


## Nomenclatural changes on some Mediterranean *Aphaenogaster* Mayr, 1853 taxa (Hymenoptera, Formicidae)

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### Abstract

The ant genus *Aphaenogaster* Mayr, 1853 is especially diverse in the West-Palearctic region, where its taxonomy is still problematic for several groups. Among other issues, there is a redundancy of valid taxa compared to the number of species whose validity is currently sustained by any evidence. Names that do not represent taxa with clearly defined identities complicate specimen identification and add confusion to biodiversity databases and checklists. Based on a review of the available literature information on several taxa, and the study of both type and non-type material, the following taxonomic changes are proposed: i) *A. mauritanica* Dalla Torre, 1893 should be considered a senior synonym of *A. gibbosa* *homonyma* Emery, 1921 **syn. nov.** and of *A. foreli* Cagniant, 1996 **syn. nov.** (the Maghrebian populations of the *pallida* group hitherto considered to represent *A. foreli* should be attributed to *A. dulcineae* Emery, 1924); ii) *A. pallida* (Nylander, 1849) should be considered a senior synonym of *A. leveillei* Emery, 1881 **syn. nov.** and of *A. leveillei laurenti* Santschi, 1939 **syn. nov.**; iii) *A. sangiorgii* (Emery, 1901) should be considered a senior synonym of *A. finzii* Müller, 1921 **syn. nov.** and *A. radchenkoi* Kiran & Tezcan, 2008 **syn. nov.**; iv) *A. sardoa* Mayr, 1853 should be considered a senior synonym of *A. sardoa ujhelyii* Szabó, 1910 **syn. nov.** and *A. sardoa anoemica* Santschi, 1910 **syn. nov.**; v) *A. subterraneosplendida* André, 1883 should be considered a senior synonym of *A. sicula* Emery, 1908 **syn. nov.**; vi) *A. subterraneoides* Emery, 1881 should be considered a senior synonym of *A. subterraneoides armeniaca* Arnol'di, 1968 **syn. nov.** These changes will reduce the gap between nomenclature and actual understanding of species diversity, while synonymized names may be resurrected if supporting evidence is discovered.

**Key words:** ants, Stenammini, synonymies, quadrinomial nomenclature, *crocea* group, *gibbosa* group, *pallida* group, *sardoa* group

### Introduction

With the exclusion of the species of the tropical *Deromyrma* Forel, 1913 clade, which appears to represent a separate genus awaiting formal recognition (Branstetter *et al.* 2022), the diversity of the ant genus *Aphaenogaster* Mayr, 1853 (Myrmicinae, Stenammini) is mostly concentrated in the West-Palearctic region, where it counts over 100 taxa (Borowiec 2014; Guénard *et al.* 2017; Schifani *et al.* 2022). Due to their remarkable morphological diversification, many of these have been classified into species groups, which were recently revised by integrating morphology with new phylogenetic data (Schifani *et al.* 2022).

The internal taxonomy of many of these groups remains problematic in many cases. For instance, the very large number of specific and subspecific taxa of the *sardoa* group described in North Africa has never been comprehensively revised (Schifani *et al.* 2022). Taxonomic revisions are also lacking for many smaller groups (e.g., *pallida*, *subterranea*). A frequent problem within the genus is represented by the large number of infrasubspecific names (morphological ‘varieties’ or ‘races’, mostly described between the 19<sup>th</sup> century and the first half of the 20<sup>th</sup> century) which have become valid taxa as either species or subspecies despite no evidence remained available to support their status. The use of these names is easily avoided by myrmecologists specifically familiar with them, yet

their formal validity often complicates the correct naming of specimens in ecological studies and implies that they are often included in checklists and biodiversity databases (Guénard *et al.* 2017; Schifani 2022).

In this study, the existing evidence concerning the validity of some West-Palearctic *Aphaenogaster* taxa is reviewed and some nomenclatural changes are proposed. We aim at reducing the gap between nomenclature and actual understanding of species diversity, adopting a conservative approach based on qualitative morphological characters in groups with no available evidence of cryptic or subcryptic speciation. We support the idea that careful synonymization of taxa paired with an adequate discussion of the reasons for taxonomic changes is desirable whenever no evidence supports their status as good species or subspecies—and easily reversible if such evidence is discovered in the future. Furthermore, we correct a few historic nomenclatural errors and we formalize and comment on a synonymy proposed by Bolton (2022) on AntCat.

## Materials and methods

Synonymization is proposed only if the distinct status of a taxon is currently not supported by any published evidence and only if it belongs to well-definable complexes for which no available evidence of cryptic diversification exists. Therefore, the main basis for all taxonomic evaluations presented in this paper is a careful examination of the published evidence available. Each case is discussed thoroughly also in terms of biogeography and taxonomic history.

Taxa are reviewed based on their original descriptions, redescriptions, or appearance in taxonomic keys, supplemented by the examination of relevant non-type or type material directly or through high-quality imaging on AntWeb ([www.antweb.org](http://www.antweb.org)).

We use the following acronyms for collection hosting samples examined in this study:

AAPC—Antonio Alicata personal collection, Catania, Italy  
ESPC—Enrico Schifani personal collection, Palermo, Italy  
MNHG—Museum of Natural History, Geneva, Switzerland  
MSNG—Natural History Museum Giacomo Doria, Genoa, Italy  
MSNT—Natural History Museum, Trieste, Italy  
NHMB—Natural History Museum, Basel, Switzerland  
NHMW—Natural History Museum, Vienna, Austria  
NHMUK—Natural History Museum, London, United Kingdom

For specimens whose pictures are available on AntWeb, the unique specimen identifier is reported in parentheses throughout the text.

