

Revision of the European ants of the *Aphaenogaster testaceopilosa*-group (Hymenoptera: Formicidae)

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The taxonomy of the myrmicine ants of the *Aphaenogaster testaceopilosa*-group is revised. Fourteen species are recognized, including two new species, both from Greece: *A. balcanicoides* sp. n. and *A. karpathica* sp. n. *Aphaenogaster melitensis* Emery, 1924 and *A. sporadis* Santschi, 1933 are elevated to species level. The following new synonyms are established: *Aphaenogaster ionia* Santschi, 1933 (= *A. balcanica* Emery, 1898), *A. senilis grata* Santschi, 1933 (= *A. senilis* Mayr, 1853), *A. senilis occidua* Santschi, 1933 (= *A. senilis*), *A. spinosa etrusca* Baroni Urbani, 1969 (= *A. spinosa* Emery, 1878) and *A. corsica* Casevitz-Weulersse, 2010 (= *A. spinosa*). Furthermore, a redescription is given for all European species of the *Aphaenogaster testaceopilosa*-group. The genus *Aphaenogaster* now includes 178 species, of which 36 are known from Europe. Identification keys are provided.

Keywords: *Aphaenogaster*, ants, new species, Europe, taxonomy, biogeography.

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Introduction

The ant genus *Aphaenogaster* Mayr, 1853 consists of 178 species, and has a widespread distribution that encompasses the Neotropical, Nearctic, Palearctic, Madagascar, Oriental, Indo-Australian and Australian biogeographic regions (Bolton et al. 2006, Bolton 2012). In Europe (Palearctic region) the genus *Aphaenogaster* is represented by 36 species, which were previously placed in three subgenera: *Aphaenogaster* Mayr, 1853, *Attomyrma* Emery, 1915a and *Ischnomyrmex* Mayr, 1861 (Emery 1908, 1915a). These subgenera are now considered junior synonyms (Bolton 1982). Subsequently, Schulz (1994) divided the Palearctic species belonging to the former subgenus *Attomyrma* into five species groups.

In Europe *Aphaenogaster* is a 'forgotten' ant genus. The taxonomic literature consists almost entirely of the original descriptions, with one recent paper dealing with the taxonomy of European *Aphaenogaster* species (Agosti & Collingwood 1987). They included *Aphaenogaster* in their key to the European

ant species, but excluded the Iberian species. Older papers dealing with European *Aphaenogaster* species include the work of Emery (1908) and Santschi (1933).

In this paper a new species group is established: the *Aphaenogaster testaceopilosa*-group, including fourteen European species. The workers of these species differ from other species in the genus by a scape which stands well over the occiput, of which the second funicular segment is >1.5 longer than wide, of which the hind tibia is more than eight times longer than broad, in having a punctate head and mesosoma, and having no elongated 'collar-shaped' head. The nomenclatural history of the European species belonging to the *Aphaenogaster testaceopilosa*-group is complex. Earlier authors (Emery 1908, Santschi 1933) used rather variable characters for the delimitation of species, such as the relative lengths of the propodeal spines, and the sculpture and the height of the petiole. Biometrical data, however, were not used. This has led to descriptions of

many varieties, subspecies and species, without argumentation and substantial comparison with related taxa.

A large portion of the taxonomic confusion in this group centres around three species, namely *A. testaceopilosa*, *A. ionia*, and *A. simonellii*. These species have been confused with closely related species.

The distribution of the *A. testaceopilosa*-group in Europe corresponds to the area south of the 20° July isotherm, roughly equal to that part of Europe influenced by the Mediterranean climate, i.e. mild, rainy winters and hot, dry summers. Little is known about the biology of these species. Menozzi (1936) and Baroni Urbani (1966) published about the biology of *Aphaenogaster*, but it is unclear which species they discussed. Species of the *Aphaenogaster testaceopilosa*-group nest in Europe in the soil, mainly under stones in dry areas. They forage (probably) only during daytime.

This revision is primarily based on the worker caste. In some cases the species differences between males proved more distinct than between workers. Diagnostic features for males, when available, are therefore included in this revision. Images are provided for some species and a key is provided for their identification. Furthermore, a key for the European species groups of the genus *Aphaenogaster* is provided, as well as a provisional key for gynes and males.

Methods and abbreviations

Europe is defined as the countries within the political boundaries of Europe, including the European part of Turkey, but excluding the Canary Islands and Cyprus. Subspecies, varieties and synonymized taxa of species treated in this paper, but not part of the European fauna, are excluded.

Size and shape characters are quantified and are reported as lengths or indices. All measurements are in millimetres. Measurements were carried out with a Leica Wild M3B and a Carl Zeiss Jena stereo microscope at various magnifications, and a Schott CL 1500LCD cold light source. The measurements and indices taken are defined below.

Explanation of numeric characters and abbreviations used in the text:

CI	Cephalic Index (CW/CL) × 100.
CL	Maximum cephalic length in median line.
CW	Maximum cephalic width, across eyes.
EYI	Eye Index (Maximum eye diameter/CL) × 100.
FTI	Femur Tibia Index (length F3/length T3) × 100.
OCI	(Outer distance between the upper ocelli/cephalic width just above the eyes) × 100.

PI	Petiole Index (Maximum width of petiole/maximum width postpetiole) × 100.
PHI	Petiole Height Index (Petiole Height (Fig. 1)/CW) × 100.
PPPI	Petiole Index (petiole width + postpetiole width)/CW × 100.
PWI	Petiole Width Index (Petiole Width/CW) × 100.
PSI	Propodeal Spine Index (x/y in Fig. 2) × 100.
PSLWI	Propodeal Spine Length-Width Index (x/z in Figs 2 and 3) × 100.
RPH	Relative Petiole Height (petiole height (Fig. 1)/maximum petiole width) × 100.
RPSI	Relative Propodeal Spine length-width Index ((x - y)/z in Figs 2 and 3) × 100.
SI	Scape Index (SL/CW) × 100.
SL	Maximum straight line scape length excluding articular condyle.
SPD	Spine Position in Dorsal view (Fig. 4).
SPL	Spine Position in Lateral view (Fig. 5).

Definition of descriptive terms (modified from Harris 1979):

Costate. Furnished with longitudinal raised ribs, rounded at their crest.

Costulate. A diminutive form of costate, less prominently ribbed than costate (Fig. 67 on postpetiole).

Microreticulated. A fine reticulated sculpture, caused by shallow impressions (visible in magnification 100×) (Fig. 29).

Microstriae. Furnished with raised, dense, fine, parallel lineations in wave patterns, often in a fingerprint-like pattern (Figs 8, 9, 67).

Pubescence. Small to minute hair-like cuticular projections that are not socketed basally (Bolton 1994).

Punctate. Set with fine, impressed points or punctures, appearing as pinpricks (Fig. 29).

Rugae. Wrinkles as in *Myrmica* species.

Ruguloreticulated. Longitudinal rugulae connected with transverse rugulae (Figs 28, 34)

Rugulose. Minutely wrinkled (Fig. 70).

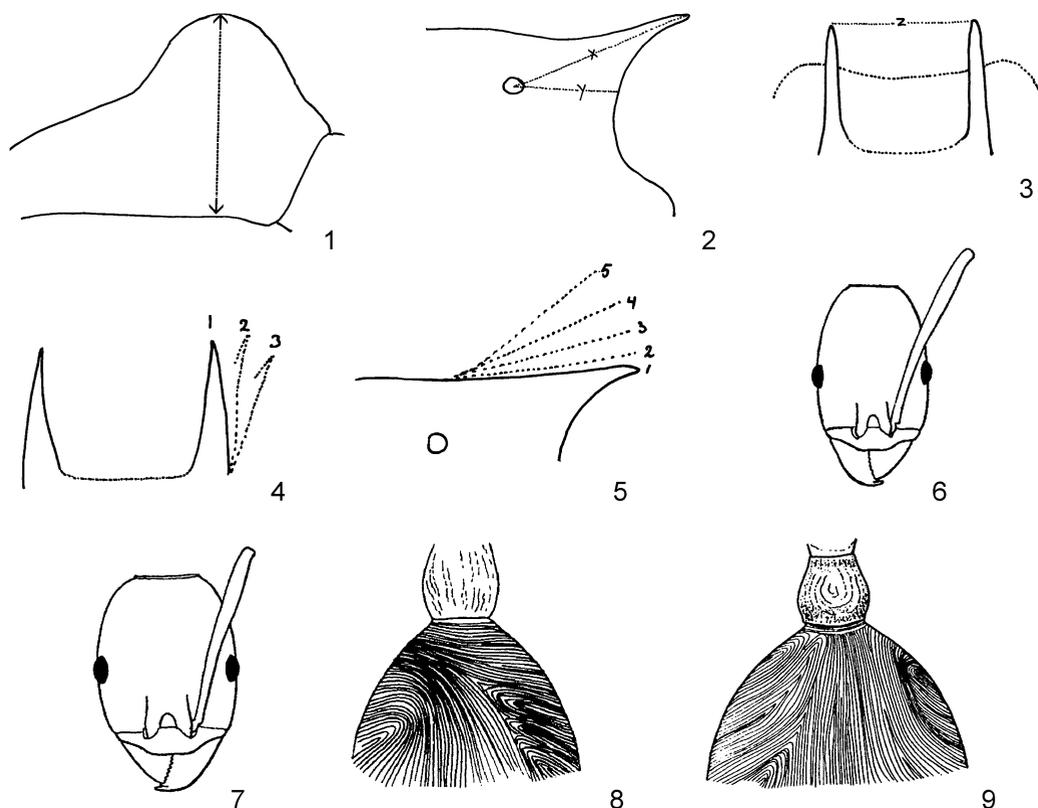
Scabriculous. With fine and regular short rugulae in different directions (Fig. 31).

Seta. Any stout hair socketed basally, plural: setae (Bolton 1994).

Shine. In order of matt to shiny: matt, matt satin, satin, shiny satin, wax glossy, glossy (= subdued shine), shiny (seen in diffuse light).

Specimens examined in this study are deposited in the following institutions and private collections:

CGB	Collection Gregor Bračko, Ljubljana, Slovenia
CG	Collection Gielen, Antwerp, Belgium
CM	Collection Maassen, Echt, Netherlands
CPB	Collection Peter Boer, Bergen NH, Netherlands



Figs 1–9. *Aphaenogaster* features. 1. Petiole height. 2. Propodeal spine length (x) and index (PSI: x : y). 3. Distance between the propodeal spines. 4. Positions of propodeal spine in dorsal view. 5. Positions of propodeal spine in lateral view. 6. Head of small worker. 7. Head of large worker. 6–7 after Emery (1908). 8. Microstriae: transverse near base. 9. Microstriae: longitudinal. 8–9 after Cagniant (1996).

IRSNB Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium

MNHN Muséum National d'Histoire Naturelle, Paris, France

MNLB Museum für Naturkunde Leibniz-Institut für Evolution- und Biodiversitätsforschung, Berlin, Germany

MSNG Museo Civico di Storia Naturale, Genova, Italy: Collection Emery

MSNV Museo Civico di Storia Naturale, Verona, Italy: Collection Baroni Urbani

NHMB Naturhistorisches Museum, Basel, Switzerland

NMW Naturhistorisches Museum Wien, Austria

RMNH Naturalis Biodiversity Center, Leiden, Netherlands (former Leiden collections)

UAB Universitat Autònoma de Barcelona, Spain

WML World Museum Liverpool, Great Britain; Collection Collingwood

ZMAN Naturalis Biodiversity Center, Leiden, Netherlands (former collections Zoologisch Museum Amsterdam)

Discussion of character variations

The variation between specimens of different localities often results in taxonomic difficulties and can lead to discussions about distinguishing varieties, subspecies and/or species. This is also the case within the *A. testaceopilosa*-group (e.g. Forel 1911, Emery 1915a, Menozzi 1936, Baroni Urbani 1968b).

The main characters used by Agosti & Collingwood (1987) in their identification key of European ant species are: 1) the length of the propodeal spines in relation to the distance between their tips, 2) the sculpture of the petioles and the propodeal dorsum, and 3) the height of the petiole. These characters are often variable, as described below, and therefore not always considered adequate characters for species identification.

The character variations most often used are discussed here:

The length of the propodeal spines in relation to the distance between their tips, expressed in the RPSI, varies greatly between specimens of the same species, this index being only useful as character in species with very short propodeal spines.

The height of the petiole, expressed in the petiole height index (PHI) hardly varies, all mean values lying between 31 and 33.

The ratio between femur and tibia of the hind leg is rather variable within a particular species: FTI 1.2–1.4, and is not a distinguishing character in this species-group.

The sculpture of the dorsum of the mesonotum is highly variable, especially on the propodeum. This feature was reviewed in 28 from ten different localities of *A. spinosa*. The occiput was smooth in 61% and was punctate in 39%. The dorsum of the pronotum was smooth in 11%, weakly rugulose in 32% and rugulose in 57%. The dorsum of the petiole was smooth in 36%, weakly rugulose in 36% and punctate in 28%. The dorsum of the postpetiole was smooth in 21%, weakly rugulose in 32%, and punctate in 47%. The surface of the first gastral tergite varied in sculpture from being totally covered with microstriae (7% of the workers) to completely smooth (36%). In 29 of the workers of *A. iberica* similar variations are observed: occiput smooth (3%) to distinct punctate (52%); dorsal sides of petiole smooth (3%) to distinct punctate (10%); postpetiole smooth (3%) to distinct punctate (21%); dorsal side of the first gastral tergite smooth (7%) to completely covered with microstriae (62%). The average cover of microstriae was 81%. The lateral side of the first gastral tergite ranged from shiny (76%) to matt (3%); and lateral sides of the petiole smooth (72%) to totally punctate (3%). Intraspecific sculpture variation is also mentioned by Longino & Cover (2004) for neotropical *Aphaenogaster* species. They presumed that selection favours smooth abdomens in montane areas and matt abdomens in lowland habitats. I cannot confirm this hypothesis because of a lack of altitudinal data. The surface of the propodeum may be without sculpture, with transverse rugulae, or with oblique or longitudinal rugulae. Longitudinal propodeal rugulae are common in *A. campana*, but rare in other species and sometimes even missing.

The sculpture of the petioles can vary considerably. Sometimes all workers in a nest have sculptured petioles (as in *A. sporadis*), especially when the sculpture of the whole body is coarse. But when the sculpture is rather weak, the differences between absent, weak and strong sculpture appear more distinct (e.g. in *A. balcanica*).

There is also variation in overall body surface sculpture and shine. The most distinguishing character of the species belonging to the *A. testaceopilosa*-group is the punctuation. The walls of these pits can be rather superficial, producing a somewhat weak imbricate or microreticulate sculpture, as seen on the ventral side of the head, the legs and petioles (Fig. 29). These sculptures can be absent, leaving a largely smooth surface, often with a few visible remnants of some sculpture, which rarely affect the shine. The main surface sculpture varies from distinctly punctate to smooth. The shine of the body is mainly determined by the sculpture of the cuticular surface. If the punctuation is deep, the body is mostly matt. The deeper-lying pits remain bright, but shine becomes more shielded. The visible glow is highly dependent on the intensity of the lighting. Diffuse light was used for observing the surface sculpture.

A variable character in all species is the direction in which the rugulae on the clypeus run. They generally follow a longitudinal direction (Figs 56, 66), but are often transverse and oblique (Fig. 28). They can be distinct (especially in species with a coarse sculpture) (Fig. 66) or weak, sometimes limited to a few rugulae (Fig. 62).

The mandibular teeth may be quite blunt, and in those cases, no exact number of teeth can be determined. In males the number of teeth on the left and right jaw often differs. There were not enough males available to find valuable diagnostic teeth characteristics.

In a few cases head shape has been mentioned as a discriminating character, however, head shape depends on the ant's size. Small workers have a narrower head (occiput) above the eyes (Fig. 6), while large ones have a more rectangular head (Fig. 7). This is also true for the thickened collar edge of the head, which is distinct on the dorsal and lateral sides of the heads of small workers, but is less pronounced, and often absent in the middle of the head of large workers.

Within a species there is, of course, variation in the cephalic index. This is partially due to the more or less curved front edge of the clypeus and the sometimes slightly curved occiput.

Previous authors discussing *Aphaenogaster* mentioned colour, which in most cases is described as black. Having studied various type specimens, most of them appear not black, but reddish-brown. Apparently over the years these ants lost their original colour. In addition, there is always a part of living nest populations of black with weakly or partial reddish pigmentation.

Longino & Cover (2004) suggest that leg pilosity (in some Neotropical *Aphaenogaster* species) has a

simple genetic basis and is, in itself, an intraspecific polymorphism showing clinal variation. They argue that it is independent of clines for other characters such as abdominal sculpture and neck shape. In the European *Aphaenogaster testaceopilosa*-group the pilosity of the legs supports this finding. However, the position of the pubescence on the scape, in one nest population, can vary from appressed to erect, making the position of the pilosity an uninformative character. The body setae length varies little between species. Sometimes a few have extra long or extra short setae. The length of the setae is only useful when all specimens have short or long setae. Also, stiff setae break off easily. Specimens in collections often have rather few setae left, due to wear.

Males are strongly variable in sculpture, shape and in biometrical features. This can easily lead to wrong interpretations about species status. Three examples of variations within the same species: 1) the mesopleura and dorsal side of the propodeum can vary from completely smooth to clear punctate, 2) if a transversal groove in the middle of the propodeal dorsum is clear, than the posterior part of the propodeum is raised, and when it is missing the propodeum is sloping, 3) the propodeum can be dentate or armed by spines.

Most of the above-mentioned characters appear unsuitable for identification. For the European species of the *A. testaceopilosa*-group the useful characters in worker, gyne and male are (mainly in combination with other characters): 1) the number of antennal club segments, 2) the length of the propodeal spines and 3) the sculpture of the mesosoma and gaster. In addition, for worker and gyne of the *A. testaceopilosa*-group: 1) the relative width of the petioles and 2) the direction of the clypeal rugulae are useful. Lastly for gyne and male: the angle between metanotum and scutellum is diagnostic.

The following characters are only applicable to one caste. For worker: 1) the direction of the microstriae on the base of the dorsal side of the gaster, 2) the shape of the pronotum in lateral view, 3) the direction of the rugulae on the dorsal side of the propodeum, 4) the length of the setae and 5) the degree of setosity of the petioles. For male the 1) outer distance between the upper ocelli, 2) the size of the eyes and 3) the pubescence of the hind tibia.

Aphaenogaster Mayr, 1853

Aphaenogaster Mayr, 1853: 107. Type species: *Aphaenogaster sardoa* Mayr, 1853, by subsequent designation of Bingham. 1903: 270. Based on the worker caste.

Ischnomyrmex Emery, 1894: 7. Type species: *Aphaenogaster (Ischnomyrmex) cecconi* Emery, 1894. Emery, 1915b: 71,

combination in *Aphaenogaster (Deromyrmex) cecconi*. Based on worker caste.

Aphaenogaster subgenus of *Stenammas* (Emery 1895: 298).

Aphaenogaster revived status as genus (Emery 1908: 309).

Aphaenogaster provisional senior synonym to include *Aratomyrma* (Emery, 1915) and *Deromyrma* Forel, 1913 (Brown, 1973: 178).

Diagnostic characters

Worker. Antennae 12-segmented with a 4- or 5-segmented club. In side view the propodeum depressed below the level of the pronotum and anterior region of the mesonotum, these two regions being connected by the steeply sloping posterior section of the mesonotum (Shattuck 2008). In Europe *Aphaenogaster* is most likely to be confused with *Pheidole* and *Messor*. These genera are polymorphic, while *Aphaenogaster* is largely monomorphic. worker of *Aphaenogaster* can be separated from *Pheidole* by the 4- or 5-segmented rather than 3-segmented club, and from *Messor* by the outer margin of the mandibles being not strongly curved toward the midline (as in *Messor*), but elongate-triangular.

Gyne. 4- or 5-segmented antennal club, like *Messor* (4), the club of *Pheidole* is 3-segmented. The scapes of *Messor* do not extend over the head edge, as in *Aphaenogaster*.

