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## Taxonomic revision of the cleptoparasitic bee genus *Epiclopus* Spinola, 1851 (Hymenoptera: Apidae: Ericrocidini)

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### Abstract

A taxonomic revision of the cleptoparasitic bee genus *Epiclopus* Spinola is presented. The following species are recognized: *Epiclopus gayi* Spinola, *E. lendlianus* (Friese), *E. wagenknechti* (Ruiz) and *E. ecphorus* **new species** from northern Chile. Floral associations, hosts, distribution records and diagnoses of both sexes based on type specimens, are given. An identification key, illustrations and an updated catalogue of the species are provided. In addition, a neotype for *Mesonychium wagenknechti* and lectotypes for *Melissa (Epiclopus) gayi albescens* Friese and *M. lendliana* are also designated.

**Key words:** cuckoo bees, taxonomy, new species, *Centris*, Andean Region

### Introduction

*Epiclopus* Spinola, 1851 is a small lineage of robust cleptoparasitic bees distributed in southern South America (Michener, 2000, 2007; Moure & Melo, 2007): the Central Chilean, Subantarctic and Patagonian biogeographic provinces, within the Andean Region *sensu* Morrone (see Morrone 2014 and references therein). Although this genus contains only *E. gayi* Spinola, 1851, *E. lendlianus* (Friese, 1910) and *E. wagenknechti* (Ruiz, 1938), there are no published keys to assist in their identification. The taxonomy of the genus, as well as of the species included in it, is confused as these bees are often identified as members of the genus *Mesonychium* Lepeletier & Serville, 1925 (Lucas, 1914; Izquierdo, 1923; Janvier, 1933; Fraga, 1937; Ruiz, 1940; Pérez-D'Angello, 1968; Wagenknecht, 1969, 1971; Kalin Arroyo *et al.*, 1982; Toro, 1986a, b; Chiappa *et al.*, 1990; Camousseight & Barrera, 1998; Chiappa *et al.*, 2000; Vivallo *et al.*, 2003; González *et al.*, 2014) or transferred to monotypic genera (Snelling & Brooks, 1985; McGinley, 1989; Michener, 1997) due to the lack of a phylogenetic analysis that recognize *Epiclopus* as a monophyletic group. However, preliminary studies show that both *Epiclopus* and *Mesonychium* are monophyletic supported by morphological characters of both sexes (Vivallo & Melo, in preparation). The slightly shorter basitarsus relative to the tibia of the hind leg, the presence of white, long and dense pubescence on mesoscutum, mesoscutellum and on the dorsal surface of T1, as well as the lack of coarse and simple hairs on the lateral surfaces of the distitarsus of the middle and hind legs (present in *Mesonychium*) are some characteristics that permit differentiation of *Epiclopus* from other genera of Ericrocidini (Vivallo & Melo, in preparation).

Although specimens of *Epiclopus* are often collected, the biology of its species is virtually unknown, their geographical distributions and floral hosts are unclear, since most of the information is scattered in the literature and many records are based on wrong identification of the bees. Although there is consistent evidence that they attack species of the bee genus *Centris* Fabricius, 1804 (Friese, 1912, 1921; Herbst, 1918; Izquierdo, 1923; Janvier, 1933; Ruiz, 1940; Wagenknecht, 1969, 1971; Snelling & Brooks, 1985; Chiappa *et al.*, 2000; Vivallo *et al.*, 2002, 2003; Rocha-Filho *et al.*, 2009; Montalva *et al.*, 2010), most of their hosts have been proposed based on indirect evidence, such as synchronized flight periods, similar floral or distribution records, or by similarity in the patterns of coloration and pubescence (Friese, 1912; Herbst, 1918; Wagenknecht, 1971; Snelling & Brooks, 1985; Chiappa *et al.*, 2000; Vivallo *et al.*, 2003; Rocha-Filho *et al.*, 2009; Montalva *et al.*, 2010). As usually occur with

The single record of *Epiclopus gayi* in Argentina (Mendoza Province) (Fig. 18) is located within the distribution range of at least three species of *Centris*: *C. brethesi* Schrottky, 1902 (Roig-Alsina, 2000; Zanella, 2002), *C. muralis* Burmeister, 1876 and *C. vardyorum* Roig-Alsina 2000 (see Vivallo, 2013 and references therein). These last two species belong to the subgenus *C. (Wagenknechtia)* which could be potential hosts of *E. gayi* in that country.