## Results

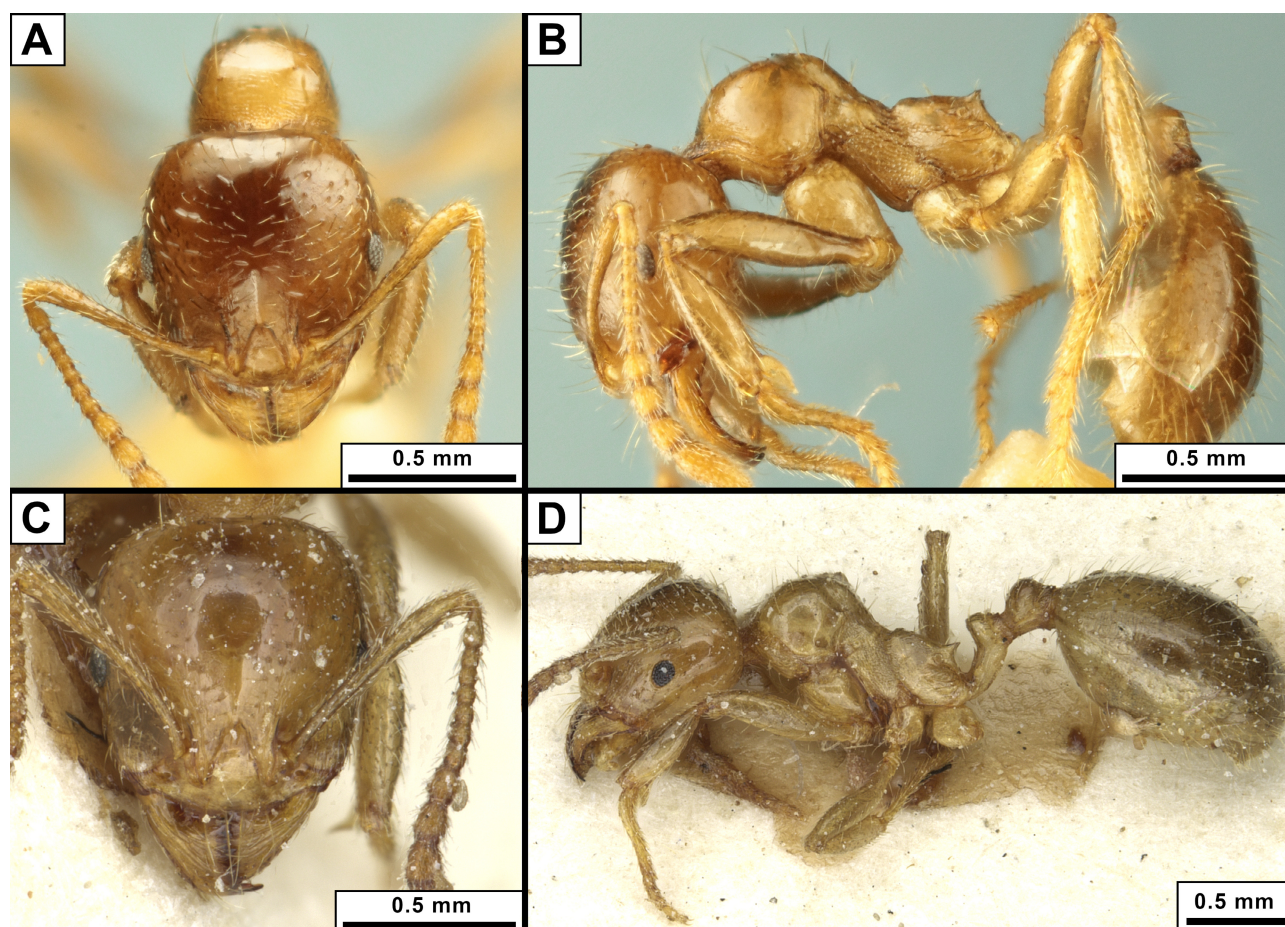
### *Aphaenogaster mauritanica* Dalla Torre, 1893

=*A. foreli* Cagniant, 1996 **syn. nov.**

=*A. gibbosa homonyma* Emery, 1921 **syn. nov.**

**Investigated material**—*Aphaenogaster mauritanica*: 1♀, Tlemcen, Tlemcen, Algeria, A. Leveillé legit (syntype specimen, AntWeb CASENT0904173, MSNG); 6♀♀, Tebourba, La Manouba, Tunisia, A. Forel legit (label as *A. striola subterranoidea*, CASENT0904172, MSNG); 5♀♀, Téboursoûk, Beja, Tunisia, 21.X.2010, A. Alicata legit (AAPC); 11♀♀, Kelibia, Nabeul, Tunisia, 36.838889, 11.115, 17.IV.2016, W. Oueslati legit (ESPC) (in Schifani *et al.* 2022); 12♀♀, Cap Serrat, Biserta, Tunisia, 07.VI.2017, W. Oueslati legit (ESPC) (in Schifani *et al.* 2022). *Aphaenogaster dulcinea*: 3♀♀, Banyuls-sur-Mer, Occitane, France, 44.47035, 3.12784, 19.IX.2010, R. Blatrix legit (ESPC) (in Schifani *et al.* 2022); 3♀♀, 1♀, 2♂ Banyuls-sur-Mer, Occitane, France, 42.468168, 3.146728 and 42.466895, 3.146689, 1.X.2022, E. Schifani legit (ESPC); 3♀♀, Puéchabon, Occitane, France, 43.71443, 3.59247,

2.II.2014, R. Blatrix legit (ESPC) (in Schifani *et al.* 2022); 3♀♀, Ramatuelle, Provence-Alpes-Côte d’Azur, France, 43.20135, 6.67421, 31.III.2013, R. Blatrix legit (ESPC) (in Schifani *et al.* 2022); 1♀, Praia da Luz, Faro, Portugal, 2.X.1982, B. Bolton legit (AntWeb CASENT0280959, NHMUK); 1♀, Pozuelo de Calatrava, Castilla-La Mancha, Spain, J.M. de la Fuente legit (syntype specimen, AntWeb CASENT0913113, NHMB); 4♀♀, 5♀♀ Alt Empordà, Catalonia, Spain, 42.170858, 2.930358, 30.IX.2022, E. Schifani legit (ESPC); 1♀, El Feija National Park, Jendouba, Tunisia, 36.773806, 8.651889, 18.XI.2016, W. Oueslati legit (ESPC), reported as *A. foreli* by Schifani *et al.* (2022).



**FIGURE 1.** Workers of *Aphaenogaster dulcineae*. A,B: specimen from Tunisia (sequenced as *A. foreli* by Schifani *et al.* 2022). C,D: Syntype specimen from Spain (*Aphaenogaster pallida dulcineae*, CASENT0913113, photo from Zach Lieberman available on [www.antweb.org](http://www.antweb.org)).

In the Maghreb, the *pallida* group includes a morphospecies with short propodeal spines which was temporarily named “*A. subterraneoides sensu* Forel, 1890” by Cagniant & Espadaler (1993), without providing any information about its identity. Later, Cagniant (1996) claimed that Forel (1890) had treated *subterraneoides* as a subspecies of *A. pallida* and that the name was preoccupied with Emery’s description of *A. pallida subterraneoides* Emery, 1881 from Greece (Emery, 1881). On this basis, he established the name *A. foreli* to replace the taxon described by Forel (1890). However, Forel (1890) had used the spelling *subterraneoides* (and not “*subterraneoides*”) as a smaller and more brownish variety of *Aphaenogaster striola* (Roger, 1859), a junior synonym of the European species *A. gibbosa* (Latreille, 1798) (Emery 1895). Moreover, Cagniant (1996) did not take into account that Emery (1921) had already introduced the name *A. gibbosa* var. *homonyma* with the explicit intent of replacing the variety *subterraneoides* described by Forel (1890) (also there mentioning it as *subterraneoides*). In the description, Emery (1921) did not explain how the variety *homonyma* differs from other members of the *gibbosa* group. An examination of the six worker specimens in the collection of Forel labeled “*A. striola subterraneoides*” immediately confirmed that they belong to the *gibbosa* group, which is very distinct from the *pallida* group that includes the Greek taxon described by Emery (Emery 1881; Schifani *et al.* 2022). Recently, on AntCat it was proposed to consider *A. foreli* as a junior synonym of *A. gibbosa homonyma*, and since Cagniant (1996) had treated *A. foreli* as a species-rank taxon, to treat it as a full species, *A. homonyma* (Bolton 2022)—even though Cagniant (1996) clearly referred to a *pallida*