Male. 5-segmented or indistinct antennal club. Distinctly flat head and at least partly low propodeum (Fig. 33).

Aphaenogaster testaceopilosa-group

Diagnostic characters

The worker of the *A. testaceopilosa*-group have a punctate head and mesosoma, while the head is neither elongated, nor collar-shaped. This character combination is absent in the other European species of the genus *Aphaenogaster*, except for *A. sardoa*. The punctation is also present in the gyne and male, but only on certain body parts, usually the head. In most species, the anterior portion of the dorsal side of the first gasteral tergite is microstriated.

Description of worker

Head, mesosoma and scape largely rugulose, sometimes partially with longitudinal rugulae. Head in full-face view partially ruguloreticulated. Frons longitudinally costulate. Punctation present on head and mesosoma, weaker on lateral side of temple and ventral side of head: more microreticulated. Microreticulation on petioles and legs, the legs often nearly smooth. Terminal end of scape somewhat swollen (Figs 34, 66) with distinct or weak longitudinal rugulae, without or with scarce oblique connections. Dorsal side of first gastral tergite largely,

sometimes partly, with microstriae in a fingerprint-like pattern (Figs 8, 9 and 67), sometimes lacking (*spinosa*, *semipolita*), usually posteriorly weakening. Bristle-like setae, regularly spaced, appressed to suberect, sharply pointed to rarely blunt; distance between the setae on the mesosoma always lesser than the length of the setae. Pubescence on head, thorax and gaster is very scarce, less than 10% of the total body setae. Tibiae and femora on all sides with pubescence. Basal margin of the mandibles slightly and unequally bluntly serrulate. Masticatory margin of mandible with 2 or 3 large apical teeth of decreasing length, the remaining part of the margin with blunt teeth and denticles of different sizes (Fig. 53). Mandibular sculpture composed of regular costulae. Anterior margin of clypeus broad, usually weakly emarginated. Femur of the hind leg 1.2–1.4× longer than tibia. Length of first tarsal segment of the hind leg 0.9× length of tibia. Tarsal claws simple. Tarsal spurs of hind tibia simple or minutely dentate. Monomorphic.

Description of gyne

Differences compared to the worker caste: Sculpture more costate than rugulose, but more expressed than in workers, while punctuation is weaker. Head wider than maximum mesonotal width. First gastral tergite dorsally microstriated.

Description of male

Mandibles smooth and mostly shiny. Masticatory margin of mandibles in all males with an apical tooth usually twice as large as tooth two, the other teeth are variable. Left and right mandible margins are often asymmetric. Total number of teeth is around 6, number of teeth per mandible may be different in individual specimens. Majority of the teeth are minute, sharp or blunt. Anterior margin of mandible very slightly crenated or straight. Head narrower than maximum pronotal width. Wings with a yellowish to brownish tint (except *A. senilis* and *A. gemella*: nearly clear). Sometimes dorsally with longitudinal microstriae on base of gaster. This seems variable in most species. Frontal midline weak or absent, distinct in some specimens of *A. picena*.

Comments

The type species of the nominotypical subgenus *Aphaenogaster* is *A. sardoa*. Originally this subgenus contained all the species here placed in the *A. testaceopilosa*-group, plus *A. sardoa*. The reason to exclude this species is that *A. sardoa* differs in several characters from the other species: 1) the males of *A. sardoa* have small, short and minutely dentate mandibles, instead of dentate, broad mandibles,

2) the males and gynes of *A. sardoa* have larger eyes and ocelli, 3) they have broad spherical petioles, and 4) all castes of *A. sardoa* are yellowish, while those of the *A. testaceopilosa*-group are blackish or (particularly after preservation) reddish-brown.

Examples of species belonging to this group outside Europe are *A. testaceopilosa* and *A. sicardi* Cagniant (1990) (North Africa) and *A. ashmeadi* Emery, 1895 (North America).

Synopsis of European species of the *Aphaenogaster testaceopilosa*-group

- A. balcanica* (Emery, 1898); Croatia, Bosnia, Albania, Greece (mainland, islands in the Aegean Sea), Turkey.
A. ionia Santschi, 1933 **syn. n.**
A. balcanicoides **sp. n.**; Greece (Crete)
A. campana Emery, 1878; Albania, Southern Italy
A. gemella (Roger, 1862); Spain
A. karpathica **sp. n.**; Greece (Karpathos)
A. iberica Emery, 1908; Portugal, Spain
A. angusta Santschi, 1925
A. inermis Bolton, 1995; Malta, Southern Italy
A. inermis Emery, 1908
A. melitensis Emery, 1924, **stat. n.**; Malta
A. picena Baroni Urbani, 1971; Slovenia, Croatia, Albania, Italy
A. semipolita (Nylander, 1856); Southern Italy
A. senilis Mayr, 1853; Portugal, Spain, France, Italy, Slovakia
A. senilis var. *acoreensis* Santschi, 1933
A. testaceopilosa var. *fuentei* Medina, 1893
A. senilis grata Santschi, 1933 **syn. n.**
A. senilis occidua Santschi, 1933 **syn. n.**
A. simonellii Emery, 1894; Greece (Crete, Karpathos)
A. spinosa Emery, 1878; Italy, France (Corsica), Switzerland
A. spinosa var. *nitida* (Emery, 1895)
A. spinosa var. *corsica* Santschi, 1933
A. spinosa var. *romana* (Emery, 1895)
A. spinosa etrusca Baroni Urbani, 1969 **syn. n.**
A. corsica Casevitz-Weulersse 2010 **syn. n.**
A. sporadis Santschi, 1933, **stat. n.**; Greece (Ikaria, Lesbos)

Key to European *Aphaenogaster* workers

1. Occiput not collar-shaped 2
 - Occiput elongated, collar-shaped. Body shining black. Crete . . . *A. ceconii* Emery, 1894
2. Scape stands well over of the occiput. Middle funicular segments longer than broad . . . 3
 - Scape from just below to protruding just above the occiput. Middle funicular seg-

- ments as broad as long, or slightly longer
 *A. pallida*-group (*A. pallida*
 (Nylander, 1849), *A. lesbica* Forel, 1913, *A.*
dulcinea Santschi, 1919, *A. finzii* Müller,
 1921, *A. holtzi* (Emery, 1898), *A. subterra-*
noides Emery, 1881).....
 & *A. obsidiana*-group (*A. obsid-*
iana (Mayr, 1861), *A. epirotes* (Emery, 1895))
3. Second funicular segment > 1.5 longer
 than wide. Hind tibia more than eight times
 longer than broad 4
 – Second funicular segment < 1.5 longer
 than wide (except *festae*?). Hind tibia circa
 five times longer than broad. Largely shiny.
 Yellowish red to dark brown. Front of head
 feeble rugulose (except *A. sicula* Emery,
 1908) *A. sub-*
terranea-group (*A. sicula*, *A. graeca* Schulz,
 1994, *A. festae* Emery, 1915, *A. crocea* (An-
 dré, 1881), *A. subterranea* (Latreille, 1798))
4. Gaster mainly smooth, sculpture, if present,
 restricted to basal part of first gastral ter-
 gite. Head and mesosoma without puncta-
 tion 5
 – At least anterior part of the dorsal side of
 the first gastral tergite finely and densely mi-
 crostriate, often in a fingerprint-like pattern
 (Figs 8, 9). Head and mesosoma punctate
 (Figs 28, 30) 6
5. Occipital outline in frontal view straight to
 weakly convex. Colour shining blackish red
 brown to purple black. CI < 1.2
 *A. gibbosa*-
 group (*A. striativentris* Forel, 1895, *A. gib-*
bosa (Latreille, 1798), *A. italica* Bondroit, 1918)
 – Head shape ovoid narrowing posteriorly.
 Colour yellowish red to dark reddish
 brown. CI > 1.2
 . *A. splendida*-group (*A. cardenai* Espadaler,
 1981, *A. muelleriana* Wolf, 1915, *A. ovati-*
ceps (Emery, 1898), *A. splendida* (Roger, 1859))
6. Petiole swollen, spherical, relative width:
 PI-mean 89. Base of gaster on dorsal side
 with some transverse microstriae, other part
 without microstriae. Propodeum angulate
 or with short spines that resemble little
 thorns. Hind tibia ca. 8 times longer than
 wide. Head and mesosoma yellow brown
 red to light rust brown *A. sardoa*
 – Petiole in dorsal view not spherical: PI-
 mean < 84. Base of gaster on dorsal side
 with longitudinal microstriae, sometimes
 (almost) lacking; if transverse microstriae
 then antennal club 5-segmented. Hind tibia
 ca. 9 times longer than wide. Darker
 *A. testaceopilosa*-group

Worker key of the European species of the *A. testaceopilosa*-group

Identifications should be preferably based on several specimens from the same colony, if possible of all three castes.

1. Antennal club 5-segmented (Figs 39, 55).
 Base of gaster on dorsal side with (some)
 transverse microstriae (Fig. 8) 2
 – Antennal club 4-segmented (Figs 44, 49).
 Base of gaster on dorsal side with longitudi-
 nal microstriae (Figs 9, 67), sometimes ab-
 sent (*A. spinosa*, *A. semipolita*) 3
2. PSLWI < 0.92. RPSI 0–14 (5). Propodeum
 dentate, these 'teeth' triangular (Fig. 42).
 Spain (Andalusia, Balears) *A. gemella*
 – PSLWI > 0.95. RPSI 11–44 (30). Propo-
 deal spines slender (Fig. 58). Iberia, Slo-
 vakia, France (Mediterranean region)
 *A. senilis*
3. Propodeum with thorns or spines 4
 – Propodeum angulate, without spines or
 thorns (Fig. 46). Italy (S), Malta ... *A. inermita*
4. Majority of a nest population with long
 and sturdy propodeal spines: PSI-mean 208
 (Figs 16, 44, 62) 5
 – Propodeal spines shorter, never sturdy: PSI-
 mean 163 (Figs 16, 37, 48) 6
5. SI/CI > 1.96 (Fig. 64). In general at least
 80% of the whole dorsal side of first gastral
 tergite with microstriae, matt; sometimes
 glossy. Iberia *A. iberica*
 – SI/CI < 2.01 (Fig. 64). Microstriae on dor-
 sal side of first gastral tergite in general
 restricted to the base, sometimes on the
 whole gaster, remainder shiny. Occiput, lat-
 eral sides of head, gaster and petiole nearly
 always shiny. Switzerland, Italy (N + S, Sar-
 dinia), France (Corsica) *A. spinosa*
6. In lateral view: pronotum and mesonotum
 forming a uniformly curved line (Fig. 30) ... 7
 – In lateral view: pronotum slightly angular,
 not forming a uniformly curved line with
 the mesonotum (Fig. 61). Mesosoma shiny.
 Greece (Crete, Karpathos) *A. simonellii*
7. Only lateral sides of head may be glossy.
 Head and mesosoma without smooth areas.
 Greatest part of head and mesosoma glossy
 to shiny. Dorsal side of first gastral tergite
 matt to wax glossy. Length of propodeal
 spines in relation to the distance between
 their tips longer: RPSI-mean > 40 8
 – Parts of head and mesosoma glossy to shiny
 and partly smooth. Dorsal side of first gas-
 tral tergite wax glossy to glossy. Length of
 propodeal spines in relation to the distance

- between their tips shorter: RPSI-mean 35. Italy *A. semipolita*
8. Longitudinal rugulae on propodeum absent or at most in small part of the workers 9
- Longitudinal rugulae on propodeum mainly present. Setae on lateral sides of head, above the eyes, in full face view, longer than the maximum diameter of the scape. Propodeal spines in lateral view horizontal to slightly erected: SPL-mean 1.7. Albania, Italy *A. campana*
9. Rugulose sculpture on the dorsal side of the mesosoma coarse or weak. Head narrower: CI-mean < 76. Scapes longer: SI-mean > 146. SI/CI-mean > 192 (Fig. 52) 10
- Rugulose sculpture on the dorsal side of the mesosoma mainly absent, largely weakly scabriculous (Fig. 49), if present then transverse weakly rugulae on propodeum. Head wider: CI-mean 81. Scape shorter: SI-mean 135. SI/CI-mean 167 (Fig. 52). Italy (Adriatic regions), Slovenia, Croatia, Bosnia. *A. picena*
10. Head wider (Fig. 65). Mainly matt, with some shine from the punctation. Lateral sides of petioles at least matt glossy. Terminal side of propodeum, beneath the propodeal spines glossy, punctation absent or weak 11
- Head narrower (Fig. 65). Mainly matt, without any shine from the punctation. Lateral sides of petioles mainly matt. Terminal side of the propodeum, beneath the propodeal spines matt, punctation distinctly. Greece (Rhodes, Ikaria) *A. sporadis*
11. SI/CI-mean < 198. PPPI-mean < 52. SI-mean < 149 12
- SI/CI-mean 215. PPPI-mean 55. SI-mean 158. Greece (Karpathos) *A. karpathica*
12. RPH-mean < 141. SPL/SPD-mean > 2.4 13
- RPH-mean 148. SPL/SPD-mean 1.3. Malta *A. melitensis*
13. Setosity relatively short (Figs 11, 34). PSI-mean 184. RPH-mean 126. RPSI-mean 55. Scattered short setae on the mesopleura. Greece (Crete) *A. balcanicoides*
- Setosity longer (Figs 10, 13, 28). PSI-mean < 156. RPH-mean > 138. RPSI-mean < 42. Short setae on the mesopleura limited to some short setae against the metapleura. Croatia, Bosnia, Albania, Greece, Turkey *A. balcanica*

Provisional key to the gynes of the European species of the *A. testaceopilosa*-group

Gynes of *A. balcanicoides*, *A. karpathica* and *A. spinosa* are unknown.

1. Antennal club 5-segmented 2
 - Antennal club 4-segmented 3
2. Propodeum denticulate *A. gemella*
 - Propodeal spines prominent *A. senilis*
3. Propodeum with thorns or spines 4
 - Probably (as in worker): Propodeum angulate, without spines or thorns *A. inermata*
4. CI < 85, SI > 121 5
 - CI > 85, SI < 121 7
5. PPPI < 82, PSLWI > 85, RPSI > 45. Punctuation on mesosoma weak 6
 - PPPI 89, PSLWI 73, RPSI 35. Punctuation on mesosoma distinct *A. sporadic*
6. PI > 76 *A. simonellii*
 - PI < 76 *A. iberica*
7. Propodeal spines longer PSI > 185. Gaster matt to satin 8
 - Propodeal spines shorter PSI < 180. Gaster glossy to shiny *A. semipolita*
8. Propodeum does not make an angle with the metanotum and scutellum. Propodeum in lateral view straight. Clypeus with longitudinal rugulae. RPSI < 60 9
 - Propodeum makes a right angle with the metanotum and scutellum. Propodeum in lateral view slightly bulging. Rugulae on clypeus transverse. RPSI > 60 *A. campana*
9. Petiole wider compared to postpetiole: PI 70-78. PPPI 63-68. Propodeal spines erected: SPL 4 *A. balcanica* and *A. melitensis*
 - Petiole narrow compared to postpetiole: PI 67-68. PPPI 75-80. Propodeal spines more horizontal: SPL 1-2 *A. picena*

Provisional key to the males of European species of the *A. testaceopilosa*-group

Males of *A. balcanicoides*, *A. karpathica*, *A. melitensis* and *A. simonellii* are unknown.

1. Antennal club 5-segmented 3
 - Antennal club 6-8-segmented (indistinct club) (Fig. 43) 2
2. Distal corner of the propodeum rounded (Fig. 19) *A. gemella*
 - Distal end of the propodeum with two, dorsally flattened, knobs (Fig. 59) *A. senilis*
3. Pubescence of the hind tibia shorter than or equal to tibial diameter 4
 - Pubescence of the hind tibia longer than tibial diameter. Between propodeum and

- metanotum a deep impression, a saddle form is emphasized (Fig. 18).....*A. campana*
4. Scape longer: SL/CL > 43.....5
 – Scape relatively short: SL/CL < 43...*A. iberica*
5. OCI > 44, head smaller CI < 95, CW < 0.87 mm.....6
 – OCI < 44, head relative wide CI 91–100 (94), CW 0.82–0.96 (0.87) mm.....*A. picena*
6. At least some lateral parts of mesosoma and petioles glossy to shiny.....7
 – Lateral parts of mesosoma and petioles matt.....*A. sporadic*
7. Head, pronotum, mesoscutum and scutellum matt. Pubescence on scape and hind tibia appressed to decumbent, equal to or longer than the diameter of scape/tibia.....8
 – Head, pronotum, mesoscutum and scutellum matt. Pubescence on scape and hind tibia subdecumbent to suberect, shorter than the diameter of scape/tibia...*A. balcanica*

8. Head wider, CI 92–95 (93), CW 0.72–0.78 (0.74) mm.....*A. spinosa*
 – Head smaller, CI 86–93 (91), CW 0.75–0.84 (0.78) mm.....*A. semipolita*

Aphaenogaster balcanica (Emery, 1898)

Figs 10, 13, 28–33, 38, 39

Stenammina (*Aphaenogaster*) *testaceo-pilosa* var. *balcanica* Emery, 1898: 136 (worker).

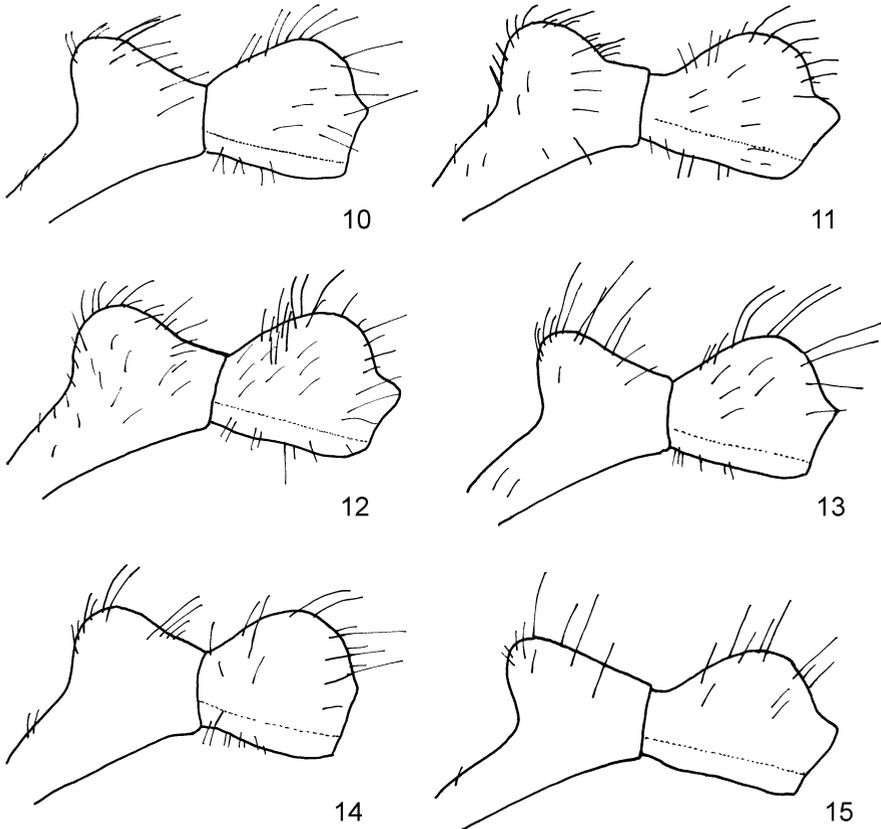
Aphaenogaster testaceopilosa semipolita var. *balcanica* (Emery, 1898): Emery, 1908: 320.

Aphaenogaster testaceo-pilosa balcanica (Emery, 1898): Forel, 1911: 346.

Aphaenogaster testaceopilosa simonellii var. *balcanica* (Emery, 1898): Emery, 1915a: 257.

Aphaenogaster balcanica (Emery, 1898): Agosti & Collingwood, 1987: 53 (raised to species status, in key).

