

ARTICLE

Notes on Iberian parasitic *Plagiolepis* Mayr 1861 ants, with the first Iberian records for *Plagiolepis ampeloni* (Faber, 1969) (Hymenoptera: Formicidae)

Notas sobre las hormigas *Plagiolepis* Mayr, 1861 parásitas en la península ibérica, las primeras citas ibéricas para *Plagiolepis ampeloni* (Faber, 1969) (Hymenoptera, Formicidae)

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Abstract: The ant genus *Plagiolepis* Mayr, 1861 includes five social parasites, with two of these species being known in Iberia so far, *Plagiolepis grassei* Le Masne, 1956 and *Plagiolepis xene* Stårcke, 1936, with a third parasitic species for the Peninsula, *Plagiolepis ampeloni* (Faber, 1969) being added in this work. The known distribution of the three parasitic *Plagiolepis* known to inhabit in the Iberian Peninsula is reviewed and new records are presented. The morphology of all species is discussed and a more precise description of all castes of *P. grassei* is presented, since a formal description of the species was never published.

Keywords: distribution, Formicidae, Hymenoptera, *Plagiolepis*, social parasite.

Resumen: El género de hormigas *Plagiolepis* Mayr, 1861 incluye cinco especies parásitas sociales. Dos de estas especies, *Plagiolepis grassei* Le Masne, 1956 y *Plagiolepis xene* Stårcke, 1936, ya se conocían en la península ibérica. En este trabajo se añade una tercera especie parásita, *Plagiolepis ampeloni* (Faber, 1969). Se revisa la distribución conocida de las tres especies parásitas de *Plagiolepis* que habitan en la península ibérica y se presentan citas nuevas. Se discute la morfología de todas las especies y se ofrece una descripción más precisa de todas las castas de *P. grassei*, dado que nunca se publicó una descripción formal de la especie.

Palabras clave: distribución, Formicidae, Hymenoptera, parásito social, *Plagiolepis*.

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Supplementary information ↓

1. INTRODUCTION

The ant genus *Plagiolepis* Mayr 1861 includes 67 extant species (Bolton, 2025), characterized for their small size (Borowiec & Salata, 2022). Five species distributed in Europe and Central Asia are inquiline social parasites (Buschinger, 2009), with some additional inquiline taxa remaining undescribed (Seifert, 2020). Phylogenetic evidence indicates that these inquilines do not form a monophyletic group, but rather originated through multiple independent speciation events, with each parasite being closely related to its free-living host species (Degueldre et al., 2021). These inquilines have small sexuates relative to the free-living *Plagiolepis*, and lack in most cases the worker caste.

Until now, two species of parasitic *Plagiolepis* were known from Iberia: *Plagiolepis xene* Störcke, 1936 and *Plagiolepis grassei* Le Masne, 1956 (e.g., García et al., 2020). Both species are parasites of *Plagiolepis pygmaea* (Latreille, 1798) (Degueldre et al., 2021), although *P. xene* has also been reported associated with other host species (Tinaut et al., 2009; Seifert, 2018). In addition, an undescribed species resembling *P. grassei*, whose records were published under this name, has also been mentioned in the literature (Catarineu et al., 2018; García et al., 2020).

In this work, we report a third inquiline *Plagiolepis* for Iberia, which we attribute to *Plagiolepis ampeloni* (Faber, 1969). We also review and expand the known Iberian distribution of *P. xene* by providing new records. Finally, we provide photographs and comments about the morphology of the three castes of *P. grassei*, a species that remained largely without a precise morphological description (Le Masne, 1956).

2. MATERIAL AND METHODS

The specimens studied in this work were collected in Spain. No specific methodology was followed for capturing *Plagiolepis*. The samplings were carried out along several years and places, involving different objectives and varied methodologies that doesn't affect the faunistic records presented here. Specimens were captured mainly through direct sampling, by searching for ant nests, typically under stones. Some of the sexuates were found after drowning in small bodies of water (e.g., ponds). One gyne was collected in Ruesga (Cervera de Pisuerga) from 64 plastic pitfall traps (140 mm deep, 90 mm in diameter) that were placed to capture arachnids from June 14 to 27, 2025; and two gynes in Cevico de la Torre from six plastic pitfall traps (88 mm deep, 65 mm in diameter) that were placed to capture ants and were replaced approximately every 20 days from June 8 to November 11, 2023.

Precise data about the new localities is provided in the Results section. The material examined comprises the following:

- *P. ampeloni*: 11 gynes from Albacete, Ávila and Huesca provinces.
- *P. xene*: 23 gynes and 1 male captured from several published and unpublished (detailed in the Results section) localities in the provinces of Barcelona, Burgos, Cádiz, Huesca, León, Palencia, Segovia and València.
- *P. grassei*: 13 workers, 14 gynes and one male, from 3 known localities in Barcelona province: Montjuïc (1 worker, 7 gynes, 1 male), Collserola (7 workers), Garraf (2 workers, 3 gynes) (García et al., 2020) and a new population in Monistrol de Montserrat.
- *Plagiolepis pyrenaica* Emery, 1921: 6 workers from the Spanish provinces of Albacete, Ávila and Huesca.
- *P. pygmaea*: 36 workers captured from colonies containing *P. xene* and *P. grassei* and from non-parasitized colonies in many other localities in the provinces of Barcelona, Burgos, Cádiz, Huesca, León, Lleida, Lugo, Palencia, Pontevedra, Segovia, Tarragona and València.

In addition, type material from *Plagiolepis pygmaea* var. *pyrenaica* Emery, 1921 from Banyuls-sur-Mer was also compared with samples (workers, gynes and males) from Saint-Cyprien plage (France; 4/IV/2008; X. Espadaler leg.), approximately 16 km from the type locality.

All the specimens are deposited dry mounted or in ethanol 96% in the FG, ADC-S and XE personal collections, except for one gyne of *P. ampeloni* and several workers and gynes of *P. grassei* which are stored in absolute ethanol in M. Menchetti's collection.

Biometrical measurements were taken using an ocular micrometer at a magnification of 90×. These are detailed hereafter. **CL**: cephalic length, from the anterior margin of the clypeus to occipital margin of the head; **CW**: maximum cephalic width, either across or above the eyes; **CS**: cephalic size, mean of CL and CW; **PoOC**: postocular distance, from the posterior margin of the eyes to the occipital margin of the head; **SL**: maximum scape length; **EL**: maximum length of the eye; **ML**: maximum length of mesosoma in lateral view (in workers, from the anteriormost point of the pronotum to the posterior point of metapleural gland; in gynes, from anterior angle of the scutum to the posterior point of the metapleural gland); **MW**: maximum width of the mesosoma in dorsal view across the pronotum; **sqPDG**: square root of the mean distance of the pubescence on dorsomedian surface of 1st gaster tergite, measured counting the number of hairs (n) crossing a line of L longitude (n/L).

Bibliographic records for the Iberian Peninsula and Balearic Islands were compiled using the AntMaps database (Guénard *et al.*, 2017) through the www.antmaps.org interface (Janicki *et al.*, 2016) and Google Scholar. Distribution maps were generated with QGIS software (QGIS, 2022). The author of all the photographs is Fede García.

3. RESULTS AND DISCUSSION

3.1. *Plagiolepis ampeloni* (Faber, 1969)

Plagiolepis ampeloni is a very scarce inquiline species with apterous and alate forms in both sexes (Faber, 1969). There are published records from Austria (Faber, 1969), Italy (Buschinger, 1999), Slovakia (Bezdecka, 1996; Werner & Wiezik, 2007), Hungary (Kanizsai *et al.*, 2009; Csősz *et al.*, 2011), Slovenia (Bračko, 2007) and Turkey (Heinze & Kauffmann, 1993). With the exception of the original description by Faber (1969), these records generally lack additional morphological information and consist mainly of faunistic listings. The species was recorded from Cyprus by Georgiadis *et al.* (2017), but later Demetriou *et al.* (2024) showed that the records were based on misidentifications and removed the species from the island list.

Plagiolepis ampeloni was listed as vulnerable in the UICN Red List (Social Insects Specialist Group, 1996a). The last captures in the type locality date back to the 1970s, being probably extinct there due to habitat destruction (Schlick-Steiner *et al.*, 2003).

The following are the first confirmed records of *P. ampeloni* for the Iberian Peninsula:

ALBACETE: Laguna Ojos de Villaverde. 12/IV/1989, 38.8° N, 2.3°W. Four apterous gynes in nest of *P. pyrenaica*, X. Espadaler *leg.*

ÁVILA: La Torre. 22/VI/2024, 40.59° N, 4.96°W, 1140 m.a.s.l., hillside with grass and small shrubs, with many paths for sheep to pass through. Three apterous gynes (Fig. 1), under stone in a nest of *P. pyrenaica* (Fig. 2), together with males. A.D. Cuesta-Segura *leg.* The specimens were collected incidentally while sampling other ant species, and the presence of the parasite was not noted at the site. Therefore, the number of parasitic gynes should not be taken as an indication of frequency in the colony.

