

# Phylogeny of the *Corynura* group, an endemic southern South American clade sister to all other Augochlorini bees (Hymenoptera: Halictidae), and a revision of *Corynura*

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## Abstract

*Corynura* Spinola, *Callistochlora* Michener and *Halictillus* Moure are the only taxa of Augochlorini endemic to southern South America. They are phylogenetically close, comprising a clade sister to all other augochlorines, which are mainly distributed in tropical America. *Corynura* and *Callistochlora* are common bees in Chile and the Argentinean Patagonia, while *Halictillus* inhabits also central Argentina and southern Brazil. A phylogenetic parsimony analysis of 93 morphological characters coded for 25 species supports the monophyly of each of the three taxa, of the clade formed by them, and their sister relationship to the remaining Augochlorini genera. Our analyses suggest *Callistochlora* as sister to *Halictillus* + *Corynura*. *Callistochlora*, which has been treated as a subgenus of *Corynura*, is elevated to genus level. The study of the gradulus of the sterna, a structure usually ignored in morphological analysis, helped in the resolution of the group. A revision of *Corynura* is presented. We recognize 19 valid species, of which five are described as new: *C. callaina* sp.n., *C. challhuacoensis* sp.n., *C. condita* sp.n., *C. luisae* sp.n., and *C. nahuelita* sp.n. The males of *C. apicata* Sichel, *C. patagonica* Cockerell and *C. spadiciventris* Alfken are described for the first time. The following are new synonyms: *Rhopalictus calli cladurus* Cockerell **syn.n.** is a junior synonym of *C. ampliata* (Alfken); *Halictus analis* Herbst **syn.n.** and *C. heterochlora* Alfken **syn.n.** are junior synonyms of *C. bruchiana* (Schrottky); *Rhopalictus corinogaster chiloeensis* Cockerell **syn.n.** is a junior synonym of *C. corinogaster* (Spinola); *R. chloronotus* Cockerell **syn.n.** and *R. melanocladus* Cockerell **syn.n.** are junior synonyms of *C. herbsti* (Alfken). Neotypes are designated to stabilize the usage of three names: *Halictus apicatus* Sichel, *Halictus bruchianus* Schrottky, and *Corynura gayi* Spinola. Lectotypes are designated for six names: *Halictus (Corynura) atrovirens* Herbst, *Halictus analis* Herbst, *Halictus (Corynura) herbsti* Alfken, *Halictus spinolae* Friese, *Corynura lepida* Alfken, and *Corynura spadiciventris* Alfken. Diagnoses, comments on the type specimens, floral associations, notes on variation within species, images, distributional data and a key to the species are provided.

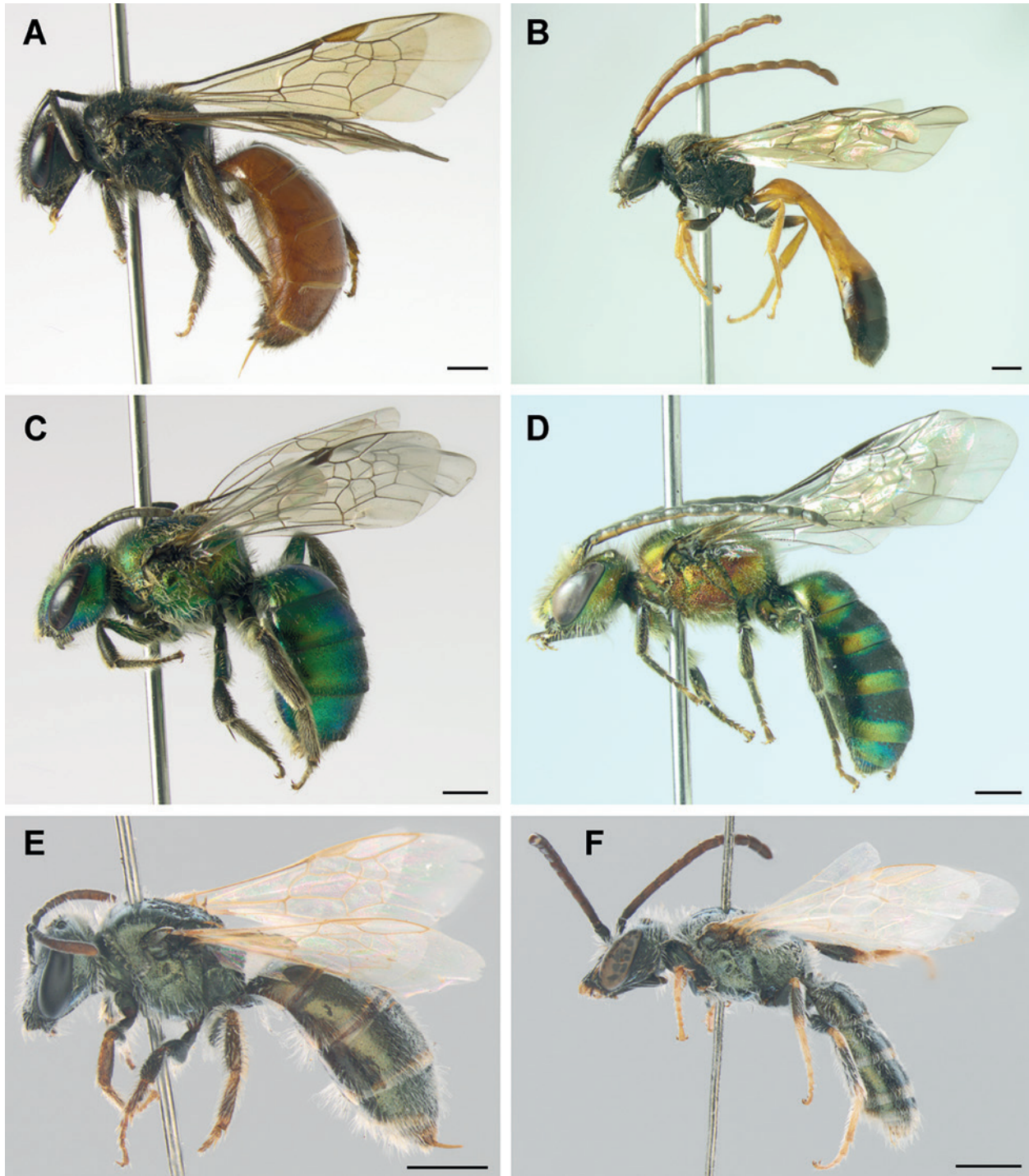
## Key words

Sweat bees, taxonomy, new species, Argentina, Chile.

## 1. Introduction

The bee tribe Augochlorini, restricted to the Americas, includes genera widely distributed in the tropics with some species reaching temperate areas, such as southern Canada, or the south of Argentina and Chile (EICKWORT 1969; ENGEL 2000). Although augochlorines are more di-

verse and abundant in the tropical areas, the tribe is well represented in southern South America. Two genera have been recognized in this region: *Halictillus* Moure, 1947, and *Corynura* Spinola, 1851, the latter with two subgenera: the nominal subgenus and *Callistochlora* Michener,



**Fig. 1.** Some species of the genera studied: habitus, lateral view. A,C,E: females; B,D,F: males. A,B: *Corynura rubella*. C,D: *Callistochlora aureoviridis*. E,F: *Halictillus amplilobus*. Scale bars = 1 mm.

1997 (EICKWORT 1969; ENGEL 2000; MICHENER 2007). *Corynura*, the augochlorine genus with the highest number of species in Chile (MONTALVA & RUZ 2010), is endemic to this country and to the Andean *Nothofagus* forest in the northwest of Argentinean Patagonia. *Halictillus* comprises two species sympatric to *Corynura* and four other species distributed along the peripampasic orogenic arc, reaching southern Brazil (GONZÁLEZ-VAQUERO 2010; FERRETTI et al. 2012). These bees, commonly collected in biodiversity samples (MOURE 2007, and refer-

ences therein), are very abundant and may play a key role in the pollination of crops and native plants (GONZÁLEZ-VAQUERO et al. 2014).

Different phylogenetic hypotheses based on morphological (PESENKO 1999) and molecular (DANFORTH et al. 2004, 2008) characters support the monophyly of the Augochlorini, but the phylogenetic relationships among the genera are not clear. The first revision of the group was performed by EICKWORT (1969), who included diagnoses and detailed drawings of structures for each genus. Based

on those characters, DANFORTH & EICKWORT (1997) proposed the first phylogeny for the tribe, where *Corynura* and *Halictillus* come together as sister genera in most of the analyses. Later, considering morphological and behavioural characters, ENGEL (2000) proposed a new classification for the tribe, recognizing 30 genera and two subtribes, of which Corynurina comprised *Corynura*, *Halictillus*, *Rhectomia* Moure, 1947, and *Rhinocorynura* Schrottky, 1909, while all other genera were included in the subtribe Augochlorina. Recently GONÇALVES (2016) combined morphological and molecular data and suggested the paraphyly of the subtribes proposed by ENGEL (2000), proposing several new groups of genera. In his analyses *Halictillus* and *Corynura* appear together (*Corynura* group) as the sister group to all remaining Augochlorini.

The two subgenera that have been recognized in *Corynura* are very different in appearance at first sight. The species included in *Corynura* are dark coloured with bluish or greenish highlights, or alternatively have a dull cuticle, the metasoma sometimes reddish (Fig. 1A,B); females have a tessellate metapostnotum with basal, very short striae, and the males have a petiolate metasoma (MICHENER 2007). ALFKEN (1926) made a revision of *Corynura*, including a key to the species that were known to him, later updating his key (ALFKEN 1931). ALFKEN's key (1931) is not useful since the characters mentioned there are difficult to understand without figures, and many of them (e.g. colour) are variable in some species. This is why in museum collections most of the specimens are identified only to subgenus level. MOURE (2007) listed 18 names as valid in his catalogue. The species included in the subgenus *Callistochlora*, are shiny green or red (Fig. 1C,D), the females have long striae on the metapostnotum, and the males have an elongate but not petiolate metasoma. The three species were recently revised by GONZÁLEZ-VAQUERO & GALVANI (2016). The taxonomy of *Halictillus* has been clarified recently (GONZÁLEZ-VAQUERO 2010), with six species. These are dull-green or bluish small bees (Fig. 1E,F) which superficially resemble species of the subgenus *Dialictus* Robertson, 1902, of *Lasioglossum* Curtis, 1833 (Halictidae: Halictini).

The augochlorine genera show a wide variety of social behaviours, ranging from solitary nesting to eusociality (DANFORTH & EICKWORT 1997). Since *Corynura*, *Callistochlora* and *Halictillus* include both solitary species and species with different levels of social behaviour (CLAUDE-JOSEPH 1926; VERA SÁNCHEZ 2002; PACKER 2006), the assessment of their phylogenetic position may shed light on the understanding of the evolution of social biology in this tribe. In this contribution we test the monophyly of both subgenera of *Corynura* as recognized by previous authors, and their presumed sister genus *Halictillus*, and also analyze the phylogenetic relationships among all species of the three groups, based on morphological characters. We also revise *Corynura* as defined in the present contribution, which is the largest group of southern South American augochlorines.

## 2. Material and methods

### 2.1. Terminology

Higher-level classification of Halictidae and terminology for structures follow MICHENER (2007), except that *metapostnotum* is used instead of *propodeal triangle* (BROTHERS 1976), and features of the genital capsule of the male follow EICKWORT (1969). The metapostnotum has two areas: one dorsal area (DAM), approximately on the same plane as the scutellum and metanotum, and a vertical area, perpendicular to DAM. We consider the gonostylus of the genital capsule of the male as a single structure, with a hairy ventral area and a usually glabrous, more sclerotized dorsal area. We describe the genital capsule and the hidden sterna of the male, structures not mentioned in the original descriptions of the species nor in ALFKEN's (1926, 1931) contributions. We present full descriptions of the males only for those species with previously unknown males. Terminology for surface sculpture follows HARRIS (1979); *tessellate* is used to define a sculpture that looks like a mosaic where the pieces are all on the same plane (not imbricate). The puncture diameter (PD) is used to give a relative measure of puncture density, and the median ocellar diameter (MOD) is used to give a relative measure of hair length. The hairs on the pleura measured are those on the mesepisternum, below the hypoepimeral area. Measurements of the head were made following MICHENER (2007: fig. 10-3b). Ratios based on measurements of body parts were taken from five specimens from distant localities. Since the inner hind tibial spur has considerable variation in the females of *Corynura*, instead of describing them as serrate or pectinate we consider the number of teeth and their length compared to the diameter of the spur rachis. Flower records were taken from the specimen labels, many of them collected on field trips made by R.A. González-Vaquero in the provinces of Neuquén and Río Negro (Argentina). Synonymical lists are restricted to original citations; for complete lists of citations refer to MOURE (2007). We examined more than 4,800 specimens but only type specimens are mentioned under Material Examined; details from additional examined specimens can be found in the Electronic Supplement File 2. A distribution map was obtained using DIVA-GIS 7.5 ([www.diva-gis.org](http://www.diva-gis.org)), taking into consideration the localities from the labels of the specimens examined. The De Martonne aridity index (DE MARTONNE 1927) is shown on the maps, providing an idea of the different environments the species inhabit. Images were taken either with a digital camera Olympus DP25 (connected to a stereomicroscope Olympus SZX16), with the program CellSens at MACN, or with a digital camera Cannon 5D Mark II (connected to a stereomicroscope Leica MZ 12), with the program CamLift at PCYU (Dr. Laurence Packer Collection, York University, Toronto). Some structures were coated with gold palladium and examined in a Philips XL30 scanning electron microscope at MACN.

## 2.2. Phylogenetic analyses

Phylogenetic analyses were based on 93 morphological characters, many of them from diagnostic structures such as the sterna and the genital capsule of the male. Some of the characters, as indicated in the list of characters, were taken from previous studies (ALEXANDER & MICHENER 1995; DANFORTH & EICKWORT 1997; ENGEL 2000). *Corynura atrovirens* (Herbst, 1924), known from the male un-dissected type specimen only, and *C. luisae* sp.n., known from a few females only, were excluded from the analyses, because internal structures such as graduli of the sterna and genitalia could not be studied. All species of *Halictillus* were included except *H. loureiroi* (Moure, 1941) from Brazil, due to lack of material. Four species of Augochlorini were selected as outgroup taxa: *Neocorynura codion* (Vachal, 1904), *Paroxystoglossa brachycera* Moure, 1960, *Rhinocorynura brunnea* Gonçalves & Melo, 2012, and *Thectochlora alaris* (Vachal, 1904). We added two species of Halictini to the analysis, *Halictus ligatus* Say, 1837, and *Lasioglossum leucozonium* (Schränk, 1781), and *Dieunomia nevadensis* (Cresson, 1874) (Halictidae: Nomiinae) was selected to root the trees. The matrix is given in the Electronic Supplement File 1.

Parsimony analyses were performed with the program TNT v. 1.1 (GOLOBOFF et al. 2008). We conducted a traditional search of 100 replicates, retaining 10 trees per replicate, under the tree bisection-reconnection (TBR) algorithm. Multistate characters were treated as unordered, except those referring to the shape of morphological structures which followed a logical transition (Characters 3, 8, 18, 28, 33, 40, 50, 56, 83, 90). The order of the states was postulated so that states that are more similar are adjacent to each other. Two characters (43, 58), based on male coloration, were treated as polymorphic. Implied weighting analysis (GOLOBOFF 1993) was also performed, considering the *k* value suggested by the script 'setk.run' (Salvador Arias in HERMES et al. 2014; *k* = 7.8125 for our dataset). To estimate the support of each node, 100 jackknife permutations (independent character removal, removal probability: 36%, FARRIS et al. 1996) were performed. The evolutionary transitions for each character were mapped in the program Winclada v. 1.00.08 (NIXON 2002); ambiguous nodes were retained as such. The trees were edited in Inkscape v. 0.48 (www.inkscape.org).

## 3. Abbreviations

**Collections.** Examined specimens are deposited in the following collections, acronyms following ARNETT et al. (1993) when possible (curators in brackets): **AMNH** – American Museum of Natural History, New York, U.S.A. (J.G. Rozen, Jr. and J. Ascher); **BMNH** – Natural History Museum, London, England (D. Notton); **CAS** – California Academy of Sciences, San Francisco, U.S.A. (W.

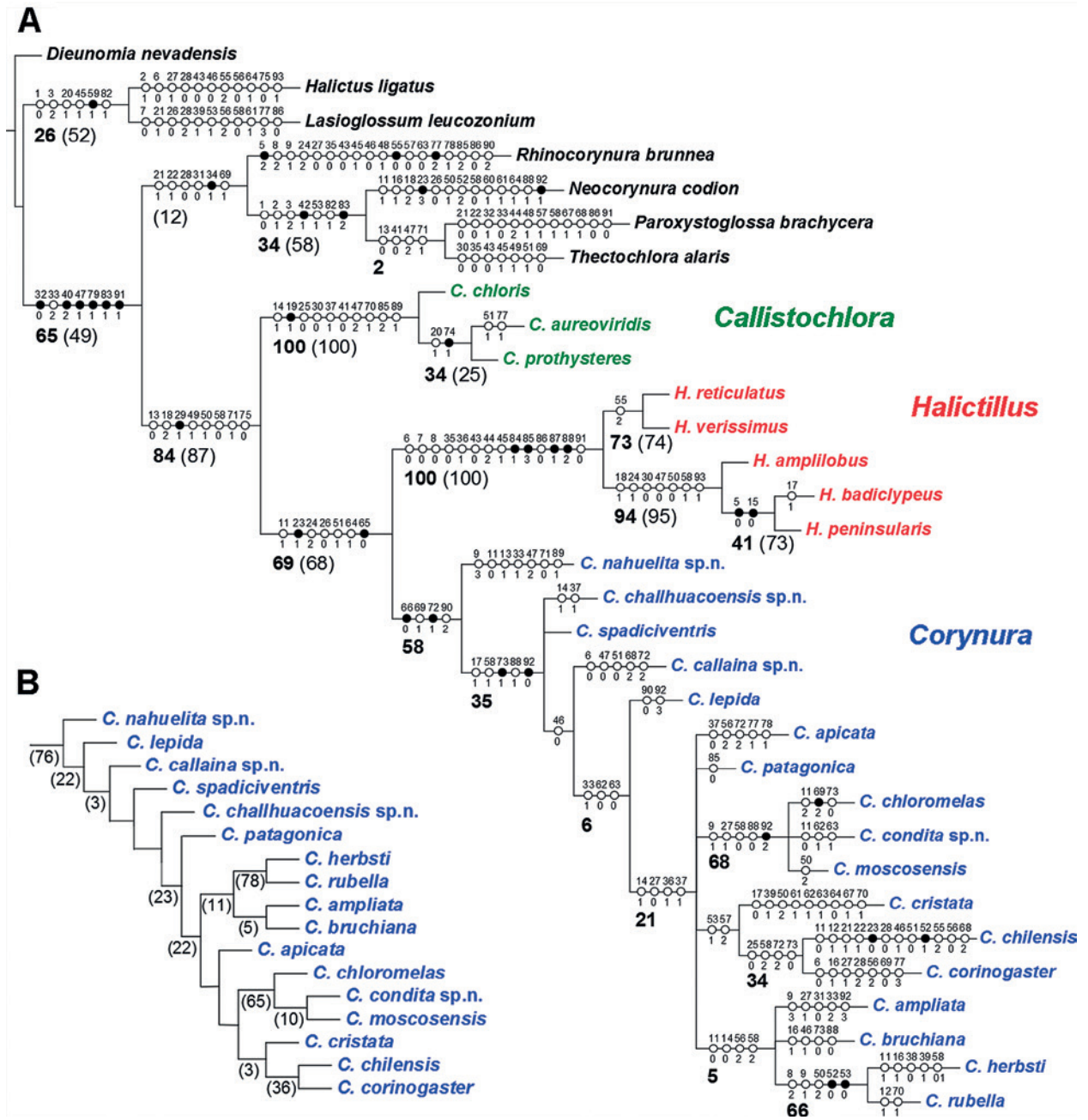
Pulawski); **FAUBA** – Cátedra de Botánica, Facultad de Agronomía, Universidad de Buenos Aires, Buenos Aires, Argentina (J.P. Torretta); **IADIZA** – Instituto Argentino de Investigaciones de las Zonas Áridas, Mendoza, Argentina (S. Roig); **IMLA** – Instituto y Fundación Miguel Lillo, San Miguel de Tucumán, Argentina (C. Berta and E. Pérez); **MACN** – Colección Nacional de Entomología, Museo Argentino de Ciencias Naturales 'Bernardino Rivadavia', Buenos Aires, Argentina (A. Roig-Alsina); **MCZ** – Museum of Comparative Zoology, Harvard University, Cambridge, U.S.A. (S. Cover and J. Rana); **MLPA** – Museo de La Plata, La Plata, Argentina (A. Lanteri and M. Lucia); **MLS** – Museo Municipal de Ciencias Naturales 'Lorenzo Scaglia', Mar del Plata, Argentina (J. Farina); **MNHN** – Muséum National d'Histoire Naturelle, Paris, France (A. Touret-Alby); **MNNC** – Museo Nacional de Historia Natural, Santiago de Chile, Chile (M. Elgueta and F. Rojas); **MRSN** – Museo Regionale di Scienze Naturale, Torino, Italia (M. Garzena); **MZSP** – Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (C.R.F. Brandão); **OUMNH** – Hope Entomological Collections, Oxford University Museum of Natural History, Oxford, England (J.E. Hogan); **PCYU** – Dr. Laurence Packer Collection, York University, Toronto, Canada (L. Packer); **SEMC** – Natural History Museum, University of Kansas, Lawrence, U.S.A. (M. Engel); **UCVC** – Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile (L. Ruz); **USNM** – National Museum of Natural History, Smithsonian Institution, Washington D.C., U.S.A. (S. Brady and B. Harris); **ZMB** – Museum für Naturkunde der Humboldt Universität, Berlin, Germany (F. Koch and V. Richter).

**Morphological structures.** *bpg* – basal process of gonostylus; *dag* – dorsal area of gonostylus; **DAM** – dorsal area metapostnotum; **F** – flagellomere; *gb* – gonobase; *gx* – gonocoxite; **MOD** – median ocellar diameter; *mz* – marginal zone of tergum; **PD** – puncture diameter; **S** – sternum; **T** – tergum; *vag* – ventral area of gonostylus.

## 4. Results and discussion

### 4.1. Phylogenetic analyses

An equal weights analysis yielded 18 equally parsimonious trees (358 steps), the strict consensus of which is shown in Fig. 2A. The relative position of some of the species of *Corynura* vary among these cladograms. The genera *Callistochlora*, *Halictillus*, and *Corynura* form a clade sister to all remaining Augochlorini. This clade, the *Corynura* group (*sensu* Danforth & Eickwort), was recovered as monophyletic in previous phylogenetic studies (DANFORTH & EICKWORT 1997; ENGEL 2000; GONÇALVES 2016), although *Callistochlora* was included in those studies as a subgenus of *Corynura*. Our results indicate that *Callistochlora* is sister to *Halictillus* + *Corynura*. Each of the three taxa are monophyletic and



**Fig. 2.** Phylogenetic relationships of *Callistochlora*, *Corynura* and *Halictillus*. **A:** Parsimony analysis based on equal weighting of morphological characters, consensus of the 18 trees obtained. Numbers above branches are characters, numbers below them represent the change of state. In black, synapomorphies; in white, homoplastic characters. **B:** The single tree obtained in the parsimony analysis based on implied weighting is identical to that in **A**, except by the relationships between the species of *Corynura* which are displayed. Numbers below the branches are jackknife support values, in bold those corresponding to the equal weighting analysis, in parentheses those corresponding to the implied weighting analysis.

well supported. The implied weighting analysis resulted in one most parsimonious tree. This tree only differs from the equal-weights consensus regarding the phylogenetic relationships within *Corynura* (Fig. 2B).

The *Corynura* group is well supported in our study. The V-shaped notch of the vertical area of the metapostnotum is the single unique synapomorphy (char. 29:1). It has already been mentioned by ENGEL (2000), and apparently, it is the only one exclusive to the *Corynura* group. ENGEL (2000) reported the presence of a metatibial spine in the female as an additional character for the group,

but such a spine is also present in the non-augochlorine outgroups selected in our study (the lack of the spine is a synapomorphy of all Augochlorini exclusive of the *Corynura* group, char. 31:0). Other noteworthy characters are the long, crenulate antennae of the males (chars. 49:1 and 50:1), although such antennae are also found in some other scattered Augochlorini, and the short, sparse pilosity of the male S6 (char. 75:0).

*Callistochlora* was recognized as a distinct genus of Augochlorini by MOURE (1964, under the preoccupied name *Callochloa*). EICKWORT (1969) treated it as a sub-

genus of *Corynura*, arguing on their close relationship. Both taxa appear as sister groups in all phylogenies published so far (DANFORTH & EICKWORT 1997; ENGEL 2000; GONÇALVES 2016), and *Callistochlora* has been considered a subgenus of *Corynura* in recent works (MOURE 2007; MICHENER 2007). We reinstate the generic status for *Callistochlora*, accordingly with our results. We favor this taxonomic view rather than considering *Halictillus* and *Callistochlora* as subgenera of *Corynura*, given the distinctiveness of each taxon, with striking differences in the size, colour, and habitus of their species (Fig. 1), as well as characteristics of the male hidden sterna and genitalia.

The sister-group relationship between *Halictillus* and *Corynura* is supported by two unique synapomorphies: mesoscutal sculpture tessellate, with weak highlights (char. 23:1, microareolate and dull in *C. chilensis* (Spinola, 1851)), and gradulus on S2 absent or vestigial (char. 65:0). This last character is present in species with an elongate metasoma. An elongate metasoma is also present in *Neocorynura* Schrottky, 1910, but examined species of this genus have S2 with a strong gradulus, evidencing the nonhomologous elongation of the metasoma in the two groups. Additional synapomorphies shared by *Halictillus* and *Corynura* are the sparse punctation on the centre of the mesoscutal disk (char. 24:2, with few exceptions), the short scutellum (char. 26:0), and the presence of distinct areas on the male flagellomeres, composed by sensilla placodea only (char. 51:1, except in *C. chilensis* and *C. callaina* sp.n.). These areas cover most of the dorsal surface of the flagellomeres in most species (Fig. 9C), but are small in *C. chloromelas* (Alfken, 1913) (Fig. 9B).

*Callistochlora* and *Halictillus* are each well supported as monophyletic groups. The single topology obtained for these genera shows fully resolved relationships among their species. *Callistochlora* is supported by a single unique synapomorphy: the presence of hairs on the compound eyes longer than an ommatidium (char. 19:1), although long hairs also appear independently in *Caenaugochlora* Michener (MICHENER 2007). Another synapomorphy is the shiny green or red cuticle (char. 41:0), which according to our cladograms appeared independently in *Callistochlora* and other Augochlorini. Additional synapomorphies of the genus are the obsolete outer border of the female basitibial plate (char. 30:0, present in some *Halictillus*), and the presence of dorsal hairs on the apical area of the male gonocoxite (char. 89:1, present also in *C. nahuelita* sp.n.). Species of *Callistochlora* are sympatric in southern Chile, with *Ca. chloris* (Spinola, 1851) extending its distribution to northern Chile, and *Ca. aureoviridis* (Friese, 1910) to Argentina across the Andes. *Halictillus* is distinctive by four unique synapomorphies of the genital capsule of the male: the long volsella (char. 84:1), with the inner apical corner of the digitus produced posteriorly (char. 85:3), the wide dorsal bridge of the penis valves (char. 87:1), and the mid projection of the dorsal inner margin of the gonocoxite (char. 88:2). Species of *Halictillus* split into two clades, with non-overlapping distributions: the Chilean-Patagonian

*H. reticulatus* González-Vaquero, 2010, and *H. verissimus* Gonçalves, 2010, sister to the group comprising *H. amplilobus* González-Vaquero, 2010, *H. badichypeus* González-Vaquero, 2010, and *H. peninsularis* González-Vaquero, 2010, distributed in central Argentina.

*Corynura* is supported by two unique synapomorphies: the absence of gradulus on S3 (char. 66:0, vestigial in *C. challhuacoensis* sp.n.), and the gradulus on S6 produced posteriorly into a median angle (char. 72:1). *Corynura nahuelita* sp.n. is sister to all other species in all trees. This is a distinctive species, with broadened gena and vertex, and a long malar space. It lacks many apomorphies present in most other species of *Corynura*, such as the enlarged, modified dorsal area of the gonostylus, and the produced apical margin of the male S6. The relationships between the remaining species of *Corynura* are poorly supported, and differ in the trees obtained with or without character weighting (Fig. 2A,B). A terminal clade of 12 species is recovered in both analyses. Within these 12 species, there are three species groups constant to all analyses. *Corynura chloromelas*, *C. moscosensis* González-Vaquero, 2017, and *C. condita* sp.n. are united by some characteristics of the male genitalia. A second group is formed by *C. chilensis* and *C. corinogaster* (Spinola, 1851), supported by homoplastic characters only. The relationship between *C. herbsti* (Alfken, 1913) and *C. rubella* (Haliday, 1836) is supported by the coarse sculpture and the strongly crenulate flagellomeres of the male and the enlarged labrum of the female.

Our results indicate a sister-group relationship between the *Corynura* group and the remaining Augochlorini, although with a relatively low jackknife value. This relationship agrees with the phylogenetic hypothesis based on combined data (molecules and morphology) by GONÇALVES (2016). A sister-group relationship between the *Corynura* group and *Rhinocorynura*, as had been suggested by ENGEL (2000) when proposing the subtribe Corynurina, is not supported. According to ENGEL (2000) all these genera share the presence of a galeal comb (ENGEL 2000: figs. 24–25), and the male labrum lacks a distal process (EICKWORT 1969: fig. 142). A galeal comb is present in other groups (e.g. *Neocorynurella* Engel, 1997), as pointed out by GONÇALVES (2016), and a distal process on the male labrum is absent in the Halictini here selected as outgroups, resulting in a plesiomorphy for the *Corynura* group in our study. GONÇALVES (2016) mentions the basal process of the gonostylus (Fig. 3F: *bpg*) as a possible putative synapomorphy for all these genera, but it is absent in *Halictillus* (ENGEL 2000; this study). In our cladograms, *Rhinocorynura* appears as sister to the remaining Augochlorini, but this relationship is poorly supported and it might be an artifact of the outgroup sorting. A character that supports this position of *Rhinocorynura* (Fig. 2A, char. 34:1) is the truncate, appendiculate marginal cell of the forewing (as in EICKWORT 1969: fig. 35), but a marginal cell with an acute apex is present in some other genera of Augochlorini, not represented in the analysis. According to GONÇALVES (2016) this relationship of *Rhinocorynura* can be supported by the galeal base inserted

near the base of the stipes (EICKWORT 1969: fig. 175), as it occurs in most augochlorines. In *Callistochlora*, *Corynura* and *Halictillus* the galeal base is inserted near the middle of the stipes (EICKWORT 1969: fig. 177), but at least in *Rhinocorynura brunnea* the insertion is somewhere in between the middle and the base of the stipes, and we decided to code this species with a third state.

Given the availability of DNA sequences for the gene COI (DNA-barcode region) for several of the species considered for these analyses (GONZÁLEZ-VAQUERO et al. 2016), we performed a parsimony analysis of the combined data (results not shown here). Almost 30% of the species of our dataset lacked barcodes, which may explain why *Halictillus* and *Corynura* were not recovered as monophyletic. Moreover, the barcode region may be useful for phylogenetic analysis of very recently diverged taxa only, and it must be used in combination with nuclear genes to get confident results (KLOPFSTEIN et al. 2010; GONZÁLEZ-VAQUERO et al. 2016; TRUNZ et al. 2016). In the future, in case both sexes of *C. atrovirens* and *C. luisae* sp.n. become known, the addition of these species to the morphological matrix as well as further molecular characters (besides DNA barcodes) may add valuable information to the resolution of *Corynura*. Furthermore, in light of our results in the resolution of the *Corynura* group, we consider that the graduli of the sterna are worth being routinely investigated in morphological analyses of halictids.