Aphaenogaster semipolita var. *ionia* Santschi, 1933: 390 (worker) [first available use of *Aphaenogaster testaceopilosa semipolita* var. *ionia* Emery, 1915a: 257; unavailable name, Bolton



Figs 10–15. *Aphaenogaster* petioles. 10. *A. balcanica*. 11. *A. balcanicoides*. 12. *A. melitensis*. 13. *A. balcanica* from Lesbos. 14. *A. picena*. 15. *A. sporadis*.

1995: 70]. Raised to species: Schembri & Collingwood, 1981: 423; misidentification.

Aphaenogaster ionia Emery, 1915: Agosti & Collingwood, 1987: 53 (raised to species status, in key) **syn. n.**

Material examined. Syntypes: **Albania:** 1893, 10 ♀ (Ilias, MSNG, former syntype of *balcanica* and later of *ionia*); Epiro, end 19th century, 10 ♀ (Baldacci, MSNG, former syntype of *balcanica* and later of *ionia*). **Bosnia:** Skutari, 2 ♀ (MSNG, former syntype of *balcanica* and later of *ionia*). Zante, xi–xii.1880, 5 ♀ (Beccari, MSNG, former syntype of *balcanica* and later of *ionia*). **Greece:** Corfu: 1 ♀ (Sahlberg, MSNG, former syntype of *balcanica* and later of *ionia*). **Turkey:** Constantinopel, 1894, 4 ♀ (MSNG, syntypes); ‘Anatoli’, 3 ♀ (syntypes, MSNG).

Non-type material. **Albania:** Logara, 20.iv.1934, 9 ♀ (Collier, RMNH). **Croatia:** Lastovo, 1.v.2007, 1 ♀ (CASENT 0179599, image). **Greece-mainland:** Epirus, 3–6 km southeast of Joannina, 8.x.1962, 1 alate ♀ (RMNH); Attiki, Dafni, 10 km west of Athens, 13.vii.1992, malaise trap, 4 ♂ (Petanidou & Lengiou, RMNH); Syrakuze, 4 ♀ (Engelhard, RMNH); Mount Parnassus, 14.v.2007, 1 ♀ (Monsees, RMNH); Akropolis, Athene, viii.1934, 5 ♀ (Engelhard, RMNH); Mycene, iv.1935, 5 ♀ (Koch, RMNH); Konistra d’Ioanina, 29.vii.1985, 1 ♀ (Vohralik, WML); Asprocisi, d’Igoumenitsa, 1–2.vii.1989, 1 ♀ (Vohralik, WML); Lete, 2 ♀ (Collingwood, WML); Parnis near Athens, 1 ♀ (Franz, WML); ‘Lykathos, Ateny’, 1 ♀ (Riedel/Collingwood, WML); Greece-Chios: 1988?, 2 ♀ (Collingwood, WML). **Greece-Corfu:** 6 ♀ (Hetschko, RMNH); Pantokrator, 5.v.1966, 6 ♀ (Van Ooststroom, RMNH); Angelokasto, 10.vi.1966, 8 ♀ (Van Ooststroom, RMNH); Paleokastrista, 2.viii.2002, 3 ♀, 1 ♂ (Bračko, RMNH). **Greece-Kefalonia** (all CM): Agrisni, northwest of Skala, alt. 800 m, ix.2007, 37 ♀ from 5 nests; Melissani, north of Sami, ix.2007, 25 ♀ from 3 nests; 1 km north of Poros, coastal area, ix.2007, 24 ♀ from 3 nests; Livadi, north of Lixouri, near prison on beach, ix.2007, 37 ♀ from 5 nests. **Greece-Tinos:** Porto, 37.54321N 25.21970E, 4.viii.2007, altitude 72 m, 1 ♀ (Gielen, RMNH); Porto, 37.54044N 25.21728E, 3.viii.2007, altitude 78 m, 1 ♀ (Gielen, RMNH), Lychnaftia, 37.55988N 25.21219E, altitude 309 m, 1 ♀ (Gielen, RMNH). **GREECE:** Lesbos, xi.2010, 5 ♀, 1 ♂ (Van Orden & Paklina, RMNH); x.2008, 4 ♀ (Van Orden & Paklina, RMNH); x.2009, 7 ♀ (Van Orden & Paklina, RMNH); Molivos, 39°22’08’’N 26°10’34’’E, 21.v.2012, 5 ♀ (Boer, RMNH); Petri, 39°19’24’’N 26°11’50’’E, 23.v.2012, from 2 nests 30 ♀, 22 ♂ (Boer, RMNH). **Turkey:** Istanbul, vii.1985, 2 ♀ (Collingwood, WML); Istanbul, 9.viii.2008, 2 ♀

(Gielen, CG); Ganatkale-Gelibolu, Urey Mountain, 40.24N 26.40E, 2.x.1997, 5 ♀ (Aktac & Kiran, RMNH) [Turkey outside Europe: Brussa (= Bursa?), 4 ♀ (Eschich, MSNG); Ayvalik, 39.31644N, 26.70069E, 11.viii.2008, altitude 60 m, 3 ♀ (Gielen, RMNH)].

Diagnostic characters

Workers. Similar to *A. balcanicoides* and *A. melitensis*. *Aphaenogaster balcanicoides* and *A. melitensis* are more setose on the petioles and have shorter setae. The SI/CI and the PPPI are significantly lower than in *A. karpathica* ($p < 0.01$), the RPH is significantly higher than in *A. balcanicoides* ($p < 0.04$), and lower than in *A. melitensis* ($p < 0.01$). Gynes. Punctuation stronger than in *A. melitensis*.

Redescription of worker

Lateral sides of mesosoma with (not always distinct) longitudinal rugulae. Dorsal side of pronotum more or less scabriculous. Propodeum with or without transverse rugulae. Head in full-face view with distinct longitudinal rugulae with cross-connections. Dorsal side of postpetiole with longitudinal costulae which are continuing in microstriae on dorsal part of gastral base. Head in full-face view, mesosoma, lateral sides of petioles and dorsal side of petiolar node punctate. Terminal side of propodeum, beneath the propodeal spines weakly punctate to smooth. Dorsal side of postpetiole more or less weakly punctate. Head in full-face view and mesosoma matt with some shine from the punctuation. Terminal side of the propodeum, lateral sides of gaster, legs and petioles glossy. Dorsal side of postpetiole and gaster satiny to glossy. Antennal club 4-segmented. Petiole equal in height to postpetiole or somewhat higher. Lateral shape of petiole variable, in general anterior side steeper than posterior side (Fig. 10).

Measurements ($n = 67$). CI 72–80 (75); CL 1.14–1.57 (1.43) mm; CW 0.84–1.25 (1.09) mm; PHI 29–35 (31); PI 67–88 (78); PPPI 43–58, 64 (52); PSI 100–200 (156); PSLWI 83–145 (115); PWI 19–27 (22); RPH 117–161 (138); RPSI 18–67 (42); SI 133–161 (149); SI/CI 163–227 (197); SL 1.27–1.77 (1.60) mm; SPD 1–3 (1.4); 1–5.5 (3.3).

Description of gyne

Longitudinal rugulae on: clypeus, head anterior to the occiput, mesoscutum and posterior side of postpetiole. Occiput indistinctly scabriculous. Transverse rugulae on pronotum and propodeum. Scutellum with oblique and transverse rugulae. Head, mesosoma and petioles punctate. Less than ten transverse microstriae present near base of first gastral tergite.

Anterior side of the petiole smooth. Head, mesosoma and petioles shiny, dorsum gaster shiny satin. Terminal side of propodeum, beneath the propodeal spines mainly smooth and shiny. Antennal club 4-segmented. Scutellum rises less above mesoscutum and does not bend over metanotum.

Measurements (n = 1). CI 86; CL 1.50 mm; CW 1.30 mm; OCI 32; PHI 42; PI 70; PPPI 63; PSI 209; PSLWI: 110; PWI 28; RPH 150; RPSI 57; SI 119; SI/CI: 138; SL 1.38 mm; SPD 1; SPL 4.

Description of male

Weakly rugulate on mesosoma, not on mesopleura. Metanotum indistinctly striate. Punctuation on head, mesosoma and dorsal sides of petioles. Lateral sides of petioles and gaster smooth. Dorsal side of gaster microreticulated, without or with very short microstriae on dorsal side of base of first gastral tergite. Head, pronotum, mesoscutum and scutellum matt, rest of body, especially some of the lateral parts of the mesosoma and the petioles glossy. Pubescence on scape and hind tibia subdecumbent to suberect, shorter than diameter of scape/tibia. Mandibles with one apical tooth, tooth 2 and or 3 smaller, 4–5 denticles. A transverse groove in middle of propodeal dorsum, so the terminal part of the propodeum is raised. Propodeum with two terminal knobs, triangular projections, slightly dentate or with short spines. Between these a weak longitudinal groove. Antennal club 5-segmented. Head without clear frontal midline. Scutellum slightly erect above mesoscutum, in whole or in part bent over metanotum (Fig. 17).

Measurements (n = 10). CI 86–92 (90); CL 0.84–0.94 (0.89) mm; CW 0.75–0.87 (0.80) mm; EYI 38–44 (41); OCI 44–52 (48); SL/CL 42–49 (47); SL 0.37–0.46 (0.42) mm.

Distribution in Europe

Croatia, Bosnia, Albania, Greece (mainland, islands in the Aegean Sea), Turkey.

Bionomics

On Lesbos observed in open, sunny locations: fields with scattered shrubs and urban areas. Nest in soil, mostly sheltered by stones. Workers are individually foraging on the ground, in herbs and bases of trees and shrubs. Foraging behavior can be described as cautious. Fast moving after disturbance. Evacuation of the nest population is observed after heavy rainfall.

Comments

Emery (1898) mentioned the variety *balcanica* as the only taxon of what is now called the *A. testaceopilosa*-group from the Balkan (Albania), Greece (Corfu and Zante), the European part of Turkey (Constantino-

ple) and Asia Minor, particularly Brussa (possibly Bursa?). Emery did not compare this taxon in 1898 with *A. simonellii*, while *A. simonellii* resembles *A. balcanica* much more than *A. testaceopilosa*. The status of *A. balcanica* was very uncertain because Emery removed this var. from *A. testaceopilosa*, to *A. semipolita* (Emery 1908) to *A. simonellii* (Emery 1915a) and other myrmecologists agreed to this (Santschi 1933, Menozzi 1936, Finzi 1939) until Agosti & Collingwood (1987) revived this taxon to species level. The reason for this is not clear. In their key they only used characteristics such as length of the propodeal spines (which was not defined) in relation to the distance between their tips, the sculpture of the petioles, the propodeal dorsum and the height of the petiole, all variable characters (see Character variations above).

Emery (1915a) split var. *ionia* from var. *balcanica*. The var. *ionia* became the Balkan taxon and the var. *balcanica* the taxon from Turkey. Remarkably, both varieties were classified, at the same moment, as two different taxa, respectively *semipolita ionia* and *simonellii balcanica*. Emery (1924) compared *ionia* with *inermis* (= *inermis*) and *semipolita*, but he split this taxon from *A. balcanica*. Finzi (1930) called this taxon *A. testaceopilosa ionia* and further in the text *A. testaceopilosa semipolita* var. *ionia* (var. *balcanica*) from Corfu, Kefalonia and Leukas.

Schembri & Collingwood (1981) revived the var. *ionia* to species level when describing the Maltese ant fauna. The Maltese '*ionia*' is in the revision *A. melitensis* (see description of *A. melitensis*).

Sicily is only mentioned by Emery (1915a, 1924), the worker in the collection of Emery labelled as *A. ionia* is in this revision *A. semipolita*. All ants identified as *A. ionia* from Italy by Emery and Baroni Urbani, now appear to belong to the species *A. campana* or *A. picena*.

Santschi (1934) and Menozzi (1936) observed *A. simonellii* var. *balcanica*, now known as *A. sporadis* on Rhodes. Menozzi (1936) mentioned this taxon also for Karpathos, in this revision I call this taxon *A. karpathica*.

At first I presumed that the population of Lesbos concerned another species, because of differences in male characters, more pronounced sculpture of the brighter worker and longer setosity (Fig. 13). However, the biometrical data between the workers of both were the same. The two males of Lesbos from May were distinctly smaller than the one from November. Perhaps this is a question of size dimorphism.

***Aphaenogaster balcanicoides* sp. n.**

Figs 11, 34, 35

Type material. Holotype: ♀, Greece: Crete: K[h]alives, ix.1990 (Collingwood, WML). **Paratypes:** Same label data as holotype (7 ♀ WML and 1 ♀ RMNH).

Diagnostic characters

Workers. A unique character are the scattered short setae on the mesopleura. In other species this setosity is limited to some short setae against the metapleura. The setosity of *A. balcanicoides* is shorter compared with that of *A. balcanica*. Differing from *A. melitensis* by the mean SPL/SPD-index (q.v.) ($p < 0.01$). The RPH is lower than in *A. balcanica* ($p < 0.04$) and *A. melitensis* ($p < 0.01$). The PSI is higher in *A. karpathica* ($p < 0.05$) and *A. balcanicoides* ($p < 0.01$) and the PPPI is lower ($p < 0.05$) than in *A. karpathica*. Gyne and male unknown.

Description of worker

Dorsal side of pronotum and propodeum with distinct rugulae (often transverse) or pronotum scabriculous. Distal end of propodeum, between and under the propodeal spines weakly punctate, in general with longitudinal or transverse rugulae. Dorsal side of gaster satin. Petioles satin to sometimes glossy. Setosity on average relatively short and setosity on petioles relatively dense (Figs 11, 35). Mesopleura with scattered, very short, setae. Lateral shape of petiole with rounded top.

Measurements ($n = 9$). CI 75–79 (77); CL 1.48–1.68 (1.55) mm; CW 1.14–1.32 (1.20) mm; PHI 31–36 (33); PI 76–86 (81); PPPI 47–59 (51); PSI 170–200 (184); PSLWI 106–133 (121); PWI 21–27 (23); RPH 112–150 (126); RPSI 44–67 (55); SI 142–156 (149); SI/CI 173–208 (192); SL 1.70–1.93 (1.79) mm; SPD 1–2 (1.1); 2–5 (3.0).

Etymology

The name refers to the similarity with *A. balcanica*.

Distribution in Europe

Greece (Crete).

***Aphaenogaster karpathica* sp. n.**

Fig. 36

Type material. Holotype: ♀, Greece: Karpathos, Amopi, v.1982 (Collingwood, WML).

Non-type material. Greece: Karpathos (all Collingwood, WML): Amopi, v.1982, 7 ♀; Mevetes, v.1982, 3 ♀; Stes, v.1982, 2 ♀.

Diagnostic characters

Compared with *A. balcanica*, *A. melitensis* and *A. balcanicoides*, the ratio between CI and SI is different (Fig. 36). The widths of the petiole and postpetiole together are wider than in the other species: PPPI-mean 54.7, against 50.9–51.5: in *A. balcanica* and *A. melitensis* ($p < 0.01$), in *A. balcanicoides* ($p < 0.05$). The scape is longer: SI-mean 158, in the other four species 149 ($p < 0.01$). The setosity is shorter than in *A. balcanica*. Gynes and males unknown.

Description of worker

Sculpture as in *A. balcanica*. Setosity relatively short (like *A. balcanicoides*, Fig. 34).

Measurements ($n = 13$). CI 70–79 (74); CL 1.27–1.52 (1.42) mm; CW 0.93–1.15 (1.05) mm; PHI 31–35 (32); PI 73–88 (80); PPPI 50–61 (55); PSI 143–200 (170); PSLWI 67–150 (111); PWI 22–28 (24); RPH 112–143 (132); RPSI 20–65 (46); SI 147–164 (158); SI/CI 186–234 (215); SL 1.41–1.77 (1.64) mm; SPD 1–3 (1.9); 1–5.5 (4.0).

Etymology

The name refers to the type locality.

Distribution in Europe

Greece (Karpathos).

***Aphaenogaster melitensis* Santschi, 1933, stat. n.**

Figs 12, 16, 37

Aphaenogaster semipolita var. *melitensis* Santschi 1933: 390 [first available use of *Aphaenogaster testaceo-pilosa semipolita* var. *melitensis* Emery, 1924; unavailable name, Bolton, 2012].

Aphaenogaster semipolita ionia Baroni Urbani 1968: 422, misidentification.

Aphaenogaster ionia Emery, 1915: Schembri & Collingwood, 1981: 423, misidentification.

Material examined. Non-type material. Malta (all Collingwood, WML): ♀, Comino, 9.v.1990; Wied is-Sewda, 26.iv.1975, 7 ♀; Mosta, 17.ix.1975, 3 ♀, 1 ♀; 1976, 4 ♀; Mhralet, 1.v.1981, 6 ♀; Comino, 9.iv.1984, 1 ♀; Gozo v.1990, 4 ♀; 8 ♀; v.1990, 3 ♀; Weeda de Fonda, 4 ♀.

Diagnostic characters

Workers. The setosity is as short as in *A. balcanicoides* and *A. karpathica*. Differs from those species by a higher petiole (RPH-mean 148) in relation to the width (other species < 141), significant in *A. balcanicoides* and *A. karpathica* ($p < 0.01$). Propodeal spines in general horizontal and slightly splayed.

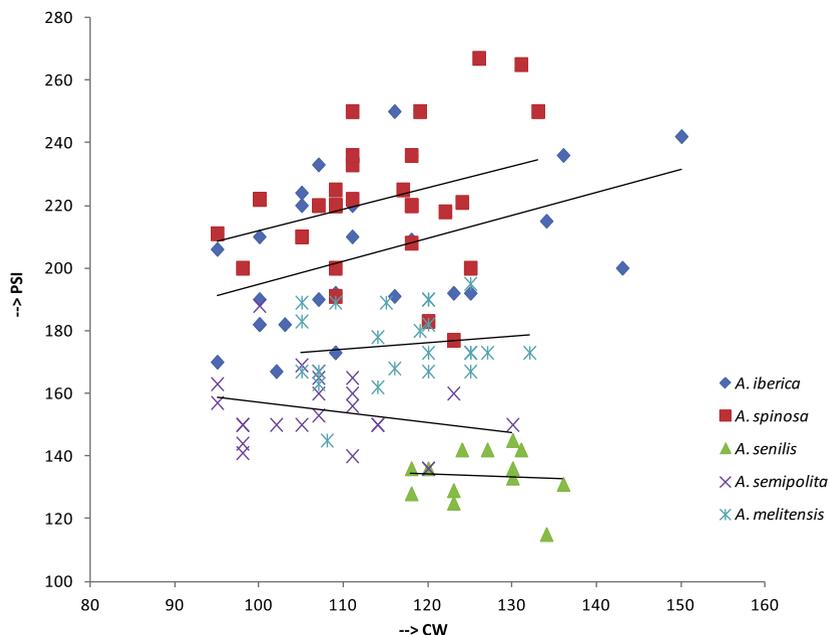


Fig. 16. Relation between size of the worker (expressed in the headwidth: CW) and length of the propodeal spines, expressed in the propodeal spine index (PSI) from *Aphaenogaster testaceopilosa*-group species which inhabiting the western Mediterranean area: *A. iberica* ($y = 0.7313x + 121.75$), *A. spinosa* ($y = 0.6929x + 142.53$), *A. melitensis* ($y = 0.2157x + 150.32$), *A. semipolita* ($y = -0.31337x + 188.4$) and *A. senilis* ($y = -0.0928x + 145.58$). This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

SPL/SPD-mean 1.3, in the other species: 2.9 (*balcanicoides*), 2.7 (*balcanica*) and 2.4 (*karpatica*), significant in *A. balcanica* and *A. balcanicoides* ($p < 0.01$) and *A. karpatica* ($p < 0.02$). The only gyne observed resembles the one observed gyne of *A. balcanica*. The biometrical differences are probably lying within normal range. The punctuation of the *A. melitensis* gyne is weaker on the mesosoma and petioles. Males unknown.

