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***Orijinal araştırma (Original article)***

# New data of the genus *Crematogaster* Lund, 1831 (Hymenoptera: Formicidae) in Crna Gora (Montenegro), Part II: Description of male of *Crematogaster auberti savinae* Zimmermann, 1934

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## Summary

The male of *Crematogaster auberti savinae* Zimmermann, 1934 is described for the first time and the worker of this subspecies is redescribed. *Crematogaster sordidula mayri* (Mayr, 1853) is synonymised with *C. sordidula sordidula* (Nylander, 1849). Geographical distribution of the genus *Crematogaster* in Montenegro (*C. gordani* Karaman, 2008, *Crematogaster ionia* Forel, 1911, *C. montenigrinus* Karaman, 2008, *C. schmidti* (Mayr, 1853a), *C. auberti savinae* Zimmermann, 1934, *C. jehovae* Forel, 1907 and *C. sordidula* (Nylander, 1849) is presented.

Identification key based on workers is composed for all the species of *Crematogaster* distributed in Southern Europe.

**Key words:** *Crematogaster*, identification key, workers, Crna Gora (Montenegro)

**Anahtar sözcükler:** *Crematogaster,* teşhis anahtarı, işçiler, Crna Gora (Montenegro)

## Introduction

The descriptions of males of the species of *Crematogaster* distributed in Southern Europe are either not detailed or accurate (Ruzsky, 1905; Atanasov & Dlusskij, 1992; Kutter, 1977; Karaman, 2008), or the description of male genitalia is lacking altogether (Bernard, 1978). In the case of three species, *C. ionia* Forel, 1911*, C. jehovae* Forel, 1907 and *C. auberti savinae* Zimmermann, 1934 the males are still unknown.

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The description of the male of *C. auberti savinae* is presented for the first time. Additionally, the taxonomy and the description of workers and females are presented for 3 species from Montenegro, as well as, their ecology. Finally, the distribution of seven *Crematogaster* species in Montenegro, and the synoptic key, based on workers, to the 15 species of *Crematogaster* in Southern Europe are given.

## Materials and Methods

This study is based on specimens collected from various localities in central and southern Montenegro during the period 1988-2008. Specimens were collected mostly from the nests. In the case the nests were not found, solitary specimens were collected from the ground, the threes or shrubs. To investigate possible variation in morphology of each species across the Balkan area specimens were compared against those collected from Macedonia, Serbia, and Bosnia and Herzegovina.

For each species the synonymy, distribution, number of specimens of each cast and the collector are given. The distribution sites are arranged successively from the westernmost to easternmost. The localities cited by other authors (Müller, 1923; Soudek, 1925; Zimmermann, 1934; Petrov, 1995 and Collingwood & Petrov, 1999) are indicated as "Localities cited".

All measurements were carried out with a micrometer apparatus attached to a stereoscopic microscope, and the values are given in μm (reading error: ±0.005 mm). The total length (TL) is given in mm.

The synoptic key is prepared based on the workers collected from the Balkans and supplemented with original descriptions for the nonBalkan's species.

### Measurements and Indices

Total length (**TL**): Total length of the body, excluding appendages, in dorsal view.

Head width (**HW**): The maximum dorsal width of the head at eyes level.

Head length (**HL**): Maximum dorsal full-face view length from the anteriormost margin of clypeus to the posterior margin of occiput.

Cephalic index (**CI**): Hw/HL x 100.

Scape length (**SL**): The maximum straight line length of the antennal scape excluding the basal constriction of the neck close to the condylar bulb.

Scape index (**SI**): SL/HW x 100.

Ocellus length (**OL**): The maximum length of main ocellus in male.

Length of mesosoma (**LM**): The diagonal length of the mesosoma from the point at which the pronotum meets the cervical shield to the posterior base of the metapleuron.

Propodeal spine length (**PS**): Lateral distance from the upper edge of propodeal spiracle to the tip of spine.

Petiole width (**PW**): The maximum width of the petiole, in dorsal view.

Postpetiole width (**PPW**): The maximum width of the postpetiole, in dorsal view.

Petiole Index (**PI**): PWx100/PPW.

Postpetiole Index (**PPI**): PPWx100/HW.

Pronotal Width (**PnW**): The maximum width of pronotum in dorsal view.

Distance Between the Tips (**DBT**): the maximum distance between the apices of propodeal spines.

