Ant diversity on the largest Mediterranean islands: on the presence or absence of 28 species in Sicily (Hymenoptera, Formicidae)

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Abstract - The ant fauna of Sicily, the largest island in the Mediterranean basin, has been significantly overlooked over the time. Drafting a reliable Sicilian ant checklist requires extensive field surveys, a careful review of the literature and of museum specimens, as well as the taxonomic investigation of some problematic issues. As a part of these ongoing efforts, we present our results on the presence or absence of 25 species. By analyzing specimens collected during the last 35 years across the island and reviewing old records in the light of present-day taxonomy, we provide evidence of the presence of 9 species (*Camponotus ruber, Lasius myops, L. platythorax, Plagiolepis schmitzii, Ponera testacea, Solenopsis orbula, Temnothorax clypeatus, T. nylanderi,* and *T. ravouxi*), while suggesting the absence of 19 others (*Camponotus ligniperda, C. sicheli, C. spissinodis, Formica lugubris, Lasius alienus, L. flavus, L. niger, L. paralienus, Messor minor, M. wasmanni, Monomorium monomorium, Myrmica scabrinodis, M. spinosior, Nylanderia* sp. 2 *sensu* Schifani & Alicata 2018, *Solenopsis fugax, Temnothorax luteus, T. tuberum, Tetramorium caespitum,* and *T. indocile*). Similar studies are necessary across Italy, as a significant portion of the existing ant records is outdated due to the evolved taxonomic framework.

Keywords: biogeography, Italy, myrmecofauna, species distribution.

Riassunto - La diversità delle formiche nelle isole Mediterranee maggiori: sulla presenza o assenza di 28 specie in Sicilia (Hymenoptera, Formicidae).

La Sicilia è la più grande isola nel bacino del Mediterraneo, e la sua mirmecofauna per decenni è stata significativamente trascurata. La stesura di un'affidabile check-list delle formiche siciliane richiede estese raccolte di campo, un'attenta revisione della letteratura e del materiale museale e l'indagine tassonomica di alcune questioni problematiche. Come parte di questi sforzi in corso, presentiamo i nostri risultati riguardanti la presenza o l'assenza di 25 specie. Analizzando i campioni raccolti sull'isola lungo gli ultimi 35 anni e revisionando le vecchie segnalazioni alla luce della tassonomia odierna, forniamo dati che testimoniano la presenza di 9 specie (*Camponotus ruber, Lasius myops, L. platythorax, Plagiolepis schmitzii, Ponera testacea, Solenopsis orbula, Temnothorax clypeatus, T. nylanderi,* and *T. ravouxi*), mentre suggeriamo l'assenza di altre 19 (*Camponotus ligniperda, C. sicheli, C. spissinodis, Formica lugubris, Lasius alienus, L. flavus, L. niger, L. paralienus, Messor minor, M. wasmanni, Monomorium monomorium, Myrmica scabrinodis, M. spinosior, Nylanderia* sp. 2 *sensu* Schifani & Alicata 2018, *Solenopsis fugax, Temnothorax luteus, T. tuberum, Tetramorium caespitum,* and *T. indocile*). Studi simili sono necessari in Italia poiché una porzione significativa delle esistenti segnalazioni di formiche è resa obsoleta a causa del mutato quadro tassonomico.

Parole chiave: biogeografia, distribuzione delle specie, Italia, mirmecofauna.

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INTRODUCTION

Ants (Hymenoptera, Formicidae) are a highly diverse family of social insects playing a fundamental role in many terrestrial ecosystems across all continents (Hölldobler & Wilson, 1990; Lach *et al*., 2010). The Mediterranean basin is considered a biodiversity hotspot, and islands need special attention for their biogeography and conservation (Myers *et al*., 2000). More specifically, the region is also a major hotspot for ant diversity within the Holarctic region (Borowiec, 2014). Sicily is the largest Mediterranean island (25,711 km^2), and because of its central position between the Eastern and the Western Mediterranean, and its proximity to both the Italian peninsula and the Maghreb (Basilone, 2012; Guarino & Pasta, 2018; Vigna Taglianti *et al*., 1994), it is characterized by high geological diversity, complex palaeogeographic history, and diverse biogeographic influences.

The first attempts to describe the island's ant fauna date back to the first half of the 19th century (Ghiliani 1842). Afterwards, an important role was played by Teodosio De Stefani Perez and its exchanges with Carlo Emery (De Stefani, 1889; 1895; Emery, 1915). In the following decades, it is certainly worth mentioning the papers pu-

blished by Donisthorpe (1927), Kutter (1927), Monastero (1950), and Baroni Urbani (1964a). By the time Baroni Urbani (1971) published his monumental checklist of the Italian ant fauna, he considered about 73 taxa to inhabit Sicily. About a quarter of a century later, the Italian checklist considered 56 taxa to be present (Poldi *et al*., 1995). However, since Baroni Urbani (1964a) visited Sicily, very little data have been published as a result of actual field surveys on the Italian ant fauna during the last few decades (e.g. Sanetra *et al*., 1999). Meanwhile, some major taxonomic revisions have been conducted on the taxonomy of the European ant fauna, resulting in the adoption of more rigorous criteria for species delimitation in cryptic complexes, and in the description or synonymization of a very large number of taxa (relevant examples for the Sicilian fauna can be found in Seifert, 1988; 1992; Seifert *et al*., 2014; 2017; Wagner *et al*., 2017; Steiner *et al*., 2018). Unfortunately, Sicilian ants were sometimes not analysed in these studies, leaving uncertainty on the identity of the Sicilian representatives of some cryptic complexes.

We conducted extensive field investigations of the Sicilian ant fauna, leading to the collection of a significant amount of specimens and data that, we hope, will allow us to shed light on many unresolved issues. As a result, we provided first records of 35 species, described three new ones and clarified the validity of four endemics (Radchenko *et al*., 2006; Schifani, 2017; Schifani & Alicata, 2018; Alicata & Schifani, 2019; Schär *et al*., 2020; Schifani *et al*., 2020; 2021a). However, since the descriptions of several new species are in due preparation, and problematic taxonomic issues remain to be solved, we still refrain from proposing a new comprehensive Sicilian ant checklist, which would become outdated very shortly. In the meantime, a checklist of the Sicilian ant fauna is nonetheless available on the website AntMaps.org (Janicki *et al*., 2016; Guénard *et al*., 2017).

In the present paper, we report new data and arguments in favour or against considering 25 ant species as part of the Sicilian ant fauna. We based our conclusions on the field surveys we conducted, revision of museum material, and a critical analysis of previous records and subsequent taxonomic changes.

In addition to the species we discuss here, it is worth mentioning that the presence of *Lepisiota nigra* (Dalla Torre 1893) in Sicily also needs confirmation: initially recorded from Taormina by Donisthorpe (1927), the identity of *L. nigra* and its distinction from *L. frauenfeldi* (Mayr 1855) is still poorly-defined as a taxonomic revision of the Mediterranean *Lepisiota* is badly needed (Emery, 1916; Schifani *et al*., 2018). For instance, according to Mei (1995), older records of *L. nigra* from the Pelagie Islands and Pantelleria represented *L. frauenfeldi* instead. Schär *et al*. (2020) studied samples from Taormina characterized by a black pigmentation showing that they clustered with *L. frauenfeldi* rather than with *L. nigra* in a barcoding approach (mtCO1 gene). However, as long as the taxonomy of the genus is unresolved, it is difficult to assess the performance of this molecular marker in this group.

MATERIALS AND METHODS

The studied specimens are mostly kept in the authors' collections, i.e., E. Schifani collection (ESC), S. Csősz collection (SCC), A. Alicata collection (AAC), and were identified by means of a stereomicroscope up to 180× magnification. Measurements were obtained using the software ImageJ from pictures taken by a Canon MP-E, with a 65 mm f/2.8 objective and a 1-5x lens (Schneider *et al*., 2012). Our material (excluding circum-Sicilian islands) amounts to 6824 colony samples (AAC: 6445 collected between 1987 and 2021; ESC: 1157, from 2014 to 2021, including 210 by Roberto Viviano; last check on 20 March 2021), whose geographical origin is illustrated in Figure 1. Sampling techniques included direct sampling, soil sifting, pitfall traps, and Milieu Souterrain Superficiel traps (Mammola *et al*., 2016; Agosti *et al*., 2000). Moreover, we benefited from the significant support of several occasional collaborators who gave us their specimens. Finally, we studied specimens from the following museum collections: Basel Natural History Museum (Switzerland), Geneva Natural History Museum (Switzerland), Milan Natural History Museum (Italy), Natural History Museum G. Doria (Genoa, Italy), Terrasini Natural History Museum (Italy), Verona Natural History Museum (Italy), Wien Natural History Museum (Austria).

