

The first record of the genus *Gracilidris* (Hymenoptera: Formicidae: Dolichoderinae) from Colombia

Primer registro del género *Gracilidris* (Hymenoptera: Formicidae: Dolichoderinae) para Colombia

ROBERTO J. GUERRERO¹ and CATALINA SANABRIA²

Abstract: The dolichoderine ant genus *Gracilidris* and its sole species, *G. pombero*, are recorded for the first time for Colombia from populations from the foothills of the Colombian Amazon basin. Comments and hypotheses about the biogeography of the genus are discussed.

Key words: Ants. Biodiversity. Caquetá. Colombian Amazon. Grazing systems.

Resumen: El género dolicoderino de hormigas *Gracilidris* y su única especie, *G. pombero*, son registrados por primera vez para Colombia, de poblaciones provenientes del piedemonte de la cuenca Amazónica colombiana. Algunos comentarios e hipótesis sobre la biogeografía del género son discutidos.

Palabras clave: Hormigas. Biodiversidad. Caquetá. Amazonas colombiano. Pasturas ganaderas.

Introduction

Currently, dolichoderine ants (Hymenoptera: Formicidae: Dolichoderinae) include 28 extant genera (Bolton *et al.* 2006; Fisher 2009) distributed in four tribes according to the latest higher level classification of the ant subfamily Dolichoderinae (Ward *et al.* 2010). Eleven of those extant genera occur in the New World: *Bothriomyrmex*, *Dolichoderus*, *Liometopum*, *Tapinoma*, and *Technomyrmex* have a global distribution, while *Anillidris*, *Azteca*, *Dorymyrmex*, *Forelius*, *Gracilidris*, and *Linepithema* are endemic to the New World. Some of these members are species-rich and have a wide distribution in the Americas (e.g., *Dolichoderus*) while others like *Bothriomyrmex* are species-poor and of very limited distribution (i.e., Costa Rica; Dubovikoff and Longino 2004).

The taxonomy of the Dolichoderinae began to be clarified from the 1990s' (Shattuck 1992); before and during this decade, the taxonomy of these ants in the New World received limited attention, with some exceptions (Longino 1989, 1991a, 1991b 1996; Mackay and Mackay 1993). A new millennium, however, has brought about a golden decade for these ants, carrying out general taxonomic contributions (e.g., Cuzzo 2000; Wild 2007) or regional studies to discoveries of new taxa at the supra-specific level (Wild and Cuzzo 2006) and transfers of taxa at the subfamily level (Ward and Brady 2009).

The picture in Colombia has been similar. Efforts to know about the dolichoderine ant fauna in Colombia have increased since 2007; resulting in new Colombian species of the genera *Technomyrmex* (Fernández and Guerrero 2008) and *Forelius* (Guerrero and Fernández 2008). We report here for the first time in Colombia the ant species *Gracilidris pombero* Wild & Cuzzo, 2006, and discuss hypotheses about the possible

distribution of the genus *Gracilidris* in South America. We also discuss each of the dolichoderine genera that occur in Colombia.

Methods

We separated *G. pombero* specimens from all ants collected in the project "Amaz_BD: Biodiversidad de los paisajes Amazónicos, determinantes socio-económicos y producción de bienes y servicios". This research was carried out in Caquetá department located in the western foothills of the Colombian Amazon basin. The ants were collected through topsoil sampling. Soil samples were 25 cm² in area by 10 cm deep. Prior to excavation, the soil surface was examined to collect all arthropods and other invertebrates present. Subsequently, the soil was transferred to a container where all invertebrates contained in the sample were collected and preserved in EtOH. This unusual method of collecting led to the partial damage of all specimens of *G. pombero* studied here. Despite the damage the specimens had diagnostic characters of the genus and species allowing their identification.

Vouchers were deposited in the following collections and institutions (abbreviations in parentheses): California Academy of Sciences, San Francisco, California, U.S.A. (CASC); Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá D.C., Colombia (ICN); Museo de Entomología de la Universidad del Valle, Santiago de Cali, Valle del Cauca, Colombia (MEUV).