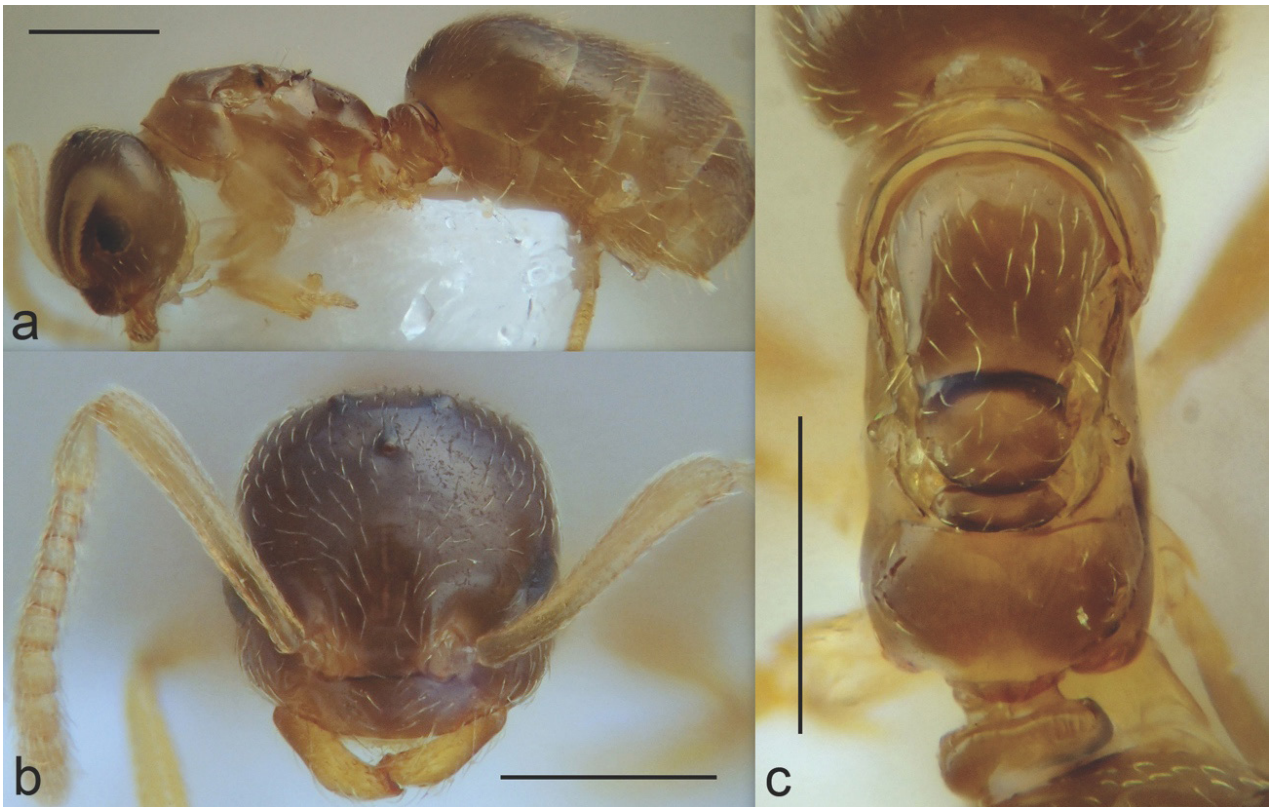


Figure 1. *Plagiolepis ampeloni* gyne from Ávila: a) habitus, lateral view; b) head, frontal view; c) mesosoma and petiole, dorsal view. Scales: 250 µm.

Figura 1. Reina de *Plagiolepis ampeloni* de Ávila: a) hábitus, vista lateral; b) cabeza, vista frontal; c) mesosoma y peciolo, vista dorsal. Escalas: 250 µm.

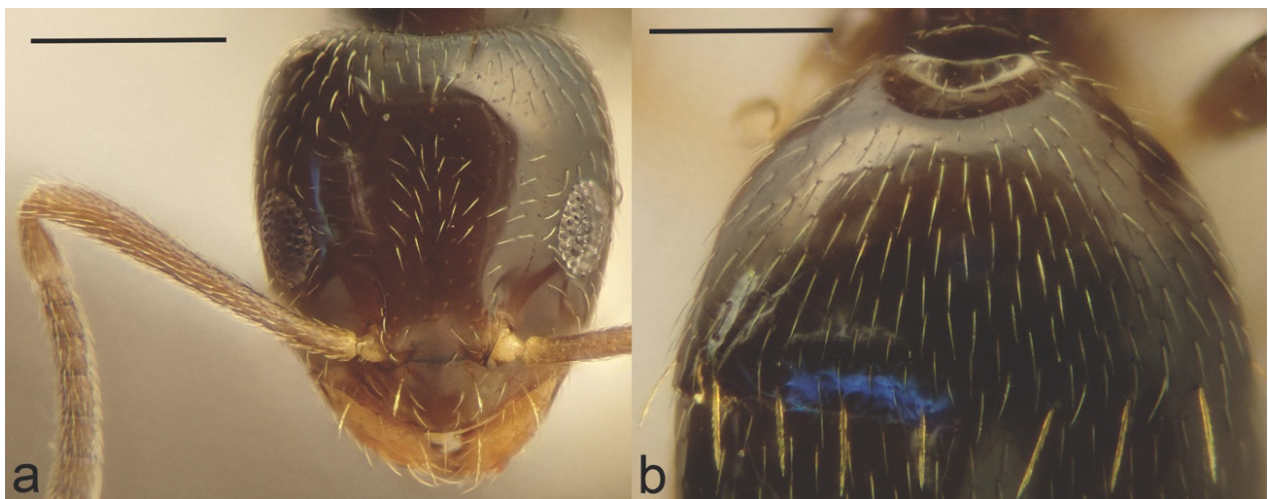


Figure 2. *Plagiolepis pyrenaica* from Ávila: a) head, frontal view; b) gaster, dorsal view. Scales: 250 µm.

Figura 2. *Plagiolepis pyrenaica* de Ávila: a) cabeza, vista frontal; b) gáster, vista dorsal. Escalas: 250 µm.

HUESCA: Sariñena. 10/V/1986, 41.7° N, 0.1°W. Eight apterous gynes in nest of *P. pyrenaica*, X. Espadaler leg.

These new records are about 1400 km away from the nearest known location in Italy (Buschinger, 1999). The fact that only apterous gynes were collected may be related to the sampling period, which did not coincide with the presence of newly produced sexuates in the nests, known to occur in mid-August (Faber, 1969).

We ascribe the samples to *P. ampeloni* given the morphological and biometrical similarity of the Iberian specimens with the apterous gynes described by Faber (1969). Among the characters that differentiate *P. ampeloni* from other parasitic *Plagiolepis* stand out the mandibular edge without defined teeth except an apical one, the eyes situated higher in frontal view (Seifert, 2018), a comparatively less elongated head and a slender mesosoma (Faber, 1969; Table 1). The only apparent difference we note in the Iberian specimens with respect to the Austrian ones described by Faber (1969) concerns the shape of the scutum, which shows more rounded borders, and lacks the trapezoidal shape noted by Faber (1969).

Host species have been reported in only two previous records of *P. ampeloni*, both involving *Plagiolepis vindobonensis* Lomnicki, 1925 (Faber, 1969; Buschinger, 1999), currently a junior synonym of *Plagiolepis taurica* Santschi, 1920 (Kirschner et al., 2023).

The complicated history of the group in Iberia and elsewhere deserves a brief overview. Because of a similar morphology of the antennal funicles, Iberian *pallescent* group samples were for a long time confused with *Plagiolepis schmitzii* Forel, 1895 in the Iberian ant bibliography (e.g., Collingwood, 1978). Espadaler et al. (2013) were the first to establish the presence of the group in Iberia under the name *P. taurica*. Later, Tinaut & García (2018) re-examined the Andalusian samples formerly identified as *P. schmitzii*, identifying half of them as *P. taurica*. More recently, western populations were assigned to *P. pyrenaica* (Kirschner et al., 2023), with *P. taurica* having an eastern distribution that includes the type locality of *P. ampeloni*. Although Kirschner et al. (2023) did not study Iberian specimens, the proximity of the type locality of *P. pyrenaica* to the French-Spanish border and the biometric concordance of the Iberian specimens are in accordance with the diagnostic framework proposed by the latter authors.

