



SHORT NOTE

First Outdoor Continental Record of *Plagiolepis alluaudi* Emery, 1894 in Europe

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Abstract

Plagiolepis alluaudi is a small, yellow, tropical tramp ant species that is rapidly spreading worldwide. In Europe, this species has primarily been reported in indoor environments, with outdoor populations previously found only in the Canary Islands (Spain). This study presents the first documented occurrence of *P. alluaudi* in outdoor continental Europe, with seemingly established populations discovered in Nerja (Malaga), a coastal town in the south of the Iberian Peninsula, characterized by mild environmental conditions associated to a subtropical climate. Given trends observed in other tropical species introduced into the Iberian Peninsula, additional populations of this species may be discovered in the coming years.

Main text

Globalization has profoundly affected not only human societies but also natural ecosystems. The intensive movement of goods and the global trade of plants and animals have inadvertently facilitated the introduction of alien species (Nentwig et al., 2017; Bertelsmeier, 2021; Bonnamour et al., 2021; Gippet et al., 2023; Menchetti et al., 2023), which can disrupt the ecological balance of native communities (Holway et al., 2002). To date, over 14,000 alien species have been recorded in Europe, and approximately 37,000 globally. Among them, arthropods account for between 23.38% and 31% of these species, with insects representing the most numerous group (Roy et al., 2020; IPBES, 2023).

The distribution of alien species across Europe is uneven. While climate change is broadening the range of environments suitable for the establishment of alien species (Gian-Reto et al., 2009), warmer regions, particularly those with Mediterranean climates, remain the most heavily impacted.

In recent years, the Mediterranean area has seen a steady increase in records of alien species, likely driven by its mild climate, which greatly facilitates both the establishment and spread of these newcomers once introduced (Schifani, 2019). Within the various groups of alien organisms, ants are among the most frequently reported, with around 50 alien ant species recorded in the Mediterranean region, particularly concentrated in the southern areas (i.e. Schifani, 2019; Gouraud & Kaufmann, 2022; Reyes-López & Rodríguez Reyes, 2022; Borowiec et al., 2023; Demetriou et al., 2023a,b; Espadaler & Lozano, 2023; Menchetti et al., 2023; Espadaler & Ruiz Ramos, 2024; Schifani et al., 2024a,b; Reyes-López et al., 2025). This growing presence not only threatens native ant communities by introducing new competitors for resources but also poses risks to public health, as some of these species, such as the red imported fire ant (*Solenopsis invicta*) (Menchetti et al., 2023) and the little fire ant (*Wasmannia auropunctata*) (Espadaler et al., 2018), can have harmful impacts on humans.



The genus *Plagiolepis* Mayr, 1861, part of the subfamily Formicinae, comprises 67 species primarily distributed across tropical and temperate regions, plus 10 fossil species (Bolton, 2012). *Plagiolepis alluaudi* Emery, 1894 is native to the Western Indian Ocean islands (Wetterer, 2014), although is widely recognized as a tramp species. This ant species is commonly found as a pest in European greenhouses and considered invasive in tropical and subtropical islands (Wetterer, 2014, 2020; Blatrix et al., 2018; Pawluk et al., 2022; Freyhof & Jantke, 2024). Like other tramp ants, this small yellow species, measuring approximately 1.5 mm, has spread globally through human commerce and is closely associated with human-disturbed environments (Passera, 1994). *Plagiolepis alluaudi* exhibits traits typical of tramp ants, including high polygyny, with up to one queen per 100-200 workers, and extreme polydomy, which allows colonies to relocate rapidly among multiple nest sites (Miller, 2020).

This study constitute the first outdoor record of *P. alluaudi* in the Mediterranean region, specifically on the Iberian Peninsula. The species was detected in Nerja (Málaga), a town located on the Mediterranean coast and known for its subtropical climate.

Plagiolepis alluaudi was first found in August 2023. Workers of this species were observed foraging on a rock (36°44'56.6"N 3°52'10.8" W) along a natural wall beside a path leading to the beach in Nerja (Malaga, Spain) – a locality from the region of Axarquía (Malaga, Andalusia) (Figure 1). The foraging trail was marked by a high density of workers retrieving cat food left by people on a rock to feed street cats. The trail emerged from a neglected area between the gardens of a nearby hotel and the promenade, although the nest could

not be located as the area was inaccessible. Other species were also observed feeding with *P. alluaudi* but without direct interaction: the holomediterranean species *Monomorium subopacum* (Smith, 1858) (Catarineu et al., 2018) and the alien *Nylanderia jaegerskioeldi* (Mayr, 1904), a widespread species in the South of the Iberian Peninsula. To determine if the colony had successfully established, a follow-up search was conducted in November 2024, revealing that workers of this species were still densely foraging in the same area. Then, 10 workers were collected, stored in vials containing 95% ethanol, and brought to the laboratory for further identification using the Olympus SZH10 stereomicroscope.

