

GEA, FLORA ET FAUNA

Pheidole rosae Forel, 1901 crosses the Atlantic: a third exotic *Pheidole* in Barcelona, Spain (Hymenoptera: Formicidae)

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Abstract

The nesting of the ant *Pheidole rosae* Forel in a public park from the city of Barcelona (Spain) is reported. Biometric data are provided for the minor and major worker and a short key to differentiate the four species of *Pheidole* in the city. This is the first record for that species of South American origin in the northern hemisphere.

Key words: *Pheidole rosae*, Barcelona, first record, emerging alien species, exotic ants, urban ants, Northern hemisphere.

Resum

Pheidole rosae Forel, 1901 creua l'Atlàntic: un tercer *Pheidole* exòtic a Barcelona, Espanya (Hymenoptera, Formicidae)

Es notifica la nidificació de la formiga *Pheidole rosae* Forel en un parc de la ciutat de Barcelona i s'aporten dades biomètriques per les obreres minor i major i una breu clau per diferenciar les quatre espècies de *Pheidole* de la ciutat. És el primer registre per l'hemisferi nord d'aquest element d'origen sud-americà.

Paraules clau: *Pheidole rosae*, Barcelona, primer registre, espècies exòtiques emergents, formigues exòtiques, formigues urbanes, hemisferi nord.

Introduction

During an ant monitoring program searching for the crazy ant *Paratrechina longicornis* (Latreille, 1802) and other ant species in public parks of Barcelona (NE Spain), two *Pheidole* minor worker ants were recovered from two pitfall traps. After discarding the three previously known species of this genus in Barcelona city (the native *P. pallidula* (Nylander), the exotics *P. megacephala* (Fabricius, 1793) and *P. indica* Mayr, 1879) and running the specimens through the keys of Sarnat *et al.* (2015) its provisional identity remained uncertain. Subsequent visits to the park allowed: i) the collection of a further 38 minor workers and four major workers, from one nest and: ii) a safe specific identification. Here we present the record of this third exotic *Pheidole* as a new outdoors nesting species for Barcelona, for Spain and for the Northern hemisphere.

Material and methods

Climatology and the park. The city's climate is Mediterranean, of a subhumid xerophytic maritime type, with an average annual temperature of 16.4°C and a relative humidity of 70%. According to the Köppen-Geiger system, the climate

is of type Csa. The urban Parc de la Pegaso –official name– dates from 1986, and it was formerly occupied by a truck manufacturer and maintenance company until 1970.

Pitfalls. Ten traps (2 cm Ø, 10 cm depth; polyethylene glycol) were set (24.vii.2024) and remained active 48 h. The two traps with *Pheidole* were 80 m distance apart.

Identification. References used to identify the species and general information on it were Wilson (2003), Kusnezov (1978); FORMIS 2024 references library; ANTWEB (2024) (<https://www.antweb.org/index.jsp>) and ANTWIKI (2024) (https://www.antwiki.org/wiki/Welcome_to_AntWiki).

Biometry follows Wilson (2003) for absolute values and Sarnat *et al.* (2015) for relative values (indexes): HW, maximum head width, exclusive of the eyes; HL, head length, transverse level of the posteriormost part of the occiput to the anteriormost transverse level of the anterior clypeal border; SL, scape length, distance from the base of the shaft to the distal tip, excluding the condylar bulb; EL, eye length, maximum length of the eye; PW, pronotum width, maximum width of the pronotum as seen from above; CI, cephalic Index, (HW/HL)×100; SI, scape index, (SL/HW)×100. Measurements were obtained using an OLYMPUS SZ61 binocular microscope, at 67.5×, and with a cross-scaled ocular micrometer with 100 graduation marks.

Digital color images have been obtained with an Olympus SZX7 trinocular microscope with a Nikon D7500 camera and using the free version of the CombineZP stacking program. Pins with one minor worker plus one major worker have been deposited at both the Museu de Ciències Naturals de Barcelona and the Museo Nacional de Ciencias Naturales de Madrid.

Results

Pheidole rosae Forel 1901 (= *P. silvestrii* Emery, 1906)

Pegaso park, Barcelona, Spain: 41.4271°N, 2.1891°E; Nest #1. One minor worker (26.vii.2024; pitfall), 25 minor workers and one major worker (28.viii.2024; from the nest opening); 12 minor and three major workers (28.viii.2024; from a bait recruitment). Nest #2. One minor worker (26.vii.2024; pitfall).

The nest

Nest #1 was detected (28.viii.2024), close to the pitfall. The single entrance was clean and devoid of any soil or refuse pile. According to Kusnezov (1978: 133) the species (as *P. silvestrii*) is “mesófila, terricola, granívora”. Therefore, a small piece of dry cookie was used as bait in nest #1, at 20 cm from the nest entrance. One minor immediately discovered the bait and returned to the nest, following a clear recruitment (<https://www.youtube.com/watch?v=DDb66wAdIYo&feature=youtu.be>). In two visits to this nest, one plus three major workers appeared during the first seconds and were collected. Two months later (28.x.2024) and after heavy rain, the nest was revisited. No ants emerged from the former nest entrance. Instead, foraging workers were attracted to crushed cashews. Following two separate directional, straight routes, workers reached two different holes. One was 90 cm distant from the initial

nest and another was distant 40 cm. No soldiers appeared. We concluded the colony had (temporarily?) changed its former nest site. Nest #2 could not be localized.