Given the morphological similarities between the parasitic *Plagiolepis* gynes from Iberia and the accurate description by Faber (1969) we do not consider the description of a new species justified at this stage, despite the association with a different host than *P. taurica*. In fact, the record from South Tyrol (Buschinger, 1999) may fall within the distribution area of *P. pyrenaica*, being very close to the distributional limits between both species (Kirschner et al., 2023). Moreover, some degree of host plasticity is not rare in many inquiline social parasites, even at a regional level, for example *Tetramorium atratum* (Schenck, 1852) and *Strongylognathus testaceus* (Schenck, 1852) (Wagner et al., 2017), *Myrmica karavajevi* Arnoldi, 1930 (Radchenko & Elmes, 2003) or even parasitic species within *Plagiolepis* itself (e.g., *P. xene*; Seifert, 2018).

Finally, given that the only detailed morphological study on the species is based on a single population coming from the original description, currently we do not have any knowledge about the possible geographic variability of the species.

The lack of a comprehensive revision of historical Iberian records formerly attributed to *P. schmitzii*, also results in incomplete knowledge of the distribution of *P. pyrenaica* which nonetheless appears to be widespread in the Iberian Peninsula (Fig. 3). In the future, myrmecologists must check the nests of *P. pyrenaica*, as it is already routinely done for *P. pygmaea* and its parasites.

Table 1: Biometric measurements and indexes for four *Plagiolepis* species studied in this work.
 Tabla 1: Medidas e índices biométricos para cuatro especies de *Plagiolepis* estudiadas en este trabajo.

Species	<i>P. ampeloni</i>	<i>P. xene</i>	<i>P. xene</i>	<i>P. grassei</i>	<i>P. grassei</i>	<i>P. grassei</i>	<i>P. pygmaea</i>
Caste	gyne	gyne	male	gyne	male	worker	worker
n	11	23	1	14	1	13	36
CS (microns)	365.9 ± 11.2 (339; 382)	358.5 ± 7.9 (345; 376)	345	420.6 ± 7.9 (407; 430)	344.5	375.5 ± 9.88 (351; 396)	420 ± 28 (379; 486)
CL/CW	1.003 ± 0.03 (0.937; 1.045)	1.042 ± 0.03 (1; 1.100)	1.032	1.059 ± 0.03 (1.0; 1.084)	1.032	1.101 ± 0.03 (1.061; 1.145)	1.123 ± 0.04 (1.049; 1.182)
SL/CS	0.887 ± 0.02 (0.847; 0.913)	0.867 ± 0.03 (0.814; 0.921)	0.952	0.905 ± 0.02 (0.879; 0.947)	0.952	0.901 ± 0.01 (0.885; 0.923)	0.914 ± 0.02 (0.865; 0.954)
POOC/CL	0.437 ± 0.02 (0.410; 0.469)	0.421 ± 0.02 (0.394; 0.456)	0.389	0.407 ± 0.02 (0.385; 0.447)	0.389	0.426 ± 0.01 (0.399; 0.443)	0.394 ± 0.01 (0.376; 0.418)
EL/CS	0.246 ± 0.02 (0.212; 0.296)	0.303 ± 0.02 (0.257; 0.336)	0.328	0.299 ± 0.01 (0.273; 0.321)	0.328	0.246 ± 0.02 (0.208; 0.271)	0.247 ± 0.01 (0.228; 0.272)
CS/ML	0.791 ± 0.03 (0.732; 0.833)	0.716 ± 0.03 (0.678; 0.768)	0.663	0.684 ± 0.03 (0.643; 0.736)	0.663	0.852 ± 0.02 (0.825; 0.885)	0.877 ± 0.03 (0.815; 0.931)
MW/CS	0.674 ± 0.03 (0.635; 0.724)	0.769 ± 0.02 (0.724; 0.808)	0.952	0.888 ± 0.03 (0.837; 0.943)	0.952	0.643 ± 0.02 (0.625; 0.676)	0.617 ± 0.02 (0.574; 0.672)
MW/ML	0.533 ± 0.03 (0.488; 0.575)	0.551 ± 0.02 (0.510; 0.575)	0.631	0.608 ± 0.04 (0.552; 0.679)	0.631	0.549 ± 0.02 (0.524; 0.598)	0.541 ± 0.02 (0.498; 0.595)
sqPDG	4.489 ± 0.20 (4.339; 4.754)	4.130 ± 0.25 (3.758; 4.754)	—	4.412 ± 0.25 (4.018; 4.754)	—	4.588 ± 0.26 (4.018; 4.754)	3.928 ± 0.32 (3.205; 4.339)

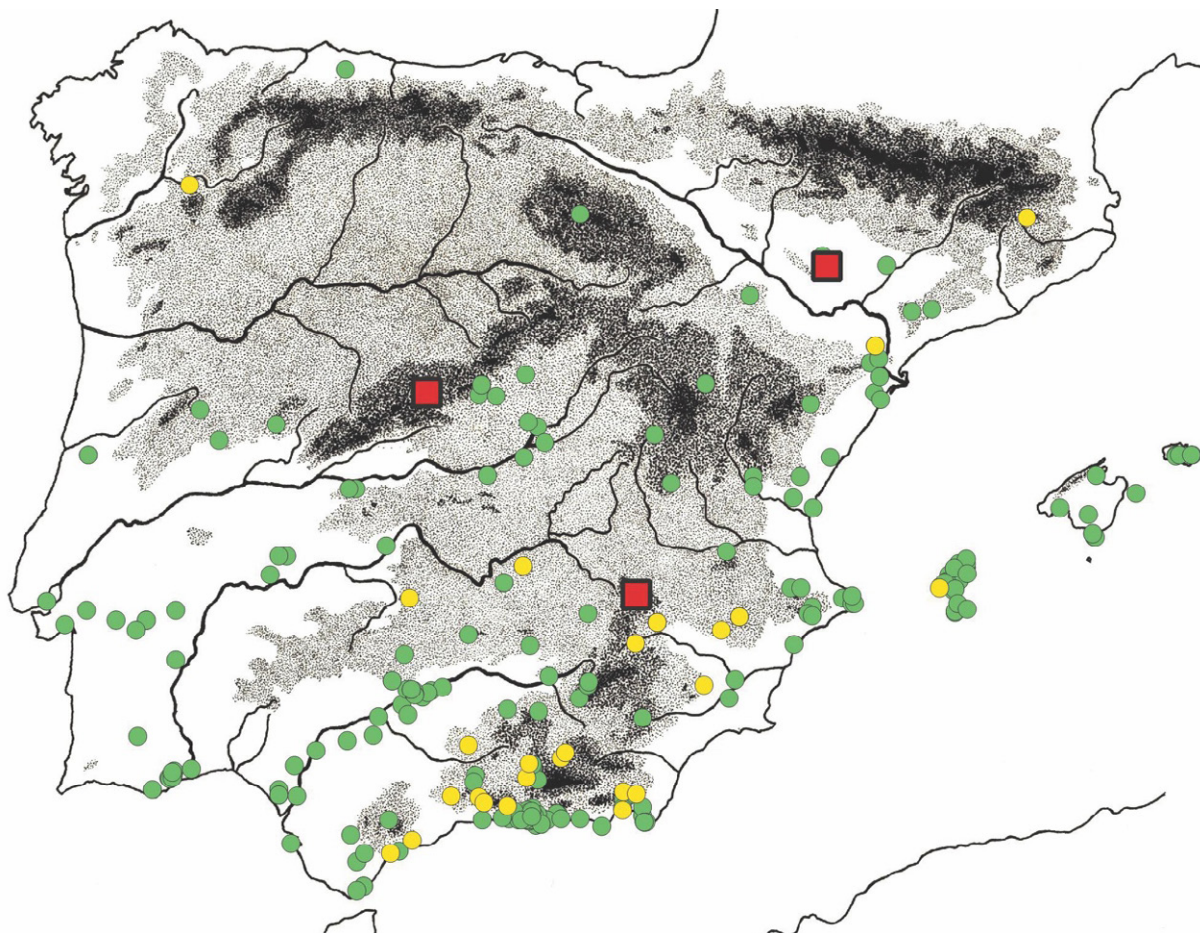


Figure 3. Map of the known Iberian and Balearic records for *Plagiolepis pyrenaica* (yellow circles), *P. ampeloni* (red squares) and non revised records for *P. schmitzii* (green circles).

Figura 3. Mapa de las citas ibéricas y baleares conocidas de *Plagiolepis pyrenaica* (círculos amarillos), *P. ampeloni* (cuadrados rojos) y citas no revisadas de *P. schmitzii* (círculos verdes).

3.2. *Plagiolepis xene* Stärcke, 1936

Plagiolepis xene is an inquiline social parasite lacking workers (Aron *et al.*, 1999). Its known host species are *P. pygmaea* and *P. pyrenaica* (Seifert, 2018). The species is widely distributed along southern Europe, with many records ranging from Iberia to Turkey and Ukraine (Borowiec & Salata, 2022).

