**Cardiocondyla obscurior** Wheeler, 1929 (Hymenoptera: Formicidae) in Catalonia (NE Spain), with comments on exotic ant species

Xavier Espadaler* & Nilo Ortiz de Zugasti**

* CREAF. Edifici C. Universitat Autònoma de Barcelona. 08193 Cerdanyola del Vallès, Spain.
** A/e: nilo_ozc@hotmail.es

Corresponding author: Xavier Espadaler. A/e: xavierespadaler@gmail.com

Rebut: 21.06.2019; Acceptat: 20.08.2019; Publicat: 30.09.2019

Abstract

The polygynous exotic ant *Cardiocondyla obscurior* Wheeler, 1929 was detected nesting in dead wood of shrubs at a public garden in urban Barcelona. Not all plant species were equally occupied by foraging workers. *Viburnum* sp. was preferentially used as foraging space. At present, fourteen exotic ant species are known from Catalonia. Only two (the Argentine ant, *Linepithema humile* Mayr, 1868 and the invasive garden ant, *Lasius neglectus* Van Loon, Boomsma & Andrásfalvy, 1990) are of major concern.

Key words: *Cardiocondyla obscurior*, exotic ants check-list, nest, *Viburnum*.

Introduction

*Cardiocondyla* ants are insects widely dispersed although rarely detected because of their minute size and unobtrusive behaviour. They are ecologically subordinate; their ecological impact is minimal and likely will never present large-scale ecological threats (Heinze *et al.*, 2006). At present, more than 70 species have been formally described.

After a random walk (30.ix.2018) the second coauthor through a Barcelona city garden with dense bushes, a single worker of a tiny ant remained on his T-shirt. A short inspection under the microscope led to identify a *Cardiocondyla* sp., unknown from Catalonia (NE Spain). This prompted a new visit to the site (12.iv.2019) in search of supplementary material for a definite identification and eventual proof of an established population. Here we confirm the presence of this exotic ant nesting outdoors and provide an updated checklist of exotic ants known from Catalonia.

Material and methods

The public garden (Gaudi square, 41°24'16.85" N, 2°09'32.84" E, elevation 32 m.a.s.l.) occupies roughly 1 ha although only a small garden section of 30 × 6 m, with 69 recently pruned bushes and a few young trees was studied. Plants were recognized using information provided by http://www.bcn.sostenible.cat/es/web/punt/placa-de-gaudi. Each bush and tree was sampled using beating trays (0.25 m²). Ants were dislodged with three vigorous hits to the bush or tree crown and the presence/absence of *Cardiocondyla* Emery, 1869 was noted. Specific identity was checked with Seifert (2003). Other ant species were also captured and identified. In addition, three baits with sugary water and tuna fish were left for two hours on the ground. Pictures were taken using a cellphone (Apple, iPhone 5). Vouchers of workers are deposited at the «Museu de Ciències Naturals de Barcelona».
Results

The species was readily identified by its prominent anterolateral corners of the postpetiolar sternite, short head (cephalic length/cephalic width (s.d.) 1.108 (0.020); n = 5) and all gaster tergites equally dark (Fig. 1).

Cardiocondyla obscurior Wheeler, 1929 was present on the canopies of 13 bushes (Table 1). The distribution among bushes –Tecoma Juss. not included– was not random (chi-square=16.3; D.F. = 6; P = 0.012), with Viburnum showing more than expected presence of C. obscurior. We do not assume that Cardiocondyla presence in a bush implies nesting in that particular plant. Neither have we accepted that the detected proportions of occupancy in April remain invariant across seasons. Flowering, eventual extrafloral nectar production or other ephemeral plant resources may perfectly vary in time, and thus influence different plant species as foraging fields for the ants. Establishing a preference for a given plant species requires a focused sampling scheme along the year.

In two bushes, two single queens (with no workers) were separately captured (data not included in Table 1). One society was located nesting in dead wood of Viburnum sp. (Fig. 2). The very small (≈ 1.5 mm length) workers were seen going up and down of the trunk. The society (12.iv.2019; N. Ortiz de Zugasti & X. Espadaler leg.) had 23 dealated queens, some 250 workers, 120 larvae and a few eggs. Kept in an artificial nest and fed twice a week with Bhatkar & Whitcomb (1970) artificial diet and freshly collected Psocoptera, after two weeks worker pupae began to appear and workers eclosed. In addition, a single, completely yellow and smooth ergatoid male, with its sharply pointed mandibles was also trying to copulate with different queens (15.v.2019). Three male pupae were detected among the brood (28.v.2019). The ergatoid male was seen attacking a male pupa (8.vi.2019). After two months fourteen winged males and some 120 winged queens have been produced (2.vii.2019). The ergatoid male was seen trying, unsuccessfully, to copulate with several of them. No other ergatoid males have reached maturity.