**A10, A9, A8, A3, A2, A1**: Length of named antennal segments.

## Results

Six species and one subspecies from two subgenera, *Crematogaster* and *Orthocrema*, are known from the territory of Montenegro. Within the subgenus *Crematogaster* (*Crematogaster*) Mayr, 1852, two groups of species inhabit Montenegro. First group is *C. scutellaris* complex that includs *C. schmidti*; *C. ionia*; *C. gordani* and C. *montenigrinus*. Second group, the *auberti* complex includes two species, *C. auberti savinae* and *C. jehovae*. Both species are characterized by the lack of keel on worker's mesonotum. The original description of *C. auberti savinae* was based only on workers (Zimmermann, 1934). We collected males from two localities, but the female remains unknown.

The workers of the subgenus *Crematogaster* (*Orthocrema*) Santschi, 1918, are characterized by the presence of quadrate petiole in dorsal view. In Montenegro this subgenus is represented with one species, *C. sordidula*.

### ***Crematogaster*** **Lund, 1831**

Type genus: *Formica scutellaris*; by subsequent designation of Bingham, 1903: 124.

Subgenus *Crematogaster* Lund, 1831

Type subgenus: *Formica scutellaris*; by subsequent designation of Bingham, 1903: 124.

**1. *Crematogaster auberti savinae*** Zimmermann, 1934 (Figs. 1, 2A-B)

*Crematogaster auberti savinae* Zimmermann, 1934: 25 (loc. typ. Savina, Montenegro); Santschi, 1937: 312; Bolton et al., 2006.

**Material examined (Montenegro):** Adriatic coast: 1 worker, Boka Kotorska Bay, Kamenari, 09.08.1988, leg. G. Karaman; 1 worker, Boka Kotorska Bay, Činovica, on the oak tree, 09.07.1992, leg. M. Karaman; 8 males, Boka Kotorska Bay, Opatovo, 23.07.1996, leg. G. Karaman;

Inland: 1 male, 15.07.2003, Podgorica, in a garden, outside of a nest, leg. M. Karaman;

Localities cited: Zimmermann (1934): 20 workers, Savina (Herceg Novi), 17.05.1931;

Altitude: 0-100 m a.s.l.

**Range**: Southern and central Montenegro. Type species inhabit Iberian Peninsula, and part of France; the citation for Corsica is doubtful (Baroni Urbani, 1971). Some valid subspecies are present on the Mediterranean coast of Africa (*Crematogaster auberti levithorax* Forel, 1902 – Algeria, *Crematogaster auberti nigripes* Menozzi, 1940 – Libya, *Crematogaster auberti regilla* Santschi, 1937 – Morocco) and *Crematogaster auberti vogti* Forel, 1909 described from Spain.

**Ecology***:* We did not find nests of this species, only individual foragers were encountered on trees and shrubs. Males were collected at night using light source. Zimmermann (1934) also did not find any nest. He collected workers on a tree trunk of *Robinia pseudoacacia* and on the ground under the tree.

**Description**

Worker: *Crematogaster auberti savinae* together with *Crematogaster auberti, Crematogaster jehovae* and *Crematogaster fuentei* Menozzi, 1922 belongs to the group of species from the Mediterranean basin with trapezoidal dorsal face of petiole, and dorsum of alitrunk without prominent keel.

The original description of workers (Zimmermann, 1934) (translated from German by the author): Head and thorax uniform dark brown, gaster darker, almost black. Scapus and appendages paler, only the last segment of funiculus as dark as the head. Head smooth and shining, covered with feeble and fine pubescence, mandibles and lower part of chests shallowly longitudinally striated. Thorax short and wide, dorsum of pro- and mesonotum without keel. Basal part of epinotum shallowly longitudinally striated. Propodeal spines short,

massive, with broad base, slightly divergented in dorsal view, slightly curved in profile. Petiole short and broad, narrowing from front to rear. Abdomen shiny, pubescent.

The morphology of specimens collected in Montenegro fully corresponds with the above description. We supplemented it with our own observations. Head smooth and shining, covered with thin and fine pubescence, clypeus and genae are not longitudinally striated as in C. *jehovae*. The general appearance of the body is thicker than in *C. jehovae*. Dorsaly promesonotum smooth and shining, weakly punctulate sculptured (as in the type specimens). Workers of the subspecies *savinae* differ from the type workers in the shape of propodeal spines and epinotal sculptures. Propodeal spines of the type workers long, attenuate, and the width equal from the base to near the top; the top is sharp. Spines in *savinae* workers short, massive, with broad base and clearly peaked from the base to the top. They are slightly divergented in dorsal view, slightly curved in profile. Each propodeal spine is with one seta at the base, which is subequal in length to the spine. Basal part of epinotum more acute and longitudinally striated in *savinae* than in the type species, but less acute than in the subspecies *jehovae*. Mesopleuron mostly microareolate.