The identification of the collected specimens was carried out by following the identification keys published by Sarnat & Suarez (2012) and Demetriou et al. (2023). Additionally, the specimens were also compared with images of the species included in Wetterer (2013) and with those available in the Antweb database. Finally, some individuals were sent to B. Seifert for confirmation of the species identification.

The specimens identified as *P. alluaudi* can be distinguished from other non-parasitic *Plagiolepis* species present in the Iberian Peninsula (*P. pygmaea*), *P. schmitzii* Forel, 1895, and *P. pallelescens*, Forel, 1889 (synonym: *Plagiolepis taurica* Santschi, 1920) based on a suite of morphological traits compiled from various identification keys (Sharaf et al., 2011; Salata et al., 2018; Seifert, 2020), including those mentioned above. *P. alluaudi* exhibits a uniformly light-yellow coloration, in contrast to the darker hues observed in the other species, which range from yellowish-brown to dark brown or blackish, depending on the age of the individuals.



Fig 1. Location of Nerja, the coastal town where *Plagiolepis alluaudi* was observed in 2023-2024. Source of map: Google Earth Pro v. 7.3.6.10201. (January 13, 2025). <http://www.earth.google.com> (image captured on October 9, 2025).

In terms of cephalic morphology, *Plagiolepis alluaudi* possesses a more rounded head, with a clypeus that projects distinctly over the mandibles and a convex occipital margin. Its antennal scape exceeds the posterior margin of the head by more than half the eye length. Conversely, the other species typically exhibit a more elongated head shape, a moderately convex clypeus, and a straight occipital margin. Worker size also serves as a distinguishing feature: *P. alluaudi* workers average approximately 1.6 mm in length, whereas those of *P. pygmaea* range from 1.5–2.0 mm, *P. pallescens* average around 2.0 mm, and *P. schmitzii* range from 1.8–2.2 mm. Additionally, *P. alluaudi* is characterized by fine, light, and sparse appressed pubescence on the scape and body, a trait that further aids in its identification.

This report represents the first record of the outdoor establishment of the tramp ant *P. alluaudi* in continental Europe. Although *P. alluaudi* is globally distributed, only two confirmed instances of outdoor nesting have been documented in Europe to date, both restricted to the Canary Islands (Staab, 2018; Hernández-Teixidor et al., 2020).

Despite its minute size, *P. alluaudi* has been reported to displace the previously established dominant alien ant *Pheidole megacephala* (Fabricius, 1793) in a neighbourhood in Florida, USA, (Chouvenc et al., 2018). However, in Nerja, no evidence of interactions or displacement involving other co-occurring dominant polydomous species (*Monomorium subopacum*, *Nylanderia jaegerskioeldi*, or *Tapinoma* sp.) was found.

The outdoor presence of this species in the subtropical region of Andalusia (Axarquía) may not be coincidental. For instance, dense populations of *Paratrechina longicornis* (Latreille, 1802) and *Nylanderia jaegerskioeldi* have been observed at different locations along the promenade in Nerja (Trigos-Peral, pers. observ.), near the site where *P. alluaudi* was found. Indeed, the presence of the populations of eight different alien species (including invasive ones) have been recorded so far in only one-sixth part of the Axarquía region: *Paratrechina longicornis* (in Torre del mar and Nerja, author pers. observ.); *Pheidole indica* Forel, 1893 (Trigos-Peral & Reyes-López, pers. observ.); *Cardiocondyla obscurior* Wheeler, 1929, *Linepithema humile* (Mayr, 1868), *N. jaegerskioeldi*, *Tetramorium caldarium* (Roger, 1857) (Trigos-Peral & Reyes-López, 2020) and *Brachymyrmex patagonicus* Mayr, 1868 (Reyes-López et al., 2021).

Finally, given the species' proximity to urban gardens containing alien plant species and considering its ecology and presumed origin, its introduction is likely associated with the trade and planting of tropical ornamental plants. Different studies support this assumption, emphasizing the role of ornamental and crop plants in the unintentional introduction of alien arthropod species, including ants (i.e., Rabitsch & Blight, 2021; Nardi et al., 2025). These findings underscore the importance of regular monitoring and the development of preventive measures to limit the spread of alien species, safeguarding native biodiversity and maintaining the health and balance of local ecosystems.

Authors' Contribution

GT-P: Conceptualization, investigation, writing-original draft, visualization.

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