Arguments in favour or against the presence of each mentioned species in Sicily are treated in detail for each taxon in the light of the relevant literature and the results of our collecting efforts throughout Sicily. Mentioned specimens are mostly kept in the authors' collections. Relevant taxonomic sources for species identification are stated directly in the comments to each taxon. Following a principle of parsimony, a taxon is declared to be absent whenever there is no convincing evidence of its presence, which does not imply that future additional investigations may eventually uncover conclusive evidence of its presence. Moreover, records of species that have been published without detailed georeferenced information (i.e., reporting a generic "Sicily") are considered unreliable: in particular, the records may not even refer to Sicily but to circum-Sicilian islands instead (e.g. Schifani & Alicata, 2018) and it is impossible to verify whether the recorded species are present in the sites where they were found.

Dates are expressed as dd.mm.yyyy throughout the text.

RESULTS AND DISCUSSION

Confirmed presence and first records

1. *Camponotus ruber* Emery 1925

This species was recorded so far from Egadi (Scupola, 2009) and Aeolian Islands (Schär *et al*., 2020). Previous records of *C. sicheli* Mayr 1866 from Sicily may all have to be attributed to *C. ruber*, but no localities were reported by Forel (1879) or any subsequent author (Poldi *et al*., 1995; Schifani *et al*., 2021a; see under *C. sicheli*). We confirm *C. ruber* at least from NW Sicily, a region that was particularly interested by Maghrebian faunal influences (Schifani *et al*., 2020).

Examined material (Fig. 2a-d)

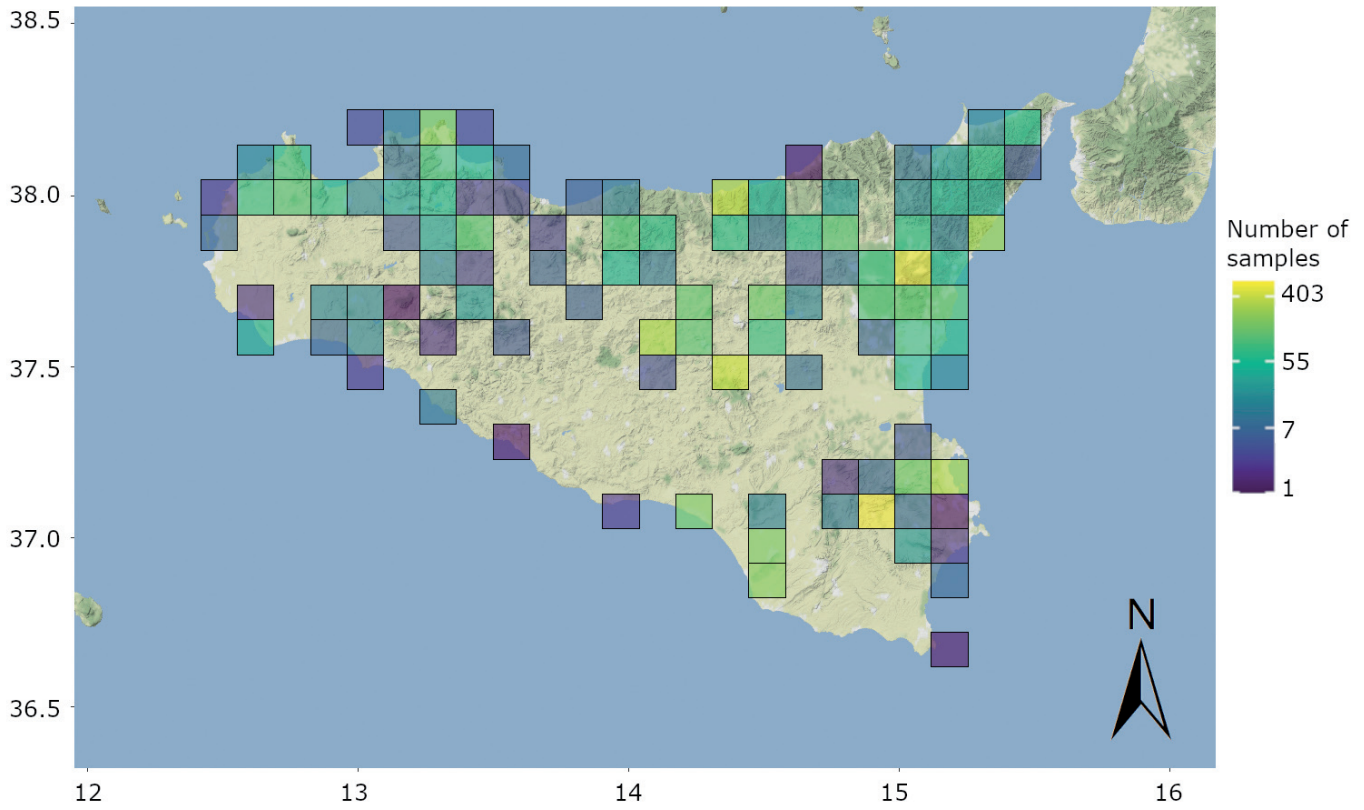

Fig. 1 - Sampling effort across Sicily (circum-Sicilian islands excluded) according to the number of samples from AAC and ESC. / Sforzo di campionamento in Sicilia (isole circumsiciliane escluse) basato sul numero di campioni in AAC e ESC.

Palermo province: Monte Pellegrino, 38.1730, 13.3510, 390 m asl, *Pinus halepensis* artificial forest, 12.04.2016, E. Schifani legit, ESC; Monte Catalfano, 38.0973, 13.5264, 230 m asl, *Ampelodesmos mauritanicus* anthropogenic steppe, 03.06.2016, E. Schifani legit, ESC; Capo Gallo, 38.2125, 13.2918, 10 m asl, *Ampelodesmos mauritanicus* anthropogenic steppe, 03.10.2017, E. Schifani legit, ESC; Mondello, 38.1895, 13.3358, 60 m asl, *Ampelodesmos mauritanicus* anthropogenic steppe, 18.11.2017, E. Schifani legit, ESC.

Trapani province: Custonaci, photographed by Luigi Barraco (no specimens collected), 12.2007. Monte Cofano, 38.1128, 12.6714, 30 m asl, degraded phrygana, 16.05.2016, E. Schifani legit, ESC.

2. *Lasius (Cautolasius) myops* (Fabricius 1782)

In the past, *Lasius myops* was often considered a subspecies or even a synonym of *L. flavus* (Fabricius 1782) until Seifert (1983) gave strong evidences to keep them as separate species. Emery (1916) reported it from Sicily without further details, and no following author provided any evidence of its presence. However, it was recently found in the nearby Aeolian Islands and Southern Calabria (Schär *et al*., 2020). We confirm its presence at least from E Sicily.

Examined material (Fig. 2e-f)

Catania province: Galvarina (Etna), 1800 m asl, 08.07.1992, A. Alicata legit, AAC; Bosco Chiuso (Etna), 25.07.1992, A. Alicata legit; Passo Zingaro (Etna), 08.08.1992, A. Alicata legit, AAC; Pineta di Linguaglossa (Etna), 1475 m asl, 8.10.1992, A. Alicata legit, AAC; Monte Rosso (Etna), 1755 m asl, 10.10.1992, A. Alicata legit, AAC; Monte La Guardia (Etna), 750 m asl, 18.10.1992, A. Alicata legit, , AAC; Contrada Cerrita (Etna), 1300 m asl, 17.7.1993, A. Alicata legit, AAC; Bosco Maletto (Etna), A. Alicata legit, AAC; Monte Ruvolo (Etna), A. Alicata legit, AAC.

Messina province: Torrente Cataolo, Santa Lucia del Mela, 38.124747, 15.328967, 350 m, 09.02.1996, A. Alicata legit, AAC; Piano Daini (Nebrodi), 02.06.2001, A. Alicata legit, AAC.

3. *Lasius (Lasius) platythorax* Seifert 1991

This species was separated from *L. niger* (Linnaeus 1758) by Seifert (1991), and closely resembles the W Mediterranean *L. grandis* Forel 1909 (Seifert, 1992; 2020a). *Lasius platythorax* looks rare in Sicily that could be the southernmost limit of its range. The distribution of *L. platythorax* in Sicily, and Italy as well, has still to be carefully investigated because of its close resemblance to *L. niger*, whose pre-1991 records surely included either species. The few known published records of *L. platythorax* show it is widespread in Italy, including Calabria and Sardinia (Seifert, 1992; 2020a; Rigato & Toni, 2011). The ecological requirements of *L. platythorax* have mostly been documented from Central Europe, but its habitat preferences in the Mediterranean region are little-known (Seifert, 2018).

Examined material (Fig. 2g-h)

Trapani province: Monte Cofano (northern slope), mixed forest, 02.03.1994, A. Alicata legit, AAC. Monte Inici, *Quercus ilex* forest, 37.995989, 12.854347, 1000 m asl, 22.1.1996, A. Alicata legit, AAC.

Messina province: Torrente Saracena, contrada Chiusitta, Nebrodi, 37.926717, 14.819856, 1400 m asl, 17.04.1993, A. Alicata legit, AAC.

