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Plagiolepis alluaudi Emery, 1894, a globally spreading exotic ant (Hymenoptera, Formicidae) newly recorded from Tenerife (Canary Islands, Spain)

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Abstract

Exotic ants have been a prevalent ecological problem, particularly in tropical and subtropical islands. Here *Plagiolepis alluaudi* Emery, 1894 is recorded from the island of Tenerife (Canary Islands, Spain) for the first time, where it was commonly encountered in the town Puerto de la Cruz. This is the first Canary Islands record of this species that is presumably native to Madagascar and surrounding islands. Whether or not *P. alluaudi* will be able to spread into natural Canary ecosystems that have a high share of endemic species is unknown.

Keywords

biogeography, conservation, endemic species, exotic species, invasive ants, Macaronesia, Oceanic island

Introduction

Many species of ants have been spread by human activities outside their native distribution ranges, where they are ecologically successful particularly in subtropical and tropical islands and disturbed habitats (McGlynn 1999). A subset of these exotic ant species have become invasive and threaten native species when they reach high densi-

ties in invaded natural ecosystems (Holway et al. 2002). Like all other non-native species (Banks et al. 2015), exotic ants are spread by humans, for example when colonies or mated queens are unintentionally moved over long distances within cargo, soil or plant material (Holway et al. 2002). Realized distributions of exotic ant species are not static and new locality records of exotic ants are constantly being reported (e.g. Gotzek et al. 2012; Guénard et al. 2018; Schifani et al. 2018; Schifani 2019).

Plagiolepis alluaudi Emery, 1894 is a tiny yellowish ant species in the subfamily Formicinae that is invasive in tropical and subtropical islands (Wilson and Taylor 1967; Wetterer 2014) and also increasingly occurring in continental localities, for example in Florida (Chouvenc et al. 2018). The type locality of *P. alluaudi* is the Seychelles (Emery 1894) and the species is originally likely native to Madagascar and neighboring islands (Wetterer 2014). In the past, *P. alluaudi* has been widely spread by human commerce (especially within living plant material, Smith 1957) and can be a nuisance in greenhouses (Smith 1957; Wetterer 2014; Blatrix et al. 2018). The distribution of the species was comprehensively mapped by Wetterer (2014), but since then it became known from additional locations (e.g. Chouvenc et al. 2018) and it is likely that *P. alluaudi* will spread further (Smith 1957).

Tenerife is the largest island of the Canary Island Archipelago located in the Atlantic Ocean west of Morocco. As oceanic islands of volcanic descent, the Canary Islands were never connected to continental land and have evolved diverse native biota with many endemic species (Juan et al. 2000). At least 50 native ant species (including subspecies) are known from the Canary Islands (Wheeler 1927; Barquín 1981; Högmo 2003; Espadaler 2007; Guénard et al. 2017), of which the majority also occurs on Tenerife. Like on other oceanic islands with a favorable climate, non-native ants are now common in the Canary Islands and at least 15 exotic ant species have been recorded from Tenerife (Espadaler and Bernal 2003; Espadaler and Fernández 2014; Schifani et al. 2018), among them the globally invasive *Linepithema humile* (Mayr, 1868) and *Paratrechina longicornis* (Latreille, 1802). Exotic ants continue to be introduced to Tenerife, as the recent finding of *Lepisiota frauenfeldi kantarensis* (Forel, 1911) exemplifies (Schifani et al. 2018), and are currently estimated to account for up to a third of the ant fauna of the entire archipelago.

Here the first record of the invasive ant species *P. alluaudi* for Tenerife is reported, where the species was commonly encountered in gardens in the town Puerto de la Cruz. This is the first record of *P. alluaudi* for the Canary Islands and for any island of Macaronesia.

Methods

In August 2018 ants were collect from the ground by hand with featherweight forceps without following a standardized collection protocol. Small yellowish ants were repeatedly noticed in gardens in Puerto de la Cruz and subsequently collected in two locations.

Specimens were stored in 95% ethanol, mounted on points and identified with http://www.antkey.org (an online tool for the identification of introduced ants, Sarnat and Suarez 2012) and by comparison with the original description (Emery 1894), a redescription (Smith 1957), and images of type specimens that are illustrated on the https://www.AntWeb.org database (AntWeb 2019).