group morphospecies. Based on comparisons between types, the morphology of the workers from the collection of Forel is fully congruent with the only other *gibbosa* group taxon in the Eastern Maghreb, *A. mauritanica* Dalla Torre, 1893, and no characters to separate the two have ever been described. They are easily distinguishable from the European *A. gibbosa* and from the Moroccan *A. theryi* Santschi, 1923, but appear indistinguishable from each other as recognized in the only existing revision of the group (Salata & Borowiec 2018a). Accordingly, we establish *A. mauritanica* as the senior synonym of both *A. foreli* and *A. gibbosa homonyma*. The Maghrebian *pallida* group morphospecies with short spines also needs a formal name: according to available morphological and phylogenetic evidence, it should be conspecific with *A. dulcineae* Emery, 1924 (Schifani *et al.* 2022; Fig. 1). The southernmost range of *A. dulcineae* was hitherto considered to end in southern Iberia (Tarifa), while surprisingly no comparison was made until recently with the population inhabiting the Maghreb (Schifani *et al.* 2022; Fig. 1).

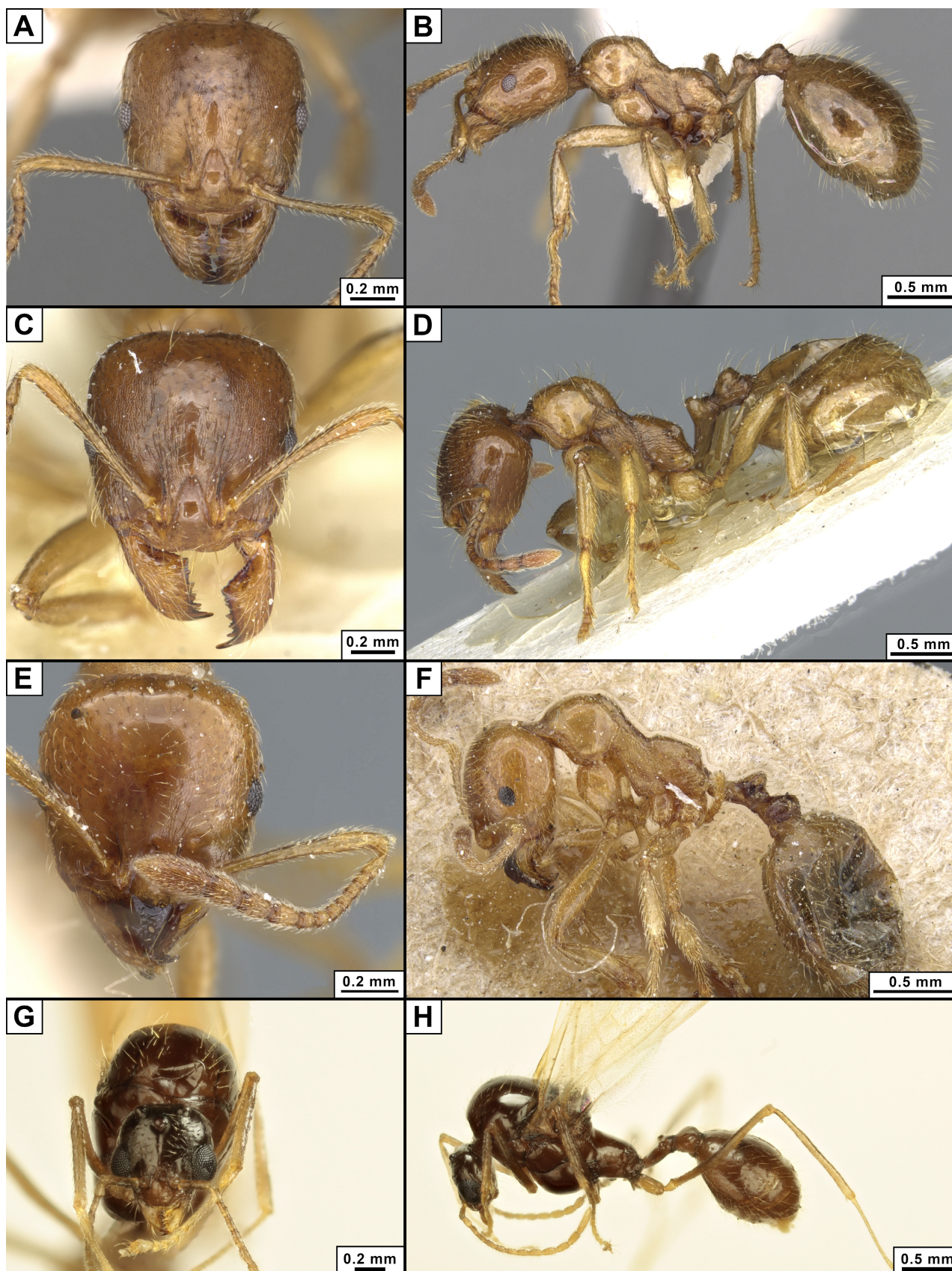
### *Aphaenogaster pallida* (Nylander, 1849)