4. *Plagiolepis schmitzii* Forel 1895

Taxonomic confusion has made the interpretation of the true identity of this taxon difficult for a long time. Recently, Salata *et al*. (2018) recognized a similar Eastern Mediterranean species, and, finally, Seifert (2020b) provided a comprehensive revision of the Euro-Mediterranean *P. schmitzii* complex, which includes three W Mediterranean taxa. Records of *P. schmitzii* from Sicily were published by La Pergola *et al*. (2008) and Degueldre *et al*. (2021). We confirm that the specimens sequenced by Degueldre *et al*. (2021) morphologically correspond to *P. schmitzii* and not to any similar species considered by Seifert (2020b). The so-called *P. schmitzii* complex is apparently polyphyletic and Sicilian specimens belong to the same genetic clade as those from Tenerife (Canary Islands), which morphologically key out as *P. schmitzii* (Seifert, 2020b). In Sicily, the genus *Plagiolepis* is represented by the social parasites *P. grassei* Le Masne 1956 and *P. xene* Stärcke 1936, the free-living *P. pygmaea* (Latreille 1798) (by far the commonest *Plagiolepis* and one of the commonest Sicilian ants), *P. pallescens* Forel 1889, and *P. schmitzii* (Schär *et al*., 2020; Degueldre *et al*., 2021). However, the *P. pallescens* complex seems to contain several still undetected species, and a revision is needed to properly identify the Sicilian population (Seifert, 2018; Degueldre *et al*., 2021). The numerous undetermined specimens in our collection still awaiting identification could shed light on the distribution of *P. schmitzii* in Sicily.

Examined material (Fig. 3a-c)

Palermo province: Mondello, 38.183284, 13.325399, 17.04.2017, 15 m, *Citrus* orchard, E. Schifani legit, ESC.

5. *Ponera testacea* Emery 1895

The European *Ponera* were periodically considered to represent one or two species, until Csősz & Seifert (2003) provided evidence to consider *P. coarctata* (Latreille 1802) and *P. testacea* as two distinct species with different ecological requirements (also see Seifert, 2018). The attribution of earlier Sicilian records to either species is problematic. Recently, Schär *et al*. (2020) recorded *P. coarctata*, while the old records by Grandi (1935) and Baroni Urbani (1964a) only referred to *P. testacea*. We confirm the presence of *P. testacea*, and further records will likely be available after the re-examination of all of the *Ponera* specimens still under study.

Examined material (Fig. 3d-e)

Palermo province: Pizzo di Pietralunga, 37.9128, 13.2205, 405 m asl, 29.10.2017, R. Viviano legit, ESC; Castello del Catalubo, 38.0152, 12.9852, 115 m asl, 23.03.2019, R. Viviano legit, ESC.

6. *Solenopsis orbula* Emery 1875

In its present definition, this species is thought to have a circum-Mediterranean distribution (Schifani *et al*., 2021b). The identity of SW European populations seems relatively certain, yet further investigation is needed to verify their relationships with those from other regions (Galkowski *et al*., 2010; Schifani *et al*., 2021b). De Stefani (1889; 1895) reported *S. orbula* from Santa Ninfa (Trapani province). However, Emery (1915) re-examined De Stefani's specimens and described them as a new taxon, i.e. *S. latro sicula* Emery 1915 (later treated in this paper). Some recently collected material and the review of Terrasini Natural History Museum material allowed us to find *S. orbula* specimens from NE Sicily, letting us suppose its continuous distribution along the Tyrrhenian coast from Calabria north to Tuscany (Poldi, 1992; Schifani *et al*., 2021b). According to the collecting data of winged gynes and males, nuptial flights occur in Sicily around July as they do in Tuscany and in Sardinia (Poldi, 1992; Schifani *et al*., 2021b).

Examined material (Fig. 3f-j)

Messina province: Messina, 06.07.1949, V. Ritiro legit, T. De Stefani Jr. collection at the Terrasini Natural History Museum. Messina, Contrada Scoppo, 12.07.2019, V. Scandura legit, V. Gentile coll. Pendici di Monte Campotto, Gualtieri Sicaminò, 38.137572, 15.335097, 290 m asl, praire, 24.02.1994, A. Alicata legit, AAC

7. *Temnothorax clypeatus* (Mayr 1853)

A widespread European species, differing from most European *Temnothorax* by belonging to the *rugatulus* clade (Prebus, 2017). Usually associated with deciduous forests (Seifert, 2018), *T. clypeatus* is one of the few exclusively tree inhabiting *Temnothorax* species in Sicily alongside *T. affinis* (Mayr 1853) and *T. mediterraneus* Ward *et al*. 2015 (Galkowski & Cagniant, 2017; Schifani & Alicata, 2018). It is unlikely that *T. clypeatus* was misidentified in the past, and it is possibly relatively widespread in Sicily, far beyond the single locality we know; in fact, arboreal-nesting species are easily overlooked during field surveys. A similar case in Sicily is that of *Camponotus tergestinus* Müller 1921 (Schifani & Alicata, 2018).

Examined material (Fig. 4a-b)

Syracuse province: Bosco di Santo Pietro, *Quercus suber* forest, 02.06.2019, S. Csősz & A. Alicata legit, SCC and AAC.

8. *Temnothorax nylanderi* (Foerster 1850)

A relatively widespread, W European species associated with forest habitats (Csősz *et al*., 2015; Seifert, 2018). It was reported from Sicily only once by De Stefani (1889), who did not provide any precise locality. *Temnothorax lichtensteini* (Bondroit 1918), from lower altitudes, is the only other *nylanderi*-group species occurring in Sicily (Schär *et al*., 2020) (not counting *T. flavicornis* (Emery 1870), recorded by Buschinger *et al*. (1988), recently discovered to be unrelated, see Prebus, 2017).

Examined material (Fig. 4c-d)

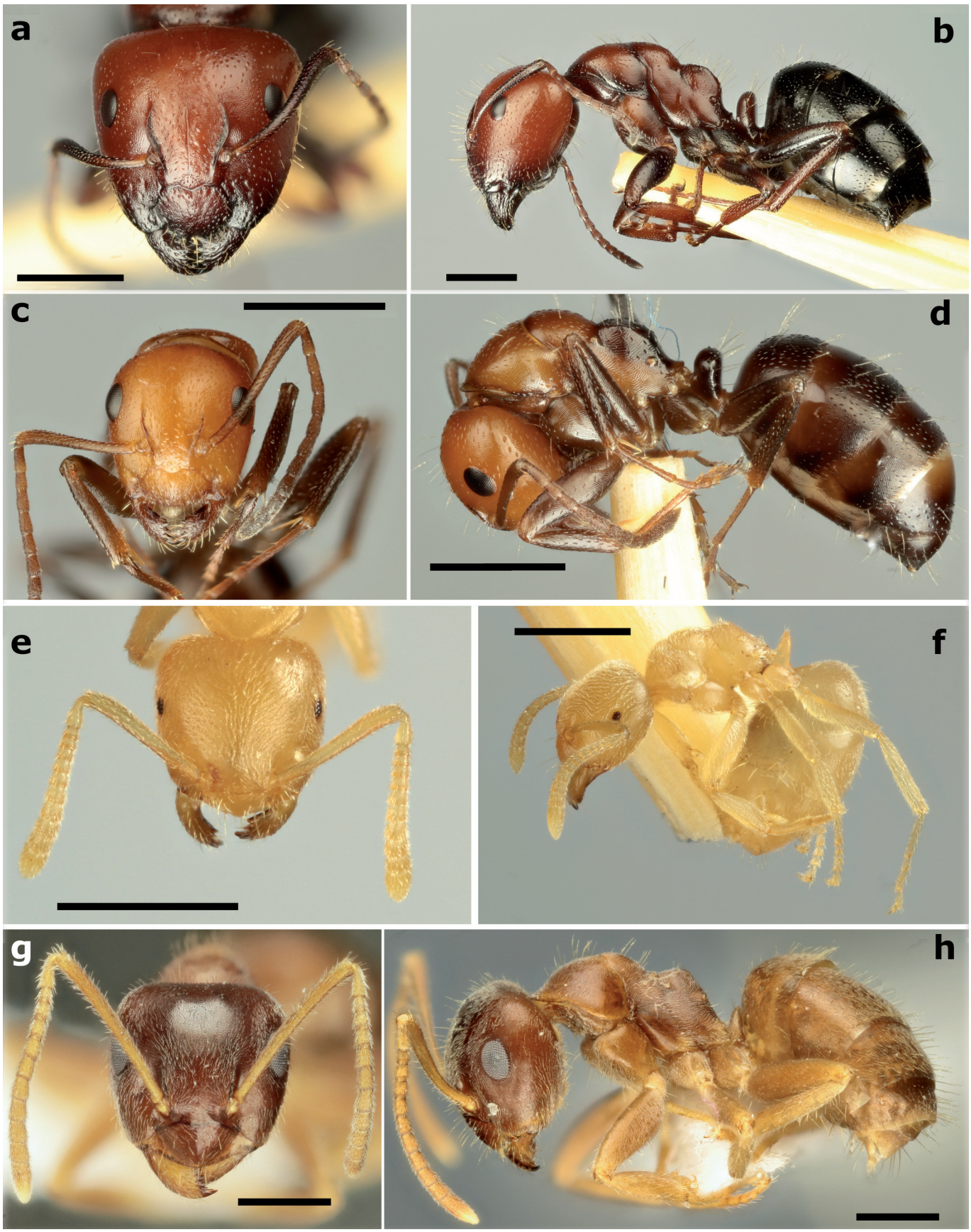

Fig. 2 - **a-d)** *Camponotus ruber*. a-b) major worker / operaia maggiore; c-d) minor worker / operaia minore. Monte Pellegrino. Scale bar / scala grafica: 1 mm (ESC). **e-f)** *Lasius myops.* Worker / operaia. Pineta di Linguaglossa. Scale bar / scala grafica: 0.5 mm (AAC). **g-h)** *Lasius platythorax.* Worker / operaia. Monte Cofano. Scale bar / scala grafica: 0.5 mm (AAC).

