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## Two new species of *Geodiscelis* Michener & Rozen (Hymenoptera: Apoidea: Colletidae) with a phylogenetic analysis and subgeneric classification of the genus

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### Abstract

Two new species of the genus *Geodiscelis* are described: *Geodiscelis nazcalinea* Packer & Dumesh, **sp. nov.** from Peru (the first record of the genus from that country) and *G. phisquiri* Packer & Dumesh, **sp. nov.** from northern Chile. The new species are most closely related to *G. longiceps*, but differ primarily in having somewhat less elongate heads and in details of the male terminalia. A key to the five known species of the genus is provided as are the results of a phylogenetic analysis based upon 68 characters, and the genus is formally divided into three subgenera: *Geodiscelis s. str.* Michener and Rozen, *Geodiscelis (Nazcoediscelis)* Packer and Dumesh, subgenus nov. and *Geodiscelis (Thaumodiscelis)* Packer and Dumesh, subgenus nov. The two new species described herein belong to subgenus *Geodiscelis (Nazcoediscelis)*. Figures of the most important characters are provided. *Tiquilia* sp. (Boraginaceae) is the probable floral host of both new species and it is suggested that all species are ground-nesters. Sexual dimorphism in an unusual character is recorded for *G. thaumaskelos* Packer.

**Key words:** bee, Xeromelissinae, extreme modifications, sexual dimorphism, nectaries, Boraginaceae, Peru, Chile

### Introduction

*Geodiscelis* Michener & Rozen, 1999 was described based upon an Argentinean species with an unusual combination of morphological characteristics (Michener & Rozen, 1999). The type species, *G. megacephala* Michener & Rozen, 1999 has unmodified maxillary palpi, epistomal lobe invading the surface of the clypeus almost reaching the clypeal apex, and a pale banded metasoma. The epistomal lobe characteristic was previously considered to be apomorphic among Xeromelissinae only for *Xeromelissa* Cockerell, 1926 *sensu* Packer (2008) (Toro & Moldenke, 1979), but all species of that genus have modified maxillary palpi, usually with the basal 3 palpomeres distinctly more robust than the apical 3 (Toro & Moldenke, 1979; Packer, 2005, 2008). Phylogenetic analysis suggests that the epistomal lobe and pale integumental metasomal band characters are synapomorphies linking *Geodiscelis* with its sister taxon, *Xeromelissa* (Packer, 2008). The unmodified maxillary palpus is plesiomorphic (Packer, 2008).

Two additional species of *Geodiscelis* have been described, both remarkably divergent from the type species, but in entirely different ways. *Geodiscelis longiceps* Packer, 2005 has an enormously elongate head with the malar space longer than the compound eye (Packer, 2005). *Geodiscelis thaumaskelos* Packer, 2009 has the malar space strongly reduced but possesses remarkably modified hind legs in the male (all other species of the genus have entirely unmodified male hind legs); it also lacks the inner hind tibial spur in both sexes and the females have an almost glabrous second metasomal sternum (Packer, 2009). This last feature is contrary to what had been a defining characteristic of the subfamily Xeromelissinae among non-cleptoparasitic bees: the scopa on S2 is as well, or better, developed than that on the hind leg (Michener 2007, p. 127; Packer & Ratti, 2009). For a genus containing so few species, the morphological diversity found in *Geodiscelis* is extreme.

During a field trip to Peru in 2009, another new species of *Geodiscelis* was discovered and is described herein. More recently, an additional new species was discovered in northern Chile and is also described. We also present

Aymara language. We are grateful Victor Gonzalez for arranging to have additional specimens sent to us and to Jerry Rozen, Claus Rasmussen and an anonymous reviewer for careful, and useful, reviews of the submitted manuscript. Fieldwork in Chile and Peru was supported by a York University Faculty Association Sabbatical Leave Fellowship, the Natural Science and Engineering Research Council of Canada and the senior author's salary. The junior author's contribution was partially funded by the Vice President for Research and Innovation and the Faculty of Science at York University. The imaging system was purchased through a Canadian Foundation for Innovation award through Canadensys.

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## APPENDIX 1.

Characters 1–59 were scored from males, 60–68 were scored from females although due to a lack of sexual dimorphism, *G. phisquiri* sp. nov. was scored for some of them despite being known only from the male on the basis of a lack of sexual dimorphism in the same characters for the other included species.

- 1 Paraocular area colour: 0 dark (Fig. 2); 1 with yellow that does not attain lower margin of antennal socket (Fig. 17); 2 yellow attaining lower margin of antennal socket (Fig. 31).
- 2 Malar area colour: 0 dark (Fig. 31); 1 with yellow (Figs. 2 and 11).
- 3 Profemur colour: 0 with some yellow (Packer, 2014, Fig. 7); 1 all yellow, or yellow except dorsobasally (Figs. 1 and 10).