=*A. leveillei* Emery, 1881 **syn. nov.**

=*A. leveillei laurenti* Santschi, 1939 **syn. nov.**

**Investigated material**—*Aphaenogaster pallida*: 6♀♀, Bova, Calabria, Italy, 37.9929, 15.93553, 13.IX.2016, E. Schifani legit (ESPC) (in Schifani *et al.* 2022); 1♀, Civita, Calabria, Italy, 30.V.1990, F. Rigato legit (AntWeb CASENT0280960, NHMUK); 19♀♀, Capo Granitola, Sicily, Italy, 37.562370, 12.676987, 02.II.1993, A. Alicata legit (AAPC); 13♀♀, Selinunte, Sicily, Italy, 37.584284, 12.838227, 02.II.1993, A. Alicata legit (AAPC); 155♀♀, Monte Sparagio, Sicily, Italy, 38.048697, 12.796222, 09.XII.1993, A. Alicata legit (AAPC); same except 25♀♀, 1♀, 38.042158, 12.753531, 1.III.1994; same except 71♀♀, 38.042158, 12.753531, 2.III.1994; 20♀♀, Villasmundo, Sicily, Italy, 37.250142, 15.088998, 8.XII.1993, A. Alicata legit (AAPC); 10♀♀, Monte Cofano, Sicily, Italy, 38.104853, 12.691378, 9.XII.1993, A. Alicata legit (AAPC); same except 5♀♀, 38.104853, 12.691378, 2.III.1994; same except 4♀♀, 38.103417, 12.677250, 15.XII.2017, E. Schifani legit (ESPC); 5♀♀, Gorgi Tondi, Sicily, Italy, 37.607771, 12.653039, 10.XII.1993, A. Alicata legit (AAPC); 59♀♀, 1♀, Monte Erice, Sicily, Italy, 38.039792, 12.595078, 10.XII.1993, A. Alicata legit (AAPC); 3♀♀, Lago Arancio, Sicily, Italy, 37.645486, 13.063864, 11.XII.1993, A. Alicata legit (AAPC); 21♀♀, Misilfurme, Sicily, Italy, 37.601222, 13.045778, 11.XII.1993, A. Alicata legit (AAPC); 17♀♀, Castello della Pietra, Sicily, Italy, 37.667067, 12.891008, 11.XII.1993, A. Alicata legit (AAPC); same except 6♀♀, 37.663300, 12.890549, 4.II.2022, E. Schifani legit (ESPC); same except 2♀♀, 37.664462, 12.891323; 1♀, Pizzo Battaglia, Sicily, Italy, 37.951728, 14.559489, 13.I.1994, A. Alicata legit (AAPC); 12♀♀, Francavilla, Sicily, Italy, 37.933358, 15.110997, 4.II.1994, A. Alicata legit (AAPC); 2♀♀, Gualtieri Sicaminò, Sicily, Italy, 38.158969, 15.322989, 8.II.1994, A. Alicata legit (AAPC); same except 11♀♀, 38.137572, 15.335097, 24.II.1994; 19♀♀, Corleone, Sicily, Italy, 37.847477, 13.319471, 19.II.1994, A. Alicata legit (AAPC); 5♀♀, Monte Inici, 37.995989, 12.854347, 3.III.1994, A. Alicata legit (AAPC); same except 14♀♀, 37.994467, 12.834525, 5.XII.1996; 17♀♀, Sciarre di Santa Venera, 37.809257, 14.835406, 30.IV.1994, A. Alicata legit (AAPC); 10♀♀, Santa Lucia del Mela, 38.124747, 15.328967, 9.II.1996, A. Alicata legit (AAPC); 2♀♀, Agira, Sicily, Italy, 37.553519, 14.533347, 2007, A. Alicata legit (AAPC); 14♀♀, Rocca Busambra, Sicily, Italy, 37.905128, 13.386528, 19.III.1997, A. Alicata legit (AAPC); same except 12♀♀, 37.860979, 13.361058, 7.III.2021, E. Schifani legit (ESPC); same except 3♀♀, 37.859918, 13.367695; 3♀♀, Pineta di Vittoria, Sicily, Italy, 36.915647, 14.504020, 06.III.2001, A. Alicata legit (AAPC); same except 11♀♀, 36.90852, 14.48389, 30.III.2001; same except 1♀, 36.87263, 14.45846, 16.V.2001; same except 4♀, 36.892726, 14.474514, 25.III.2019, E. Schifani legit (ESPC); 2♀♀, Villarosa, Sicily, Italy, 37.553803, 14.168458, 29.VI.2007, A. Alicata legit (AAPC); same except 1♀, 37.626167, 14.172367; same except 2♀♀, 37.553803, 14.168458, 6.XI.2007; same except 1♀, 37.638508, 14.191286; 2♀♀, Monte Pellegrino, Sicily, Italy, 38.172887, 13.350970, III.2016, E. Schifani legit (ESPC); same except 3♀♀, 38.174444, 13.345556, 20.III.2017, R. Viviano legit; same except 2♀♀, 38.163889, 13.347222, 23.III.2017; same except 1♀, 38.185983, 13.334625, 18.XI.2017; same except 2♀♀, 38.162639, 13.354306, I.XI.2020; same except 38.164444, 13.358611, 15.XI.2020; same except 3♀♀, 38.168472, 13.360139, 21.II.2021; same except 5♀♀, 1♀, 38.157694, 13.365824, II.IV.2021, E. Schifani legit; same except 10♀♀, 38.189282, 13.334694, 30.IV.2021; 2♀♀, 1♂, Bompietro, Sicily, Italy, 37.750526, 14.097143, X.2016, E. Schifani legit (ESPC); 2♀♀, Lago Scanzano, Sicily, Italy, 37.91445, 13.37139, 18.III.2017, E. Schifani legit (ESPC); 1♀, Levanzo, Sicily, Italy, 37.989651, 12.348252, 8.IV.2017, E. Schifani legit (ESPC); 3♀♀, Lampedusa, Sicily, Italy, 35.509264, 12.624002, 7.X.2017, E. Schifani legit (ESPC)





**FIGURE 2.** Workers and male of *Aphaenogaster pallida*. A,B: worker from Italy (CASENT0280960, photo by Shannon Hartman). C,D: syntype worker of *A. pallida* var. *laurenti* from Algeria (CASENT0913118, photo by Z. Lieberman). E,F: syntype worker of *A. pallida* r. *leveillei* from Algeria (CASENT0904154, photo by Z. Lieberman). G,H: male from Sicily, Italy. Photos A–F are available on [www.antweb.org](http://www.antweb.org).



(in Schifani *et al.* 2022); same except 2♀♀, 35.514889, 12.569083; 16♀♀, 9♀♀, 18♂♂, Capo Gallo, Sicily, Italy, 38.212208, 13.291560, 15.X.2018, E. Schifani legit (ESPC) (in Schifani *et al.* 2022); 3♀♀, Marettimo, Sicily, Italy, 37.961944, 12.062111, 8.III.2019, E. Schifani legit (ESPC); same except 2♀♀, 37.961944, 12.062111, 26.VIII.2020; same except 4♀♀, 37.973378, 12.057659, 28.IV.2022; 1♀, Castello del Calatubo, Sicily, Italy, 38.015278, 12.986944, 23.III.2019, R. Viviano legit (ESPC); 4♀♀, Monte Pecoraro, Sicily, Italy, 38.168139, 13.126389, 18.X.2020, R. Viviano legit (ESPC); same except 2♀♀, 37.972367, 12.058748, 16.VIII.2020; same except 1♀, 37.973378, 12.057659, 28.IV.2022; 8♀♀, Bosco Angimbè, Sicily, Italy, 37.949908, 12.887768, 14.III.2020, E. Schifani legit (ESPC); same except 3♀♀, 37.950376, 12.887631; 3♀♀, Monte San Calogero, Sicily, Italy, 37.938866, 13.724756, 15.I.2022, E. Schifani legit (ESPC); same except 6♀♀, 37.942601, 13.731630; 4♀♀, Isola di San Pantaleo, Sicily, Italy, 37.867999, 12.464691, 26.IV.2022, E. Schifani legit (ESPC); 1♀, Buseto Palizzolo, Sicily, Italy, 38.013940, 12.719377, 13.II.2022, E. Schifani legit (ESPC); 10♀♀, Zingaro, Sicily, Italy, 38.100448, 12.797266, 15.I.2023, E. Schifani legit (ESPC); 2♀♀, El Feija National Park, Jendouba, Tunisia, 36.773806, 8.651889, 18.XI.2016, W. Oueslati legit (ESPC); 16♀♀, Beni Mtir, Jendouba, Tunisia, 36.741167, 8.726500, W. Oueslati legit (ESPC) (in Schifani *et al.* 2022).