Other ant species present on the sampled vegetation were: Crematogaster scutellaris (Olivier, 1792); Lasius grandis Forel, 1909; L. neglectus Van Loon, Boomsma & Andrásfalvy, 1990; Plagiopis pygmaea (Latreille 1798) and P. schmitzii Forel 1895. Tetramorium immigrans Santschi 1927 and Solenopsis sp. were also detected at the baits, although no C. obscurior workers were seen. The public garden contains an artificial pond with dense vegetation around. That habitat is heavily infested by the Argentine ant, Linepithema humile Mayr, 1868. Thus, C. obscurior is able to coexist with two notorious exotic and invasive ants (Lasius neglectus, Linepithema humile). This resistance seems to be general in the genus Cardiocondyla (Heinze et al., 2006), although the exact mechanism by which this is accomplished is still elusive.

Discussion

Three soil nesting species for this genus had been previously noted in Catalonia. C. batesii Forel, 1894 (Roig et al., 2008), C. elegans Emery, 1869 (Espadaler, 1979) and C. mauritanica Forel, 1890 (Espadaler, 1992). Using Seifert (2003), there should be no problem to differentiate the four Cardiocondyla species now known from Catalonia. The pattern of colouration and petiole and postpetiole shape are diagnostic.
Two outdoors localities for \textit{C. obscurior}, both strictly urban, were previously known for continental Spain: 1) VALENCIA: Burjassot (Sánchez-García & Espadaler, 2015), 2) ALICANTE: Alicante (Trigos-Peral & Reyes-López, 2016). The 3rd locality, here documented (see material and methods), is also urban. In Europe, the species had been detected exclusively indoors in greenhouses from France, Deutschland (Seifert, 2003) and The Netherlands (Boer et al. 2018).

Table 2. Exotic ant species detected in Catalonia (up to May 2019).

<table>
<thead>
<tr>
<th>Species</th>
<th># loc. nesting</th>
<th>1st reference</th>
<th>last detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiocondyla mauritanica Forel 1890</td>
<td>9 o</td>
<td>Espadaler (1992)</td>
<td>2014</td>
</tr>
<tr>
<td>Cardiocondyla obscurior Wheeler 1928</td>
<td>1 o</td>
<td>This paper</td>
<td>2019</td>
</tr>
<tr>
<td>Hypoponera punctatissima (Roger 1859)</td>
<td>4 i</td>
<td>Forel (1895)</td>
<td>2019</td>
</tr>
<tr>
<td>Linepithema humile (Mayr 1868) &gt;110 o,i</td>
<td></td>
<td>Goetsch (1942)</td>
<td>2019</td>
</tr>
<tr>
<td>Monomorium pharaonis (Linnaeus 1758)</td>
<td>1 o,i</td>
<td>Miravete et al. (2013)</td>
<td>2018</td>
</tr>
<tr>
<td>Monomorium pharaonis (Linnaeus 1758)</td>
<td>1 i</td>
<td>Goetsch (1942)</td>
<td>2012</td>
</tr>
<tr>
<td>Nylanderia jaegerskioeldi (Mayr 1904)</td>
<td>1 o</td>
<td>Espadaler &amp; Collingwood (2001)</td>
<td>2003</td>
</tr>
<tr>
<td>Nylanderia viviluda (Nylander 1846)</td>
<td>1 o</td>
<td>Espadaler &amp; Collingwood (2001)</td>
<td>2013</td>
</tr>
<tr>
<td>Pheidole indica Mayr 1879</td>
<td>3 o</td>
<td>Espadaler &amp; Collingwood (2001)</td>
<td>2018</td>
</tr>
<tr>
<td>Pheidole megacephala (Fabricius 1793)</td>
<td>1 o,i</td>
<td>Espadaler et al. (2013)</td>
<td>2019</td>
</tr>
<tr>
<td>Strumigenys membranifera Emery 1869</td>
<td>4 o</td>
<td>Espadaler (1979)</td>
<td>2015</td>
</tr>
<tr>
<td>Tapinoma melanocephalum (Fabricius 1793)</td>
<td>1 i</td>
<td>Espadaler &amp; Espejo (2002)</td>
<td>2017</td>
</tr>
<tr>
<td>Tetramorium bicarinatum (Nylander 1846)</td>
<td>1 i</td>
<td>F. García leg. (14.xi.2007, unpub.)</td>
<td>2019</td>
</tr>
</tbody>
</table>

Acknowledgements

To Federico García, Antoni Vaquer and Carlos Pradera for their unpublished information about recent findings of several exotic species in Table 2. The authors received no funding for this work.

References