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The larvae of *Leptanilla charonea* and *Leptanilla zaballosi*

(Hymenoptera, Formicidae)

By

J. M. Barandica, F. López, M. D. Martínez & V. M. Ortuño

With 2 Figures

Abstract

The aberrant larvae of the ant genus *Leptanilla* are only known for five of the 35 species described in the world. In this paper, we describe the larvae of *L. charonea* and *L. zaballosi*, two recently discovered species. Some morphological traits found in these species disagree with the diagnosis of the genus. The type of larvae instars and some observations on the behaviour of workers support previous assumptions on the biology of *Leptanilla* ants.

Introduction

The genus *Leptanilla* Emery is composed of minute and hypogaeic ants. The scarcity of specimens found throughout its history has led to a comparative ignorance about many questions on these ants, such as their phylogenetic relationships, their biology, and the taxonomic kinship between individuals from different castes (workers, females, and males). Some recent studies have cast new light on these questions. Baroni Urbani (1977) and Bolton (1990) have revised the taxonomy and higher classification of the whole subfamily Leptanillinae Emery, and Masuko (1990) has offered a fine and detailed study on the behavior, biology, and ecology of cultured colonies of *L. japonica* Baroni Urbani.

To date, 35 species of this genus have been discovered in the world, but the different castes are known in few of them (Baroni Urbani 1977; Bolton 1990; Lopez et al., in preparation). Males are the only caste described in 13 species, and females are only known in six species. Similarly, only the inmature forms of five species are known: *L. japonica* Baroni Urbani, *L. revelierei* Emery, *L. swani* Wheeler, *L. escheri* (Kutter) and *L. judaica* Kugler (Wheeler 1928; Kutter 1948; Wheeler & Wheeler 1965; Kugler 1986; Wheeler & Wheeler 1988; Masuko 1990). This is due to the difficulty of finding complete colonies or important portions of them.

Larvae have a prominent role in phylogenetic studies on ants (Wheeler & Wheeler 1976, 1985). In the case of *Leptanilla*, for instance, some striking traits of the larval morphology contributed decisively to the separation of the Leptanillini from the Dorylinae, to constitute an independent subfamily (Wheeler 1923; Wheeler & Wheeler 1930). The larvae of *Leptanilla* are unique among the Formicidae, because they have several aberrant, specialized morphological and behavioural traits: These traits are key factors in relation

to their social organization. They are: (1) a ventral projection of the prothorax, used for larval transportation by workers, (2) the 'larval hemolymph taps', through which the adult nestmates (specially the queen) feed on the larval hemolymph, (3) outwardly-directed mandibles, which help the larvae to dig into the prey body tissues (WHEELER & WHEELER 1965; MASUKO 1989, 1990).

In this paper, we describe the larvae of two recently discovered species of *Leptanilla*. The specimens are part of three exceptional findings, in which a large portion or the whole colony was collected. The description of these larvae provides new information on the larvae of Leptanillinae, whose diagnosis remains unsettled due to the very scarcity of data on these inmature stages (BOLTON, 1990). Some morphological traits found in the larvae described differ from those given for WHEELER & WHEELER's (1988) characterization of the genus.

Materials and methods

The larvae described in this study belong to two recently discovered species from the Iberian peninsula and North Africa (LOPEZ et al., in preparation). The specimens of *L. charonea* come from a complete colony found during the excavation of a *Leptothorax* nest. All living specimens were taken to the laboratory and installed in an artificial nest. The rearing of this colony, however, was unsuccessful due to an incipient fungal infection, which forced the complete colony to be fixed in a Scheerpeltz solution. The *L. zaballosi* specimens were collected – together with some workers – in large soil samples from small seasonal water courses, by means of a method employed by some coleopterologists studying hypogaeic beetles ('lavage de terre' method; NORMAND 1911; COIFFAIT 1958; ZABALLOS 1990).

All specimens were cleaned by immersion in a 100% solution of lactic acid for a period of 30 min. For observation, they were mounted in ephemeral preparations of lactic acid, using excavated slides. The head and the prothoracic structure of some specimens were separated and mounted in permanent preparations with Hoyer, to study them in detail. The head had to be fragmented for an adequate observation of the mouthparts. The observations were made using an Izumi light microscope, with a maximum magnification of $\times 1000$. Measurements were done with $\times 100$ (error $= \pm 0.01$ mm) and $\times 400$ (error $= \pm 0.002$ mm) magnifications. Diagrams were drawn using a Zeiss binocular microscope.