*Aphaenogaster pallida* (Nylander, 1849) was described from Sicily, while its two varieties *leveillei* Emery, 1881 and *laurenti* Santschi, 1939 were described from Algeria (Nylander 1849; Emery 1881; Santschi 1939). In particular, the “race” *leveillei* (CASENT0904154) was proposed by Emery as an infrasubspecific name for a single Algerian worker of *A. pallida*, which was anecdotally described as “more gracile” in comparison with the Sicilian form (Emery 1881). In a similar but opposite fashion, Santschi (1939) described the variety *laurenti* (CASENT0913118) as “more robust” than the Sicilian form, but at the same time, he noted that *laurenti* was “more similar” to the Sicilian typical form than to the variety *leveillei*.

Since the publication of the original descriptions, no additional data was produced to sustain that *leveillei* and *laurenti* represented distinct taxa, and their identity has remained unclear. Nonetheless, Cagniant (1996) elevated the variety *leveillei* to species rank and considered the variety *laurenti* as its subspecies without providing any explanation. The type specimens of *A. leveillei* and *A. leveillei laurenti* do not differ by any qualitative morphological character that would support their status as separate forms of *A. pallida*. Furthermore, available phylogenetic data indicate that the same species occurs in the Maghreb and Sicily (Schifani *et al.* 2022). Therefore, *A. pallida* is established as a senior synonym of *A. laurenti* and *A. leveillei* (Fig. 2).

### *Aphaenogaster sangiorgii* (Emery, 1901)

= *A. finzii* Müller, 1921 **syn. nov.**

= *A. radchenkoi* Kiran & Tezcan, 2008 **syn. nov.**

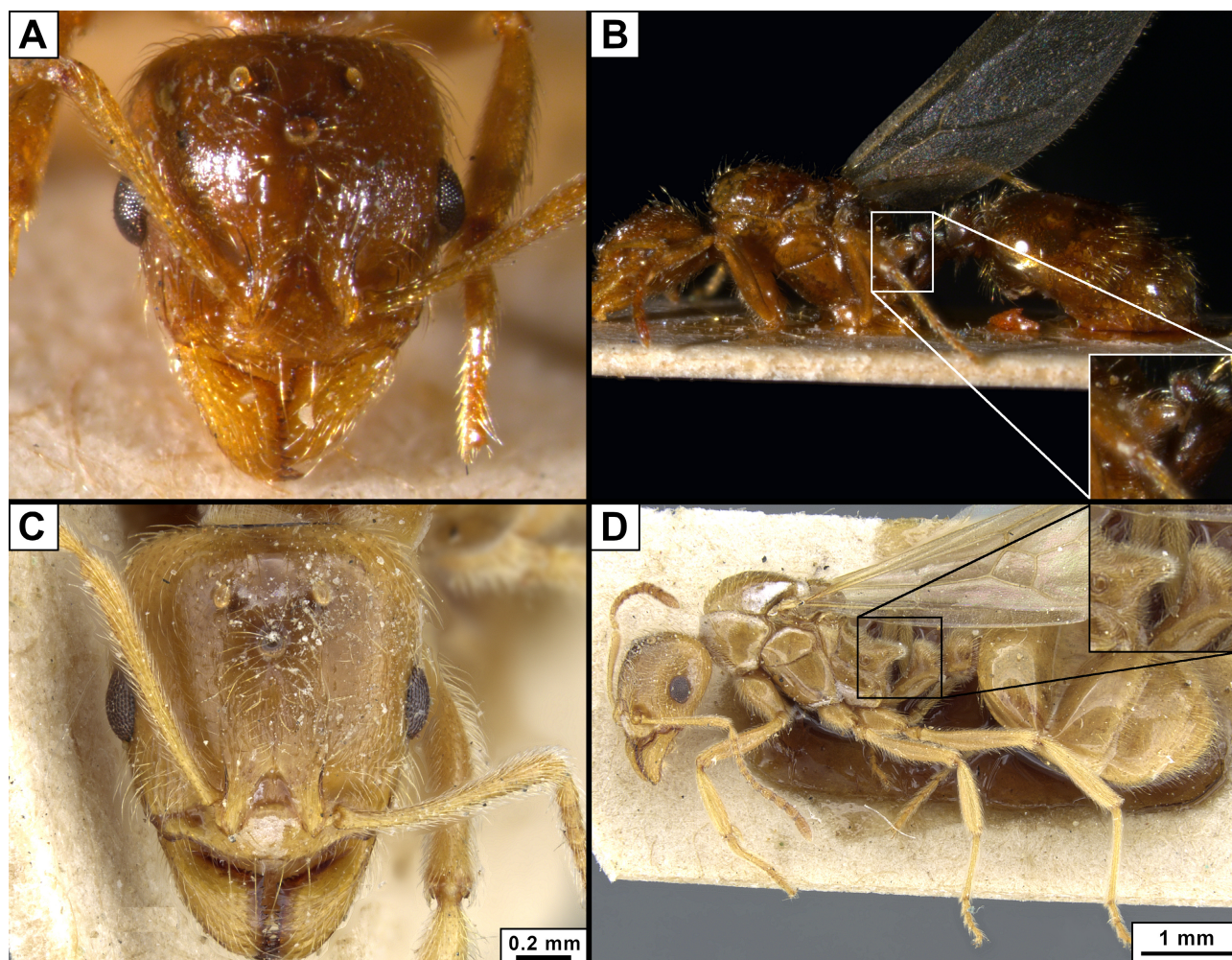
**Investigated material**—*Aphaenogaster sangiorgii*: 1♀, Kefalonia, Ionian Islands, Greece, D. Sangiorgi legit (MSNG) (*A. sangiorgii* holotype); 1♀, W. Argolida near Karia, Peloponnese, Greece, 37.62867, 22.54787, 2.IX.2013, L. Borowiec legit (CAS); 12♀♀, Pallagorio, Calabria, Italy, 39.321814, 16.916941, 15.IV.2016 and 13.IV.2018, Alicata legit (AAPC) (as *A. finzii* in Schifani & Alicata 2019); 10♀♀, San Nicola dell’Alto, Calabria, Italy, 39.290411, 16.980319, 5.IV.2019, G. Sabella & D. Misfud legit (AAPC, ESPC) (as *A. finzii* in Schifani & Alicata 2019; Schifani *et al.* 2022); 1♀, 1♀, Žegar, Croatia, P. Novak legit (MSNT) (*A. finzii* type series, photos in Schifani & Alicata 2019 and in Fig. 3).