According to Wagenknecht (1969, 1971) *Epiclopus wagenknechti* attacks *Centris (Wagenknechtia) rhodophthalma* and *C. (Penthemisia) chilensis*. The first record seems to be true, by the congruent distributional range and by the size of the specimens of both species. However, the second record must be checked to confirm if the hosts of *Epiclopus* are actually restricted to species of *C. (Wagenknechtia)* or if the species of that genus also attack species of other subgenera of *Centris*.

Unfortunately, there are no host records for *Epiclopus ephorus* **new species**. As previously indicated, this species is distributed exclusively in the biogeographical province of Coquimbo (Fig. 9), where *C. cineraria*, *C. chilensis*, *C. nigerrima* and *C. rhodophthalma* also occur (Zanella, 2002; Vivallo *et al.*, 2003; Vivallo, 2013). This last species appears to be a possible candidate, for their congruent distribution ranges, their synchrony in flight period and for their similar body size.

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## References

- Ashmead, W.M.H. (1899) Classification of the bees of the superfamily Apoidea. *Transactions of the American Entomological Society*, 26, 49–100.
- Brêthes, J. (1910) Sur quelques Hyménoptères du Chili. *Revista Chilena de Historia Natural*, 14, 141–146.
- Burmeister, H. (1876) Hymenopterologische Mittheilungen. *Stettinger Entomologische Zeitung*, 37, 151–183.
- Cabrera, A.L. & Willink, A. (1973) *Biogeografía de América Latina. Monografía 13, Serie de Biología*. OEA, Washington, D.C., 120 pp.
- Camousseight, A. & Barrera, E. (1998) Análisis del polen transportado por insectos estivales en el sector de La Parva, Cordillera de Santiago. *Revista Chilena de Entomología*, 25, 77–81.
- Cardinal, S., Straka, J. & Danforth, B.N. (2010) Comprehensive phylogeny of apid bees reveals the evolutionary origins and antiquity of cleptoparasitism. *Proceedings of the National Academy of Sciences*, 10.1073, 1–5. [supporting information 1–8; tables S1: 1–4; S2:1–3; S3: 1–6; S4: 1–5]
- Chiappa, E., Bascañán, R. & Rodríguez, S. (2000) Nidificación, conducta de machos de *Centris (Wagenknechtia) rodophthalma* Pérez (Hymenoptera: Anthophoridae) y comparación con otras especies chilenas del género. *Acta Entomológica Chilena*, 24, 19–28.
- Chiappa, E., Rojas, M. & Toro, H. (1990) Clave para los géneros de abejas de Chile (Hymenoptera: Apoidea). *Revista Chilena de Entomología*, 18, 67–81.
- Cockerell, T.D.A. (1904) New and little-known bees in the collection of the British Museum. *The Annals and Magazine of Natural History*, 14, 203–208.
- Cresson, E.T. (1878) Descriptions of new North American Hymenoptera in the collection of the American Entomological Society. *Transactions of the American Entomological Society*, 7, 61–136.
- Cresson, E.T. (1887) Synopsis of the families and genera of the Hymenoptera of America, north of Mexico, together with a catalogue of the described species, and bibliography. *Transactions of the American Entomological Society*, 14, 1–350.
- Dalla Torre, C.G. (1896) *Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus. Vol. 10*. Guilelmi Engelmann, Lipsiae, 643 pp.

