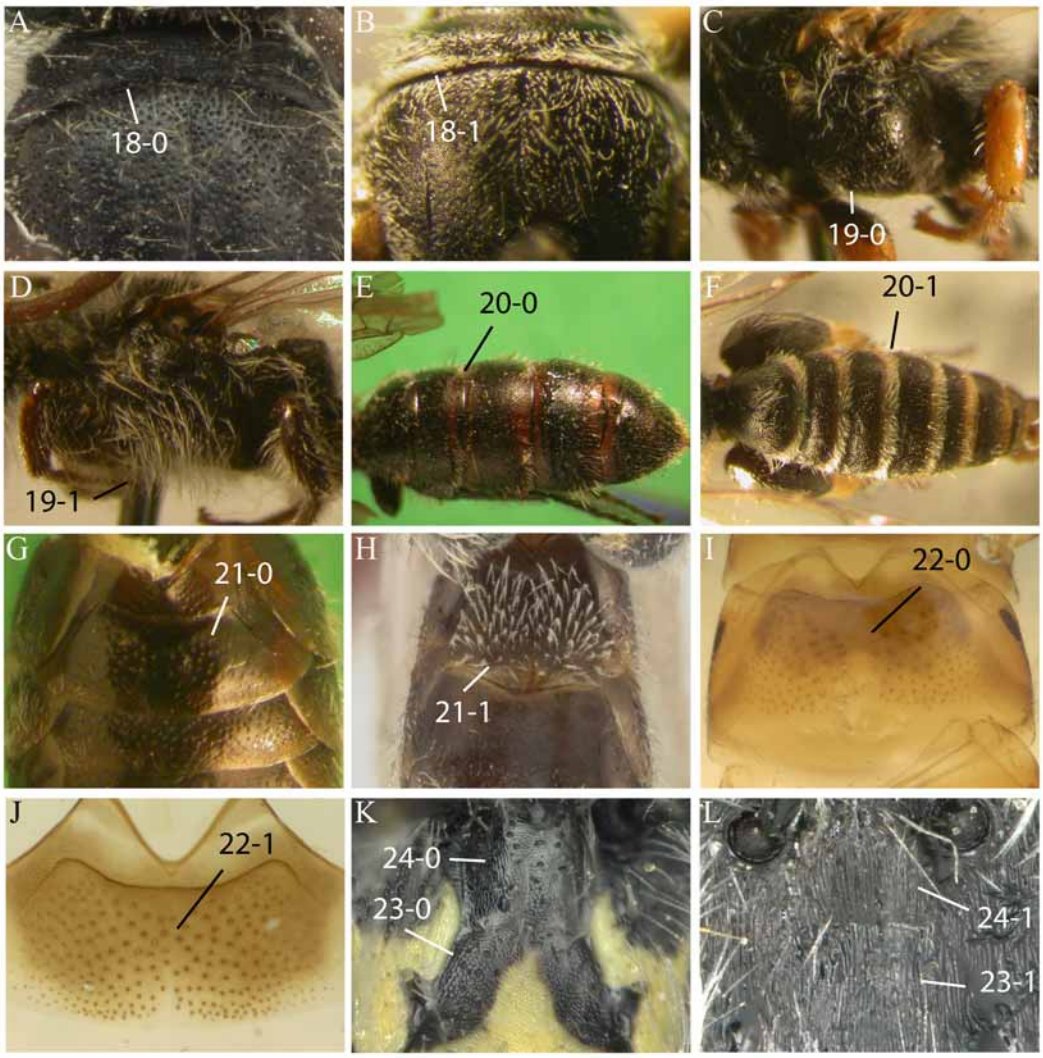

FIGURE 12 A–K. Morphological structures described as character states for the phylogenetic analysis (refer to the Appendix for complete list of characters). A. pronotal pubescence of male *C. colliguay*, B. pronotal tomentum of male *C. venticola*, C. mesopleural pubescence of male *C. (Chilioediscelis) patagonica*, D. mesopleural pubescence of male *C. rubriventris*, E. metasomal pubescence of male *C. colliguay*, F. metasomal pubescence of male *C. venticola*, G. S2 pubescence of male *C. (Oediscelis) vernalis*, H. S2 pubescence of male *C. rubriventris*, I. S2 of female *C. rubriventris* in gelatin showing punctures of scopal hairs with impunctate area of the corbicula, J. S2 of female *C. (Chilioediscelis) patagonica* in gelatine showing punctures of scopal hairs, K. supraclypeal area of male *C. rubriventris*, L. supraclypeal area of female *C. (Chilioediscelis) patagonica*.

