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First record of *Lenomyrmex inusitatus* (Formicidae: Myrmicinae) in Ecuador and description of the queen.

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Abstract

The rarely collected ant *Lenomyrmex inusitatus* Fernández 2001 is recorded for the first time in Ecuador. The queen is described. The new record is the southernmost limit of distribution for the genus. A key to the workers of the six *Lenomyrmex* species and a key for the known queens are provided.

Key Words: Ecuador, Formicidae, Keys, *Lenomyrmex*, Queen.

Resumen

Lenomyrmex inusitatus Fernández 2001, especie raramente coleccionada, se registra por primera vez para Ecuador y se describe la reina. Se amplía el rango de distribución del género hacia el sur. Se ofrece una clave para las obreras de todas las especies y reinas conocidas de *Lenomyrmex*.

Palabras clave: Clave, Ecuador, Formicidae, *Lenomyrmex*, Reina.

1. Introduction

The myrmicine ant genus *Lenomyrmex* Fernández and Palacio 1999 includes six species rarely collected from Costa Rica to Ecuador [1-3]. The genus is characterised by elongate mandibles bearing a series of minute peg-like denticles that arise behind the masticatory margin, by frontal lobes that are poorly expanded laterally, by large and deep antennal fossae, and by pedunculate petiole, with a poorly defined node [1]. The fact that *Lenomyrmex* possesses both primitive (e.g. promesonotal suture well developed) and derived (e.g. specialized morphology of the mandibles) characters makes ascertaining its correct phylogenetic position challenging [1-2, 4]. The genus was tentatively placed in its own tribe, Lenomyrmecini [5], but its position within the

Myrmicinae remains to be determined [5]. Preliminary results of a phylogenetic analysis (Ant-AToL project, <http://www.antweb.org/atol.jsp>) indicate that *Lenomyrmex* falls within a clade of predominantly New World ants that includes the tribes Attini, Cephalotini, Dacetini, and the genus *Pheidole* (T. Schultz and P. Ward, comm. pers.).

The worker of *Lenomyrmex inusitatus* Fernández 2001 is distinguished from other *Lenomyrmex* workers by smooth and shiny mesosoma with well-developed propodeal spines and by the foveolate-striate sculpture covering all the dorsal surface of its head [2]. *L. inusitatus* has an unusual distribution since it is the single *Lenomyrmex* species recorded east of the Andes [2]. Nevertheless, it was previously only known from the type locality ("Territorio Kofanes", Nariño, Colombia). Here, the species is recorded for the first time in the Eastern Cordillera of the South-Ecuadorian Andes.

Among *Lenomyrmex* species, the queen caste has been described only for *L. mandibularis* Fernández and Palacio 1999 and *L. wardi* Fernández and Palacio 1999. In this paper, we provide the first record and a description of the queen of *L. inusitatus*.

2. Materials and Methods

The sampling of *Lenomyrmex* in the Ecuadorian Andes is part of a rainfall exclusion experiment [6] and was based on the Winkler extraction method. The leaf litter inside a 0.25 or 0.5-m² quadrat was collected and sifted and its fauna was extracted during 48 h. All specimens were collected close to the Podocarpus National Park, within the "Copalinga" property, at 1420 m (Zamora-Chinchipe province, Ecuador). Vegetation

corresponds to an evergreen lower montane forest [7]. Mean annual precipitation is about 2100 mm. Mean temperature in the leaf litter from December 2009 to May 2010 was 18.5°C (min-max: 15.7-22.2°C).

A worker (# 4042619; from sample # 40426) and a queen (# 4042602, from the same sample) have been imaged (Figure 1 and 2, respectively) and are available at <http://projects.biodiversity.be/ants>.

Measurements and Indices. All measurements are in millimeters. The abbreviations are as follows:

HL Head length, measured in full face view, from the anterior margin of the medial lobe of the clypeus to the posterior border of the head (excluding the mandibles).

HW Head width, the maximum width of the head measured in full face view, excluding the compound eyes.

ML Mandible length, the maximum length of the mandible measured in dorsal view, from the anteriormost portion of the head to the apex of closed mandibles.

EL Eye length, the maximum diameter of the eye in frontal view.

SL Scape length, excluding the basal condyle and the neck.

WL Weber's length, measured diagonally in lateral view from the anterior edge of the pronotum to the posterior edge of the propodeal lobe.

PL Petiole length, the axial distance from the dorsal corner of the posterior peduncle to the nearest edge of the propodeal lobe.

PW Petiole width, the maximum transverse distance across the node measured in dorsal view.