Redescription of worker

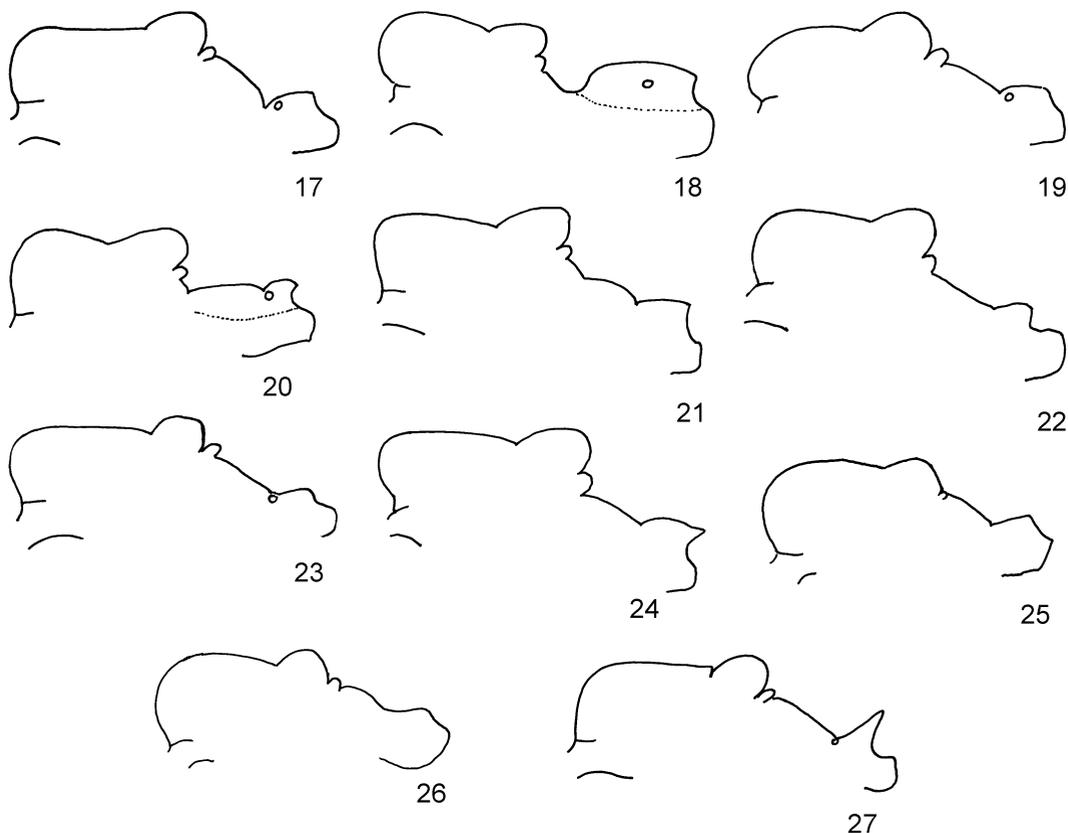
Rugulose sculpture on dorsal side of pronotum. Dorsal side of petiolar nodes rugulose and punctate. Terminal side of propodeum, beneath the propodeal spines costulate. Lateral sides of petioles wax glossy. Setae relatively short: setae on anterior side of fore coxa and pronotum much longer than that on head, mesonotum and propodeum. Setae on lateral sides of head, shorter than maximum scape diameter. Petioles relatively setose (Fig. 12). Petiole with rounded top, anterior side steeper than posterior side.

Measurements ($n = 32$). CI 73–82 (74); CL 1.33–1.66 (1.52) mm; CW 1.05–1.32 (1.17) mm; PHI 28–37 (32); PI 69–86 (76); PPI 48–55 (51); PSI 145–195 (175); PSLWI 93–142 (116); PWI 20–

32 (24); RPH 124–168 (148); RPSI 35–67 (49); SI 142–159 (149); SI/CI 174–215 (193); SL 1.55–1.91 (1.75) mm; SPD 1–3 (1.8); SPL 1–5 (2.0).

Description of gyne

Longitudinal rugulae on clypeus, on some parts of mesoscutum and scutellum. Head anterior to the occiput with longitudinal rugulae and cross-connections, occiput with transverse rugulae. Transverse rugulae on anterior side of pronotum, dorsal side of propodeum and some parts of mesoscutum. Lateral sides of propodeum with longitudinal rugulae, lateral sides of pronotum ruguloreticulated. Mesopleura strigulate. Distal side of petiole and post-petiole scabridulous. Base of gastral tergite with approximately ten circular rugulae. Terminal side of propodeum, beneath the propodeal spines rugulose, glossy. Punctuation distinct on head, weak to very weak on the mesosoma and petioles. First gastral tergite dorsally completely microstriated. Anterior side of petiole smooth. Mesosoma matt glossy, gaster dorsally satin. Antennal club 4-segmented. Scape longitudinally rugulose. Scutellum rises distinctly above mesoscutum and bends almost entirely over metan-



Figs 17–27. *Aphaenogaster*, lateral view of mesosoma of male. 17. *A. balcanica*. 18. *A. campana*. 19. *A. gemella gemella*. 20. *A. gemella marocana*. 21. *A. iberica*. 22. *A. picena*. 23. *A. semipolita*. 24. *A. senilis*. 25. *A. spinosa*. 26. *A. sporadis* from Ikaria. 27. *A. sporadis* from Rhodes.

otum. Setae on the lateral sides of the head shorter than the maximum scape diameter.

Measurements ($n = 1$). CI 92; CL 1.72 mm; CW 1.59 mm; OCI 31; PHI 44; PI 78; PPPI 68; PSI 188; PSLWI 120; PWI 28; RPH 143; RPSI 56; SI 110; SI/CI 120; SL 1.75 mm; SPD 1; SPL 4.

Distribution in Europe

Malta (Malta Island, Comino, Gozo).

Bionomics

Specimens were found under stones in dry habitats. The workers forage singly during daytime. Alate gynes were observed to emerge singly during late morning in September (Schembri & Collingwood 1981).

Comments

Emery (1924) mentions that *A. melitensis* corresponds with *A. ionia* from Sicily, Calabria and

Greece: 'the petioles more gracious and especially the postpetiole smaller with less bent sides'. *Aphaenogaster ionia* (now *A. balcanica*), does not occur in Italy. Emery compared *A. melitensis* with *A. semipolita* of Sicily, *A. campana* of Calabria and *A. balcanica* of Greece. When the petioles are compared with the postpetioles of these four taxa, there is no difference in petiole width (PI, PWI). However, the petiole of *A. melitensis* is narrower (in relation to the height) than in the other species: RPH-mean 148, against 139 in *A. semipolita*, 133 in *A. campana* and 138 in *A. balcanica*, all significant ($p < 0.01$). If we include the postpetiole, and we take the sum of the petiole and postpetiole width in relation to cephalic width to verify Emery's proposition that *A. melitensis* has narrower petioles, I see no differences between the four taxa: PPPI-mean: *A. melitensis* 51.3, *A. semipolita* 51.1, *A. campana* 51.4 and *A. balcanica* 51.5.

I could not find a part of the petiole that could be described as gracious, as Emery (1924) did. Schem-

bri & Collingwood (1981) stated that the Maltese population 'compare well with those on Crete and differ from the Italian population of *A. semipolita*'. But the two known species of the *A. testaceopilosa*-group on Crete are the most common *A. simonellii* and the rarer *A. balcanicoides*. In addition, I identified the Italian *A. semipolita* from Collingwood's collection as *A. picena*. Schembri & Collingwood mentioned the following differences: longer propodeal spines and higher petioles than the Italian *A. semipolita*. I found a propodeal spine index and PSI-mean for *A. melitensis* 175 and for *A. semipolita* 155 ($p < 0.01$) and a petiole height index and PHI-mean for *A. melitensis* and *A. semipolita* both 32.

Baroni Urbani (1968a, b) used for his description of *A. semipolita ionia* material collected on Malta and Italy. I identified the Italian specimens as *A. picena*. His description, the drawing of a worker in his paper, and material from the collection of Collingwood from Malta agree with *A. melitensis* and not with *A. ionia* (= *A. balcanica*). Therefore *A. semipolita ionia* Baroni Urbani (1968b) is not a senior synonym of *A. ionia* Santschi (1933) as stated by Bolton (1995), but a senior synonym of *A. melitensis* and partly of *A. picena*.

Aphaenogaster campana Emery, 1878

Fig. 18

Aphaenogaster testaceo-pilosa var. *campana* Emery 1878: 54 (worker, gyne, male).

Aphaenogaster testaceopilosa campana Emery 1878: Emery, 1908c: 322.

Aphaenogaster campana Emery 1878: Dalla Torre, 1893: 100; Santschi, 1933: 400 (raised to species status).

Material examined. Syntypes. Italy: Portici (Campania), vii.1868, 2 ♀ and ix.1868, 4 ♂ and 1 ♀, and without date 1 ♀ and 3 ♀ (Emery, MSNG).

Non-type material: Albania: 6 ♀ (Collier, RMNH). **Italy:** "Mer" [= southern?], 1 ♀ (Emery, RMNH, identified by Emery as *testaceopilosa*); Naples (Campania), 2 ♀ (Emery, RMNH, identified by Emery as *campana*); Crotone (Calabria), 16.iv.1912, 2 ♀ (Fiori, MSNG, identified by Emery as *semipolita*); Lecce (Apulia), 2 ♀ (MSNG, identified by Emery as *semipolita*); Vulture (Basilicata), 29.v.1911, 2 ♀ (Fiori, MSNG, identified by Emery as *semipolita*); Sambiasi (Calabria), iv.1920, 4 ♀, 1 ♀ (Menozzi, RMNH; identified by Menozzi as *semipolita* var. *ionia*) and v.1920, 5 ♀ (Menozzi, NHMB; identified by Menozzi as *semipolita*); old town Salerno (Campania), 7.x.1955, 1 ♀ (Kramer, RMNH).

Diagnostic characters

The workers, gynes, and especially the males are rather easy to distinguish from the other species (see keys), and only because of their shiny parts they could be misidentified as *A. semipolita* (see worker key).

Redescription of worker

Lateral sides of mesosoma with distinct longitudinal rugulae. Rugulose sculpture on the dorsal side coarse. Most of the workers with longitudinal rugae on posterior part of propodeum. Head in full-face view with longitudinal rugulae with cross-connections. Clypeus of nearly all workers with transverse, U-shaped rugulae. Terminal side of propodeum, beneath the propodeal spines nearly smooth, sometimes transversely costulate. Dorsal half of lateral sides of petiole and postpetiole with or without punctation. Dorsal side of petiolar nodes punctate. Dorsal side of postpetiole with longitudinal costulae that continue into microstriae on first gastral tergite. Posterior half of gaster often smooth. Pronotum nearly glossy. Dorsal side of the gaster glossy satin. Head and mesosoma nearly matt. Dorsal half of lateral sides of petiole and postpetiole wax glossy. Dorsal side of petiolar nodes, terminal side of propodeum, beneath the propodeal spines and lateral sides of gaster glossy to shiny. Petiole equal in height to postpetiole or somewhat higher. Antennal club 4-segmented. Propodeum in lateral view generally slightly bulging. Setosity on propodeum longer than on other parts.

Measurements (n = 29). CI 69–80 (76); CL 1.16–1.57 (1.36) mm; CW 0.84–1.24 (1.03) mm; PHI 27–36 (32); PI 67–96 (81); PPPI 48–58 (51); PSI 144–200 (168); PSLWI 89–136 (114); PWI 20–35 (23); RPH 113–150 (133); RPSI 33–64 (46); SI 136–151 (144); SI/CI 173–230 (191); SL 1.32–1.70 (1.48) mm; SPD 1–3 (2.2); SPL 1–5 (1.7).

Redescription of gyne

Longitudinal rugulae on head, scutellum, anterior side of postpetiole and on some parts of mesoscutum. Transverse rugulae on clypeus, pronotum, propodeum, posterior side of petioles and on some parts of mesoscutum. Punctation distinct on head, weakly pronounced on mesosoma and petioles. Less than ten transverse microstriae near base of first gastral tergite. Anterior side of the petiole smooth. Mesosoma dorsally matt glossy, gaster dorsally satin. Mesosoma and dorsal side of petioles glossy. Antennal club 4-segmented. Scape weakly or not at all rugulose. Scutellum rises slightly above the mesoscutum and bends over the metanotum.

Measurements (n = 3). CI 86–91; CL 1.70–1.77 mm; CW: 1.52–1.55 mm; OCI: 27–30 (28); PHI 129–132; PI 70–79; PPPI 63–69; PSI 213–233; PSLWI: 100–118; PWI 28–33; RPH: 36–37; RPSI 63–93; SI 106–110; SI/CI 116–124; SL 1.64–1.68 mm; SPL 1–4.

Redescription of male

Rugulae only on lateral parts of the propodeum. Punctuation on head, lateral sides of the mesosoma, petioles and on clypeus very weak. Dorsal side of propodeum, petioles and dorsal side of gaster very weakly microreticulated, nearly smooth. Head, clypeus and mesoscutum softly glossy, dorsal side of gaster wax glossy. Dorsal side of propodeum, lateral sides of mesosoma and gaster shiny. Antennal club 5-segmented. Pubescence on hind tibia suberect to erect, their length longer than the diameter of the tibia. Mesoscutum strongly elevated (more than in other species) (Fig. 18). Scutellum lower than mesoscutum, bent over metanotum. Head without frontal midline. No groove at posterior side of the propodeum, terminal end rounded. Propodeum wider than metasternum and bulging, saddle-shaped (Fig. 18).

Measurements (n = 6). CI 94–102 (97); CL 0.70–0.78 (0.74) mm; CW 0.67–0.75 (0.72) mm; EYI 41–47 (43); OCI 40–45 (42); SL/CL 40–43 (41); SL 0.30–0.31 (0.31) mm.

Distribution in Europe

Albania and southern Italy.

Comments

The record of *A. campana* from the Maltese Islands Comino (Malta), 24.iv.1965 (Baroni Urbani 1968a, b) is probably based on a misidentification. Despite searching, Schembri & Collingwood (1981) could not find this species at this locality.

Aphaenogaster gemella (Roger, 1862)

Figs 19, 20, 40–43

Atta gemella Roger, 1862: 260 (worker, male).

Aphaenogaster gemella (Roger, 1862): Roger 1863: 29.

Aphaenogaster testaceopilosa r[ace] *gemella* (Roger, 1862): Emery & Forel, 1879: 463.

Aphaenogaster testaceo-pilosa gemella (Roger, 1862): Emery, 1908: 318.

Aphaenogaster testaceopilosa gemella (Roger, 1862): Santschi, 1929: 140 (gyne).

Aphaenogaster gemella (Roger, 1862): Santschi 1933: 401 (revived to species status).

Material examined. Holotype: ♀, **Spain:** Mallorca, Balears (MNLB). **Non-type material: Spain:** Mallorca (Balears), 1 ♂ [Von?] Homeier, coll. (Roger, MNLB); Soller, Palma, Mallorca (Balears), 17.viii.1929, 6 ♀ (Van den Bergh, RMNH); Tarifa (Cadiz), 15.viii.1954, 4 ♀ (Bosschoert, RMNH).

Diagnostic characters

Largest species of the subgenus. Workers and gynes are very similar to *A. senilis*. Only *A. senilis* and *A. gemella* have a 5-segmented antennal club. Different from *A. senilis* by the lack of distinct propodeal spines. Males are distinctly different from the other species by their large ocelli and 6–8-segmented (indistinct) antennal club (Fig. 43).

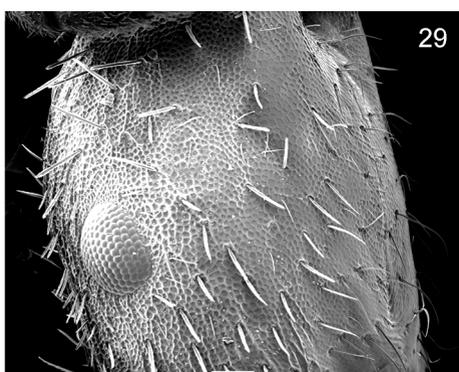
Redescription of worker

Lateral sides of propodeum with some longitudinal rugulae, which are weak or absent on pronotum and metanotum. Head in full-face view with longitudinal rugulae, here and there with some cross-connections. Punctuation on head and mesosoma. Petioles and legs distinctly microreticulated. Scape coarsely rugulose. Spurs of hind tibia dentate. Terminal side of propodeum, beneath the propodeal spines punctate and some weak transverse rugulae. Postpetiole with fine longitudinal microstriae. Dorsal side of base of gaster with transverse microstriae (Fig. 8). Whole head, pronotum, mesosoma, petioles and dorsal side of first gastral tergite matt, sometimes with some satin shine on dorsal side of postpetiole. Lateral sides of gaster matt to glossy. Antennal club 5-segmented. Lateral shape of petiolar node with rounded top. Petiole slightly higher than postpetiole.

Measurements (n = 9). CI 74–78 (76); CL 1.63–1.77 (1.70) mm; CW 1.25–1.36 (1.31) mm; PHI 31–34 (32); PI 78–88 (84); PPPI: 44–55 (47); PWI 19–26 (22); RPH 140–167 (154); SI 132–144 (137); SI/CI 174–187 (181); SL 1.75–1.84 (1.80) mm.

Redescription of male

Rugulae absent. Very weak, finely rugulose on the dorsal sides of the petioles. Punctuation on head (including clypeus), pronotum, mesoscutum (partly), scutellum and lateral sides of mesosoma. Petioles nearly smooth. Dorsum of first gastral tergite with microreticulation, microstriae absent. Head, pronotum, scutellum and mesoscutum mostly matt. Lateral sides of mesosoma, part of mesoscutum and propodeum glossy. Dorsum of gaster and petioles wax glossy. Antennal club 8-segmented (indistinct club) (Fig. 43). Pubescence of hind tibia subdecumbent to suberect, their length longer than the tibial diameter. Wings nearly clear, with a yellowish tint.

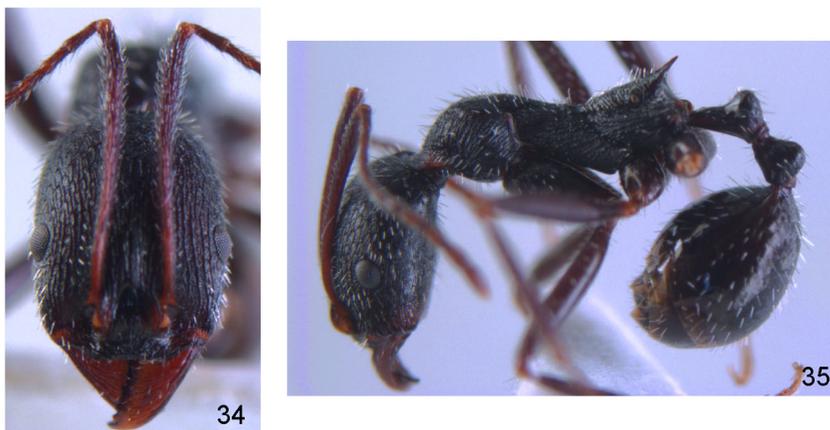


Figs 28–33. *Aphaenogaster balcanica*. 28–31. Head. 29. Head in lateral view: gradual transition from punctation (lateral side) to microreticulation (ventral side). 30. Mesosoma in lateral view. 31. Mesosoma in dorsal view (foto Erin Prado, antweb.org). 32–33. Male. 32. Head. 33. Lateral view. This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

Scutellum slightly erected above mesoscutum, not bent over metanotum. Head without frontal midline. Mandibles with one big apical tooth and 4 sharply pointed denticles. Posterior side of propodeal

dorsum longitudinally emarginate. Petiole low. Terminal corner of propodeum rounded.

Measurements ($n = 1$). CI 108; CL 1.00 mm; CW 1.08 mm; EYI 50; OCI 47; SL/CL 48; SL 0.48 mm.