12. *Female, colour of mid tibia*: (0) black (Fig. 10J); (1) black with yellow base (Fig. 10K); (2) black with yellow apex and base (Fig. 10L).
13. *Male, colour of hind tibia*: (0) brown (Fig. 11A); (1) brown and yellow (Fig. 11B).
14. *Male, colour of hind basitarsus*: (0) brown (Fig. 11C); (1) mostly brown with yellow base (Fig. 11D); (2) mostly yellow with brown apex (Fig. 11E).
15. *Female, colour of metasoma*: (0) black (Fig. 11F); (1) black with orange-red on T4-T6 (Fig. 11G); (2) T1-T4 orange-red (Fig. 11H).
16. *Male, genal beard*: (0) absent (Fig. 11I); (1) present but sparse distally (Fig. 11J); (2) present, dense throughout (Fig. 11K).
17. *Male, dorsal setae on flagellomeres*: (0) short (Fig. 9K; (1) long (Fig. 9L).
18. *Male, hairs on posterior margin of pronotum*: (0) sparse (Fig. 12A); (1) dense tomentum (Fig. 12B).
19. *Male, density of mesepisternal pubescence*: (0) sparse (Fig. 12C); (1) dense (Fig. 12D).
20. *Male, pubescence on basal impressed areas of metasomal terga*: (0) absent (Fig. 12E); (1) present (Fig. 12F).
21. *Male, S2 pubescence*: (0) sparse (Fig. 12G); (1) dense (Fig. 12H).
22. *Female, S2 pubescence*: (0) corbiculate (Fig. 12I); (1) not corbiculate (Fig. 12J).
23. *Male, sculpture of clypeus immediately below epistomal suture*: (0) granulose (Fig. 12K); (1) striate (Fig. 12L).
24. *Male, sculpture of supraclypeal area*: (0) granulose (Fig. 12K); (1) striate (Fig. 12L).
25. *Male and female, longitudinal striae on distal half of gena*: (0) absent (Fig. 13A); (1) present (Fig. 13B).
26. *Female, longitudinal striae on frons*: (0) absent (Fig. 13C); (1) present (Fig. 13D).
27. *Male, punctation on mesoscutum*: (0) dense, usually even (Fig. 13E); (1) mostly sparse, uneven (Fig. 13F).
28. *Male, punctation on mesopleuron*: (0) dense (Fig. 13G); (1) sparse (Fig. 13H).
29. *Male, sculpture of dorsal area of propodeum*: (0) reticulate (Fig. 13I); (1) striate (Fig. 13J).
30. *Female, sculpture of dorsal area of propodeum*: (0) reticulate (Fig. 13K); (1) striate (Fig. 13L).
31. *Male, basal margin of labrum*: (0) flat (Fig. 9A); (1) concave (Fig. 9B).
32. *Male and female, lateral margin of clypeus below lateral margin of labrum*: (0) straight (Fig. 14A); (1) curved (Fig. 14B).
33. *Male, median groove on clypeus*: (0) absent (Fig. 14C); (1) short, less than half the length of clypeus (Fig. 14D); (2) long, entire length of clypeus (Fig. 14E).