Results and discussion

Description of the *Leptanilla charonea* larva (Fig. 1)

Length approximately 0.7 mm. Body elongated and slender, narrow and cylindrical anteriorly, laterally extended, wider and club-like posteriorly, ending in a small naked boss. Prothoracic structure composed by three pairs of U-shaped projecting structures. First pair (posterior) with slender arms, expanding themselves in pedunculated membranous flaps. With a small striated area at the base. Second pair formed by two lateral, quadrangular expansions. Third pair (anterior) with thin arms directed downwards. Between the arms of the paired structures there is a central sclerotized spatula-shaped structure, rounded by a membranous border. With two thick spines furnished with setae at the base of the prothoracic structure. Spiracles not seen. A pair of hemolymph feeding taps located dorsolaterally and near the posterior border, on the abdominal somite IV; each tap opening eccentrically in a slit on a naked circular area bordered by a fringe of stiff hairs.

Body hairs simple. They can be classified in three different types, according to their length and morphology: (1) 0.007–0.023 mm long, numerous, uniformly distributed.

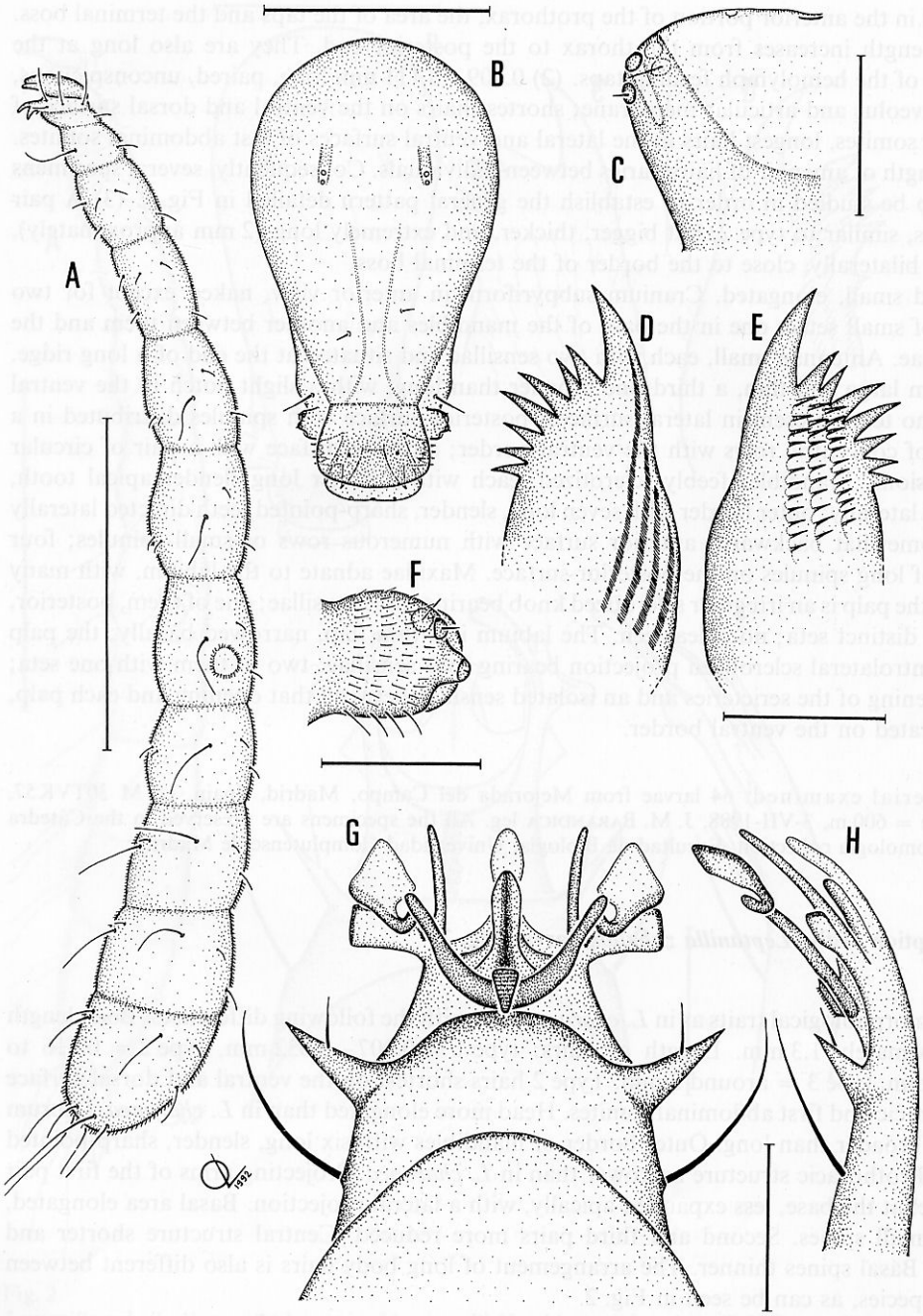

Fig. 1
Leptanilla charonea larva: A) Larva in side view, B) Head in anterior view, C) Left labial palp, D) Left mandible in anterior view, E) Left mandible in posterior view, F) Left maxillary palp, G) Ventral prothoracic structure in posterior view, H) Ventral prothoracic structure in lateral view. Scales: A = 0.5 mm; B = 50 μ; C, D, E, F = 10 μ. G, H = 20 μ