Figs 34, 35. *Aphaenogaster balcanicoides*. 34. Head. 35. Lateral view. This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

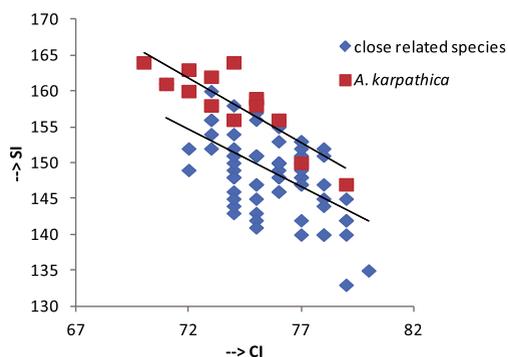


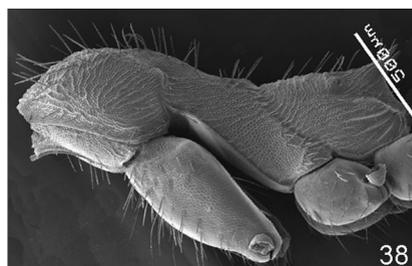
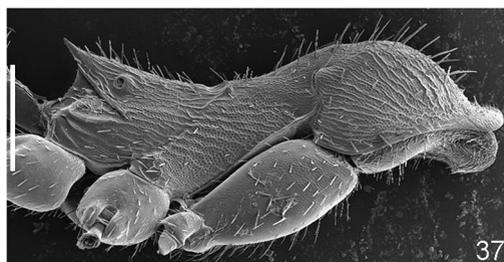
Fig. 36. Relation between the scape index (SI) and the cephalic index (CI) between *Aphaenogaster karpathica* ($y = -1.771x + 289.23$) and the close related species *A. balcanica*, *A. balcanicoides* and *A. melitensis* ($y = -1.4176x + 256.62$). This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

Distribution in Europe

Spain: Balears and Cadiz. Apparently extinct on the Balears, as the species has not been observed since 1983 (pers. comm. Espadaler).

Comments

I have seen males of *A. gemella marocana* Forel (1903), identified by Cagniant. There are differences between the only male of Spain (Balears), which is supposed to belong to another subspecies, namely *A. gemella gemella* and the two males from Morocco. The two from Morocco have a saddle-shaped propodeum (Fig. 20), while the males from the Balears has a sloping propodeum (Fig. 19). Cagni-



Figs 37–39. 37 *Aphaenogaster melitensis* in lateral view. 38–39. *A. balcanica mesosoma*. 38. Lateral view. 39. Dorsal view.



Figs 40–43. *Aphaenogaster gemella*. 40–42. 40. Head (Kiko Gómez, formicidae.org). 41. Lateral view (Kiko Gómez, formicidae.org). 42. Petioles and posterior end of propodeum. 43. Male, head (Kiko Gómez, formicidae.org). This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

ant (1990a, 1994) redescribed *A. gemella marocana*, but did not make an informative comparison between the two subspecies. Cagniant only compared 6 specimens from the Balears with 30 from Morocco. He concluded that the workers from the Balears were much smaller and the microstriae on the dorsal side of the first gastral tergite were differently directed. I compared my biometrical data of the workers of the Balears with these of Cagniant from Morocco. All my data fall well within the range of Cagniant's data. The structural differences between the taxa mentioned, cannot be significant, because of the great variance (see discussion on character variations, above); moreover Cagniant mentioned (!) some of the variations between some Moroccan populations of *A. gemella marocana*. A description of a female from Spain is lacking. Which subspecies the Cadiz population belongs to is unclear. Given the differences between the males, additional species are expected. I have not seen gynes of Spanish origin.

Aphaenogaster iberica Emery, 1908

Figs 16, 21, 44, 45, 64

Aphaenogaster testaceopilosa iberica Emery, 1908: 321 (worker, male).



Figs 44, 45. *Aphaenogaster iberica*. 44. Worker in lateral view (Kiko Gómez, formicidae.org). 45. Male in lateral view (Kiko Gómez, formicidae.org). This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

Aphaenogaster iberica Emery, 1908: Bondroit, 1918: 162 (raised to species status).

Aphaenogaster testaceopilosa iberica var. *vieirai* Emery, 1908 (worker, male) (synonymized with *A. iberica* by Espadaler & Riasol, 1983: 226).

Aphaenogaster angusta Santschi, 1925: 340 (worker) (synonymized with *A. iberica* by Espadaler & Riasol, 1983: 226).

Material examined. Syntypes: Spain: illegible locality, 2 ♀ (Cabrera, MSNG); **holotype** ♀ of var. *vieirai* SPAIN, Cambra, 1908 (Vieira, NHMB). **Non-type material. Portugal:** Algarve, Serra de Monchique, 12.v.1967, 1 ♀ (Van Ooststroom, RMNH); Bus-sago, 14.vii.1988, 2 ♀ (Speijer, RMNH); Urrgeirica, Beirã Alta, 8.v.1967, 9 ♀ (Van Ooststroom, RMNH). **Spain:** Salamanca (Castilië en León), 9.ii.1980, 1 ♀ (Speijer, RMNH); El Viso del Alcor (Sevilla); 1 ♀ (Franz, NHMB); Sta Maria de Huerta, between Ariza and Medinaceli (Soria), 23.iv.1951, alt. 760 m, 7 ♀ (Kramer, RMNH); Fuente la Reina, El Escorial (Castellon), 21.iv.1951, 2 ♀ (Kramer, RMNH); El Escorial (Castellon) 11.v.1933 (Brandhorst, NCMN); Sierra de Corbera (Valencia), 15.iv.1951, 400 m, 2 ♀ (RMNH); Villajoyosa (Alicante), 22.viii.1952, 3 ♀ (Bosschoert, RMNH); Garrigue, south of Oropesa (Castellon), 13.iv.1951, 1 ♀ (Kramer, RMNH); Alicante, 16.v.1951, 3 ♀ (Kramer, RMNH); Alicante, 21.iv.1953, 4 ♀ (vd-Wiel, ZMAN); Obon (Teruel), 20.viii.1982, 2 ♀, 1 ♀ (Espadaler, UAB); Cartaya (Huelva), 19.iii.1975, 1 ♀ (Espadaler, UAB); Pons (Lérida), 10.vii.197[?], 4 ♀, 1 alate ♀ (Espadaler, UAB); Morella (Castellón), 5.iv.1974, alt. 800 m, 1 ♀, 1 ♀ (Espadaler, UAB); San José (Alicante), 22.viii.2001, 1 ♀, 2 ♂ (Espadaler, UAB); Zas (Galicia), 29.vii.1982, 1 ♀ (Speijer, RMNH).

Diagnostic characters

The only species which resembles *A. iberica* is *A. spinosa*. Workers of *A. spinosa* are shinier and with smaller SI/CI (Fig. 64). According to the description of Emery (1908) *A. spinosa* gynes are smooth and shiny on the lateral sides of the head, instead of matt, as in *A. iberica*. The scape of the male is shorter SL/CL < 43, than in *A. spinosa* > 48.

Redescription of worker

Rugulose sculpture on dorsal side of pronotum fine, longitudinal or transverse or scabriculous, on propodeum absent or with transverse rugulae. Lateral sides of mesosoma with fine longitudinal rugulae or absent. Head with longitudinal rugulae and with some cross-connections, occiput mainly ruguloreticulated. Terminal side of propodeum, beneath the

propodeal spines and petioles microreticulated. Post-petiole with fine longitudinal (seldom transverse) microstriae which continue on first gastral tergite. Dorsum of first gastral tergite with or without microstriae. Lateral side of temple and underside of head shiny satin. Terminal side of propodeum, beneath the propodeal spines and petiole glossy. Dorsal side of postpetiolus matt to glossy. Pronotum and dorsal side of gaster satin to moderately glossy. Lateral sides of gaster shiny satin to shiny. Occiput close to the collared edge shiny, rest of the head largely matt. Antennal club 4-segmented. Lateral shape of petiole with rounded to oval top. Petiole somewhat higher than postpetiole. Setosity mainly on propodeum and anterior side of fore coxa somewhat longer than those on the frontal side of the head, rest of the mesosoma, gaster and underside of the head.

Measurements (n = 30). CI 60–76 (71); CL 1.35–2.02 (1.59) mm; CW 0.95–1.50 (1.15) mm; PHI 27–37 (33); PI 67–85 (77); PPPI: 47–69 (54); PSI 133–250 (202); PSLWI 105–186 (138); PWI 20–25 (23); RPH 118–173 (144); RPSI 27–107 (70); SI 147–175 (161); SI/CI 196–277 (227); SL 1.55–2.14 (1.79) mm; SPD 1–3 (1.4); SPL 1–4 (1.7).

Redescription of gyne

Rugulae on lateral and dorsal parts of mesosoma. Longitudinal rugulae on clypeus. Head anterior to the occiput with longitudinal rugulae without or with cross-connections, occiput ruguloreticulated. Ventral to the propodeal spines smooth. Transverse rugulae on dorsal pronotum and propodeum. Punctuation distinct on the head, weak to very weak on the mesosoma and petioles. Transverse microstriae near base of first gastral tergite. Anterior side of petiole smooth. Mesoscutum matt glossy, dorsal side of gaster satin. Mesosoma, petiole and gaster matt to glossy. Antennal club 4-segmented. Scape longitudinally rugulose. Wings with a brownish tint. Scutellum rises above mesoscutum and does not bend over metanotum.

Measurements (n = 5). CI 79–82 (80); CL 1.59–1.77 (1.70) mm; CW 1.30–1.41 (1.38) mm; OCI 28–31 (30); PHI 42–44 (43); PI 65–73 (70); PPPI 67–75 (70); PSI 193–236 (223); PSLWI: 108–145 (126); PWI 28–31 (30); RPH 134–159 (151); RPSI 54–81 (70); SI 123–131 (128); SI/CI 152–166 (159); SL 1.59–1.84 (1.75) mm; SPL 4–5 (4.8).

Redescription of male

Weak or no rugulose sculpture on mesonotum. If there are propodeal projections, than rugulae are present between them. Punctuation on head (partly), pronotum, mesoscutum, scutellum, lateral sides of

mesosoma and petioles. Microstriae on base of dorsal side of first gastral tergite. Clypeus smooth. Head, pronotum, mesoscutum, scutellum, lateral sides of mesosoma and petioles matt. Dorsal side of propodeum and gaster satin to wax glossy. Antennal club 5-segmented. Pubescence on scape and hind tibia appressed to decumbent, their length shorter than the diameter of the scape/tibia. Scutellum erected above mesoscutum, bent over metanotum. Frontal midline weak or absent. A transverse groove in the middle of the propodeal dorsum. Posterior part of propodeum raised, forming two knobs or triangular projections, with longitudinal groove in between.

Measurements (n = 4). CI 88–96 (92); CL 0.73–0.89 (0.81) mm; CW 0.70–0.78 (0.74) mm; EYI 40–45 (43); OCI 41–46 (44); SL/CL 40–43 (42); SL 0.32–0.38 (0.34) mm.

Distribution in Europe

Portugal, Spain.

Aphaenogaster inermis Bolton, 1995

Fig. 46

Aphaenogaster inermis Bolton, 1995: 70. Replacement name for *inermis* Santschi, 1933c: 390 [which is first available use of *Aphaenogaster testaceopilosa semipolita* var. *inermis* Emery, 1908: 320 (worker), and junior primary homonym of *inermis* Forel, 1899c: 60].

Aphaenogaster semipolita ionia Baroni Urbani, 1968a, misidentification.

Aphaenogaster inermis Emery, 1908: Schembri & Collingwood, 1981: 423 (raised to species status).

Material examined. Holotype: ♀, **Italy:** Palizzi, Calabria (MSNG). **Non-type material. Malta:** (all Schembri/Collingwood, WML) 1 ♀; St. Pauls Island, 20.iv.1975 3 ♀ and iv.1978, 4 ♀; Cominetto, 12.viii.1975, 6 ♀; Comino, Ste. Marija Bay, 7 ♀; 1.v.1981, 1 ♀.

Diagnostic characters

By the absence of propodeal spines or teeth, the workers cannot be confused with other species. Moreover, the setae are fine instead of bristle-like, as in most species. Gynes and males unknown.

Redescription of worker

Lateral sides of mesosoma with weak longitudinal rugulae, on the propodeal dorsum absent or rugulose. Head longitudinally rugulose with some cross-connections. Terminal side of propodeum, opposite of petiole rugulose and punctate. Petiolar nodes punctate. Dorsal side of postpetiole with longitudinal costulae. Microstriae on dorsal side of gaster

dense, less pronounced than in other species. Dorsal side of postpetiole matt. Pronotum matt glossy. Dorsal side of gaster matt satin. Terminal side of propodeum, opposite of the petiole matt glossy. Antennal club 4-segmented. Propodeal spines absent. Terminal side of propodeum oblong, without any spine, generally slightly dentate (Fig. 46). All hairs not bristle-like as in most species. The fine hairs of the underside of the head and anterior side of the first coxae have the same shape as those of the mesosoma.

Measurements (n = 10). CI 78–81 (80); CL 1.22–1.41 (1.28) mm; CW 0.95–1.15 (1.02) mm; PHI 25–29 (27); PI 66–86 (77); PPPI 47–51 (50); PWI 20–24 (22); RPH 110–141 (126); SI 139–145 (142); SL 1.36–1.59 (1.44) mm.

Distribution in Europe

Italy (Calabria), Malta (Gozo (Baroni Urbani 1968a), Malta Island and Comino).

Bionomics

Hunting singly during daytime and nesting under stones in arid coastal areas on Malta (Schembri & Collingwood 1981).

Aphaenogaster picena Baroni Urbani, 1971

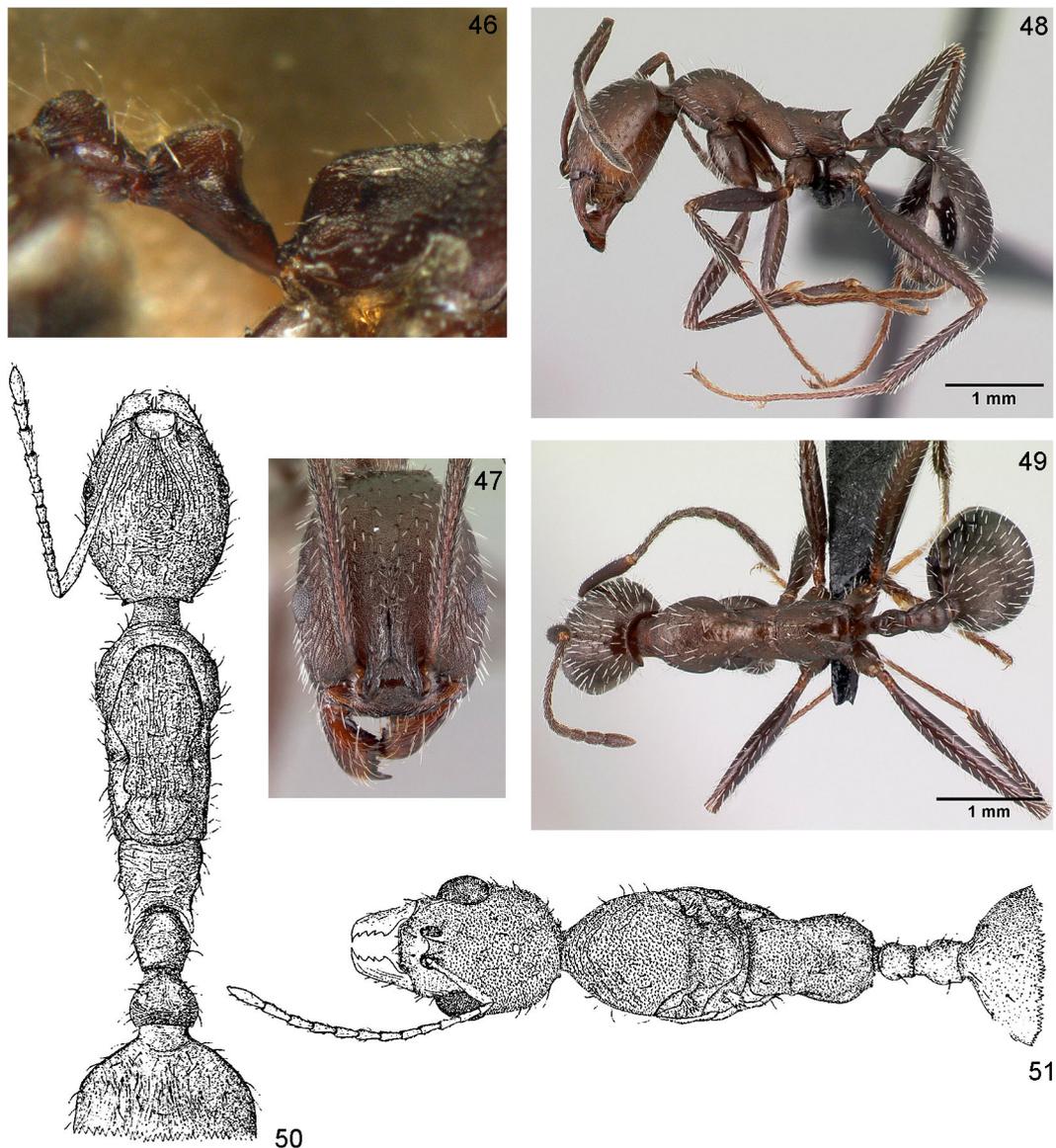
Figs 14, 22, 47–52

Aphaenogaster picena Baroni Urbani, 1971: 32 (worker, gyne, male).

Aphaenogaster semipolita ionia: Baroni Urbani, 1968, misidentification.

Aphaenogaster picena Baroni Urbani, 1966: 69 (nomen nudum: Bolton 1995: 72).

Material examined. Paratypes: Italy, Sirolo (Marche), 31.viii.1964, 12 ♀, 2 ♂ and 16.ix.1964, 1 ♂ (Baroni Urbani; MSNV). **Non-type material. Albania:** 5 ♀ (Collier, RMNH). **Croatia:** Zadar 1.viii.1978, 1 ♀ (Beroušková, WML); near Split, 25.viii.1984, 2 ♂ (Collingwood, WML, identified by Collingwood as *A. ionia*); Baska, Krk, 1–8.vi.1934, 4 ♀ (Collier, RMNH); Krk, vii.2000, 1 ♀ (Gielen, CG); Ciovo, Arbadija, 11.iii.2006, 3 ♀ (Rada, RMNH), Pakoštane, 43°55'N, 15°30'E, 12.ix.2008, 1 ♀ (Borowiec & Poprawska, CASENT 0179599, image; identified as *A. ionia*). **Italy:** Apulia, 24.v.1913, 7 ♀ (Fiori, MSNG, former syntype of *balcanica*; former syntype of *ionia*); Torre Fantina, Gargano (Apulia), 18.iv.1963, 3 ♀ (Baroni Urbani, MSNV; ID by Baroni Urbani as *A. ionia*); Manfredonia, Gargano (Apulia), 10.x.1961; 1 ♀, 1 ♀ (Baroni Urbani, MSNV, identified by Baroni Urbani as *A. ionia*); Foggia (Apulia), vii.1875, 2 ♂



Figs 46–51. 46. *Aphaenogaster inermite* worker, petioles and propodeum in lateral view. 47–51 *A. picena*. 47–49 (Erin Prado, antweb.org). 47. Head. 48. Lateral view. 49. Dorsal view. 50. Gyne in dorsal view (Baroni Urbani 1971). 51. Male in dorsal view (Baroni Urbani 1971). This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

(one incomplete) (MSNG; identified by Emery as *A. semipolita*); Siponto, Gargano (Apulia), 10.x.1961, 1 ♀ (Baroni Urbani, MSNV; identified by Baroni Urbani as *A. ionia*); Monte Angelo, Gargano (Apulia), 9–10.x.1961, 1 ♀ (Collingwood, WML; identified by Collingwood as *A. semipolita*), 2 ♀, 2 ♂, 1 ♀ (Baroni Urbani, MSNV; identified by Scupola as *A. ionia*); Rodi, Gargano (Apulia), 11.x.1961, 1 ♀, 1 ♂

(Baroni Urbani, MSNV; identified by Baroni Urbani as *A. ionia*); Ancona, Sirolo (Marche), 5.vii.1956, 1 ♂ (Baroni Urbani, MSNV). **Slovenia:** Piran, sea shore, 16.vi.2007, 3 ♀ (Bračko, CGB).