PPL Postpetiole length, the axial distance from the base of the node in front to the tip of the posterior peduncle measured in lateral view.

PPW Postpetiole width, the maximum transverse distance across the postpetiole in dorsal view.

GL Gaster length, in lateral view, from the anterior edge of the first tergum to the posterior edge of the last visible tergum.

GW Gaster width, in dorsal view, the maximum transverse distance across the gaster.

TL Total length measured in lateral view (ML+HL+WL+PL+PPL+GL).

OI Ocular index, $EL/HW \times 100$.

CI Cephalic index, $HW/HL \times 100$.

SI Scape index, $SL/HL \times 100$.

Queens and workers have been deposited at the Royal Belgian Institute of Natural Sciences, Brussels, Belgium, (RBINS), the Laboratorio de Entomología - Universidad Técnica Particular de Loja, Loja, Ecuador (UTPL), and the Museo de Insectos, Instituto de Ciencias Naturales - Museo de Historia Natural, Universidad Nacional de Colombia, Santafé de Bogotá D.C., Colombia (ICN).

3. Results

3.1. Material examined.

A total of 34 workers and two dealated queens of *Lenomyrmex inusitatus* were collected. The worker (Figure 1) corresponds to the description of the holotype [2], except that it is slightly smaller.

Workers. ECUADOR: Zamora-Chinchiipe province: Zamora: Bombuscaro: Copalinga property; Lat: -4.083; Long: -78.967; 26.IV-01.V.2010; collected by Delsinne T. & Arias Penna T.; 34 workers in 23 Winkler samples (number of specimens / Winkler sample: 1 - 4); sample codes: 40343, 40367, 40369, 40374, 40375, 40382, 40387, 40391, 40395, 40417, 40418, 40424, 40426, 40428, 40437, 40439, 40440, 40446, 40449, 40453, 40455, 40457, 40459, 40461; RBINS, UTPL, ICN.

Worker measurements (# 4042619). TL 4.23, HL 0.74, HW 0.64, ML 0.41, SL 0.60, EL 0.16, WL 1.15, PL 0.62, PW 0.20, PPL 0.30, PPW 0.24, GL 1.11, GW 0.76, CI 86, OI 24, SI 81

Queens. ECUADOR: Same data as workers; two queens in two Winkler samples; sample codes: 40426 and 40343; RBINS, UTPL.

Queen measurements (# 4042602). TL 4.34, HL 0.75, HW 0.65, ML 0.41, SL 0.59, EL 0.20, WL 1.16, PL 0.64, PW 0.21, PPL 0.27, PPW 0.24, GL 1.11, GW 0.78, CI 86, OI 31, SI 79.

Queen diagnosis (Figure 2). As the worker [2] but differing in the following characters: anterior margin of clypeus mostly convex, with a slight median notch or concavity; compound eyes bigger, with 11-12 facets in maximum diameter; three ocelli present; mesosoma robust; dorsum of pronotum smooth and shiny, with sparse punctures; mesoscutum foveolate, with longitudinal striae; scutellum and axillae foveolate, with smooth and shiny interspaces; dorsum of propodeum completely smooth and polished; propodeal spines long and stout but shorter than distance

between their bases; mesopleuron with anepisternum clearly separated from katepisternum by a suture; lateral face of pronotum, anepisternum, katepisternum, metapleuron and lateral face of propodeum mostly smooth and shiny, with some sparse punctures; punctures of lateral and dorsal faces of petiole and postpetiole more defined and deeper than in workers; short and appressed pilosity more abundant on mesosoma than in workers.

3.2. *Key to the workers of the six described Lenomyrmex species.*

1. Mesosoma predominantly smooth and shiny, with no erect hairs...2.

- Mesosoma with conspicuous sculpture and at least a pair of erect hairs...3.

2(1). Propodeum without spines; head only foveolate (SW Colombia)...*foveolatus*.

- Propodeum with a pair of acute and well defined spines; head foveolate, with median longitudinal striae (Cordillera Oriental of the Andes in S Colombia and S Ecuador)...*inusitatus*.

3(1). Dorsum of head and petiole with longitudinal conspicuous costae; erect hairs of antennal scape as long as or longer than maximum diameter of scape; body ferruginous yellow (W Panama)...*costatus*.

- Dorsum of head densely rugo-reticulate; sculpture of the petiole variable, rugulate to rugo-reticulate or longitudinally striate but never costate; erect hairs of antennal scape not longer than maximum diameter of the scape; body brownish black or dark red brown...4.