Absent in the anterior portion of the prothorax, the area of the taps and the terminal boss. Their length increases from the thorax to the posterior end. They are also long at the border of the hemolymph feeding taps. (2) 0.009 – 0.111 mm long, paired, unconspicuous, with alveolus and articular membrane; shortest hairs on the ventral and dorsal surface of central somites, longest hairs in the lateral and ventral surfaces of last abdominal somites. The length of any pair of hairs varies between individuals. Consequently, several specimens need to be studied in order to establish the general pattern detailed in Fig. 1. (3) A pair of hairs, similar to type 2, but bigger, thicker, and extremely long (2 mm approximately), placed bilaterally, close to the border of the terminal boss.

Head small, elongated. Cranium subpyriform in anterior view, naked except for two pairs of small setae, one in the base of the mandibles and another between them and the antennae. Antennae small, each with two sensillae and situated at the end of a long ridge. Labrum large and thin, a third one broader than long, with a slight notch in the ventral edge; no teeth present in lateral surfaces; posterior surface with spinules distributed in a series of concentric rows with the ventral border; anterior surface with a pair of circular depressions. Mandibles feebly sclerotized, each with a rather long slender apical tooth, curved laterally; outer border with seven long, slender, sharp-pointed teeth directed laterally and somewhat backward; anterior surface with numerous rows of small spinules; four rows of long spinules on the posterior surface. Maxillae adnate to the labium, with many setae; the palp is an irregular sclerotized knob bearing three sensillae; one of them, posterior, with a distinct seta; no galea seen. The labium is a thin flap, narrowed basally; the palp is a ventrolateral sclerotized projection bearing four sensillae: two of them with one seta; the opening of the sericteries and an isolated sensillae between that opening and each palp, are located on the ventral border.

Material examined: 64 larvae from Mejorada del Campo, Madrid, Spain, UTM 30TVK57, altitude = 600 m, 3-VII-1988, J. M. Barandica leg. All the specimens are preserved in the Cátedra de Entomología collection, Facultad de Biología, Universidad Complutense de Madrid.

Description of the *Leptanilla zaballosi* larva (Fig. 2)

All morphological traits as in *L. charonea*, but with the following differences. Body length approximately 1.3 mm. Length of hairs: type 1 = 0.007 – 0.032 mm, type 2 = 0.016 to 0.174 mm, type 3 = around 3 mm. Type 2 hairs shortest on the ventral and dorsal surface of thoracic and first abdominal somites. Head more elongated than in *L. charonea*. Labrum a half broader than long. Outer border of mandibles with six long, slender, sharp-pointed teeth. Prothoracic structure narrower than in *L. charonea*. Projecting arms of the first pair parallel at the base, less expanded apically, with a lateral projection. Basal area elongated, with small spines. Second and third pairs more reduced. Central structure shorter and blunt. Basal spines thinner. The arrangement of long body hairs is also different between both species, as can be seen in Fig. 2.

Material examinated: (1) 1 larva from Caserío Cuaternos, Cáceres, Spain, UTM 30TTK73, altitude = 250 m, 17-V-1988, J. P. Zaballos leg. (2) 8 larvae from Clavería, Cáceres, Spain, UTM 29SPD67, altitude = 350 m, 18-XII-91, J. C. Atienza leg. All specimens are preserved in the Cátedra de Entomología collection, Facultad de Biología, Universidad Complutense de Madrid.