Morphology

The species belongs to the *tristis* group (sensu Wilson, 2003), defined by the short antennal scape, relatively small eyes, mesonotal convexity poorly developed, horn-like protrusions from the frontal lobes and mid clypeal carina in majors and, in minors, pronotum with conspicuous parallel transverse carinulae.

Major (Fig. 1a, b): In lateral view, the frontal lobes extended forward as prominent lobes; shallow, but visible, antennal scrobes, weakly developed, clearly delimited by surrounding sculpture on the dorsal head surface, and of equal length than the scape, although not at all deep enough for concealing the scape. Longitudinal carinulae present from the clypeus up to the midfront. Rugoreticulum is limited to a small patch between eye and antennal fossa. Two well developed outer hypostomal teeth plus three inner, less developed hypostomal teeth, very visible even in lateral view. Antennal club of three segments. Transverse rugae at the pronotum; in lateral view, the mesonotum has a sharp meso-propodeal declivity falling abruptly and obliquely to metanotum. In dorsal view, postpetiole with strongly developed spines. Long, curved and pointed hairs all over the head, mesosoma and gaster. Hind tibia without pubescence, with long subdecumbent to decumbent hairs. Minor (Fig 2a, b): Head smooth, shining, with 3-4 longitudinal carinulae growing from the also prominent frontal lobes to nearly the occiput. Two to five semicircular carinulae at the antennal fossa. A single carinula goes from the gena, surpassing the eye and reaching the occiput. Two to four genal carinulae do not surpass the posterior eye level. Though short, a distinct nuchal collar is present. Transverse, incomplete carinulae at the pronotum and the propodeum are visible. Very small, upwards directed, propodeal spines. Pilosity as in the major.



Figure 1. *Pheidole rosae* Forel. Major worker. a. Frontal view. b. Lateral view. Image by Roger Vila.



Figure 2. *Pheidole rosae* Forel. Minor worker. a. Frontal view. Arrows indicate long carinulae. b. Lateral view. Image by Roger Vila.

Emery's description of this species (as *P. silvestrii* Emery, 1906: 146) is much more detailed, and informative, than the original Forel's description of 1901. Especially, all Emery's comments concerning head and mesosoma surface sculpture. But for a bit smaller absolute size, our material fits Wilson's description, biometry, and figures (Wilson, 2003: 742) (Table 1). A short key using diagnostic characters that can be recognized by eye inspection and simple morphometrics to name the four *Pheidole* species from Barcelona city and, by extension, Catalonia, follows:

1. Postpetiole, in lateral view with inflated ventral margin, forming an anteroventral bulge..... *P. megacephala*
- Postpetiole, in lateral view, with a ventral margin flat or slightly concave..... 2
2. *Major*: Head with carinulae covering the entire dorsal head surface, except for the midclypeus and frontal triangle. *Minor*: SI>120; promesonotum in profile with two convexities; katapisternum and metapleurae entirely reticulated; bicoloured, with the dark brown head and gaster contrasting with the dark reddish mesosoma..... *P. indica*
- *Major*: Carinulae covering only the anterior half of dorsal head surface. *Minor*: SI<120; promesonotum in profile without two convexities; katapisternum and metapleurae only striated longitudinally; different colouration, from

uniform yellow to bicoloured though the mesosoma yellow to dark yellow..... 3

3. *Major*: Without any trace of antennal scrobe. Frontal laminae not extended forward. CI>95. Anterior margin of hypostoma with two or three poorly developed, blunt, rounded dents. *Minor*: posterior 3/4 of head entirely smooth; longer scape (SI>110). Pronotum and propodeum without transversal rugae..... *P. pallidula*
- *Major*: with a distinct antennal scrobe delimited by carinulae. Frontal laminae extended forward as prominent lobes. CI<95; hypostoma with five well developed dents. *Minor*: head with 2-3 longitudinal rugae from the frontal laminae to the occiput, that has short, transversal rugae; scape shorter (SI<100). Pronotum and propodeum with transversal rugae..... *P. rosae*

Other ant species present in the same habitat: the exotics *Cardiocondyla obscurior* Wheeler, 1929, *Linepithema humile* (Mayr, 1868), *Monomorium carbonarium* (Smith, F., 1858) and the natives *Aphaenogaster ichnusa* Santschi, 1925, *Crematogaster scutellaris* (Olivier, 1792), *Formica* sp., *Lasius grandis* Forel, 1909, *Lasius lasioides* (Emery, 1869), *Plagiolepis schmitzii* Forel, 1895, *Solenopsis* sp. Another species was also present, *Tetramorium immigrans* Santschi, 1927, which has a debated native or exotic status

Table 1. Biometry for Barcelona specimens of *Pheidole rosae* Forel, compared with species values given in Wilson (2003: 742). Measures in mm: mean (range).