Some measurements are those used by Wild y Cuzzo (2006) to describe the *G. pombero* holotype and made using a Nikon stereomicroscope SMZ645 at 80X magnification with ocular micrometer. Measurements are expressed in mm. The images of the ants were generated with a Nikon Coolpix digi-

¹ Biologist. Grupo de Investigación en Insectos Neotropicales. Instituto de Investigaciones Tropicales - INTROPIC. Universidad del Magdalena. Carrera 32 N° 22-08, Santa Marta, Magdalena, Colombia. Current address: Programa de Doctorado en Zoología. Instituto de Zoología y Ecología Tropical. Universidad Central de Venezuela. Caracas, Venezuela. robertojoseguerroflores@yahoo.es. Corresponding author. ² Biologist. Grupo Biología, Ecología y Manejo de Hormigas. Facultad de Ciencias. Departamento de Biología. Universidad del Valle. Campus Universitario Meléndez, Santiago de Cali, Valle del Cauca, Colombia.

tal camera adapted to SMZ645 stereoscope; one of us (RJG) took 20 pictures at the same scale but at different depths of field. These photographs were then used to generate a single image through the software CombineZ5. Finally, the figures were prepared in CorelDraw® Graphics Suite X3.

Results

Subfamily Dolichoderinae

Genus *Gracilidris* Wild & Cuzzo, 2006

Gracilidris pombero Wild & Cuzzo, 2006

(Figures 1-2)

Worker measurements

(n= 4): HL 0.85 – 0.91, HW 0.62 – 0.70, SL 0.96 – 1.03, FL 0.78 – 0.93, LHT 0.91 – 1.05, PW 0.48 – 0.52, WL 1.35 – 1.40.

Material examined: *Gracilidris pombero*. 9 workers (w).

COLOMBIA: Caquetá: Florencia. Municipio Puerto Arango. 1°30'29.4"N 75°32'57.3"W. vi. 2008. Sanabria, C. leg (8w); San Juan del Barro. 1°25'43.3"N 75°29'30.3"W. vi. 2008. Sanabria, C. leg. (1w).

Natural History: The Colombian specimens of *Gracilidris pombero* came from the western foothills of the Colombian Amazon basin. All specimens of *G. pombero* were collected in mixed environments highly disturbed by man, as a result of logging and the introduction of livestock grazing. Puerto Arango sites are open grassland areas (traditional grazing system) where the vegetation is predominantly *Brachiaria humidicola* (Rendle) Schweick (Poaceae alt. Gramineae); San Juan del Barro sites are for silvopastoral systems consisting primarily of pasture with scattered shrubs.

Collection records of *G. pombero* indicate that this species probably forages actively during the day, through shallow underground galleries (0-10 cm depth), because all specimens are from subsurface samples and none was collected at ground level during diurnal visual searches and at depths greater than 10 cm. Although there are few data on its biology, *G. pombero* ants from Colombia show a behavior similar to that present in the populations of Argentina, Brazil and Paraguay. Given its current range, wherever it has been recorded, *G. pombero* is found in open areas with some degree of human disturbance, especially grazing areas. Moreover, the possibility of nocturnal behavior (Wild and Cuzzo 2006) is corroborated by the absence in our daytime sampling, and their appearance in the soil samples.

Comments: Ants reported here correspond to the genus *Gracilidris* and its only living species *G. pombero*, because they maintain the combination of diagnostic characters of the genus and the morphological details of the species listed in Wild and Cuzzo (2006). In spite of agreeing in all diagnostic characters, there are small differences between Colombian populations and the Chaco and Brazilian region ones. The middle region of the posterior cephalic margin is more or less straight in Colombian ants, while Paraguayan and Brazilian ants have a smooth concavity in the middle of the posterior cephalic margin (Wild and Cuzzo 2006: Fig. 1). The trochanters, legs (femora and tarsi), and bulla of the metapleural gland are yellow to brown testaceous in Colombian ants, while in the workers from the southern portion of the range the appendices may become dark brown and sometimes with

body parts lighter, varying light brown to whitish (Wild and Cuzzo 2006: Figs. 2 and 3). Despite the minor variations in morphology and color, measurement ranges of the Colombian specimens overlap with the measurements of the populations of Argentina, Brazil and Paraguay.