*Aphaenogaster sangiorgii* (Emery, 1901) was originally described from a single queen specimen collected in Greece (Emery 1901, see CASENT0904171). The description provided by Emery (1901) is especially detailed for the standards of that time, nonetheless, the name was almost completely neglected in the subsequent literature. Workers or males of this species have never been described, and the species was never recorded from other sites. *Aphaenogaster sangiorgii* was never classified into any of the species groups, as its identity was considered uncertain (Schifani *et al.* 2022).

By investigating the holotype queen of *A. sangiorgii*, it was possible to determine safely its status as a member of the *pallida* group by the combination of very long and abundant hairs, shiny integument, and characteristic pigmentation (see Schifani *et al.* 2022). On the other hand, its long spines, are a character of only two other taxa within the group, which are recorded in the Balkans and Türkiye: *A. finzii* Müller, 1921 and *A. radchenkoi* Kiran

& Tezcan, 2008 (Schifani & Alicata 2019; Borowiec *et al.* 2019). *Aphaenogaster finzii* was first described from Croatia based on workers and its queen was described soon after (Müller 1921; Müller 1923). It was later recorded in the rest of the Balkans south to Greece and in southern Italy (Müller 1921; Salata & Borowiec 2018b; Schifani & Alicata 2019), but it has never been compared with *A. sangiorgii*.

*A. radchenkoi* was described from Türkiye based on both workers and queens and was not compared with either *A. sangiorgii* or *A. finzii*, but only with the short-spined *pallida* group species *A. subterraneoides* (Kiran *et al.* 2008; Borowiec *et al.* 2019). Later, Borowiec *et al.* (2019) recorded it in Bulgaria proposing a hypothetical distinction based on subtle differences in the shape of the spines of workers. In qualitative terms, the morphology of *A. sangiorgii* queen is identical to that of the *A. finzii* queen specimens in Müller's collection, and there is no difference compared to the description of *A. radchenkoi* (Kiran *et al.* 2008; Fig. 3). Therefore, based on morphological evidence and congruent biogeography *A. sangiorgii* is established as the senior synonym of both *A. finzii* and *A. radchenkoi*.



**FIGURE 3.** Queens of *Aphaenogaster sangiorgii*. A,B: Italian specimen labeled as *A. finzii* in Giuseppe Müller collection at the Natural History Museum of Trieste (photo by Silvia Rocio Castro-Delgado). C,D: holotype specimen of *A. sangiorgii* from Greece (CASENT0904171, photo by Z. Lieberman, available on [www.antweb.org](http://www.antweb.org)).

### *Aphaenogaster sardoa* Mayr, 1853

=*A. sardoa anoemica* Santschi, 1910 **syn. nov.**

=*A. sardoa ujhelyii* Szabó, 1910 **syn. nov.**

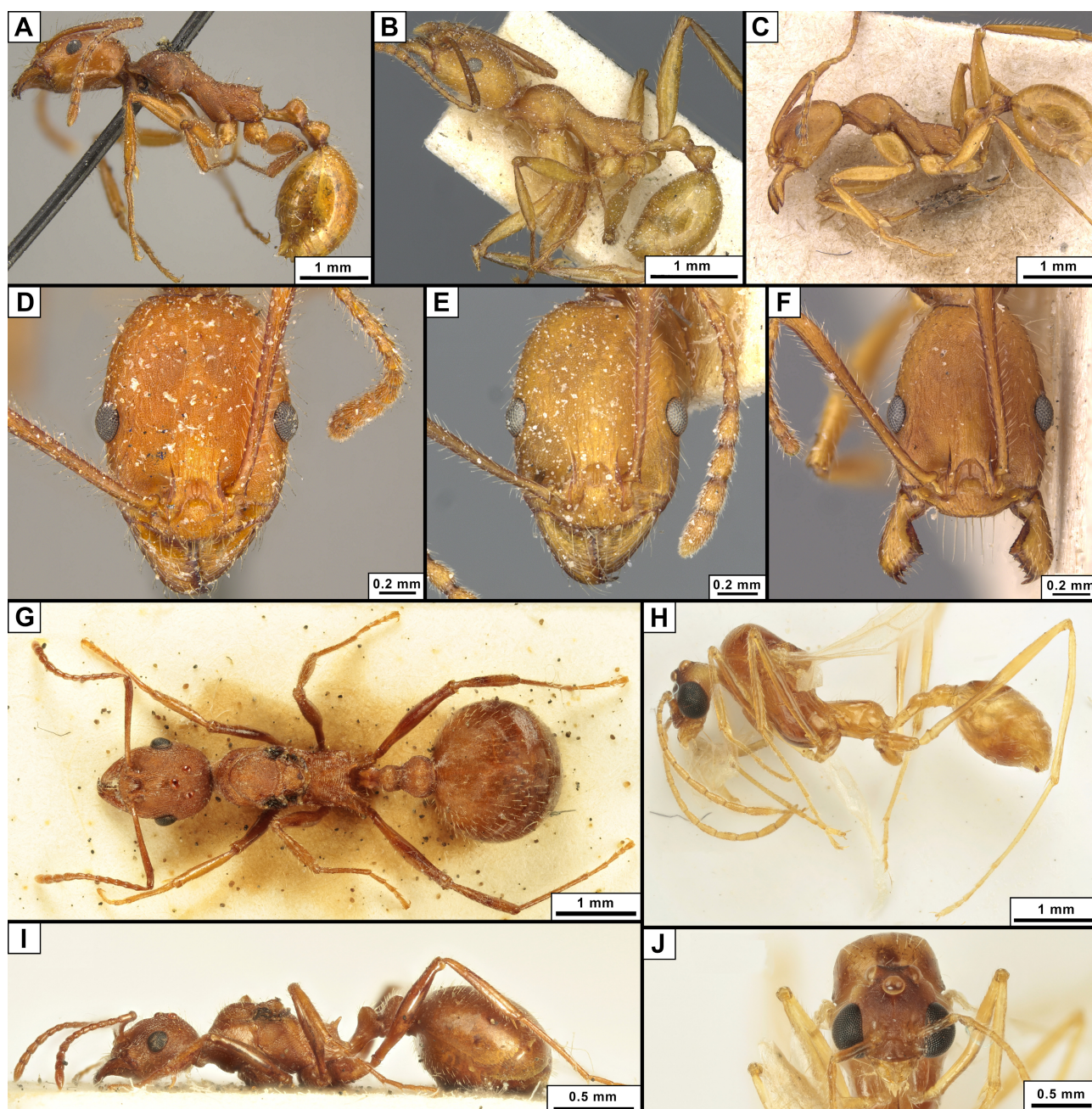
**Investigated material**—*Aphaenogaster sardoa*: 2♀♀, Sardinia, Italy (syntypes of *A. sardoa* CASENT0900461, CASENT0916080, NHMW); 10♀♀, 16♂♂, Capo Rama, Sicily, Italy, R. Lo Duca legit (ESPC); 9♀♀, 1♀, Trapani, Sicily, Italy, F.P. Romano legit (ESPC); 65♀♀, Monte Sparagio, Sicily, Italy, 38.048697, 12.796222, 9.XII.1993,