34. *Female, median groove on clypeus* (0) absent or short, less than half the length of clypeus (Fig. 14F); (1) present and long, entire length of clypeus (Fig. 14G).
35. *Male and female, face in lateral view*: (0) convex (Fig. 14H); (1) concave (Fig. 14I).
36. *Male and female, vertex*: (0) convex (Fig. 14J); (1) concave (Fig. 14K).
37. *Male, relative lengths of pedicel and F1*: (0) similar (Fig. 15A); (1) F1 distinctly longer (=1.2X) (Fig. 15B).
38. *Male and female, episternal suture below scrobe*: (0) present (Fig. 13H); (1) absent (Fig. 13G).
39. *Male, hind tibia anteroventral margin*: (0) not greatly expanded (Fig. 15C); (1) expanded; (2) expanded with preapical concavity and apical transverse lamina (Fig. 15D).
40. *Male and female, hind tibial spurs*: (0) straight (Fig. 15E); (1) curved (Fig. 15F).
41. *Female, inner tooth of hind claw*: (0) well developed (Fig. 15G); (1) small (Fig. 15H).
42. *Male, S1 ventrally oriented process*: (0) absent (Fig. 15I); (1) present (Fig. 15J).
43. *Female, S6 apical spine*: (0) absent (Fig. 15K); (1) present (Fig. 15L).

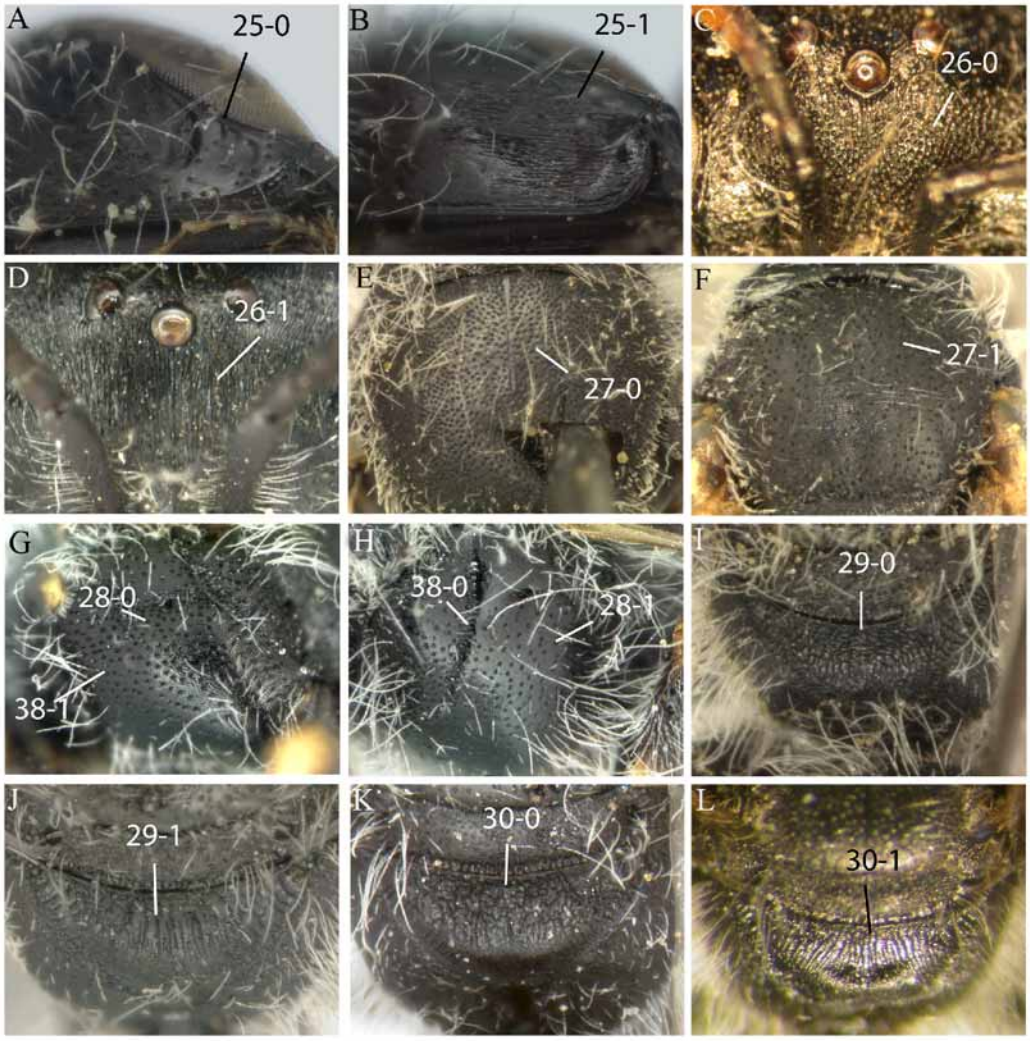

FIGURE 13 A–L. Morphological structures described as character states for the phylogenetic analysis (refer to the Appendix for complete list of characters). A. genal sculpture of male *C. luzmarieae*, B. genal sculpture of male *C. colliguay*, C. frons of female *C. (Oediscelis) vernalis*, D. frons of female *C. colliguay*, E. scutum punctation of male *C. rubriventris*, F. scutum punctation of male *C. luzmarieae*, G. pleura of male *C. (Chilioediscelis) araucana*, H. pleura of male *C. rubriventris C. (Chilioediscelis) araucana*, I. dorsal area of propodeum of male *C. rubriventris*, J. dorsal area of propodeum of male *C. (Chilioediscelis) araucana*, K. dorsal area of propodeum of female *C. colliguay*, L. dorsal area of propodeum of female *C. (Chilioediscelis) patagonica.*