## 4.2. List of characters

### Females

- Galeal comb (ENGEL 2000: char. 7): (0) absent; (1) present.
- Galeal distal area, length compared to length of galeal basal area (measured from insertion of maxillary palpus): (0)  $\geq 0.3$ ; (1)  $\leq 0.2$ .
- Galeal base, location (DANFORTH & EICKWORT 1997: char. 21; ENGEL 2000: char. 8): (0) near middle of stipes; (1) between middle and base of stipes; (2) near base of stipes. [treated as ordered]
- Maxillary palpus, length compared to prementum length: (0)  $\geq 0.5$ ; (1)  $\leq 0.3$ .
- Labrum, structure: (0) with median, longitudinally oval elevation (GONZÁLEZ-VAQUERO 2010: fig. 22); (1) with median, rounded or transversely oval elevation (Fig. 10); (2) with a pair of median small elevations. [treated as unordered]
- Basal area of labrum, width compared to its total length: (0)  $< 2$  (Fig. 10C); (1)  $> 2$  (Fig. 10G).
- Apical process of labrum, width compared to maximum width of labrum (ENGEL 2000: char. 1, modified): (0)  $< 0.4$ ; (1)  $> 0.5$  (Fig. 10).
- Area of apical process of labrum compared to area of basal area of labrum: (0)  $\leq 0.1$ ; (1) 0.2–1.0 (Fig. 10K); (2)  $> 1.0$  (Fig. 10L). [treated as ordered]
- Margin of apical process of labrum posterior to setae: (0) not expanded (Fig. 10B); (1) expanded on entire margin (Fig. 10I); (2) expanded basally (Fig. 10E); (3) expanded apically (Fig. 10A). [treated as unordered]
- Labrum, keel of apical process: (0) wider near apex (GONZÁLEZ-VAQUERO & GALVANI 2016: fig. 7E); (1) uniformly wide (Fig. 10H).
- Clypeus, sculpture between punctures: (0) evenly tessellate (Fig. 5C); (1) basally tessellate, apical half smooth; (2) smooth (Fig. 5E). [treated as unordered]
- Clypeus, transverse apical keel: (0) absent (Fig. 5E); (1) present. The keel is stronger in *C. rubella* (Fig. 5C) than in *C. chilensis* (Fig. 5D); both were coded (1). In some specimens of *C. herbsti*, the clypeus has transverse striae near the apex, but not a keel.
- Clypeus, apical band: (0) well defined, colour contrasting with rest of clypeus; (1) absent or poorly defined.
- Clypeus, apical margin: (0) short, not produced (Fig. 5C); (1) long, produced (Fig. 5D).
- Epistomal suture: (0) poorly defined from anterior tentorial pit to base of mandible (GONZÁLEZ-VAQUERO 2010: fig. 6); (1) well defined throughout its length (Fig. 6C).
- Subantennal suture, length compared to length of sector of epistomal suture between subantennal sutures: (0) shorter; (1) equal or longer.
- Malar area, length compared to mandible basal width: (0)  $> 0.2$ ; (1)  $< 0.2$ .
- Compound eye, inner orbit (DANFORTH & EICKWORT 1997: char. 10): (0) not emarginate, nearly straight; (1) slightly emarginate; (2) deeply emarginate. [treated as ordered as in DANFORTH & EICKWORT 1997]
- Compound eye, hairs (ENGEL 2000: char. 12): (0) shorter than diameter of an ommatidium, generally not detectable under the compound microscope (Fig. 11D); (1) longer than diameter of an ommatidium (Fig. 11C).
- Gena, sculpture between punctures: (0) tessellate, without striae; (1) tessellate, with striae.
- Pronotum, dorsolateral angle: (0) rounded, poorly developed (Fig. 5B); (1) well developed (Fig. 5A), bearing a carina or lamella.
- Mesoscutum, shape of anterior border (ENGEL 2000: char. 17): (0) broadly rounded, not covering median dorsal area of pronotum (Fig. 5B); (1) strongly narrowed and projecting forward, covering median dorsal area of pronotum (Fig. 5A).
- Mesoscutum, sculpture between punctures: (0) microareolate, dull (Fig. 5A); (1) strongly tessellate, with weak reflections; (2) weakly tessellate or smooth, shiny (Fig. 5B); (3) reticulate. [treated as unordered]
- Centre of mesoscutal disk, puncture density: (0)  $< 2$  PD; (1) 2–4 PD; (2)  $> 4$  PD. In the species that have punctures of two sizes, the smaller punctures were considered. [treated as unordered]
- Scutellum, median longitudinal furrow: (0) present, well defined; (1) absent or weak and thus difficult to detect.

26. DAM, length compared to scutellum length (ENGEL 2000: char. 19, modified): (0)  $\geq 0.66 \times$ ; (1)  $< 0.66 \times$ .
  27. DAM, striae: (0) absent (Fig. 8F); (1) short, not reaching midlength of DAM (Fig. 8A); (2) long, reaching or surpassing midlength of DAM (GONZÁLEZ-VAQUERO & GALVANI 2016: fig. 7A). In *Halictillus* the length of the rugose area was measured. [treated as unordered]
  28. DAM, apical margin: (0) rounded, undifferentiated from propodeum; (1) angulate, but not carinate; (2) angulate, well defined by a carina. [treated as ordered]
  29. Vertical area of metapostnotum (DANFORTH & EICKWORTH 1997: char. 38; ENGEL 2000: char. 20): (0) narrow; (1) enclosed within V-shaped notch.
  30. Outer border of basitibial plate (ENGEL 2000: char. 22): (0) obsolete (Fig. 11A); (1) rimmed (Fig. 11B). Two species of *Halictillus* show a basitibial plate rimmed on both borders, contrasting with the state considered by ENGEL (2000) for this genus.
  31. Metatibial spine (ENGEL 2000: char. 23): (0) absent (Fig. 12A); (1) present (Fig. 12B,C). The number of metatibial spines varies between species and within some species; since this condition is not consistent within the species we decided to treat this character as did ENGEL (2000). The species of *Lasioglossum*, *Halictus* and *Dieunomia* considered in this study were coded one, thus contrasting with the coding of ENGEL (2000) for these genera.
  32. Inner hind tibial spur, number of teeth: (0)  $\leq 7$ ; (1)  $\geq 8$ .
  33. Inner hind tibial spur, length of teeth compared to diameter of spur rachis: (0) shorter (Fig. 7A); (1) equal (Fig. 7B); (2) longer (Fig. 7F: a, length of tooth; b, diameter of spur rachis). [treated as ordered]
  34. Apex of marginal cell of forewing, shape (ENGEL 2000: char. 27): (0) acute; (1) truncate, frequently feebly appendiculate. ENGEL (2000) coded this character as (0) for the genera *Neocorynura* and *Rhinocorynura*, but the species included here have state (1).
  35. Hamuli, number and distribution: (0) 5, distributed 2/1/2; (1) 6–10, different pattern; (2) 15–16, equidistant. [treated as unordered]
  36. Terga, marginal zones: (0) not translucent; (1) translucent.
  37. T2, presence of posteriorly curved lateral part of gradulus: (0) absent; (1) present.
  38. T2–T3, marginal zones: (0) with hairs (Fig. 12E); (1) glabrous, at most a few hairs scattered on sides (Fig. 12D, *mz*).
  39. Base of T2–T4 laterally, tuft of long, dense, white hairs: (0) absent; (1) present (Fig. 6E,F).
  40. T5, prepygidial fimbria (ALEXANDER & MICHENER 1995: char. 97): (0) without area of fine punctures and hairs middorsally; (1) with such an area; (2) with such an area, itself divided by a deep cleft. [treated as ordered as in PESENKO 1999]
  41. Head and mesosoma, colour of cuticle: (0) green, blue or red, shiny (Fig. 1C); (1) black or dark brown, sometimes with bluish or greenish weak highlights (Fig. 1A,E).
- Males**
42. Labrum, presence of apical process (ENGEL 2000: char. 34): (0) absent; (1) present. This character was coded as (1) by ENGEL (2000) for *Rhinocorynura* and *Dieunomia*. The species considered for our analyses have no apical process.
  43. Labrum, colour: (0) yellow or yellowish brown; (1) dark brown or black.
  44. Clypeus below lower orbital tangent: (0) not produced; (1) slightly produced,  $\leq 0.5$  of its total length; (2) greatly produced,  $\geq 0.6$  of its total length.
  45. Clypeus, presence of yellow apical band: (0) absent; (1) present.
  46. Clypeus, pilosity: (0) two layers of plumose hairs: one with appressed, short hairs with many branches, another with erect, usually longer hairs with few branches; (1) plumose hairs of various lengths but not forming two layers.
  47. Lower paraocular area and supraclypeal area, pilosity: (0) dense, appressed plumose hairs throughout; (1) dense, appressed plumose hairs bordering inner ocular orbit, sparser and erect near to and on supraclypeal area; (2) sparse, erect plumose hairs on both areas. [treated as unordered]
  48. Scape, length compared to maximum width: (0)  $2-3 \times$ ; (1)  $> 3 \times$ .
  49. Flagellomere F2, length compared to F1 length: (0)  $< 2 \times$ ; (1)  $\geq 2 \times$ .
  50. Shape of flagellomeres: (0) cylindrical; (1) crenulate dorsally, straight or weakly crenulate ventrally; (2) crenulate dorsally, ventral surface as crenulate as dorsal surface. [treated as ordered]
  51. Flagellomeres, presence of areas composed of sensilla placodea only: (0) absent (Fig. 9A); (1) present (Fig. 9B,C).
  52. Mesoscutum, sculpture between punctures: (0) reticulate; (1) microareolate; (2) strongly tessellate; (3) weakly tessellate or smooth. [treated as unordered]
  53. Mesoscutum, puncture density on centre of disk: (0) punctures coalescent; (1) punctures separated by less than 1 PD but not coalescent; (2) punctures separated by more than 1 PD. [treated as unordered]
  54. Mesoscutum, pilosity: (0) hairs of different lengths intermixed, variously branched, not forming definite layers; (1) with layer of dense, short hairs, and longer intermixed hairs; short hairs simple or two/three-branched; (2) with layer of short hairs, and longer intermixed hairs; short hairs many-branched. [treated as unordered]
  55. DAM, basal sculpture: (0) smooth; (1) with strong, radiating striae; (2) rugulose. [treated as unordered]
  56. DAM, apical margin: (0) rounded, undifferentiated from propodeum; (1) angulate, but not carinate; (2)



- angulate, well defined by a carina. This character was coded separately for each sex (see character 28) since it is dimorphic in *C. apicata*, *C. herbsti* and *C. rubella*. [treated as ordered]
57. DAM, sculpture of apical margin: (0) smooth; (1) tessellate (Fig. 8H); (2) striate (Fig. 8G). [treated as unordered]
  58. Tibia I, colour: (0) dark brown; (1) dark brown with an anterior yellow spot; (2) yellowish brown or yellow. [treated as unordered]
  59. Tarsus III, length of second tarsomere compared to third tarsomere: (0) longer; (1) equal or shorter.
  60. T1, length compared to its apical width: (0) shorter (metasoma not petiolate); (1) longer (petiolate metasoma) (Fig. 6G).
  61. T2–T4, presence of basal tufts of dense, plumose hairs: (0) absent; (1) present.
  62. T2–T4, length of basal hairs: (0) all hairs of similar length (one layer); (1) short hairs with scattered longer hairs (two layers).
  63. T2–T4, presence of plumose hairs at base: (0) absent; (1) present.
  64. T2–T4, impressed apical areas: (0) depressed; (1) not depressed.
  65. S2, presence of gradulus: (0) absent or vestigial; (1) present.
  66. S3, presence of gradulus: (0) absent or vestigial; (1) present.
  67. S4, extension of gradulus towards antecosta (ENGEL 2000: char. 42): (0) not reaching antecosta; (1) reaching antecosta medially.
  68. S4, shape of mid apical margin (ENGEL 2000: char. 43): (0) straight; (1) concave; (2) with small median notch. ENGEL (2000) differs in the coding of this character for *Dieunomia* and *Paroxystoglossa*. [treated as unordered]
  69. S5, shape of mid apical margin: (0) straight; (1) with small median notch; (2) with small median projection bearing coarse setae; (3) bilobed. [treated as unordered]
  70. S6, shape of antecosta: (0) uniform; (1) thickened in middle.
  71. S6, extension of gradulus towards antecosta: (0) not reaching antecosta; (1) reaching antecosta medially.
  72. S6, shape of gradulus: (0) straight; (1) produced posteriorly into a median angle; (2) slightly curved posteriorly; (3) not recognizable. [treated as unordered]
  73. S6, shape of mid apical margin (ENGEL 2000: char. 48, modified): (0) not produced, without lateral bend; (1) produced, and strongly bent at level of union of gradulus with apical margin.
  74. S6, direction of hairs along median apical area: (0) postero-medially at 45°; (1) medially at 90°.
  75. S6, length of hairs: (0) short, barely surpassing apical margin; (1) long, clearly surpassing apical margin.
  76. T7, shape: (0) with a simple margin, similar to that of the preceding tergum; (1) with a carina forming a projecting pygidial plate; (2) medially emarginate. [treated as unordered]
  77. S7, posterior margin: (0) simple (GONZÁLEZ-VAQUERO & GALVANI 2016: fig. 5B); (1) bilobed (GONZÁLEZ-VAQUERO & GALVANI 2016: fig. 5A); (2) with two pointed projections; (3) medially produced. [treated as unordered]
  78. S8, posterior margin: (0) medially produced; (1) straight or almost straight; (2) with a cleft and a median peglike structure. [treated as unordered]
  79. S8, presence of spiculum: (0) absent; (1) present.
  80. S8, shape of spiculum: (0) narrow; (1) wide. Inapplicable for taxa lacking spiculum.
  81. S8, shape of apex of spiculum: (0) pointed; (1) bilobed. Inapplicable for taxa lacking spiculum.
  82. Gonobase, width of ventral bridge (DANFORTH & EICKWORT 1997: char. 76): (0) broad; (1) narrow.
  83. Gonobase, size of dorsal lobes (DANFORTH & EICKWORT 1997: char. 77): (0) small (as in EICKWORT 1969: fig. 376); (1) moderate (EICKWORT 1969: figs. 326, 330, 332); (2) large (EICKWORT 1969: fig. 371). [treated as ordered as in DANFORTH & EICKWORT 1997]
  84. Volsella, length: (0) short, not reaching apex of gonocoxite; (1) long, reaching or surpassing apex of gonocoxite.
  85. Volsella, shape of inner apical corner of digitus: (0) rounded; (1) produced mesally; (2) angulate, forming an angle of 90°–110°; (3) produced posteriorly. [treated as unordered]
  86. Volsellar notch (opposing dentate margins of cuspis and digitus), orientations relative to longitudinal axis of volsella: (0) perpendicular; (1) parallel.
  87. Penis valves, dorsal bridge: (0) narrow, close to base of valves; (1) wide, at middle of valves.
  88. Gonocoxite, shape of dorsal inner margins: (0) almost straight (Fig. 3M); (1) forming an angle, with no projection (Fig. 3A); (2) forming an angle, with an inner mid projection in the shape of a cone. [treated as unordered]
  89. Gonocoxite, presence of dorsal hairs on apical area: (0) absent; (1) present (Fig. 4I).
  90. Gonostylus, basal process (ENGEL 2000: char. 58): (0) absent; (1) present, small, glabrous or with inconspicuous setae (GONZÁLEZ-VAQUERO & GALVANI 2016: fig. 4B: *bpg*); (2) present, well developed, with setae (Fig. 3F: *bpg*). [treated as ordered]
  91. Gonostylus, presence of dorsal sclerotized area: (0) absent; (1) present (Fig. 3A: *dag*).
  92. Gonostylus, shape of dorsal area, caudal view: (0) quadrate (Fig. 3C: *dag*); (1) elongate; (2) triangular (Fig. 3M: *dag*); (3) reduced to the base of gonostylus (Fig. 3A: *dag*). Inapplicable for taxa lacking dorsal sclerotized area. [treated as unordered]
  93. Gonostylus, pilosity: (0) with hairs; (1) glabrous.

## 5. Taxonomy

### 5.1. *Callistochlora* Michener, 1997

*Callochlora* Moure, 1964: 269. Type species: *Halictus chloris* Spinola, 1851, by original designation. Preocc. by *Callochlora* Packard, 1864.

*Callistochlora* Michener, 1997: 12. Nom. nov. for *Callochlora* Moure, 1964.

The species of *Callistochlora* can be distinguished from all other Augochlorini by the following combination of characters: compound eyes bearing hairs which are longer than an ommatidium; cuticle shiny green or red, sometimes with a bluish tint; preoccipital ridge rounded; dorsolateral angle of pronotum rounded, poorly developed; integument smooth or very weakly tessellate on mesoscutum, scutellum, supraclypeal area and clypeus; metapostnotum with strong, long striae, almost reaching the apical margin; inner metatibial spur of female pectinate, with up to seven teeth, and basitibial plate with anterior border obsolete; apical margin of S4 and S5 of male straight. Descriptions, images, synonyms, distributional data and a key to the species were recently provided by GONZÁLEZ-VAQUERO & GALVANI (2016), in their revision of the group.

We treat *Callistochlora* at the genus level, according to our phylogenetic results for the *Corynura* group, since it is sister to *Corynura* + *Halictillus*.

### 5.2. *Corynura* Spinola

*Corynura* Spinola, 1851: 296. Type species: *Corynura gayi* Spinola, 1851 (= *Halictus rubellus* Haliday), by subsequent designation of ALFKEN 1926: 146.

*Rhopalictus* Sichel, 1867: 146. Type species: *Corynura flavofasciata* Spinola, 1851 (= *Halictus chilensis* Spinola), by subsequent designation of SANDHOUSE 1943: 596.

A nomenclatural problem is still pending in the usage of the name *Corynura*. The designated type species of *Corynura*, *C. gayi*, is a composite species. It was described on the basis of two females of Thynnidae, and males of halictid bees. Currently *Corynura* is interpreted as a genus of Halictidae, but a lectotype for *C. gayi* has never been selected to fix the usage of the name as a bee, not as a thynnid. This is no longer possible because the types are lost. Thus, a neotype is here designated.

*Corynura* was described by SPINOLA (1851) based on specimens from Chile. The description of the genus is very detailed, that of the male (pp. 297–300) considerably longer than the one of the female (pp. 300–301), and these are followed by the description of two new species: *C. gayi* (p. 301, pl. 3, figs. 6, 7) and *C. flavofasciata* (p. 302). The females are wingless wasps which were assigned to *C. gayi* by Spinola (p. 301). The characters described for the male *C. gayi* agree with those of the halictid bee *Halictus rubellus* Haliday, 1836. The types of *C. gayi* are not present at the Museo Regionale di Scienze

Naturali in Torino (Marinella Garzena pers. comm.) and they are presumed to be lost. The male lectotype of *C. flavofasciata* was examined by us, and it belongs to the species *Halictus chilensis* Spinola, 1851. *Corynura* was originally included in the Thynnidae by Spinola because of the wingless female and, in the case of the male, probably because of the claviform shape of the metasoma and the long antennae, characters that make it look more similar to some wasps than to most bees. The description of the genus by SPINOLA (1851) agrees partially with males of the bees that are currently interpreted as *Corynura* (*sensu* ALFKEN 1926, 1931; EICKWORT 1969; ENGEL 2000; MICHENER 2007).

There are some dubious characters mentioned in the description of *Corynura*. SPINOLA (1851) describes a male antenna with 12 ‘articles’ while the male bee antenna is composed of a scape, a pedicel and 11 flagellomeres. Considering the relative measures reported by Spinola, he may have considered the pedicel and first flagellomere as a single structure. The three first terga are two or three times longer than wide according to Spinola’s description, but actually, in males of *Corynura*, these structures are at most twice as long as their apical width. Spinola mentions two straight spines of the tibia II, although all bees have only one spur in the structure. In spite of these doubtful characters, the appearance of the male illustrated in the plate (SPINOLA 1851: pl. 3 fig. 6a) and especially its wing venation (SPINOLA 1851: pl. 3 fig. 6b) are clear indicators that the male specimen described as *C. gayi* was a halictid bee.

SICHEL (1867: 146) was the first to notice the wrong association of sexes made by SPINOLA (1851). He created the subgenus *Rhopalictus* (in the genus *Halictus*) to include the males with a clavate metasoma described by SPINOLA (1851) as *C. gayi* and *C. flavofasciata*, although using the name ‘Corynogaster’ instead of *Corynura*, a confusion already clarified (HERBST 1917; EICKWORT 1969; DALY et al. 1987). He left *Corynura* as a genus of Thynnidae. Only COCKERELL (1918a: 344–345, 1918b: 180–181) described species of *Corynura* under the name *Rhopalictus*. Other generic names used to describe species currently included in *Corynura*, were *Halictus*, *Augochlora*, and *Cacosoma* (MOURE 2007).

In the catalogue of DALLA TORRE (1896: 92) *Corynura* is placed as a bee genus of Apidae (Anthophila), but this author associates the halictid male of *C. gayi* Spinola, 1851: 301, with the xylocopine female described as *Halictus gayi* Spinola, 1851: 208 (currently *Manuelia gayi*, see DALY et al. 1987).

Later, VACHAL (1904: 144) considered *Corynura gayi* as a species of Thynnidae based on the wingless females, and he proposed the new name *Halictus pullatus* for the males described under *C. gayi*. This act cannot be considered as a valid type designation (International Code of Zoological Nomenclature: article 69.2.3).

ALFKEN (1926: 146) designated *Corynura gayi* Spinola as the type species of *Corynura*, for the genus-name stability, but he failed to designate a type specimen for *C. gayi*, which remained as a composite species. We pro-

pose a neotype in accordance with Article 75.6 of the Code to define the nominal species *C. gayi* in the sense that it has been known since ALFKEN (1926).

### 5.3. Male genital capsule

The genital capsule of the male has many differences among the species of *Corynura*. This is a specialized set of structures, each of which may be diagnostic for some taxa of bees. Unfortunately, the genital capsule was not considered by ALFKEN (1926, 1931) in his revisions of *Corynura*. The genital capsule and S7–S8 of *C. chilensis* were illustrated by EICKWORT (1969: figs. 325–328, 268–270). In some species such as *C. apicata* (Sichel, 1867) (Fig. 3C,D: *gx*) and *C. cristata* (Smith, 1853) (Fig. 4C,D), the gonocoxites are slightly divergent, resulting in a capsule wider apically, in contrast to other species where both gonocoxites are arranged in parallel, such as in *C. chilensis* (Fig. 3K,L: *gx*). Some species, such as *C. chilensis*, have the gonocoxite slightly concave laterally (arrow on Fig. 3K), whereas in other species it is straight (e.g. *C. ampliata* (Alfken, 1913), arrow on Fig. 3A). The dorsal inner margin of the gonocoxite may be straight or almost straight, both margins converging to the gonobase (as in *Ca. chloris*, EICKWORT 1969: fig. 330), or it can form a mesal angle of approximately 90°, dorsal margins nearly parallel from the mesal angle to the gonobase (as in *C. chilensis*, EICKWORT 1969: fig. 326). The gonocoxite bears some simple setae near the apex in *C. nahuelita* sp.n. (Fig. 4I,J), as in *Callistochlora* (GONZÁLEZ-VAQUERO & GALVANI 2016). The gonobase is greatly developed in *C. bruchiana* (Schrottky, 1908) (Fig. 3E,F: *gb*) and *C. chilensis* (Fig. 3K,L), while in other species, such as *C. ampliata* (Fig. 3A,B: *gb*), the gonobase is reduced. The width of the gonobase can be equal to, shorter (e.g. *C. ampliata*, Fig. 3A,B) or longer (e.g. *C. chilensis*; Fig. 3K,L) than the length of the gonocoxite. *Corynura* and *Callistochlora* have a short volsella, in contrast to *Halictillus* in which the volsella surpasses the apex of the gonocoxite. The inner apical corner of the digitus of the volsella is rounded or mesally produced in the species of *Corynura*, while it forms an angle of 90°–110° in *Callistochlora*, and it is produced posteriorly and has a complex apex in *Halictillus*. The volsellar notch is parallel to its longitudinal axis in *Corynura* and *Callistochlora*, but it is perpendicular in *Halictillus*.

The gonostylus is the most complex and variable structure among the species of *Corynura*. It is easy to differentiate a membranous ventral area, bearing setae of various lengths (Fig. 3A: *vag*), from a dorsal area, more sclerotized and usually glabrous (Fig. 3A: *dag*). The gonostylus has a basal process (Fig. 3F: *bpg*), which has few setae; *C. lepida* Alfken, 1926, is the only species that lacks this process.

The ventral area of the gonostylus ends in a mesally directed projection with short and scattered setae in most of the species of *Corynura* (Fig. 3C: *vag*). This ventral area is a rounded structure with dense setae in *C. chall-*

*huacoensis* sp.n. (Fig. 3J: *vag*), while in *C. ampliata* it is greatly developed and bears long setae on its apical region (Fig. 3A: *vag*). *Corynura nahuelita* sp.n. has a very small ventral area (Fig. 4J: *vag*). *Corynura chloromelas* is the only species with a *vag* bearing a basal lobe with long setae (Fig. 3N: *vag*). This species also has a group of long, plumose setae on the apical region of the *vag*, whereas *C. moscosensis* and *C. condita* sp.n. (Fig. 3P) also have a group of setae, but these are short and simple.

In the dorsal area of the gonostylus some similarities can be detected among the species, which are more easily seen in caudal view. This area is reduced in some *Corynura* (Fig. 3A: *dag*), and in *Callistochlora* (GONZÁLEZ-VAQUERO & GALVANI 2016). It forms a squared, conspicuous structure in species like *C. apicata* (Fig. 3C: *dag*) and *C. patagonica* (Cockerell, 1918); in contrast, in *C. moscosensis*, *C. condita* sp.n. and *C. chloromelas* (Fig. 3M: *dag*) the *dag* has a triangular shape.

### 5.4. Male sterna

Although the male sterna are greatly modified in some genera of Augochlorini, such as *Augochloropsis* Cockerell, 1897, *Pseudaugochlora* Michener, 1954, and *Augochlorodes* Moure, 1958 (EICKWORT 1969: figs. 244, 248), those of *Corynura* are very simple, bearing no processes or specialized setae. The gradulus of S2 is absent or vestigial, as in *Halictillus*, and it is also absent or vestigial on S3; it is present from S4 to S6. The apical margin of S4 is straight or almost straight in all species but *C. chilensis* and *C. callaina* sp.n., where S4 has a small median notch. The S5 has a small median notch in the apical margin, except in *C. corinogaster* where it is straight; in *C. chloromelas* the mid apical margin of S5 has the peculiarity of bearing a small projection, with a cluster of short, coarse setae. The S6 is the most variable of the exposed sterna. The antecostal suture thickens in the middle in *C. cristata* and *C. rubella*, but it has a uniform thickness in the other species. The gradulus reaches the antecosta medially in some species, and it is either produced posteriorly into a median angle or just slightly curved posteriorly. Most of the species of *Corynura* have the mid apical margin of S6 produced, strongly bent at the level of the union of the gradulus with the apical margin; this feature is absent in some *Corynura* (*C. nahuelita* sp.n., *C. bruchiana*, *C. chilensis*, *C. chloromelas*, and *C. corinogaster*), in *Callistochlora*, and in *Halictillus*, where S6 is not produced.

The hidden sterna, S7 and S8, are laterally jointed, but they can be easily separated with a pin. The posterior margin of S7 is curved and simple, glabrous or with a few scattered short setae; in *C. chloromelas*, *C. corinogaster*, and *C. condita* sp.n. this margin is medially produced. Only in the S7 of *C. apicata* is the posterior margin bilobed, which is present also in *Ca. aureoviridis* (GONZÁLEZ-VAQUERO & GALVANI 2016: fig. 5A). The S8 has a spiculum in *Corynura* and *Callistochlora*, which is broad and bilobed, a character not shared with any other genera of Augochlorini (EICKWORT 1969; ENGEL 2000). The posterior margin of S8

is medially produced, and it usually bears one or more setae; this margin is truncate in *C. apicata*.

## 5.5. Geographic distribution

*Corynura* is distributed from the regions of Coquimbo to Aysén in Chile, and in the western areas of the provinces of Neuquén, Río Negro and Chubut, in Argentina (Figs. 19, 20). Its species tolerate a wide range of precipitation and temperatures, and they inhabit from above 3000 m in some parts of the Andes to sea level in the Chilean Pacific coast. *Corynura ampliata*, *C. chilensis*, *C. corinogaster* and *C. rubella* are the most widely distributed species, inhabiting different environments in south and central Chile. There are few records from the hyperarid Atacama Desert in northern Chile (for *C. cristata*, *C. herbsti* and *C. callaina* sp.n.), including a record of *C. chilensis* from the region of Antofagasta (latitude  $-24.5^\circ$ ). On the contrary, some species such as *C. bruchiana*, *C. nahuelita* sp.n. and *C. moscosensis* are endemic to humid and perhumid areas, inhabiting only south of the parallel  $-35^\circ$ , from the region of Maule to the south in Chile, and the *Nothofagus*-dominated forest and its ecotones in Argentina (CABRERA & WILLINK 1973).

*Corynura corinogaster* has been doubtfully recorded from Peru (MOURE & HURD 1987; MOURE 2007). Since no specimens of *C. corinogaster* have been examined from further north than the region of Coquimbo (Chile), we believe that this may be an error in species identification or specimen labelling.