Measures & Indices	Minor worker (n=12)	Major worker (n=4)	Wilson (2003) Minor worker (n=1)	Wilson (2003) Major worker (n=1)
Head width	0.59 (0.57-0.62)	1.19 (1.11-1.26)	0.62	1.40
Head length	0.62 (0.60-0.66)	1.33 (1.24-1.37)	0.64	1.52
Scape length	0.57 (0.51-0.60)	0.57 (0.55-0.58)	0.58	0.60
Eye length	0.13 (0.12-0.14)	0.18	0.12	0.16
Pronotum width	0.40 (0.37-0.42)	0.63 (0.55-0.66)	0.42	0.72
Cephalic Index	95 (93-98)	89 (87-91)	97	92
Scape index	97 (88-100)	47 (44-50)	93	43

in Western Europe (ANTWIKI: https://antwiki.org/wiki/Tetramorium_immigrans ; accessed: 3 February, 2025).

Discussion

P. rosae is recorded, nidifying outdoors, for the first time out of the Neotropical region. The species is known from northern ARGENTINA (Emery, 1906 (as *P. silvestrii*)); Kusnezov, 1952 (as *P. silvestrii*); Cuezso & González-Campero, 2009; Josens *et al.* 2014; Canepuccia *et al.*, 2016; González *et al.* 2018), southern BRAZIL (Kempf, 1972; both as *P. rosae* and as *P. silvestrii*) ; Rosa da Silva *et al.* 1999; Nascimeto, 2005; Ulysséa *et al.*, 2011; Silva Melo & Delabie, 2017; Klunk *et al.* 2018; Casadei-Ferreira *et al.*, 2020; Lasmar *et al.*, 2020; Martins *et al.*, 2020), and URUGUAY (Zolessi *et al.*, 1998 (as *P. silvestrii*)) (ANTMAPS, 2024).

P. rosae is qualified as inhabitant of subtropical forests although noted also from marshes in the Argentinean Southwest Atlantic coast (Canepuccia *et al.* 2016), from Brazilian southern grasslands (Casadei-Ferreira *et al.* 2020), or as an indicator species for edges in fragmented forests of the Chaco Serrano in Central Argentina (González *et al.*, 2018). The habitat in Barcelona, an urban public park, is plentiful of exotic vegetation (Wikipedia, 2023). Interestingly, some plant species are from South American origin (*Phytolacca dioica* L. from northeast Argentina, Uruguay and south Brazil; intriguingly, the same geographical region from where *P. rosae* is known) or *Schinus molle* L. and *Jacaranda mimosifolia* D. Don). Three other exotic ant species were recorded from the park. One of them, the Argentine ant, is strongly invasive (Silverman & Brightwell, 2008).

The genus *Pheidole* is notable for the number of introduced species established out of their native range (Sarnat *et al.*, 2015). In addition to the native *Pheidole pallidula* (Nylander), two other exotic *Pheidole* were previously known from Barcelona city: *P. indica* Mayr (Espadaler & Collingwood, 2001; as the synonym *P. teneriffana*), of Tropical Asia origin, detected from a few isolated sites within the city and *P. megacephala* (Fabricius, 1793) of African origin, from a continuous area (>2 ha) (Espadaler & Pradera, 2016). A striking example, if needed, of the increasing interconnection between bioclimatic regions: four *Pheidole* species, from four continents (Europe, Africa, South America, and Tropical Asia) nesting outdoors, in the parks or streets of Barcelona.

Urban parks, in addition to being pleasant sites to visit, may offer surprising findings such as a south American ant, never seen before alive in the northern hemisphere. We propose to qualify the situation of *Pheidole rosae* in Barcelona as “temporarily introduced ants”, in the sense of Bolton *et al.* (2006) that is, non-native ants that are found at the place of first record, and do not spread to other areas forming populations that eventually go extinct. A rather similar term could be “ephemeral establishment” as Lester (2005) used for several exotic species observed to nest but not established in New Zealand. A more general expression, “emerging alien species”, that is, those never encountered as aliens (Seebens

et al., 2018) is also a mode of qualifying at present *P. rosae*. Thus, first records of so-called emerging alien species. are a transient status of each alien species at its first detection globally. Alternatively, as an example of “casual alien (pl)ants”, in the sense of Pyšek *et al.*, (2004), concerning alien plants in checklists and floras, that is “Alien ants that sustain self-replacing populations without direct intervention by people (or in spite of human intervention) by recruitment from fertilized queens capable of independent growth” (freely adapted definition by authors). The species has never, anywhere, been declared as showing any hint of invasive behaviour. Obviously, a science-based risk assessment (Cooney, 2004) would provide a better, rational basis, to support a major action such as a dedicated, exhaustive survey of the park, including a directed effort to localize nest #2, and then digging both up. Therefore, considering the scientific uncertainties and without more knowledge available, no control action is deemed necessary to undertake at present concerning this *Pheidole* in Barcelona.

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