Measurements: TL 3.5 mm, 3.1 mm; HW 869.50, 795.50; HL 786.25, 721.50; CI 110.58, 110.26; SL 629.00, 656.75; SI 72.34, 82.55; LM 952.75, 841.75; PS 83.25, 69.37; A10 259.00, 259.00; A9 129.50, 120.25; A8 101.75, 97.12; DBT 351.50, 342.25; PW 296.00, 277.50; PPW 254.37, 231.25; PI 116.36, 119.78; PPI 29.25, 29.06; PnW 439.38, 411.62.

Workers of *C. auberti savinae* and *C. jehovae* are clearly different from other *Crematogaster* species that inhabit Montenegro in the size and the shape of the propodeal stigma. Thus, the aperture of stigma is slightly eliptical and the diameter equals the lenght of the propodeal spine (70 μm in our specimen) in *C. auberti-savinae* and *C. jehovae* (Fig. 1). In other species (*C. schmidti, C. gordani* and *C. ionia*) workers have dorso-ventral flattened aperture with diameter significantly smaller than the lenght of spines. Workers of *C. montenegrinus* have intermediate shape of aperture, and the width almost equals the length of propodeal spine, but the aperture is flattened dorso-ventrally.

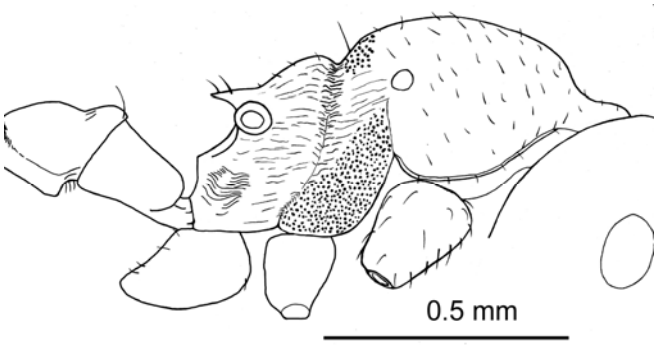


Figure 1. *Crematogaster. auberti savinae* Zimmermann, 1934, worker, thorax and petiole nodes, lateral view. Locality: Činovica, 09.07.1992.

Male: TL = 3.3-4.0 mm. Head smooth and shiny. 6-10 longitudinally rugulae are present from upper edge of mandible to lower border of eye. Striae are also present between the antennal insertion and the eye. Ocelli are eliptical (1/3 times wider than longer), ocelli 2 and 3 have the same diameter as ocelli 1. Mandible unidentate, sabre-shaped or with subapical small tooth (Fig. 2B). Several setae (6-9) are present on external side of each mandible. Scutum (mesonotum) shiny laterally, with very fine longitudinal striae medially. Notauli (Mayrian furrows) are not developed. Posterior margin of scutum is deeply longitudinally notched. Body is uniformly dark brown, appendages are slightly paler. Wings are without infuscation, veins are pale brown. Whole body covered with scattered, short, white setae. Several longer hairs present on dorsum of scuttelum.

Measurements: TL 3.6 mm, 3.5 mm, 3.3 mm; HW 610.50, 619.75, 601.25; HL 536.50, 564.25, 545.75; CI 113.79, 109.83, 110.17; SL 115.62, 97.12, 148.0; SI 18.94, 15.67, 24.61; OL 97.12, 106.37, 101.75; LM 1432.64, 1465.20, 1361.24; A1 92.50, 92.50, 83.25; A2 78.63, 87.87, 74.0; A3 69.37, 83.25, 74.0; PS 0, 0, 0.

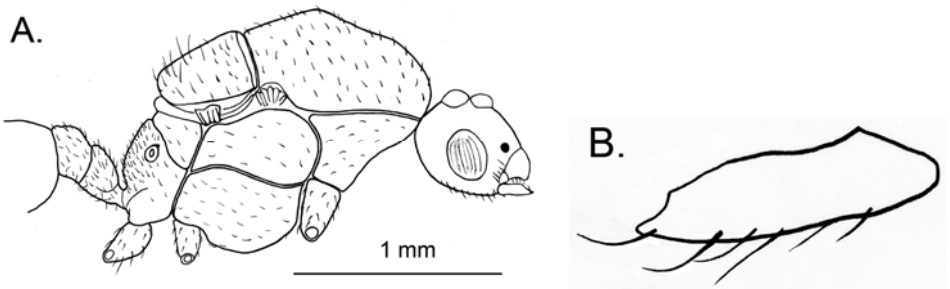


Figure 2. *Crematogaster auberti savinae* Zimmermann, 1934, male. Locality: Opatovo, 23.07.1996 A) Profil; B) Mandible.