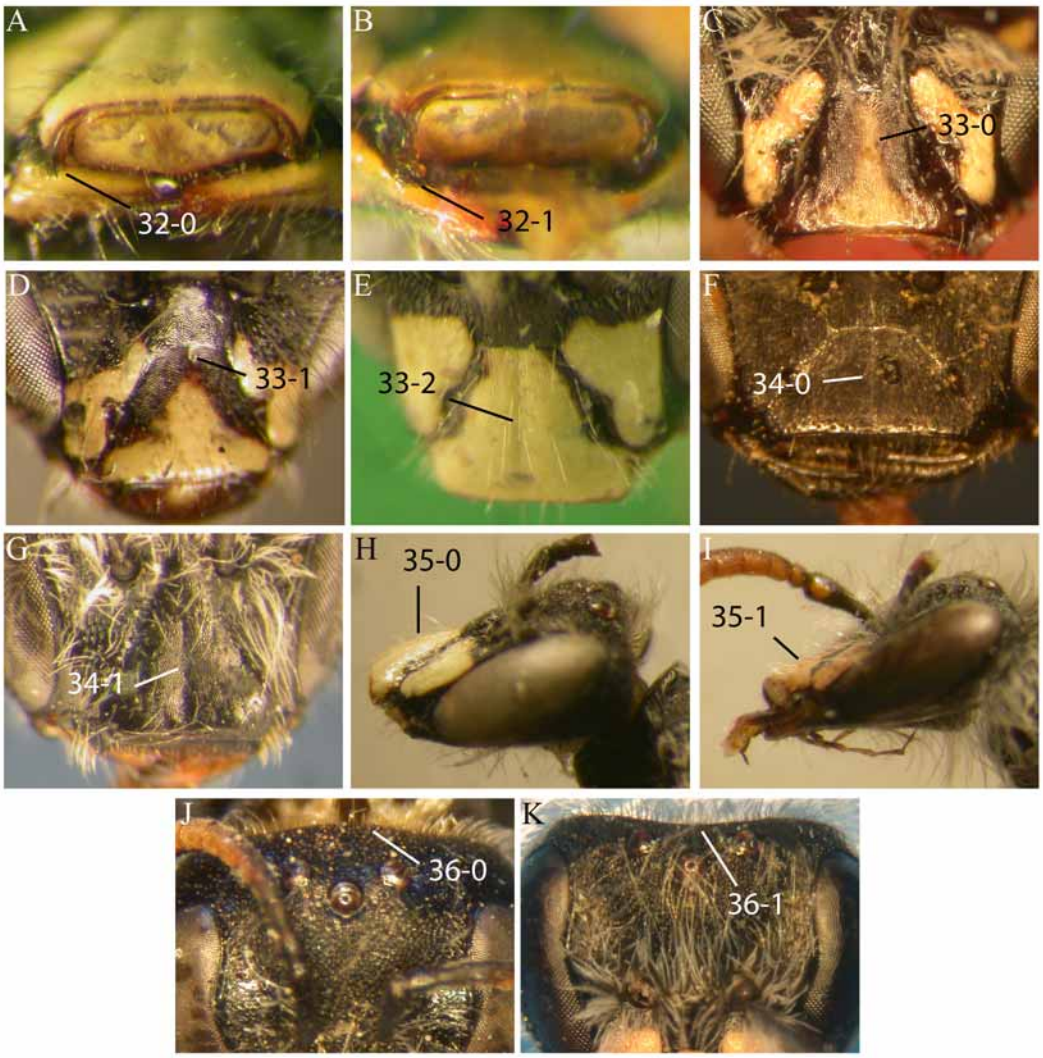

FIGURE 14 A–J. Morphological structures described as character states for the phylogenetic analysis (refer to the Appendix for complete list of characters). A. distal margin of clypeus of male *C. (Chilioediscelis) patagonica*, B. distal margin of clypeus of male *C. luzmarieae*. C. clypeus of male *C. aisenensis*, D. clypeus of male *C. rubriventris*, E. clypeus of male *C. (Chilioediscelis) patagonica*, F. clypeus of female *C. colliguay*, G. clypeus of female *C. luzmarieae*, H. head of *C. (Chilioediscelis) patagonica*, lateral view, I. head of *C. luzmarieae*, lateral view, J. vertex of female *C. (Oediscelis) vernalis*, K. vertex of male *C. venticola*.

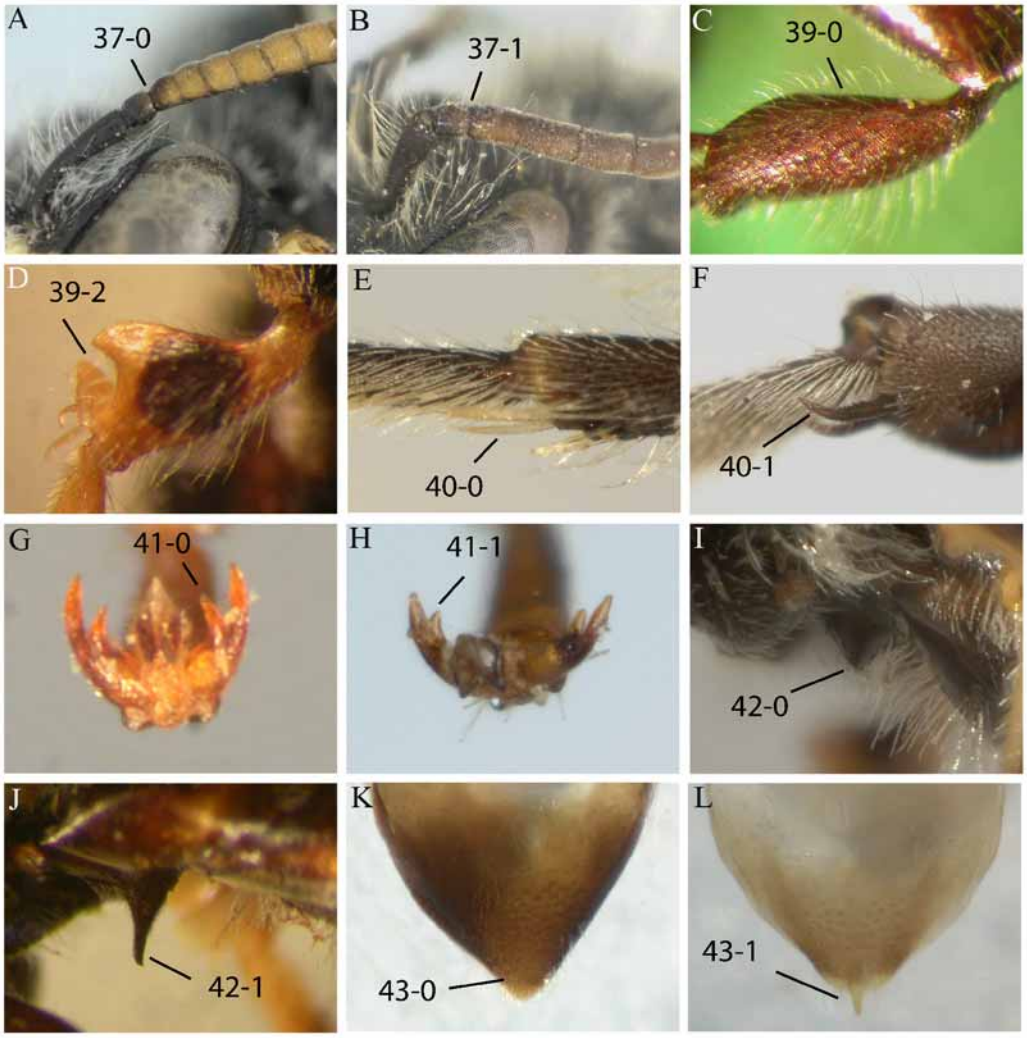

FIGURE 15 A–K. Morphological structures described as character states for the phylogenetic analysis (refer to the Appendix for complete list of characters). A. antenna of male *C. (Chilioediscelis) araucana,* B. antenna of male *C. colliguay,* C. hind tibia of male *C. colliguay,* D. hind tibia of male *C. rubriventris,* E. hind tibial spurs of female *C. (Anoediscelis) herbsti,* F. hind tibial spurs of male *C. colliguay,* G. hind claws of female *C. rubriventris,* H. hind claws of female *C. patagonica,* I. swollen S1 of male *C. luzmarieae,* J. S1 projection of male *C. rubriventris,* K. S6 of female *C. (Chilioediscelis) patagonica,* L. S6 spinose projection of female *C. rubriventris.*

44. Male, shape of S7 ventral lobe: (0) narrow (Fig. 16A); (1) broad (Fig. 16B).
45. Male, S7 dorsal lobe: (0) straight and basally or laterally oriented (Fig. 16A); (1) curved and apically oriented (Fig. 16B).
