

Online Material

APPENDIX 1.

Justification for the use of *Scrapterinae* Melo and Gonçalves, 2005

In 2005, two family-group names were proposed to include the African colletid genus *Scrapter* Lepeletier and Serville (Ascher and Engel *in* Engel, 2005; and Melo and Gonçalves, 2005; the latter being published approximately two months earlier than the former; according to Ascher and Engel, 2006). *Scrapter* used to be traditionally included in Colletinae (*sensu* Michener, 2000) or in Paracolletini (Michener, 1989). Its removal from Colletinae and placement in a subfamily of its own makes the classification more concordant with the accumulating phylogenetic evidence for lack of a close relationship between *Scrapter* and remaining paracolletine bees (references in Melo and Gonçalves, 2005; Ascher and Engel *in* Engel, 2005). The two names are spelled differently, which facilitates their distinction: Melo and Gonçalves (2005) used the stem “Scrapter-”, whereas Ascher and Engel (*in* Engel, 2005) picked “Scraptr-”.

Based on the Principle of Priority (ICZN, 1999: article 23.1), the name proposed by Melo and Gonçalves (2005) is to be considered the senior synonym. However, Ascher and Engel (2006) claimed that the name based on the stem “Scrapter-” is not valid because Melo and Gonçalves did not comply with article 13.1 (ICZN, 1999) in providing an explicit diagnosis for the group. By accepting Ascher and Engel’s (2006) position, *Scrapterini* Melo and Gonçalves is to be interpreted as *nomen nudum*. Nevertheless, Melo and Gonçalves (2005) listed various references that indirectly serve for the diagnosis of the group and,

therefore, comply with Article 13.1.2 of the Code (ICZN, 1999).

Because we believe the interpretation of this matter remains contentious and depends on the subjective interpretation of article 13.1, we prefer to remain neutral on this and adhere to the Principle of Priority, which favors the name by Melo and Gonçalves (2005). The name used throughout the paper hence is **Scrapterinae** Melo and Gonçalves.

Finally, we would like to point out that the reason for this choice does not have to do with the adoption of a more correct spelling of the stem of the family-group name based on *Scrapter*. Under the International Code of Zoological Nomenclature, stems of both names, i.e. Scrapter- and Scraptr-, are equally acceptable because they were proposed after 1999 (ICZN, 1999: Article 29.4.2; and, for further discussion, see Ascher and Engel, 2006: 118).

REFERENCES

- Ascher J.S., Engel M.S. (2006) On the availability of family-group names based on *Scrapter* (Hymenoptera: Colletidae), *Entomol. News* 117, 117–119.
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- Engel M.S. (2005) Family-group names for bees (Hymenoptera: Apoidea), *Am. Mus. Novit.* 3476, 1–33.
- Melo G.A.R., Gonçalves R.B. (2005) Revised bee classifications (Hymenoptera, Apoidea, Apidae *sensu lato*), *Rev. Bras. Zool.* 22, 153–159.
- Michener C.D. (1989) Classification of American Colletinae (Hymenoptera, Apoidea), *Univ. Kans. Sci. Bull.* 53, 622–703.
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APPENDIX 2

Additional morphological character states

For a full description of the characters see Packer (2008: Appendix 1). An asterisk marks a state that was present in the original matrix but was redefined for current purposes.

Character #	Additional state(s)
25	6. Metasomal terga with amber submarginal zones
38	3*. S2 specialised hairs sparse
39	3. S4 with long erect hairs
40	4. S5 with long erect hairs and apical hair row
41	9. S6 with hairs
61	4*. Labrum narrowly concave apically
82	4. Genal margin mostly parallel to posterior margin of compound eye
86	5. F1 petiolate
119	2. Stigma absent
140	4*. S7 ventral lobe anteriorly directed basally, laterally directed apically
143	9. S7 dorsal lobe triangular
144	4*. S7 apical disk unique 9*. S7 apical disk unique
145	8. S8 apical lobe unique
151	3. Inner posterior margin of gonoforceps with acute process
152	5. Mesovenral lobe of gonoforceps broadly based, swollen
153	4. Membranous lobe of gonoforceps long and broadly attached
156	8. Gonostylus unique
164	3. Paraocular area with triangular pale marking
174	5. Metasomal terga with sparse apical bands of silver setae
179	4. Frontal line below broadly raised
181	9. Facial fovea broadly S-shaped
184	6*. Epipharyngeal tongs with apex unique
191	4. Basal articulation of cardo L-shaped
210	2. Premental rods of intermediate length
211	4. Prementum ventrally angularly convex
214	7. Premental lobe short, bilobed 8. Premental lobe parallel-sided basally, flared apically
226	9. Metapleural flange broadly convex

Table S1. List of species included in this study and their respective locality data.