## 5.6. Keys to the species of *Corynura*

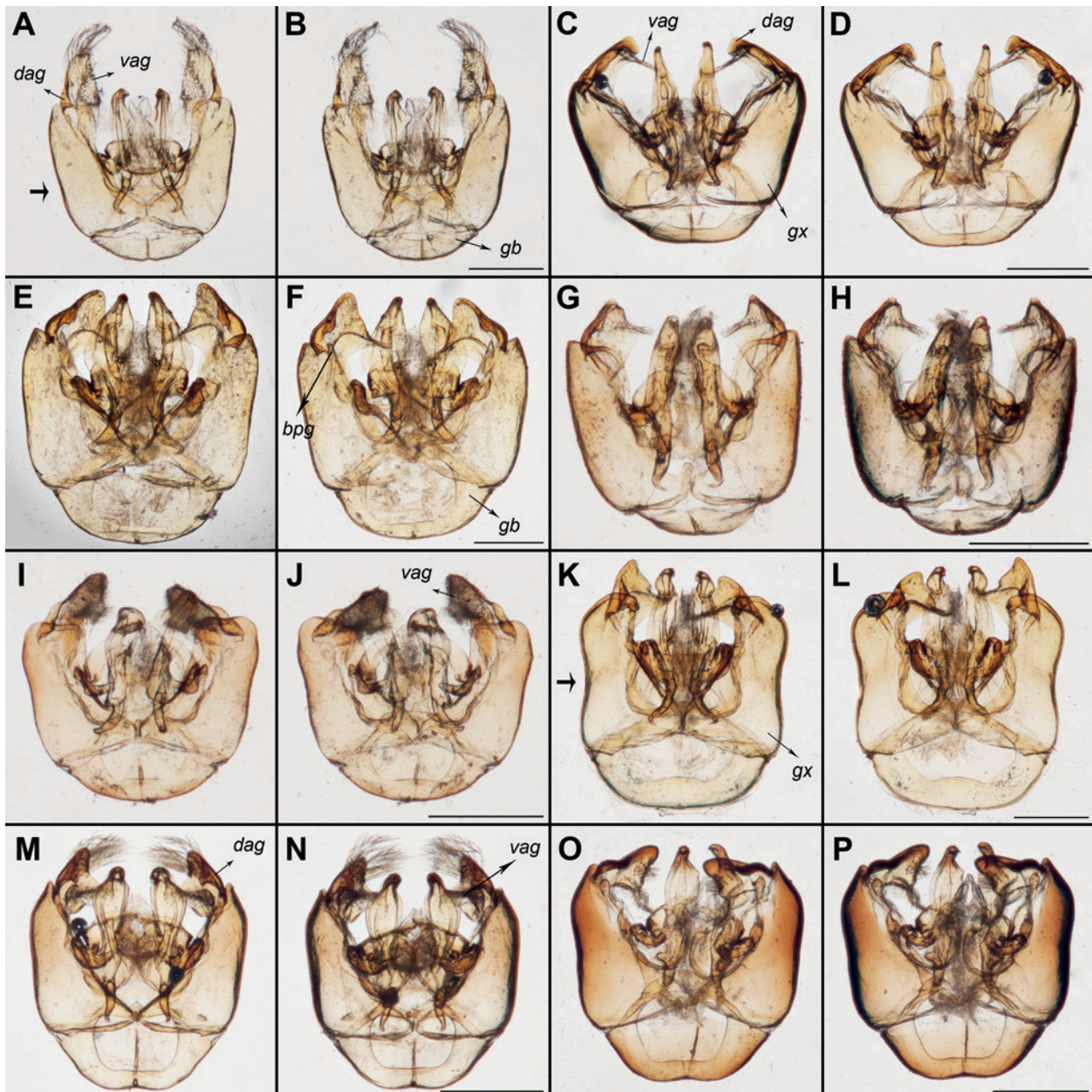
### 5.6.1. Females

- 1 T1–T3 with marginal zones pearly. Dorsolateral angle of pronotum produced (arrow on Fig. 5A). Mesoscutum with punctures separated by  $\sim 1$  PD; interspaces microareolate, dull (Fig. 5A) ..... ***C. chilensis* (Spinola)**
- 1' T1–T3 with marginal zones translucent or of the same colour as the disc, but never pearly. Dorsolateral angle of pronotum rounded, not produced (as shown by the arrow on Fig. 5B). Mesoscutum usually with punctures separated by  $> 1$  PD; interspaces tessellate, with highlights ..... **2**
- 2 Base of T3–T4 laterally with patches of appressed, whitish or yellowish hairs, which occupy  $\sim 0.33$  of tergum length (Fig. 6E,F) ..... **3**
- 2' Base of T3–T4 laterally without patches of appressed hairs; some species with higher density of hairs on the sides, but never reaching  $> 0.25$  of tergum length ..... **4**
- 3 Pronotal lobe and antero-lateral angle of mesoscutum with conspicuous tuft of yellow hairs. Mesoscutum with punctures of two sizes (fine and coarse). T1 with coarse punctures (Fig. 6E). Terga with marginal zones greatly depressed, long and translucent, covering the patches of pilosity (Fig. 6E) ..... ***C. cristata* (Smith)**
- 3' Pronotal lobe and antero-lateral angle of mesoscutum bearing whitish hairs, not forming a distinct tuft different from adjacent pubescence. Mesoscutum with fine punctures. T1 with fine punctures (Fig. 6F). Terga with marginal zones slightly depressed, not covering the patches of pilosity (Fig. 6F) ..... ***C. herbsti* (Alfken)**
- 4 Clypeus with transverse preapical keel (Fig. 5C). Head and mesosoma black, barely shiny (Figs. 1A, 6D) ..... ***C. rubella* (Haliday)**
- 4' Clypeus without transverse keel (as in Fig. 5E). Head and mesosoma black with greenish, bluish or purplish highlights ..... **5**
- 5 Mesoscutum with coarse and deep punctures, separated by 1–2 PD. Clypeus with base tessellate between punctures, and apical 0.7 smooth; black apical band of clypeus extending through inner ocular orbit, almost reaching level of antennal sockets (Fig. 6B). Supraclypeal area almost smooth. Sides of mesoscutum with yellowish hairs ..... ***C. corinogaster* (Spinola)**
- 5' Mesoscutum with fine and shallow punctures, separated by  $\geq 3$  PD on disc ..... **6**
- 6 Marginal zones of T2–T3 with short hairs (Fig. 12E). Metasoma black or dark brown, with bluish, greenish or purplish highlights ..... **7**
- 6' Marginal zones of T2–T3 glabrous (Fig. 12D, *mz*). Metasoma reddish, at least in part (except in *C. challhuacoensis* sp.n. and *C. spadiciventris* Alfken, 1926, with metasoma dark brown) ..... **12**
- 7 Malar area relatively long (approximately 0.25 of mandible basal width) and occipital area broadened, which results in a 'quadrangular' shape of the head in frontal view (Fig. 17C). Most specimens with apical tarsomeres dark brown, rest of tarsi yellowish brown ..... ***C. nahuelita* González-Vaquero & Roig-Alsina, sp.n.**
- 7' Malar area short ( $< 0.2$  of mandible basal width) and occipital area not broadened (as in Fig. 14C). Tarsi uniform in colour ..... **8**
- 8 Inner hind tibial spur with  $\geq 8$  teeth, which are shorter than diameter of spur rachis (as in Fig. 7A) ..... **9**
- 8' Inner hind tibial spur with  $\leq 7$  teeth, which are equal to or longer than diameter of spur rachis (as in Fig. 7D–F) ..... **11**
- 9 Propodeum bearing simple and plumose hairs. Disc of mesoscutum and scutellum smooth or weakly tessellate between punctures, shiny. Marginal zones of terga translucent ..... ***C. chloromelas* (Alfken)**
- 9' Propodeum bearing only plumose hairs. Disc of mesoscutum and scutellum tessellate between punctures, dull. Marginal zones of terga dark brown ..... **10**
- 10 Apex of clypeus more weakly tessellate than its base. S3 mainly bearing simple hairs. Marginal zone of T4 glabrous or bearing a few hairs. DAM with long striae, reaching half or more of DAM total length. Body

- length 7.2–7.8 mm  
 ..... *C. moscosensis* **González-Vaquero**
- 10' Clypeus uniformly tessellate. S3 mainly bearing plumose hairs. Marginal zone of T4 with abundant pilosity. DAM with very short striae, not surpassing 0.3 of DAM total length (Fig. 8D). Body length 6.2–7.1 mm ..... *C. condita* **González-Vaquero & Roig-Alsina, sp.n.**
- 11 DAM with short radiating striae. DAM shorter than scutellum. Disc of mesoscutum with punctures separated by 3 PD, marginal area of mesoscutum with punctures of two sizes. Body length 5.8–7.2 mm  
 ..... *C. callaina* **González-Vaquero & Roig-Alsina, sp.n.**
- 11' DAM with very fine striae transversely oriented on median area, with some radiating striae on sides. DAM equal or longer than scutellum. Disc of mesoscutum with punctures separated by 5–6 PD, marginal area of mesoscutum with punctures of one size. Body length 4.6–5.9 mm ..... *C. lepida* **Alfken**
- 12 Inner hind tibial spur with short teeth, shorter than diameter of spur rachis (as in Fig. 7A). Pleura with intense purplish highlights. Disc of T1 tessellate between punctures. Metasoma dark brown except T4–T5 reddish ..... *C. apicata* (**Sichel**)
- 12' Inner hind tibial spur with long teeth, equal (as in Fig. 7B–D) or longer (as in Fig. 7E,F) than diameter of spur rachis. Pleura rarely with weak purplish highlights, usually with bluish highlights or no highlights at all. Disc of T1 tessellate or substrigulate between punctures. Metasoma dark brown or reddish, rarely dark brown with T4–T5 reddish (some specimens of *C. patagonica*) ..... **13**
- 13 Profile of clypeus straight in lateral view, uniformly tessellate between punctures, without black apical band (as in Fig. 6A). Large species, body length  $\geq 8.5$  mm ..... **14**
- 13' Profile of clypeus slightly convex in lateral view, apex more weakly tessellate than its base (except in *C. spadiciventris*), sometimes with black apical band (as in Fig. 6C). Small and moderate sized species, body length  $\leq 7.7$  mm ..... **15**
- 14 DAM with short radiating striae, posterior margin angulate but not upraised. Clypeus  $0.9–1.0 \times$  as long as epistomal suture measured between subantennal sutures. Supraclypeal area as protuberant as clypeus in lateral view. Apical tarsomeres and underside of antenna dark brown ..... *C. luisae* **González-Vaquero & Roig-Alsina, sp.n.**
- 14' DAM without striae, posterior margin upraised, greatly developed. Clypeus  $1.1–1.3 \times$  as long as epistomal suture measured between subantennal sutures. Supraclypeal area more protuberant than clypeus in lateral view. Apical tarsomeres and underside of antenna usually yellowish light brown (Fig. 6A) ..... *C. bruchiana* (**Schrottky**)
- 15 Inner hind tibial spur with 2–4 teeth, well separated, perpendicular to spur rachis (Fig. 7F). Metasoma reddish ..... *C. ampliata* (**Alfken**)
- 15' Inner hind tibial spur with 4 or more teeth, close together when only 4, usually slanting to the apex of the spur (Fig. 7D,E). Metasoma reddish or dark brown ..... **16**
- 16 Supraclypeal area weakly tessellate between punctures, smoother than base of clypeus. Metasoma reddish or dark brown with T4–T5 reddish  
 ..... *C. patagonica* (**Cockerell**)
- 16' Supraclypeal area and base of clypeus equally tessellate between punctures. Metasoma dark brown .... **17**
- 17 DAM usually without striae, when present radiating striae not surpassing basal 0.2 of DAM total length (Fig. 8B). Apex of clypeus more weakly tessellate and shinier than its base. Head and pleura with bluish or purplish highlights ..... *C. challhuacoensis* **González-Vaquero & Roig-Alsina, sp.n.**
- 17' DAM with radiating striae, covering basal 0.2–0.5 of DAM total length. Clypeus uniformly tessellate and dull. Head and pleura usually with greenish highlights, rarely with bluish highlights  
 ..... *C. spadiciventris* **Alfken**

## 5.6.2. Males

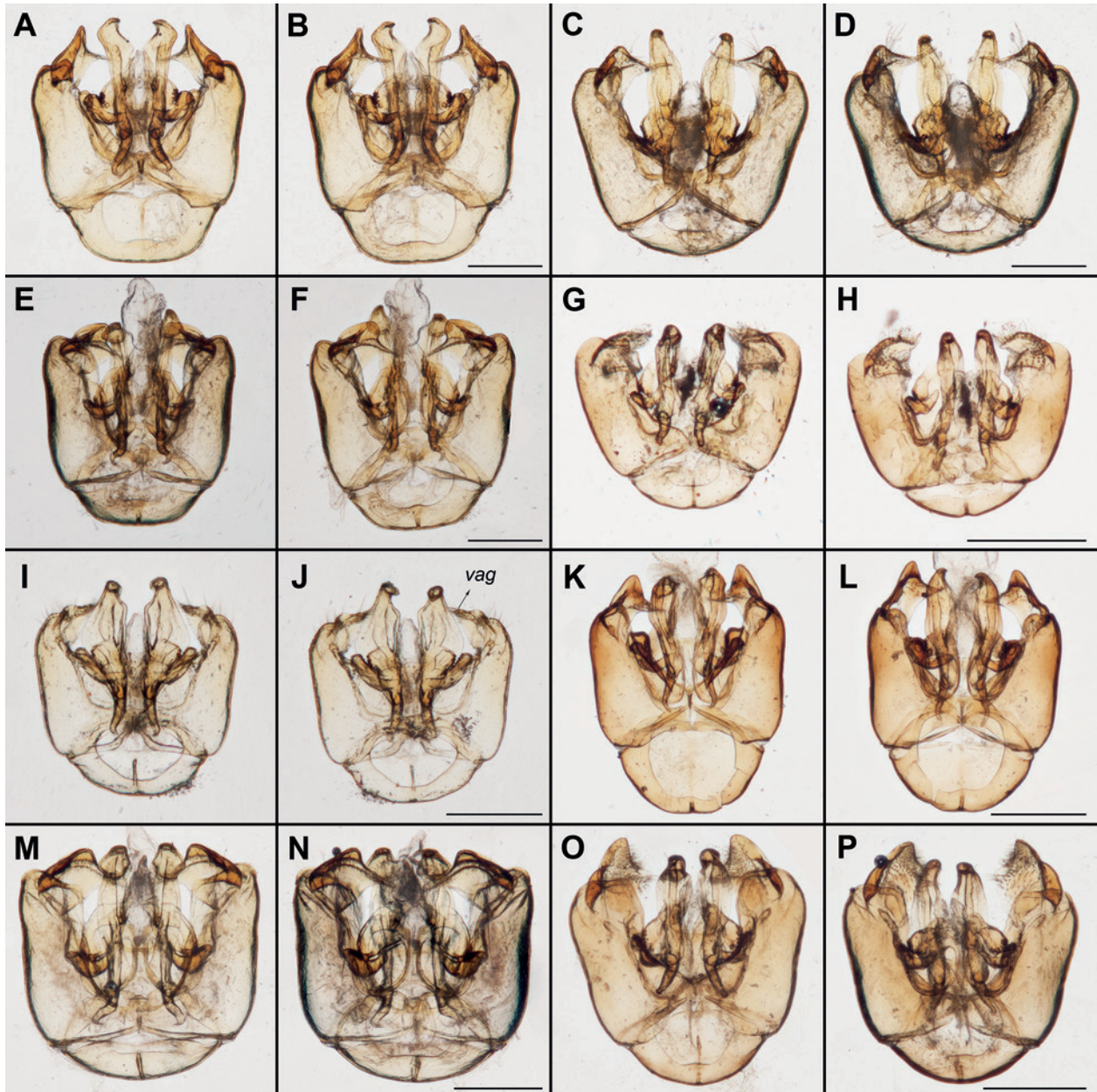
- 1 T1–T4 with marginal zones pearly. Metanotum with well defined basal strip of very short, dense hairs, lacking long hairs intermixed (Head and mesosoma black with bluish or greenish highlights; metasoma black except for apical pearly bands; tibiae, tarsi, tegula and wings yellowish orange)  
 ..... *C. chilensis* (**Spinola**)
- 1' T1–T4 with marginal zones translucent or of the same colour of the disc, not pearly. Metanotum with short and long hairs intermixed, without basal strip ..... **2**
- 2 Base of T3–T4 laterally with patches of appressed, white-yellowish pilosity, covered by the translucent marginal zones of preceding terga. Pronotal lobe and antero-lateral angle of mesoscutum with conspicuous tuft of yellow hairs. Discs of terga elevated, with punctures of two sizes ..... *C. cristata* (**Smith**)
- 2' Base of T3–T4 laterally without patches of appressed pilosity. Pronotal lobe and antero-lateral angle of mesoscutum bearing whitish hairs, but not forming a distinct tuft different from adjacent pubescence. Discs of terga not elevated, with punctures of one size .... **3**
- 3 Clypeus produced below inferior orbital tangent by  $\sim 0.5$  of clypeus length. (Head and sides of mesoscutum with yellowish pilosity. Mesosoma with vivid green highlights; metasoma either dark brown, dark brown with light brown apex and base of terga, or entirely reddish light brown. Tibiae II and III orange. Body length 8.4–9.8 mm) ..... *C. corinogaster* (**Spinola**)
- 3' Clypeus produced below inferior orbital tangent by  $\leq 0.3$  of clypeus length ..... **4**
- 4 Metasoma clavate: T1 very narrow, T2 longer than its apical width (as in Fig. 6G) ..... **5**
- 4' Metasoma slightly clavate: T1 slightly narrower than T2, T2 almost as wide as its apical length (as in Fig. 6H,I) ..... **6**



**Fig. 3.** *Corynura* spp.: genital capsule of the male. A,C,E,G,I,K,M,O: dorsal view; B,D,F,H,J,L,N,P: ventral view. A,B: *C. ampliata*. C,D: *C. apicata*. E,F: *C. bruchiana*. G,H: *C. callaina* sp.n. I,J: *C. challhuacoensis* sp.n. K,L: *C. chilensis*. M,N: *C. chloromelas*. O,P: *C. condita* sp.n. — **Abbreviations:** vag, ventral area of gonostylus; dag, dorsal area of gonostylus; gx, gonocoxite; gb, gonobase; bpg, basal process of gonostylus. Scale bars = 500  $\mu$ m.

- 5 F2–F10 cylindrical. Clypeus smooth with coarse punctures separated by 0.5–1.0 PD; supraclypeal area almost smooth between punctures, shiny. Mandible usually brown, metasoma dark brown but T2–T4 sometimes reddish  
..... *C. patagonica* (Cockerell)
- 5' F2–F10 narrowed medially. Clypeus tessellate (except apex) with fine punctures separated by 1.0 PD; supraclypeal area tessellate between punctures, dull. Mandible yellow, metasoma entirely dark brown  
..... *C. apicata* (Sichel)
- 6 F2–F11 with sensilla placodea intermixed with other types of sensilla (Fig. 9A); these sensilla can be detected through a stereo microscope at 20  $\times$  mag-

- nification. Lower paraocular area and supraclypeal area with appressed, dense, plumose hairs, which hide the cuticle ..... *C. callaina* González-Vaquero & Roig-Alsina, sp.n.
- 6' F2–F11 with dorsal areas composed mainly by sensilla placodea (Fig. 9B,C); these areas are easily seen through a stereo microscope at 20  $\times$  magnification. Lower paraocular area with appressed, dense, plumose hairs only around the ocular orbit, and erect, scattered hairs towards and on the supraclypeal area; cuticle exposed .....
- 7 F2–F10 with small dorsal areas of sensilla placodea, which cover 0.33 of flagellomere dorsal surface (Fig. 9B). Apical margin of S5 bearing small median pro-



**Fig. 4.** *Corynura* spp.: genital capsule of the male. A,C,E,G,I,K,M,O: dorsal view; B,D,F,H,J,L,N,P: ventral view. A,B: *C. corinogaster*. C,D: *C. cristata*. E,F: *C. herbsti*. G,H: *C. lepida*. I,J: *C. nahuelita* sp.n. K,L: *C. patagonica*. M,N: *C. rubella*. O,P: *C. spadiciventris*. — **Abbreviations:** vag, ventral area of gonostylus. Scale bars = 500  $\mu$ m.

jection with tuft of short, coarse setae. Ventral area of gonostylus bearing a basal lobe with long setae (Fig. 3N: vag) ..... ***C. chloromelas* (Alfken)**

7' F2–F10 with large dorsal areas of sensilla placodea, which cover 0.75 or more of flagellomere dorsal surface (Fig. 9C). Apical margin of S5 with small median notch, without specialized setae. Ventral area of gonostylus without basal lobe (as in Fig. 3A: vag) ..... **8**

8 Mesoscutum and scutellum with punctures separated by  $\leq 0.25$  PD, sculpture reticulate between punctures ..... **9**

8' Mesoscutum and scutellum with punctures separated by  $\geq 1.00$  PD, sculpture tessellate between punctures ..... **10**

9 T1–T3 reddish, following terga dark brown (Fig. 1B). T1 tessellate between punctures, disc with punctures separated by 5–6 PD. Pilosity dark brown ..... ***C. rubella* (Haliday)**

9' Metasoma dark brown, sometimes terga yellowish basally. T1 substrigulate between punctures, disc with punctures separated by 1 PD. Pilosity whitish or light brown ..... ***C. herbsti* (Alfken)**

10 T2–T3 with short hairs, and a few longer, mainly simple hairs. T1–T3 completely reddish or orangish, or with only the disc of T2 and/or T3 of that colour, or entirely dark brown ..... **11**

10' T2–T3 with short hairs intermixed with longer, plumose hairs. T1–T3 entirely dark brown ..... **14**

- 11 DAM longer than scutellum, elongate; DAM with basal, short striae, not reaching midlength. Body length 5.6–6.1 mm ..... *C. lepida* Alfken
- 11' DAM equal to or shorter than scutellum; DAM with basal, long striae, surpassing midlength (Fig. 8G,H). Body length 7.0–10.5 mm ..... 12
- 12 Posterior margin of DAM upraised. Metasoma entirely reddish, or dark brown with discs of T2–T3 reddish (Fig. 6H) ..... 13
- 12' Posterior margin of DAM angulate, but not upraised. Metasoma entirely dark brown ..... *C. moscosensis* González-Vaquero
- 13 Disc of T1 tessellate between punctures. Clypeus with hairs of different lengths intermixed. Head with yellowish hairs. Ventral area of gonostylus with a mesal process, bearing short, scattered setae (Fig. 3F). Body length 9.7–10.5 mm ..... *C. bruchiana* (Schrottky)
- 13' Disc of T1 substrigulate between punctures. Clypeus with two distinctive layers of hairs: one of short, appressed, many-branched hairs, and another one of longer, erect hairs with few branches. Head with whitish hairs. Ventral area of gonostylus greatly developed, without mesal process, bearing long setae on its apical region (Fig. 3A: *vag*). Body length 7.1–8.4 mm ..... *C. ampliata* (Alfken)
- 14 DAM with basal short striae, not reaching half of DAM total length ..... 15
- 14' DAM with long striae, surpassing half of DAM total length (as in Fig. 8H) or even reaching DAM posterior margin (as in Fig. 8G) ..... 16
- 15 Clypeus smooth between punctures. DAM longer than scutellum, elongate ..... *C. atrovirens* (Herbst)
- 15' Clypeus tessellate between punctures. DAM equal or shorter than scutellum ..... *C. condita* González-Vaquero & Roig-Alsina, sp.n.
- 16 Paraocular areas with dark brown hairs, their length  $\leq 2.4 \times \text{MOD}$ . Distance between lateral ocellus and occipital margin  $1.5 \times \text{MOD}$ . Tibia I dark brown. Tarsus III yellow, last tarsomere dark brown. DAM with coarse striae. Ventral area of gonostylus reduced (Fig. 4J: *vag*) ..... *C. nahuelita* González-Vaquero & Roig-Alsina, sp.n.
- 16' Paraocular areas with whitish hairs, their length  $\leq 1.7 \times \text{MOD}$ . Distance between lateral ocellus and occipital margin  $1.0 \times \text{MOD}$ . Tibia I yellow on outer side and brown on inner side. Tarsus III brown or yellowish. DAM with fine striae. Ventral area of gonostylus developed (Figs. 3J, 4P) ..... 17
- 17 T2 with coarse punctures, separated by 1–2 PD. Antenna brown dorsally. Ventral area of gonostylus with a mesal process, with scattered setae (Fig. 4P) ..... *C. spadiciventris* Alfken
- 17' T2 with fine punctures, separated by 4–6 PD. Antenna yellow dorsally. Ventral area of gonostylus rounded, with dense setae (Fig. 3J: *vag*) ..... *C. challhuacoensis* González-Vaquero & Roig-Alsina, sp.n.

## 5.7. Species of *Corynura*

### 5.7.1. *Corynura ampliata* (Alfken)

Figs. 3A,B, 6H, 7F, 8A,G, 10A, 12A, 19A

*Halictus* (*Cacosoma*) *ampliatius* Alfken, 1913: 323. Syntypes, lost: females, Osorno, Chile.

*Rhopalictus calli cladurus* Cockerell, 1918a: 344. Holotype: male, Chile; USNM (No. 23175); examined; **new synonymy**.

*Corynura ampliata*: ALFKEN 1931: 218; GONZÁLEZ-VAQUERO et al. 2016: 891, 893, 894.

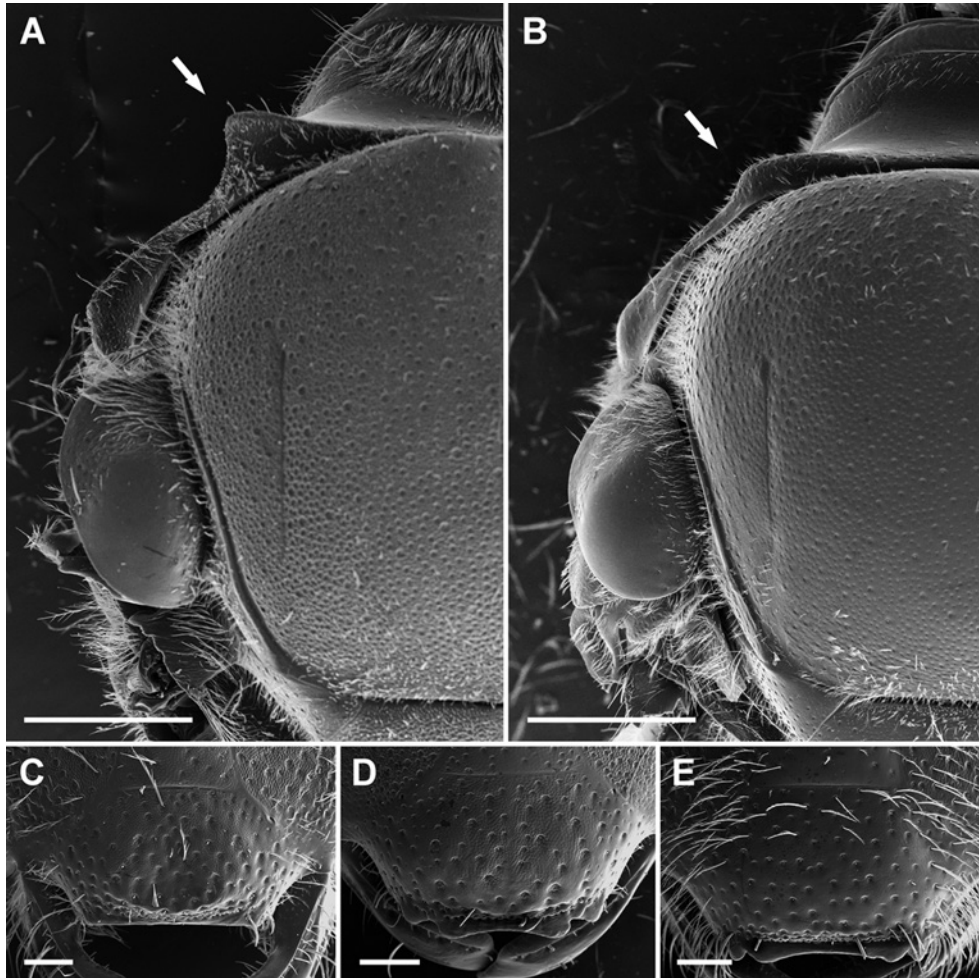
*Corynura* sp. 2: GONZÁLEZ-VAQUERO et al. 2014: 190.

**Differential diagnosis.** Females of *C. ampliata* can be distinguished from other *Corynura* species by the combination of the wide, glabrous, marginal zones of the terga, the inner hind tibial spur with 2–5 long teeth (Fig. 7F), and the DAM, with fine, basal striae, and the apex well defined by a raised margin (Fig. 8A). Males are characterised by the yellowish or reddish light brown base of T2–T3, and the light brown tibiae and tarsi. Males of *C. patagonica* and *C. bruchiana* may have the same colour pattern as *C. ampliata*, which can be separated from *C. patagonica* by the strongly tessellate clypeus and supra-clypeal area, from *C. bruchiana* by the smaller size (*C. ampliata*: 7.1–8.4 mm long; *C. bruchiana* 9.7–10.5 mm long), and from these and all other species of *Corynura* by the unique genital capsule, with a greatly developed ventral area of the gonostylus bearing long setae on the apical region (Fig. 3A,B).

**Description of male genital capsule** (Fig. 3A,B). Volsella short; inner apical corner of digitus mesally produced. Inner dorsal margin of gonocoxite forming mesal angle; dorsal margins nearly parallel from mesal angle to base. Dorsal area of gonostylus reduced (Fig. 3A: *dag*). Ventral area of gonostylus greatly developed, bearing long setae on apical region (Fig. 3A: *vag*), and forming small, mesally directed projection. Basal process of gonostylus with few setae.

**Variation.** Females and males of *Corynura ampliata* have considerable variation in colour, which does not match any particular geographical distribution. In the males, the labrum can be yellow or brown, and the metasoma is usually brown with at least the base of T2–T3, T6–T7 and S2–S3 entirely yellowish or reddish; this colour can extend to other segments. The legs are brown almost to the apex of the femora, while the tibiae and tarsi are yellowish, and the tibiae II and III usually have a central dark brown spot. The colour of the female metasoma can be from entirely reddish with the base of T1 dark brown to entirely dark brown. The terga bear long, plumose, erect hairs, which can be light brown, dark brown or both, independently of the colour of the cuticle. Although most of the specimens examined have a black cuticle with greenish or bluish highlights on the head and the mesosoma, some have head and mesosoma





**Fig. 5.** *Corynura* and *Callistochlora*. A,B: mesoscutum of the female; C–E: clypeus of the female. A,D: *C. chilensis*. B,E: *Ca. aureo-viridis*. C: *C. rubella*. Scale bars = 0.5 mm (A,B), 200  $\mu$ m (C–E).

black with a waxy appearance. Females also vary in the inner hind tibial spur, which has 2–5 teeth. In spite of the variation observed, DNA barcoding analyses suggest that the specimens belong to a single species (GONZÁLEZ-VAQUERO et al. 2016).

**Type material.** In the description of *Halictus ampliatus*, ALFKEN (1913) mentions two females from Osorno, Chile. These specimens are considered to be lost, since they are not housed at ZMB with the material from Chile studied by him, yet the original description allows recognition of the species. Alfken clearly distinguished this species from others with reddish metasoma known to him. Two species not considered in his keys are *C. patagonica* and *C. luisae* sp.n. These species do not agree with the description of *H. ampliatus*, *C. patagonica* due to the lack of striae and central keel in the DAM and its small body size, and *C. luisae* sp.n. due to the inner hind tibial spur with many short teeth. These considerations allow recognizing *C. ampliata* as a distinct species. Alfken was also able to identify the male of *H. ampliatus*, two specimens studied by him (ALFKEN 1931: 218) were examined by us.

The type of *Rhopalictus callicladurus* has the metasoma and the left leg III glued to the propodeum, the flag-

ellomeres of both antennae are missing from F8 on, and the left leg II lacks two tarsomeres. The specimen has the following labels: ‘*Rhopalictus* | *callicladurus* CkII | TYPE’ handwritten, white with a blue border; ‘Chile | ECRreed’ printed; ‘Type No. | 23175 | U.S.N.M.’ printed, orange; ‘USNM ENT | 00536822’ printed, yellow, with barcode.

**Note.** Specimens of *C. ampliata* have been barcoded (GONZÁLEZ-VAQUERO et al. 2016: Barcode Index Number BOLD:ABA1596).

**Floral records.** Alstroemeriaceae: *Alstroemeria auria*; Anacardiaceae: *Schinus patagonicus*; Apiaceae: *Daucus pusillus*, *Mulinum spinosum*; Asteraceae: *Achillea millefolium*, *Baccharis obovata*, *B. umbelliformis*, *Carduus* sp., *Chrysanthemum* sp., *Taraxacum officinale*; Boraginaceae: *Phacelia secunda*; Buddlejaceae: *Buddleja globosa*; Elaeocarpaceae: *Aristotelia chilensis*; Escalloniaceae: *Escallonia virgata*; Fabaceae: *Cytisus scoparius*; Grossulariaceae: *Ribes magellanicum*; Malvaceae: *Tilia moltkei*; Nothofagaceae: *Nothofagus* sp.; Proteaceae: *Embothrium coccineum*, *Lomatia hirsuta*; Rhamnaceae: *Discaria articulata*, *D. chacayae*.

**Distribution** (Fig. 19A). Argentina: Neuquén, Río Negro and Chubut. Chile: from Santiago to Aisén.

### 5.7.2. *Corynura apicata* (Sichel)

Figs. 3C,D, 19A

*Halictus apicatus* Sichel, 1867: 145. Holotype, lost: female, Chile.

Neotype: female, Arauco, Chile; MNNC; **present designation**.

*Halictus haemorrhous* Vachal, 1904: 143. Holotype: female, Valdivia, Chile; MNHN; examined. Synonymized by HERBST 1922: 188.

*Corynura apicata*: ALFKEN 1926: 152.

**Differential diagnosis.** Females of this species can be identified by the combination of the colour of the female metasoma, which is dark brown with T4–T6 or T5–T6 reddish, the purplish highlights on the head and mesosoma, and the short teeth of the inner hind tibial spur. Some specimens of *C. patagonica* have the same body size and colour pattern in the metasoma, but *C. apicata* is distinguished by the absence of the posteriorly curved lateral part of gradulus on T2. Males can be identified from any other *Corynura* by the shape of F2–F10, which are narrowed medially, and by the straight margin of S8.

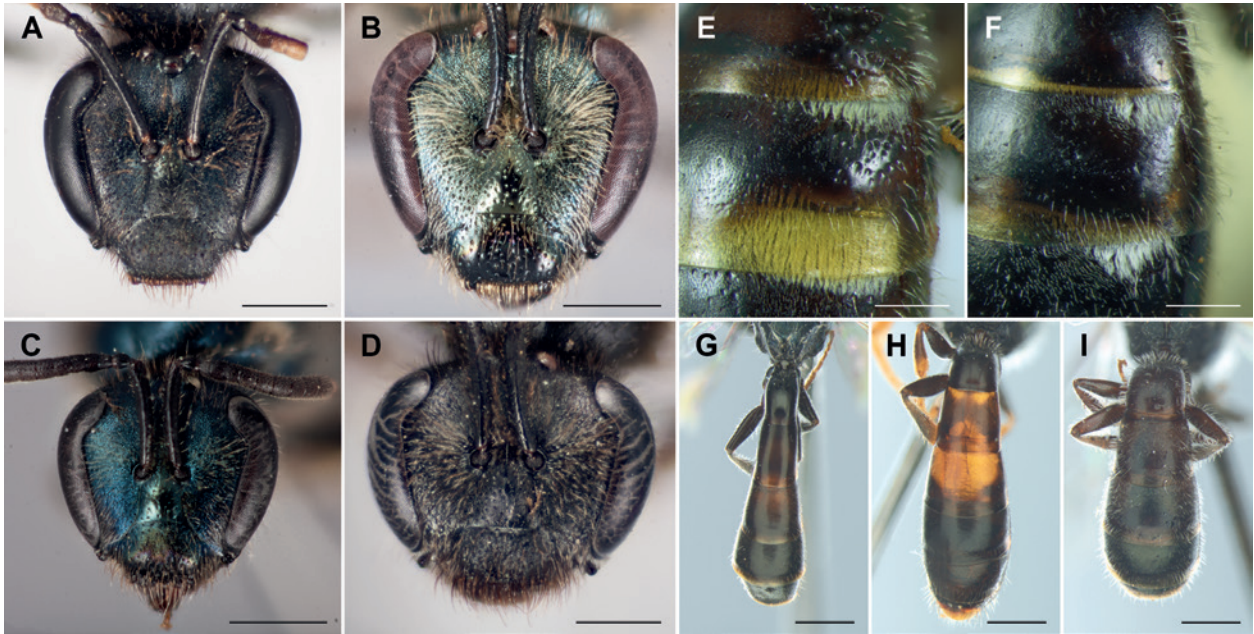
**Description of male.** Body length, 7.7–8.4 mm; forewing length, 6.0–6.3 mm. **Colour:** Body black, with bluish and purplish highlights on head and mesosoma. Following parts black: scape, pedicel. Following parts dark brown: labrum, malar area, base of mandible, flagellum, legs, tegula, metasoma. Following parts yellowish light brown: mandible, outer spot on tibia I, tarsi. Wings hyaline, with brown veins and pterostigma, radial vein dark brown to black. **Pubescence:** Whitish. Head with plumose hairs as long as  $1.8 \times \text{MOD}$  on clypeus, supra-clypeal area, paraocular area and vertex. Lower part of gena with hairs as long as  $2.8 \times \text{MOD}$ . Upper paraocular area, mesoscutum, scutellum and metanotum with dark, short ( $0.2 \times \text{MOD}$ ), simple hairs, denser on lower paraocular area. Mesosoma with plumose hairs on mesoscutum and metanotum ( $1.4\text{--}1.6 \times \text{MOD}$ ), longer on pleura (up to  $3.0 \times \text{MOD}$ ). Base of T2–T3 with short ( $0.2\text{--}0.3 \times \text{MOD}$ ), simple hairs, and longer plumose hairs on T5–T6 (up to  $1.3 \times \text{MOD}$ ); marginal zones glabrous. Sterna with simple hairs, denser on S5–S6, as long as  $0.4 \times \text{MOD}$ . **Sculpture:** Clypeus with punctures separated by 1–2 PD, those on supra-clypeal area separated by 3–5 PD. Lower paraocular area with punctures separated by 2–3 PD. Punctures on disc of mesoscutum separated by 3–5 PD, denser at sides, those on scutellum separated by 1–2 PD. DAM with fine radiating striae, not reaching apical margin. Terga with punctures separated by 2–4 PD, sparser towards apex. Body surface tessellate between punctures, except metasoma substrigulate. **Structure:** Head broader than long, width : length =  $1.03\text{--}1.10 : 1$ . Ratio of lower to upper interocular distance,  $0.67\text{--}0.70 : 1$ . Clypeus broader than long,  $1.16\text{--}1.24 : 1$ . Ratio of interantennal to antennocular distance,  $1.40\text{--}1.68 : 1$ . Ratio of posterior interocellar to ocellocular distance,

$1.53\text{--}2.10 : 1$ . F2–F11 dorsally covered almost exclusively by sensilla placodea. Ratio of lengths of scape, pedicel, F1 and F2  $0.90\text{--}0.98 : 0.22\text{--}0.25 : 0.23\text{--}0.30 : 1$ . Apical margins of sterna: S1–S4 straight, S5 with small median notch, S6 produced, strongly bent at level of union of gradulus with apical margin, S7 bilobed, S8 straight or almost straight. **Genital capsule** (Fig. 3C,D): Volsella short; inner apical corner of digitus mesally produced. Inner dorsal margin of gonocoxite forming mesal angle; dorsal margins nearly parallel from mesal angle to base. Dorsal area of gonostylus quadrate in caudal view, more sclerotized than ventral area. Ventral area of gonostylus mesally directed, with sparsely setose projection. Basal process of gonostylus with few setae.