- Dinerstein, E., Olson, D., Graham, D., Webster, A., Primm, S., Bookbinder, M. & Ledec, G. (1995) *Una evaluación del estado de conservación de las ecorregiones terrestres de América Latina y el Caribe*. Banco Internacional de Reconstrucción y Fomento/ Banco Mundial, Washington, 135 pp.
- Ducke, A. (1908) Contributions à la connaissance des hyménoptères des deux Amériques. *Revue d'Entomologie (Caen)*, 27, 28–55.
- Ducke, A. (1910) Zur Synonymie der neotropischen Apidae. (Hym.). *Deutsche Entomologische Zeitschrift*, 1910, 362–369.
- Ducke, A. (1912) Die natürlichen Bienengenera Südamerikas. *Zoologische Jahrbücher, Abteilung für Systematik, Geographie und Biologie der Tiere*, 34, 51–116.
- Fabricius, J.C. (1804) *Systema Piezatorum secundum ordines, genera, species, adjectis synonymis, locis, observationibus, descriptionibus*. Reichard, Brunsvigae, 439 pp.
- Fernández, F. (2001) Checklist of genera and subgenera of aculeate Hymenoptera of the Neotropical Region (Hymenoptera: Vespomorpha). *Biota Colombiana*, 2, 87–30.
- Fernández, F. (2002) Filogenia y sistemática de los himenópteros con aguijón en la Región Neotropical (Hymenoptera: Vespomorpha). In: Costa, C., Vanin, S.A., Lobo, J.M. & Melic, A. (Eds.), *II. Inventarios y biodiversidad de insectos*. Red Iberoamericana de Biogeografía y Entomología Sistemática, Monografías Tercer Milenio, pp. 101–138.
- Fraga, G. (1937) Insectos colectados en la Hacienda Mauro. *Revista Chilena de Entomología*, 41, 196–200.
- Friese, H. (1899) Neue arten der Bienengattungen *Epicharis* Klug und *Centris* Fabr. *Természetrázi Füzetek*, 23, 39–48.
- Friese, H. (1900) Neue exotische Schmarotzerbienen. *Entomologische Nachrichten*, 26, 65–67.
- Friese, H. (1906) Resultate einer Reise des Herrn A.C. Jensen-Haarup in die Gegend von Mendoza (Argentina). *Flora og Fauna*, 8, 89–102.
- Friese, H. (1910) Zur Bienenfauna des südlichen Argentinien (Hym.). *Zoologische Jahrbücher, Abteilung für Systematik, Geographie und Biologie der Tiere*, 29, 641–660.
- Friese, H. (1912) Neue und wenig bekannte Bienenarten der neotropischen Region. *Archiv für Naturgeschichte, Abteilung A*, 78, 198–226.
- Friese, H. (1921) Neue Arten der Schmarotzerbienen. *Deutsche Entomologie Zeitschrift*, 1920 (1/2), 251–266.
- Friese, H. (1925) Neue neotropische Bienenarten, zugleich II. Nachtrag zur Bienenfauna von Costa Rica. (Hym.). *Stettinger Entomologische Zeitung*, 86, 1–41.
- Gazulla, P. & Ruiz, F. (1928) Los insectos de la Hacienda de “Las Mercedes”. *Revista Chilena de Historia Natural*, 32, 288–305.
- González, A.V., Marúa, M. & Ramírez, P.A. (2014) Temporal and spatial variation of the pollinator assemblages in *Alstroemeria ligtu* (Alstroemeriaceae). *Revista Chilena de Historia Natural*.
- Griswold, T., Hanson, P.E. & Alves-dos-Santos, I. (2006) Las abejas. In: Hanson, P.E. & Gauld, I.D. (Eds.), *Hymenoptera de la Región Neotropical*. Memoirs of the American Entomological Institute, 77, The American Entomological Institute, pp. 734–785.
- Harris, R.A. (1979) A glossary of surface sculpturing. *Occasional Papers in Entomology*, 28, 1–32.
- Herbst, P. (1917) Nuevas avispas antófilas de Chile (Adipae [sic] Hymenopt.). *Revista Chilena de Historia Natural*, 21, 105–112.
- Herbst, P. (1918) Nuevas avispas antófilas de Chile (Apidae. Hymenoptera). *Revista Chilena de Historia Natural*, 22, 149–152.
- Izquierdo, V. (1923) Sociedad Entomológica de Chile (Sesión del 9 de Diciembre de 1923). *Revista Chilena de Historia Natural*, 27, 225–241.
- Janvier, H. (1933) Étude biologique de quelques hyménoptères du Chili. *Annales des Sciences Naturelles. Zoologie et Biologie Animale*, 16, 209–356.
- Kalin Arroyo, M., Primack, R., Armesto, J. (1982) Community studies in pollination ecology in the high temperate Andes of central Chile. I. Pollination mechanisms and altitudinal variation. *American Journal of Botany*, 69, 82–97.  
<http://dx.doi.org/10.2307/2442833>
- Kawakita, A., Ascher, J.S., Sota, T., Kato, M. & Roubik, D.W. (2008) Phylogenetic analysis of the corbiculate bee tribes based on 12 nuclear protein-coding genes (Hymenoptera: Apoidea: Apidae). *Apidologie*, 39, 163–175.  
<http://dx.doi.org/10.1051/apido:2007046>
- Lepeletier, A.L.M. & Serville, J.G.A. (1825) [Articles] In: Diderot, M. et al. (Eds.), *Encyclopédie Méthodique. Histoire Naturelle. Entomologie, ou Histoire Naturelle des Crustacés, des Arachnides et des Insectes. Vol. 10. P.A. Latreille*. Agasse, Paris, pp. 1–344.
- Lucas, R. (1914) Hymenoptera für 1913. *Archiv für Naturgeschichte*, 6, 1–401.
- McGinley, R.J. (1989) A catalog and review of immature Apoidea (Hymenoptera). *Smithsonian Contributions to Zoology*, 494, 1–24.  
<http://dx.doi.org/10.5479/si.00810282.494>
- Michener, C.D. (1944) Comparative external morphology, phylogeny, and a classification of the bees. *Bulletin of the American Museum of Natural History*, 82, 151–326.
- Michener, C.D. (1997) Genus-group names of bees and supplemental family group names. *Scientific Papers, Natural History Museum, University of Kansas*, 1, 1–81.
- Michener, C.D. (2000) *The Bees of the World* (1<sup>st</sup> edition). Johns Hopkins University Press, xiv + 913 pp.
- Michener, C.D. (2007) *The Bees of the World*. (2<sup>nd</sup> Edition). Johns Hopkins University Press, xvi + 953 pp.