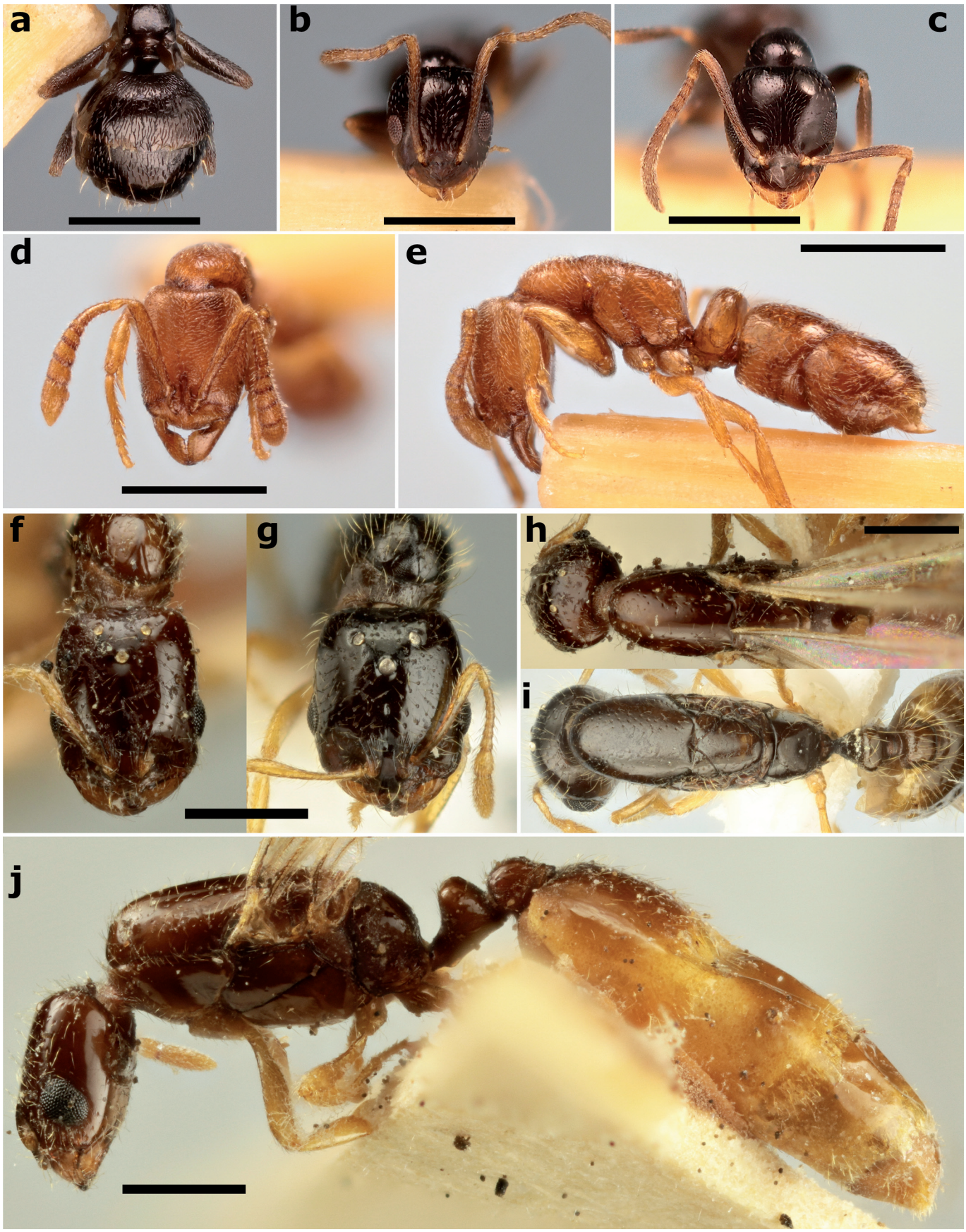

Fig. 3 - **a-c)** *Plagiolepis schmitzii.* Workers / operaie. Mondello (ESC). **d-e)** *Ponera testacea.* Worker / operaia. Pizzo di Pietralunga (ESC). **f-j)** *Solenopsis orbula.* Queens / regine. Messina. A specimen from De Stefani's collection / esemplare dalla collezione De Stefani (f,h,j) and a recently collected one / ed uno recentemente raccolto (g,i) (ESC). Scale bar / scala grafica: 0.5 mm.

Catania province: Timpone, Etna, 37.7325, 14.9228, 1695 m, R. Blatrix legit, ESC.

Messina province: Contrada Moglia (Messina), *Fagus sylvatica* forest, 37.900541, 14.393331, 1350 m asl, 01.10.1987, A. Alicata legit, AAC; Bosco di Malabotta, *Fagus sylvatica* forest, 37.972330, 15.051064, 1000 m, 05.04.2001, A. Alicata legit, AAC. Lago Maulazzo, Monte Soro, *Fagus sylvatica* forest, 37.9409, 14.6709, 1550 m, 23.06.2018, R. Viviano legit, ESC.

Palermo province: Piano Battaglia, Monte Mufara, *Fagus sylvatica* forest, 37.8745, 14.0178, 1500 m, 08.06.2016, E. Schifani legit, ESC.

9. *Temnothorax ravouxi* (André 1896)

This is a relatively widespread social parasite species, alternatively placed in the genus *Myrmoxenus* Ruzsky 1902 (see Ward *et al*., 2015; 2016; Seifert *et al*., 2016). Its potential host species are numerous, and most frequently belong to the *tuberum* group (Seifert 2018). We collected a single gyne by leaf litter sifting, and its Sicilian host(s) remain unknown. Unfortunately, that queen, found more 20 years ago, is poorly preserved, and shows faded pigmentation and abraded pilosity, making some relevant taxonomic characters unusable (Seifert 2018). However, we confidently identified it on the basis of