Discussion

Based on previous works (Shattuck 1992; Mackay 1993; Fernández and Sendoya 2004; Wild 2007; Fernández and Guerrero 2008; Guerrero and Fernández 2008) it is now possible to give a first summary of the current state of the dolichoderine ant fauna in Colombia. The recent records of the ant genera *Forelius* and *Technomyrmex* in Colombia (Guerrero and Fernández 2008; Fernández and Guerrero 2008), with the description of new species in each of these taxa, allows us to recognize a total of eight dolichoderine genera (*Azteca*, *Dolichoderus*, *Dorymyrmex*, *Forelius*, *Gracilidris*, *Linepithema*, *Tapinoma*, and *Technomyrmex*) for the country:

Gracilidris in Colombia can be seen as a biogeographical rarity. However, the representation of this genus in Dominican amber in the form of *G. humilioides* (Wilson 1985; Wild and Cuzzo 2006) and estimated age of 43 million years (Ward *et al.* 2010) suggest their ancient presence in the Neotropics. The biogeographic situation of genus *Gracilidris* is similar to that of other dolichoderine genera in the New World such as *Technomyrmex* and *Bothriomyrmex*. Apparently each one represents a group of ants widely distributed in the past but now restricted to a few isolated forests in areas in the Neotropical region, perhaps as lineages that may become extinct (Fernández and Guerrero 2008) due to their high specificity and limited distribution.

Several hypotheses may explain the current distribution range of *Gracilidris*. The first reinforces a pattern that includes the Amazon Basin as a potential biogeographic barrier of the dolichoderine ants (Guerrero and Fernández 2008). Since *Gracilidris* lies above and below the Amazon basin (including the fossil record in its distribution), primarily in open environments, this suggests as in *Forelius* (Guerrero and Fernández 2008), that in the past *Gracilidris* lived from Para-

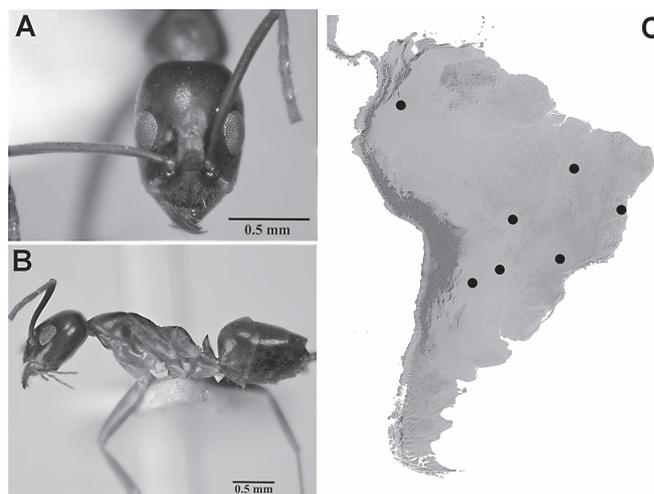


Figure 1. *Gracilidris pombero* Wild & Cuzzo worker from Florencia, Colombia. **A.** Head in full face view. **B.** Body in lateral view. **C.** Distribution of *Gracilidris pombero* Wild & Cuzzo in South America. (Adapted from Wild and Cuzzo 2006).

guay to Puerto Rico, including the Amazon basin during a period of drier climate. Increasing humidity and the emergence or expansion of an Amazonian wet forest could have resulted in local extinctions, with subsequent isolation of *Gracilidris* in the extreme north and south of the Amazon basin. The second hypothesis takes into account the effect of the rise of the Andes on the Amazon basin (Hooghiemstra and van der Hammen 2001; Hoorn 2006). In this case, the lifting of the Eastern slope of the Northern Andes (i.e., Colombian Eastern Cordillera), approximately during the late Miocene, changed the course of the rivers of the western Amazon basin to the east of the continent, resulting in the current Amazonian river system and therefore a new natural barrier that separated the constituent species of the genus (i.e., fossil *G. humiloides* and *G. pombero*). In the case of *G. pombero*, this new natural barrier separated Colombian populations from those of Brazil, Argentina and Paraguay. Given the peculiarity biogeographic pattern, it is necessary to perform molecular analysis at the population level in *G. pombero* to try and differentiate between these hypotheses.

Acknowledgments

RJG is grateful to Inge Armbrecht and James Montoya (University of Valle, Cali, Colombia) for funding the visit to their laboratory, and thus study the specimens of *G. pombero*. CS thanks the project "Amaz_BD" funding for travel to Florence and all the logistical support. "Amaz_BD" project was supported by IFB-ANR grant to Patrick Lavelle. We are indebted to Fernando Fernandez and Jack Longino for comments to first draft of MS. We are in debt with Phil Ward and Jack Longino for their comments invaluable and help us with English to final version of MS. We thank to editor and two referees for critical comments that improved this manuscript. This is scientific contribution number DOL-004 research project "Composición y Distribución de la Subfamilia Dolichoderinae (Hymenoptera: Formicidae) en Colombia" (Agreement # 122 COLCIENCIAS - University of Magdalena).