- Montalva, J. & Ruz, L. (2010) Actualización de la lista sistemática de las abejas chilenas (Hymenoptera: Apoidea). *Revista Chilena de Entomología*, 35, 15–52.
- Montalva, J., Allendes, J.L. & Castro, B. (2010) Las abejas (Hymenoptera: Apoidea) del Jardín Botánico Chagual. Estudio de caso de abejas nativas en zonas urbanas de Santiago de Chile. *Revista Chagual*, 8, 13–23.
- Morrone, J.J. (2001) *Biogeografía de América Latina y el Caribe*. M & T- Manuales y Tesis SEA, Zaragoza, 148 pp.
- Morrone, J.J. (2011) América do Sul e geografia da vida: Comparação de algumas propostas de regionalização. In: Carvalho, C.J.B. & Almeida, E.A.B. (Orgs.), *Biogeografia da América do Sul Padrões e Processos*. Editora Roca, São Paulo, pp. 14–40.
- Morrone, J.J. (2014) Biogeographical regionalisation of the Neotropical region. *Zootaxa*, 3782, 1–110.  
<http://dx.doi.org/10.11646/zootaxa.3782.1.1>
- Moure, J.S. (1946) Notas sobre as mamangabas. *Boletim Agrícola*, 4, 1–32.
- Moure, J.S. (1950) Alguns agrupamentos novos de abelhas neotropicais (Hymenoptera, Apoidea). *Dusenía*, 1, 385–394.
- Moure, J.S. & Melo, G.A.R. (2007) Ericrocidini Cockerell & Atkins, 1902. In: Moure, J.S., Urban, D. & Melo, G.A.R. (Orgs.), *Catalogue of Bees (Hymenoptera, Apoidea) in the Neotropical Region*. Sociedade Brasileira de Entomologia, Curitiba, pp. 158–167.
- Moure, J.S., Urban, D. & Melo, G.A.R. (2007) *Catalogue of Bees (Hymenoptera, Apoidea) in the Neotropical Region*. Sociedade Brasileira de Entomologia, Curitiba, Brazil, xiv + 1058 pp.
- Pérez, J. (1911) Mellifères nouveaux du Chili. *Revista Chilena de Historia Natural*, 15, 55–59.
- Pérez-D'Angello, V. (1968) Algunas consideraciones sobre el mimetismo. *Museo Nacional de Historia Natural, Noticiario Mensual*, 142, 3–7.
- Perty, J.A.M. (1833) *Delectus animalium articulorum, quae in itinere per Brasiliam annis MDCCCXVII-MDCCCXX jussu et auspiciis Maximiliani Josephi I. Bavariae regis augustissimi peracto collegerunt Dr. J. B. de Spix et Dr. C. F. Ph. de Martius. Fasc. 3*. Author's Edition, München, 100 pp., 16 pls. [pp. 125–224, pls. 25–40]
- Porter, C.E. (1929) El entomólogo don Pablo Herbst fallecido el 27 de marzo en Valparaíso. *Revista Chilena de Historia Natural*, 33, 77–80.
- Posadas, P. & Ortiz-Jaureguizar, E. (2011) Evolução da Região Andina da América do Sul. In: Carvalho, C.J.B. & Almeida, E.A.B. (Eds.), *Biogeografia da América do Sul Padrões e Processos*. Editora Roca, São Paulo, pp 175–188.
- Rasmussen, C. & Ascher, J.S. (2008) Heinrich Friese (1860–1948): Names proposed and notes on a pioneer melittologist (Hymenoptera, Anthophila). *Zootaxa*, 1833, 1–118.
- Rocha-Filho, L.C., Morato, E.F. & Melo, G.A.R. (2009) New host records of *Aglaomelissa duckei* and a compilation of host associations of Ericrocidini bees (Hymenoptera: Apidae). *Zoologia*, 26, 299–304.  