4(3). Length of propodeal spines approximately equal to distance between their bases; mesopleuron with some irregular longitudinal striae, but mostly smooth and shiny; metapleuron with irregular longitudinal striae; HL > 0.80 mm; mesosoma with only two suberect hairs on the pronotum (SW Colombia)...*mandibularis*.

- Length of propodeal spines variable, either shorter or longer than distance between their bases; metapleuron and subsequent portion of mesopleuron with fine transverse rugulae or rugo-reticulate, without smooth areas; HL < 0.80 mm; mesosoma with numerous erect to suberect hairs...5.

5(4). Propodeal spines shorter than distance between their bases; eyes with six or seven facets in maximum diameter; petiolar node protruding over the peduncle and well defined; postpetiolar dorsum with longitudinal striae (NW Ecuador, SW Colombia)...*wardi*.

- Propodeal spines longer than distance between their bases; eyes with about nine facets in maximum diameter; petiolar node undifferentiated from the peduncle; postpetiolar dorsum smooth and polished (Costa Rica)...*colwelli*.

3.3. Key for the known queens of *Lenomyrmex*.

1. Head foveolate, with median longitudinal striae; mesosoma predominantly smooth and shiny, with sparse punctures on pronotum, mesopleuron, metapleuron, and propodeum, scutellum and axillae foveolate, mesoscutum foveolate-striate, no erect hairs...*inuitatus*.

- Head densely rugo-reticulate; mesosoma covered by sculpture, mesopleuron, scutellum and propodeal dorsum with striae, axillae rugo-reticulate, mesoscutum rugulose, erect hairs...2.

2(1). Propodeal spines approximately equal in length to distance between their bases; integument predominantly shiny; $HL > 0.80$...*mandibularis*.

- Propodeal spines notably shorter than distance between their bases; integument predominantly opaque; $HL < 0.80$...*wardi*.

4. Discussion

Lenomyrmex inusitatus is, with *L. wardi*, the second *Lenomyrmex* species collected in Ecuador. To our knowledge, the new record represents only the ninth locality known for the entire genus and constitutes its southernmost limit of distribution. The range of the species and of the genus increase nearly 510 km and 470 km to the South, respectively. Although data remain insufficient to understand the biogeography of *Lenomyrmex*, it is interesting to note that the new record confirms the presence of *L. inusitatus* on the Eastern side of the Cordillera Oriental of the Andes.

Lenomyrmex species were collected from elevations close to sea level to 1800 m but seem to be mainly restricted to mid-elevations, i.e. 1100-1500 m [1-3, this study]. The degree of queen-worker dimorphism is weak, suggesting small colony sizes and absence of claustral independent colony foundation [8]. *Lenomyrmex* ants seem always locally rare and it is in fact the first time that up to 34 workers have been collected within a relatively small area (400-m²). A thorough inspection of the dead wood laying on the ground and of soil samples failed to uncover any nest of *L. inusitatus*. This and the fact that both workers and dealate queens were extracted from the leaf litter (Winkler method) may indicate that this species nests and forages in the leaf litter. The unusual morphology of the mandibles suggests that *Lenomyrmex* is a

specialist predator on an unknown prey. This habit is possibly linked to its apparent rarity and restricted elevational distribution. More data are needed to accurately determine the biology and biogeography of these interesting ants.

N.B. After submitting the manuscript, two additional workers were found within a soil sample, at slightly higher elevation (1500 m), within the "Copalinga" property. The two workers were maintained alive during six days. They moved relatively slowly and feigned death when disturbed. They did not feed on any offered food items (alive and dead termites, millipedes, mites, various insect parts, sugar/water, tuna, salty biscuits). The information for these specimens are: ECUADOR: Zamora-Chinchipe province: Zamora: Bombuscaro: Copalinga property; Lat: -4.082; Long: -78.968; 13.IV.2011; collected by Delsinne T. & Arias Penna T.; two workers in one soil sample (= a thorough visual search for ants for twenty person-minutes from a 15x15x15-cm core of soil); specimen codes: 4649901 and 4649902; RBINS.

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Figure 1: Worker (specimen number 4042619) of *Lenomyrmex inusitatus* Fernández 2001: in (A) frontal, (B) lateral and (C) dorsal views. Note the predominantly smooth and shiny mesosoma, with no erect hairs (B, C) and the foveolate head, with median longitudinal striae (A).



Figure 2: Queen (specimen number 4042602) of *Lenomyrmex inusitatus* Fernández 2001: in (A) frontal, (B) lateral and (C) dorsal views. Note the predominantly smooth and shiny mesosoma, with mesoscutum foveolate-striate and without erect hairs (B, C) and the foveolate head, with median longitudinal striae (A).