About fifty records of *P. xene* are known from Iberia, the vast majority associated with *P. pygmaea* as host, although there is a finding with *P. schmitzii* (Tinaut *et al.*, 2009). However, this record should be interpreted with caution, considering the history of confusion of *P. schmitzii* with *P. pyrenaica*, as discussed above.

In mainland Spain, *P. xene* has been recorded from the provinces of Alicante (Arcos *et al.*, 2013); Almería (Tinaut *et al.*, 2009); Barcelona (Espadaler, 1979; Restrepo *et al.*, 1985; Espadaler & López-Soria, 1991; Bernal, 2015; García *et al.*, 2020; Degueldre *et al.*, 2021; Herraiz & Espadaler, 2022); Burgos (García & Cuesta-Segura, 2017); Cádiz (Degueldre *et al.*, 2021); Castelló (Espadaler, 1997a); Ciudad Real (Obregón & Reyes-López, 2015); Girona (Degueldre *et al.*, 2021); Granada (Pascual, 1986; Jiménez & Tinaut, 1992; Tinaut *et al.*, 1994, 2007; Tinaut, 2016); Guadalajara (Fernández, 2021); Huesca (Espadaler, 1979); Jaén (Espadaler, 1997b; Obregón *et al.*, 2014); León (Crespo-Montalbán *et al.*, 2025); Lleida (García *et al.*, 2009); Madrid (Espadaler & López-Colón, 2011); Murcia (Martínez-Ibáñez *et al.*, 2002; Arcos *et al.*, 2013; Catarineu *et al.*, 2018); Tarragona (De Haro & Collingwood, 1981) and Zaragoza (Espadaler, 1997c). In the Balearic Islands is known only from Majorca (Espadaler & Cagniant, 1991; Gómez, 2004; Borowiec *et al.*, 2015). In Andorra it was recorded by Espadaler *et al.* (2008) and in Portugal there are two records close to Lisbon (AIM, 2015) (Fig. 4).

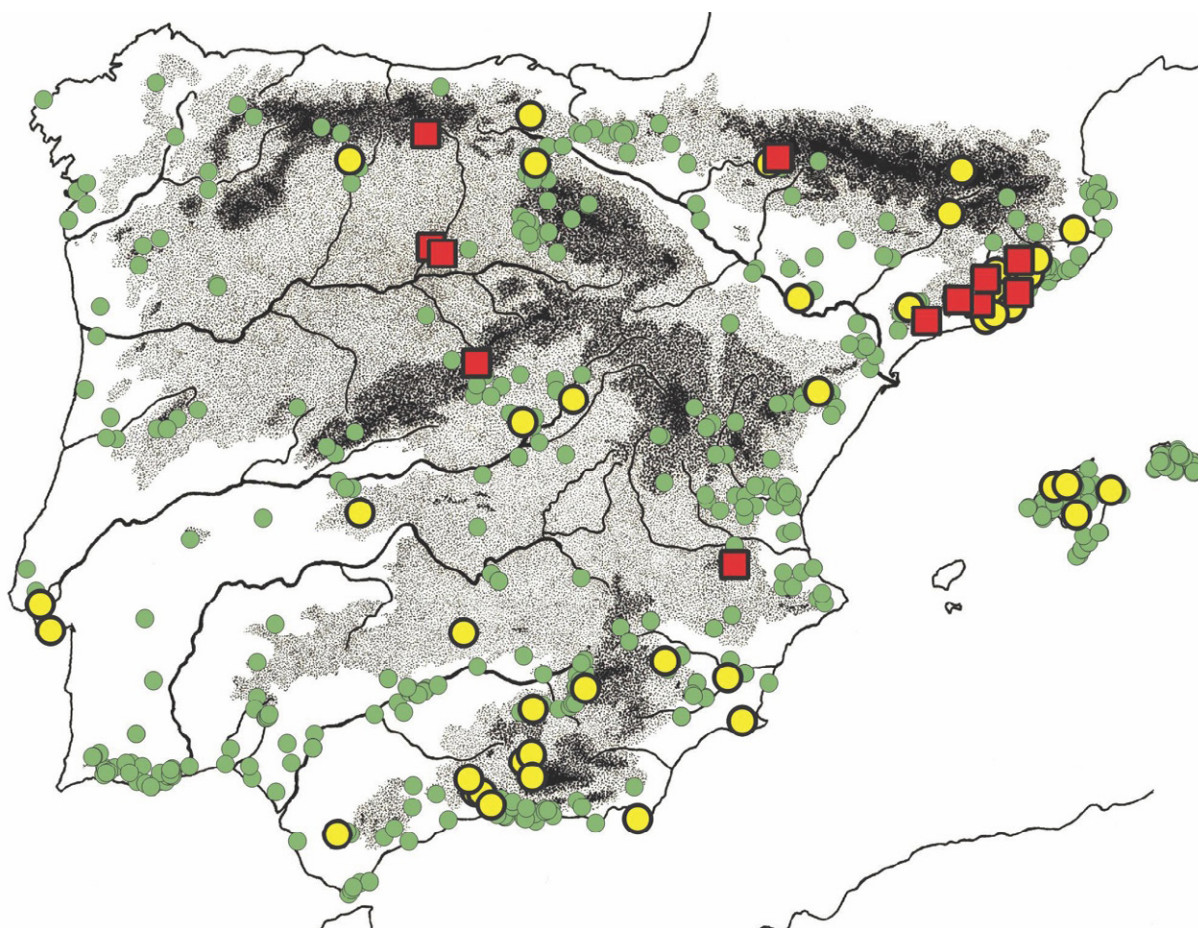


Figure 4. Map of the known Iberian and Balearic records for *Plagiolepis xene* (yellow circles are bibliographical; red squares new ones) and *P. pygmaea* (green circles).

Figura 4. Mapa de las citas ibéricas y baleares conocidas de *Plagiolepis xene* (los círculos amarillos son bibliográficas; los cuadrados rojos, nuevas) y *P. pygmaea* (círculos verdes).

The following are new records from Spain sorted by provinces. In all cases the captures were made in *P. pygmaea* colonies nesting under stones:

BARCELONA: Vinyes de Sabadell, Lavern. 28/IV/2022. 41.399° N, 1.785° E. 220 m.a.s.l. Crops edge. Four gynes. F. García leg. // L'Abella, Sant Martí de Centelles. 24/III/2014. 41.765° N, 2.243° E. 680 m.a.s.l. Mediterranean shrubland. Six gynes. F. García leg. // La Coscollada, Badalona. 29/III/2018. 41.488° N, 2.237° E. 280 m.a.s.l. Mediterranean shrubland. Three gynes. F. García leg. // Monistrol de Montserrat. 26/III/2025. 41.6055° N, 1.8598° E, 290 m.a.s.l. *Rosmarinus officinalis* L. shrubs, under stone. *Plagiolepis grassei* was present in the same nest. M. Menchetti & F. García leg. // Les Pinedes de l'Armengol, La Torre de Claramunt. -IV-2026. 41.509° N, 1.620° E. 460 m.a.s.l. *Pinus halepensis* Mill. forest. F. García leg.

HUESCA: Puerto de Angelé, Castiello de Jaca. 13/V/2025. 42.650° N, 0.573° W. 1140 m.a.s.l. Three gynes. F. García leg.

PALENCIA: Dueñas, "pico de Torilejo". 29/IV/2024. 41.880° N, 4.624° W. 820 m.a.s.l. Open forest with pastures. Eight gynes. F. García & A.D. Cuesta-Segura leg. // Cevico de la Torre, 28/VI-18/VII/2023, 41.834° N, 4.449° W, 873 m.a.s.l., one alate gyne; 41.836° N, 4.448° W, 869 m.a.s.l., one gyne, grasses and scattered low scrub, with some holm oaks and bare ground. Both gynes were collected in pitfall traps together with *P. pygmaea* workers. A.D. Cuesta-Segura leg. // Ruesga (Cervera de Pisuerga), 14- 27/ VI/2025, 42.8667° N, 4.5369° W. 1065 m.a.s.l. One gyne in a pitfall trap. C. Prieto, J. Fernández & A.D. Cuesta-Segura leg.

SEGOVIA: Revenga reservoir. 5/V/2018. 40.862° N, 4.091°W. 1180 m.a.s.l. *Quercus ilex* L. forest edge. There were dozens of gynes in the nest. F. García *leg.*

TARRAGONA: La Selva del Camp. 4/VII/2012. 41.2188° N, 1.1436° E. 224 m.a.s.l. A dealate gyne in a pitfall trap set in an organic citrus grove. X. Espadaler *leg.* The presence in the area has been known since 2005.

VALENCIA: Las Fuentes, Ayora. 18/II/2017. 39.068° N, 1.081°W. 670 m.a.s.l. Open *Pinus halepensis* Mill. forest. There were dozens of gynes in the nest. F. García *leg.*

The main host species, *P. pygmaea*, is widely distributed around the Mediterranean Basin (Borowiec & Salata, 2022), and is an abundant species in the Mediterranean biogeographic region of Iberia, where it accounts with more than 600 records (Fig. 4), following the database of antmaps.org (Janicki *et al.*, 2016; Guénard *et al.*, 2017).