To illustrate a worker and a dealate queen, raw image stacks were recorded with a Leica M165 C microscope that was equipped with a Leica MC190 HD camera (Leica Microsystems, Wetzlar, Germany) and the final montage images were assembled with Helicon Focus (version 7) software (Helicon Soft Ltd., Kharkiv, Ukraine). Voucher specimens will be deposited in the Museum für Naturkunde der Humboldt-Universität (Berlin, Germany) and the personal collection of the author.

Results

The specimens from Puerto de la Cruz (Tenerife, Canary Islands) were identified as *Plagiolepis alluaudi* (Fig. 1) and agree in all aspects with the original description, the redescription, the type series (CASENT0101699, CASENT0102083, CASENT0102084) and further syntypes (CASENT0912413, CASENT0912414). Even though the species superficially resembles yellow *Brachymyrmex* species, *P. alluaudi* can be easily distinguished by having eleven antennal segments (nine in *Brachymyrmex*). *Plagiolepis alluaudi* was found in a garden in the town center (28°24'54"N, 16°33'19"W, 20 m asl, 26-VIII-2018, label 'MS1884', leg. Michael Staab) and in a second more suburban garden approximately 1.1 km away from the first location (28°24'49"N, 16°32'40"W, 60 m asl, 29-VIII-2018, label 'MS1886', leg. Michael Staab). Ants with the general appearance of *P. alluaudi* were seen in several further locations in Puerto de la Cruz but not collected. For sample MS1886, several dealate queens (Fig. 2) were moving on a linear trail together with workers that were carrying brood, presumably during a nest relocation. Co-occurring species were the exotic *Cardiocondyla obscurior* (Wheeler, 1929) (MS1886), *Linepithema humile* (MS1884), *Nylanderia jaegerskioeldi* (Mayr, 1904), *Paratrechina longicornis* (MS1884, MS1886), *Tapinoma melanocephalum* (Fabricius, 1793) (MS1886), and *Tetramorium caldarium* (Roger, 1857) (MS1884, MS1886), the possibly native *Lasius grandis* Forel, 1909 (MS1886) and *Plagiolepis pygmaea* (Latreille, 1798) (MS1886), and the native *Plagiolepis schmitzii canariensis* Santschi, 1920 (MS1886) (see locality data in Suppl. material 1: Table S1).

Discussion

The globally spreading *P. alluaudi* is here recorded from Tenerife for the first time. The species was in August 2018 found in several locations in Puerto de la Cruz, a tourist town in the north of the island, where the species appears to be firmly established. Albeit no systematic search was performed, *P. alluaudi* was not collected outside Puerto de la Cruz.