**Variation.** Three male specimens from Valparaíso (CAS) are slightly smaller ( $\sim 7.2$  mm) than the rest, have more intense purplish highlights, and the DAM has stronger radiating striae, and some fine striae transversely oriented on the posterior margin. A female from the same collecting event, although smaller (5.7 mm), has no differences from the rest of the examined females of *C. apicata*. A female from Río Negro, Argentina (MACN), has the metasoma entirely reddish.

**Type material.** The type specimen of *Halictus apicatus* is not in the Sichel Collection of the MNHN of Paris, and it is lost according to MOURE (2007). The description of the species is brief, and it agrees with the holotypes of both *Halictus haemorrhous* and *Rhopalictus patagonicus* Cockerell; these holotypes undoubtedly belong to different species of *Corynura*. Among the few characters described by Sichel for *H. apicatus* is the reddish apex of the metasoma, a consistent character present in most of the material studied assigned to *H. haemorrhous*, although it is also present in some specimens of *C. patagonica*. HERBST (1922: 188) synonymized *H. haemorrhous* with *H. apicatus*. We decided to take a conservative attitude, keep the synonymy suggested by Herbst, and designate a neotype for *C. apicata* in order to stabilize the usage of the name. With this action *H. haemorrhous* is a junior synonym of *H. apicatus*, and *C. patagonica* stands as a valid species. The neotype belongs to the MNNC, and it has the following labels: ‘Arauco | H. Lanalhue | 23.1.975 | Cerda’ handwritten; ‘COLL. CERDA | MNHN CHILE’ printed.

We studied the holotype of *H. haemorrhous*, a female in very poor condition: it lacks the head, the metasoma, the left hind wing, the right forewing is broken, and the trochanter and the femur of the right leg III and the left leg II are glued to a label. The description of *H. haemorrhous* is very short, but it mentions that T5–T6 are reddish. This specimen has the following labels: ‘TYPE’ printed, red; ‘Hal. ♀ | haemorrh- | ous Vach.’ handwritten; ‘Valdivia’ handwritten; ‘Muséum Paris’ printed. A male with the same labels but no ‘TYPE’ label was examined. This specimen has the supra-clypeal area and the clypeus smoother and the tarsi more yellowish than other specimens, but it shares the peculiar shape of the flagel-



**Fig. 6.** *Corynura* spp. A–D: head of the female; E–F: T2–T3 of the female; G–I: metasoma of the male. A: *C. bruchiana*. B: *C. corinogaster*. C, G: *C. patagonica*. D: *C. rubella*. E: *C. cristata*. F: *C. herbsti*. H: *C. ampliata*. I: *C. nahuelita* sp.n. Scale bars = 1 mm (A–D, G–I), 0.5 mm (E, F).

lomers and other characters. Oddly, this specimen was labelled as a female, and it was not included by Vachal in his key to the males of the ‘*Halicti rhopali*’ (VACHAL 1904: 142–144).

**Taxonomic notes.** ALFKEN (1926: 156, 162) synonymized *H. haemorrhous* with *C. ampliata*, as he considered the former a variety darker in coloration of the latter. Later, (ALFKEN 1931: 211) mentioned that his action was a mistake, and that if T5–T6 of *C. apicata* are reddish and the remaining of the metasoma brown *H. haemorrhous* must be synonymized with *C. apicata* instead.

**Floral records.** Unknown.

**Distribution** (Fig. 19A). Argentina: Neuquén. Chile: from Santiago to Los Lagos.

### 5.7.3. *Corynura atrovirens* (Herbst)

Fig. 19A

*Halictus (Corynura) atrovirens* Herbst, 1924: 43. Lectotype: male, Estero de Marga-Marga, Chile; MCZ (MCZT\_23488); examined; **present designation**.  
*Corynura atrovirens*: MOURE & HURD 1987: 208.

**Differential diagnosis.** The males of *C. atrovirens* can be separated from any other *Corynura* by the combination of the following characters: metasoma entirely dark brown, DAM longer than scutellum, elongate, and the presence of long, erect and plumose hairs on T2–T3. The male of this species can be confused with that of *C. lepida* due to the small size (5.5–6.0 mm long) and

general appearance of both species. *Corynura atrovirens* differs from *C. lepida* by its smoother sculpture: clypeus smooth, mesoscutum very weakly tessellate and disc of T1 substrigulate between punctures. In *C. atrovirens*, F1 is 0.3 longer than the pedicel, while both have the same length in *C. lepida*. The female is unknown.

**Type material.** The lectotype of *Halictus atrovirens*, in excellent condition, has the following labels: ‘*Halictus | atrovirens* | ♂ P. Herbst | Type’ handwritten; ‘In floribus | *Daucus | carota*’ handwritten; a small square of red paper; ‘Chile | Marga- | Marga | 12.I.1919 | P. Herbst’ printed; ‘M.C.Z. | Type | 23488’ printed, red; ‘P. Herbst | Collection’ printed; ‘MCZ-ENT | 00023488’ printed, with a QR code. HERBST (1924) mentions more specimens, but the lectotype is the only specimen examined by us.

**Taxonomic notes.** Although HERBST (1924) included this species in *Corynura*, considering *Corynura* as a subgenus of *Halictus*, ALFKEN (1926, 1931) did not include *C. atrovirens* in his keys.

**Note.** *C. atrovirens* seems to be a very rare species. Despite the intense bee collecting from Central Chile performed by Haroldo Toro and other melittologists in the past, we have not found any other specimen besides the lectotype in collections.

**Floral records.** The lectotype was collected on *Daucus carota* (Apiaceae).

**Distribution** (Fig. 19A). Chile: Valparaíso.

5.7.4. *Corynura bruchiana* (Schrottky)

Figs. 3E,F, 6A, 7B, 10B, 19A

*Halictus bruchianus* Schrottky, 1908: 225. Holotype, lost: female, Lago Nahuel Huapi, Argentina. Neotype: female, Lago Guillermo, Parque Nacional Nahuel Huapi, Río Negro, Argentina; MACN; **present designation**.

*Halictus analis* Herbst, 1924: 43. Lectotype: female, Colchagua, O'Higgins, Chile; MCZ (MCZT\_23487); examined; **present designation; new synonymy**.

*Corynura heterochlora* Alfken, 1926: 162. Holotype: female, Osorno, Chile; lost?; **new synonymy**.

*Corynura bruchiana*: MOURE & HURD 1987: 208; GONZÁLEZ-VAQUERO et al. 2016: 891, 893.

*Corynura analis*: GONZÁLEZ-VAQUERO et al. 2014: 190.

**Differential diagnosis.** *Corynura bruchiana* is characterized by its large size; females are 8.6–9.3 mm long, and males can be up to 10.5 mm long. Females can be easily identified from other species of the genus by the combination of the sculpture of the clypeus, uniformly tessellate between punctures and almost straight in lateral view, the reddish metasoma, and the yellowish inner side of the flagellum. Females of *C. bruchiana* are very similar to those of *C. luisae* sp.n., from which they differ by the tessellate DAM with no striae and a greatly developed postero-lateral upraised margin. Males are similar at first glance to those of *C. rubella*, but in *C. bruchiana* the mesoscutum is tessellate between punctures, and the punctures are separated by 1–2 PD.

**Description of male genital capsule** (Fig. 3E,F). Volsella short; inner apical corner of digitus mesally produced. Inner dorsal margin of gonocoxite almost straight; dorsal margins converging towards gonobase. Dorsal area of gonostylus quadrate in caudal view, more sclerotized than ventral area. Ventral area of gonostylus mesally directed, with sparsely setose projection. Basal process of gonostylus with few setae.

**Variation.** Most of the females examined have the metasoma reddish, but in some specimens it is dark brown, as in the lectotype of *H. analis* and in a specimen from Malleco, Chile (PCYU). In these cases the inner side of the flagellum is also brown.

**Type material.** The type studied by Schrottky of *Halictus bruchianus* is not present in MACN, as informed by MOURE (2007) and the catalog of the types of Schrottky (RASMUSSEN et al. 2009: 23), nor it is in MLPA, where some Argentinian bees studied by him are housed. A neotype of *H. bruchianus* is here designated (see “Taxonomic notes”), which was collected in the surroundings of Lago Guillermo, very close to the type locality. It has the following printed labels: ‘ARG. Río Negro, PN Nahuel | Huapi: Lago Guillermo | –41.37425 –71.490278 | 29–I–2011, R. González V. | En área de nidificación’, ‘MACN-En | 8220’, ‘Barcode of Life | DNA voucher specimen | MACN-En 8220’.

We examined one of the female syntypes of *Halictus analis*. The name was correctly assigned to the genus

*Corynura* by MOURE & HURD (1987: 208). The specimen agrees with the original description, although the metasoma is dark brown. The metasoma is glued to the right wings with an excessive amount of enamel. The left flagellum is missing from F2 on, and the legs II, and the left leg III from the trocanther on. It has the following labels: ‘*Halictus* | *analis* | ♀ P. Herbst | Type’ handwritten; a small square of blue paper; ‘Chile | Tramuné | provincia | Colchagua | 15.II.1921 | P. Herbst’ printed; ‘M.C.Z. | Type | 23487’ printed, red; ‘P. Herbst | Collection’ printed; ‘*Corynura* | (*Corynura*) | det. G.C.Eickwort’ printed; ‘MCZ-ENT | 00023487’ printed, with a QR code. This specimen is here designated as the lectotype.

The female holotype of *C. heterochlora* (ALFKEN 1926, 1931) was not found in ZMB, but its description agrees with *C. bruchiana*.

**Taxonomic notes.** ROBERTS (1972: 443) places *H. bruchianus* under *incertae sedis*, but he suggests that it is a species of *Corynura* or *Ruizantheda*. In the Nahuel Huapi Lake area, the bee fauna of which is well known, there are two species of *Ruizantheda*: *R. proxima* and *R. mutabilis*. The former has some conspicuous characters that disagree with Schrottky’s description. The latter was described by SCHROTTKY (1908) as *Halictus nahuelhuapiensis* in the same paper and page as *H. bruchianus*. Later, SCHROTTKY (1913) synonymizes *H. nahuelhuapiensis* under *R. mutabilis* and recognises *H. bruchianus* as a distinct species, placing both species in the genus *Agapostemon*. Finally, MOURE & HURD (1987: 208) place *bruchianus* in *Corynura*, which is what the original description suggests, considering also the halictids known for that area.

SCHROTTKY (1908) made a short description of *H. bruchianus* based on a female of red metasoma, 10 mm long. In the Nahuel Huapi National Park, the only *Corynura* known of that size are *C. corinogaster*, *C. rubella*, and the species usually identified as *C. analis*; other species with a red metasoma are considerably smaller (*C. ampliata*, *C. apicata*, and *C. patagonica*). According to the description, the mesoscutum and the scutellum of *H. bruchianus* are glabrous and without punctures; *C. corinogaster*, which has coarse punctures separated by 1–2 PD and dense, yellowish pilosity in the mesosoma, can therefore be discarded. The author describes a truncate metapostnotum with a concave dorsal area and a carina on the apical margin (‘*carinula acuta circumdata*’); the DAM of *C. rubella* is almost straight and the apical margin is weakly elevated. In addition, SCHROTTKY (1908) describes a convex clypeus for *H. bruchianus*, while that of *C. rubella* has a striking transverse keel, which gives a straight or slightly concave appearance to the apical half of the clypeus in lateral view. A third characteristic reported for *H. bruchianus* is the dark head with greenish highlights; in contrast, the head of *C. rubella* is black and dull. The features reported for *H. bruchianus* agree with the specimens currently identified as *C. analis*. To stabilize the interpretation and usage of the name *H. bruchianus*, we here designate a neotype.

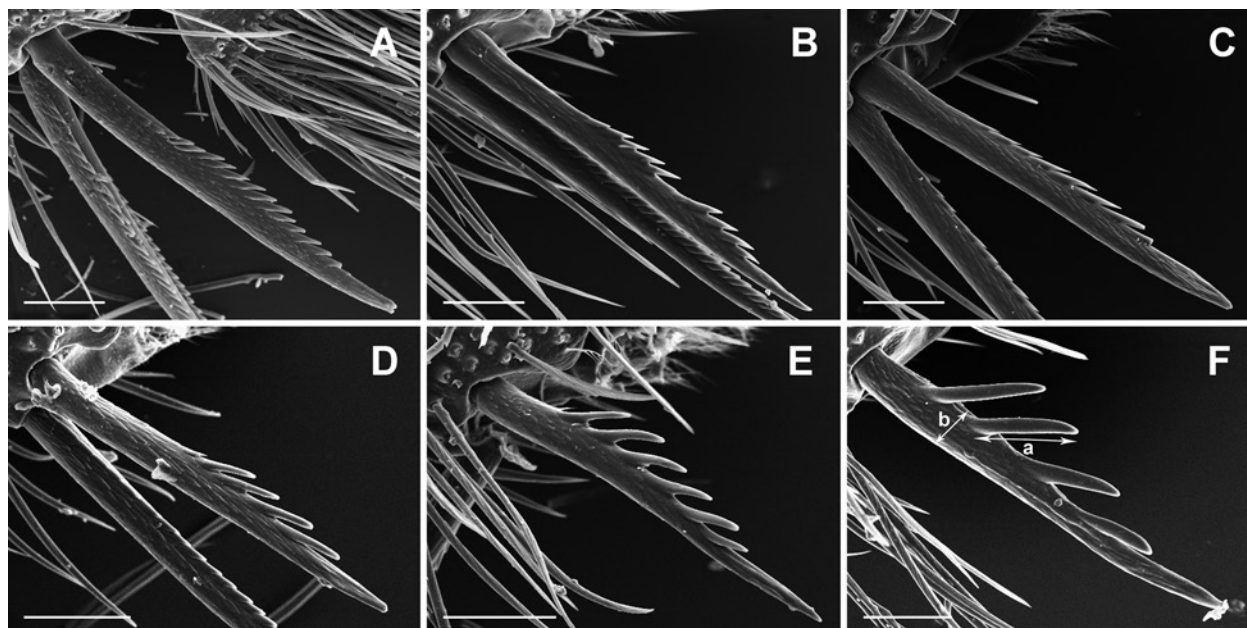


Fig. 7. *Corynura* spp.: inner hind tibial spur of the female. A: *C. chilensis*. B: *C. bruchiana*. C: *C. corinogaster*. D: *C. patagonica*. E: *C. challhuacoensis* sp.n. F: *C. ampliata*; a, length of tooth; b, diameter of spur shaft (see character 33). Scale bars = 100  $\mu$ m.

ALFKEN (1913: 325) mentions that *C. heterochlora* (under the name *C. placida* Smith) is related to *H. ampliatum* by the shape of DAM, which is weakly tessellate and has the apical margin upraised in a keel in both species. Alfken did not compare his material with the type of *Halictus placidus* (synonym of *Ruizanthedella mutabilis* (Spinola, 1851)), but he states that being this species new, it should be named *C. heterochlora* (ALFKEN 1926). Later, ALFKEN (1931) indicates that in *H. placidus* the mesosoma is blue, while in his species it is black. The male described by ALFKEN (1931: 216–217) as *C. heterochlora* was examined, and it is a male of *C. bruchiana*. This specimen is in excellent condition, unlike the rest of the few male specimens studied of this species.

**Note.** Females of *C. bruchiana* have been barcoded (GONZÁLEZ-VAQUERO et al. 2016: Barcode Index Number BOLD:ABW7107). Males are very scarce in collections, barely nine specimens have been found so far.

**Floral records.** Buddlejaceae: *Buddleja globosa*; Elaeocarpaceae: *Aristotelia chilensis*; Escalloniaceae: *Escallonia virgata*; Grossulariaceae: *Ribes magellanicum*; Malvaceae: *Tilia moltkei*; Myrtaceae: *Myrceugenia planipes*; Rhamnaceae: *Discaria chacayae*; Rosaceae: *Malus* sp., *Rosa rubiginosa*.

**Distribution** (Fig. 19A). Argentina: Neuquén, Río Negro and Chubut. Chile: from Maule to Aisén.

#### 5.7.5. *Corynura callaina* sp.n.

Figs. 3G,H, 13A–D, 10C, 20C

*Corynura* sp. 9: GONZÁLEZ-VAQUERO et al. 2016: 891, 893.

**Differential diagnosis.** The females of this species can be easily identified by the combination of the following characters: vivid bluish-green highlights on the head and mesosoma, and present even in the metasoma, inner hind tibial spur with long teeth, and marginal zones of the terga bearing erect setae. The antennae of the male *C. callaina* sp.n. lack the areas composed exclusively of sensilla placodea, these sensilla being intermixed with other types of sensilla, a characteristic shared only with *C. chilensis*. Additional features of the males of these two species are the small median notch of the apical margin of S4, and the appressed plumose hairs on the lower paraocular and supraclypeal areas.

**Description of male** (holotype, Fig. 13A,B). Body length, 6.8 mm; forewing length, 5.0 mm (paratypes, body length, 6.8–7.7 mm; forewing length, 5.0–5.6 mm). **Colour:** Head and mesosoma dark brown, with very vivid greenish highlights, bluish on gena, propodeum and metapostnotum. Following parts dark brown: labrum, malar area, mandible except apex, scape, pedicel, ventral surface of flagellum, coxae, trochanters, femora, posterior surface of tibia I, central area of tibiae II and III, metasoma. Following parts yellowish light brown: apex of mandible, dorsal surface of flagellum, outer surface of tibia I, apex and base of tibiae II and III, tegula. Wings hyaline, with light brown veins and pterostigma, radial vein dark brown. **Pubescence:** Whitish. Head with plumose hairs as long as  $1.3\text{--}1.7 \times \text{MOD}$  on clypeus, supraclypeal area, lower paraocular area, and shorter ( $0.5 \times \text{MOD}$ ) appressed hairs. Hairs on vertex as long as  $1.8 \times \text{MOD}$ , those of lower part of gena as long as  $2.2 \times \text{MOD}$ . Upper paraocular area, mesoscutum, scutellum and metanotum with short ( $0.2 \times \text{MOD}$ ), simple hairs, denser on lower paraocular area. Mesosoma with plumose hairs on me-

soscutum, pleura and metanotum ( $1.4\text{--}1.9 \times \text{MOD}$ ). Base of T2–T3 with short ( $0.1\text{--}0.2 \times \text{MOD}$ ), simple hairs, intermixed with plumose hairs as long as  $0.7 \times \text{MOD}$ ; hairs longer on T5–T6 (up to  $1.3 \times \text{MOD}$ ); marginal zones with short, simple hairs. Sterna with simple hairs, denser on S5–S6, as long as  $0.6 \times \text{MOD}$ . **Sculpture:** Clypeus with punctures separated by  $1.5\text{--}2.0$  PD, those on supraclypeal area separated by  $2.0\text{--}3.0$  PD. Lower paraocular area with punctures separated by  $1.0\text{--}2.0$  PD. Punctures on disc of mesoscutum and scutellum separated by  $3.0\text{--}5.0$  PD. DAM with fine radiating striae, not reaching apical margin. Terga with punctures separated by  $3.0\text{--}5.0$  PD, sparser towards apex. Body surface tessellate between punctures except: clypeus smooth, supraclypeal area weakly tessellate, metasoma substrigulate. **Structure:** Head as broad as long, width : length =  $1.00 : 1$  (paratypes,  $0.98\text{--}1.03 : 1$ ). Ratio of lower to upper interocular distance,  $0.65 : 1$  (paratypes,  $0.64\text{--}0.68 : 1$ ). Clypeus broader than long,  $1.25 : 1$  (paratypes,  $1.22\text{--}1.28 : 1$ ). Ratio of interantennal to antennocular distance,  $1.95 : 1$  (paratypes,  $1.68\text{--}1.95 : 1$ ). Ratio of posterior interocellar to ocellocular distance,  $1.28 : 1$  (paratypes,  $1.28\text{--}1.41 : 1$ ). Ratio of lengths of scape, pedicel, F1 and F2  $0.72 : 0.26 : 0.39 : 1$  (paratypes,  $0.72\text{--}0.84 : 0.22\text{--}0.26 : 0.33\text{--}0.42 : 1$ ). F2–F11 dorsally covered by different types of intermixed sensilla, without areas bearing exclusively sensilla placodea. Apical margins of sterna: S1–S3 straight, S4–S5 with small median notch, S6 produced, strongly bent at level of union of gradulus with apical margin, S7 curved, S8 medially produced, usually bearing one or two setae. **Genital capsule** (Fig. 3G,H): Volsella short; inner apical corner of digitus mesally produced. Inner dorsal margin of gonocoxite forming mesal angle; dorsal margins nearly parallel from mesal angle to base. Dorsal area of gonostylus quadrate in caudal view, more sclerotized than ventral area. Ventral area of gonostylus mesally directed, with sparsely setose projection. Basal process of gonostylus with few setae.

**Description of female** (Fig. 13C,D). Body length,  $5.8\text{--}7.2$  mm; forewing length,  $5.5\text{--}5.8$  mm. **Colour:** Body dark brown with vivid bluish highlights, bluish-green on mesoscutum. Clypeus with purplish or yellowish highlights near base, and black apical margin as long as  $0.7$  of clypeus; black area extending through inner orbit of eye up to level of eye emargination. Following parts black: labrum, malar area, mandible except reddish apex. Following parts dark brown: scape, pedicel, ventral surface of flagellum, legs except tarsi II and III, sterna. Following parts light brown: dorsal surface of flagellum, tarsi II and III, tegula. Wings hyaline, with light brown veins and pterostigma, radial vein dark brown. **Pubescence:** Light brown. Head with erect, plumose hairs, those on paraocular area and vertex as long as  $1.6\text{--}1.9 \times \text{MOD}$ . Lower part of gena with hairs as long as  $1.7\text{--}2.2 \times \text{MOD}$ . Upper paraocular area, mesoscutum, and scutellum with short ( $0.2\text{--}0.3 \times \text{MOD}$ ), simple hairs. Mesoscutum with scattered, plumose, long hairs ( $1.3\text{--}1.6 \times \text{MOD}$ ), longer on

pleura ( $2.3\text{--}2.6 \times \text{MOD}$ ) and metanotum (up to  $1.7 \times \text{MOD}$ ). Lateral area of propodeum with plumose hairs as long as  $1.5\text{--}2.0 \times \text{MOD}$ . T1 with hairs plumose anteriorly ( $1.1\text{--}1.3 \times \text{MOD}$ ), shorter and sparser on disk. T2–T4 with simple, short ( $0.2 \times \text{MOD}$ ) hairs, intermixed with some plumose longer hairs ( $0.5\text{--}1.1 \times \text{MOD}$ ) directed posteriorly; marginal zones with short, simple hairs. Sterna with very short, sparse hairs basally, and long, plumose and simple hairs on posterior half, those on S2–S3 with their apices bent caudally. **Sculpture:** Labrum with verrucose, median, basal elevation (Fig. 10C). Clypeus and supraclypeal area with punctures separated by  $4.0\text{--}5.0$  PD. Lower paraocular area with punctures separated by  $3.0\text{--}4.0$  PD, those on upper paraocular area separated by  $0.5\text{--}1.0$  PD. Punctures on disc of mesoscutum separated by  $3.0\text{--}4.0$  PD, denser at sides, those on scutellum separated by  $2.0\text{--}3.0$  PD, punctures evenly distributed. Metanotum with punctures separated by  $2.0$  PD, those on lateral area of propodeum separated by  $6.0\text{--}7.0$  PD. DAM with fine striae on its base. T2–T4 with punctures separated by  $3.0\text{--}5.0$  PD, sparser on disk of T1. Body surface tessellate between punctures, except terga and sterna substrigulate. **Structure:** Head broader than long,  $1.07\text{--}1.09 : 1$ . Ratio of lower to upper interocular distance,  $0.94\text{--}0.97 : 1$ . Clypeus broader than long,  $1.52\text{--}1.69 : 1$ . Ratio of interantennal to antennocular distance,  $0.49\text{--}0.54 : 1$ . Ratio of posterior interocellar to ocellocular distance,  $1.08\text{--}1.29 : 1$ . Inner hind tibial spur with  $4\text{--}5$  teeth longer than diameter of spur rachis.

**Variation.** Some males have legs and metasoma darker than the holotype, almost black; in these specimens the contrast of the light brown tarsi, tibia I and the apex and base of tibiae II and III is more evident.

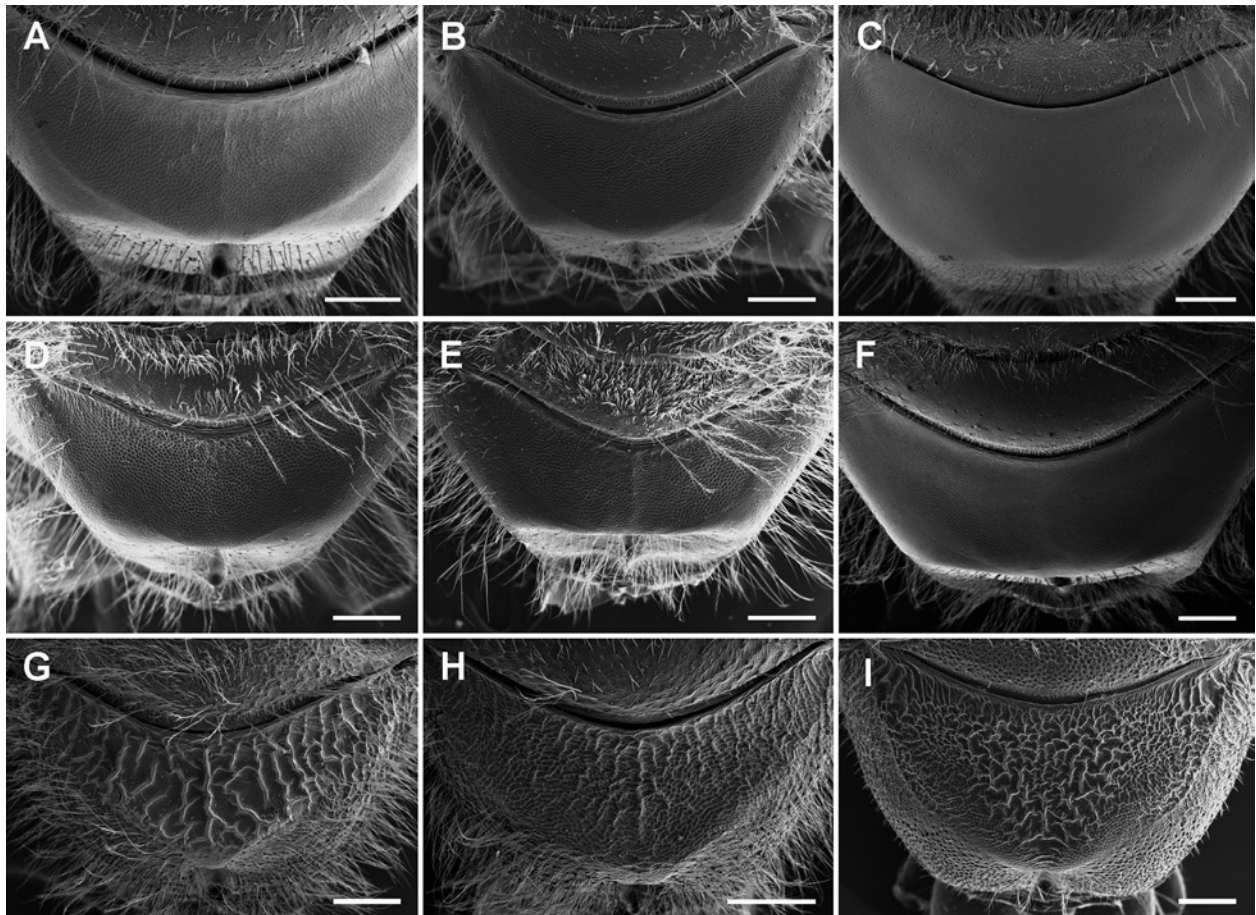
**Derivatio nominis.** This species is named *callaina* because of the vivid bluish-green highlights of the cuticle. The specific name is the nominative feminine singular of the Latin adjective *callainus*, which means ‘bluish-green’.

**Type material.** The male designated as the holotype is housed at MNNC. This specimen is in good condition; T6, S7–S8 and the genital capsule are in a microvial attached to the pin. The holotype has the following labels: ‘Aconcagua | Juncal | 3.2.74’ handwritten; ‘Coll. Sielfeld | MNHN Chile’ printed; ‘*Corynura* | *callaina* sp.n. | HOLOTYPE | González-Vaquero & Roig Alsina 2017’ printed.

**Note.** Five paratypes have been barcoded (GONZÁLEZ-VAQUERO et al. 2016: Barcode Index Number BOLD: AAO3485), and their sequences are publicly available online (project CORYN, <http://www.boldsystems.org>).

**Floral records.** Unknown.

**Distribution** (Fig. 20C). Chile: from Valparaíso to Maule, and a single record for Atacama.



**Fig. 8.** *Corynura* spp.: dorsal area of metapostnotum. A–F: females; G–I: males. A,G: *C. ampliata*. B,H: *C. challhuacoensis* sp.n. C,I: *C. chilensis*. D: *C. condita* sp.n. E: *C. nahuelita* sp.n. F: *C. rubella*. Scale bars = 200  $\mu$ m.

**Material examined.** *Holotype* ♂. CHILE: Valparaíso: Aconcagua: Juncal, 3–II–1974, Coll. Sielfeld (MNNC). *Paratypes*. CHILE: Atacama: 3♀, 15km Hwy C–13, 16–IX–2010, L. Packer (PCYU). Valparaíso: 1♂, Aconcagua: Juncal, 3–II–1974 (MNNC). 2♀ 1♂, Peñuelas, 15–I–1975, M. Cerda (MNNC). 1♂, Valparaíso, 23–XII–1970, W. Sielfeld (MNNC). Colliguay, Las Computas, 4–X–1, L. Packer & G. Fraser: 4♀ (PCYU); 1♀ (MACN). Santiago: 1♀, Caleu, 19–IX–1987, M. Cerda (MNNC). 1♀, Caleu, Til Til, 31–VIII–1986, M. Cerda (MNNC). 1♀, Valparaíso–Santiago: Cuesta La Dormida, 1970–1972, A.R. Moldenke (MNNC). 2♀, Apoquindo, 15–IX–1965, V. Perez (MNNC). 1♂, El Manzano, 10–XII–1964, T. Ramírez (MNNC). 2♀, Farelones, 2–V–2010, L. Packer & G. Fraser (PCYU). 1♂, Peñalolén, X–1953, L.E. Peña (UCVC). 1♂, El Peumo, 23–XI–1967, T. Ramírez (MNNC). O’Higgins: 1♀, Colchagua: La Correana, Río Tinguirico, 16/20–II–1977, L.E. Peña (AMNH). Maule: 1♂, Los Queñes: Río Teno, 7/14–II–1965, L.E. Peña (AMNH). Río Teno, 25–I–1968, L.E. Peña: 2♂ (MNNC); 1♂ (AMNH).