Diagnostic characters

In the Adriatic region *A. picena* is the largest species. Workers: The shorter scape and head, especially

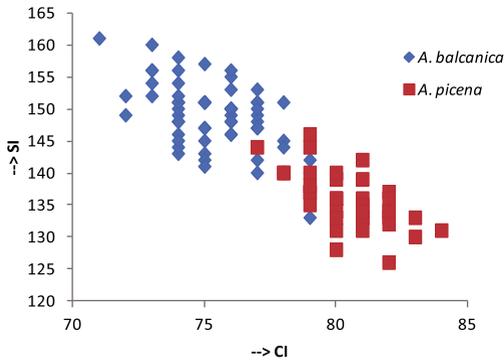


Fig. 52. Relation between the scape index (SI) and the cephalic index (CI) between *Aphaenogaster picena* and *A. balcanica*. This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

the relation between CI and SI (Fig. 52) and the less rugulose sculpture on the mesosomal dorsum are characteristic. Gynes: Compared with the other Adriatic species *A. balcanica* and *A. campana*, *A. picena* has a smaller petiole in relation to the postpetiole and the petioles are wider in these species, just like *A. semipolita*. However the latter has shorter propodeal spines and a shinier gaster. Males: The CI corresponds with *A. campana*, but *A. picena* is distinctly different from this species by the propodeal shape.

Redescription of worker

Lateral sides of mesosoma with some longitudinal rugulae, usually weak or complete absent. Dorsal side of mesosoma (weakly) scabriculous. Head with longitudinal rugulae on frons, on the rest of the head less distinct, with some cross-connections. Terminal side of propodeum, beneath the propodeal spines smooth. Petiolar nodes punctate. Dorsal side of postpetiole punctate, with longitudinal costulae. First gastral tergite with microstriae. Mesosoma matt, with glossy punctation. Dorsal side of gaster matt to matt satin, beneath the propodeal spines glossy. Lateral sides of petioles and petiolar node glossy. Dorsal side of postpetiole and first gastral tergite matt. Lateral sides of first gastral tergite and legs wax glossy. Antennal club 4-segmented. Petiole with rounded top.

Measurements (n = 37). CI 77–84 (81); CL 1.32–1.64 (1.51) mm; CW 1.01–1.36 (1.21) mm; PHI 29–33 (31); PI 65–88 (75); PPPI: 49–58 (53); PSI 120–173 (153); PSLWI 96–160 (123); PWI 20–25 (22); RPH 117–153 (135); RPSI 17–64 (43); SI

126–146 (135); SI/CI 154–190 (169); SL 1.43–1.77 (1.64) mm; SPD 1–2 (1.5); SPL 1–5 (2.9).

Redescription of gyne

Longitudinal rugulae on clypeus, head, mesoscutum, scutellum and anterior side of postpetiole. Transverse rugulae on pronotum, propodeum and posterior sides of the petioles. Punctuation distinct on head, weak on mesosoma and petioles. Less than ten transverse microstriae near base of first gastral tergite. Mesosoma slightly glossy, petioles and gaster satin. Anterior side of petiole smooth. Antennal club 4-segmented. Scutellum rises distinctly above mesoscutum and bends almost entirely over metanotum.

Measurements (n = 2). CI 88–91; CL 1.53–1.60 mm; CW 1.39–1.41; PHI 41–42; PI 67–68; PPPI 75–80; PSI 185–200; PSLWI 98–102; PWI 30–32; RPH 126–139; RPSI 47–49; SI 107–110; SI/CI 118–125; SL 1.48–1.55 mm; SPD 1–2; SPL 1–2.

Redescription of male

Rugulae are absent from the entire body, except for transverse rugulae (not in all individuals) on dorsal side and longitudinal ones on lateral sides of the propodeum; partly rugulose on mesoscutum and scutellum. Head, mesonotum and petioles punctate. Dorsal side of gaster microreticulated, longitudinal microstriae on base. Head, mesoscutum and petioles matt. Dorsal side of gaster wax glossy. Mesosoma matt with more or less glossy pits. Antennal club 5-segmented. Scape and legs microreticulated, shiny. Pubescence on scape and hind tibia decumbent, their length shorter than diameter of scape/tibia. Scutellum slightly erect above mesoscutum, partly bent over metanotum. With or without frontal midline. One large apical tooth, two or three smaller teeth, four denticles on masticatory margin of the mandibles. A groove between the two knobs at the terminal side of the propodeum. A distinct transverse groove in middle of propodeal dorsum, the posterior part of the propodeum is raised (Fig. 22).

Measurements (n = 11). CI 91–100 (94); CL 0.87–1.06 (92); CW 0.82–0.96 (87); EYI 42–46 (44); OCI 41–44 (43); SL/CL 49–54 (51); SL 0.45–0.52 (47).

Distribution in Europe

Slovenia, Croatia, Albania, Italy (Adriatic regions).

Bionomics

See Baroni Urbani (1966).

Comments

Baroni Urbani (1968a, b) described *Aphaenogaster semipolita ionia* based on material from Malta and Puglia (Italy). The ants in the collection of Baroni Urbani from Puglia (Italy), identified by him as *ionia*, after re-examination proved to be *A. picena*; the one from Malta must be *A. melitensis*.

Aphaenogaster semipolita (Nylander, 1856)

Figs 16, 23, 53–55

Myrmica semi-polita Nylander, 1856: 86 (worker).

Atta semipolita (Nylander, 1856): Roger, 1859: 256.

Aphaenogaster semipolita (Nylander, 1856): Roger 1863: 29; André, 1883: 370 (gyne).

Aphaenogaster testaceopilosa semipolita (Nylander, 1856): Emery 1878: 53 (male); Forel 1910: 24.

Aphaenogaster semipolita (Nylander, 1856): Santschi, 1933: 390 (revived status as species).

Material examined. Non-type material. Italy-Sicily:

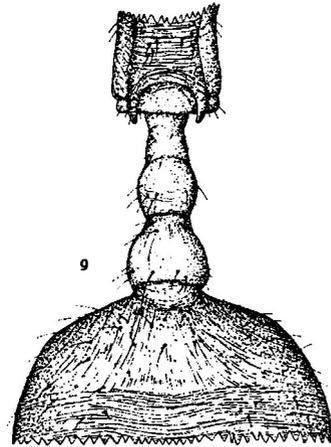
2 ♀, 2 ♂ (Ragusa, MSNG); 1 ♀, 1 ♀ (Destefani, MSNG, former syntype of *ionia*); iv.1884, 1 ♀ (MSNG, identified by Emery as *ionia*); Bagharia, 2 ♀ (MSNG); San Martino, iv.1882, 8 ♀ (Destefani, MSNG); Is. Ustica (Palermo), 7.x.1979, 4 ♀, 3 ♂ (Baroni Urbani, NHMB); Palermo, 3 ♀ (MSNG); Palermo, iii.1927, 2 ♀ (Eidmann, NHMB); Palermo, 1 ♀ (Everts, RMNH); Agrigento, iii.1962, 1 ♀ (Baroni Urbani, MSNV) and iv.1953, 1 ♀ (Vos-Beijerman, RMNH); S. Margherita Belice, iii.1962, 1 ♀ (Scupola/Baroni Urbani, MSNV); Syracuse, viii.1934, 4 ♀ (Engelhard, RMNH).

Diagnostic characters

The workers of *A. semipolita* resemble *A. spinosa* because of their shine, but the two are easily separated by the characters provided in the key. These species are examples of allopatric speciation. The glossy to shiny gaster of the gyne is a remarkable character. The nearly smooth and shiny gaster of the male is also a distinct characteristic.

Redescription of worker

Rugulose sculpture in general weak. Punctuation on mesosoma and head in full-face view, occasionally(!) weak or absent. Lateral sides of mesosoma with longitudinal rugulae. Dorsal side of mesosoma without rugulae, weakly rugulose or with distinct transverse rugulae on propodeum. Head with longitudinal rugulae (not always) on frontal side with some cross connections. Dorsal side of petiolar node weakly punctate or without punctuation. Dorsal side of post-petiole with longitudinal costulae. Dorsal side of first gastral tergite largely smooth, microstriae limited



Figs 53–55. *Aphaenogaster semipolita*. 53. Worker, mandibles. 54. Gyne posterior end of propodeum and petioles in dorsal view (Baroni Urbani 1968b). 55. Male, head. This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

to the base: 0–30% of the surface. Lateral sides of petioles nearly smooth to smooth. Whole body with some shine, especially temple, occiput, ventral side of head, legs and gaster. Underside of head, posterior side of propodeum, beneath the propodeal spines and lateral sides of gaster shiny. Petioles shiny. Dorsal side of gaster wax glossy to glossy. Antennal club 4-

segmented. In lateral view setae on head and mesoma of equal length. Petiole equal in height to postpetiole or somewhat higher.

Measurements (n = 26). CI 70–83 (77); CL 1.11–1.69 (1.41) mm; CW 0.95–1.30 (1.08) mm; PHI 26–35 (32); PI 68–90 (82); PPPI 46–54 (51); PSI 136–188 (154); PSLWI 81–150 (104); PWI 20–25 (-43) (23); RPH 131–152 (140); RPSI 25–56 (35); SI 134–150 (143); SI/CI: 168–206 (186); SL 1.34–1.82 (1.55) mm; SPD 1–3 (1.7); SPL 1–5 (3.4).

Redescription of gyne

Longitudinal rugulae on clypeus, head and mesoscutum. Rugulae on lateral sides weak. Transverse rugulae on pronotum, propodeum, scutellum and posterior sides of the petioles. Punctuation on head, very weak on mesosoma and petioles. Less than ten transverse microstriae near base of first gastral tergite. Anterior side of petioles smooth. Mesosoma, petioles and gaster satin to glossy. Antennal club 4-segmented. Scutellum rises weakly above mesoscutum and does not bend over metanotum.

Measurements (n = 2). CI 88–93; CL 1.58–1.64 mm; CW 1.44–1.46 mm; PHI 40–43; PI 69–71; PPPI 71–79; PSI 169–179; PSLWI 100–113; PWI 29–33; RPH 130–139; RPSI 44–46; SI 111; SI/CI 119–126; SL 1.60–1.62 mm; SPD 1; SPL 5–5.5.

Redescription of male

Rugulae are absent on whole body, except longitudinal rugulae on lateral sides of propodeum. Whole body punctate, weak on propodeum and petioles. The punctuation on mesonotum is ranked as a fine striated sculpture. Dorsal side of the first gastral tergite with very weak microreticulation, nearly smooth, without microstriae. Head and mesonotum soft glossy, dorsal side of gaster glossy, propodeum with transverse striation, glossy. Clypeus without rugulae or punctuation, soft glossy. Antennal club 5-segmented. Pubescence on scape and hind tibia appressed to decumbent, their length shorter than diameter of scape/tibia. Scutellum slightly erect above mesoscutum, partly or not bent over metanotum. Head without frontal midline. Mandibles with one large apical tooth, tooth 2 and or 3 relatively large, rest of masticatory margin contains 4 denticles. A weak groove between the two knobs at the posterior side of the propodeum. Corner of terminal end of propodeum not sharp, not dentate (Fig. 23).

Measurements (n = 5). CI 86–93 (91); CL 0.81–0.90 (0.87) mm; CW 0.75–0.84 (0.78) mm; EYI 38–44 (41); OCI 46–48 (47); SL/CL 48–52 (50); SL 0.39–0.48 (43) mm.

Distribution in Europe

Italy: Calabria (Baroni Urbani 1964), Sicily.

Comments

Emery (1915a, 1916) mentioned as distribution area Sicily, Calabria, and Apulia. The Apulia and Calabria material in his collection, labelled as *A. semipolita*, are after re-identification, *A. campana*. At that time he did not mention the Balkan, Crete, Cyprus and Asia Minor as he did before (Emery 1908), probably because of the discovery of *A. ionia*, then known as a variety of *A. semipolita*. The worker of Venice (Finzi 1922) probably concerns a misidentification. The only known similar species in that region is *A. picena*. The confusion about the distribution of *A. semipolita* finds its origin in the description of Roger (1859). He stated that the gastral tergites are not always (as Nylander describes) shiny. But Roger investigated obviously more (now known as separate) species, particularly *A. balcanica*, *A. campana* and *A. picena*. The type material of Nylander is probably lost (pers. comm. J. Paukkunen, Zoological Museum, Helsinki).

Aphaenogaster senilis Mayr, 1853

Figs 16, 24, 56–59

Aphaenogaster senilis Mayr, 1853: 108 (worker, gyne).

Aphaenogaster testaceopilosa senilis Mayr, 1853: Emery, 1878b: 53.

Aphaenogaster testaceo-pilosa var. *senilis* Mayr, 1853: Emery, 1916: 140 (male).

Aphaenogaster senilis Mayr, 1853: Bondroit, 1918: 161 (revived status as species).

A. senilis var. *acorensis* Santschi 1933: 396; junior synonym of *senilis* by Yarrow, 1967: 26.

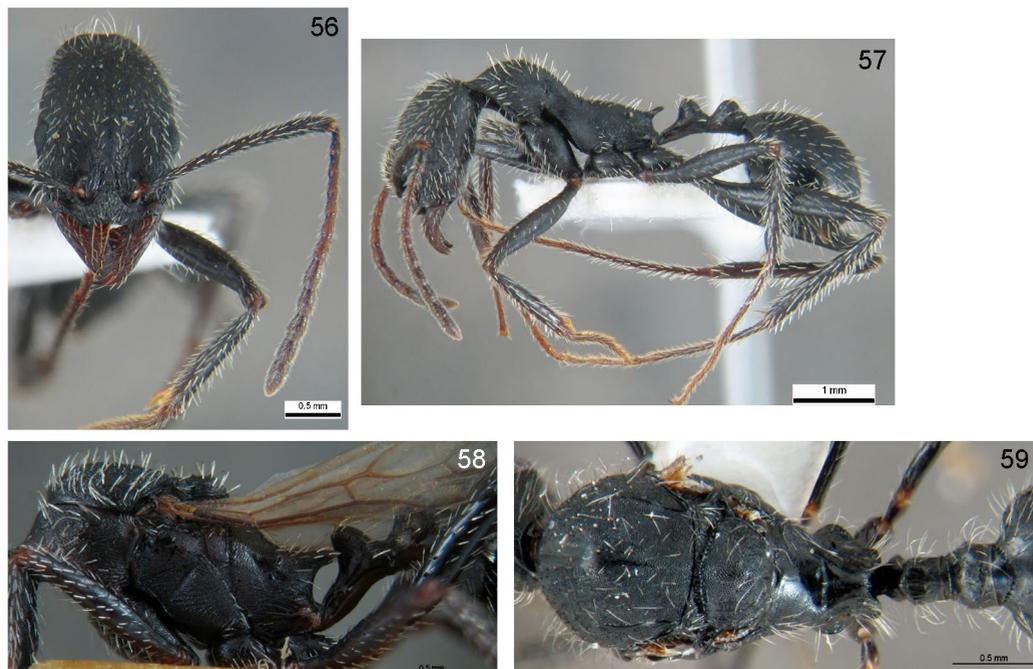
A. testaceopilosa var. *fuentei* Medina, 1893: 105 (worker); junior synonym of *senilis* by Collingwood 1978: 67.

A. senilis var. *grata* Santschi, 1933: 397 (male); **syn. n.**

A. senilis var. *occidua* Santschi, 1933: 396 (worker, male); **syn. n.**

Material examined. Holotype: ♂ of *A. senilis grata*:

Spain: Parla (Madrid), 28.v.1927 (Dusmet, NHMB). **Syntypes:** of *A. senilis occidua*: **France:** Banyuls (Pyr. Or.), vii.1932, 5 ♀, 4 ♂ (Denis, NHMB). **Non-type material: Portugal:** Conceição de Tariva (Algarve), 18.v.1958, 1 ♀ (RMNH); Algarve, 1 ♀ (RMNH); Quinta de Lagos (Algarve), 3.iii.2006, 4 ♀ (Van der Vlies, RMNH); Quelfes (Algarve), 7.iii.2006, 4 ♀ (Van der Vlies, RMNH); Lisboa, 1 ♀ (RMNH); near Lisboa, 20–30.x.1949, 1 ♀ (Verhoeff, RMNH). **Spain:** Cadaqués (Girona), 17.vi.1965, 6 ♀ (vdVecht, RMNH); Ciudad Rodrigo (Sevilla), 13.vii.1986, 1 ♀ (Speijer, RMNH); Sevilla, 10.viii.1954, 4 ♀ (Kramer, RMNH); Torredembarra (Tarragona), 10.iv.1951, 3 ♀ (Kramer,



Figs 56–59. *Aphaenogaster senilis* (Kiko Gómez, formicidae.org). 56–57. Worker. 56. Head. 57. Lateral view. 58. Gyne, mesosoma in lateral view. 59. Male, mesosoma in dorsal view. This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

RMNH); Osuna (Segovia), 30.vii.1970, 5 ♀ (Pronk, RMNH); Aranjuez (Madrid), 4 ♀ (Franz, NMW); Vaciamadrid (Madrid), 1 ♀ (Franz, NMW); Aznalc ollar (Huelva), 12.ix.2004, 1 ♀ (Wijker, RMNH); Sanluc ar de Barrameda (C adiz), 2000, 1 ♀ (Wijker, RMNH); Sesefia, Tajo-valley (Toledo), alt. 500 m, 3 ♀ (Kramer, RMNH); Barcelona, 6.iv.1951, 2 ♀ (Kramer, RMNH); Guejar-Sierra (Granada), 20.iv.1958, 1 ♀ (Kramer, RMNH); Barcelona, Botanical Garden, 7.iv.1951, 2 ♀ (Kramer, RMNH); Bellaterra (Barcelona), 2.v.1978, 1 ♀ and 1 ♀ laboratory (Espadaler, UAB); Pe on Grande, Grazalema (Cadiz), 10.iv.1990, 1 ♀, 1 ♀ (Escol a, UAB); near Prado Negro, Sierra de Huetor (Granada) 25.vii.2008, 1 ♀ (Bra cko, CGB). **France:** Vall e de la Massane pr s de Argel s (Pyr. Or.) 2 ♀ (Collingwood, NMW); Banyuls, 4 ♀ (IRSNB); Banyuls (Pyr. Or.), viii.1929, 2 ♀ (vdBergh, RMNH), and 22.ix.1957 2 ♀, 3 ♂ (RMNH). **Slovakia:** Tatra Mountains, 49 11'N 20 15'W, 6.viii.1994, 5 ♀ (Boer, RMNH).

Diagnostic characters

Workers and gynes have one funiculus segment more than the other species of the *A. testaceopilosa*-group, just as in *A. gemella*. Antennal club of male is 6–8-segmented (indistinct club), instead of a distinct

5-segmented club, again just as in *A. gemella*. The species resembles *A. gemella* very much. The main difference in all castes is the absence of propodeal spines or knobs in *A. gemella*.

Redescription of worker

Lateral sides of pronotum and metanotum without or with weak longitudinal rugulae, propodeum with distinct longitudinal rugulae. Rugulose sculpture on dorsal side absent. Head in full-face view with longitudinal rugulae, here and there with some cross-connections. Mesosoma, head in full-face view, dorsal and lateral sides of petioles punctate. Legs of different individuals are showing a transition from punctulation to microreticulation. Ventral to the propodeal spines punctate and sometimes transversely costulate. Dorsal side of postpetiole with longitudinal costulae. Dorsal side of base of gaster with transverse microstriae (Fig. 8). Head, pronotum, terminal side of propodeum, beneath the propodeal spines, lateral sides of petioles and dorsal side of the gaster matt. Dorsum postpetiole wax gloss to matt. Lateral sides of gaster satin. Dorsal side of petiole matt to wax gloss. Antennal club 5-segmented. Petiolar node with rounded top. Petiole equal in height

as postpetiole or somewhat higher. Spur of hind tibia with minute dentation.