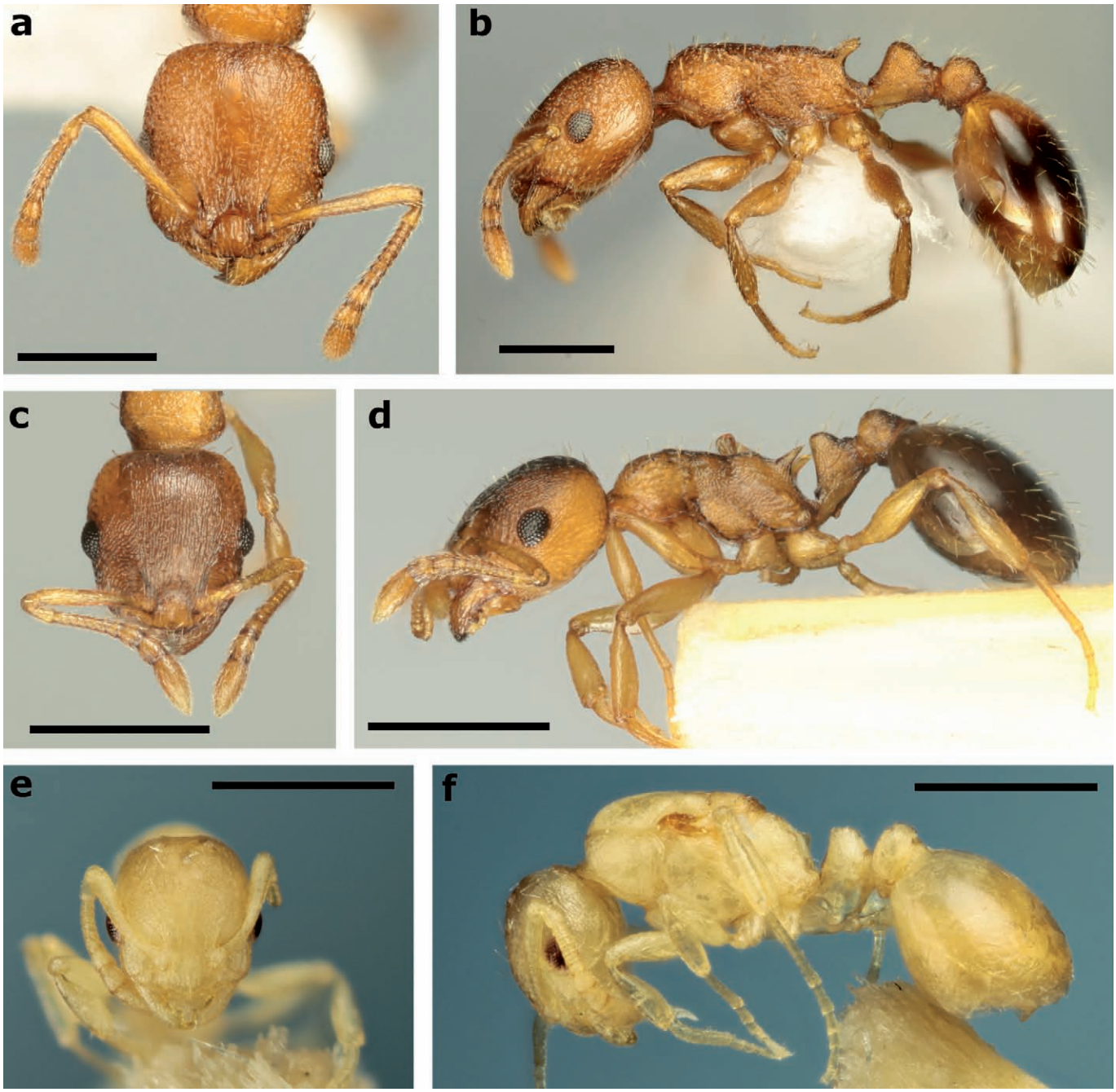

Fig. 4 - **a-b)** *Temnothorax clypeatus.* Worker / operaia. Bosco di Santo Pietro (AAC). **c-d)** *Temnothorax nylanderi.* Worker / operaia. Lago Maulazzo (ESC). **e-f)** *Temnothorax ravouxi.* Queen / regina. Madonna delle Grazie (AAC). Scale bar / scala grafica: 0.5 mm.

the following character combination (see Ruzsky, 1902; Emery, 1915; Cagniant, 1968; Seifert, 2018): *i*) 11-segmented antennae, excluding the Eastern Mediterranean *T. gordiagini* (Ruzsky 1902); *ii*) yellowish color in the original pigmentation, different from *T. kraussei* (Emery 1915) (the specimen was also caught in an area probably unsuitable for the exclusive host of *T. kraussei*, *T. recedens* (Nylander 1856)); *iii*) well developed lobe-like shape of the subpetiolar process, excluding *T. algerianus* Cagniant 1968; *iv*) mandible armed with 4-5 dents or denticles, excluding *T. stumperi* Kutter 1950. *Temnothorax ravouxi* is the second parasitic *Temnothorax* reported from Sicily after *T. muellerianus* (Finzi) which belongs to a separate group (Buschinger *et al*., 1988). However, Sicily may likely be inhabited by another species of the same group, *T. kraussei*, considering its biogeography (particularly its presence in both Calabria and Tunisia) and the relatively widespread presence of its host, *T. recedens*, in Sicily.

Examined material (Fig. 4e-f)

Syracuse province: Madonna delle Grazie, Buccheri, *Quercus* spp. forest, 05.05.1997, G. Silluzio legit, AAC.

SPECIES TO BE CONSIDERED ABSENT

1. *Camponotus ligniperda* (Latreille 1802)

This European species has a rather montane distribution in Italy, where it is especially common in the Northern Apennines and the Alps (Baroni Urbani, 1964b). Considering that it is one of the largest European ant species (Seifert, 2018), it is unlikely to be overlooked during field surveys. There are two Sicilian records of this species: De Stefani (1889) reports about its presence in Monreale, and Emery (1915) vaguely mentions the Madonie Mountains. Accordingly, several following papers uncritically mentioned *C. ligniperda* as a member of the Sicilian ant fauna (De Stefani, 1895; Donisthorpe, 1927; Kutter, 1927; Emery, 1916; Monastero, 1950; Baroni Urbani, 1964b; 1971; Poldi *et al*., 1995). Monreale and its hill (Monte Caputo, 764 m asl) represent unsuitable sites for this species, being rather thermophilous areas hosting a rather Mediterranean ant assemblage. Species such as *Aphaenogaster ichnusa* Santschi 1925, *Lasius lasioides* (Emery 1869) and *Temnothorax lagrecai* (Baroni Urbani 1964) are common at Monte Caputo's highest elevations (Schifani & Alicata, 2018; authors' unpublished data). Some nearby mountains reach a higher elevation (e.g. Monte Moarda, 1090 m asl), but even there we did not detect *C. ligniperda* nor an ecologically related fauna: species such as *L. casevitzi* Seifert & Galkowski 2016 and *Formica cunicularia* Latreille 1798 characterize the higher elevations (Schifani & Alicata, 2018; authors' unpublished data). On the other hand, Emery's record (1915) may look more reliable: Madonie Mountains, a protected regional park of 39,941 ha, have many high elevation sites, among which Pizzo Carbonara is the second highest Sicilian peak (1979 m asl). These sites are inhabited by some of Sicily's most cryophilous ant species, all mainland Europe species that likely colonized the island descending along the Italian Peninsula (e.g. *Aphaenogaster subterranea* Latreille 1798, *Formica sanguinea* Latreille 1798, *Lasius psammophilus* Seifert 1992). Such context would be more suited for *C. ligniperda*, yet in decades of extensive investigation, we found no evidence of its presence, including on the other main mountains of Sicily, such as the Nebrodi Mountains (highest peak 1847 m asl) and the Etna volcano (3326 m asl). We speculate that some previous records of *C. ligniperda* in Sicily were probably based on misidentifications of *C. nylanderi*, whose chromatic variation sometimes produces forms resembling the colour pattern of *C. ligniperda*. It would not be surprising if De Stefani (1889) had committed such a mistake considering the underdeveloped status of ant taxonomy at his time. On the other hand, Emery has been one of the most prominent myrmecologists for decades and at the time the record was published, it is hard to imagine him unable to distinguish between *C. ligniperda* and *C. nylanderi*. However, it is uncertain whether Emery's statement was based on directly observed specimens, while significant exchanges of information with De Stefani certainly occurred (e.g. Schifani *et al*., 2020). However, in the event that Emery actually examined some *C. ligniperda* specimens from the Madonie Mountains, the most parsimonious hypothesis seems to be that of the temporary establishment of a small population of allochthonous origin. Although the Sicilian forests suffered a great reduction during the two world wars, all fragile insects associated with high elevation forest habitats survived until today (e.g. *Rosalia alpina* Linnaeus 1758, see Drag *et al*., 2018), which makes it difficult to believe in the extinction of a large natural population of *C. ligniperda* from the whole Sicilian Apennines.

2. *Camponotus sicheli* Mayr 1866

Forel (1879) provided the first Sicilian record of this North African species, without offering any precise locality. Subsequent authors who mentioned this species did not add further data (De Stefani, 1889; 1895; Emery, 1915; 1916; 1925; Donisthorpe, 1927; Monastero, 1950; Baroni Urbani, 1971; Poldi *et al*., 1995), but a more complete record came as the island of Ustica (Riggio & De Stefani Perez, 1887).

Cagniant (1996) elevated *C. ruber*, previously considered as a variety of *C. sicheli*, to species rank (also see a correction in Cagniant, 2006), considering *C. sicheli* to be an entirely black species and *C. ruber* a red and black species. While we offered here data on the presence of *C. ruber* in Sicily, we have never found entirely black specimens compatible with *C. sicheli*. While Cagniant (1996; 2006) did not offer detailed data to back his decision, and other authors did not follow the nomenclature change he proposed (see Seifert, 2019), the absence of colonies characterized by black workers in Sicily appears to support the distinctness of *C. ruber* from *C. sicheli*.