#### 5.7.6. *Corynura challhuacoensis* sp.n.

Figs. 31J, 7E, 8B,H, 14A–D, 10D, 11D, 12D, 20C

*Corynura* sp. 5: GONZÁLEZ-VAQUERO et al. 2014: 190; 2016: 891, 893.

**Differential diagnosis.** The females of this small (5.5–6.0 mm long), dark brown species can be identified by the combination of the inner hind tibial spur, with 5–6

long, slender teeth (Fig. 7E), the glabrous marginal zones of the terga, and the black apical margin of the clypeus. The males can be distinguished from other species by the following combination of characters: dorsal surface of the flagellum yellowish, T2–T3 bearing short, simple hairs, intermixed with longer, erect, plumose hairs, and the *vag* is rounded, bears dense setae, and lacks the mesally directed projection present in most *Corynura*. This species can be confused with *C. spadiciventris*, but the females of *C. challhuacoensis* sp.n. have the apex of the clypeus more weakly tessellate between punctures than its base and the DAM without striae (or with short basal striae), and the males have small, sparser (4–6 PD) punctures on T2.

**Description of male** (holotype, Fig. 14A,B). Body length, 6.5 mm; forewing length, 5.2 mm (paratypes, body length, 6.4–7.7 mm; forewing length, 5.2–5.6 mm). **Colour:** Body black, with bluish highlights on head and mesosoma. Following parts black: labrum, malar area, mandible except apex, scape, pedicel, ventral surface of flagellum. Following parts dark brown: legs, tegula, metasoma. Following parts yellowish light brown: apex of mandible, dorsal surface of flagellum, outer spot on tibia I, base of forewing. Wings hyaline, with dark brown veins and pterostigma, radial vein dark

brown to black. **Pubescence:** Whitish. Head with dense, plumose hairs as long as  $1.7 \times \text{MOD}$  on clypeus, supra-clypeal area, paraocular area and vertex. Lower part of gena with hairs as long as  $2.0 \times \text{MOD}$ . Upper paraocular area, mesoscutum, scutellum and metanotum with dark, short ( $0.2\text{--}0.3 \times \text{MOD}$ ), simple hairs, denser on lower paraocular area. Mesosoma with plumose hairs on mesoscutum and metanotum ( $1.4\text{--}1.7 \times \text{MOD}$ ), longer on pleura (up to  $2.4 \times \text{MOD}$ ). Base of T2–T3 with short ( $0.1\text{--}0.2 \times \text{MOD}$ ), simple hairs, intermixed with a few plumose hairs as long as  $0.8 \times \text{MOD}$ ; hairs longer on T5–T6 (up to  $1.2 \times \text{MOD}$ ); marginal zones glabrous. Sterna with simple hairs, denser on S5–S6, as long as  $0.3 \times \text{MOD}$ . **Sculpture:** Clypeus with punctures separated by 2–3 PD, those on supra-clypeal area separated by 3–4 PD. Lower paraocular area with punctures separated by 2–3 PD. Punctures on disc of mesoscutum separated by 5–6 PD, denser at sides, those on scutellum separated by 3–4 PD. DAM with fine radiating striae, reaching apical margin. Terga with punctures separated by 4–6 PD, sparser towards apex. Body surface tessellate between punctures except: propodeum finely rugose, metasoma substrigulate. **Structure:** Head broader than long, width : length = 1.12 : 1 (paratypes, 1.08–1.15 : 1). Ratio of lower to upper interocular distance, 0.67 : 1 (paratypes, 0.65–0.68 : 1). Clypeus broader than long, 1.50 : 1 (paratypes, 1.35–1.50 : 1). Ratio of interantennal to antennocular distance, 1.65 : 1 (paratypes, 1.50–1.65 : 1). Ratio of posterior interocellar to ocellocular distance, 1.30 : 1 (paratypes, 1.15–1.28 : 1). Ratio of lengths of scape, pedicel, F1 and F2 0.78 : 0.26 : 0.33 : 1 (paratypes, 0.78–0.88 : 0.23–0.26 : 0.27–0.33 : 1). F2–F11 dorsally covered almost exclusively by sensilla placodea. Apical margins of sterna: S1–S4 straight, S5 with small median notch, S6 produced, strongly bent at level of union of gradulus with apical margin, S7 curved, S8 medially produced, usually bearing one or two setae. **Genital capsule** (Fig. 3I,J): Volsella short; inner apical corner of digitus rounded. Inner dorsal margin of gonocoxite forming mesal angle; dorsal margins nearly parallel from mesal angle to base. Dorsal area of gonostylus quadrate in caudal view, more sclerotized than ventral area. Ventral area of gonostylus rounded, membranous, with dense setae. Basal process of gonostylus with few setae.

**Description of female** (Fig. 14C,D). Body length, 5.5–6.0 mm; forewing length, 5.0–5.3 mm. **Colour:** Head and mesosoma black, with bluish or greenish highlights; terga dark brown with weak highlights. Clypeus with purplish or yellowish highlights near base and black apical margin as long as 0.5–0.7 of clypeus; black area extending through inner orbit of eye not reaching level of antennal socket. Following parts black: labrum, malar area, mandible except reddish apex, scape, pedicel, ventral surface of flagellum. Following parts dark brown: dorsal surface of flagellum, legs, tegula, metasoma. Wings hyaline, with dark brown veins and pterostigma, radial vein dark brown to black. **Pubescence:** Light brown. Head with erect, plumose hairs, those on paraoc-

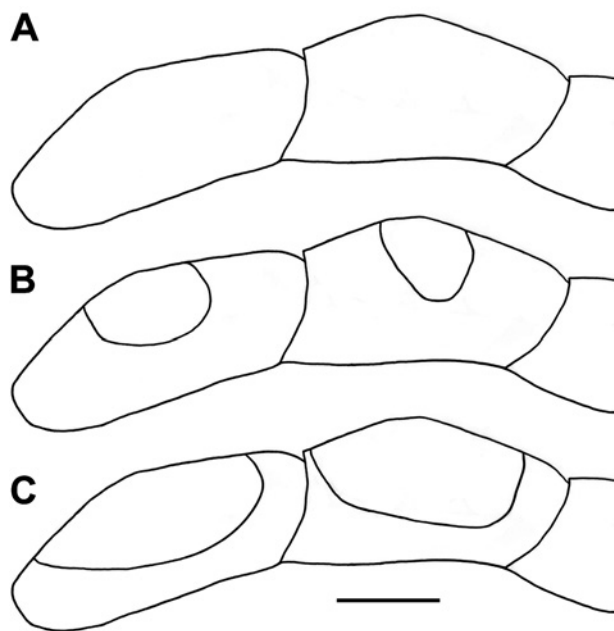
ular area and vertex as long as  $1.2\text{--}2.0 \times \text{MOD}$ . Lower part of gena with hairs as long as  $1.8\text{--}2.6 \times \text{MOD}$ . Upper paraocular area, mesoscutum, and scutellum with short ( $0.2\text{--}0.3 \times \text{MOD}$ ), simple hairs. Mesoscutum with scattered, plumose, long hairs ( $1.4\text{--}1.9 \times \text{MOD}$ ), longer on pleura ( $2.2\text{--}2.6 \times \text{MOD}$ ) and metanotum (up to  $3.0 \times \text{MOD}$ ). Lateral area of propodeum with plumose hairs as long as  $2.6\text{--}3.2 \times \text{MOD}$ . T1 with hairs plumose anteriorly ( $0.9\text{--}1.5 \times \text{MOD}$ ), shorter and sparser on disk. T2–T4 with simple, short ( $0.2 \times \text{MOD}$ ) hairs, intermixed with some plumose longer hairs ( $0.5\text{--}1.4 \times \text{MOD}$ ) directed posteriorly; marginal zones glabrous (Fig. 12D). Sterna with very short, sparse hairs basally, and long, mostly plumose hairs on posterior half, those on S2–S3 with their apices bent caudally. **Sculpture:** Labrum with verrucose, median, basal elevation (Fig. 10D). Clypeus and supra-clypeal area with punctures separated by 3–5 PD. Lower paraocular area with punctures separated by 4–5 PD. Punctures on disc of mesoscutum separated by 6 PD, denser at sides, those on scutellum separated by 2–3 PD, punctures evenly distributed. Metanotum with punctures separated by 2 PD, those on lateral area of propodeum separated by 5–7 PD. DAM without striae (Fig. 8B) or with a few fine striae on its base, not reaching 0.3 of total length of DAM. T2–T4 with punctures separated by 6–7 PD, sparser on disk of T1. Body surface tessellate between punctures, except terga and sterna substrigulate. **Structure:** Head broader than long, 1.19–1.22 : 1. Ratio of lower to upper interocular distance, 0.94–1.00 : 1. Clypeus broader than long, 1.59–1.64 : 1. Ratio of interantennal to antennocular distance, 0.43–0.48 : 1. Ratio of posterior interocellar to ocellocular distance, 0.95–1.03 : 1. Inner hind tibial spur with 5–6 teeth longer than diameter of spur rachis (Fig. 7E).

**Variation.** In females, the black apical margin of the clypeus is more evident in specimens with intense highlights on the head. Some specimens from Neuquén have tibiae and tarsi lighter than specimens from other geographic areas. The outer surface of tibia I is completely yellow in some males, while in others (from the same locality) a light brown spot covers the median  $\frac{1}{4}$  of this area.

**Derivatio nominis.** This species is named *challhuacoensis* after the type locality, Valle del Challhuaco, a beautiful valley in the Nahuel Huapi National Park (Argentina).

**Type material.** The male designated as the holotype is housed at MACN. This specimen lacks the right antenna from the pedicel on, the right leg I, and the right leg II from the trochanter on, which was removed for DNA barcoding (658 bp: BOLD number HALIC154–11; GenBank accession number KU983426). T6, S6–S8 and the genital capsule are in a microvial attached to the pin. The holotype has the following printed labels: ‘ARG. Río Negro, PN Nahuel | Huapi: Valle del Challhuaco | –41.213472 –71.308361 | 27–I–2011 R. González V. | Sobre *Escallonia virgata*’; ‘MACN-En | 8183’; ‘Bar-





**Fig. 9.** *Corynura* spp.: F10–F11 of the male antennae in lateral view. **A:** absence of areas composed of sensilla placodea (e.g. *C. chilensis*). **B:** with small areas composed of sensilla placodea (e.g. *C. chloromelas*). **C:** with large areas composed of sensilla placodea (e.g. *C. ampliata*). Scale bar = 200  $\mu\text{m}$ .

coding of Life | DNA voucher specimen | MACN-En 8183'; '*Corynura | challhuacoensis* sp.n. | HOLOTYPE | González-Vaquero & Roig Alsina 2017'.

**Note.** Besides the holotype nine paratypes have been barcoded (GONZÁLEZ-VAQUERO et al. 2016: Barcode Index Number BOLD:ABW7138), and their sequences are publicly available online (project CORYN, <http://www.boldsystems.org>). This species is very common in Argentina.

**Floral records.** Alstroemeriaceae: *Alstroemeria auria*; Anacardiaceae: *Schinus patagonicus*; Apiaceae: *Daucus pusillus*; Asteraceae: *Baccharis obovata*, *B. rhotinodes*, *Solidago chilensis*, *Taraxacum officinale*; Buddlejaceae: *Buddleja globosa*; Elaeocarpaceae: *Aristotelia chilensis*; Escalloniaceae: *Escallonia virgata*; Fabaceae: *Cytisus scoparius*, *Trifolium repens*; Grossulariaceae: *Ribes magellanicum*; Nothofagaceae: *Nothofagus antarctica*; Plantaginaceae: *Plantago lanceolata*; Proteaceae: *Embothrium coccineum*, *Lomatia hirsuta*; Ranunculaceae: *Anemone multifida*; Rhamnaceae: *Discaria articulata*, *D. chacaye*; Rosaceae: *Rosa rubiginosa*; Verbenaceae: *Diostea juncea*.

**Distribution** (Fig. 20C). Argentina: Neuquén, Río Negro and Chubut. Chile: Araucanía.

**Material examined.** *Holotype* ♂. ARGENTINA: Río Negro: Parque Nacional Nahuel Huapi: Valle del Challhuaco, -41.213472 -71.308361, 27-I-2011, R. González V., sobre *Escallonia virgata*, MACN-En 8183 (MACN). *Paratypes*. ARGENTINA: Neuquén: Villa Pehuenia, 27-I-2012, R. González Vaquero: 7♀ 10♂

(MACN); 1♀, Pan trap (MACN). 1♀, Chapelco, 28-XII-1951, J. Magunacelaya (MLPA). San Martín de los Andes, 23-XI-1972, M. Gentili: 2♀ (MACN), 10♀ (IADIZA). 1♀, Arroyo Pedregoso, 10-XII-2001, D. Medan, N.H. Montaldo, M. Devoto et al. (FAUBA). PN Lanín: 2♀, Lago Huechulafquen, margen N, 15-XII-2010, L. Compagnucci & R. González Vaquero (MACN). 1♀, Lago Queñi, 11-XII-1999, N.H. Montaldo, M. Devoto & G. Gleiser (FAUBA). PN Nahuel Huapi: Isla Victoria: 1♂, I-1943, F. Monrós (MLPA); 1♀, Schajovskoi (MLPA). Río Negro: 1♂, Pampa del Toro (Camino El Bolsón-Bariloche), 5-II-1975, Willink & Claps (IMLA). 3♀, San Carlos de Bariloche, XI-1926, R. & E. Shannon (USNM). PN Nahuel Huapi: 1♂, Cerro Catedral, 28-I-1949, W. Wittmer (MLPA). Valle del Challhuaco, R. González Vaquero: 2♀, 24-I-2011 (MACN); 2♂, 27-I-2011 (MACN); 1♂, 2-II-2011 (MACN). 1♀, Brazo Tronador, Lago Mascaradi, 19-XII-1986, S. Roig (IADIZA). Chubut: 1♂, INTA Trevelin, 25-I-2006, M.E. Hollmann (PCYU). 1♂, Río Futaleufú, 7km E límite con Chile, 31-I-1994, A. Roig Alsina (MACN). PN Los Alerces: Lago Futaleufquen: 1♀, 13/18-XII-1997, C. & M. Vardy Malaise trap (BMNH); 2♂, 3-II-1975, Willink & Claps (IMLA); 9♂, 31-I-1980, Willink, Fidalgo, Dominguez & Claps (IMLA). 1♂, Lago Menéndez, 1-II-1980, Willink, Fidalgo, Dominguez & Claps (IMLA). 1♀, Laguna Larga, c. 5km E Villa Futaleufquen, 16-XII-1997, C. & M. Vardy (BMNH). 1♀, Río Desaguadero, 2km NE Villa Futaleufquen, 18-XII-1997, C. & M. Vardy (BMNH). 1♀, Villa Futaleufquen, 13/18-XII-1997, C. & M. Vardy (BMNH). CHILE: Araucanía: 5♂, Curacautín, 19-II-1975, L. Peña (AMNH). Icalma: 1♀, 11-I-1979, De la Hoz (AMNH); 1♂, II-1973, H. Toro (UCVC). 2♂, Lago Galletué, 2-II-1962, Valencia (MLPA).

#### 5.7.7. *Corynura chilensis* (Spinola)

Figs. 3K,L, 5A,D, 7A, 8C,I, 10E, 12B, 19B

*Halictus chilensis* Spinola, 1851: 201. Lectotype: female, Chile; MRSN; not examined. Designated by MOURE & HURD 1987: 209.

*Corynura flavofasciata* Spinola, 1851: 302. Lectotype: male, Chile; Sichel Collection, MNHN; examined. Designated by MOURE & HURD 1987: 209. Synonymized by HERBST 1907: 130.

*Cacosoma marginatum* Smith, 1879: 41. Holotype: male, Chile; BMNH (No. 17a. 1036); examined through photographs. Synonymized by HERBST 1907: 130.

*Corynura chilensis*: SCHROTTKY 1913: 240; GONZÁLEZ-VAQUERO et al. 2014: 190, 191; GONZÁLEZ-VAQUERO et al. 2016: 891–893, 895.

**Differential diagnosis.** This species can be easily identified by its structure, sculpture and coloration. The dorso-lateral angle of the pronotum is more produced than in any other *Corynura* (arrow on Fig. 5A), and the mesoscutum is strongly tessellate, with punctures separated by 1–2 PD in females (Fig. 5A) and 0.5–1.0 PD in males. In addition, the metanotum has a basal band of short, white, plumose hairs not present in other species. The DAM is convex, with no striae in the females (Fig. 8C) and rugose in the males (Fig. 8I). The marginal zones of T1–T3 are pearly (covering the basal band of white, plumose hairs of the following terga), and the wing venation, tegula, tibiae and tarsi are orange. Females are 7.6–8.7 mm long, and males 8.4–9.8 mm long.

**Description of male genital capsule** (Fig. 3K,L). Volsella short; inner apical corner of digitus mesally produced. Inner dorsal margin of gonocoxite forming mesal angle;

dorsal margins nearly parallel from mesal angle to base. Dorsal area of gonostylus quadrate in caudal view, more sclerotized than ventral area. Ventral area of gonostylus mesally directed, with sparsely setose projection. Basal process of gonostylus with few setae.

**Variation.** This species varies in the coloration of the antenna and the mandible. Some females have the antenna entirely orange from the apical half of the pedicel, while in others only the inner side of the flagellum or the last flagellomere is orange, and the rest dark brown. Sometimes the apical half of the mandible is orange. In the males, the pedicel and the flagellum can be orange or dark brown, and the mandible can be yellow with a red apex, or dark brown. Usually the specimens from Santiago to Maule (Chile) show a colour pattern more orangish, while the dark brown forms are in the south of Chile and Argentina.

**Type material.** SPINOLA (1851) describes the female and the male of *C. chilensis* as species from different families, in the same publication: the former is described as *Halictus chilensis* (Halictidae), while the latter is described as *Corynura flavofasciata*, in the family of wasps Thynnidae. Although the males of several species of *Corynura* may look superficially like wasps because of the petiolate metasoma, Spinola's failure to associate the sexes is strange, since they have many striking characters in common, such as the coloration of the cuticle, the sculpture, and the apical impressed pearly areas of the terga.

The type of *Halictus chilensis* could not be examined, but it is housed in the MRSN (Marinella Garzena pers. comm.). According to MOURE & HURD (1987) a female was labeled by Moure in May 1958 as the 'lectoholotype'. *Corynura chilensis* can be identified by several striking characters, which were mentioned by Spinola.

The lectotype of *Corynura flavofasciata* is in poor condition, it lacks the metasoma after T2 and S1, the eyes and antennae are damaged, probably by dermestids, and the head is glued to the mesosoma with transparent enamel. The right F2–F11 are glued to a label, F9–F11 of the left antenna are missing, the femora of the legs III are also damaged but the remaining legs and the wings are in good condition. Although MOURE & HURD (1987) mention that a specimen was labeled as the 'lectoholotype' by Moure, in March 1958, this specimen has no label with that information. The specimen has the following labels: '*Corynura* | *flavofas-* | *ciata* Sp.' handwritten, 'Chili' handwritten, and 'Museum Paris | Chili | Coll. O. Sichel, 1867' printed.

The holotype of *Cacosoma marginatum* was examined through photographs, and kindly compared to specimens previously identified by us, by Dr. Laurence Packer. Although the specimen has the left side of the head damaged and the metasoma glued to the mesosoma, it is in relatively good condition. This specimen has the following labels: '*Cacosoma* | *marginata* | (Type) Sm.' handwritten, 'Chili' printed, and 'B.M. TYPE | HYM. | 17a. 1036' printed.

**Note.** Specimens of *C. chilensis* from Argentina and Chile have been barcoded (GONZÁLEZ-VAQUERO et al. 2016: Barcode Index Numbers BOLD:AAU2326 and BOLD:ABW7066).

**Floral records.** Alstroemeriaceae: *Alstroemeria auria*; Anacardiaceae: *Schinus patagonicus*; Apiaceae: *Daucus pusillus*; Araucariaceae: *Araucaria araucana*; Asteraceae: *Achillea millefolium*, *Baccharis obovata*, *B. umbelliformis*, *Baccharis* sp., *Matricaria inodora*, *Solidago chilensis*, *Taraxacum officinale*; Buddlejaceae: *Buddleja globosa*; Elaeocarpaceae: *Aristotelia chilensis*; Escalloniaceae: *Escallonia virgata*; Fabaceae: *Medicago lupulina*, *Trifolium repens*; Geraniaceae: *Geranium sessiliflorum*; Grossulariaceae: *Ribes magellanicum*; Proteaceae: *Lomatia hirsuta*; Rhamnaceae: *Discaria articulata*, *D. chacaye*.

**Distribution** (Fig. 19B). Argentina: Neuquén, Río Negro and Chubut. Chile: from Coquimbo to Araucanía (two isolated records, one for Antofagasta and another one for Los Lagos).

#### 5.7.8. *Corynura chloromelas* (Alfken)

Figs. 3M,N, 10F, 19C

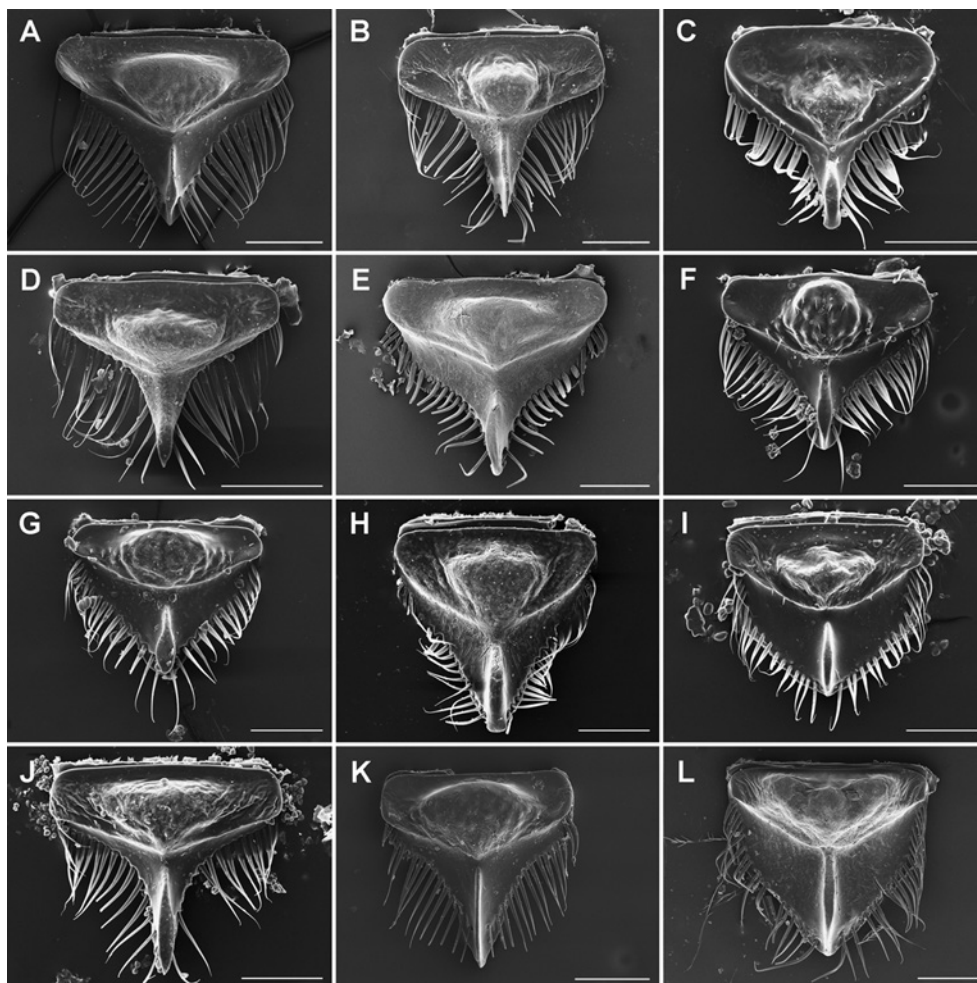
*Halictus* (*Corynura*) *chloromelas* Alfken, 1913: 327. Lectotype: female, Concepción, Chile; ZMB; examined. Designated by GONZÁLEZ-VAQUERO et al. 2017: 98.

*Corynura chloromelas*: ALFKEN 1926: 152.

**Differential diagnosis.** Males of *C. chloromelas* can be easily separated from other *Corynura* by some unique characters: area composed of sensilla placodea restricted to the middle of each flagellomere in F2–F10 (covering approximately one third of its total length), apical margin of S5 with a small median projection bearing a tuft of short, coarse setae, and a characteristic gonostylus (Fig. 3N: *vag*). Females of this dark brown species are similar in size (5.9–6.2 mm long) and colour to *C. moscosensis* and *C. condita* sp.n., but they can be separated from these two species by the smooth to very weakly tessellate sculpture on the disc of the mesoscutum and the apical margin of the DAM, by the presence of both simple and plumose hairs on the propodeum, and the distinct, translucent marginal zones of the terga.

**Description of male genital capsule** (Fig. 3M,N). Volsella short; inner apical corner of digitus mesally produced. Inner dorsal margin of gonocoxite straight, dorsal margins converging towards gonobase. Dorsal area of gonostylus triangular in caudal view, more sclerotized than ventral area. Ventral area of gonostylus mesally directed, with a basal lobe with long setae, and with apical region with tuft of long, plumose setae. Basal process of gonostylus with few setae.

**Variation.** The paralectotype has light brown tarsi, but all other males examined have them dark brown, last tarsomere somewhat lighter.



**Fig. 10.** *Corynura* spp.: labrum of the female. **A:** *C. ampliata*. **B:** *C. bruchiana*. **C:** *C. callaina* sp.n. **D:** *C. challhuacoensis* sp.n. **E:** *C. chilensis*. **F:** *C. chloromelas*. **G:** *C. condita* sp.n. **H:** *C. corinogaster*. **I:** *C. herbsti*. **J:** *C. luisae* sp.n. **K:** *C. nahuelita* sp.n. **L:** *C. rubella*. Scale bars = 200  $\mu$ m.

**Type material.** Described in GONZÁLEZ-VAQUERO et al. (2017).

**Floral records.** Asteraceae: *Baccharis poeppigiana*; Proteaceae: *Gevuina avellana* (ALFKEN 1913).

**Distribution** (Fig. 19C). Chile: from Maule to Los Lagos.

#### 5.7.9. *Corynura condita* sp.n.

Figs. 30P, 8D, 15A–D, 10G, 20B

*Corynura* sp. 3b: GONZÁLEZ-VAQUERO et al. 2016: 891–894, 896.

**Differential diagnosis.** The females of this species can be identified from any *Corynura* by the combination of the entirely dark brown metasoma, the propodeum bearing only plumose hairs, the inner hind tibial spur with 8 or more teeth, which are shorter than diameter of spur rachis, and the marginal zones of T2–T3 with bear short hairs. Females of *C. condita* sp.n. are very similar to those of *C. moscosensis*, but they can be separated by the

smaller size (6.2–7.1 mm body length), the uniformly tessellate clypeus, the mainly plumose hairs of S3, and the shorter striae of the DAM (Fig. 8D). The males can be identified by the following combination of characters: dorsal surface of flagellum yellowish, DAM with basal short striae, metasoma entirely dark brown, and T2–T3 with short, simple hairs, intermixed with longer, erect, plumose hairs.

**Description of male** (holotype, Fig. 15A,B). Body length, 6.2 mm; forewing length, 5.5 mm (paratypes, body length, 6.2–7.1 mm; forewing length, 5.5–6.1 mm). **Colour:** Body black, with bluish or greenish highlights on head and mesosoma. Following parts black: labrum, malar area, mandible except apex, scape, pedicel, ventral surface of flagellum. Following parts dark brown: apex of mandible, legs, tegula, metasoma. Dorsal surface of flagellum yellowish light brown. Wings hyaline, with dark brown veins and pterostigma, radial vein dark brown to black. **Pubescence:** Whitish. Head with dense, plumose hairs as long as  $2.0 \times \text{MOD}$  on clypeus, supraclypeal area, paraocular area and vertex. Lower part of gena with hairs as long as  $1.6\text{--}2.1 \times \text{MOD}$ . Upper paraocular area,

mesoscutum, scutellum and metanotum with dark, short ( $0.2\text{--}0.3 \times \text{MOD}$ ), simple hairs, denser on lower paraocular area. Mesosoma with plumose hairs on mesoscutum and pleura ( $1.2\text{--}1.4 \times \text{MOD}$ ), longer on metanotum (up to  $2.1 \times \text{MOD}$ ). Base of T2–T3 with short ( $0.1\text{--}1.2 \times \text{MOD}$ ), simple hairs, intermixed with a few plumose hairs as long as  $0.8 \times \text{MOD}$ ; hairs longer on T5–T6 (up to  $1.3 \times \text{MOD}$ ); marginal zones with short ( $0.2 \times \text{MOD}$ ), simple hairs. Sterna with simple hairs, denser on S5–S6, as long as  $0.5 \times \text{MOD}$ . **Sculpture:** Clypeus with punctures separated by  $0.5\text{--}1.5 \text{ PD}$ , those on supraclypeal area separated by  $1.0\text{--}1.5 \text{ PD}$ . Lower paraocular area with punctures separated by  $1.0\text{--}1.5 \text{ PD}$ . Punctures on disc of mesoscutum separated by  $3.0\text{--}5.0 \text{ PD}$ , denser at sides, those on scutellum separated by  $2.0\text{--}3.0 \text{ PD}$ . DAM with fine radiating striae, not reaching midlength of DAM. Terga with punctures separated by  $2.0\text{--}3.0 \text{ PD}$ , sparser towards apex. Body surface tessellate between punctures except: propodeum finely rugose, metasoma substrigulate. **Structure:** Head broader than long, width : length =  $1.20 : 1$  (paratypes,  $1.20\text{--}1.23 : 1$ ). Ratio of lower to upper interocular distance,  $0.66 : 1$  (paratypes,  $0.66\text{--}0.74 : 1$ ). Clypeus broader than long,  $1.45 : 1$  (paratypes,  $1.40\text{--}1.66 : 1$ ). Ratio of interantennal to antennocular distance,  $1.64 : 1$  (paratypes,  $1.56\text{--}1.77 : 1$ ). Ratio of posterior interocellar to ocellocular distance,  $1.13 : 1$  (paratypes,  $1.13\text{--}1.23 : 1$ ). Ratio of lengths of scape, pedicel, F1 and F2  $0.91 : 0.24 : 0.28 : 1$  (paratypes,  $0.82\text{--}0.91 : 0.23\text{--}0.25 : 0.27\text{--}0.30 : 1$ ). F2–F11 dorsally covered almost exclusively by sensilla placodea. Apical margins of sterna: S1–S4 straight, S5 with small median notch, S6 produced, strongly bent at level of union of gradulus with apical margin, S7 curved with median process, S8 with median process usually bearing one or two setae. **Genital capsule** (Fig. 3O,P): Volsella short; inner apical corner of digitus mesally produced. Inner dorsal margin of gonocoxite straight, dorsal margins converging towards gonobase. Dorsal area of gonostylus triangular in caudal view, more sclerotized than ventral area. Ventral area of gonostylus mesally directed, with a small projection sparsely setose, and apical region with tuft of short, simple setae. Basal process of gonostylus with few setae.