Measurements (n = 33). CI 71–84 (76); CW 1.18–1.46 (1.29) mm; CL 1.50–1.87 (1.71) mm; PHI 31–35 (32); PI 72–93 (81); PPPI: 43–54 (48); PSI 112–167 (135); PSLWI 95–188 (121); PWI 20–43 (24); RPH 121–153 (139); RPSI 11–44 (30); SI 129–149 (141); SL 1.70–1.89 (1.83) mm; SPD 1–3 (1.7); SPL 4–6 (4.9).

Redescription of gyne

Head in full-face view, including occiput, with longitudinal rugulae with cross-connections. Longitudinal rugulae on clypeus, head and anterior side of the postpetiole and lateral sides of the mesosoma. Transverse rugulae on pronotum (partly), propodeum and terminal sides of petioles. Pronotum (partly), mesoscutum and scutellum scabriculous. Punctuation on head, mesosoma and petioles (including anterior part of the petiole). About 30 transverse microstriae in the midline of the first gastral tergite near the base. Mesosoma dorsally matt, gaster dorsally matt satin to satin. Antennal club 5-segmented. Wings with a light yellowish tint. Scutellum rises weakly above the mesoscutum and does not bend over the metanotum.

Measurements (n = 3). CI: 83–87; CL: 1.82–1.86 mm; CW: 1.50–1.61 mm; OCI: 29–37 (33); PHI 44–47; PI 64–68; PPPI 78–88; PSI 208–280; PSLWI 104–110; PWI 30–35; RPH 135–157; RPSI 57–67; SI 114; SI/CI: 132–138; SL 1.70–1.84 mm; SPD 1; SPL 4–5.5.

Description of male

Rugulae are absent on the whole body. Whole body punctate, except the propodeum and gaster. No microstriae on first gastral tergite. Clypeus with transverse rugulae. Head, pronotum and mesonotum matt. Lateral sides of mesosoma (partly) and propodeum shiny. Petioles and dorsal side of gaster glossy to shiny. Lateral sides of gaster shiny. Antennal club 6–8-segmented (indistinct club). Pubescence on hind tibia suberect, their length longer than the diameter of the tibia. Wings clear. Scutellum slightly erect above mesoscutum, partly bent over metanotum. Mandible with one large apical tooth, tooth 2 and or 3 relatively large, rest of the masticatory margin of the mandibles distinctly dentate. A longitudinal groove between the two knobs at the terminal side of the propodeum. These knobs are dorsally flattened, diagonally to the rear. Ventral to the propodeal stigma are the metapleural gland bullae, which are extremely developed into broad discus-like, sharp ending knobs, bowed in the lateral direction, and slightly deflected in the more ventral direction.

Measurements (n = 7). CI 85–91 (89); CL 0.90–1.08 (1.03) mm; CW: 0.81–1.00 (0.91) mm; EYI 37–43 (39); OCI 44–56 (51); SL/CL 32–36 (33); SL 0.29–0.37 (34) mm.

Distribution in Europe

Italy (Sardinia, Cagniant 1990c), Portugal (Azores, Yarrow 1967 and mainland), Spain, France (Mediterranean departments, Cagniant & Galkovski 2011), Slovakia.

Bionomics

Observed on open, sunny locations: forest edges, lawns, fields with scattered shrubs, urban areas. Nest in soil, mostly sheltered by stones; workers are individual foragers on the ground, in herbs and bases of trees and shrubs. Fast moving after disturbance. Details about colony structure (Boulay et al. 2007): < four gynes per colony, mean colony size 1260 specimens.

Comments

Santschi 1933 describes the variety *occidua* (later elevated to subspecies level by Bolton 1995) only because of a longer postpetiole and a less rounded top. These males of *occidua* are not different from the other studied males. Because the shape of the petioles may vary (see introduction) this subspecies should be treated as a variety. Besides, I could not find other diagnostic characters for *occidua*.

The only known specimen of *A. senilis grata* is a male from Parla (Spain). That male did not differ from the other male I examined: a 'slightly shorter' propodeum (Santschi 1933) lying within the range, just like a variation in the form of the teeth, while a 'longer than higher' postpetiole is rather a rule than an exception. Therefore *A. senilis grata* is considered a junior synonym of *A. senilis*.

The observation of this species in Slovakia, far from neighbouring populations, could be explained as a result of human transport.

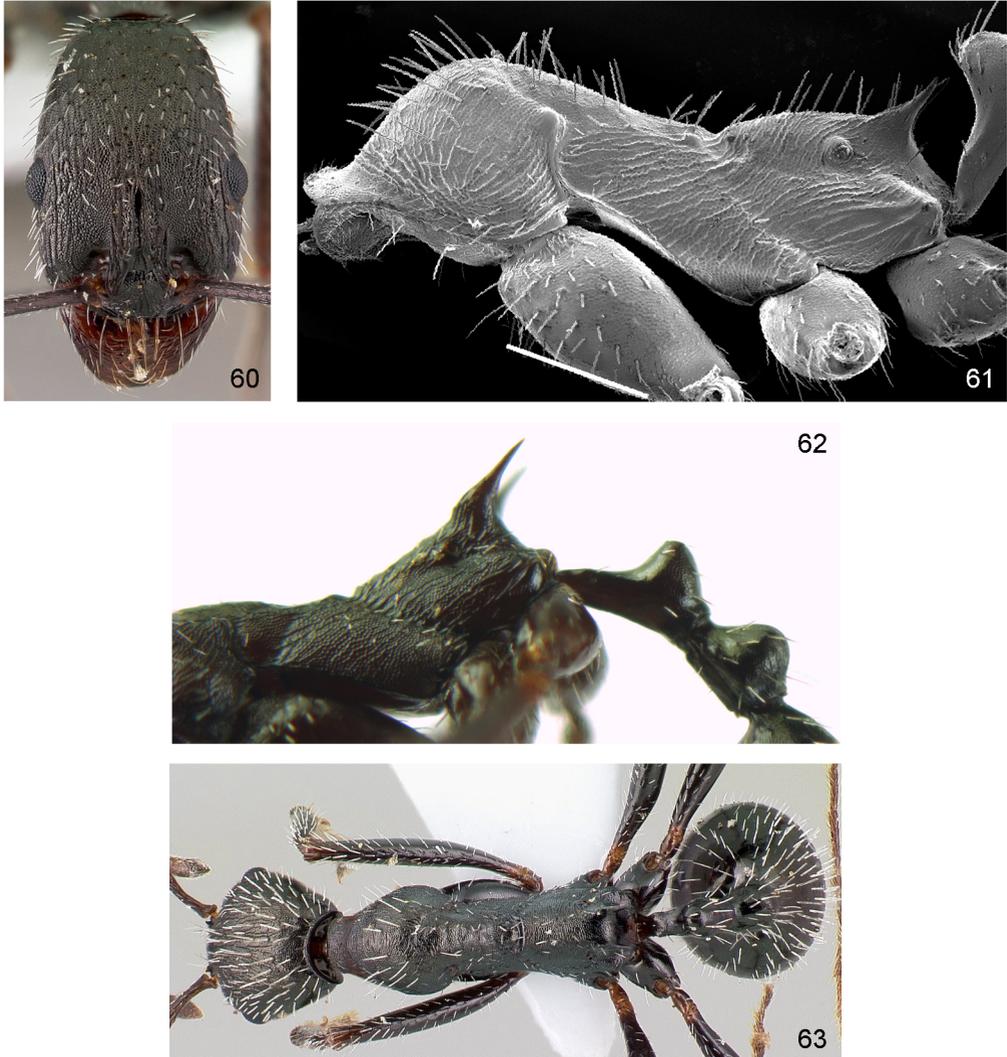
Aphaenogaster simonellii Emery, 1894

Figs 60, 61, 63

Aphaenogaster testaceopilosa var. *simonellii* Emery, 1894: 8 (worker).

Aphaenogaster simonellii Emery, 1894: Santschi, 1933: 390, 401 (raised to species status).

Material examined. Syntypes: Greece: Crete: Retina, 1 ♀ (Cecconi, MSNG); Almiros, 1 ♀ (Cecconi, MSNG), Kalives, 2 ♀ (MSNG). **Non-type material:** Greece-Crete (all CM unless otherwise noted): Nomos Iracliou, north of Kastelli, v.2008, 20 ♂ from 2 nests; Nomos Iracliou, Anno Vian-



Figs 60–63. 60, 61, 63. *Aphaenogaster simonellii*. 60. Head (Erin Prado, antweb.org). 61. Mesosoma in lateral view. 63. Dorsal view (Erin Prado, antweb.org). 62. *A. spinosa* worker, propodeum and petioles in lateral view. This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

nos, v.2008, 25 ♀ from 3 nests; Nomos Lasithiou, Kato Metohi, v.2008, 19 ♀ from 2 nests; Nomos Lasithiou, Kavousi, north coast, v.2008, 10 ♀; Nomos Chania, Omalos, x.2001, 9 ♀; Nomos Rethimniou, Nida Plateau, alt. 1400 m, v.2008, 12 ♀; i.2000 23 ♀ from 2 nests; Nomos Rethimniou, Rethimniou, i.2000, 10 ♀; Nomos Iraclion, Perama, i.2000, 12 ♀; Nomos Iraclion, Archanes, i.2000, 11 ♀; Nomos Lassithi, Malia, i.2000, 20 ♀; Phaestos (Heracilion), 26.iv.1973, 6 ♀ (Van Ooststroom, RMNH); iv.1990, altitude 800 m, 1 ♀ (Collingwood, WML); Panormos, iv.1990, 3 ♀ (Collingwood, WML);

Pomeron, iv.1990, 1 ♀; iv.1990 21 ♀ (Collingwood, WML); iv.1976, 1 ♀ (Collingwood, WML); Iraclion, iv.1988, 1 ♀ (Collingwood, WML); Heracilion, iv.1990, 3 ♀ (Collingwood, WML); v.1990, 1 ♀ (Collingwood, WML); Kato Gouves, 22–26.vii.2006, 4 ♀ (Bračko, CGB); Sellia, 35°12'04"N 24°22'15"E, 5.v.2012, 10 ♀ (Boer, RMNH); Arkadi, 35°18'N 24°37'E, 7.v.2012, 1 ♀ (Boer, RMNH); Spili, 35°14'N 24°31'E, 11.v.2012, 3 ♀, 1 ♀ (Boer, RMNH); Greece-Karpathos: Amopi, 14.v.1982, 1 ♀ (Collingwood, WML).

Diagnostic characters

Workers. A unique combination of characters is, in lateral view, a slightly angular pronotum (Fig. 61) and the shiny body. Resembles *A. spinosa* only because of the shine. Gynes and males unknown. It is likely that the males are shiny (as in *spinosa*).

Redescription of worker

Longitudinal rugulae on the lateral sides of the mesosoma variable: distinct to weak and limited. Dorsal side of pronotum and propodeum finely rugulose or scabriculous, mainly transverse. Head in full-face view with longitudinal rugulae with cross connections, on temples and occiput often absent. Punctuation distinct on head, weaker on mesosoma and petioles. Dorsal side of postpetiole punctate to smooth, with longitudinal costulae which are continuing on the first gastral tergite as microstriae. Terminal side of propodeum, beneath the propodeal spines smooth and shiny. Lateral side of temple, underside of head and legs shiny. Head in full-face view and mesosoma glossy. Dorsal side of gaster glossy satin. Lateral sides of gaster shiny. Antennal club 4-segmented. Petiole slightly higher than postpetiole. Lateral shape of petiole with rounded top. Setosity on fore coxa and pronotum higher than on other parts, relatively dense and long. In lateral view, a slightly angular pronotum.

Measurements (n = 36). CI 69–78 (73); CL 1.18–1.82 (1.48) mm; CW 0.89–1.41 (1.08) mm; PHI 27–36 (33); PI 67–125 (81); PPI 50–62 (54); PSI 136–200 (166); PSLWI 94–154 (124); PWI 21–28 (24); RPH 103–154 (138); RPSI 33–69 (50); SI 135–163 (150); SI/CI: 173–233 (206); SL 1.32–1.91 (1.63) mm; SPD 1–2 (1.1); SPL 1–5 (3.4).

Description of gyne

Rugulae on lateral and dorsal parts of mesosoma. Transverse and oblique rugulae on clypeus. Head anterior to occiput with longitudinal rugulae with cross-connections, occiput ruguloreticulated. Ventral portion of the propodeal spines smooth. Transverse rugulae on dorsal pronotum and propodeum. Punctuation distinct on head and petioles, weak to very weak on the mesosoma. Dorsal side of first gastral tergite microstriated, base with five circular rugulae. Anterior side of the petiole smooth. Head, mesosoma, petiole and gaster glossy. Antennal club 4-segmented. Scape longitudinally rugulose. Scutellum rises above mesoscutum and does not bend over the metanotum.

Measurements (n = 1). CI 81; CL 1.68 mm; CW 1.37 mm; OCI 34; PHI 44; PI 79; PPI 78; PSI 217; PSLWI: 100; PWI 34; RPH 129; RPSI 54; SI 130; SI/CI 160; SL 1.78 mm; SPD 1.5; SPL 4.

Distribution in Europe

Greece (Crete, Karpathos).

Bionomics

On Crete, a common species in open, sunny locations: open dry forest, wood edges, olive groves, lawns, fields with scattered shrubs, urban areas. Observed up to 800 m altitude. Nest in the soil, mostly sheltered by stones, also in cavities of rocks. Workers are individual foraging on the ground, in herbs and bases of trees and shrubs. Foraging behaviour can be described as precautionary. Feeds on live and dead arthropods, and myrmecochorous seeds. I have seen them carrying petals of olives, which results in crops of hundreds of bare petals. Also other dead vegetable material was collected. Fast moving after disturbance. I observed several times territorial behavior and evacuation of the nest (in May).

Aphaenogaster spinosa Emery 1878

Figs 16, 25, 62

Aphaenogaster testaceopilosa var. *spinosa* Emery, 1878: 54 (worker).

Aphaenogaster spinosa Emery, 1878: Dalla Torre, 1893: 105, raised to species status.

Aphaenogaster testaceopilosa spinosa Emery, 1878: Emery, 1908: 320 (gyne, male).

Aphaenogaster spinosa Emery, 1878: Bondroit, 1918: 162, revived to species status.

Aphaenogaster testaceopilosa var. *nitida* Krausse, 1912: 163 (worker) [first available use of *Stenamamma (Aphaenogaster) testaceopilosa spinosum* var. *nitidum* Emery, 1895: 70 by Bolton, 1995: 71], junior synonym of *spinosa* by Baroni Urbani 1971b: 1039 and Casevitz-Weulersse, 1990b: 435, but later revived as var. Casevitz-Weulersse, 2010: 5.

Aphaenogaster spinosa var. *romana* Santschi, 1933 (worker) [first available use of *Stenamamma (Aphaenogaster) testaceopilosa spinosum* var. *romana* Emery, 1895: 302; Bolton 1995: 72: unavailable name]; junior synonym of *spinosa* by Baroni Urbani, 1971: 1039.

Aphaenogaster spinosa etrusca Baroni Urbani, 1969, **syn. n.**

Aphaenogaster spinosa var. *corsica* Santschi, 1933: nomen nudum by Baroni Urbani, 1971: 1039.

Aphaenogaster corsica Casevitz-Weulersse, 2010: 4 (worker, male), **syn. n.**

Material examined. Holotype: France, Corsica: Region Belgodère, 27.ix.1973 (Casevitz-Weulersse), 1 ♀ holotype of *A. corsica* Casevitz-Weulersse and **paratypes** of the same date and location, 7 ♀, 5 ♂. **Syntypes:** Italy, Sardinia: 1872, 5 ♀ (Vito & Gestro, MSNG); syntypes of *A. spinosa etrusca*: **Italy**, Volterra (Pisa), iv.1963, 8 ♀ and 30.v.1962, 2 ♀ (Baroni Urbani, BUMW). **Non-type material:** **Italy-mainland:** Napels (Calabria), 1 ♀ (Everts, RMNH); between Bologna and Roma (Tuscany?), 2 ♀ (Goldtschmidt, ZMAN); Tivoli (Lazio)

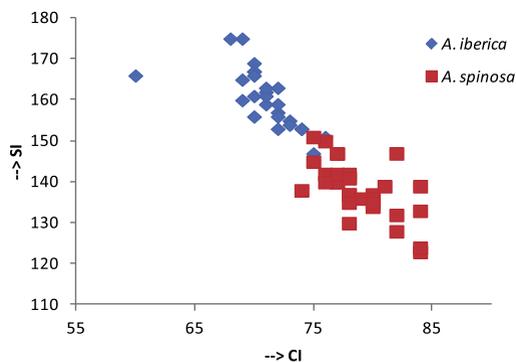


Fig. 64. Relation between the scape index (SI) and the cephalic index (CI) between *A. iberica* and *A. spinosa*. This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

28.viii.1953, 1 ♀ (Lucas, RMNH); Ostia (Lazio) 27.v.2009, 2 ♀ (Boer, RMNH); Roma (Lazio) 24.v.2009, 3 ♀ (Boer, RMNH). **Sardinia:** Dorgali, 1 ♀ (RMNH); Dorgali, Golf van Oroschi, vi/vii.1935, 1 ♀ (Mill, ZMAN). **France-Corsica:** Porto vecchio, 1 ♀ [var. *nitida* identified by Emery] (MSNG); Galeria, 17.iv.1932, 1 ♀ (Douglas, RMNH), 1 ♀ (ZMAN); Ajaccio, iv.1938, 13 ♀ (Kruseman, RMNH); 1–11.viii.1949, 17 ♀ (Verhoeff, RMNH); 1 ♀ (Ellis, ZMAN); Ajaccio, 1898, 1 ♀ (dWeeli, RMNH); Bonifacia, 5–6.v.1926, 8 ♀ (vdBerg, RMNH); 1 ♀ (ZMAN); Corte, altitude 500 m, 7.viii.1956, 1 ♂ (Blöte & Hasselbach, RMNH); Calcatoggio-Orcino, 8–18.v.1968, 10 ♀ (Van Oostroom, RMNH); Vizzavona, 3.viii.1912, 8 ♀, 22.vii.1912, 1 ♀ (Hetschko, RMNH); Col de Vizzavona, 12.viii.1971, alt. 1100–1250 m, 9 ♀ (Ellis, ZMAN); Propriano Campomora, 13.vi.1970, 2 ♀ (vdVecht, RMNH); Cap Corsica, 10 km N of Erbalunga, 29.iv.2006, 3 ♀ (Bračko, CGB). **Switzerland:** Giubiasco, Tessin, 4.vi.1946, 5 ♀ (Van Oostroom, RMNH).

Diagnostic characters

The worker of *A. semipolita* resemble *A. spinosa* because of their body shine, but the two can easily be separated by the characters given in the key. These species are allopatric. *Aphaenogaster spinosa* most resembles *A. iberica*, especially because of the sturdy propodeal spines. Both species differ in the ratio between the SI and the CI (Fig. 64). In both species, the degree of shiny parts varies greatly. For gynes and males see *A. iberica*.

Redescription of worker

Lateral sides of mesosoma with longitudinal rugulae. Rugulae on dorsum of pronotum and propodeum fine or absent. Head with longitudinal rugulae with some cross-connections, rugulae sometimes almost lacking especially on occiput and temples. Punctuation on head (often absent on occiput and temples) and mesosoma. Occiput, temples, legs and lateral sides of petioles microreticulated. Terminal side of propodeum, beneath the propodeal spines smooth and shiny, sometimes transversely costulate. Dorsum of petioles smooth to weak rugulose and punctate. Dorsal side of postpetiole with longitudinal costulae which continue on first gastral tergite as microstriae; first gastral tergite may be smooth. Lateral side of temples, underside of head, terminal side of propodeum, beneath the propodeal spines, lateral sides of gaster and lateral sides of petioles shiny. Dorsal side of first gastral tergite matt to shiny. Ventral part of petioles wax gloss to shiny. Antennal club 4-segmented. Lateral shape of petiole with narrow, round top. Petiole equal in height as postpetiole or somewhat higher.