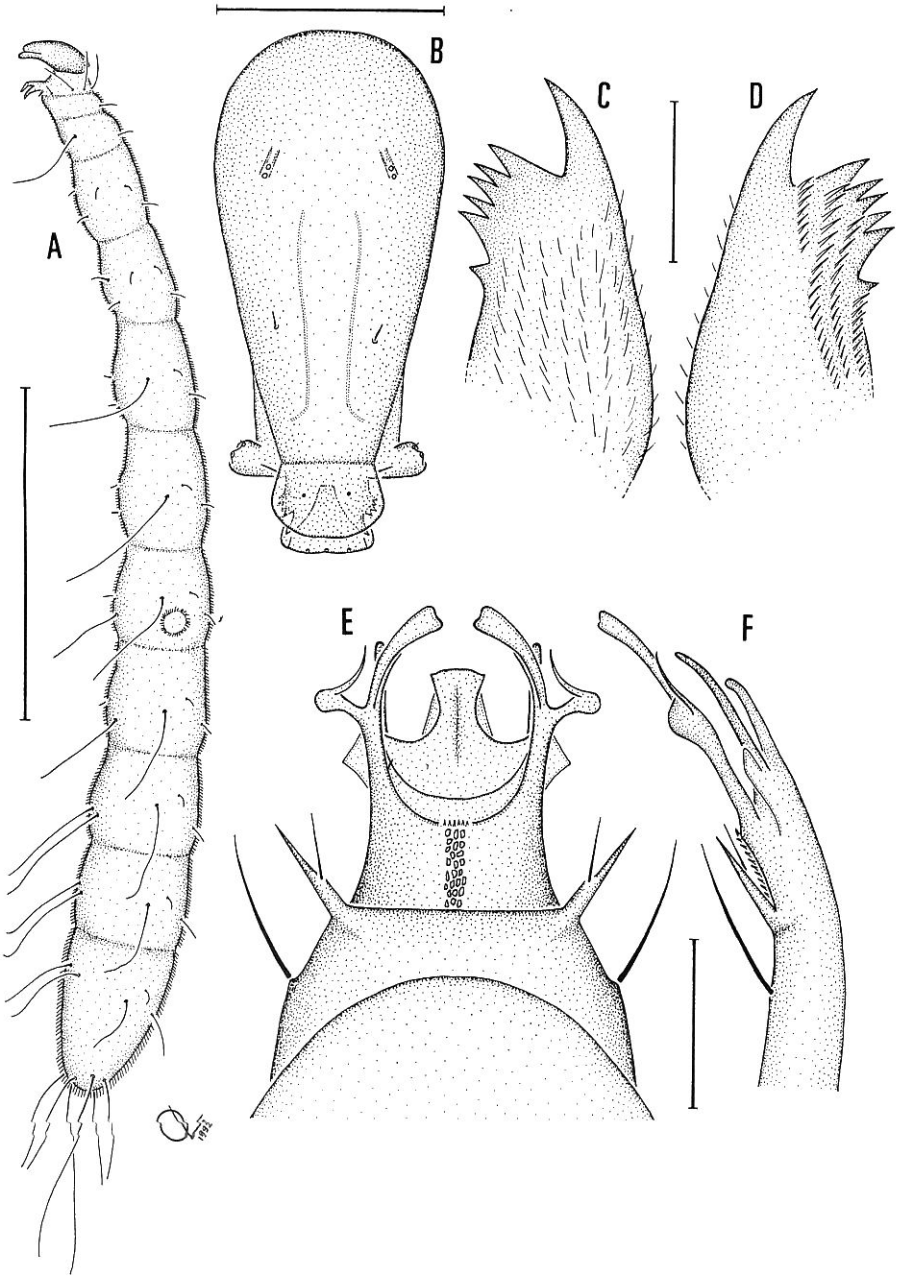

Fig. 2
Leptanilla zaballosi larva: A) Larva in side view, B) Head in anterior view, C) Left mandible in anterior view, D) Left mandible in posterior view, E) Ventral prothoracic structure in posterior view, F) Ventral prothoracic structure in lateral view. Scales: A = 0.5 mm; B = 50 μ; C, D = 10 μ. E, F = 20 μ

Morphological observations

Studying the larva of *L. japonica*, WHEELER & WHEELER (1988) described the lateral surfaces of the labrum having a few long slender sharp-pointed teeth, and they included this trait in the diagnosis of the genus. We have not found these teeth in the larvae of *L. charonea* and *L. zaballosi*. They are neither observed in the drawnings and micrographs of other *Leptanilla* species (WHEELER 1928; WHEELER & WHEELER 1965; MASUKO 1990). We think that this morphological trait should be eliminated from the diagnosis of the genus.

Similarly, WHEELER & WHEELER (1965, 1988) also included the labial and maxillary palps having five sensillae in the diagnosis of the genus. In all our specimens we have only observed four sensillae in the labium and three in the maxilla.

Biological notes

Due to their size and shape, the specimens of *L. charonea* seem to be final-instar larvae. 60% of them, however, had reached the prepupa stage, with swollen anterior segments. All larvae were aggregated in a single pile inside the nest chamber where they were found. This grouping of larvae is similar to that described by MASUKO (1990) in *L. japonica*. Larvae were also transported exactly as the present author described for this species. The morphology of *L. zaballosi* specimens collected in December and May did not differ (both were final-instar larvae). This coincides with MASUKO's (1990) data on larvae instars before and after winter, and supports his assumption that *Leptanilla* larvae overwinter.

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Authors' address:

J. M. BARANDÍCA
M. D. MARTÍNEZ
V. M. ORTUÑO
Departamento de Biología Animal I (Zoología)
F. LOPEZ
Departamento de Ecología
Facultad de Biología,
Universidad Complutense de Madrid
28040 Madrid
Spain