Species	Collecting Information
<i>Trichocolletes (Trichocolletes) sp.</i>	AUSTRALIA. NSW. 53 km S Oberon. 30.xi.1999
<i>Colletes bicolor</i> Smith 1879	CHILE. Region II (Antofagasta). 16 km. N Taltal. 5.x.2002
<i>Colletes bicolor</i> Smith 1879	ARGENTINA. Tucumán. 2 km ENE Amaicha del Valle. 24.x.2004
<i>Scrapier heterodoxus</i> (Cockerell 1921)	SOUTH AFRICA. WCP. 31 km S Clanwilliam. 7.ix.2001
<i>Scrapier niger</i> Lapeletier & Serville 1825	SOUTH AFRICA. WCP. 21 km N Hermanus. 28.ix.2001
<i>Hyleoides concinna</i> (Fabricius 1775)	AUSTRALIA. Queensland. South of Eukey. 18.xii.2002
<i>Hylaeus (Prosopis) affinis</i> (Smith 1853)	USA. NY. Tompkins Co., Ithaca.
<i>Euhesma platyrhina</i> (Cockerell 1915)	AUSTRALIA. WA; Kalbarri Nat.Prk. Rd to Z-Bend, 5 km along. 08.x.2005
<i>Euhesma aff. crabronica</i> (Cockerell 1914)	AUSTRALIA. WA; Eurardy Stat. 09.x.2005
<i>Callohesma calliopsella</i> (Cockerell 1910)	AUSTRALIA. Victoria. Yan yaen. 20.xi.1999
<i>Geodiscelea longiceps</i> Packer, 2005	CHILE. Region I (Tarapacá). HWY.687, km 29. ~ 62 km ESE Pozo Almonte. 9.iv.2004
<i>Chilimelissa nortina</i> Toro & Moldenke, 1979	CHILE. Region III (Atacama). Aguas Blancas S of Toconao
<i>Chilimelissa rozeni</i> Toro & Moldenke, 1979	CHILE. Region III (Atacama). Panamerican Hwy., km 1005, NE Chanaral
<i>Chilimelissa australis</i> Toro & Moldenke, 1979	ARGENTINA. Santa Cruz. 20 km E Los Antiguos. 17.xi.2003
<i>Chilimelissa australis</i> Toro & Moldenke 1979	ARGENTINA. Santa Cruz. 20 km E Los Antiguos. 17.xi.2003
<i>Chilimelissa irwini</i> Toro & Moldenke, 1979	ARGENTINA. Santa Cruz. 25 km E Los Antiguos. 25.0m. 22.xi.2003. "pan trap"
<i>Chilimelissa pedroi</i> Toro & Moldenke, 1979	CHILE. Region II (Antofagasta). Aguas Blancas, S of Toconao
<i>Chilimelissa rosie</i> Toro & Packer, 2001	CHILE. Region II (Antofagasta). Aguas Blancas, S of Toconao
<i>Chilimelissa laureli</i> Toro & Packer, 2001	CHILE. Region I (Tarapacá). Near Zapahuira. iv.2004
<i>Chilimelissa chusmiza</i> Toro, 1981	CHILE. Region I (Tarapacá). Chusmiza. iv.2004
<i>Chilimelissa</i> sp.1 ¹	ARGENTINA. Tucumán. Los Cardones; 19 km SE Amaicha del Valle. 2765m. 17.ii.2003
<i>Chilimelissa</i> sp.2 ¹	CHILE. Region I (Tarapacá). km 46.8, 79.8 km ESE Pozo Almonte. iv.2004
<i>Chilimelissa</i> sp.3 ¹	CHILE. Region II (Antofagasta). 10 km SE Chug Chung, W of Chuquicamata. 31.x.2000
<i>Xeromelissa wilmattae</i> Cockerell, 1926	CHILE. Region II (Antofagasta). Chusmiza. iv.2004. on Malvaceae
<i>Xenochilicola mamigna</i> Toro & Moldenke 1979	CHILE. Region I (Tarapacá). HWY.687, km 50.5. ~83.5km ESE Pozo Almonte
<i>Chilicola (Aneodisceleis) herbsti</i> (Friese, 1906)	CHILE. Region IV (Coquimbo). Limari, Chañar. 04.ix.2004
<i>Chilicola chubutense</i> Packer, 2007 ²	ARGENTINA. Region IV (Coquimbo). Limari, Chañar. 04.ix.2004
<i>Chilicola (Stenoedisceleis) inermis</i> (Friese, 1906)	CHILE. Region IV (Coquimbo). Limari, Chañar. 04.ix.2004
<i>Chilicola (Stenoedisceleis) denisii</i> Packer, 2007	ARGENTINA. Santa Cruz. 20 km E Los Antiguos. 17.xi.2003