**2. *Crematogaster jehovae* Forel, 1907**

*Crematogaster auberti* subsp. *jehovae* Forel, 1907: 207 (loc.typ. Jerusalem-Israel);

*Crematogaster auberti* subsp. *jehovae* Wheeler & Mann, 1916:170;

*Crematogaster jehovae* Emery, 1926: 3; Menozzi, 1933: 58; Agosti & Collingwood, 1987: 54.

**Material examined (Montenegro):** Adriatic coast: 1 worker, Boka Kotorska Bay, Jeremino brdo hill, 09.08.1988, leg. G. Karaman;

*Localities cited*: Collingwood & Petrov (1999): Škaljari, Boka Kotorska Bay, July 1993.

Altitude: 100 m a.s.l.

**Range**: Northeastern and Eastern coast of the Mediterranean Sea: Syria Wheeler & Mann, 1916; Palestine Menozzi, 1933; Lebanon Finzi, 1936; Israel Forel, 1907; Montenegro Karaman, 1999; Collingwood & Petrov, 1999.

**Ecology**: Very few data are available about the ecology of this species. In the coastal region of the Mediterranean Sea the nests were found at the bases of trees of *Tamarix* sp. and *Olea europea*, and various shrubs. Menozzi (1933) observed the workers feeding on scale insects (superfamily Coccoidea) on a tree of *Tamarix* sp.

**Description**

Workers: Cleary larger than the workers of the similar species, *C. auberti savinae*. Sculpture of head smooth and shining with only scattered micropunctures. Space between mandibula and eye longitudinally striated. Frontal line is not noticable. Clypeus shiny, longitudinally striated with ten weak lines starting from its lower edge and gradually fading at 1/2 to 2/3 of the clipeal height. Mandibles coarsely striated (stronger than in *C. auberti savinae* and *C. sordidula*). Head covered with scattered pubescence. Distance between their bases is equal the 1 ½ length of setae. The scape, the head and the last segment of the funiculus with the uniform colour, while the rest of the funiculus slightly lighter. Dorsum of alitrunk smooth without a prominent keel. Dorsal surface of thorax striated, striae less prominent than in *C. schmidti* and *C. gordani*, but stronger than in *C. sordidula*. Punctulate sculpture, originating from the tubers of the setae, is also prominent. Lateral side of epinotum longitudinally striated, infraspinal area smooth. Propodeal spines parallel when seen from above. Each propodeal spine is with one seta at base, seta is subequal in

length to the spine. Petiole trapezoidal, reddish-brown, uniform colour with head and thorax. Postpetiole dark brown, and with the uniform colour with the abdomen. Whole body covered with soft setae.

Measurements: TL 4.0 mm; HW 952.75; HL 869.50; CI 109.57; SL 703.00; SI 73.78; LM 138.75; PS 120.25; A10 342.25; A9 129.50; A8 111.00; DBT 351.50; PW 342.25; PPW 272.87; PI 125.43; PPI 28.64; PnW 453.25.

Subgenus *Orthocrema* Santschi, 1918

Type species: *Myrmica sordidula*; by original description.

**3. *Crematogaster sordidula* (Nylander, 1849)** (Fig. 3)

*Myrmica sordidula* Nylander, 1849: 44;

*Acrocoelia Mayri* Mayr, 1853b: 114 (loc.typ. Zadar-Dalmacija);

*Crematogaster sordidula Mayri* Müller, 1923: 74;

*Crematogaster sordidula mayri* (=var. *flachi* Forel) Zimmermann, 1934: 26; Karaman, 1999: 96; Karaman, 2002: 53;

*Orthocrema sordidula* Bernard, 1978: 43;

*Crematogaster sordidula* Agosti & Collingwood 1987: 54; Karaman et al., 1998: 46; Bračko, 2006: 136.