<http://dx.doi.org/10.1590/S1984-46702009000200012>
- Rodríguez-Serrano, E., Inostroza-Michael, O., Avaria-Llautureo, J. & Hernández, C.E. (2012) Colony size evolution and the origin of eusociality in corbiculate bees (Hymenoptera: Apinae). *PlosOne*, 7, 1–8.  
<http://dx.doi.org/10.1371/journal.pone.0040838>
- Roig-Alsina, A. (2000) Claves para las especies argentinas de *Centris* (Hymenoptera, Apidae), con descripción de nuevas especies y notas sobre distribución. *Revista del Museo Argentino de Ciencias Naturales, Nueva Serie*, 2, 171–193.
- Rozen, J.G. (2001) A taxonomic key to mature larvae of cleptoparasitic bees (Hymenoptera: Apoidea). *American Museum Novitates*, 3309, 1–27.  
[http://dx.doi.org/10.1206/0003-0082\(2001\)309<0001:ATKTML>2.0.CO;2](http://dx.doi.org/10.1206/0003-0082(2001)309<0001:ATKTML>2.0.CO;2)
- Rozen, J.G. (2003) Eggs, ovariole number, and modes of parasitism of cleptoparasitic bees, with emphasis on Neotropical species (Hymenoptera: Apoidea). *American Museum Novitates*, 3413, 1–36.  
[http://dx.doi.org/10.1206/0003-0082\(2003\)413<0001:EONAMO>2.0.CO;2](http://dx.doi.org/10.1206/0003-0082(2003)413<0001:EONAMO>2.0.CO;2)
- Rozen, J.G., Vinson, S.B., Coville, R. & Frankie, G. (2011) Biology of the cleptoparasite bee *Mesoplia sapphirina* (Ericrocidini) and its host *Centris flavofasciata* (Centridini) (Apidae: Apinae). *American Museum Novitates*, 3723, 1–36.  
<http://dx.doi.org/10.1206/3723.2>
- Ruiz, F. (1936) Himenopteros de la Provincia de Coquimbo. *Revista Chilena de Historia Natural*, 40, 159–169.
- Ruiz, F. (1938) Nuevas especies de abejas chilenas. *Revista Chilena de Historia Natural*, 42, 148–153.
- Ruiz, F. (1940) Apidología Chilena. *Revista Chilena de Historia Natural*, 44, 281–377.
- Sandhouse, G. (1943) The type species of the genera and subgenera of bees. *Proceedings of the United States National Museum*, 92, 519–619.
- Schrottky, C. (1902) Neue Argentinische Hymenopteren. *Anales del Museo Nacional de Historia Natural de Buenos Aires*, 1, 91–117.
- Sichel, J. (1867) Hymenoptera fossoria et mellifera. In: Akademie d. Wissenschaften Wien (Ed.), *Reise der Österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wüllerstorff-Urbair. Zoologische Teil, 2 Bde*. Karl Gerold's Sohn, Wien, pp. 141–156.
- Smith, F. (1854) *Catalogue of Hymenopterous Insects in the Collection of the British Museum. Part II. Apidae*. British Museum, London, 267 pp. [pp. 199–465]
- Snelling, R.R. & Brooks, R.W. (1985) A review of the genera of cleptoparasitic bees of the tribe Ericrocini [sic] (Hymenoptera: Anthophoridae). *Contributions in Science Natural History Museum of Los Angeles County*, 369, 1–34.
- Spinola, M. (1851) Himenopteros. In: Gay, C. (Ed.), *Historia Física y Política de Chile. Zoología. Vol. 6*. Casa del autor, Paris, pp. 153–569.