3. *Camponotus spissinodis* Forel 1909

The validity of this species, originally described from Tunisia, has long been uncertain or defined exclusively on the thickness of its petiole, as its name suggests (Forel, 1909; Emery, 1925). This subtle character was thought

to allow the distinction of *C. spissinodis* from *C. piceus* (Leach 1825), yet it was never properly described with quantitative data (Forel, 1909; Emery, 1925). A recent revision of the *lateralis* group, even though only marginally treating this taxon, suggested considering *C. spissinodis* as a cryptic species similar to the Eastern-Mediterranean *C. candiotes* Emery 1894 and the European *C. piceus* (Seifert, 2019). According to the new analyses, the most distinctive characters to separate *C. spissinodis* from *C. piceus* lays in the shape of the scapi (Seifert, 2019). *Camponotus spissinodis* was recorded twice near the Sicilian Ionian coast: the village of Taormina (210 m asl) and the nearby Monte Ziretto (550 m asl) (Donisthorpe, 1927; Kutter, 1927). These are also the only Italian records of this species. On the other hand, the very similar *C. piceus* is widespread in Italy (Baroni Urbani, 1971) and was recorded from several Sicilian localities (Baroni Urbani, 1964a; La Pergola *et al*., 2008; Schär *et al*., 2020). We repeatedly collected *C. piceus* samples in a wide variety of habitats (from sea-level coastal localities to about 1400 m asl), without finding any convincing evidence of the presence of *C. spissinodis sensu* Seifert (2019). Also, preliminary molecular data did not suggest a strong differentiation between Tuscan and Sicilian *C. piceus* (Schär *et al*., 2020). It appears that *C. spissinodis* may benefit from a more focused taxonomic revision in the future, but at the same time previous records by Donisthorpe (1927) and Kutter (1927) bear no relation with the current interpretation of this species (Seifert, 2019), thus providing no evidence to consider this species as a part of the Sicilian and Italian fauna.

4. *Formica lugubris* Zetterstedt 1838

The natural distribution of *F. lugubris* (a member of the *rufa* group, the renowned "red wood ants") in Italy is restricted to the Alps. In 1956, *F. lugubris* was introduced to the Etna by Pavan (1959). Sicily does not naturally host red wood ants, as the southernmost distribution of *F. pratensis* Retzius 1783, the sole species not originally restricted to the Alps in Italy, is in the Central Apennines (Baroni Urbani, 1971). Such action, which today would immediately be seen as ecologically dangerous, was part of a broader state program aimed at the biological control of forest pests, which consisted of several introductions across Italy (Pavan, 1959; Baroni Urbani, 1971). At least a majority of the introduced ant colonies did not truly represent *F. lugubris*, but instead its cryptic species endemic to the Alps, *F. paralugubris* Seifert 1996 (Frizzi *et al*., 2018; 2020; Masoni *et al*., 2019). Such introductions were sometimes successful, and recent studies have begun to analyse their ecological consequences (Frizzi *et al*., 2018; 2020; Masoni *et al*., 2019). Anyway, Pavan himself and subsequent authors (Pavan, 1959; Baroni Urbani, 1971; Poldi *et al*., 1995) considered the establishment of a viable population on the Etna as probably failed. To the best of our knowledge, no targeted surveys were hitherto carried out to verify their assertions. However, considering that a population of red wood ants would be impossible to overlook during field surveys, and the extensive searching efforts spent on the Etna, we can safely consider red wood ants absent from Sicily.

5. *Lasius (Cautolasius) flavus* (Fabricius 1782)

The status of the Western Palearctic members of the subgenus *Cautolasius* has been debated for decades although in the absence of a rigorous morphological approach. Finally, Seifert (1983) provided evidence to consider the existence of two species, *L. flavus* and *L. myops*, differing for their ecology even if in a partially overlapping distribution (Seifert, 1983; 2017; 2018). Although morphological separation of *L. flavus* from *L. myops* is relatively easy, unfortunately the distribution of these two taxa in the Mediterranean remains little known: in particular, old records of *L. flavus*, which was usually considered a senior synonym of *L. myops*, are unreliable. In addition, the only Sicilian record of *L. flavus* was already considered doubtful: it was a *Lasius (Chthonolasius) mixtus* (Nylander 1846) record by Monastero (1950), and was later referred to *L. flavus* by Baroni Urbani (1971). While Baroni Urbani (1971) considered this interpretation doubtful, he did not provide any reason to support this change. By the way, the only *Lasius* (*Chthonolasius*) spp. ascertained in Sicily are *L. bicornis* (Foerster 1850) and *L. umbratus* (Nylander 1846) (Schifani & Alicata, 2018). The presence of *L. myops*, and not *L. flavus*, even at considerably high elevation, further suggests the absence of the latter from Sicily.

6. *Lasius (Lasius) alienus* (Foerster 1850)

This taxon is one of the 57 currently recognized Palaearctic *Lasius* s. str. species, many of which are close to morphological crypsis, and less than 10 were recognized before 1992 (Seifert 1992; 2020a). In this context, older records are completely unreliable. This is the condition of almost the complete totality of the Eurosiberian *L. alienus* records in Italy, which makes the presence of this species on the Italian territory entirely doubtful (e.g. Baroni Urbani, 1971; Guénard *et al*., 2017). In Sicily, *L. alienus* was recorded from the following localities: Contrada Renda (near Giacalone), Santa Ninfa, Palermo, Capo Peloro and Piana di Catania (De Stefani 1885; De Stefani Perez 1894; Monastero 1950; Baroni Urbani 1964a; La Pergola *et al*. 2008). Moreover, it was recorded from the Egadi Islands (Scupola, 2009). Nevertheless, records by La Pergola *et al*. (2008) and Scupola (2009) were misidentification of *L. lasioides*, whose presence in Sicily was very recently discovered (Schifani & Alicata, 2018; also Scupola, pers. comm.). The distribution and ecology of *L. alienus* in Europe (Seifert, 2017) would suggest it would occur at relatively high altitudes in Sicily, where we found the similar *L. psammophilus* only (Schifani & Alicata, 2018). However, all of the old Sicilian records come from sites where the very common, thermophilous *L. lasioides* is expected.

7. *Lasius (Lasius) niger* (Linnaeus 1758)

As in the case of *L. alienus* described above, the nature of *L. niger* has been the subject of severe confusion over the decades and was finally clarified about 30 years ago (Seifert 1991; 1992; 2020a). As a result, records from Baroni Urbani (1964a) should be considered unreliable (even more so since they refer to a 'transitional form' between *L. alienus* and *L. niger*). The only recent Sicilian

records of *L. niger* were published by Li Vigni (2014); however, they were based on misidentified specimens of *L. casevitzi* (F. Rigato, pers. comm.). We believe *L. casevitzi* to be a possible candidate of past confusion with *L. niger* in Italy: despite being closely related to *L. paralienus* Seifert, 1992, which has historically been confused with *L. alienus* and not with *L. niger*, *L. casevitzi* possess a higher number of erect setae on various key areas resembling *L. niger*. Overall, *L. niger* is a Palearctic species not particularly frequent in the Mediterranean, sometimes existing in isolated introduced populations (Seifert, 2018; 2020a), and its whole distribution in Italy should be revised.

8. *Lasius (Lasius) paralienus* Seifert 1992

A vast number of localities were published by Schifani & Alicata (2018) under the name *L.* cf. *paralienus*. These records should be actually referred to *L. casevitzi*, which was described as a Corsican endemic, but occurs in mainland Italy and Sicily too (Seifert & Galkowski, 2016; Schär *et al*., 2020; Seifert, 2020a). First *L. casevitzi* Sicilian records were published by Schär *et al*. (2020), who confirmed the identity of Sicilian specimens by mtDNA comparison with the type colony.

9. *Messor minor* (André 1883)

This is a Mediterranean species recorded from the Canary Islands, east to Iran (Barquin, 1981; Paknia *et al*., 2008), with Naples (Italy) as its type locality (Santschi, 1927). André (1883) considered *M. minor* as inhabiting Italian Peninsula, Corsica, Sardinia, and Sicily. Subsequently, two subspecies of very dubious taxonomic value were described from the Island of Capri and Calabria respectively (*M. minor capreensis* Santschi 1927 and *M. minor calabricus* Santschi 1927; see Santschi, 1927). André (1883) did not mention any specific locality in Sicily to support his claim. While numerous records of *M. minor* were subsequently produced from all other regions he mentioned (see Baroni Urbani, 1971), the only Sicilian record (Taormina village) was published by Kutter (1927). Our field investigations confirm the widespread presence in Sicily of only three taxa: *M. bouvieri* Bondroit 1918, *M. capitatus* (Latreille 1798), and *M. ibericus* Santschi 1931 (also see Schifani & Alicata 2018). However, a taxonomic revision of *M. bouvieri* and the similar North African forms is needed to clarify the identity of the Sicilian population (presently considered a disjunct population of a Franco-Iberian species). Here we only mention that the Sicilian *M. bouvieri*, even though usually reported as an entirely jet black species, can sometimes show red or violet colour patches. On the other hand, the iconic bicoloured pattern of *M. minor* is just one of different phenotypic variation of the species (Santschi, 1927), and even near its type locality much darker phenotypes are common (V. Gentile, pers. comm.). It is likely that Kutter (1927) based his identification on the chromatic aspect of some *M. bouvieri* specimens, instead of using much more reliable characters, such as chaetotaxy. In addition, it is already established that some old Sicilian records of *M. minor* are to be referred to *M. bouvieri* (Baroni Urbani, 1971). The genus *Messor* in Southern Italy awaits a proper taxonomic revision, which may be complicated by relatively common hybridization and backcrossing events even between relatively distantly related species (Steiner *et al*., 2011). However, we do not consider *M. minor* as present in Sicily, and we consider doubtful the *M. minor calabricus* records from the nearby Aeolian Islands (Lo Cascio & Navarra, 2003; Schär *et al*., 2020; Turrisi *et al*., 2020).