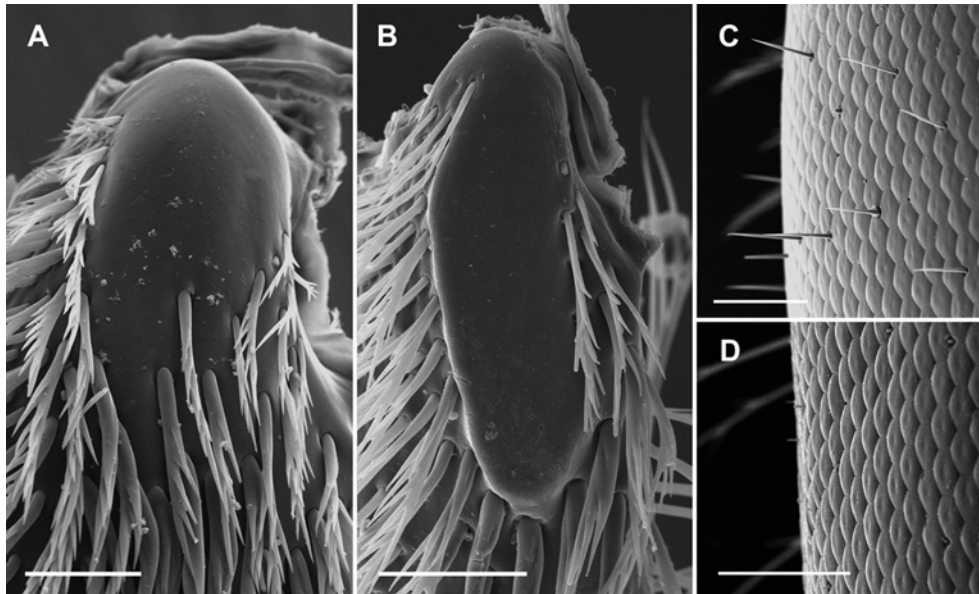
**Description of female** (Fig. 15C,D). Body length,  $6.2\text{--}7.1 \text{ mm}$ ; forewing length,  $5.6\text{--}5.9 \text{ mm}$ . **Colour:** Head and mesosoma black, with weak bluish highlights. Following parts black: labrum, malar area, mandible except reddish apex, scape, pedicel, ventral surface of flagellum, metasoma. Following parts dark brown: dorsal surface of flagellum, legs, tegula. Wings hyaline, with dark brown veins and pterostigma, radial vein dark brown to black. **Pubescence:** Light brown, with brown hairs on paraocular area. Head with erect, plumose hairs, those on paraocular area and vertex as long as  $1.4\text{--}1.7 \times \text{MOD}$ . Lower part of gena with hairs as long as  $1.6\text{--}1.9 \times \text{MOD}$ . Upper paraocular area, mesoscutum, and scutellum with short ( $0.1\text{--}0.2 \times \text{MOD}$ ), simple hairs, which are longer and sparser on pleura and scutellum ( $0.3\text{--}0.4 \times \text{MOD}$ ).

Mesoscutum and metanotum with scattered, plumose, long hairs (up to  $1.7 \times \text{MOD}$ ), longer on pleura (up to  $2.4 \times \text{MOD}$ ). Lateral area of propodeum with plumose hairs as long as  $2.7\text{--}3.1 \times \text{MOD}$ . T1 with hairs plumose anteriorly ( $0.9\text{--}1.1 \times \text{MOD}$ ), shorter and sparser on disk. T2–T4 with simple, short ( $0.2 \times \text{MOD}$ ) hairs, intermixed with some plumose longer hairs ( $0.6\text{--}1.7 \times \text{MOD}$ ) directed posteriorly; marginal zones with simple, short hairs. Sterna with very short, sparse hairs basally, and long, mostly plumose hairs on posterior half, those on S2–S3 with their apices bent caudally. **Sculpture:** Labrum with verrucose, median, basal elevation (Fig. 10G). Clypeus with punctures separated by  $1.0\text{--}2.0 \text{ PD}$ , those on supraclypeal area separated by  $2.0\text{--}3.0 \text{ PD}$ . Lower paraocular area with punctures separated by  $3.0\text{--}4.0 \text{ PD}$ , those on upper paraocular area separated by  $0.5\text{--}1.0 \text{ PD}$ . Punctures on disc of mesoscutum separated by  $4.0\text{--}5.0 \text{ PD}$ , denser at sides, those on scutellum separated by  $2.0\text{--}3.0 \text{ PD}$ , punctures evenly distributed. Hypoepimeral area with punctures separated by  $4.0\text{--}5.0 \text{ PD}$ , those on lateral area of propodeum separated by  $5.0\text{--}7.0 \text{ PD}$ . DAM with fine striae on its base, not reaching 0.3 of total length of DAM (Fig. 8D). T2–T4 with punctures separated by  $2.0\text{--}4.0 \text{ PD}$ , sparser on disk of T1 (punctures separated by  $5.0\text{--}6.0 \text{ PD}$ ). Body surface tessellate between punctures, except terga and sterna substrigulate. **Structure:** Head broader than long,  $1.29\text{--}1.34 : 1$ . Ratio of lower to upper interocular distance,  $0.93\text{--}0.96 : 1$ . Clypeus broader than long,  $1.84\text{--}2.08 : 1$ . Ratio of interantennal to antennocular distance,  $0.53\text{--}0.61 : 1$ . Ratio of posterior interocellar to ocellocular distance,  $0.88\text{--}1.05 : 1$ . Inner hind tibial spur with  $8\text{--}9$  teeth shorter than diameter of spur rachis.

**Variation.** Some males have the apex of the mandible and the outer surface of tibia I yellowish light brown, while in others, as in the holotype, these structures are dark brown. This variation in colour also occurs in *C. cristata*, *C. herbsti* and *C. patagonica*. In some male specimens the sculpture on the frons and upper paraocular areas is finely rugose.

**Derivatio nominis.** This species is named *condita*, nominative feminine singular of the Latin adjective *conditus*, which means ‘hidden, secret’. The material examined of *C. condita* sp.n. was initially ‘hidden’ among specimens of *C. moscosensis*, a species similar in morphology.

**Type material.** The male designated as the holotype is housed at MACN. The right leg II from the trochanter on was removed for DNA barcoding (658 bp: BOLD number HALIC225–12; GenBank accession number KU983425). The genital capsule and S4–S8 are in a microvial attached to the pin. The holotype has the following printed labels: ‘ARG. Neuquén Camino Lagos | Lolog-Curruhue –39.976310° | –71.259336° 7–II–2012 | R. González V.’; ‘Sobre | *Matricaria* | *inodora*’; ‘MACN-En | 9730’; ‘Barcoding of Life | DNA voucher specimen | MACN-En 9730’; ‘*Corynura* | *condita* sp.n. | HOLOTYPE | González-Vaquero & Roig Alsina 2017’.



**Fig. 11.** Females. A,B: basitibial plate; C,D: compound eyes. A,C: *Callistochlora aureoviridis*. B: *Halictillus reticulatus*. D: *Corynura challhuacoensis* sp.n. Scale bars = 50  $\mu$ m.

**Note.** Besides the holotype six paratypes have been barcoded (GONZÁLEZ-VAQUERO et al. 2016: Barcode Index Number BOLD:AAV9113), and their sequences are publicly available online (project CORYN, <http://www.boldsystems.org>).

**Floral records.** Asteraceae: *Baccharis rhetinodes*, *Hypochaeris radicata*; Boraginaceae: *Phacelia secunda*; Caryophyllaceae: *Cerastium* sp.; Escalloniaceae: *Escallonia virgata*; Nothofagaceae: *Nothofagus* sp.; Plantaginaceae: *Plantago lanceolata*; Proteaceae: *Embothrium coccineum*; Rhamnaceae: *Discaria chacaye*; Rosaceae: *Rosa rubiginosa*.

**Distribution** (Fig. 20B). Argentina: Neuquén and Río Negro. Chile: Bío-Bío and Araucanía.

**Material examined.** *Holotype* ♂. ARGENTINA: Neuquén: Camino Lagos Lolog-Curruhue,  $-39.976310^{\circ}$   $-71.259336^{\circ}$ , 7-II-2012, R. González V., sobre *Matricaria inodora*, MACN-En 9730 (MACN). *Paratypes*. ARGENTINA: Neuquén: 1♀, Villa Pehuenia, 27-I-2012, R. González Vaquero (MACN). Cabecera SE Lago Tromen: 2♀, 12-XII-2003, D. Medan, M. Devoto, J.P. Torretta et al. (FAUBA); 10♀, 9-XII-1998, D. Medan & A. Basilio (FAUBA); 1♀, 13-XII-1998, D. Medan & A. Basilio (FAUBA); 2♀, 14-XII-1998, G.G. Roitman N.H. Montaldo & M. Devoto (MACN); 7♀, 10-XII-1998, G.G. Roitman N.H. Montaldo & M. Devoto (MACN). San Martín de los Andes: 10♀, 23-XI-1972, M. Gentili (IADIZA); 1♀, 8-I-1970, M. Gentili (IADIZA); 4♀, XII-1990 (MACN); 3♀, 18-XI-1985, M. & P. Gentili (MACN); 1♀, 30-XI-1985, M. & P. Gentili (MACN); 1♀, 16-XI-1985, M. & P. Gentili (MACN); 1♀, 23-XI-1972, M. Gentili (MACN); 1♀, 5-XII-1980, M. Gentili (MACN); 1♀, I-1941, Schajovskoi (MLPA). 3♂, Lago Meliquina, 20-II-1980, M. Gentili (IADIZA). 3♀, Arroyo Pedregoso, 10-XII-2001, D. Medan, N.H. Montaldo, M. Devoto et al. (FAUBA). 1♀, Confluencia Trafal, 13-XII-2001, D. Medan, N.H. Montaldo, M. Devoto et al. (FAUBA). 2♀, Paso Coihue, 5-I-1964, A.J. Giai (SEMC).

Trolope: 1♂, 26-II-1964 (MACN); 1♂, 25-II-1964, Schajovskoi (MLPA). 6♂, Paimún, 7-II-1953, Schajovskoi (MLPA). 3♀, Puerto Canoa, 17-XII-1997, D. Medan & M. Devoto (FAUBA). 2♀, 2km S San Martín de los Andes, Quitrahue, 17-XI-1997, C. & M. Vardy (BMNH). 20♀, 8km N San Martín de los Andes, 16/22-XI-1997, C. & M. Vardy Malaise trap (BMNH). 4♀, Chapelco, 28-XII-1951, Schajovskoi (MLPA). PN Lanín: 1♀, Camino a Lago Curruhué Grande, 16-XII-2010, L. Compagnucci & R. González Vaquero (MACN). 3♂, Camino Lagos Lolog-Curruhué, 7-II-2012, R. González Vaquero (MACN). 13♂, Lago Curruhué, III-1952, Schajovskoi (MLPA). 14♀, Lago Curruhué Chico, 16-XII-2010, L. Compagnucci & R. González Vaquero (MACN). 5♂, Lago Curruhué Grande, III-1952, Schajovskoi (MLPA). 1♀, Lago Huechulafquen, margen N, 15-XII-2010, L. Compagnucci & R. González Vaquero (MACN). Lago Tromen: 3♀, 13-I-2003, G. Debandi (IADIZA); 3♂, 3-III-1954, Schajovskoi (MLPA). 2♀, Lago Huevo, XI-1949, S.I. Bridarolli (MLPA). 1♀, Lago Queñi, 11-XII-1999, D. Medan & A. Basilio (FAUBA). Pucará: 1♀, X-1952 (MLPA); 1♀ 4♂ (MLPA); 9♂, II-1953, J. Foerster (SEMC). PN Nahuel Huapi: 14♀, Lago Falkner, 2-XII-1985, A. Roig Alsina (MACN). 1♂, Isla Victoria, I-1943, F. Monrós (MLPA). 1♀, Puerto Arrayán, 20-XII-2010, L. Compagnucci & R. González Vaquero (MACN). 1♀, Puerto Arrayanes, Lago Trafal, 31-I-1968, J. & L. Stange (IMLA). Villa Trafal: 7♀, 9/11-XII-2001, D. Medan, N.H. Montaldo, M. Devoto et al. (FAUBA); 3♀, 17-XII-2002, M. Devoto & J.P. Torretta (FAUBA). Río Negro: PN Nahuel Huapi: 4♂, Valle del Challohuaco, 24-I-2011, R. González Vaquero (MACN). CHILE: Bío-Bío: 3♂, Parque Nacional Laguna de Laja (SEMC). Chillán: Las Trancas, SE Recinto, L.E. Peña: 1♀ 2♂, I/II-1987 (AMNH); 10♀, 13/17-XI-1983 (AMNH). 1♀, Las Trancas (PCYU). 5♀, Puente Marchant, 15-XII-1989, J.E. Barriga (MACN). 1♀ 1♂, Chillán: Las Cabras, S of Chillán Volcano, 6/31-I-1963, L.E. Peña (AMNH). Araucanía: 17♂, Curacautín, Río Blanco, 19-II-1975, L.E. Peña (AMNH). Lago Icalma: 82♀, 15-I-1962, L.E. Peña (AMNH); 2♀, M. Barrera (MLPA). 1♀ 1♂, Lonquimay: Las Raíces, 13/20-II-1980, L.E. Peña (AMNH). 1♂, Cordillera de Las Raíces, XII-1976, L. Peña (AMNH). 4♂, Río Mallico, 15-III-1954 (MLPA). 1♂, Victoria (Río Blanco), 15-I-1945, L.E. Peña (SEMC).

5.7.10. *Corynura corinogaster* (Spinola)

Figs. 4A,B, 6B, 7C, 10H, 19B

*Halictus corinogaster* Spinola, 1851: 206. Holotype: male, Chile; lost?*Cacosoma abdominale* Smith, 1879: 40. Holotype: male, Chile; BMNH (No. 17a. 1033); examined through photographs. Synonymized by VACHAL 1904: 144.*Halictus corynogaster* var. *corralensis* Friese, 1916: 553. Syntypes, lost: males, Corral, Los Ríos, and Osorno, Los Lagos, Chile. Synonymized by MOURE & HURD 1987: 210.*Rhopalictus corinogaster chiloeensis* Cockerell, 1918a: 344. Holotype: female, Chiloé, Chile; AMNH; examined; **new synonymy**.*Halictus (Corynura) corynogaster* var. *valparadisaea* Herbst, 1922: 187. Syntypes, lost: female, male, Valparaíso, Chile. Synonymized by MOURE & HURD 1987: 210.*Corynura corinogaster*: DALLA TORRE 1896: 93, as *Corynura corynogaster (sic)*; GONZÁLEZ-VAQUERO et al. 2014: 189–191; GONZÁLEZ-VAQUERO et al. 2016: 891, 893, 895.

**Differential diagnosis.** This species can be separated from all other *Corynura* by the following combination of characters: intense greenish highlights on head and mesosoma (Fig. 6B), coarse punctures of the mesoscutum (separated by 0.5–1.0 PD in males, 1.0–2.0 PD in females), yellowish, long and plumose hairs on the sides of the mesoscutum, and smooth clypeus, weakly tessellate between punctures only on its base, large size (8.4–9.8 mm long). The metasoma can be entirely brown, brown with the apical areas of the terga light brown, or entirely reddish light brown, both in males and females. The paracocular areas of the male have dense, plumose hairs bordering the inner orbits. Males are also distinguished by the short ocello-ocular distance, which is  $0.6 \times$  the posterior interocellar distance.

**Description of male genital capsule** (Fig. 4A,B). Volsella short; inner apical corner of digitus mesally produced. Inner dorsal margin of gonocoxite forming mesal angle; dorsal margins nearly parallel from mesal angle to base. Dorsal area of gonostylus quadrate in caudal view, more sclerotized than ventral area. Ventral area of gonostylus mesally directed, with sparsely setose projection. Basal process of gonostylus with few setae.

**Variation.** This species varies considerably regarding the coloration of legs, antenna and metasoma. There are specimens with the metasoma entirely reddish light brown, others with the base of the terga dark brown, and some with the whole metasoma reddish dark brown. The apex of femora, tibiae, tarsi and antenna vary from yellowish light brown to dark brown. None of the specimens examined differ in structure, sculpture or size, and they can be considered as a single species. According to HERBST (1922), the variety of the original description of Spinola is restricted to the Andes, while his variety *valparadisaea* (brown legs and ‘rings’ of yellowish/dark brown colour on the metasoma) inhabits the coast of the Pacific. While only light brown specimens inhabit Argentina, all the colour gradation is present in Chile,

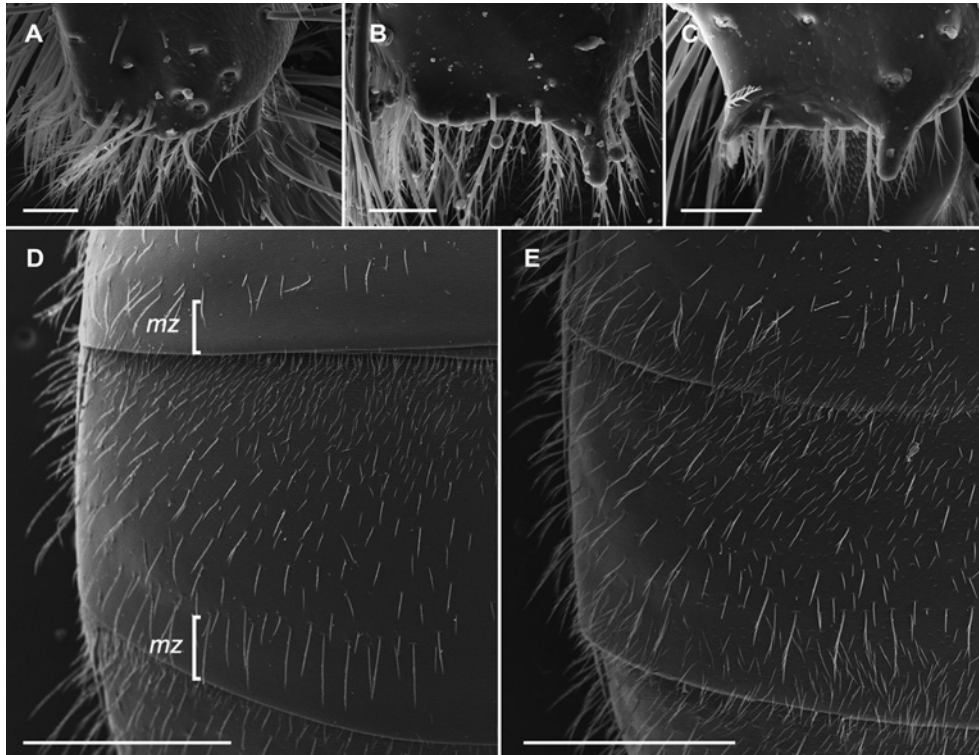
following no geographic pattern in particular. This difference in colour has been observed even among specimens collected at the same place and time.

**Type material.** According to MOURE & HURD (1987: 210) the holotype of *Halictus corinogaster* is lost, although there is a male at MNHN that may be this specimen, since it has labels and typography very similar to those of the types of *C. (Callistochlora) chloris*, a species also described by Spinola. VACHAL (1904: 144) studied this same specimen and included it in his key. The specimen has eyes, antennae, gena and lateral ocelli damaged probably by dermestids, it lacks the right antenna from F5 on, and the mesoscutum was depressed by the pin. The specimen agrees with SPINOLA’s (1851) description except by the antennae, which are brown instead of black, with the inner side of the flagellum light brown. The femora are brown, with their apex, tibiae and tarsi light brown, the metasoma is reddish light brown with the disc of T1, T5–T6 slightly darker, wing venation brown and stigma light brown. The specimen has the following labels: ‘*H. corynog | aster | Spin.*’ handwritten; ‘*coryno- | gaster | Sp. 8*’ handwritten; ‘Chili 63’ handwritten; ‘Museum Paris | Chili | Coll. O. Sichel, 1867’ printed. SPINOLA (1851) numbered the species of *Halictus* described in his work, and N°8 is *H. corinogaster*. Some specimens of the type series of *H. chloris* also have a label ‘Chili 63’. Since both species descriptions were before 1863, ‘63’ may have been a batch number. In the original description the name of the species was written with ‘i’, although in the labels of this specimen as in many publications it appears written with ‘y’, probably due to the mistake made by SICHEL (1867) mentioning *Corynogaster* instead of *Corynura* to refer to the genus. Since the status of this specimen is unclear and the species can be easily identified from its original description, we decided not to designate a lectotype.

The holotype of *Cacosoma abdominale* was examined through photographs, and kindly compared to specimens previously identified by us, by Dr. Laurence Packer. The specimen lacks the left antenna, from the femur of the left leg II on, and the metasoma is glued to the mesosoma. This specimen has the metasoma reddish light brown, with some areas darker on T3–T5. It has the following labels: ‘*Cacosoma | abdominalis | (Type) Sm.*’ handwritten; ‘Chili’ printed; ‘B.M. TYPE | HYM. | 17a. 1033’ printed.

Two colour varieties have been described, *corralensis* Friese and *valparadisaea* Herbst. The specimens used to describe these varieties are not housed at ZMB nor MNHN. Due to the broad variation in colour pattern of the species, these varieties are considered synonyms.

The holotype of *Rhopalictus corinogaster chiloeensis* is in good condition; it has a reddish dark metasoma with the base of T1 brown (not black as stated in the description), and the tegula, legs and antenna are reddish dark brown. The holotype does not have any morphological differences from the rest of the material examined, and falls in the colour range of the species. The holotype has



**Fig. 12.** *Corynura* spp. A–C: Metatibial spine of the female; D,E: T2–T3 of the female. A: *C. ampliata*. B: *C. chilensis*. C: *H. reticulatus*. D: *C. challhuacoensis* sp.n. E: *C. moscosensis*. Abbreviation: *mz*, marginal zone of tergum. Scale bars = 50  $\mu\text{m}$  (A–C), 0.5 mm (D,E).

the following labels: ‘*Halictus | corynogaster | Spin.*’ handwritten; ‘subsp. | *chiloeensis | Ckll TYPE*’ handwritten; ‘Chiloé | XII.94’ printed; ‘Ace. 34970’ handwritten.

**Note.** Three specimens of *C. corinogaster* have been bar-coded (GONZÁLEZ-VAQUERO et al. 2016: Barcode Index Number BOLD:AAN5034).

**Floral records.** Rhamnaceae: *Discaria chacaye*, *Discaria* sp.; Rosaceae: *Rubus idaeus*, *Schinus latifolius*, *Azara celastrina* (HERBST 1922).

**Distribution** (Fig. 19B). Argentina: Neuquén, Río Negro and Chubut. Chile: from Coquimbo to Los Lagos.

#### 5.7.11. *Corynura cristata* (Smith)

Figs. 4C,D, 6E, 19C

*Halictus cristatus* Smith, 1853: 66. Holotype: female, South America; OUMNH; examined through photographs.

*Halictus humeralis* Sichel, 1867: 145. Holotype, lost: female, Chile. Synonymized by HERBST 1922: 185–186.

*Halictus excellens* Friese, 1916: 549, 552. Type, lost: female, Concepción, Chile. Synonymized by HERBST 1922: 185–186.

*Corynura cristata*: ALFKEN 1926: 152.

**Differential diagnosis.** This species can be easily separated from other *Corynura* by the following combination of characters, which are common to males and females: patches of yellowish to white plumose hairs on each side of the base of T3–T4, which are covered by the trans-

lucent marginal zones of the preceding terga (Fig. 6E), pronotal lobe and antero-lateral angle of the mesoscutum also have abundant yellow hairs (denser and more conspicuous than those of *C. corinogaster*), the mesoscutum and the terga have coarse punctures, and smaller punctures intermixed, the coarse punctures are very striking on T1–T4, especially in the males. This species only inhabits regions of Central Chile. Females are 7.0–8.4 mm long, and males 7.9–8.3 mm long.

**Description of male genital capsule** (Fig. 4C,D). Volsella short; inner apical corner of digitus mesally produced. Inner dorsal margin of gonocoxite forming mesal angle; dorsal margins nearly parallel from mesal angle to base. Dorsal area of gonostylus quadrate in caudal view, more sclerotized than ventral area. Ventral area of gonostylus mesally directed, with sparsely setose projection. Basal process of gonostylus with few setae.

**Type material.** The holotype of *Halictus cristatus* was examined through photographs kindly sent by Dr. James E. Hogan (OUMNH). The specimen is in good condition, although it lacks both antennae from F2 on. It has the following labels: an illegible handwritten label; ‘*cristatus | S. Am. Sm.*’ handwritten; ‘*Halictus cristatus | Smith, 1853 | SYNTYPE* det. J.E. Hogan | Ex W.W.Saunders Colln. | OX.UNI.MUS.NAT. | HIST. (OUMNH)’ printed. The holotype of *Halictus humeralis* is not in the Sichel Collection of MNHN. The type material of *Halictus excellens* is supposed to be lost as well, since it is not in ZMB, where many of the types of Friese are housed, nor

in AMNH. Regarding the patches of plumose hairs on the metasoma, the description of *H. humeralis* merely mentions that the species has four yellow patches on the metasoma. Nor was this character properly described in the descriptions of *H. cristatus* and *H. excellens*, where it is said that the patches are on the segments 2 and 3. Females have conspicuous lateral patches of yellow and whitish hairs in the base of T3–T4; these patches are usually covered by the translucent apical margin of the preceding terga (Fig. 6E), which may have led to a misinterpretation of their location. These synonymies can be considered correct as the descriptions of *H. humeralis* and *H. excellens* agree with *C. cristata* in further characters.

**Floral records.** Rhamnaceae: *Retanilla trinervia*, *Trevoa quinquenervia*.

**Distribution** (Fig. 19C). Chile: from Coquimbo to Araucanía.

#### 5.7.12. *Corynura herbsti* (Alfken)

Figs. 4E,F, 6F, 10I, 19C

*Halictus* (*Corynura*) *herbsti* Alfken, 1913: 328. Lectotype: male, Concepción, Chile; ZMB; examined; **present designation**.

*Rhopalictus melanocladus* Cockerell, 1918a: 345. Holotype: male, Chile; USNM (No. 23174); examined; **new synonymy**.

*Rhopalictus chloronotus* Cockerell, 1918b: 181. Holotype: female, Chile; USNM (No. 23206); examined; **new synonymy**.

*Corynura herbsti*: ALFKEN 1926: 152; GONZÁLEZ-VAQUERO et al. 2016: 891–894.

**Differential diagnosis.** The females of *C. cristata* can be identified by a character present only in this species: the basal lateral patches of whitish, dense, plumose hairs on T2–T4 (Fig. 6F), not covered by the preceding terga. *Corynura cristata* also has similar patches but they are larger and those of T3–T4 are covered by the preceding terga (Fig. 6E); *C. herbsti* can be further separated from *C. cristata* by the whitish, not yellowish, pilosity on the pronotal lobe and the antero-lateral angle of the mesoscutum, and by the smaller punctures on T1–T4 (Fig. 6E,F). Males are distinguished from other species by the sculpture of the mesoscutum, which has coarse punctures separated by at most 0.5 PD, and by the strongly substrigulate T1, which has punctures separated by 1–2 PD. Females have an entirely dark brown metasoma, but males with yellowish areas on the base of some terga are commonly found. This species only inhabits regions of Central Chile. Females are 5.9–8.0 mm long, and males 7.4–8.7 mm long.

**Description of male genital capsule** (Fig. 4E,F). Volsella short; inner apical corner of digitus mesally produced. Inner dorsal margin of gonocoxite forming mesal angle; dorsal margins nearly parallel from mesal angle to base. Dorsal area of gonostylus quadrate in caudal view, more sclerotized than ventral area. Ventral area of gonostylus

mesally directed, with sparsely setose projection. Basal process of gonostylus with few setae.

**Variation.** Males vary greatly regarding metasoma coloration. Those which have a dark brown metasoma also have the mandible and tibiae of that colour, and only the tarsi, the marginal zones of the terga and T7 are yellowish brown; the types of *H. herbsti* and *R. melanocladus* have this pattern of coloration. Some specimens have the following parts yellowish light brown: a spot in the middle of the mandible, apex of femora, apex and base of tibiae, tarsi, tegula, wing venation, discs and marginal zones of the terga, and a great part of the sterna. The only author who reports about colour variation is HERBST (1922: 186), who mentions some males with a yellow reddish spot in the middle of the terga. The variation in colour does not follow any particular geographic pattern.

**Type material.** A male and a female syntypes of *Halictus* (*Corynura*) *herbsti* have been studied, both in excellent condition; the male has faded wings, the female has the hairs of the head matted, and it lacks both antennae from F2 on. Both specimens agree with the detailed description of ALFKEN (1913). The male has the following labels: ‘*Corynura* ♂ | *herbsti* | Type Alfken. | Alfken det.’ handwritten; ‘Chile | Concep. | 9.1903 | P. Herbst’ printed; ‘5 | 30’ printed; ‘Typus’ printed, red; ‘Zool. Mus. | Berlin’ printed. The female has the same labels as the male, except ♀ instead of ♂ in the identification label, ‘21.9.1904’ instead of ‘9.1903’ in the locality label, and it lacks the label ‘5 | 30’. The male is designated here as the lectotype.

The holotypes of *Rhopalictus melanocladus* and *Rhopalictus chloronotus* agree with the descriptions of Cockerell except that the mesosoma of *R. chloronotus* is brown instead of dark green. The holotype of *R. melanocladus* only lacks the left antenna from F3 on, while the holotype of *R. chloronotus* lacks the right leg I, the last tarsomere of the left leg III, the whole left antenna and the pedicel and flagellum of the right antenna. The holotype of *R. chloronotus* has the following labels: ‘*Rhopalictus* | *chloronotus* Ckll | TYPE’ handwritten, white with blue frame; ‘Chile | ECreed’ printed; a label that reads what seems to be ‘Chacayesx’ handwritten; ‘Type No. | 23206 | U.S.N.M.’ printed, orange; ‘USNM ENT | 00536823’ printed, yellow, with barcode. The holotype of *R. melanocladus* has the same labels except ‘*melanocladus*’ instead of ‘*chloronotus*’ in the identification label, ‘23174’ instead of ‘23206’ in the type identification label, ‘00536824’ instead of ‘00536823’ in the barcode label, and it has no ‘Chacayesx’ label. Probably Cockerell overlooked that both specimens belong to the same species due to the strong sexual dimorphism of this species. MOURE & HURD (1987: 212) synonymized *R. melanocladus* and *R. chloronotus*, but they kept *C. herbsti* as a different species in their catalogue.

**Note.** Specimens of this species have been barcoded (GONZÁLEZ-VAQUERO et al. 2016: Barcode Index Number BOLD:AAJ5542).



**Floral records.** Rhamnaceae: *Retanilla trinervia*, *Trevoa quinquenervia*.

**Distribution** (Fig. 19C). Chile: from Atacama to Bío-Bío.

### 5.7.13. *Corynura lepida* Alfken

Figs. 4G,H, 20A

*Halictus spinolae* Friese, 1916: 551, 562. Lectotype: female, Concepción, Chile; ZMB; examined; **present designation**. Synonymized by ALFKEN 1932: 18. Homonym of *Halictus spinolae* Reed, 1892.

*Corynura lepida* Alfken, 1926: 157. Lectotype: female, Concepción, Chile; ZMB; examined; **present designation**. GONZÁLEZ-VAQUERO et al. 2016: 891, 893.

*Corynura spadiciventris*: ALFKEN 1926: 159, 163. Male, not the female, identification error.

**Differential diagnosis.** This species stands out because of its small size (Females 4.6–5.9 mm long; males 5.6–6.1 mm long). It has bluish or greenish highlights on head and mesosoma, and the metasoma is brown. Females have fine, radiating short striae on the DAM, with some scattered striae usually transversely oriented in the mid area; this character is unique among *Corynura*. Males can be identified from other species by the DAM, which is longer than the scutellum in dorsal view, weakly tessellate, and has short radiating striae. Males are similar to those of *C. atrovirens*, from which they differ by having the clypeus weakly tessellate between punctures, and T2–T3 with short, simple hairs, and a few intermixed longer, simple hairs.

**Description of male genital capsule** (Fig. 4G,H). Volsella short; inner apical corner of digitus rounded. Inner dorsal margin of gonocoxite forming mesal angle; dorsal margins nearly parallel from mesal angle to base. Dorsal area of gonostylus reduced. Ventral area of gonostylus mesally directed, with a small projection sparsely setose. Basal process of gonostylus absent.

**Variation.** Females vary regarding the sculpture of the DAM. Usually they have some scattered striae, transversely oriented in the mid area, and some very fine radiating striae, on the sides; the latest is the case of the types of *C. lepida* and *H. spinolae*. In some specimens the striae are stronger, and they are all radially oriented (specimens from El Radal and Los Queñes, Maule region).

**Type material.** A syntype of *Halictus spinolae* from ZMB was examined; we designate this specimen as the lectotype. This specimen agrees with the original description and belongs to the same species as the lectotype of *C. lepida*. It lacks some tarsomeres, has the metasoma glued to the locality label and a drop of glue in the propodeum. The specimen has the following labels: ‘*Halictus spinolae* ♀ 1915 Friese det.’ handwritten; ‘Chile | Con-

cepcion | 10.1903 | Herbst’ printed; ‘Typus’ printed, red; ‘18’ printed; ‘Zool. Mus. | Berlin’ printed. We studied an additional female from the type series housed at AMNH (No. 25423). FRIESE (1916a) mentions 11 females, and according to MOURE (2007) more syntypes should be housed at USNM, yet these specimens could not be located (Brian Harris pers. comm.).

We examined one of the two female syntypes of *C. lepida*, which is in excellent condition. This specimen is designated here as the lectotype. It has blue-purplish highlights on the mesosoma, which is not green as described by Alfken, and the apical margin of the DAM has a small keel, although both characters vary in the material examined. The specimen has the following labels: ‘*Corynura* ♀ | *lepida* | Type Alfk. | Alfken det.’ handwritten; ‘Chile | Concep. | 21.10.1904 | P. Herbst’ printed; ‘Typus’ printed, red; ‘14 | 27’ printed; ‘Zool. Mus. | Berlin’ printed. Although ALFKEN (1926) studied a male of *C. lepida* from the same locality of the female, he made the mistake of associating this male with the female of *C. spadiciventris*, another species that he described in the same publication.