Table S1. Cont.

Species	Collecting Information
<i>Chilicola liliانا</i> Packer, 2007 ³	ARGENTINA. Santa Cruz. 56 km S Perito Moreno. 23.xi.2003
<i>Chilicola (Pseudiscelis) rostrata</i> (Friese, 1906)	ARGENTINA. Tucumán. Los Cardones; 19 km SE Amaicha del Valle. 2765m. 17.ii.2003
<i>Chilicola (Oroediscelis) sp.</i>	BOLIVIA. La Paz. Sorata, env. 3100 m. 20.iv.1997 (open shrub). "s.s. B-04"
<i>Chilicola (Oroediscelis) styliiventris</i> (Friese, 1908)	PERU. Junin Dept. Tarma. 22.x.1999
<i>Chilicola (Chiltoediscelis) patagonica</i> Toro & Moldenke, 1979	ARGENTINA. Santa Cruz. 25 km S Los Antiguos. 22.xi.2003
<i>Chilicola (Chiltoediscelis) araucana</i> Toro & Moldenke, 1979	ARGENTINA. Santa Cruz. 23 km E Las Heras. 16.xi.2003.
<i>Chilicola aenigma</i> Packer, 2007	ARGENTINA. Santa Cruz. 20 km E Los Antiguos. 17.xi.2003
<i>Chilicola aenigma</i> Packer, 2007	ARGENTINA. Santa Cruz. 25 km S Los Antiguos. 22.xi.2003
<i>Chilicola (Oediscelis) vernalis</i> (Philippi 1866)	CHILE. Region IV (Coquimbo). Parque Nacional Fray Jorge. 12.iv.2000
<i>Chilicola (Heteroediscelis) vicugna</i> Toro & Moldenke, 1979	CHILE. Region IV (Coquimbo). Elqui, Pangué. 11-30.ix.2004
<i>Chilicola (Oediscelis) tricarminatoides</i> Packer, 2007	ARGENTINA. Chubut. 8 km S Rada Tilly. 30m. 24.xi.2003

¹ Descriptions of these three species are given by: Packer (in press) New descriptions of *Xeromelissa* (Hymenoptera: Apoidea: Colletidae), Zootaxa.].

² *Chilicola chubutense* is used here to represent the taxon represented by *Cc. unicarinata* by Packer L. (2008) [Packer L. (2008) Phylogeny and classification of the Xeromelissinae (Hymenoptera: Apoidea, Colletidae) with special emphasis upon the genus *Chilicola*, Syst. Entomol., in press, published article online: 6 September, 2007: doi: 10.1111/j.1365-3113.2007.00398.x].

³ *Chilicola liliانا* is used here to represent the taxon represented by *Cc. olmue* by Packer (2008).

Table S2. Primer sequences for EF-1a, 28S rRNA, and COI used for PCR assays of bees.