Cited Literature

- BOLTON, B.; ALPERT, G.; WARD, P. S.; NASKRECKI, P. 2006. Bolton's catalogue of ants of the world: 1758-2005. Harvard University Press, Cambridge, MA, USA. CD-ROM.
- CUEZZO, F. 2000 Revisión del género *Forelius* (Hymenoptera: Formicidae: Dolichoderinae). *Sociobiology* 35: 197-277.
- DUBOVIKOFF, D. A.; LONGINO, J. T. 2004. A new species of the genus *Bothriomyrmex* Emery, 1869 (Hymenoptera: Formicidae: Dolichoderinae) from Costa Rica. *Zootaxa* 776: 1-10.
- FERNÁNDEZ, F.; SENDOYA, S. 2004. List of Neotropical ants (Hymenoptera: Formicidae). *Biota Colombiana* 5: 3-109.
- FERNÁNDEZ, F.; GUERRERO, R. 2008. *Technomyrmex* (Formicidae: Dolichoderinae) in the New World: synopsis and description of a new species. *Revista Colombiana de Entomología* 34: 110-115.
- FISHER, B. L. 2009. Two new dolichoderine ant genera from Madagascar: *Aptinoma* gen. n. and *Ravavy* gen. n. (Hymenoptera: Formicidae). *Zootaxa* 2118: 37-52.
- GUERRERO, R.; FERNÁNDEZ, F. 2008. A new species of the ant genus *Forelius* (Formicidae: Dolichoderinae) from the dry forest of Colombia. *Zootaxa* 1958: 51-60.
- HOOGHIEMSTRA, H.; VAN DER HAMMEN, T. 2001. Desarrollo del bosque húmedo Neotropical en el Neógeno y en el Cuaternario: La hipótesis de los refugios. In: Llorente-Bousquets, J. & J. Morrone (Eds.), *Introducción a la Biogeografía en Latinoamérica*. UNAM, México, pp 129-136.
- HOORN C. 2006. The birth of the mighty Amazon. *Scientific American* 294: 40-47.
- LONGINO, J. T. 1989. Taxonomy of the *Cecropia*-inhabiting ants in the *Azteca alfari* species group: evidence for two broadly sympatric species. *Contributions in Science (Natural History Museum of Los Angeles County)* 412: 1-16.
- LONGINO, J. T. 1991a. *Azteca* ants in *Cecropia* trees: taxonomy, colony structure, and behavior. p. 271-288. In: Huxley, C.; Cutler, D. (Eds.). *Ant-Plant Interactions*. Oxford University Press, Oxford, UK. 601p.
- LONGINO, J. T. 1991b. Taxonomy of the *Cecropia*-inhabiting *Azteca* ants. *Journal of Natural History* 25: 1571-1602.
- LONGINO, J. T. 1996. Taxonomic characterization of some live-stem inhabiting *Azteca* (Hymenoptera: Formicidae) in Costa Rica, with special reference to the ants of *Cordia* (Boraginaceae) and *Triplaris* (Polygonaceae). *Journal of Hymenoptera Research* 5: 131-156.
- MACKAY, W., E. MACKAY 1993. A review of the New World ants of the genus *Dolichoderus* (Hymenoptera: Formicidae). *Sociobiology* 22: 1-144.
- SHATTUCK, S. O. 1992. Generic revision of the ant subfamily Dolichoderinae. *Sociobiology* 21: 1-181.
- WARD, P. S.; BRADY, S. G. 2009. Rediscovery of the ant genus *Amyrmex* Kusnezov (Hymenoptera: Formicidae) and its transfer from Dolichoderinae to Leptanilloidinae. *Zootaxa* 2063: 46-54.
- WARD, P. S.; BRADY, S. G.; FISHER, B. L.; SCHULTZ, T. R. 2010. Phylogeny and biogeography of dolichoderine ants: effects of data partitioning and relict taxa on historical inference. *Systematic Biology* 59: 342-362.
- WILD, A. L.; CUEZZO, F. 2006. Rediscovery of a fossil dolichoderine ant lineage (Hymenoptera: Formicidae: Dolichoderinae) and a description of a new genus from South America. *Zootaxa* 1142: 57-68.
- WILD, A. L. 2007. Taxonomic revision of the ant genus *Linepithema* (Hymenoptera: Formicidae). University of California Publications in Entomology 126: 1-151.
- WILSON, E. O. 1985. Ants of the Dominican amber. 3. The subfamily Dolichoderinae. *Psyche* 92: 17-37.

Recibido: 4-feb-2010 • Aceptado: 21-ene-2011