**Material examined (Montenegro):** Adriatic coast: 10 workers, Boka Kotorska Bay, Donji Morinj, macchia, under the stone, 11.06.1998, leg. M. Karaman; 18 workers, Vrmac Mnt., Špilje, meadow, in the ground, 30.04.1994, leg. M. Karaman; 1 female, 60 workers, Tivat, 26.03.1991, leg. G. Karaman; 43 workers, Lovćen Mnt., Kaluđerovići village, under a stone, in the ground, macchia, 15.03.2002, leg. M. Karaman; 47 workers, Trsteno, macchia, under a stone, 12.05.2004, leg. M. Karaman; 6 workers, Rijeka Crnojevića, under a plank, in the ground, 13.05.1999, leg. M. Karaman; 12 workers, Crmnica, Boljevići village, nest is in a tree trunk, at the forest edge, 07.09.2001, leg. M. Karaman; 3 workers, Reževići village (Budva), nest in the ground, under a stone, 20.04.1997, leg. Č. Ivanović; 2 workers, Stari Bar, 01.04.1994, leg. G. Karaman; 5 workers, Vrsuta Mnt, at graveled top of the mountain, under a stone, 29.04.2002, leg. M. Karaman; 11 workers, Sutorman Mnt, plant association of hornbeam, oak tree and *Ruscus aculeatus* L., 18.03.2002, leg. M. Karaman; 1 female, 30 workers, Valdanos, olive forest, under a stone, in the ground, 03.09.1997, leg. M. Karaman; 3 workers, Skadar Lake, Donji Šestani village, on a rocky slope, 08.05.1998, leg. M. Karaman; 8 workers, Ulcinj, pine forest, 08.05.1998, leg. M. Karaman;

Inland: 25 workers, Podgorica: mouth of Zeta River, 20.04.1985, leg. G. Karaman; 44 workers, Podgorica: Selišta hill, 10.05.1987, leg. G. Karaman; 21 workers, 5 females, 14 males, Canyon of Mala Rijeka River, 20.06.1996, leg. M. Karaman; 20 workers, Podgorica, Ljubović hill, 11.10.1996, leg. M. Karaman; 33 workers, Canyon of Morača River, Begova Luka, 19.08.2004, leg. M. Karaman; 101 workers, Podgorica: Piperi, Vežešnik, on a rocky slope, nest under a stone, 09.10.2005, leg. M. Karaman;

Localities cited: Zimmermann (1934): Sutorina, Topla, Trebešin, Savina, Zelenika, Kotor and Budva, September 1928 and May 1931;

Altitude: 0-1183 m a.s.l.

**Range**: This is a palaearctic species, distributed from the Mediterranean region to Japan. The typical subspecies, *C. sordidula sordidula*, is restricted to the coastal region of the Mediterranean Sea, the Near East and the Caspian Sea.

**Ecology**: This species prefers open, exposed habitats. Most of the collections were made in the open fields, grassy and rocky, and rarely in macchia or in forest edges. On the southern slopes of the mountain range Rumija we observed this subspecies from the sea level to the top of mountain Vrsuta at 1183 m a.s.l.

**Description**

Workers: Front of the head smooth and shiny. Only the punctulate sculpture, originating from the tubers of the setae, is prominent. Distance between the bases of setae is 7/10-9/10 the length of setae. Clypeus shiny, smooth medially, with a pair of longitudinal rugulae on both sides, at the level of frontal carinae. Inner rugula longer than the outer one. Mandibles smooth and shiny, covered with appresed pubescence. Masticatory border with five teeth, the first tooth is the biggest, sharply pointed, the second one is half the size of the first one, and the remaining three are blunt and small. Thorax shiny dorsally, some parts of pro- and mesonotum finely irregularly sculptured. Promesonotum with 6-10, epinotum with four long setae, of which two are at a base of each propodeal spine. Petiole with four, and postpetiole with 6-10 suberect long setae. Dorsal surface of gaster densely setose, setae long, distance between their bases equals their length. Antennae with abundant, long, suberected setae, legs with scattered suberect setae. Propodeal suture broad, well impressed but less visible in side view due to lateral mesonotal carinulae that continues into dorsal face of propodeum. Propodeal spines long, about 2-2.5 times longer than their width at the base, thin, sharply pointed, divergent in dorsal view. Apex is upcurved.

Based on the cephalic index, two groups of workers can be recognized, the first group with CI≥104, and the second one with CI ≤ 95. Similar grouping is not exhibited in the total length of the body of the specimens, and no other morphological differences between these two groups were observed.