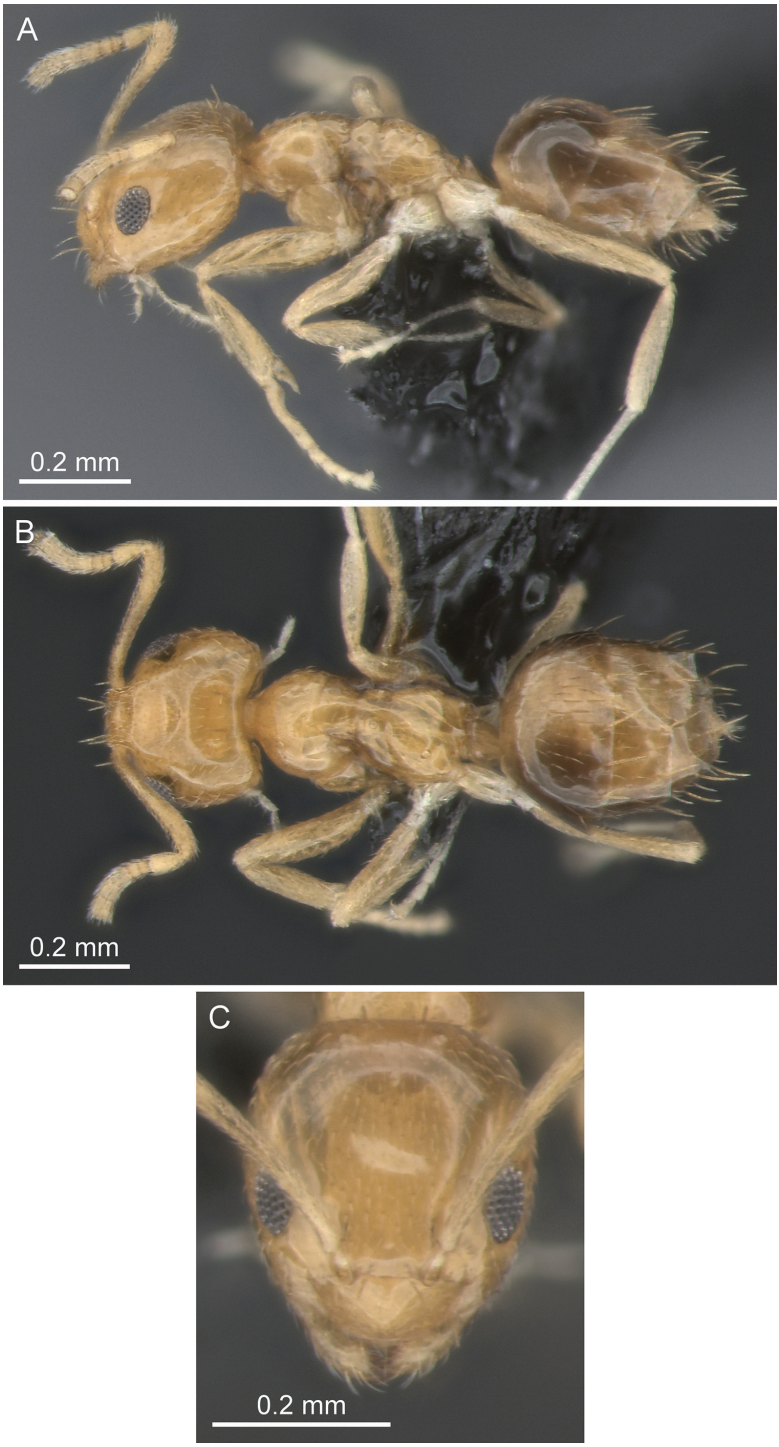

Figure 1. *Plagiolepis alluaudi* worker (MS1866) from Puerto de la Cruz, Tenerife **A** body in profile **B** body in dorsal view **C** head in full-face view.