A. Alicata legit (ASPC); same except 31♀♀,1♀, 38.042158, 12.753531; 37♀♀,1♀, Monte Erice, Sicily, Italy, 38.039792, 12.595078, 10.XII.1993, A. Alicata legit (ASPC); 36♀♀, Corleone, Sicily, Italy, 37.852538, 13.313867, 19.II.1994, A. Alicata legit (ASPC); 12♀♀, Monte Inici, Sicily, Italy, 37.994467, 12.834525, 5.XII.1996, A. Alicata legit (ASPC); ♀♀, Gole del Drago, Sicily, Italy, 37.865866, 13.300869, 24.IV.2016, E. Schifani legit (ESPC); ♀♀, Marausa, Sicily, Italy, 37.928834, 12.484920, 7.VIII.2017, L. Barraco legit (ESPC); ♀♀, Favignana, Sicily, Italy, 37.921667, 12.317222, 18.III.2017, R. Viviano legit (ESPC); 33♀♀, Lampedusa, Sicily, Italy, 35.499117, 12.594717, 7.X.2017, E. Schifani legit (ESPC); same except 33♀♀, 35.514889, 12.569083, 8.X.2017; same except 7♀♀, 35.518217, 12.526533, 9.X.2017; same except 3♀♀, 35.496017, 12.612233, 10.X.2017; same except 1♀, 35.518867, 12.531567, 11.X.2017; same except 1♀, 35.522778, 12.567694, 12.X.2017; same except 5♀♀, 35.516972, 12.594028; 2♀♀, San Martino delle Scale, Sicily, Italy, 22.IX.2018, S. Costa legit (ESPC); 15♀♀, Bosco Scorce, Sicily, Italy, 37.976944, 12.773889, 7.VI.2020, R. Viviano legit (ESPC); 20♀♀, Rocca Busambra, Sicily, Italy, 37.861010, 13.360556, 7.III.2021, E. Schifani legit (ESPC); 1♀, Borgo Iudeo, Sicily, Italy, 37.836492, 13.22806, 12.VIII.20121, S. Chiarello legit (ESPC); 2♀♀, Ficuzza, Sicily, Italy, 37.888528, 13.365232, 13.IX.2021, E. Schifani legit (ESPC); 6♀♀, Isola di San Pantaleo, Sicily, Italy, 37.867999, 12.464691, 26.IV.2022, E. Schifani legit (ESPC); 2♀♀, Borgo Iudeo, Sicily, Italy, 37.769259, 12.635924, 16.V.2022, E. Schifani legit (ESPC); 1♀, Tangier, Tanger-Tetouan-Al Hoceima, Morocco, G. Buchet legit (syntype of *A. sardoa anoemica*, CASENT0913123, NHMB); 1♀, Zarhouan, Zaghuan, Tunisia, 1905, M.J. Ujhelyi legit (syntype of *A. ujhelyii*, CASENT0907702, NHMG); 17♀♀, Teborsouk, Béja, Tunisia, 13.III.2018, I. Sparacio legit (ESPC); 8♀♀, El Feija National Park, Jendouba, Tunisia, 36.773806, 8.651889, 18.XI.2016, W. Oueslati legit (AAPC, ESPC); 9♀♀, Aïn Soltane, Jendouba, Tunisia, 36.532083, 8.348111, 19.XI.2016, W. Oueslati legit (AAPC, ESPC); 10♀♀, Ksour, Jendouba, Tunisia, 35.758639, 8.871194, 17.IV.2017, W. Oueslati legit (AAPC, ESPC).

*Aphaenogaster sardoa* Mayr, 1853 is the type species of the genus *Aphaenogaster* and a member of the *sardoa* group, which is currently recognized as the most species-rich group within the genus (Schifani *et al.* 2022). Its peculiar morphology and pigmentation led to its classification as an entity separate from its true phylogenetic clade until recently (Boer 2013; Schifani *et al.* 2022). While *A. sardoa* was described from Sardinia based on workers (Fig. 4), it is also present in western Sicily (Mayr 1853; Schifani *et al.* 2020) and is widespread in the Maghreb. In the latter region, two related forms are also currently recognized, both described in the same year: *A. sardoa anoemica* Santschi, 1910 was described based on Moroccan and Tunisian material, and *A. sardoa ujhelyii* Szabó, 1910 based on Tunisian material (Santschi 1910; Szabó, 1910). Santschi (1910) and Szabó (1910) were unaware of each other's work according to their descriptions. Santschi (1910) described *anoemica* as a variety of *A. sardoa* providing only a queen description but depositing also undescribed syntype workers (Fig. 4). Later, the variety was elevated to the subspecies rank (Emery 1921). On the other hand, Szabó described *A. ujhelyi* as a good species which was later reconsidered as a subspecies based on the morphology of workers (Abdi-Hamecha *et al.* 2021).

Since their descriptions in 1910, the morphological characteristics of the two subspecies remained unclear. Santschi (1910) reported shorter hairs, a smaller first funicular segment, and a longer anterior margin of the petiole compared to the dorsal one to be the defining characteristics of the *A. sardoa anoemica* queen. It is unclear, however, whether Santschi (1910) was able to compare the queen he used for the description to Sardinian queens since the only queen description of *A. sardoa* was provided by André (1883) based on specimens of unknown provenience and did not include any of the characters used by Santschi (1910). Moreover, the petiole's anterior margin was longer than the dorsal margin in all the Italian *A. sardoa* queens that we examined, while the other characters allegedly defining *A. sardoa anoemica* would require many measured specimens to be convincingly assessed. On the other hand, Szabó (1910) defined *A. sardoa ujhelyii* as distinct from *A. sardoa* due to the following characteristics of workers: smaller size, finer surface sculpturing, slenderer thorax (probably referring to the mesosoma), and mesonotum higher than the pronotum. Out of these four, the second and the third are commonly associated with the first in the intraspecific variation of ant workers, while the mesonotum higher than the pronotum, which is illustrated with emphasis by Szabó (1910) is not visible in the type workers (Fig. 4). Therefore, *A. sardoa* is established as the senior synonym of both *A. sardoa anoemica* and *A. sardoa ujhelyii*.