Until a decade ago, the known Iberian distribution of *P. xene* was restricted to the eastern part of the peninsula, in areas more or less close to the Mediterranean Sea, while *P. pygmaea* was found across most of the territory. Since then, new records from Portugal and central Spain (AIM, 2015; Obregón & Reyes-López, 2015; Crespo-Montalbán *et al.*, 2025) show that *P. xene* has a similar distribution to *P. pygmaea*, suggesting no particular ecological requirements with respect to its host. New samplings in southwestern Iberia could help to clarify this pattern.

Gynes of *P. xene* are very small (1.2–1.3 mm long), resembling the size of the host workers (1.2–2.4 mm) (Fig. 5) and being much smaller than the host gynes (3.4–4.5 mm) (Kutter, 1952). However, their yellowish coloration (sometimes brownish), and the structure of the mesosoma should allow the identification inside the host nest, even if callow workers of the host were present. Moreover, *P. xene* gynes have a slower and distinct way of moving than the host workers. Wing development is variable, from fully alate individuals to others with just vestigial wings (Le Masne, 1956). In lateral view, metanotum and propodeum are at the same level, making the dorsal profile of the mesosoma relatively flat (Fig. 6). Although similar in size to *P. ampeloni* (Table 1), *P. xene* can be distinguished by the presence of four or five mandibular teeth and by the lower eye position (Seifert, 2018) (Figs. 1, 6).



Figure 5. *Plagiolepis xene* gynes from Collserola in a nest of *P. pygmaea*.
Figura 5. Reinas de *Plagiolepis xene* de Collserola en un nido de *P. pygmaea*.

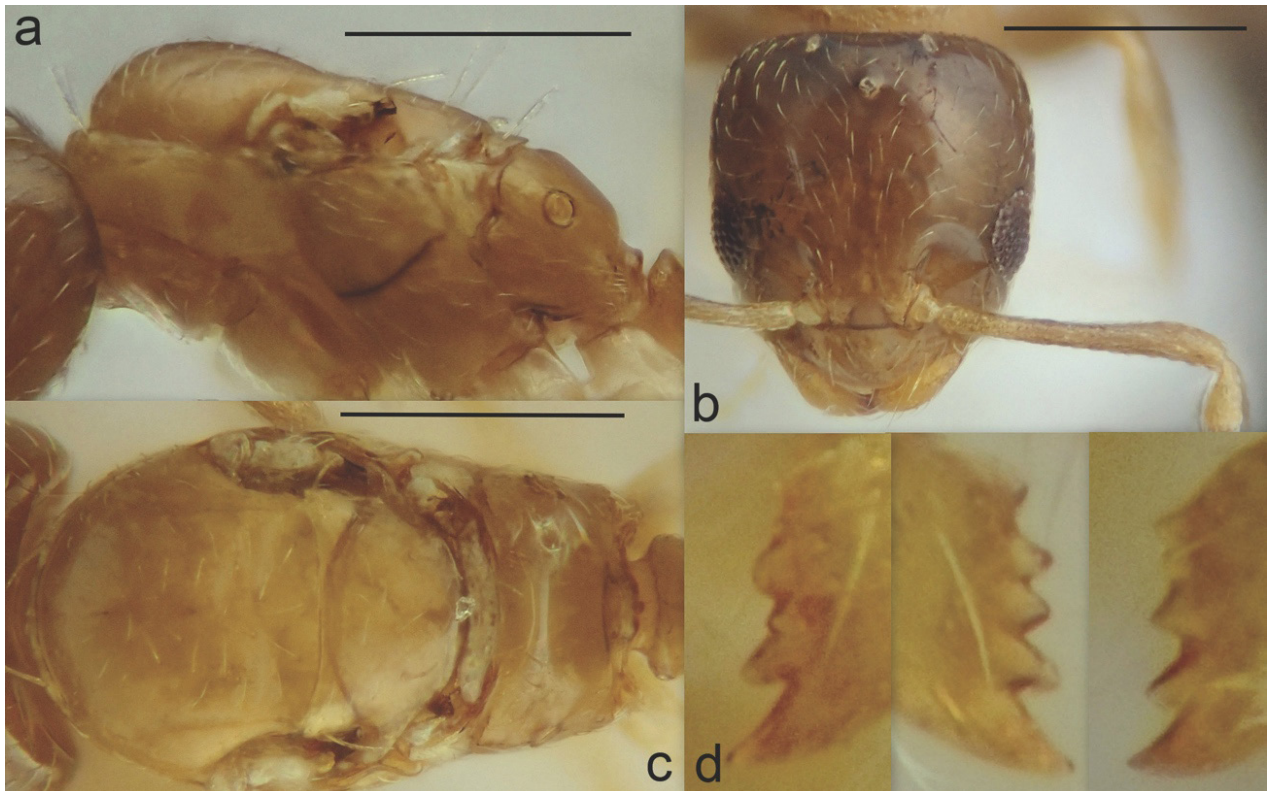


Figure 6. *Plagiolepis xene* gyne from Collserola: a) mesosoma, lateral view; b) head, frontal view; c) mesosoma, dorsal view; d) detail of the mandibular teeth in three specimens. Scales: 250 µm.

Figura 6. Reina de *Plagiolepis xene* de Collserola: a) mesosoma, vista lateral; b) cabeza, vista frontal; c) mesosoma, vista dorsal; d) detalle de los dientes mandibulares en tres ejemplares. Escalas: 250 µm.

Males are apterous and closely resemble gynes, differing mainly in the presence of the genitalia and the six gastral tergites (Le Masne, 1956). The genitalia are very characteristic, being ventrally projected, with a long and pointed sagitta and the volsella protruding from the stipites margin (Kutter, 1952) (Fig. 7).

The number of *P. xene* individuals in a colony can oscillate from a few to several dozens (Aron *et al.*, 1999). Even though the species can be considered globally rare, local populations may exhibit high parasitism rates, with 30-50% of host colonies affected (Passera *et al.*, 2001). This pattern is common in social parasites, which present patchy distribution in those areas with a higher density of host colonies, although generally the proportion of parasitized colonies found in other social parasitic species is much lower, commonly being 1 to 3% (Buschinger, 2009). Gynes of *P. xene* are not treated as queens by *P. pygmaea* workers, and were not observed to be surrounded by aggregations of host workers (Passera, 1969). *Plagiolepis xene* has an effect on the host societies by reducing the worker production through oophagy (Passera *et al.*, 2001). Mating is intranidal, and the gynes fly from late June to October (Aron *et al.*, 1999; García *et al.*, 2020), as recorded in the captures from the pitfall traps of Cevico de la Torre and Ruesga in this study.

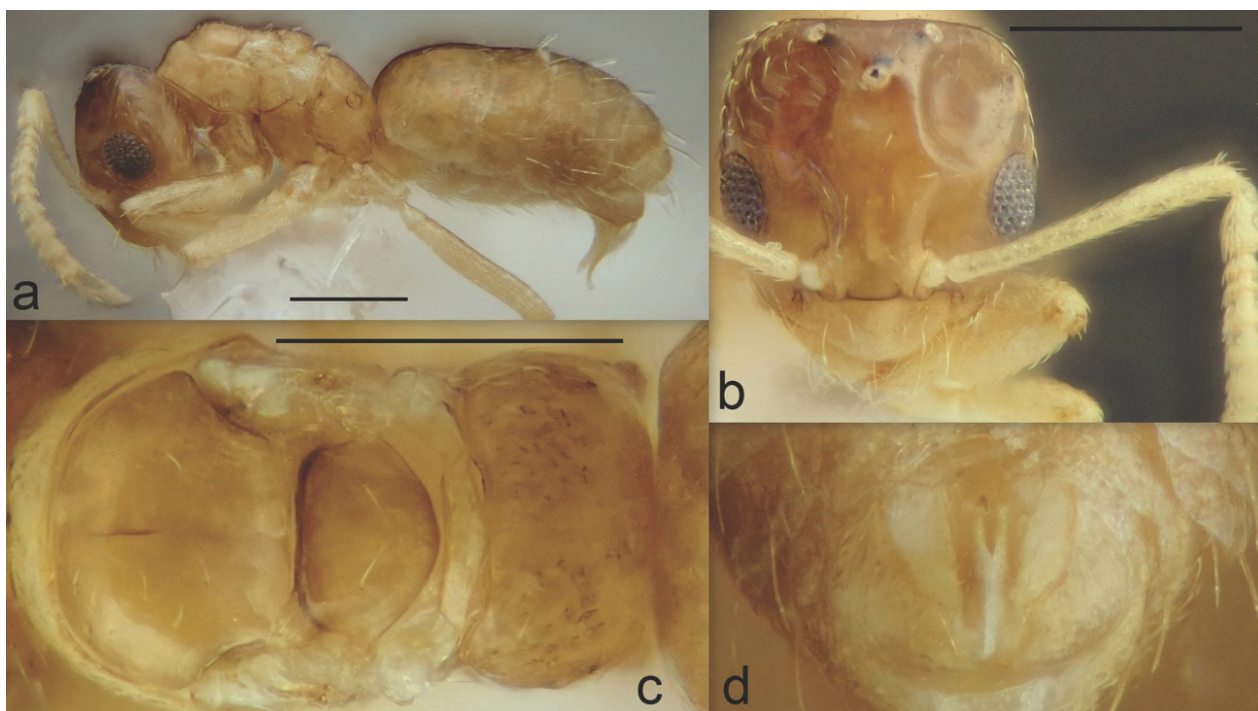


Figure 7. *Plagiolepis xene* male from Collserola: a) habitus, lateral view; b) head, frontal view; c) mesosoma, dorsal view; d) genitalia, ventral view. Scales: 250 μ m.