Measurements (n = 46). CI 74–84 (79); CL 1.27–1.59 (1.47) mm; CW 0.95–1.33 (1.14) mm; PHI 30–34 (31); PI 71–87 (79); PPPI 46–60 (52); PSI 177–267 (221); PSLWI 115–183 (141); PWI 22–25 (23); RPH 113–156 (132); RPSI 59–100 (77); SI 123–151 (138); SI/CI 146–201 (176); SL 1.36–1.75 (1.58) mm; SPD 1–3 (1.7); SPL 1–5 (2.3).

Description of gyne

According to Emery (1908): Lateral sides of head shiny. Space between the rugulae on the thorax smooth and rather shiny.

Redescription of male

Rugulae are absent on the whole body. Partly striated on mesosomal dorsum. Head punctate, rest of body smooth or at least weakly punctate. Dorsum of gaster weakly microreticulate. Head glossy. Mesosoma and lateral sides of gaster shiny. Dorsum of gaster glossy. Antennal club 5-segmented. Pubescence on hind tibia and scape appressed to decumbent, their length about equal to diameter of tibia/scape. Scutellum erect above mesoscutum. Mandibles with one large apical tooth, 2 or 3 smaller teeth, and 2–3 denticles. Anterior and posterior half of propodeum makes a nearly right angle. A weak longitudinal groove between the two knobs at the terminal side of the propodeum.

Measurements (n = 6). CI 92–95 (93); CL 0.76–0.81(0.80) mm; CW: 0.72–0.78 (0.74) mm; EYI

39–43 (41); OCI 45–53 (50); SL/CL 48–52 (50); SL 0.41 mm.

Distribution in Europe

Italy (including Sardinia, excluding Sicily), France (Corsica), Switzerland (Tessin).

Bionomics

Casevitz-Weulersse (1990a) calculated after an ecological survey from 234 samples in 189 localities, that *A. spinosa* is one of the most common epigeic ant species on the island of Corsica (France). The species is dominant in nearly every habitat, especially at altitudes below 400 m, but is also present above 1200 m.

Comments

According to Emery (1908) the petiolar node of the male should be smaller than that of *A. semipolita*, but the petiolar node does not differ from that of most of the other species. The species status of *A. corsica* is based on very variable characters: color (black) and shine (more mat, satin instead of brilliant), the width of the constriction of the mesosoma and 'different sculpture'. As described above, these characters fall within the range of the species.

Aphaenogaster sporadis Santschi, 1933, stat. n.

Figs 15, 26, 27, 65–70

Aphaenogaster simonellii var. *sporadis* Santschi, 1933: 401 (worker, male).

Aphaenogaster simonellii sporadis Santschi, 1933: Bolton, 1995: 73.

Aphaenogaster simonellii var. *balcanica*: Menozzi, 1936: 271, misidentification.

Material examined. Syntypes: Greece, Nikaria: 1 ♂ (Von Oetz, NHMB; labelled: *A. campana* v. *sporadis*) and 1 ♀ (without head) and 1 ♂ (same label, MNLB). **Non-type material: Greece-Rhodes:** 30.vii.1933, 1 ♀ (Santschi, NHMB; identified by Santschi as *simonellii* var. *balcanica*); viii.1934, 14 ♀ (Engelhard, RMNH); Oros Profitis Ilias, north of Apollona, alt. 500 m, v.2007, 72 ♀ from 9 nests (Maassen, CM); from Castello Monolithos to Akr. Fourni, v.2007, 11 ♀ from 2 nests (Maassen, CM); Epta Pigi, east of Kolymbia, v.2007, 29 ♀, 1 ♀ from 3 nests (Maassen, CM); Vati between Gennadi and Apolakkia, v.2007, 23 ♀ and 1 ♂ from 3 nests (Maassen, CM/RMNH); Lindos, 28.iii.1970, 11 ♀; 6.iv.1970, 14 ♀; 10.iv.1970, 8 ♀ (Ellis, ZMAN); Trianda, 19.vi.1980, 1 ♀ (Stoel, ZMAN; identified by Dlussky as *simonellii*); viii.1934, 8 ♀ (Engelhard, RMNH); Rodini, 14.iv.1970, 2 ♀ (Van Oostroom, RMNH); coastal area, viii.1934, 1 ♀ and viii.1934, 9 ♀ (Engelhard, RMNH); 18.v.1982,

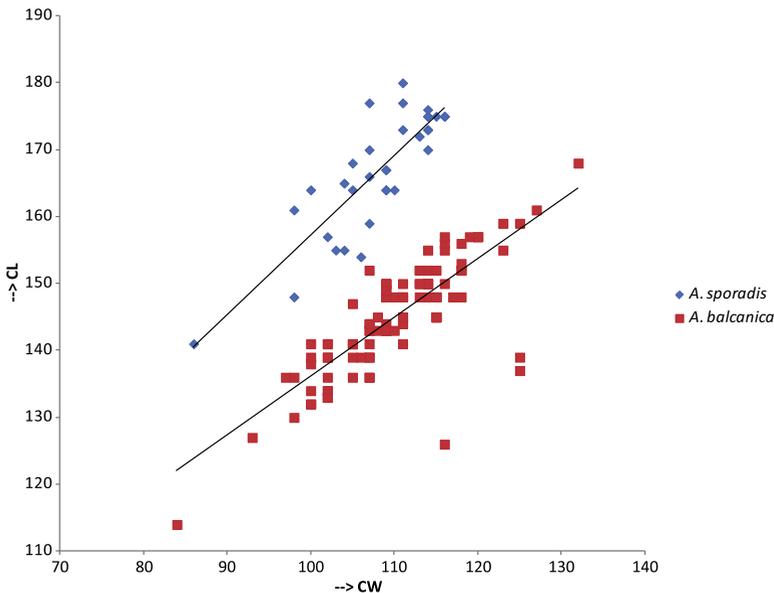
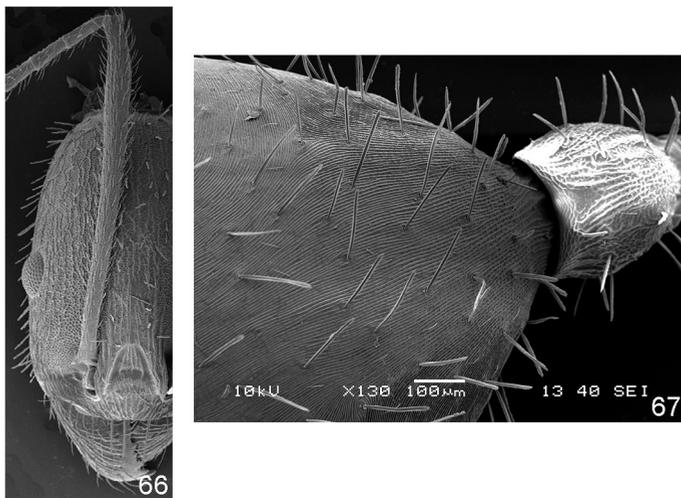


Fig. 65. Relation between the head width (CW) and the head length (CL) between *Aphaenogaster sporadis* ($y = 1.192x + 37.974$) and *A. balcanica* ($y = 0.8791x + 48.247$). This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.



Figs 66, 67. *Aphaenogaster sporadis*. 66. Head. 67. Dorsal side of gaster and postpetiole.

1 ♀ (Collingwood, WML) [outside Europe: **Turkey:** Akçabük, Bodrum, 30.v.1973, 2 ♀ (Collingwood, WML); Tarsus, 29.ix.2011, 2 ♀ (Van Orden & Paklina, RMNH).

Diagnostic characters

The worker of *A. sporadis* resemble *A. balcanica*. Especially freshly collected *A. sporadis* are remarkably matt. Head is smaller than in related species (Fig. 65). The petioles of the gynes are wider than in *A. balcanica*. *Aphaenogaster balcanica* males are on the lateral sides partly glossy, while *A. sporadis* is matt.

Redescription of worker

Lateral sides of mesosoma with longitudinal rugulae. Pronotal dorsum scabriculous or only punctate. Dorsal side of propodeum mainly without rugulae. Head in full-face view with distinct longitudinal rugulae with cross-connections. Head in full-face view, mesosoma, terminal side of propodeum, beneath the propodeal spines and petioles punctate. Dorsal side of postpetiole with longitudinal costulae which continue on first gastral tergite in microstriae. Head in full-face view, mesosoma and petioles matt. Dorsal side of gaster matt satin to satin. Lateral sides of gaster wax glossy to slightly shiny. Antennal club 4-segmented. Lateral shape of petiole less variable than in other species: shape of descending half relatively long and narrow (Fig. 15). Setosity on fore coxa and pronotum longer than on other parts.

Measurements (n = 36). CI 66–76 (72); CL 1.32–1.59 (1.50) mm; CW 0.86–1.16 (1.05) mm; PHI 30–36 (32); PI 71–86 (78); PPPI 46–59 (52); PSI 113–200 (161); PSLWI 100–146 (125); PWI

20–25 (22); RPH 125–168 (144); RPSI 12–73 (46); SI 140–170 (155); SI/CI 195–247 (216); SL 1.41–1.80 (1.67) mm; SPD 1–2 (1.2); SPL 1–5 (4.2).

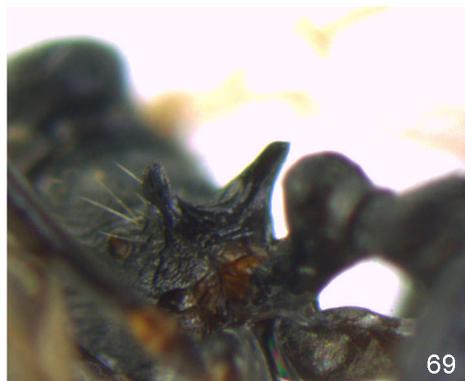
Description of gyne

Head in full-face view with longitudinal rugulae with cross connections, occiput ruguloreticulated. Anterior side of pronotum with transverse rugulae. Terminal side of propodeum, beneath the propodeal spines transversely costulate. Lateral sides mesonotum with longitudinal rugulae. Pronotum and dorsal sides of petioles scabriculous. Longitudinal rugulose on clypeus, head (exclusive occiput), mesoscutum, scutellum, propodeum and anterior side of postpetiole. Transversely rugulose on terminal side of postpetiole. Punctuation present between rugulae on head, and everywhere on lateral and dorsal sides of mesosoma and petioles. Anterior side of first gastral tergite with longitudinal microstriae, except fifteen transverse microstriae near base of first gastral tergite. Anterior side of petiole smooth. Mesosoma matt with some shine from the punctuation. Gaster dorsally satin. Antennal club 4-segmented. Scutellum rises distinctly above mesoscutum and bends entirely over metanotum.

Measurements (n = 1). CI 82; CL 1.55 mm; CW 1.29 mm; OCI 31; PHI 49; PI 79; PPPI 89; PSI 193; PSLWI 73; PWI 39; RPH 127; RPSI 35; SI 127; SI/CI 155; SL 1.61 mm; SPD 1.5; SPL 6.

Redescription of male

Dorsal side of mesonotum striate (Fig. 70). Lateral sides of propodeum with or without rugulae. Punctuation on head and mesosoma. Anterior



Figs 68–70. *Aphaenogaster sporadis* male. 68. Head. 69. Propodeal spines. 70. Dorsal side of mesonotum. This figure is published in colour in the online version of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/22119434>.

side of propodeal dorsum could be partly smooth. Clypeus weakly longitudinally rugulose. Gaster dor-

sally microreticulated, with hardly visible microstriation. Mandibles smooth, less shiny than in other species, more dull. Head, mesoscutum and (largely on) propodeum matt, dorsal side of gaster at least near base satin, other parts wax glossy. Antennal club 5-segmented. Pubescence on scape and hind tibia appressed to suberect, shorter than their diameter. Scutellum erected above the mesoscutum, partly bent over the metanotum. Head without frontal midline. Except the apical tooth and tooth 2, the masticatory margin of the mandibles is set with denticles. A distinct groove between the two spines at the terminal side of the propodeum. Anterior clypeal margin slightly convex, in middle hardly concave. A distinct transverse groove in middle of propodeal dorsum, posterior part of the propodeum being raised. Propodeum dentate (Fig. 26) or with coarse spines (Figs 27, 69).

Measurements ($n = 4$). CI 87–89 (88); CL 0.89–0.90 (0.90) mm; CW 0.79–0.80 (0.80) mm; EYI 37–44 (41); OCI 45–49; SL/CL 44–47; SL 0.42–0.44 (0.43) mm.

Distribution in Europe

Greece (Rhodes, Ikaria).

Bionomics

Menozzi (1936) called this species very common on Rhodes up to an altitude of 800 m.

Comments

Menozzi (1936) described his *Aphaenogaster simonellii* var. *balcanica* from Rhodes and Karpathos. It is unclear whether his described characteristics are referring to Rhodes or Karpathos. Menozzi described males with 'two triangular projections' (= propodeal projections). That could be a male of Karpathos (*A. karpathica*). Unfortunately, the collection of specimens of the by Menozzi described castes was unavailable for research.

At first I presumed that the population of Rhodes concerns another species than that of Ikaria, because of the very well expressed propodeal spines of the male of Rhodes (Figs 27, 69) instead of dentate ones (Fig. 26), the smaller eyes and differences in sculpture. But I have seen that the male of the species in the *A. testaceopilosa*-group are variable in size, sculpture and biometrical indices. I consider the coarse propodeal spines of this var. *androsipinosa* an ergatomorphic character.

Discussion

Most European species of the *A. testaceopilosa*-group were originally described as subspecies or varieties

of *A. testaceopilosa* (Lucas 1849). *Aphaneogaster testaceopilosa* has so far been regarded as a European species (Gomez 2011, Radchenko 2011). After studying the holotype and five paratypes of *A. testaceopilosa* from Algeria (Lucas, MNHN), I can state that this species is not one of the European representatives of the *A. testaceopilosa*-group. The most important differences are the (indistinct) five-segmented antennal club, the relatively long suberect pilosity on the scape and more robust habitus. In fact, this species more closely resembles *A. senilis* than the initially described varieties and subspecies of the species.

The distribution of the *A. testaceopilosa*-group in Europe corresponds to the area south of the 20° July isotherm, roughly equal to that part of Europe influenced by the Mediterranean climate, i.e. mild, rainy winters and hot, dry summers. This explains the absence of the subgenus in countries like Ukraine, Bulgaria and Romania (Atanassov & Dlussky 1992, Markó et al. 2006, Radchenko 2011), the more inland countries like Serbia (Petrov 2011), as well as the more inland departments of France (Cagniant & Galkowski 2011).

One could divide the overall European distribution area of the *A. testaceopilosa*-group into five biogeographical regions: the Iberian Peninsula (*A. iberica*, *A. gemella*, *A. senilis*), a more or less Tyrrhenian area (western and south Italy, Corsica, Sardinia, Sicily, Malta) (*A. inermis*, *A. semipolita*, *A. melitensis*, *A. spinosa*), an area around the Adriatic Sea (*A. picena*, *A. campana*), the Balkan, from the Adriatic Sea to Turkey (*A. balcanica*), the eastern part of the Aegean, the Sporades and the Asian part of Turkey (*A. sporadis*) and Karpathos and Crete (*A. balcanicoides*, *A. karpathica*, *A. simonellii*). That means that the majority of the species in the *A. testaceopilosa*-group can be considered endemic for a particular area (in the sense of 'limited to a relative restricted geological historical area'). Especially *A. melitensis* (Malta), *A. inermis* (Malta and south-western Italy), *A. semipolita* (Sicily and south-western Italy), *A. simonellii*, *A. karpathica* and *A. balcanicoides* (Crete and Karpathos), *A. picena* (around the Adriatic Sea) and *A. iberica* (Iberian peninsula) show a limited distribution, undoubtedly due to geographical isolation. The distribution of *A. gemella* in Europe is also limited, but the species status is uncertain (see the comments above). Only three species are more widespread: *A. senilis* (North Africa, Iberian Peninsula, southern France, and, most remarkably, Slovakia), *A. spinosa* (Corsica, Sardinia and from northern Italy to the southern flanks of the Alps in Switzerland) and *A. balcanica* (from Bosnia to the Anatolian part of Turkey and perhaps further beyond).

The distribution of the species of the *A. testaceopilosa*-group on the Greek islands shows similarities with those of other organisms in this region. These islands have been formed by tectonism, volcanism and eustatism, with the floral and faunal elements originating from Europe, Asia and Africa. The distribution of the species of the *A. testaceopilosa*-group matches the basic barriers of geological origin in the Aegean, as illustrated by Lymberakis & Poulakakis (2010). Crete has a high endemism for many taxa, due to its long-term isolation and topographic heterogeneity (Kostas et al. 2008). In this context *A. simonellii* and *A. balcanicoides* are typically Crete species (with one record of *A. simonellii* from the neighbouring island Karpathos), just like *A. karpathica* on Karpathos. The speciation of *A. sporadis* probably originated after isolation from the eastern Cyclades and the separation between Greece and Anatolia 9 to 12 mya, one of the basic barriers of geological origin in the Aegean (Lymberakis & Poulakakis 2010). The distribution of *A. balcanica* is wider. This taxon was apparently more capable than the other taxa to populate other areas, like the Ionian Islands in the west and the Cyclades in the south.

Most species occur in Italy, most likely in relation to the complex geological history of this region. The southern part is of another origin than the northern part. And in the south: Malta, Sicily and south-western Italy became at different times, connected and again separated, and a concordant speciation pressure in this part of Europe seems likely.

There is morphological similarity between *A. spinosa* and *A. iberica*, and they are living parapatric. The possible ancestor dates from the time that the islands Corsica and Sardinia were still part of respectively France and Spain, or still older, the period that also the northern half of Italy was part of this landmass.

It is however noteworthy that at least eight of the fourteen species of the *A. testaceopilosa*-group exhibit a distribution that can be traced back to the geological history of their range and are still limited to this area. The explanation lies perhaps in the absence of or limited nuptial flights in gyne and the usual dispersal by nest budding (Baroni Urbani 1966).

The scarce material I have seen from Algeria and Tunisia concerns species which are different from the European species, except for *A. gemella* and *A. senilis*. The other North-African species of the *Aphaneogaster testaceopilosa*-group described by Cagniant (1990b, 1996), Santschi (1929, 1933) and Mohamed et al. (2001) do not match the European species.

I have seen a limited number of Turkish specimen (Anatolian), which I identified as *A. balcanica* and *A. sporadis*.

This paper should be considered a partial revision of this problematic genus. Nearly all the type material has been studied and as much material as possible has been collected. Nevertheless, more material is needed for a more thorough revision. There is a need for more material from Greece, especially the Peloponnese and the North and South Aegean Islands. And there is a great need of more gynes and males, especially now that it appears that they often show distinct species-level characters, perhaps more so than workers. DNA-analyses could also bring more clarity in taxonomy of the *Aphaenogaster testaceopilosa*-group.

Conclusions

The genus *Aphaenogaster* Mayr, 1853 now consists of 178 species. Species of the *Aphaenogaster testaceopilosa*-group ranges in Europe from widespread (*A. balcanica*) to endemic in small areas (*A. balcanicoidea*, *A. karpatica*, *A. melitensis*, *A. semipolita* and *A. simonellii*). Two species are described as new to science: *A. balcanicoidea*, and *A. karpatica*. Two species are elevated to species level (*A. sporadis* and *A. melitensis*). One of the most commonly used names in the Balkan region, *A. ionia*, is synonymized, and now considered a junior synonym of *A. balcanica*. *Aphaenogaster corsica* is a junior synonym of *A. spinosa*. The subspecies *A. senilis grata* and *A. senilis occidua* are synonyms of *A. senilis* and *A. spinosa etrusca* of *A. spinosa*.

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