**FIGURE 4.** The three castes of *Aphaenogaster sardoa*. A,D: syntype worker from Sardinia, Italy (CASENT0916080, photo by Anna Pal). B,E: syntype worker of *A. sardoa anoemica* from Morocco (CASENT0913123, photo by Z. Lieberman); C,F: syntype worker of *A. ujhelyii* from Tunisia (CASENT0907702, photo by Z. Lieberman). G,I: queen from Sicily, Italy. H,J: male from Sicily, Italy. Photos A–F are available on [www.antweb.org](http://www.antweb.org).

### *Aphaenogaster subterraneoides* Emery, 1881

=*A. subterraneoides armeniaca* Arnol'di, 1968 **syn. nov.**

**Investigated material**—*Aphaenogaster subterraneoides*: ♀♀, Chania, Crete, Greece, 35.5, 23.96666, 6.V.2011, L. Borowiec legit (ESPC); Vrbanj, Splitsko-dalmatinska županija, Croatia, P. Novak legit (CASENT0904155, MSNG).

*Aphaenogaster subterraneoides*, described from Greece, is a member of the *pallida* group that resembles the West-Mediterranean (and allopatric) *A. dulcineae* in having short propodeal spines (Schifani *et al.* 2022). Its



distribution encompasses the Balkans, Cyprus, and Ukraine, and extends east to the Caucasus (covering Russia, Azerbaijan, and Georgia). However, in Armenia, *A. subterraneoides* is allegedly replaced by *A. subterraneoides armeniaca* Arnol'di, 1968 (Arnol'di 1968; Arakelian 1994). This subspecies was first described as a subspecies of *A. pallida* and then considered to be a subspecies of *A. subterraneoides* by Arakelian (1994). No biogeographic explanation has ever been proposed to justify why the Armenian population should have differentiated from the ones of the neighboring countries and no similar examples exist among other ants. Furthermore, the morphological distinction of *A. subterraneoides armeniaca* from *A. subterraneoides* is only based on two characters that were never quantified: the presence of thinner hairs on the gaster and mesosoma and abundant hairs on the scapi that diverge of about 45° from the scapus in its distalmost half (Arnol'di 1968). At a magnification of up to 180x, there is no appreciable difference between the thickness of hairs of any of the *pallida* group species. On the other hand, examined type and non-type specimens of *A. subterraneoides* from *terra typica* (Greece) always have abundant hairs on the scapi and hairs diverging of about 45° in their distalmost half. Considering the lack of supporting evidence to keep the validity of *A. subterraneoides armeniaca*, *A. subterraneoides* is established as its senior synonym.

### ***Aphaenogaster subterraneosplendida* André, 1883**

= *Aphaenogaster sicula* Emery, 1908 **syn. nov.**

What follows is based on a taxonomic change that appeared on AntCat in 2022 as ‘unpublished’ that declared *A. sicula* Emery, 1908 to be a junior synonym of *A. subterraneosplendida* André, 1883 (Bolton 2022). The purpose of this section is to formalize this change in a taxonomic paper as suggested by Bolton (pers. comm.) and discuss it. *Aphaenogaster sicula* is a recently redescribed member of the *crocea* group endemic to Sicily and Calabria (Alicata & Schifani 2019; Schifani *et al.* 2022). It was described by Emery (1908) to replace the quadrinomial “*Aphaenogaster subterranea striola subterraneo-splendida*” previously published by Emery & Forel (1879) as a *nomen nudum* and with the geographic origin (Palermo, Sicily) as the only information. This first name was a puzzle of the actual *gibbosa*, *splendida*, and *subterranea* groups. This mixing testifies to the difficulties encountered at that time in classifying *Aphaenogaster* species as well as the fact that the *crocea* group was still unrecognized (Alicata & Schifani 2019; Schifani *et al.* 2022). The description by Emery (1908), almost three decades later, aimed to clarify the identity of this taxon but was based on the wrong assumption that the previous name had remained a *nomen nudum*. Instead, André (1883), in a key containing several *Aphaenogaster* species, treated also “*A. subterranea* var. *subterraneo-splendida* Emery & Forel” and made a very brief description of its morphology based on specimens from Sicily and from Lebanon, which represents a valid description. Thus, *A. subterraneosplendida* André, 1883 has priority over *A. sicula*. Treating *A. subterraneosplendida* as a subspecies of *A. subterranea* (Latreille, 1798) is clearly incorrect (Alicata & Schifani 2019; Schifani *et al.* 2022).

Thus, the Lebanese specimens that André (1883) mentioned certainly are not conspecific with the Sicilian ones and perhaps represented what Emery (1908) eventually described as *A. gibbosa syriaca* Emery, 1908. André and Emery, at least for some years, had a close collaboration and exchanged Sicilian samples on different occasions (Schifani *et al.* 2020). This obligate synonymization that follows the ICZN code unfortunately retroactively strips Emery of the paternity of a taxon he first discovered and later described in detail, even though there is no evidence that André (1883) intended to make a formal description.

## **Discussion**

The nomenclatural changes proposed in this paper constitute a step closer to a nomenclature that reflects the current understanding of *Aphaenogaster* diversity in the Mediterranean region. The removal of names that were not linked to clear species definitions will facilitate specimen identification in both north Africa and Europe and help remove dubious data from regional lists and global datasets used to infer biodiversity patterns (Guénard *et al.* 2017; Wang *et al.* 2023). While *A. sangiorgii* is no longer a species of uncertain identity, further investigations are required to clarify the position of other three *Aphaenogaster* species from the region, namely *A. burri* (Donisthorpe, 1950) and *A. depressa* Bolton, 1995 from Türkiye, and *A. saharensis* (Bernard, 1953) from Algeria (Schifani *et al.* 2022).



Synonymies discussed in this paper are proposed with the awareness that some of the synonymized names may eventually regain species status if solid evidence is produced. While morphological crypsis among West-Palearctic *Aphaenogaster* species seems rare, efforts to search for cryptic species within the genus have still been very limited. In recent years, some extreme levels of morphological crypsis were discovered in some Mediterranean ant lineages. The *Messor structor*, *Tapinoma nigerrimum*, and *Tetramorium caespitum* species complexes represent prominent examples (Seifert *et al.* 2017; Wagner *et al.* 2017; Steiner *et al.* 2018). However, it is still unclear how widespread crypsis is across other genera and lineages, and optimal integrative taxonomic investigations are still relatively rare. In this scenario, almost every available taxonomic name has some potential to be recognized as the correct name for a cryptic species in the future. This should not be a reason to maintain today the validity of taxonomic names whose status is not sustained by any form of evidence, but rather a stimulus to promote further integrative studies on diversification patterns of Mediterranean ants.

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