Figura 7. Macho de *P. xene* de Collserola: a) hábitus, vista lateral; b) cabeza, vista frontal; c) mesosoma, vista dorsal; d) genitalia, vista ventral. Escalas: 250 μ m.

3.3. *Plagiolepis grassei* (Le Masne, 1956)

Plagiolepis grassei is a species with a restricted distribution known to occur in a few locations in southern France, northern Spain and Sicily (Schifani, 2017; García *et al.*, 2020; Antarea, 2024) (Fig. 8). It is listed as vulnerable by the IUCN (Social Insects Specialist Group, 1996b). In Spain the species has been recorded in five localities in the provinces of Pontevedra (Espadaler, 1979) and Barcelona (Valcárcel *et al.*, 2010; García *et al.*, 2020). Other records from southern Iberia (Reyes-López *et al.*, 2008; Martínez-Ibáñez *et al.*, 2002, Catarineu *et al.*, 2018) may correspond to a closely related, yet undescribed species (García *et al.*, 2020).

We add two new records for the species:

BARCELONA: Serra de Cul de Portadora, Monistrol de Montserrat. 26/III/2025, 41.6055° N, 1.8598° E, 290 m.a.s.l. *Rosmarinus officinalis* L. shrubs, under stone. Ten gynes and 5 workers. *Plagiolepis xene* was also present in the same nest. M. Menchetti and F. García *leg.*

TARRAGONA: La Selva del Camp. 4/VII/2012. 41.2188° N, 1.1436° E. 224 m.a.s.l. A dealate gyne in a pitfall trap set in an organic citrus grove. X. Espadaler *leg.*

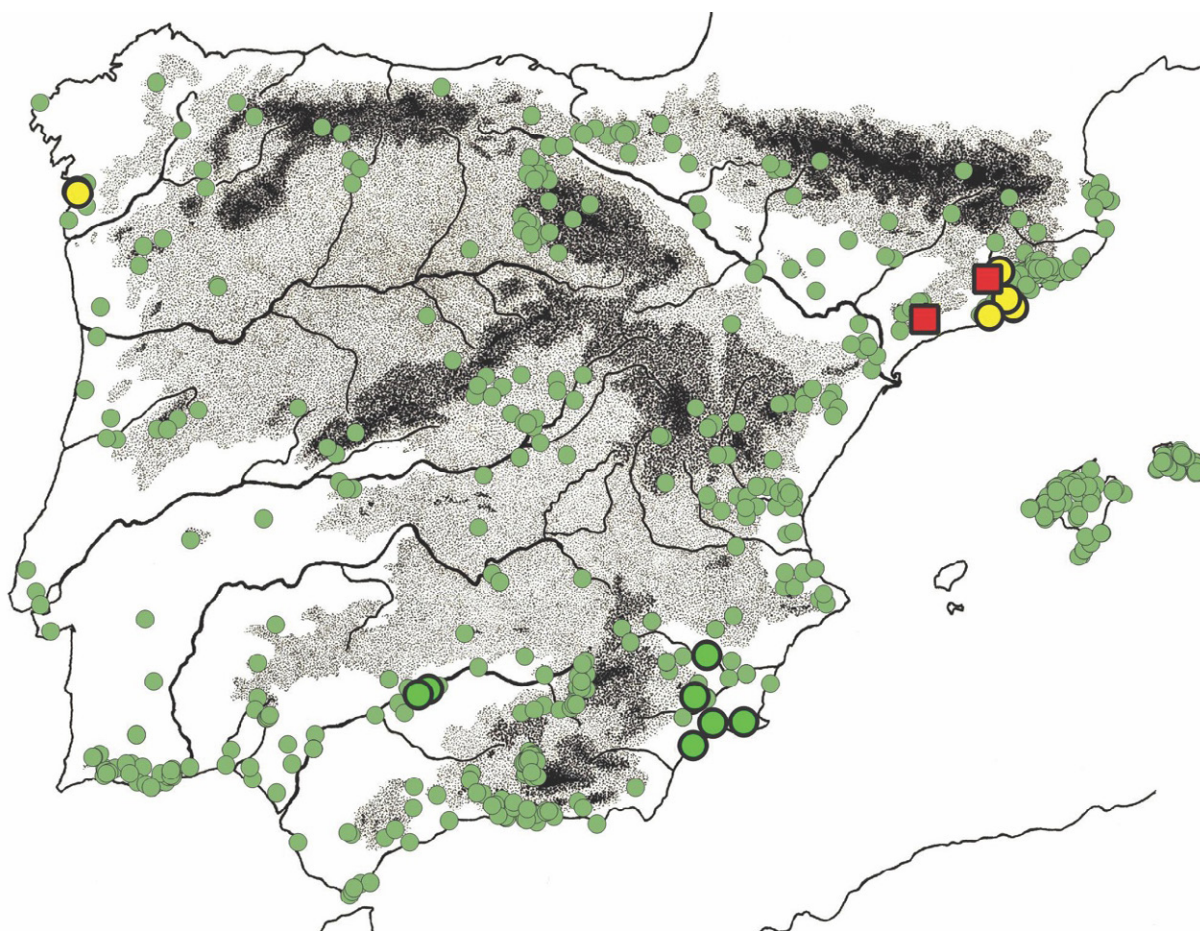


Figure 8. Map of the known records for *Plagiolepis grassei* (yellow circles are bibliographical; red squares new ones) and *P. pygmaea* (green circles) in the Iberian Peninsula and Balearic Islands. A possible new species recorded in the literature as *P. grassei* are represented by big green light circles.

Figura 8. Mapa de las citas conocidas de *Plagiolepis grassei* (círculos amarillos: registros bibliográficos; cuadrados rojos: registros nuevos) y *P. pygmaea* (círculos verdes) en la península ibérica e Islas Baleares. La posible nueva especie citada en la literatura como *P. grassei* se representa con círculos verdes claros de mayor tamaño.

In Montjuïc, Barcelona, drowned alates were collected in 2007 between 10/VII and 18/VIII (García *et al.*, 2020). In the same mountain, a colony apparently engaging in nest relocation, with alate gynes and a male, was found on 5/VIII/2009. It is worth noting that Montjuïc is surrounded by the urban area of Barcelona and most of its surface is covered by urban parks.

Its host is *P. pygmaea* (Le Masne, 1956). *Plagiolepis grassei* presents a worker caste (Fig. 9), although in low numbers, having been thought to represent an intermediate stage in social parasitic evolution towards a full inquiline (Le Masne, 1956; Passera, 1968). The best account of colony population was made by Passera (1977), who found a colony composed of 1500 *P. pygmaea* workers, 24 *P. grassei* gynes and 160 *P. grassei* workers, even though parasite numbers are usually lower (Passera, 1968). In some cases, *P. grassei* and *P. xene* have been found parasitizing the same *P. pygmaea* nests (Schifani, 2017; García *et al.*, 2020; this work).

Worker caste cannot maintain the gynes alive without the presence of *P. pygmaea* workers (Passera, 1968). The gynes are treated in a similar way as the host's gynes, with groups of workers being observed surrounding them (Passera, 1969) (Fig. 9b). Although the sex ratio is balanced and nuptial flights have been observed, adelphogamy (i.e., mating between sexuates from the same colony) has been suggested (Passera, 1968). Sexuates emerge from hibernated larvae, while workers develop later from eggs laid in the same year (Passera, 1968).