**Note.** Three females of *C. lepida* have been barcoded (GONZÁLEZ-VAQUERO et al. 2016: Barcode Index Number BOLD:AAO3484).

**Floral records.** Rhamnaceae: *Colletia spinosa*.

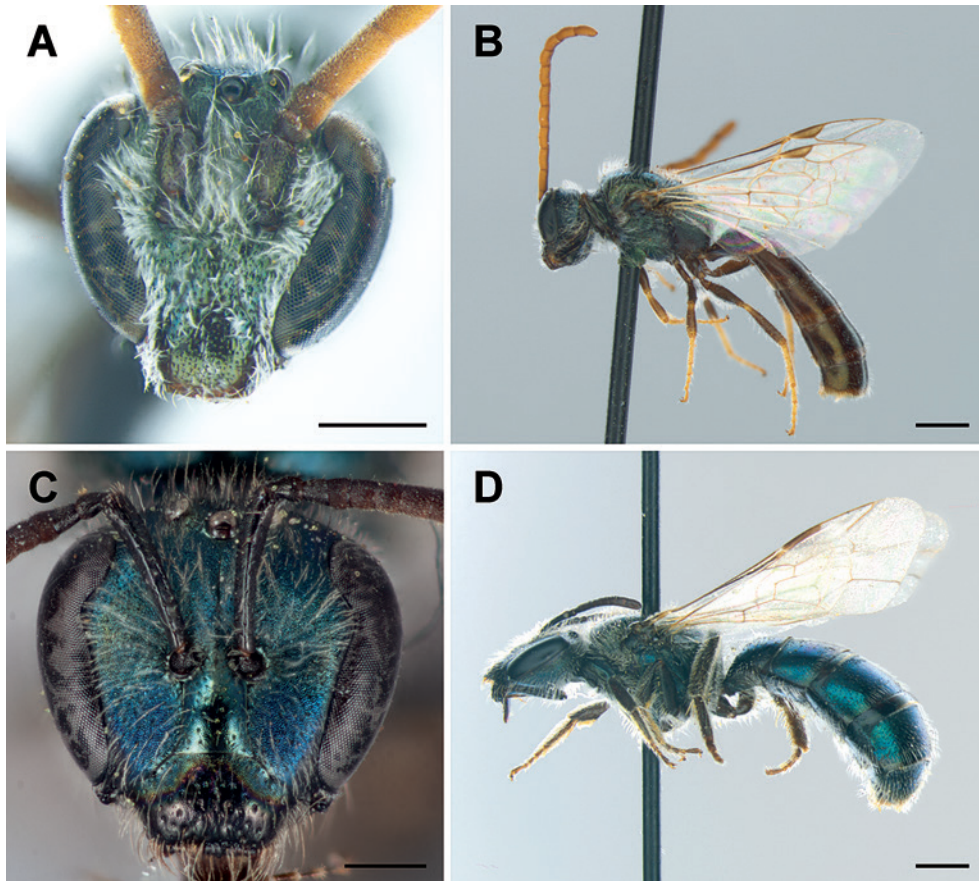
**Distribution** (Fig. 20A). Chile: from Coquimbo to Araucanía, and a record for Los Lagos.

### 5.7.14. *Corynura luisae* sp.n.

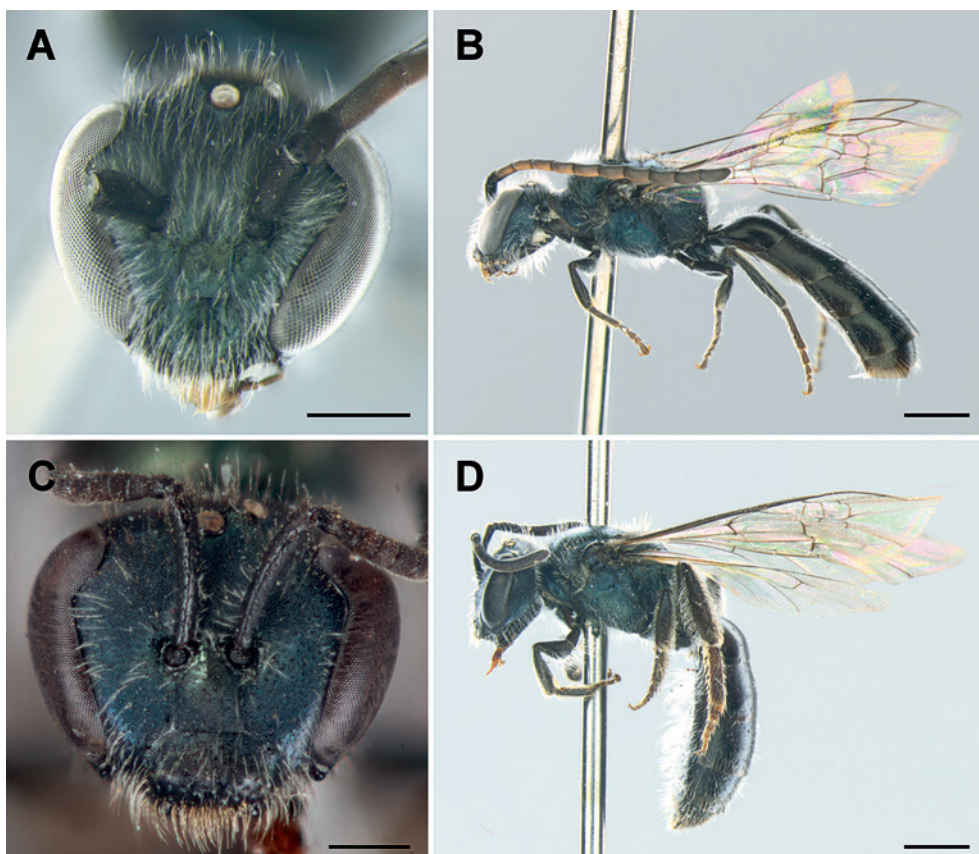
Figs. 16A,B, 10J, 20C

**Differential diagnosis.** This species can be identified by the following combination of characters: metasoma mostly reddish, inner hind tibial spur with many teeth, equal in length to diameter of spur rachis, DAM with short, basal striae and apical margin angulate (not carinate), clypeus and supraclypeal area tessellate between punctures, and scutellum with long hairs (as long as 3.5 × MOD). This species superficially resembles *C. bruchiana*, *C. ampliata* and *C. patagonica* but it can be separated from them by the characters previously mentioned. The male of this species is unknown.

**Description of female** (holotype, Fig. 16A,B). Body length, 8.2 mm; forewing length, 7.3 mm (paratypes, body length, 7.6–8.2 mm; forewing length, 6.9–7.3 mm). **Colour:** Head and mesosoma black, with bluish and purplish highlights on head, pleura and metapostnotum; metasoma reddish except base of T1, and T4–T5 dark brown. Clypeus with black apical margin as long as 0.3 of clypeus; black area extending through inner orbit of eye not reaching level of antennal socket. Following parts black: labrum, malar area, mandible except reddish apex. Following parts dark brown: antenna, legs,



**Fig. 13.** *Corynura callaina* sp.n. A,B: male, holotype; C,D: female. A,C: head. B,D: habitus. Scale bars = 0.5 mm (A,C), 1 mm (B,D).



**Fig. 14.** *Corynura challhuacoensis* sp.n. A,B: male, holotype; C,D: female. A,C: head. B,D: habitus. Scale bars = 0.5 mm (A,C), 1 mm (B,D).

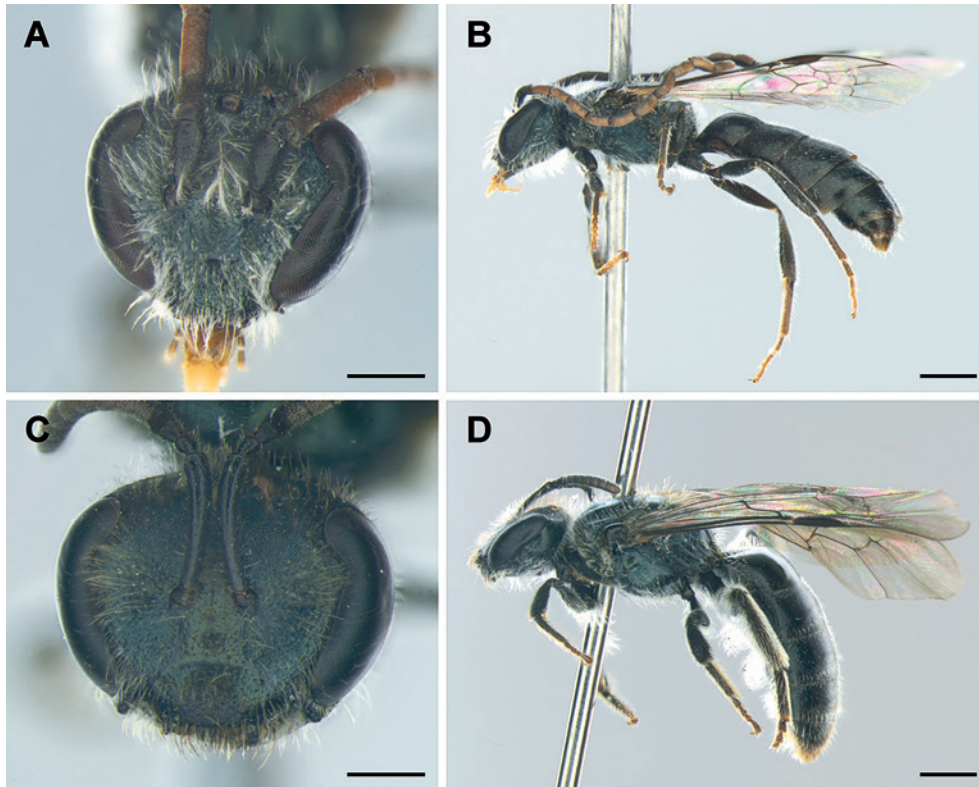


Fig. 15. *Corynura condita* sp.n. A,B: male, holotype; C,D: female. A,C: head. B,D: habitus. Scale bars = 0.5 mm (A,C), 1 mm (B,D).

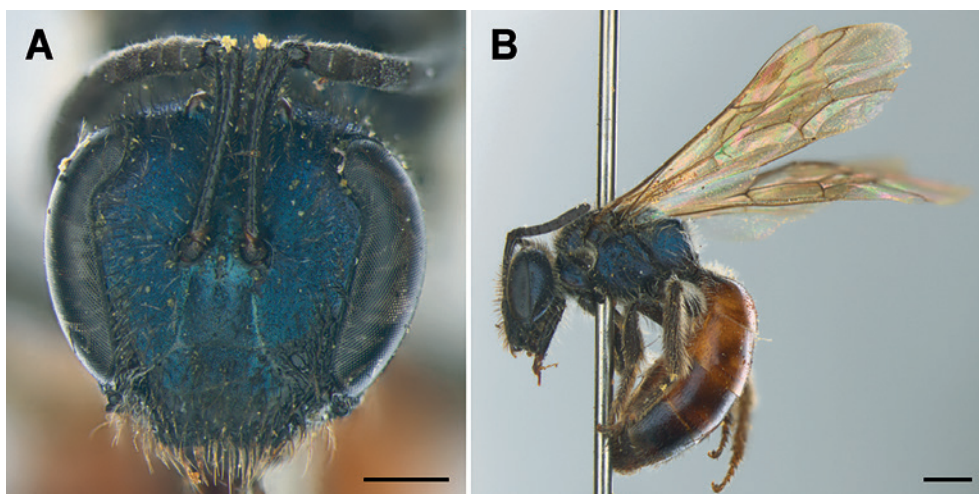


Fig. 16. *Corynura luisae* sp.n., female. A: head. B: habitus. Scale bars = 0.5 mm (A), 1 mm (B).

tegula. Wings hyaline, with dark brown veins and pterostigma, radial vein black. **Pubescence:** Light brown, with some dark brown hairs on head, mesosoma, tarsi, tibia III, T5–T6 and sterna. Head with erect, plumose hairs, those on paraocular area and vertex as long as  $1.3\text{--}2.1 \times \text{MOD}$ . Lower part of gena with hairs as long as  $3.1 \times \text{MOD}$ . Upper paraocular area, mesoscutum, and scutellum with short ( $0.1\text{--}0.2 \times \text{MOD}$ ), simple hairs. Mesoscutum and metanotum with scattered, plumose, long hairs ( $1.1\text{--}1.8 \times \text{MOD}$ ), longer on pleura (up to  $2.7 \times \text{MOD}$ ). Scutellum with some hairs as long as  $3.5 \times \text{MOD}$ . Lateral area of propodeum with plumose hairs as long as  $2.6\text{--}3.1 \times \text{MOD}$ . T1 with hairs plumose anteri-

orly ( $1.2\text{--}1.5 \times \text{MOD}$ ), shorter and sparser on disk. Terga with simple and plumose hairs as long as  $0.7\text{--}1.0 \times \text{MOD}$ , those on T4–T5 as long as  $2.8 \times \text{MOD}$ ; marginal zones glabrous. Sterna glabrous basally, and with long, mainly plumose hairs on posterior half, those on S2–S3 with their apices bent caudally. **Sculpture:** Labrum with verrucose, median, basal elevation (Fig. 10J). Clypeus and lower paraocular area with punctures separated by 3 PD, those on supraclypeal area separated by 3–4 PD. Punctures on disc of mesoscutum separated by 5–6 PD, denser at sides, those on scutellum separated by 2–3 PD, punctures evenly distributed. Hypoepimeral area and lateral area of propodeum with punctures separated

by 5–6 PD. DAM with short striae on its base. T2–T4 with punctures separated by 6–7 PD, sparser on disk of T1. Body surface tessellate between punctures, except terga and sterna substrigulate. **Structure:** Head broader than long, 1.13 : 1 (paratypes, 1.13–1.20 : 1). Ratio of lower to upper interocular distance, 0.98 : 1 (paratypes, 0.98–1.01 : 1). Clypeus broader than long, 1.82 : 1 (paratypes, 1.76–1.85 : 1). Ratio of interantennal to antennoocular distance, 0.48 : 1 (paratypes, 0.38–0.48 : 1). Ratio of posterior interocellar to ocellocular distance, 0.93 : 1 (paratypes, 0.93–1.00 : 1). Inner hind tibial spur with 8–9 teeth, equal in length to diameter of spur rachis.

**Variation.** Females of *C. luisae* sp.n. vary in the coloration of the metasoma, which can be entirely reddish except the base of T1 dark brown, or reddish with some dark brown areas. The black apical margin of the clypeus, easily observed in the holotype, cannot be recognized in specimens with weak highlights on the head.

**Derivatio nominis.** This species is named *luisae* in honour to the entomologist Luisa Ruz, who made important contributions to the knowledge of Chilean bees. The specific name is the genitive feminine singular case.

**Type material.** The female designated as the holotype is housed at UCVC. This specimen is in good condition. The holotype has the following labels: ‘Chiloé | Huinai | Ene. 81’, ‘J. Magunacelaya | Chile’ and ‘*Corynura luisae* sp.n. | HOLOTYPE | González-Vaquero & Roig Alsina 2017’ printed.

**Floral records.** Unknown.

**Distribution** (Fig. 20C). Chile: Bío-Bío and Los Lagos.

**Material examined.** *Holotype* ♀. CHILE: Los Lagos: Palena: Huinay, I–1981, J. Magunacelaya (UCVC). *Paratypes*. CHILE: Bío-Bío: 1♀, Chillán: Las Trancas, E of Recinto (Shangri la), 13/17–XII–1983, L.E. Peña (AMNH). 2♀, Chillán: Termas, 17–XII–1977, H. Flores (AMNH). 1♀, Shangrilá, XII–1998, A. Ugarte Peña (AMNH). 2♀, Termas de Chillán, 17–XII–1977, H. Toro (UCVC). Los Lagos: 2♀, Huinai, I–1981, J. Magunacelaya (UCVC).

#### 5.7.15. *Corynura moscosensis* González-Vaquero Fig. 12E, 21B

*Corynura moscosensis* González-Vaquero, GONZÁLEZ-VAQUERO et al. 2017: 98–104, figs. 1A–C, E–G, 2A. Holotype: male, Los Moscos, PN Nahuel Huapi, Río Negro, Argentina; MACN (MACN-En 8207); examined.

*Corynura* sp. 3a: GONZÁLEZ-VAQUERO et al. 2016: 891–894, 896.

**Differential diagnosis.** The females of *C. moscosensis* can be distinguished by the following combination of characters: metasoma dark brown, inner hind tibial spur with many short teeth, propodeum bearing only plumose hairs, apex of clypeus more weakly tessellate than its

base, and S3 bearing mainly simple hairs. Males can be identified by the DAM with long striae, posterior margin of DAM angulate, T2–T3 with short hairs and few long hairs up to  $0.4 \times \text{MOD}$ , and the following characters of the genital capsule (shared only with *C. condita*): dorsal area of the gonostylus triangular in shape, and apical region of the ventral area bearing short and simple setae.

**Note.** The male genitalia and sterna have been described in detail in GONZÁLEZ-VAQUERO et al. (2017).

**Distribution** (Fig. 20B). Argentina: Neuquén, Río Negro and Chubut. Chile: from La Araucanía to Los Lagos.

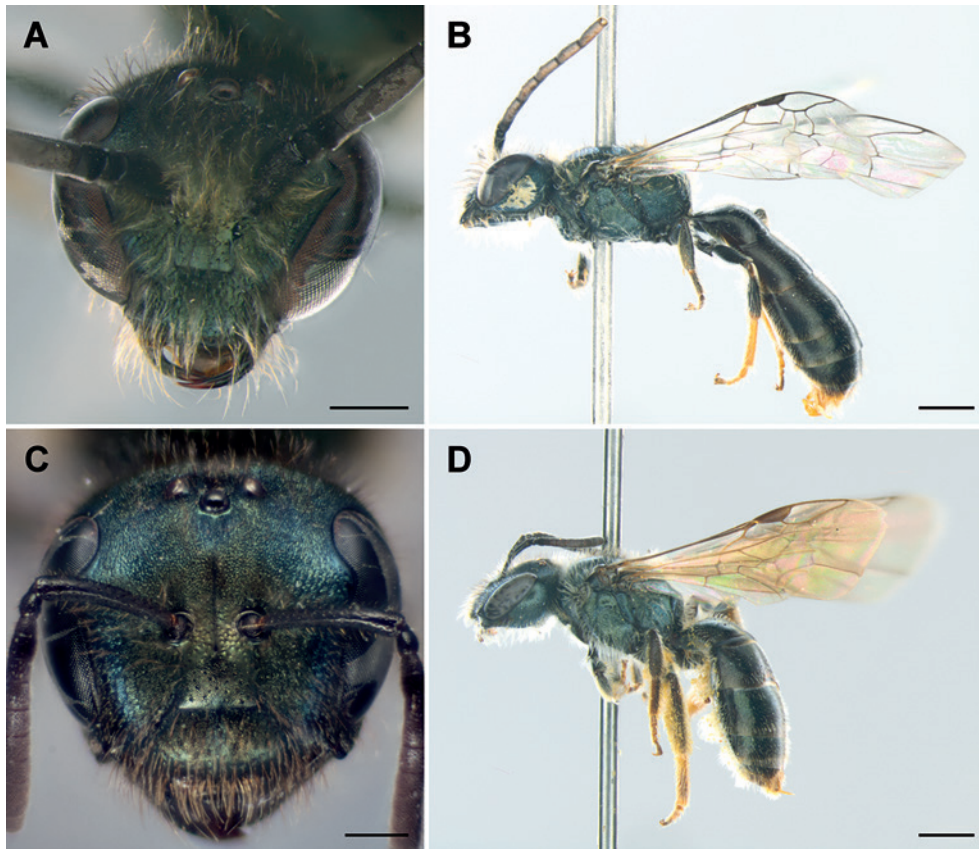
#### 5.7.16. *Corynura nahuelita* sp.n.

Figs. 4I, J, 6I, 8E, 17A–D, 10K, 20B

*Corynura* sp. 1: GONZÁLEZ-VAQUERO et al. 2014: 189–191; 2016: 891, 893.

**Differential diagnosis.** This species can be identified from other *Corynura* by the combination of its long and abundant pilosity, by the enlarged gena and occipital area, and by the greenish highlights on the head and mesosoma. Females have the malar area as long as 0.25 of the mandible basal width, character shared with *C. cristata* only. The males can be distinguished by the long hairs on the clypeus and paraocular area, which can be as long as  $2.4 \times \text{MOD}$ , the DAM has striae reaching the apex (Fig. 8E), and T2–T4 bear short and simple hairs, intermixed with long and plumose hairs. The genital capsule has a small, sclerotized *vag*, bearing few setae (Fig. 4J: *vag*). Both sexes have a yellowish tarsus III with the last tarsomere dark brown.

**Description of male** (holotype, Fig. 17A, B). Body length, 7.2 mm; forewing length, 6.1 mm (paratypes, body length, 7.0–7.8 mm; forewing length, 5.7–6.2 mm). **Colour:** Body black, with vivid greenish highlights on head, mesosoma and coxae. Following parts black: labrum, malar area, mandible except apex, scape, pedicel, ventral surface of flagellum, trochanters, femora, tibiae, T1–T5 and basal half of T6. Following parts dark brown: apex of mandible, dorsal surface of flagellum, tarsi I and II, apical tarsomere of tarsus III, tegula, S1–S5. Basal tarsomeres of tarsus III light brown. Wings hyaline, with dark brown veins and pterostigma, radial vein dark brown to black. **Pubescence:** Light brown, with dark brown hairs on head and mesoscutum. Head with plumose hairs as long as  $2.4 \times \text{MOD}$  on clypeus, supraclypeal area, and paraocular area, those on vertex  $1.5–1.8 \times \text{MOD}$ . Lower part of gena with hairs as long as  $2.1–2.8 \times \text{MOD}$ . Upper paraocular area, mesoscutum, scutellum and metanotum with dark, short ( $0.3–0.4 \times \text{MOD}$ ), simple hairs. Mesosoma with plumose hairs on mesoscutum, pleura and metanotum ( $1.5–1.9 \times \text{MOD}$ ). Base of T2–T3 with short ( $0.2 \times \text{MOD}$ ), simple hairs, intermixed with a few plumose hairs as long as  $0.7–0.9 \times \text{MOD}$ ; hairs longer



**Fig. 17.** *Corynura nahuelita* sp.n. A,B: male, holotype; C,D: female. A,C: head. B,D: habitus. Scale bars = 0.5 mm (A,C), 1 mm (B,D).

on T5–T6 (up to  $2.4 \times \text{MOD}$ ); marginal zones with short ( $0.2 \times \text{MOD}$ ), simple hairs. Sterna with simple hairs, as long as  $0.7 \times \text{MOD}$ . **Sculpture:** Clypeus with punctures separated by 1.0–2.0 PD, those on supraclypeal area separated by 2.0–3.0 PD. Lower paraocular area with punctures separated by 1.0–1.5 PD, those of upper paraocular area separated by 1.0–2.0 PD. Punctures on disc of mesoscutum separated by 2.0–3.0 PD, denser at sides, those on scutellum separated by 1.0–2.0 PD. DAM with fine radiating striae, reaching apical margin. Terga with punctures separated by 2.0–3.0 PD, sparser towards apex. Body surface tessellate between punctures except: frons and upper paraocular area strongly tessellate, propodeum finely rugose, metasoma substrigulate. **Structure:** Head broader than long, width : length = 1.20 : 1 (paratypes, 1.15–1.20 : 1). Ratio of lower to upper interocular distance, 0.70 : 1 (paratypes, 0.65–0.72 : 1). Clypeus broader than long, 1.59 : 1 (paratypes, 1.31–1.59 : 1). Ratio of interantennal to antennocular distance, 1.35 : 1 (paratypes, 1.35–1.51 : 1). Ratio of posterior interocellar to ocellocular distance, 0.86 : 1 (paratypes, 0.86–1.00 : 1). Ratio of lengths of scape, pedicel, F1 and F2 0.74 : 0.22 : 0.27 : 1 (paratypes, 0.70–0.76 : 0.16–0.23 : 0.27–0.33 : 1). F2–F11 dorsally covered almost exclusively by sensilla placodea. Apical margins of sterna: S1–S4 straight, S5 with small median notch, S6 not produced, without lateral bend, S7 curved, S8 with median, membranous glabrous process. **Genital capsule** (Fig. 4I,J): volsella short; inner apical corner of digitus rounded. Inner dor-

sal margin of gonocoxite almost straight, dorsal margins converging towards gonobase. Apex of gonocoxite with a few setae. Dorsal area of gonostylus reduced. Ventral area of gonostylus small, sclerotized, bearing some setae (Fig. 4J: *vag*). Basal process of gonostylus with few setae.

**Description of female** (Fig. 17C,D). Body length, 6.1–7.0 mm; forewing length, 5.4–6.0 mm. **Colour:** Head and mesosoma black, with vivid greenish or bluish highlights, terga dark brown with weak bluish highlights. Following parts black: labrum, malar area, mandible except reddish apex, scape, pedicel, ventral surface of flagellum. Following parts dark brown: dorsal surface of flagellum, legs except basal tarsomeres of tarsus III, tegula, sterna. Basal tarsomeres of tarsus III light brown. Wings hyaline, with dark brown veins and pterostigma, radial vein dark brown to black. **Pubescence:** Light brown, with dark brown hairs on paraocular area, mesosoma, T4–T5, tibiae and tarsi. Head with erect, plumose hairs, those on paraocular area and vertex as long as  $1.5–2.4 \times \text{MOD}$ . Lower part of gena with hairs as long as  $1.6–2.2 \times \text{MOD}$ . Upper paraocular area, mesoscutum, and scutellum with dark, short ( $0.2–0.3 \times \text{MOD}$ ), simple hairs. Mesoscutum with scattered, plumose, long hairs ( $1.1–1.9 \times \text{MOD}$ ), longer on pleura ( $2.0–2.7 \times \text{MOD}$ ) and metanotum (up to  $2.5 \times \text{MOD}$ ). Lateral area of propodeum with simple and plumose hairs as long as  $1.6–2.9 \times \text{MOD}$ . T1 with hairs plumose anteriorly ( $0.7–1.1 \times \text{MOD}$ ), shorter and

sparser on disk. T2–T4 with simple, short ( $0.2 \times \text{MOD}$ ) hairs, intermixed with plumose longer hairs ( $0.6\text{--}1.5 \times \text{MOD}$ ) directed posteriorly; marginal zones with simple, short hairs. Sterna with very short, sparse hairs basally, and long, mostly plumose hairs on posterior half, those on S2–S3 with their apices bent caudally. **Sculpture:** Labrum with verrucose, median, basal elevation (Fig. 10K). Clypeus and supraclypeal area with punctures separated by 1.0–2.0 PD. Lower paraocular area with punctures separated by 3.0–4.0 PD. Punctures on disc of mesoscutum separated by 4.0–5.0 PD, denser at sides, those on scutellum separated by 0.5–1.0 PD, punctures evenly distributed. Hypoepimeral area with punctures separated by 4.0–6.0 PD, those on lateral area of propodeum separated by 5.0–6.0 PD. DAM without striae (Fig. 8E), or with a few very fine basal striae, not reaching midlength of DAM. T2–T4 with punctures separated by 3.0–4.0 PD, sparser on disk of T1 (punctures separated by 5.0–7.0 PD). Body surface tessellate between punctures, except: upper paraocular area and gena finely rugose; sterna substrigulate. **Structure:** Head broader than long, 1.17–1.23 : 1. Ratio of lower to upper interocular distance, 0.97–1.0 : 1. Clypeus broader than long, 1.93–2.19 : 1. Ratio of interantennal to antennocular distance, 0.52–0.59 : 1. Ratio of posterior interocellar to ocellocular distance, 0.71–0.86 : 1. Inner hind tibial spur with 3–4 teeth, equal in length to diameter of spur rachis.

**Derivatio nominis.** This species is named *nahuelita* after the popular legend of the Nahuelito, an aquatic monster thought to inhabit the Nahuel Huapi Lake (Argentina). The specific name is a noun in apposition.

**Type material.** The male designated as the holotype is housed at MACN. This specimen is in good condition, it lacks from F7 of the left antenna on, tibia and tarsus of the left leg I, and the right leg II from the trochanter on, which was removed for DNA barcoding (658 bp: BOLD number HALIC224–12; GenBank accession number KU983414). The genital capsule was not dissected, but it is visible. The holotype has the following printed labels: ‘ARG. Neuquén Lago | Moquehue –38.890565° | –71.280991° 28–I–2012 | R. González V. Sobre | *Hypochoaeris radicata*’; ‘MACN-En | 9729’; ‘Barcoding of Life | DNA voucher specimen | MACN-En 9729’; ‘*Corynura* | *nahuelita* sp.n. | HOLOTYPE | González-Vaquero & Roig Alsina 2017’.

**Note.** Besides the holotype ten paratypes have been barcoded (GONZÁLEZ-VAQUERO et al. 2016: Barcode Index Number BOLD:AAV9111) and their sequences are publicly available online (project CORYN, <http://www.boldsystems.org>).

**Floral records.** Asteraceae: *Baccharis rhetinodes*, *Hypochoaeris radicata*; Berberidaceae: *Berberis darwinii*; Ericaceae: *Gaultheria phillyreaefolia*; Escalloniaceae: *Escallonia virgata*; Rhamnaceae: *Discaria chacaye*; Salicaceae: *Azara lanceolata*.

**Distribution** (Fig. 20B). Argentina: Neuquén, Río Negro and Chubut. Chile: from Bío-Bío to Los Lagos.

**Material examined.** *Holotype* ♂. ARGENTINA: Neuquén: Lago Moquehue, –38.890565° –71.280991°, 28–I–2012, R. González V., sobre *Hypochoaeris radicata*, MACN-En 9729 (MACN). *Paratypes*. ARGENTINA: Neuquén: 1♀ 1♂, Lago Moquehue, 28–I–2012, R. González Vaquero (MACN). 1♀, Villa Pehuenia, 27–I–2012, R. González Vaquero (MACN). 2♀, Cabecera SE Lago Tromen, 10–XII–1998, G.G. Roitman N.H. Montaldo & M. Devoto (MACN). 1♀, Lago Epulafquén, 5–XII–1956 (SEMC). San Martín de los Andes, II–1954: 5♀, F.H. Walls (SEMC); 18♀, L.E. Peña (SEMC). 2♀, Paso Puyehue, 14–XII–2001, D. Medan, N.H. Montaldo, M. Devoto et al. (FAUBA). PN Lanín: 1♀, Boquete (Lago Lolog), X–1955 (SEMC). 3♂, Lago Curruhué Grande, III–1952, Schajovskoi (MLPA). 1♀, Lago Huechulafquen, margen N, 15–XII–2010, L. Compagnucci & R. González Vaquero (MACN). 1♂, Lago Lolog, 22–I–1980, Willink, Fidalgo, Claps & Dominguez (IMLA). 1♀, Lago Lácar, 21–I–1954, M.M. Senkute (SEMC). Lago Queñi: 3♀, 10–XII–1999, D. Medan & A. Basilio (FAUBA); 44♀, I–1954, M.M. Senkute (SEMC). Pucará: 4♀, XII–1953, Schajovskoi (MLPA); 1♂, III–1951, Schajovskoi (MLPA); 1♂, II–1953, J. Foerster (SEMC). PN Nahuel Huapi: 2♂, Isla Victoria, I–1943, F. Monrós (MLPA). 4♀, Lago Traful, 22–I–1954, M.M. Senkute (SEMC). 26♀ 3♂, Puerto Arrayán, 20/21–XII–2010, L. Compagnucci & R. González Vaquero (MACN). 1♂, Puerto Arrayanes, Lago Traful, 31–I–1968, J. & L. Stange (IMLA). Río Negro: 1♀, Río Azul, c. 5km O El Bolsón, 9–XII–1997, C. & M. Vardy (BMNH). PN Nahuel Huapi: 2♂, Lago Los Moscos, 28–I–2011, R. González Vaquero (MACN). Puerto Blest: 10♂, 24–I–1945, J. Lichmann (MLPA); 1♀, 10–II–1949, W. Wittmer (MLPA). Chubut: PN Los Alerces: Lago Futalafquen: 3♂, 3–II–1975, Willink & Claps (IMLA); 4♂, 31–I–1980, Willink, Fidalgo, Claps & Dominguez (IMLA); 1♀, Lago Verde, 24–X–2014, L. Compagnucci (MACN). CHILE: Bío-Bío: 7♂, Caramavida, 7–II–1953, L.E. Peña (SEMC). Araucanía: 4♂, Curacautín, 19–II–1975, L. Peña (AMNH). 1♂, Termas Río Blanco, Etchevery (UCVC). 4♂, Angol, 1–II–1979, L. Peña (AMNH). 14♀, Cabreria, Cordillera Nahuelbuta, 22–XII–1985, A. Roig Alsina (MACN). 25♂, Cordillera de Las Raíces, 13/20–II–1980, L. Peña (AMNH). 1♀, Lonquimay area, Cuesta Las Raíces, 9–XII–2004, J.S. Ascher & A. Kawahara (AMNH). 6♀ 5♂, Lonquimay: Las Raíces, 13/20–II–1980, L. Peña (AMNH). 1♀, Pichimahuel, Nahuelbuta Mt., 12–II–1953, L.E. Peña (SEMC). 36♂, Tolhuaca, Lago Malleco, 7–II–1997, M. Guerrero (AMNH). Los Lagos: 1♀, 3km E Casa Pangue, 16–XI–1966 (CAS). 1♀ 4♂, Peulla, 7–II–1974, L. Ruz (UCVC). 14♂, Puyehue, 10–I–1981, J.E. Barriga (MACN). 1♀, Reserva Nacional Mocho Choshuenco, 21–I–2006, A.B.T. Smith (PCYU).