- Taschenberg, E. (1883) Die Gattungen der Bienen (Anthophila). *Berliner Entomologische Zeitschrift*, 27, 37–100.  
<http://dx.doi.org/10.1002/mmnd.18830270106>
- Toro, H. (1986a) Lista preliminar de los ápidos chilenos. *Acta Entomológica Chilena*, 13, 121–132.
- Toro, H. (1986b) Problemas en la introducción y desarrollo de la apicultura en zonas áridas o semiáridas de Chile. *Boletín de la Sociedad de Biología de Concepción*, 57, 81–88.
- Vivallo, F. (2013) Revision of the bee subgenus *Centris* (*Wagenknechtia*) Moure, 1950 (Hymenoptera: Apidae: Centridini). *Zootaxa*, 3683 (5), 501–537.  
<http://dx.doi.org/10.11646/zootaxa.3683.5.1>
- Vivallo, F., Zanella, F.C.V. & Toro, H. (2002) Las especies chilenas de *Centris* (*Wagenknechtia*) Moure, 1950 (Hymenoptera: Apidae). *Acta Entomológica Chilena*, 26, 59–80.
- Vivallo, F., Zanella, F.C.V. & Toro, H. (2003) Las especies chilenas de *Centris* (*Paracentris*) Cameron, 1903 y *Centris* (*Penthemisia*) Moure, 1950 (Hymenoptera: Apidae). In: Melo, G.A.R. & Alves-dos-Santos, I. (Eds.), *Apoidea Neotropica: Homenagem aos 90 anos de Jesús Santiago Moure*. UNESCO, 2003, Criciúma, pp. 77–83.
- Wagenknecht, R. (1969) Contribución a la biología de los Apoidea chilenos. *Anales del Museo de Historia Natural de Valparaíso*, 2, 171–181.
- Wagenknecht, R. (1971) Contribución a la biología de los Apoidea chilenos. *Anales del Museo de Historia Natural de Valparaíso*, 4, 277–286.
- Zanella, F.C.V. (2002) Sistemática, filogenia e distribuição geográfica das espécies sul-americanas de *Centris* (*Paracentris*) Cameron, 1903 e de *Centris* (*Penthemisia*) Moure, 1950, incluindo uma análise filogenética do “grupo *Centris*” sensu Ayala 1998 Hymenoptera, Apoidea, Centridini). *Revista Brasileira de Entomologia*, 46, 435–488.  
<http://dx.doi.org/10.1590/S0085-56262002000400001>