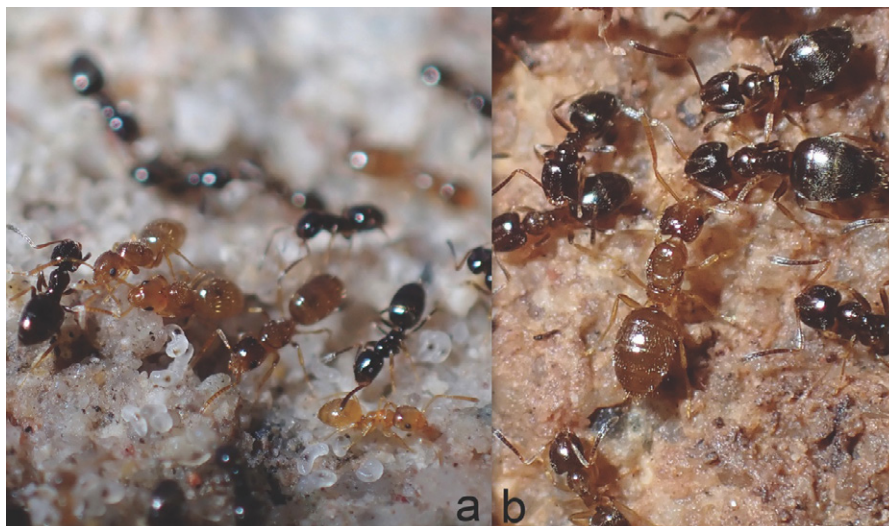


Figure 9. *Plagiolepis grassei* from Monistrol de Montserrat, in a nest of *P. pygmaea*. a) three gynes (centre) between host workers; b) gyne with host workers around.

Figura 9. *Plagiolepis grassei* de Monistrol de Montserrat, en un nido de *P. pygmaea*. a) tres reinas (centro) entre obreras hospedadoras; b) reina con obreras hospedadoras alrededor.

There are few images concerning this species, and for some castes the only information available is the short verbal diagnosis given by **Le Masne (1956)**, since the formal morphological description announced there was never published. Therefore, we present pictures of all castes, biometry and a more precise diagnosis of them.

4. WORKER

Workers are yellowish and have a total length of 1.7-1.9 mm (**Le Masne, 1956**), being smaller than average *P. pygmaea* workers (**Passera, 1968**), without almost any observed overlap in the studied sample (**Table 1**). The ocelli are always present (**Le Masne, 1956**) (**Fig. 10**). However, they are somewhat lightly coloured, and preserved specimens appear to lose the pigmentation over time. The antennal structure resembles that of *P. pygmaea*, with the 3rd and 4th segments shorter than the 5th (**Fig. 10**).

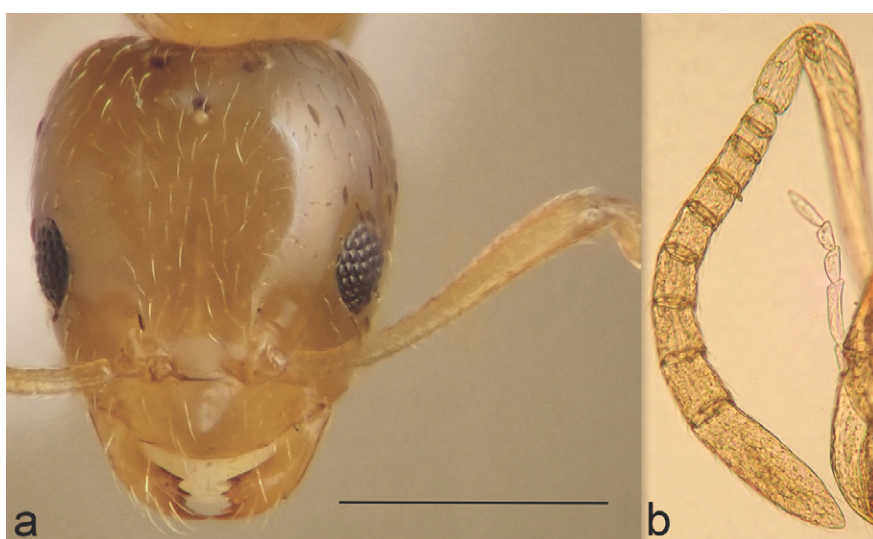


Figure 10. *Plagiolepis grassei* worker from Monistrol de Montserrat: a) head, frontal view; b) detail of the funicle. Scale: 250 μ m.

Figura 10. Obrera de *Plagiolepis grassei* de Monistrol de Montserrat: a) cabeza, vista frontal; b) detalle del funículo. Escala: 250 μ m.

The mesosoma is distinctly gynecoid, with a more developed mesonotum that makes the suture with the pronotum more sinuose in lateral view (Fig. 11). The degree of mesonotal development is variable. In dorsal view, the mesonotum can be asymmetric and presents different degrees of development regarding its posterolateral margins, ranging from having vestigial wings (Passera, 1977) to two scar-like perforations or invaginations (Fig. 11). In some specimens, a trace of scutellum can be found. Pronotum and mesonotum bear erect or suberect pilosity (Fig. 11), while in *P. pygmaea* there is only appressed pubescence.

Plagiolepis grassei workers can be confused with small callow workers of *P. pygmaea*, but the latter are generally more whitish.

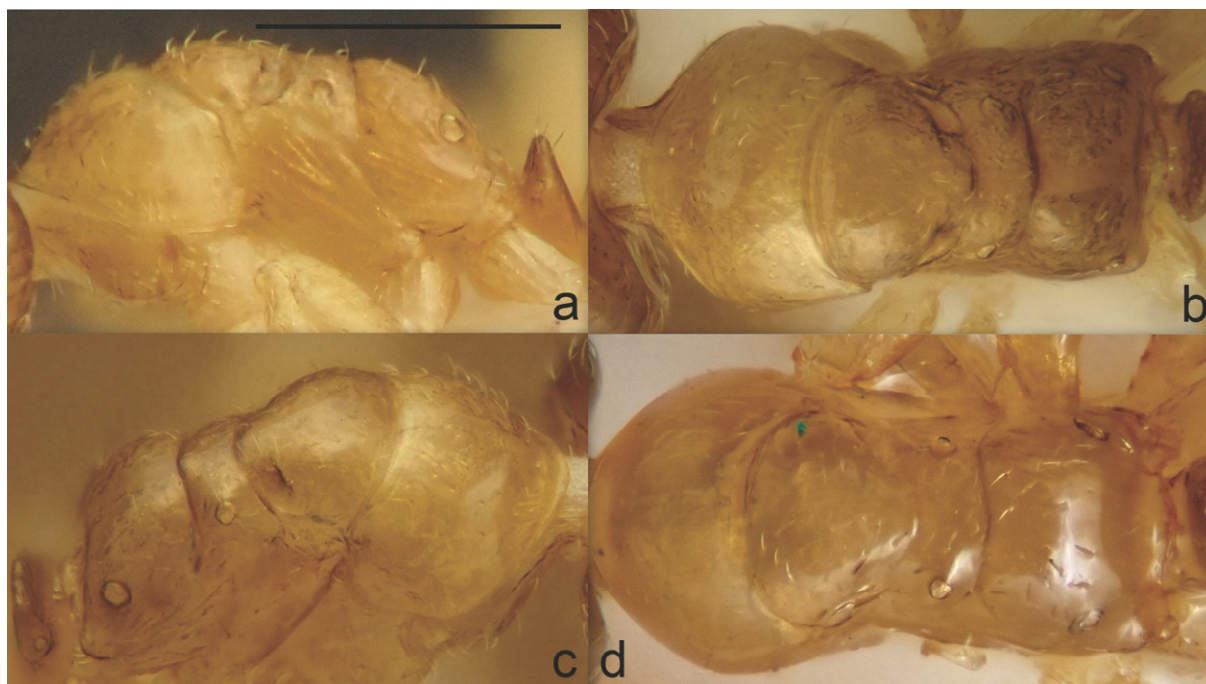


Figure 11. Mesosoma of *Plagiolepis grassei* workers from Collserola (a-c) and from Monistrol de Montserrat (d). a) lateral view; b, d) dorsal view; c) dorsolateral view. Note the lower degree of development of the sockets on the base of mesonotum in d. Scale: 250 μ m.

Figura 11. Mesosoma de obreras de *Plagiolepis grassei* de Collserola (a-c) y de Monistrol de Montserrat (d): a) vista lateral; b, d) vista dorsal; c) vista dorsolateral. Obsérvese el menor grado de desarrollo de las cavidades en la base del mesonoto en d. Escalas: 250 μ m.

5. GYNE

This caste has a yellowish coloration and a total length of 2–2.4 mm (Le Masne, 1956), showing no size overlap with the smaller *P. xene* (Table 1). Antennal structure is similar to that of *P. pygmaea*, with the 3rd and 4th segments shorter than the 5th. Mandibles with 4 or 5 teeth (Fig. 12).

