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Short scientific note
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First record of the ant *Formica clara* in the Iberian Peninsula (Hymenoptera: Formicidae)

Javier ARCOS

C/Médico Vicente Reyes Nº18, 5ºB. 03015 Alacant, Spain - javier.arcos@e-campus.uab.cat

Abstract
The ant *F. clara* is reported from two localities in Barcelona (NE Iberian Peninsula), representing the southernmost record of the species in Southwestern Europe. Foraging workers were manually collected from both undisturbed and disturbed habitats. Its separation from the similar species *F. cunicularia* and *F. rufibarbis* in the Iberian Peninsula is discussed.

Key words: *Formica*, new record, taxonomy, Iberian Peninsula, Barcelona.

Introduction

The *Formica rufibarbis* Fabricius, 1793 species group belongs to the subgenus *Serviformica* Forel, 1913, and is represented in the Iberian Peninsula by two species: *Formica cunicularia* Latreille, 1798 and *F. rufibarbis* (Borowiec 2014). They can be distinguished from other members of the subgenus *Serviformica* by the almost complete to partially reddish mesosoma and the absent or low setae number on mesosoma and posterior margin of head (Seifert & Schultz 2009). These ants are thermophilic species with preference for open habitats, and appear widely distributed across the Palearctic region. In this paper, the species *F. clara* Forel, 1886 is recorded for the first time in the Iberian Peninsula, locally adding a third species to the *F. rufibarbis* group.

Material and Methods

In 2016, during ordinary hand-collecting samplings near the Autonomous University of Barcelona (NE Iberian Peninsula), several workers of *Formica* with an unusual light-reddish coloration pattern were found foraging in a woodland pathway. Some individuals were taken for proper investigation with a stereomicroscope. The reduced pigmentation on mesosoma and low setae number on pronotum motivated a further morphometric inspection, which matched the diagnostic criteria for *F. clara*. In 2018, another sample with the same phenotype and matching morphometry was collected in the city of Barcelona. In the first case, the studied area was a woodland with patches of grassland, and in the second case the individuals were taken from an urban park with grass.

Terminology and indexes follow Seifert & Schultz (2009). All measurements were made using a Nikon SMZ-U stereomicroscope at magnifications between 80-140x, with a cold-light source equipped with two flexible cold-light arms covered with a light diffusor, and a LED ring mounted on the stereomicroscope focus. The indexes RipD and sqPDG were impossible to measure due to the lack of extremely powerful equipment required by the authors (magnification of 320x). Photographs were taken using a Nikon D300 camera and compiled using Adobe Photoshop.

Results

Examined material: **Spain**: 5 workers, Autonomous University of Barcelona, Bellaterra (Barcelona). 31T 0424251 4594536. 157m. 3.VII.2016. J. Arcos leg./det; 18 workers, park near Hospital de la Santa Creu i Sant Pau, Barcelona (Barcelona). 31T 430757 4585094. 86m. 6.VI.2018. J. Arcos leg./det.

Measurements (n=10) [mean ± standard deviation, in mm]: CS: 1.540 ± 0.110, CL / $CW_{1.4}$: 1.195 ± 0.015, SL / $CS_{1.4}$: 1.122 ± 0.025, PEW / $CL_{1.4}$: 0.401 ± 0.017, EYE / $CS_{1.4}$: 0.298 ± 0.012, OceD / $CS_{1.4}$: 0.150 ± 0.005, GHL / $CS_{1.4}$ [%]: 7.12 ± 0.80, $nOCC_{1.4}$: 0.11 ± 0.09, $nGU_{1.4}$: 0.09 ± 0.08, $nPN_{1.4}$: 1.92 ± 1.12, $nMN_{1.4}$: 1.02 ± 1.15, $nPRME_{1.4}$: 0.05 ± 0.10, $nPE_{1.4}$: 0.87 ± 0.37, $nHFFL_{1.4}$: 0.70 ± 0.71, $PIGM_{1.4}$: 16.1 ± 10.9, $CONT_{1.4}$: 0.23 ± 0.12.

In both samples, the discriminant function safely allocated the individuals in *F. clara*. The coloration pattern of *F. clara* most resembles the species *F. rufibarbis*, since they both show reddish mesosoma, generally with a few dark-pigmented patches especially visible on pronotum

Fig. 1 – Lateral (left) and frontal (right) aspect of *Formica clara*.

and mesonotum. The difference on the unilateral pronotum setae number (RAV-corrected nest sample means of 2.77 in *F. clara* and 11.12 in *F. rufibarbis*) is a first approach in their distinction. A discriminant function is also available in Seifert & Schultz (2009).

The separation between *F. clara* and the similar species *F. cunicularia* is more difficult. The differences in coloration pattern are a preliminary distinction sign, but morphometry is mandatory to reach a confident identification, even though the pigmentation of the cuticula play a major role in the discriminant function. In typical individuals of *F. clara*, the mesosoma is mostly reddish to yellowish, with absent pigmentation on genae and clypeus, contrasting with the dark pigmented back of the head (see Fig. 1). On the other hand, typical individuals of *F. cunicularia* show a darker head and mesosoma, with more pigmented genae and clypeus. Rarely, some specimens of *F. clara* can show the pigmentation pattern of *F. cunicularia* and viceversa, and so samples must ideally consist on at least 3-5 workers to evaluate the intraspecific coloration variability. For the discriminant functions see Seifert & Schultz (2009).

Discussion

Formica clara shows a remarkable distribution range. According to Antmaps.org (Janicki et al. 2016), its Western Palearctic distribution includes the following countries: Austria, Azerbaijan; Belgium, Bosnia and Hercegovina, Britain, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Georgia, Germany, Greece, Hungary, Iran, Israel, Italy, Montenegro, Netherlands, Poland, Romania, Slovakia, Slovenia, Sweden, Switzerland, Syria and Turkey. The only record from France noted in Seifert & Schultz (2009) is at some 11km from the Iberian Peninsula, so its presence in this territory is no surprise. This new data represents the southernmost records of *F. clara* in Southwestern Europe.

The finding of *F. clara* in both a low-disturbed Mediterranean woodland and a highly-disturbed urban park indicates a strong possibility that its actual distribution range in the Iberian Peninsula may not be limited to Barcelona, as it seems to adapt well to different habitats. As a result, the identity of the records under the name *F. cunicularia* in the NE Iberian Peninsula should be cautiously checked looking for misidentifications with *F. clara*.

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