Locus	Primer	Sequence	Reference
EF-1a (F2 copy) ^a	HaF2For1	5'-GGG YAA AGG WTC CTT CAA RTA TGC -3'	Danforth et al., 1999
	For3rho	5'-GGY GAC AAY GTT GTT TTY AAY G -3'	Danforth et al., 1999
	F2-rev1	5'-A ATC AGC AGC ACC TTT AGG TGG -3'	Danforth et al., 1999
	Cho10-Rev(mod)	5'-AC RGC VAC KGT YTG HCK CAF GTC -3'	Danforth et al., 1999
28S rRNA ^b	A-28S-For	5'-CCC CCT GAA TTT AAG CAT AT-3'	Ward and Brady, 2003
	Bel28S-For (D2-3665F)	5'-AGA GAG AGT TCA AGA GTA CG TG -3'	Belshaw and Quicke, 1997
	Mar28S-Rev (D3-4283R)	5'-TAG TTC ACC ATC TTT CGG GTC CC -3'	Mardulyn and Whitfield, 1999
	28SD4-Rev (D5-4749R)	5'-GTT ACA CAC TCC TTA GCG GA -3'	Danforth et al., 2006a
COI ^c	LCO	5'-GGTCAACAAATCAATAAAGATATTGG -3'	Folmers et al., 1994
	LCO Hym	5'-CAAATCATAAAGATATTGG -3'	Schulmeister et al., 2004
	LCO bee1 FOR	5'-TCWACMAATCAWAAARAYATTGG -3'	original primer sequence
	HCO	5'-TAAACTTCAGGGTGACCAAAAATCA -3'	Folmers et al., 1994
	HCO extA hym	5'-GAAAGTTATATTTTAAATTTTACCTGG -3'	Schulmeister et al., 2004
	HCO extB hym rev	5'-CCTATTGAWARAAACATARTGAAAATG -3'	Schulmeister et al., 2004
	HCO out hym rev	5'-CCAGGTAAAATTAATAATATAAACTTC -3'	Schulmeister et al., 2004
	HCO outout hym rev	5'-GTAAATATATGRTGDGCTC -3'	Schulmeister et al., 2004
	HCO (mod A)	5'-ATABACTTCWGGRTGWCCAAARAATCA -3'	original primer sequence
	HCO (mod B)	5'-ACTTCWGGRTGWCCAAARAATCAAAATAA -3'	original primer sequence

^a PCR conditions. HaF2For1 / F2-rev1: 94 °C for 1 min, 48–52 °C for 1.5 min (35 cycles); For3rho / Cho10-Rev(mod): 94 °C for 1 min, 54–56 °C for 1 min, 72 °C for 1 min (35 cycles).

^b PCR conditions. A-28S-For Mar28S-Rev: 94 °C for 1 min, 58 °C for 1 min, 72 °C for 1.5 min (35 cycles); Bel28S-For / 28SD4-Rev: 94 °C for 1 min, 58 °C for 1 min, 72 °C for 1.5 min (35 cycles).

^c PCR conditions: 94 °C for 1 min, 48–52 °C for 1.5 min (35 cycles).

Table S3. List of species included in this study and their respective voucher numbers and GenBank accession numbers.

Species	Voucher #	EF-1alpha	28S rRNA	COI
<i>Trichocolletes (Trichocolletes) sp.</i>	Trsp708	AY585139	DQ872760	DQ872677
<i>Colletes bicolor</i> Smith 1879	EA0044	DQ884646	DQ768535	DQ872688
<i>Colletes bicolor</i> Smith 1879	EA0082	DQ884650	DQ768539	DQ872692
<i>Scapter heterodoxus</i> (Cockerell 1921)	Scht903	AY585136	DQ872773	—
<i>Scapter niger</i> Lepeletier & Serville 1825	Scng905	AY585137	DQ872774	—
<i>Hyleoides concinna</i> (Fabricius 1775)	KM268	DQ884691	DQ768601	DQ872734
<i>Hylaeus (Proxopsis) affinis</i> (Smith 1853)	KM112	DQ884672	DQ768581	—
<i>Euhesma platyrhina</i> (Cockerell 1915)	EA0148	DQ884652	DQ768541	DQ872694
<i>Euhesma aff. crabronica</i> (Cockerell 1914)	EA0155	DQ884654	DQ768543	—
<i>Callohesma calliopsella</i> (Cockerell 1910)	Euca688	AY585126	DQ872768	DQ872696
<i>Geodiscelis longiceps</i> Packer, 2005	EA0049	DQ884655	DQ768544	DQ872700
<i>Chilimelissa nortina</i> Toro & Moldenke, 1979	EA0052	DQ884657	DQ768546	DQ872702
<i>Chilimelissa rozeni</i> Toro & Moldenke, 1979	ChrZ857	AY585120	DQ872776	DQ872714
<i>Chilimelissa australis</i> Toro & Moldenke, 1979	EA0051	DQ884656	DQ768545	DQ872701
<i>Chilimelissa australis</i> Toro & Moldenke 1979	EA0141	DQ872741	DQ768555	DQ872711
<i>Chilimelissa irwini</i> Toro & Moldenke, 1979	EA0053	DQ884658	DQ768547	DQ872703
<i>Chilimelissa</i> sp. ¹	EA0138	DQ884659	DQ768554	DQ872710
<i>Chilimelissa pedroi</i> Toro & Moldenke, 1979	EA0153	DQ872742	DQ768556	DQ872712
<i>Chilimelissa rosie</i> Toro & Packer, 2001	EA0132	DQ872738	DQ768551	DQ872707
<i>Chilimelissa laureli</i> Toro & Packer, 2001	EA0133	DQ872739	DQ768552	DQ872708
<i>Chilimelissa chusmiza</i> Toro, 1981	EA0134	DQ872740	DQ768553	DQ872709
<i>Chilimelissa</i> sp. ²	EA0131	DQ872737	DQ768550	DQ872706
<i>Chilimelissa</i> sp. ³	EA0154	DQ872743	DQ768557	DQ872713
<i>Xeromelissa wilmattae</i> Cockerell, 1926	EA0054	DQ872735	DQ768548	DQ872704
<i>Xenochilicola mamigna</i> Toro & Moldenke 1979	EA0055	DQ884660	DQ768558	DQ872715
<i>Chilicola (Anoediscelis) herbsti</i> (Friese, 1906)	EA0140	DQ884663	DQ768572	DQ872729