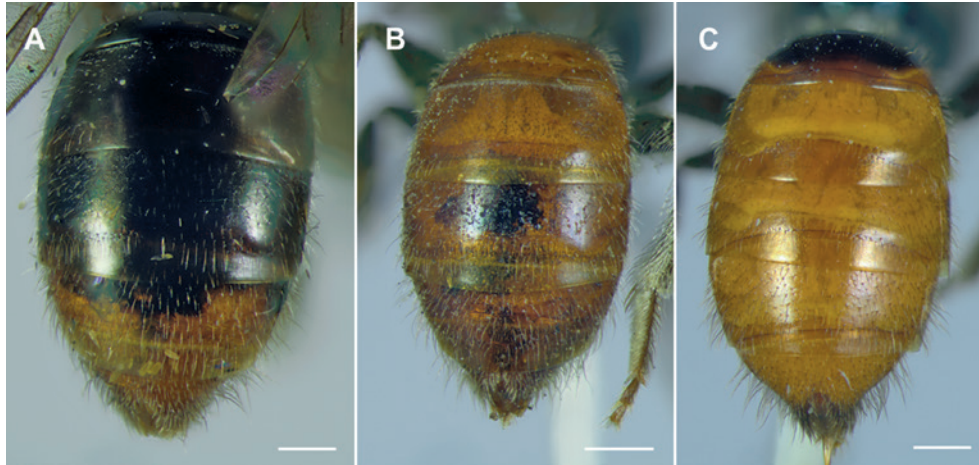
#### 5.7.17. *Corynura patagonica* (Cockerell)

Figs. 4K,L, 6C,G, 7D, 18A–C, 20A

*Rhopalictus patagonicus* Cockerell, 1918b: 180. Holotype: female, Chubut, Argentina; USNM (No. 23704); examined.

*Corynura patagonica*: MOURE & HURD 1987: 212; GONZÁLEZ-VAQUERO et al. 2016: 889, 891–896.

**Differential diagnosis.** *Corynura patagonica* can be separated from any other species of the genus by a combination of characters. Females have the DAM weakly tessellate, with no striae, the marginal zones are glabrous, the inner hind tibial spur with 4–5 teeth, which slant toward the apex of the spur (Fig. 7D), and the supraclypeal area is more weakly tessellate between punctures than the base of the clypeus. Males can be easily identified by



**Fig. 18.** *Corynura patagonica*, variation in the colour of the female metasoma. Scale bars = 0.5 mm.

their smooth clypeus, very weakly tessellate supraclypeal area, and by their narrow T1–T2. Both sexes vary in the coloration of the metasoma (Fig. 18A–C).

**Description of male.** Body length, 6.2–7.4 mm; forewing length, 5.2–5.8 mm. **Colour:** Body black, with greenish or bluish highlights on head and mesosoma. Following parts black: labrum, malar area, base of mandible, scape, pedicel, ventral surface of flagellum. Following parts dark brown: dorsal surface of flagellum, legs, tegula, metasoma. Following parts yellowish light brown: apex of mandible, outer spot on tibia I, tarsi, base of forewing, in some specimens, the bases of T2–T3. Wings hyaline, with brown veins and pterostigma, radial vein dark brown to black. **Pubescence:** Whitish. Head with plumose hairs as long as  $1.8 \times \text{MOD}$  on clypeus, supraclypeal area, paraocular area and vertex. Lower part of gena with hairs as long as  $2.0 \times \text{MOD}$ . Upper paraocular area, mesoscutum, scutellum and metanotum with dark, short ( $0.2 \times \text{MOD}$ ), simple hairs, denser on lower paraocular area. Mesosoma with plumose hairs on mesoscutum and metanotum ( $1.3\text{--}1.6 \times \text{MOD}$ ), longer on pleura (up to  $1.9 \times \text{MOD}$ ). Base of T2–T3 with short ( $0.2 \times \text{MOD}$ ), simple hairs, and longer plumose hairs on T5–T6 (up to  $1.5 \times \text{MOD}$ ); marginal zones glabrous. Sterna with simple hairs, denser on S5–S6, as long as  $0.4 \times \text{MOD}$ . **Sculpture:** Clypeus with punctures separated by 1–2 PD, those on supraclypeal area separated by 4–5 PD. Lower paraocular area with punctures separated by 2–3 PD. Punctures on disc of mesoscutum separated by 3–5 PD, denser at sides, those on scutellum separated by 3–4 PD. DAM with fine radiating striae, reaching apical margin. Terga with punctures separated by 2–4 PD, sparser towards apex. Surface between punctures equally weakly tessellate throughout the body except: clypeus and supraclypeal area practically smooth, metasoma substrigulate. **Structure:** Head broader than long, width : length =  $1.06\text{--}1.10 : 1$ . Ratio of lower to upper interocular distance,  $0.60\text{--}0.68 : 1$ . Clypeus broader than long,  $1.23\text{--}1.42 : 1$ . Ratio of interantennal to antennocular distance,  $1.51\text{--}1.73 : 1$ . Ratio of posterior interocellar to ocellocular distance,  $1.10\text{--}1.58 : 1$ .

Ratio of lengths of scape, pedicel, F1 and F2  $0.74\text{--}0.83 : 0.20\text{--}0.24 : 0.26\text{--}0.27 : 1$ . F2–F11 dorsally covered almost exclusively by sensilla placodea. Apical margins of sterna: S1–S4 straight, S5 with small median notch, S6 produced, strongly bent at level of union of gradulus with apical margin, S7 curved, S8 medially produced, glabrous or bearing one or two setae. **Genital capsule** (Fig. 4K,L): Volsella short; inner apical corner of digitus rounded. Inner dorsal margin of gonocoxite forming mesal angle; dorsal margins nearly parallel from mesal angle to base. Dorsal area of gonostylus quadrate in caudal view, more sclerotized than ventral area. Ventral area of gonostylus mesally directed, with sparsely setose projection. Basal process of gonostylus with few setae.

**Variation.** Females and males of *C. patagonica* vary in the coloration of the metasoma. In the females the metasoma can be entirely reddish except the base of T1 dark brown (Fig. 18C), reddish with some dark brown areas (Fig. 18B), dark brown with the apical half of T4, and T5 reddish (Fig. 18A), or entirely dark brown. A female from Recinto (Ñuble, Bio-Bío) had the metasoma, legs, flagellum and wing venation yellowish light brown. Males can have the disc of T2–T3 and the apex of T7 light brown and the remaining metasoma dark brown, or the metasoma entirely dark brown. Some males have a yellow spot on the outer surface of tibia I, and have the apex of tarsi, mandible, inferior side of the flagellum and wing venation light brown. The sterna usually have the same colour as their corresponding terga. Dark specimens are particularly common from Los Rios to Aisen in Chile. Females vary in the length of the lateral sector of the gradulus of T2, which can reach from half of the tergum length to almost touching the apical depressed area. Males usually have the clypeus entirely smooth between punctures, though the base is very weakly tessellate in some specimens.

**Type material.** The holotype of *Rhopalictus patagonicus* agrees with the description of COCKERELL (1918b), and it is in good condition. It lacks the pedicel and flagellum of the right antenna, from the second tarsomere

of both legs II on, the right leg III, and the left leg III from the tibia on, therefore the character of the inner hind tibial spur could not be checked, although COCKRELL (1918b) described it ‘with numerous short, slender spines’. The metasoma is reddish, with the base of T1 dark brown, as S1–S3. The specimen has the following labels: ‘*Rhopalictus* | *patagonicus* | Ckll. TYPE’ handwritten, white with blue frame; ‘Chubut | Patagonia’ printed; ‘From WFH | Rosenberg’ printed; ‘Type No. | 23704 | U.S.N.M.’ printed, orange; ‘USNM ENT | 00536825’ printed, yellow, with barcode.

**Note.** Specimens from Argentina and Chile differ considerably in their barcodes (see GONZÁLEZ-VAQUERO et al. 2016: Barcode Index Numbers BOLD:ABW9179 and BOLD:AAU2654). We have found no morphological evidence indicating that this is not a single species.

**Floral records.** Asteraceae: *Baccharis rhetinodes*, *Matricaria inodora*; Rhamnaceae: *Discaria* sp.

**Distribution** (Fig. 20A). Argentina: Neuquén, Río Negro and Chubut. Chile: from Bío-Bío to Aisén.

#### 5.7.18. *Corynura rubella* (Haliday)

Figs. 1A,B, 4M,N, 5C, 6D, 8F, 10L, 20A

*Halictus rubellus* Haliday, 1837: 321. Syntype: female, Chile; BMNH (No. 17a. 1030); examined through photographs.

*Corynura gayi* Spinola, 1851: 301, pl. 3, figs. 6–7. Types: male and female, Chile; lost. Neotype: male, Valdivia, Chile; MNNC; **present designation.** Synonymized by ALFKEN 1926: 161.

*Halictus pullatus* Vachal, 1904: 143, 144. Syntype?: female, Chile; MNHN; examined. Synonymized by ALFKEN 1926: 161.

*Halictus uretai* Ruiz, 1941: 134. Holotype, lost?: female, Aisén: Coyhaique, Chile.

*Corynura rubella*: ALFKEN 1926: 160; GONZÁLEZ-VAQUERO et al. 2014: 189, 190; GONZÁLEZ-VAQUERO et al. 2016: 891–895.

**Differential diagnosis.** This species can be easily distinguished from all other *Corynura* by the combination of the transverse apical keel on the clypeus of the female (Fig. 5C), its dark pilosity, the black waxy cuticle of the mesoscutum and the coloration of the metasoma, which is usually shiny red (Fig. 1A). Males are also unmistakable due to their large body size (10.7–12.5 mm long; females 8.3–9.4 mm long), the coalescent punctures of the mesoscutum, and the strong striae of the DAM.

**Description of male genital capsule** (Fig. 4M,N). Volsella short; inner apical corner of digitus mesally produced. Inner dorsal margin of gonocoxite forming mesal angle; dorsal margins nearly parallel from mesal angle to base. Dorsal area of gonostylus quadrate in caudal view, more sclerotized than ventral area. Ventral area of gonostylus mesally directed, with sparsely setose projection. Basal process of gonostylus with few setae.

**Variation.** This species varies in the coloration of the metasoma of the female, which is usually red, but in

some specimens from southern Chile (Palena, Los Lagos) it is dark brown. The pilosity of the gena and the pleura is dark brown, though some females have some light brown hairs in these areas, and a male from Valdivia has light hairs on the mesoscutum.

**Type material.** A syntype of *Halictus rubellus* was examined through photographs kindly taken by Dr. Laurence Packer, and compared to specimens previously identified by the authors. This syntype has the head glued to the mesosoma, it lacks both antennae, both legs I, and some tarsomeres of the legs II. It has the following labels: ‘*Halictus* | *rubellus* Hal.’ handwritten; ‘22 | Chil’ handwritten; ‘63 | 43’ handwritten, light blue, round; ‘B.M. TYPE | HYM. | 17a. 1030’ printed; ‘Type’ printed, orange border; ‘SYNTYPE ♀ | *Halictus* | *rubellus* | Haliday, 1836: 321 | det. D. Notton 2012’ printed; ‘SYN- | TYPE’ printed, blue border.

The type material of *Corynura gayi* is lost (MOURE & HURD 1987; MOURE 2007), and it is not in MNHN nor in the Museo Regionale di Scienze Naturali in Torino (CASOLARI & CASOLARI MORENO 1980; Marinella Garzena pers. comm.). *Corynura gayi* was designated as the type species of *Corynura* (ALFKEN 1926) but a type specimen for this composite species was never designated. To stabilize the interpretation and usage of the name we here designate a neotype. The designated neotype is a male housed in MNNC. The specimen has the following printed labels, with a black frame: ‘Prov. Valdivia | Vald., CHILE | 12 – 2 – 71 | E. Krahmer’ date handwritten; ‘COLL. CERDA | MNHN CHILE’.

A presumed female syntype of *Halictus pullatus* from MNHN was examined, although VACHAL (1904) does not mention where the types are housed (nor localities or number of specimens examined), and according to MOURE (2007) the syntypes are lost. The metasoma of this specimen is dark brown with some reddish areas. It lacks two tarsomeres from the left leg I, and the tibia and tarsus from the left leg III. This specimen has the following labels: ‘*pullatus* | ♀ Vach.’ handwritten; ‘Chili’ printed; ‘Muséum Paris’ printed. Vachal separates the female of *H. pullatus* from that of *H. rubellus* by the colour of the metasoma and the hairs of the tarsi I, both characters variable in this species.

Although according to MOURE’s catalogue (2007) the type material of *Halictus uretai* is housed in MNNC, none of the specimens mentioned by Ruiz in the original description could be found in the Museum (Mario Elgueta pers. comm.). The specimens were not mentioned in the *Catálogo de Tipos de Insecta* of this Museum (CAMOUSSEIGHT 1980).

**Note.** Specimens of *C. rubella* have been barcoded (GONZÁLEZ-VAQUERO et al. 2016: Barcode Index Numbers BOLD:AAV9112 and BOLD:ABY4791).

**Floral records.** Alstroemeriaceae: *Alstroemeria auria*; Anacardiaceae: *Schinus patagonicus*; Apiaceae: *Daucus pusillus*, *Mulinum spinosum*; Asteraceae: *Baccharis ob-*



*ovata*, *B. umbelliformis*, *Baccharis* sp., *Taraxacum officinale*; Boraginaceae: *Phacelia secunda*; Buddlejaceae: *Buddleja globosa*; Elaeocarpaceae: *Aristotelia chilensis*; Escalloniaceae: *Escallonia virgata*; Fabaceae: *Adesmia* sp., *Cytisus scoparius*, *Lupinus polyphyllus*, *Melilotus alba*, *Trifolium repens*, *Vicia nigricans*; Grossulariaceae: *Ribes magellanicum*; Malvaceae: *Tilia moltkei*; Myrtaceae: *Myrceugenia planipes*; Nothofagaceae: *Nothofagus* sp.; Proteaceae: *Embothrium coccineum*, *Lomatia hirsuta*; Ranunculaceae: *Anemone multifida*; Rhamnaceae: *Discaria articulata*, *D. chacaye*; Rosaceae: *Malus* sp., *Rosa rubiginosa*; Thymelaeaceae: *Ovidia andina*.

**Distribution** (Fig. 20A). Argentina: Neuquén, Río Negro and Chubut. Chile: from Maule to Aisén, and there is a record from Santiago.

#### 5.7.19. *Corynura spadiciventris* Alfken

Figs. 40,P, 20C

*Corynura spadiciventris* Alfken, 1926: 163. Lectotype: female, Termas de Tolhuaca, Malleco, Chile; ZMB; examined; **present designation**.

**Differential diagnosis.** Females of this small species can be identified by the combination of the following characters: entirely dark brown metasoma, inner hind tibial spur with 4–7 teeth, clypeus uniformly tessellate and dull, and marginal zones of T2–T3 glabrous. Females of *C. spadiciventris* are difficult to separate from those of *C. challhuacoensis*, but the former species can be identified by the sculpture of the DAM, which has radiating striae reaching nearly half of the total length of the DAM. Males have coarse punctures on T2, which are separated by 1–2 PD, an exclusive character of this species, and they have a mesal process in the ventral area of the gonostylus (Fig. 40,P), which is absent in *C. challhuacoensis*.

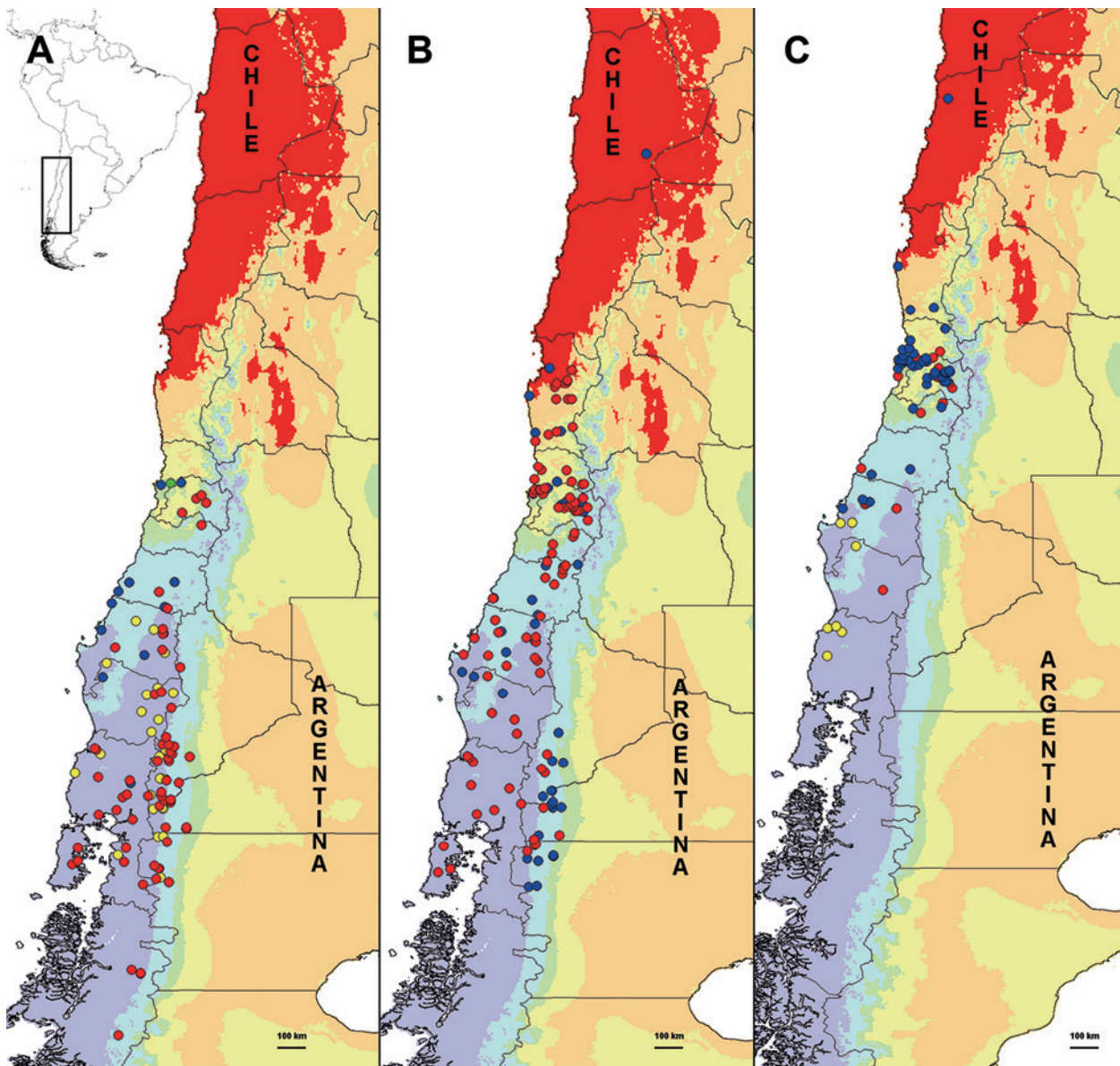
**Description of male.** Body length, 6.7–6.9 mm; forewing length, 5.6–5.7 mm. **Colour:** Body black, with greenish highlights on head and mesosoma. Following parts dark brown: labrum, malar area, mandible except apex, antenna, legs, tegula, metasoma. Following parts yellowish light brown: apex of mandible, outer spot on tibia I. Wings hyaline, with brown veins and pterostigma, radial vein dark brown to black. **Pubescence:** Whitish on head, light brown on remaining body. Head with plumose hairs as long as  $1.8 \times \text{MOD}$  on clypeus, supraclypeal area, paraocular area and vertex. Lower part of gena with hairs as long as  $2.2 \times \text{MOD}$ . Upper paraocular area, mesoscutum, scutellum and metanotum with dark, short ( $0.2 \times \text{MOD}$ ), simple hairs, denser on lower paraocular area. Mesosoma with plumose hairs on mesoscutum and metanotum ( $1.5\text{--}1.7 \times \text{MOD}$ ), longer on pleura (up to  $1.9 \times \text{MOD}$ ). Base of T2–T3 with short ( $0.1\text{--}0.2 \times \text{MOD}$ ), simple hairs, intermixed with erect, plumose hairs as long as  $0.7 \times \text{MOD}$ ; longer plumose hairs on T5–T6 (up to  $0.9 \times \text{MOD}$ ); margin-

al zones glabrous. Sterna with simple hairs, denser on S5–S6, as long as  $0.2 \times \text{MOD}$ . **Sculpture:** Clypeus with punctures separated by 2 PD, those on supraclypeal area separated by 3–4 PD. Lower paraocular area with punctures separated by 3–4 PD. Punctures on disc of mesoscutum separated by 1–3 PD, denser at sides, those on scutellum separated by 1 PD. DAM with fine radiating striae, reaching apical margin. Terga with coarse punctures separated by 1–2 PD, sparser towards apex. Body surface tessellate between punctures except: propodeum finely rugose, metasoma substrigulate. **Structure:** Head broader than long, width : length =  $1.15\text{--}1.20 : 1$ . Ratio of lower to upper interocular distance,  $0.66 : 1$ . Clypeus broader than long,  $1.52\text{--}1.70 : 1$ . Ratio of interantennal to antennocular distance,  $1.95\text{--}2.28 : 1$ . Ratio of posterior interocellar to ocellocular distance,  $1.02\text{--}1.16 : 1$ . Ratio of lengths of scape, pedicel, F1 and F2  $0.81\text{--}0.86 : 0.27\text{--}0.29 : 0.30\text{--}0.34 : 1$ . F2–F11 dorsally covered almost exclusively by sensilla placodea. Apical margins of sterna: S1–S4 straight, S5 with small median notch, S6 produced, strongly bent at level of union of gradulus with apical margin, S7 curved, S8 medially produced, usually bearing one or two setae. **Genital capsule** (Fig. 40,P): volsella short; inner apical corner of digitus rounded. Inner dorsal margin of gonocoxite forming mesal angle; dorsal margins nearly parallel from mesal angle to base. Dorsal area of gonostylus quadrate in caudal view, more sclerotized than ventral area. Ventral area of gonostylus mesally directed, with a projection bearing dense setae. Basal process of gonostylus with few setae.

**Type material.** We examined the two syntypes studied by ALFKEN (1926). The female specimen is in excellent condition, and it is here designated as the lectotype. The male syntype is not conspecific; it is a male of *C. lepida*. The lectotype only lacks the right antenna. The clypeus is uniformly tessellate between punctures, and the DAM has radiating striae that although they do not reach the half of the total length, they are longer and coarser than those present in *C. challhuacoensis*, a closely related species. The lectotype has greenish and bluish highlights on the head and mesosoma, although the rest of the material examined of this species has only greenish highlights. The base of the terga have a denser pilosity than the apex, though they have no patches (e.g. as those of *C. herbsti*) as it can be interpreted from the original description. The specimen has the following labels: ‘*Corynura* ♀ | *spadiciventris* | Type Alfken. | Alfken det.’ handwritten; ‘Chile | Termas Tolhuaca | 1.II.1907 | P. Herbst’ printed; ‘Typus’ printed, red; ‘15 | 15’ printed; ‘Zool. Mus. | Berlin’ printed. Even though Alfken studied a specimen of each sex, MOURE (2007) mistakenly mentions in his catalogue that the species has a male holotype.

**Floral records.** Calceolariaceae: *Calceolaria crenatiflora*; Rhamnaceae: *Discaria chacaye*.

**Distribution** (Fig. 20C). Argentina: Neuquén. Chile: from Bío-Bío to Los Lagos.



**Fig. 19.** Distribution maps of *Corynura* species. Colour patterns follow DeMartonne aridity index: red (0–5), hyperarid; orange (5–10), arid; yellow (10–20), semiarid; green (20–30), subhumid; light blue (30–60), humid; purple (60–500), perhumid. **A:** *C. ampliata* (red circles), *C. apicata* (blue circles), *C. atrovirens* (green circle), *C. bruchiana* (yellow circles). **B:** *C. chilensis* (blue circles), *C. corinogaster* (red circles). **C:** *C. chloromelas* (yellow circles), *C. cristata* (blue circles), *C. herbsti* (red circles).

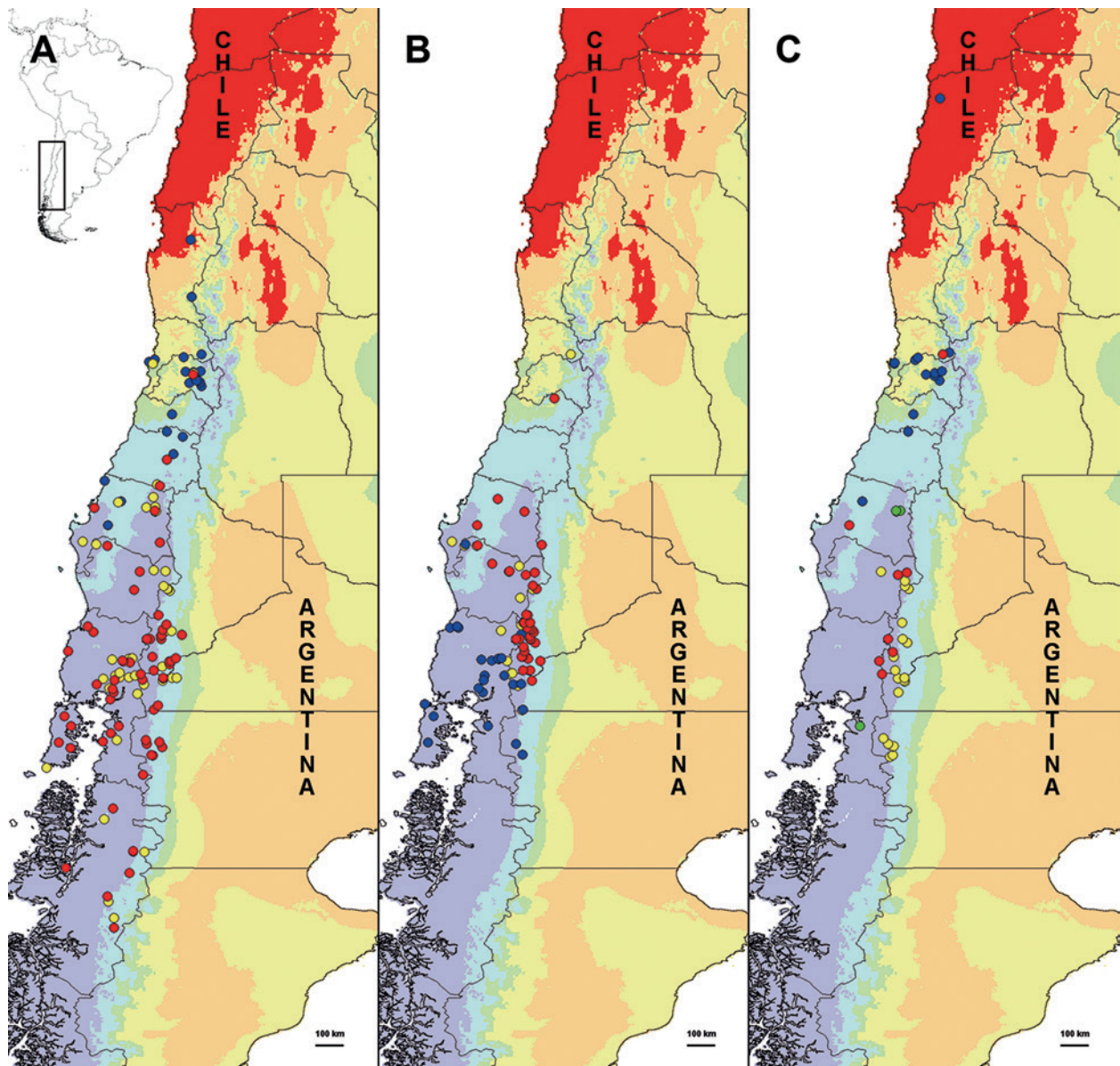
### 5.8. Nomen dubium “*Halictus cyanicollis*” Friese

*Halictus cyanicollis* Friese, 1916: 550, 557–558. Type: male, Corral, Los Ríos, Chile; lost.

The material from Chile described by FRIESE (1916a) is considered lost. MOURE & HURD (1987: 208) synonymized *H. cyanicollis* with *H. ampliatus*, probably because FRIESE (1916a: 557) said that *H. cyanicollis* might be the male of *H. ampliatus*, although he listed both as distinct species. On the contrary, HERBST (1922: 188) suggested that *H. cyanicollis* is the male of *C. apicata*.

FRIESE (1916a) described a large male 9–10 mm of body length, with a clavate metasoma similar to that of

*C. chilensis* and *C. corinogaster*. According to Friese the head and the mesosoma of *H. cyanicollis* were brilliant blue, the pedicel was as long as F1, the DAM had striae and upraised margins, the metasoma was dark brown with the apex of the segments 2–3 and the segment 7 light brown, the mandible yellow, and the legs with the following pattern: femora blue, tarsi brown, tibia I yellowish in front, and the remainder of legs dark brown. Although the description is fairly detailed, some of the characters are shared by many species, while others are confusing. The most intriguing character is that of the apex of T2–T3 light brown, since the species in which the metasoma has lighter areas have these areas always on the base of the terga. The few males of *C. apicata* studied by us compare well to the description, but they are smaller and have T2–T3 entirely brown, as the re-



**Fig. 20.** Distribution maps of *Corynura* species. Colour patterns follow DeMartonne aridity index: red (0–5), hyperarid; orange (5–10), arid; yellow (10–20), semiarid; green (20–30), subhumid; light blue (30–60), humid; purple (60–500), perhumid. **A:** *C. lepida* (blue circles), *C. patagonica* (yellow circles), *C. rubella* (red circles). **B:** *C. nahuelita* sp.n. (yellow circles), *C. moscosensis* (blue circles), *C. condita* sp.n. (red circles). **C:** *C. challhuacoensis* sp.n. (yellow circles), *C. callaina* sp.n. (blue circles), *C. luisae* sp.n. (green circles), *C. spadiciventris* (red circles).

maining terga except for the last one which is lighter. The species that may have light areas on T2–T3 are *C. ampliata*, *C. bruchiana*, *C. corinogaster*, *C. patagonica* and *C. rubella*. None of these species agrees with all the characters mentioned by Friese. For these reasons we consider *H. cyanicollis* Friese as a *nomen dubium*.

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## Electronic Supplement Files

at [www.senckenberg.de/arthropod-systematics](http://www.senckenberg.de/arthropod-systematics)

**File 1:** [gonzalezvaquero&roigalsina-halictidae-asp2017-electronic-supplement-1.doc](#). – Matrix of morphological characters.

**File 2:** [gonzalezvaquero&roigalsina-halictidae-asp2017-electronic-supplement-2.doc](#). – Additional material examined.

## Zoobank registrations

at <http://zoobank.org>

**Present article:** <http://zoobank.org/References/F270F677-2BB6-4EB5-9033-8936118A68F9>

***Callistochlora Michener*, 1997:** <http://zoobank.org/NomenclaturalActs/FBB5F5A5-BB7F-47F6-AFDE-B619B778E021>

***Corynura callaina* González-Vaquero & Roig-Alsina, 2017:** <http://zoobank.org/NomenclaturalActs/75093597-B3B8-4DC3-B9DF-2345917A158E>

***Corynura challhuacoensis* González-Vaquero & Roig-Alsina, 2017:** <http://zoobank.org/NomenclaturalActs/F1622192-DE87-4F2E-B730-F0A4C9C3BD95>

***Corynura condita* González-Vaquero & Roig-Alsina, 2017:** <http://zoobank.org/NomenclaturalActs/F8D2A06C-C73D-4A26-90E2-CF679F9B0DF8>

***Corynura luisae* González-Vaquero & Roig-Alsina, 2017:** <http://zoobank.org/NomenclaturalActs/17DDFB4A-1478-4F53-A3E6-FFBD15131D2B>

***Corynura nahuelita* González-Vaquero & Roig-Alsina, 2017:** <http://zoobank.org/NomenclaturalActs/A4D01871-D248-40CE-8020-E75C4277EA11>



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