10. *Messor wasmanni* Krausse 1910

The same argumentation described for *M. minor* is also valid for *M. wasmanni*. Although different from *M. bouvieri* in terms of chaetotaxy or the degree of the workers' polymorphism (much more marked in *M. wasmanni*), we speculate that *M. bouvieri* specimens with a reddish mesosoma could be misidentified for *M. wasmanni*. In particular, *M. wasmanni* appears to be a mostly Eastern-Mediterranean species and it was described from its westernmost distribution limit in Sardinia (Krausse, 1910). A neotype should be fixed to preserve its name (Steiner *et al*., 2011). Kutter (1927) recorded *M. wasmanni* from Eurialo, near Syracuse, and from the Aeolian islands (where the presence of *M. bouvieri*, *M. capitatus*, and *M. ibericus* only was confirmed, see Schär *et al*. 2020). In the Aeolian Islands *M. wasmanni* was recently incorrectly listed as *M. meridionalis* (André) by Turrisi *et al*. (2020), who also considered *M. structor* to be present. Apparently, both names were listed due to a misunderstanding of the relevant literature.

11. *Monomorium monomorium* Bolton 1987

The sole record of this S European species from Sicily was published by Emery (1914), without mentioning any specific locality. In Italy, *M. monomorium* presence was mostly recorded in the North (Baroni Urbani, 1971; Castracani *et al*., 2020). The only *Monomorium* species we are aware of in Sicily is *M. subopacum* (Smith, F. 1858), while a record of the tramp species *M. pharaonis* (Linnaeus 1758) is the consequence of a series of errors on the part of the FaunaEur database (Wetterer, 2010; Schifani & Alicata, 2018).

12. *Myrmica scabrinodis* Nylander 1846

The taxonomy of the *M. scabrinodis* group in Europe was very confused for a long time (Seifert, 1988; 2018; Radchenko & Elmes, 2010). While phylogenetic reconstructions are often still problematic (Ebsen *et al*., 2019; Blatrix *et al*., 2020), morphological species-delimitation appears solidly established in most cases (Seifert, 2018). *Myrmica scabrinodis* is widespread in Europe (Seifert, 2018), and was recorded from Mount Etna in Sicily (Kutter, 1927). Later, Bernard (1967) reported from the same locality *M. sabuleti* Meinert 1861, whose presence on the Etna in the same locality the presence of the European *M. sabuleti* was recorded by Bernard (1967) and was confirmed by Seifert (2018). We revised material of the *M. scabrinodis* group from most important Sicilian mountains (Etna, Madonie, Nebrodi) and lowland streams (e.g. Cavagrande del Cassibile), and always detected the presence of *M. sabuleti* only (first recorded from lowland sites by Baroni Urbani, 1964a). It is also worth noting that the species status of *M. tulinae* Elmes *et al*. 2002, whose workers

are considered undistinguishable from *M. sabuleti* (Radchenko & Elmes, 2010), is currently considered doubtful (Seifert 2018): if demonstrated to be a good species, our identification of samples as *M. sabuleti* would become doubtful.

13. *Myrmica spinosior* Santschi 1931

The distribution of the W Mediterranean *M. spinosior* in Italy is unclear outside Sardinia (Seifert 2005; Radchenko & Elmes, 2010; Schifani *et al*., 2021b). A recent record from Sicily (Etna) by Blatrix *et al*. (2020) shall be considered doubtful: its morphological identity as either *M. sabuleti* or *M. spinosior* was uncertain (Blatrix, pers. comm.), and no clear identification could be obtained in a DNA barcoding approach, which appears highly unreliable for the *scabrinodis* species-group (Blatrix *et al*., 2020). At present, we confidently confirm the following three *Myrmica* species from Sicily: *M. lobulicornis*, the relatively widespread *M. sabuleti*, and the endemic *M. siciliana* Radchenko *et al*. 2006 from Etna, Nebrodi and Madonie (Radchenko *et al*., 2006; Schifani & Alicata, 2018; authors' unpublished data).

14. *Nylanderia* sp. 2 *sensu* Schifani & Alicata (2018)

This morphospecies was mentioned by Schifani & Alicata (2018) and later reported by Schifani (2019) too. Upon careful revision of a larger number of workers and males, we concluded that *Nylanderia* sp. 2 is actually *N. jaegerskioeldi* (Mayr 1904), a hypothesis that we had initially abandoned due to some observations on male morphology (J. LaPolla, pers. comm.). This conclusion was supported by J. LaPolla who directly examined some of our specimens (J. LaPolla, pers. comm.). Therefore, we consider two introduced *Nylanderia* species to be present in Sicily: *N. jaegerskioeldi*, which is widespread on the island and spreading over other S European countries (Schifani, 2019), and *Nylanderia* sp. 1, which share some features of *N. vaga* (Forel 1901) (J. LaPolla, pers. comm.) but whose identity is still to be ascertained (Schifani & Alicata, 2018).

15. *Solenopsis fugax* (Latreille 1798)

The taxonomy of most *Solenopsis* species in the Mediterranean is still in dire conditions with a few exceptions. One of the problems regarding all the remaining species has been confusion under the name *S. fugax*. Similar to *L. alienus* and *L. niger* for *Lasius* s. str. (as mentioned before), the name *S. fugax* was extensively used to name most *Solenopsis* populations in the region avoiding serious identification efforts. Such a confusing approach has long been justified by the lack of clarity regarding the concept of *S. fugax* itself. Since Galkowski *et al*. (2010) finally provided a clearer definition of *S. fugax*, it became possible to test whether many populations previously assigned to *S. fugax* truly represented this species. While *S. fugax* convincingly appears to be the sole species of its genus in Central Europe, there are many Mediterranean taxa with a similar look, and its distribution in the Mediterranean is still unclear (Seifert, 2018). For instance, a recent examination of newly collected specimens and museum material suggested *S. fugax* to be absent from Sardinia, where only *S. lusitanica* Emery 1915 (and *S. orbula*) may be present (Schifani *et al*., 2021b). In Sicily, *S. fugax* was recorded from several localities by Donisthorpe (1927), Baroni Urbani (1964a), and La Pergola *et al*. (2008). In addition, it was recorded from the circum-Sicilian island of Ustica (Riggio & De Stefani Perez, 1887), Aeolian (Kutter, 1927), and Egadi islands (Scupola, 2009). We never found *S. fugax* during our surveys in Sicily and on the Egadi and Aeolian islands (see also Schär *et al*. 2020; authors' unpublished data), even at higher altitudes where Central-European species are more common. Instead, the widespread form that we encountered is provisionally named *S. latro sicula* (Schär *et al*., 2020). The attribution of the Sardinian population to *S. lusitanica* awaits to be confirmed by a proper revision (Schifani *et al*., 2021b), as well as the identification of the Sicilian one as *S. latro sicula*. In addition, a review of North African *Solenopsis* taxonomy, regrettably plagued by scientific names based on few workers, is strongly needed to understand whether Sicilian *Solenopsis* are related to them. At the same time, our finding undermines the assumption that *S. fugax* is widespread in Italy, where the only reliable records come from the northern regions (Castracani *et al*., 2020; Schifani *et al*., 2021b). The recognition of *S. latro sicula* from *S. fugax* may be based on worker chaetotaxy (see images in Schär *et al*., 2020), but, similarly to Sardinian *S. lusitanica*, gynes and males have better diagnostic features, especially size, head shape, and sculpture (Galkowski *et al*., 2010; Fig. 5).

16. *Temnothorax luteus* (Forel 1874)

A S European species suspected to have had its glacial refugium in the Apennines (Seifert *et al*., 2014). It was recorded once from Etna by Baroni Urbani (1964a), and more doubtfully as *T.* cf. *luteus* by Buschinger *et al*. (1988) from the same locality. There are several species, including some still undescribed ones, we deem may have been confused with *T. luteus* by both authors. However, no Sicilian specimens we collected correspond to *T. luteus* as redefined by Seifert *et al*. (2014). Despite the interesting hypothesis stating that the main glacial refugium of *T. luteus* was probably in the Apennines (Seifert *et al*., 2014) (in contrast to *T. racovitzai* (Bondroit)), the actual distribution of *T. luteus* in the Italian peninsula is still unclear.