Table S3. Cont.

Species	Voucher #	EF-1alpha	28S rRNA	COI
<i>Chilicola chubutense</i> Packer, 2007 ²	EA0067	DQ872753	DQ768568	DQ872725
<i>Chilicola (Stenoediscelis) inermis</i> (Friese, 1906)	EA0139	DQ872754	DQ768571	DQ872728
<i>Chilicola (Stenoediscelis) denisii</i> Packer, 2007	EA0058	DQ872745	DQ768560	DQ872717
<i>Chilicola lilitana</i> Packer, 2007 ³	EA0060	DQ872746	DQ768561	DQ872718
<i>Chilicola (Pseudoediscelis) rostrata</i> (Friese, 1906)	EA0137	DQ884662	DQ768570	DQ872727
<i>Chilicola (Oroediscelis) sp.</i>	EA0063	DQ872749	DQ768564	DQ872721
<i>Chilicola (Oroediscelis) styliventris</i> (Friese, 1908)	Chsp800	AY585121	DQ872780	DQ872730
<i>Chilicola (Chilioediscelis) patagonica</i> Toro & Moldenke, 1979	EA0064	DQ872750	DQ768565	DQ872722
<i>Chilicola (Chilioediscelis) araucana</i> Toro & Moldenke, 1979	EA0065	DQ872751	DQ768566	DQ872723
<i>Chilicola aenigma</i> Packer, 2007	EA0061	DQ872747	DQ768562	DQ872719
<i>Chilicola aenigma</i> Packer, 2007	EA0066	DQ872752	DQ768567	DQ872724
<i>Chilicola (Oediscelis) vernalis</i> (Philippi 1866)	EA0057	DQ872744	DQ768559	DQ872716
<i>Chilicola (Heteroediscelis) vicugna</i> Toro & Moldenke, 1979	EA0136	DQ884661	DQ768569	DQ872726
<i>Chilicola (Oediscelis) tricarinatoides</i> Packer, 2007	EA0062	DQ872748	DQ768563	DQ872720

¹ Descriptions of these three species are given by Packer (in press) [Packer L. (in press) New descriptions of *Xeromelissa* (Hymenoptera: Apoidea: Colletidae), Zootaxa].

² *Chilicola chubutense* is used here to represent the taxon represented by *Cc. unicarinata* by Packer L. (2008) [Packer L. (2008) Phylogeny and classification of the Xeromelissinae (Hymenoptera: Apoidea, Colletidae) with special emphasis upon the genus *Chilicola*, Syst. Entomol., in press, published article online: 6 September, 2007: doi: 10.1111/j.1365-3113.2007.00398.x].

³ *Chilicola lilitana* is used here to represent the taxon represented by *Cc. olmue* by Packer (2008).