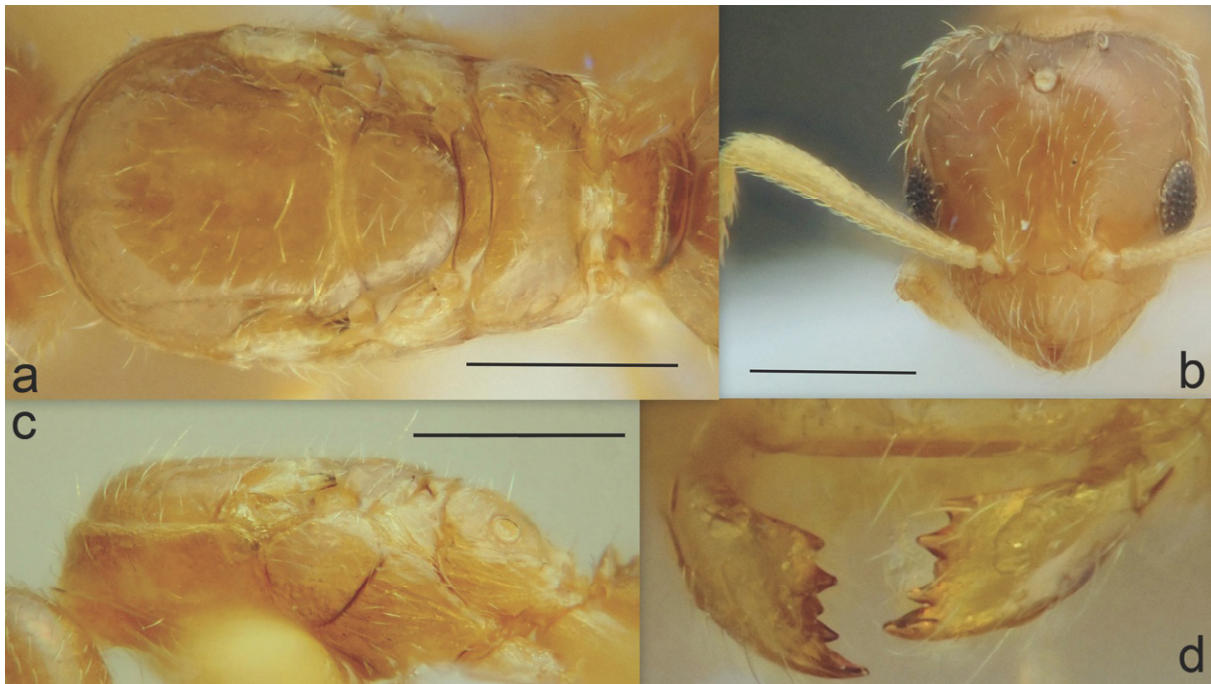


Figure 12. *Plagiolepis grassei* gyne from the Garraf Massif: a) mesosoma and petiole, dorsal view; b) head, frontal view; c) mesosoma and petiole, lateral view; d) mandibular teeth. Scales: 250 μ m.

Figura 12. Reina de *Plagiolepis grassei* del macizo del Garraf: a) mesosoma y pecíolo, vista dorsal; b) cabeza, vista frontal; c) mesosoma y pecíolo, vista lateral; d) dientes mandibulares. Escalas: 250 μ m.

In lateral view of the mesosoma, the metanotum is usually at a higher position than the propodeum, while in *P. xene* it is almost always at the same level (Figs. 6, 12). Pilosity is more profuse on head and mesosoma (Figs. 6, 12).

6. MALE

In the male, the most diagnostic characters are found in the head, which is longer than wide (Table 1), and with smaller and less protruding eyes with respect to free-living *Plagiolepis* males (Fig. 13). The antennae are 11-segmented as in female castes, while in *P. pygmaea* is 12-segmented (Le Masne, 1956). Funicle with structure similar to that of the female castes. Mandibles with four teeth. Coloration is yellowish brown. Size is similar to or slightly smaller than, that of average *P. pygmaea* males. Mesosoma sclerites structure is mostly similar to those in *P. pygmaea* males, except for a less developed pronotum (Fig. 13). Even though Le Masne (1956) mentions an imperfect wing development, the poor state of conservation of the wings in the single male available prevented a reliable assessment. The genitalia are directed downwards, similarly to *P. xene*, but without the sagitta and volsella projecting from stipites (Fig. 13).

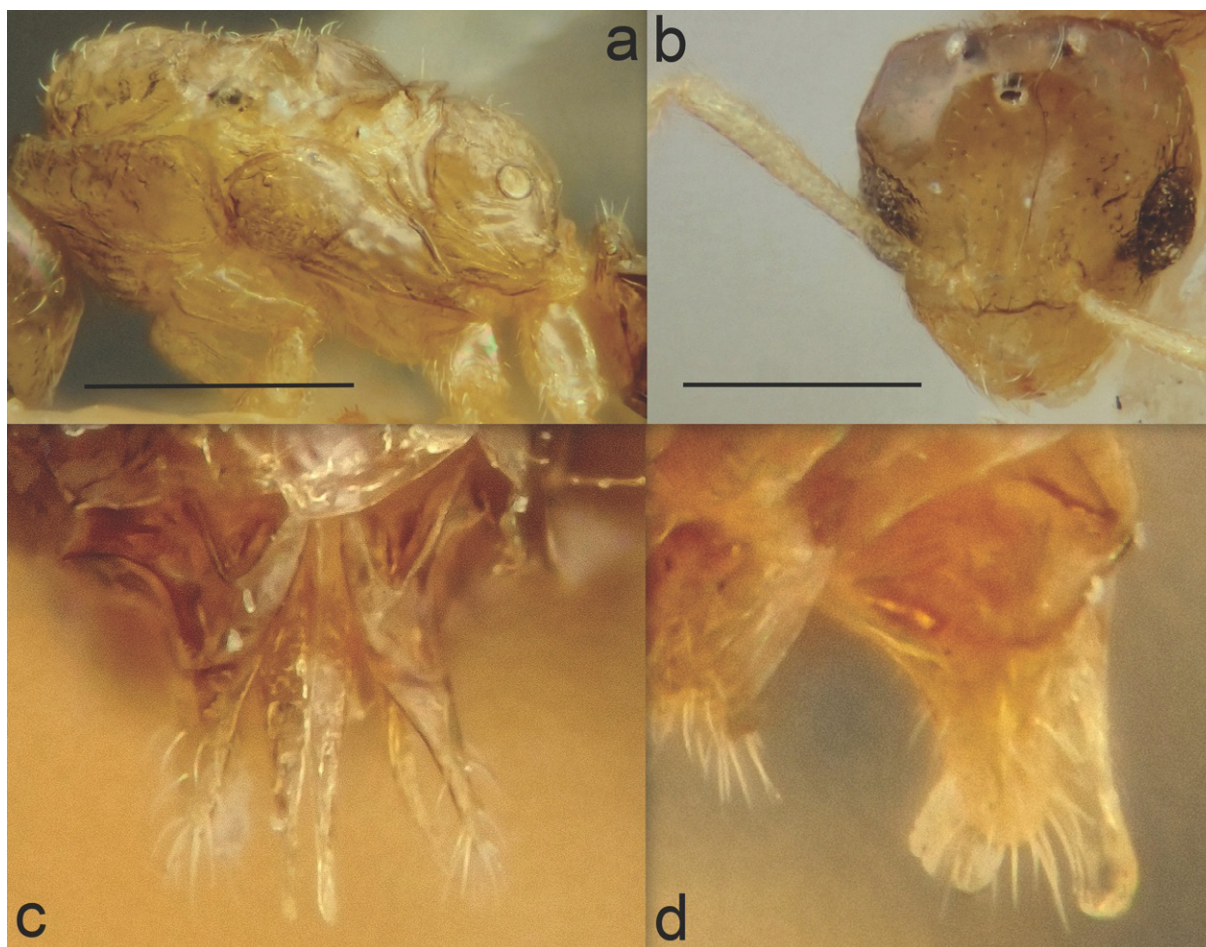


Figure 13. *Plagiolepis grassei* male from Montjuïc: a) mesosoma and petiole, lateral view; b) head, frontal view; c) genitalia, ventral view; d) genitalia, lateral view. Scales: 250 µm.

Figura 13. Macho de *P. grassei* de Montjuïc: a) mesosoma y peciolo, vista lateral; b) cabeza, vista frontal; c) genitalia, vista ventral; d) genitalia, vista lateral. Escalas: 250 µm.

Supplementary information ↑

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Authorship contribution statement

Fede García: Conceptualization, Formal Analysis, Research, Methodology, Project Management, Writing – original draft, Writing – revision, and editing.

Amonio David Cuesta-Segura: Formal Analysis, Research, Methodology, Writing – revision, and editing.

Xavier Espadaler: Research, Methodology, Writing – revision, and editing.

Competing interests

The authors declare that there are no conflicts of interest related to this research.

Statement on the use of Artificial Intelligence

Not applicable.

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