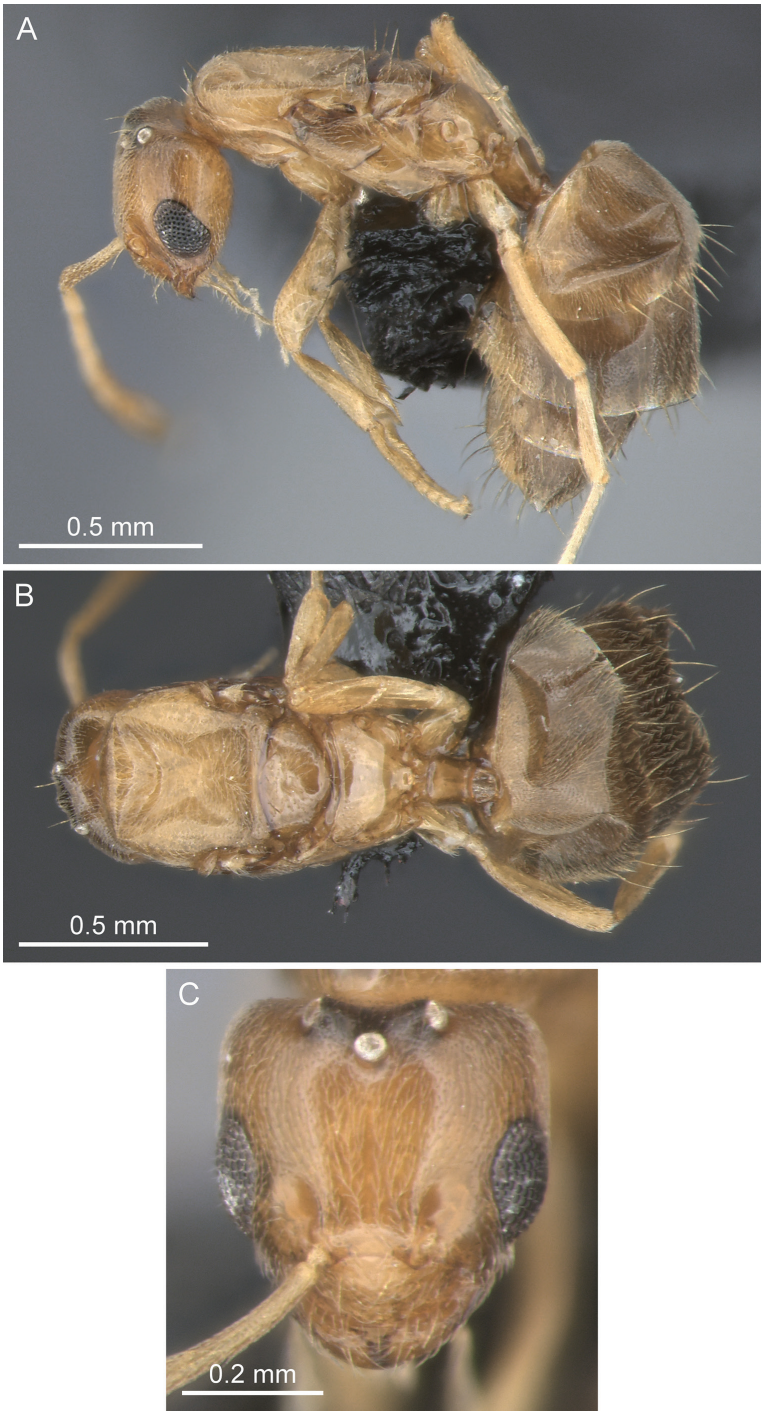

Figure 2. *Plagiolepis alluaudi* dealate queen (MS1866) from Puerto de la Cruz, Tenerife **A** body in profile **B** body in dorsal view **C** head in full-face view. The specimen was collected from the same colony as the worker in Fig. 1.

As the species was not detected in previous surveys of ants on Teneriffe (e.g. Stitz 1917; Wheeler 1927; Barquín 1981; Espadaler and Bernal 2003; Schifani et al. 2018), this may suggest a rather recent introduction event, potentially with plant material (Smith 1957; Wetterer 2014; Blatrix et al. 2018). Because *P. alluaudi* is widespread in tropical and subtropical islands and commonly occurs in greenhouses around the world, it is at present not possible to determine the source of the population in Tenerife. The Canary Islands are over 8,000 km from the native distribution range and over 2000 km from the closest exotic records from greenhouses in France (Wetterer 2014; Guénard et al. 2017).

Being an oceanic island in a subtropical climate, diverse endemic biota have evolved on Tenerife for example in plants and beetles (Emerson et al. 1999; Juan et al. 2000). Regarding ants, endemic species likely account for over 30% of the Canary Islands myrmecofauna (Schifani et al. 2018). Competition between exotic and native species is likely and can have far-reaching consequences for native biota. For example, Valido et al. (2019) recently showed that in Tenerife managed exotic honeybees reduce the diversity of wild pollinators and change pollination networks. Concerning *P. alluaudi*, it is currently unknown if and how the species will integrate into undisturbed native ecosystems. Most exotic ants are not imposing threats to native ecosystems and only a relatively small subset of species can establish outside disturbed areas (McGlynn 1999; Holway et al. 2002). However, *P. alluaudi* has in several places spread into relatively undisturbed forests, for example in Hawaii, where it is now the most common ant species in some areas (Krushelnycky 2015).

Being a generalist forager that frequently tends Hemiptera for honeydew (Smith 1957; Krushelnycky 2015), it can live in mutualistic association with many honeydew producers (compare Staab et al. 2015), many of which are also exotic and can facilitate the ecological success of exotic ants (Lach 2003). Thus, in case *P. alluaudi* will become established in native habitats, it may compete with native ants for resources. When an ant species spreads on an island, the species often replaces other native and exotic ants (Wilson and Taylor 1967). Even though *P. alluaudi* has a very small body size (~ 1.2 mm total length in workers), it can vigorously defend resource and is resistant to larger competitively superior ants (Burwell et al. 2012). This also explains why the species was in Puerto de la Cruz thriving in direct proximity to the Argentine ant *L. humile*, an invasive species that is notoriously known for displacing other ants (Holway 1999) and is a pest in Tenerife since the early 20th century (Stitz 1917; Wheeler 1927; Espadaler and Bernal 2003).

The present record of *P. alluaudi* is the first record for the Canary Islands. As the species combines a small body size, opportunistic foraging and polygyny, which are all traits facilitating spread of exotic ants (McGlynn 1999; Wetterer 2014), it is not unlikely that *P. alluaudi* will soon be found on other islands of the Canary Archipelago (see also Espadaler and Fernández 2014; Schifani et al. 2018).

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Supplementary material 1

Table S1. Locality data for all ant species reported in this study

Authors: Michael Staab

Data type: Occurrence data

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