46. Male, S8 spiculum: (0) short (Fig. 16C); (1) long (Fig. 16D).

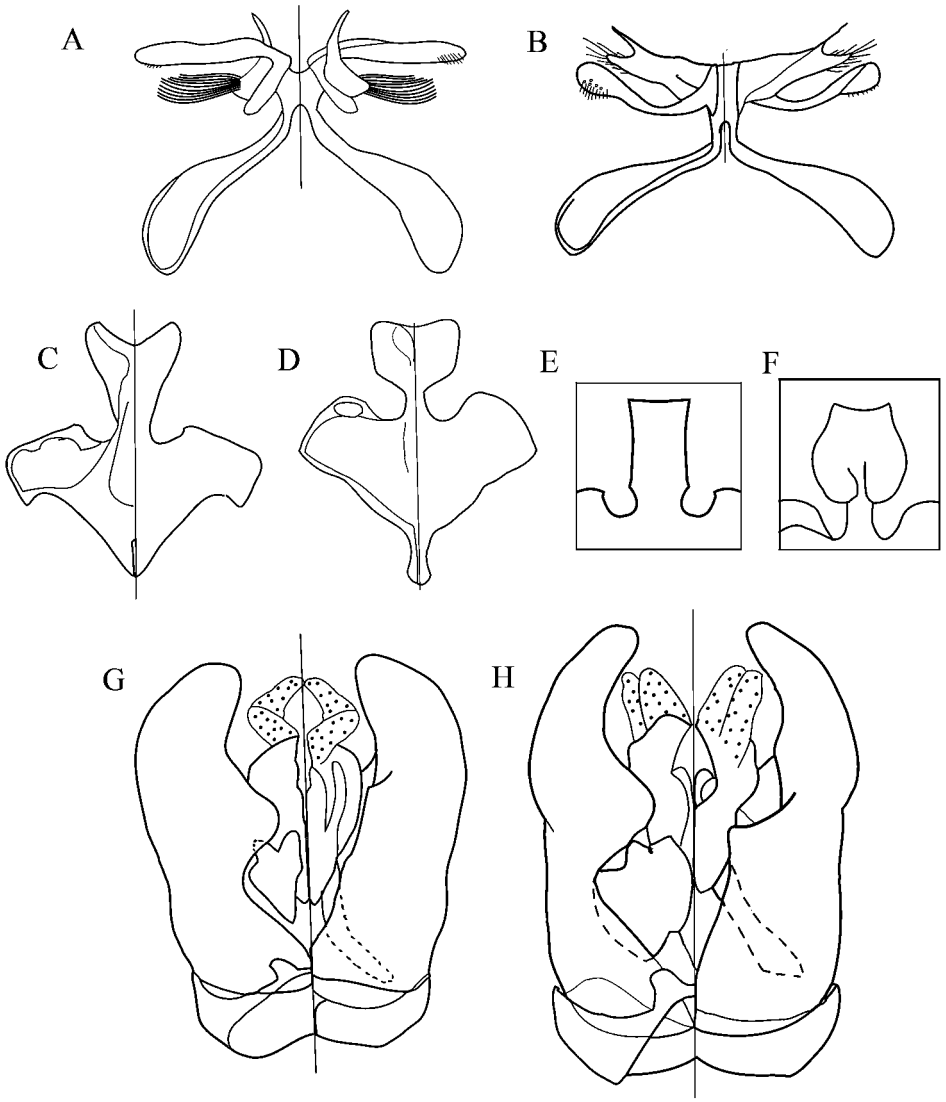

FIGURE 16 A–G. Morphological structures described as character states for the phylogenetic analysis (refer to the Appendix for complete list of characters). A. S7 of *C. (Oediscelis) vernalis*, B. S7 of *C. rubriventris*, C. S8 of *C. (Oediscelis) vernalis*, D. S8 of *C. aisenensis*, E. S8 apical lobe of *C. (Anoediscelis) herbsti*, F. S8 apical lobe of *C. colliguay*, G. genitalia of *C. (Oediscelis) vernalis*, H. genitalia of *C. luzmarieae.*

47. *Male, S8 lateral lobe with basally oriented apodeme*: (0) absent (Fig. 16D); (1) present (Fig. 16C).
48. *Male, apex of S8 apical lobe*: (0) narrow, parallel sided (Fig. 16E); (1) broad, diverging gradually to apex (Fig. 16C); (2) narrow base with broad apical half (Fig. 16D); (3) narrow base with broadly round apical half (Fig. 16F).
49. *Male, shape of penis valve apodeme*: (0) narrow (Fig. 16G); (1) broad (Fig. 16H).
50. *Male, gonostylus*: (0) broad (Fig. 16G); (1) narrow (Fig. 16H).