17. *Temnothorax tuberum* (Fabricius 1775)

The taxonomy of *T. tuberum* is still not fully resolved, as it may comprise some cryptic species (Seifert, 2018). However, it is presently thought to have a very wide distribution across Europe, from the Pyrenees east to Buryatia (Russian Federation) and from the Apennines to Scandinavia (Seifert, 2018). However, in the past, the name *T. tuberum* was commonly applied to a very diverse and large array of currently distinct species, which were at most considered as infraspecific forms due to the poor evolutionary understanding of ants' diversification. There is only an old Sicilian record of *T. tuberum* from Santa Ninfa in the Belice Valley (De Stefani, 1894), a thermophilous locality below 500 m asl. However, in Sicily we found no true *T. tuberum*, but two or even more, superficially similar undescribed *Temnothorax*. Moreo-

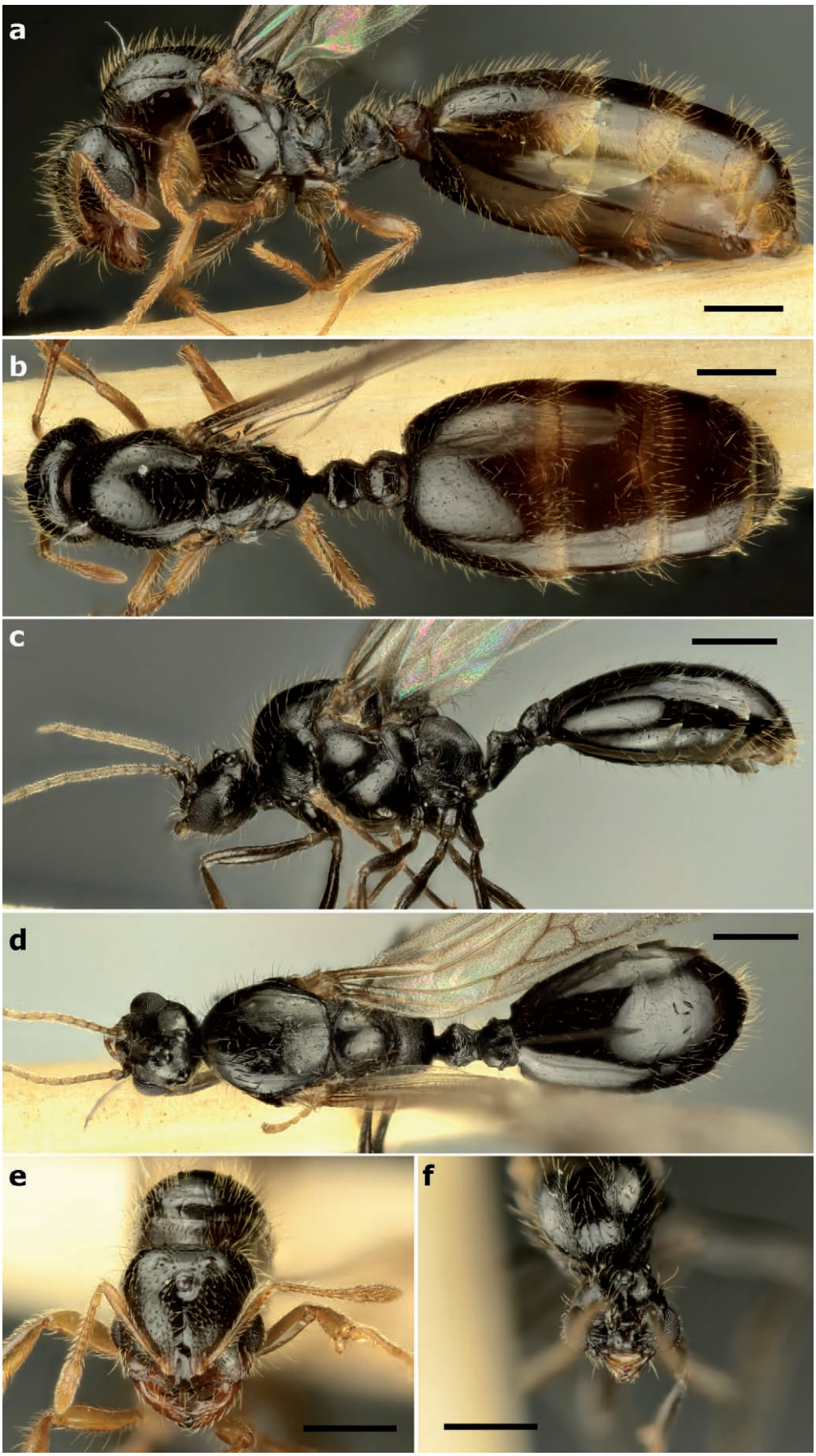

Fig. 5 - *Solenopsis latro sicula*. **a-b,e)** Queen / regina; **c-d,f)** male / maschio. Monte Pellegrino. Scale bar / scala grafica: 0.5 mm (ESC).

ver, considering the age of this record, De Stefani (1894) may have named so a species that does not even resemble *T. tuberum*.

18. *Tetramorium caespitum* (Linnaeus 1758)

Long recognized as the sole species of the *caespitum* complex other than *T. impurum* (Foerster 1850), *T. caespitum* has then been recognized to be just one of 10 West-Palearctic cryptic species (Schlick-Steiner *et al*., 2006; Wagner *et al*., 2017). Consequently, previous records of *T. caespitum* in Sicily and elsewhere must be regarded as unreliable and, of course, including the Sicilian (see De Stefani, 1881; Baroni Urbani, 1964a; Sanetra *et al*., 1999; La Pergola *et al*., 2008). Indeed, the ecological conditions of the sites of these records may even suggest that some represent misidentifications for *Tetramorium* species not belonging to the *caespitum* complex (Sanetra *et al*., 1999). However, in a recent paper two of the present work authors (Schifani & Alicata, 2018) published some erroneous records of *T. caespitum* from Sicily: by using the on-line key provided by Wagner *et al*. (2017), they erroneously transcribed latitudinal and altitudinal data, which resulted in a misleading identification output. We currently recognize only the following eight *Tetramorium* species in Sicily: *T. alpestre* Steiner *et al*. 2010, *T. atratulum* (Schenck 1852), *T. bicarinatum* (Nylander 1846), *T. diomedeum* Emery 1908, *T. immigrans* Santschi 1927, *T. lanuginosum* Mayr 1870, *T. punctatum* Santschi 1927, and *T. semilaeve* André 1883 (also see Sanetra *et al*., 1999; Schär *et al*., 2020). Of these, three are exotic (*T. bicarinatum, T. immigrans, T. lanuginosum*). In addition, there are three social parasites currently attributed to the genus *Strongylognathus* (but see Ward *et al*. 2015): *S. alpinus* Wheeler, W.M. 1909, *S. destefanii* Emery 1915, and *S. testaceus* (Schenck 1852) (Sanetra *et al*., 1999; Schifani & Alicata, 2018; Schär *et al*., 2020). In Sicily the hosts of social parasite species appear to be *T. alpestre* for *S. alpinus* and *S. testaceus*, *T. immigrans* for *T. atratulum* (but see Schifani *et al*., 2021b), and *T. semilaeve* for *T. destefanii* (Sanetra *et al*., 1999; Schifani & Alicata, 2018; Schär *et al*., 2020). Regarding the *caespitum* complex, it is worth adding that *T. alpestre* seems widespread across mid-to-high altitude sites of Sicily's main mountain complexes, while *T. immigrans* occurs in urban or highly disturbed habitats (Sanetra *et al*. 1999; Schifani & Alicata, 2018; Castracani *et al*., 2020). However, in Sicily *T. alpestre* is represented by the U3 lineage *sensu* Wagner *et al*. (2017) which deserves further taxonomic investigation, so that the situation is not settled yet.

19. *Tetramorium indocile* Santschi 1927

Another member of the *T. caespitum* complex, whose previous record, for the same reasons expressed above, was a misidentification of *T. alpestre* (which also means that no current finding of *T. indocile* as a host of *S. testaceus* exists) (Schifani & Alicata, 2018).

Tab. 1 - Summary of the faunistic changes introduced by the present study on the Sicilian ant fauna. / Riassunto dei cambiamenti faunistici introdotti da questo studio sulla fauna siciliana di formiche.

Species confirmed or added for the first time	Species to be considered absent
Camponotus ruber	*Camponotus ligniperda*
Lasius myops	*Camponotus sicheli*
Lasius platythorax	*Camponotus spissinodis*
Plagiolepis schmitzii	*Formica lugubris*
Ponera testacea	*Lasius alienus*
Solenopsis orbula	*Lasius flavus*
Temnothorax clypeatus	*Lasius niger*
Temnothorax nylanderi	*Lasius paralienus*
Temnothorax ravouxi	*Messor minor*
	Messor wasmanni
	Monomorium monomorium
	Myrmica scabrinodis
	Myrmica spinosior
	Nylanderia sp. 2 *sensu* Schifani & Alicata 2018
	Solenopsis fugax
	Temnothorax luteus
	Temnothorax tuberum
	Tetramorium caespitum
	Tetramorium indocile

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