Measurements (Italic font indicates CI ≤ 95): TL 3.0 mm, 2.7 mm, 2.3 mm, 3.2 mm, 3.0 mm, 2.9 mm; HW 721.50, 721.50, 693.75, 703.0, 610.5, 647.50; HL 693.75, 619.75, 656.75, 740.0, 689.12, 703.00; CI 104.00, 116.41, 105.63, *95.0, 88.60, 92.10;* SL 592.00, 545.75, 527.25, 582.75, 550.37, 555.00; SI 82.05, 75.64, 76.00, 82.90, 90.15, 85.71; LM 767.75, 666.00, 666.00, 795.5, 712.26, 841.75; PS 111.00, 129.50, 101.75, 115.63, 111.0, 129.50; A10 249.75, 249.75, 259.00, 231.26, 254.38, 240.50; A9 97.125, 115.62, 120.25, 124.88, 106.37, 106.37; A8 64.75, 64.75, 64.75, 74.0, 55.5, 60.12;

Female: The front of the head and the occiput smooth. Mandibles smooth, covered with pubescence. Masticatory border the same as in worker. Clypeus with the same ornamentation as in worker. Frontal furrow deeply grooved. Antennal scape reaches occipital margin. Scutum and scutellum smooth dorsally, as well as paraptera of mesonotum. Only the joint region between paraptera and scutellum longitudinally striated. Pubescence covers entire body including antennae and legs. Entire dorsal surface of the first gaster tergit with appressed pubescence, other segments with pubescence only at posterior border. Longer setae on thorax present on scutum, scutelum, epinotum, petiole and postpetiole. Distance between their bases equals the half of their length. Propodeal spines short, triangular, shorter than their width at the base. Wing venation is brown, and wings are yellow-brown.

Measurements: TL 8.0 mm, 7.8 mm, 6.2 mm; HW 1233.60, 1066.55, 1092.25; HL 1092.25, 989.45, 976.60; CI 112.94, 107.79, 111.84; SL 783.85, 796.70, 777.00; SI 63.54, 74.69, 71.14; OL 83.25, 89.95, 64.75; LM 2107.0, 2099.16, 2058.00; PS 185.00, 0, barely visible protuberances; A10 296.00, 300.62, 305.25; A9 138.75, 124.87, 138.75; A8 101.75, 106.37, 92.50.

Male: Face and clypeus smooth, only the bases of setae prominent. Mandible smooth and shiny, with well differentiated apical tooth. Several long setae present on external and masticatory margins (Fig. 3). Main ocellus orbiculate, lateral ocelli eliptic. Dorsal surface of thorax smooth and shiny without underlying pubescence. Only scattered erected setae are present. Mayer's line is well defined, visible up to the half of the scutum length. Petiole nodes and abdominal tergits with sparce long hairs on dorsal surfaces, somewhat more abundant at tergits. Funiculus shortly, and densely pilose, legs with longer and scattered pubescence. Postpetiole subquadrate, not broadly bilobed. Colour is uniformly brown, appendiges somewhat lighter.

Measurements: TL 3.0 mm, 2.6 mm, 2.6 mm; HW 508.75, 481.00, 508.75; HL 453.25, 444.00, 444.00; CI 112.24, 108.33, 114.58; SL 101.75,

92.50, 92.50; SI 20.00, 19.23, 18.18; OL 55.50, 55.50, 64.75; LM 1054.50, 1015.15, 999.00; A1 64.75, 55.50, 64.75; A2 55.50, 46.25, 55.50; A3 41.62, 46.25, 46.25; PS 0, 0, 0.

Figure 3. *Crematogaster sordidula* (Nylander, 1849), male mandible. Locality: Canyon of Mala Rijeka River, 20.06.1996.

**Taxonomical note:** The species belongs to the subgenus *Crematogaster* (*Orthocrema*) Santschi, 1918, characterized by quadrate petiole in a dorsal view. Mayr (1853b) described var. *mayri* from the east coast of the Adriatic Sea. This taxon differs from the type species in several characteristics as noted by Zimmermann (1934) and Emery (1926). Zimmermann distinguished *mayri* from the type species by its darker, brown to black, body colour, and nearly smooth to completely smooth dorsum of promesonotum (the type workers have irregular rugae). Emery remarks that in the females of the subspecies *mayri* the scape does not reach occipital border, and the head is almost quadrate with slightly emarginate occipital border. In type female head is rectangular, and the scape reaches occipital border. Antenae in the typical species are yellow, versus dark in *mayri*. Head in males of the type species is about 1.25 times as wide as long. In *mayri* the head is about 1.5 times as wide as long, the eyes are slightly larger and pronounced, and the mandibles are smaller than in the type species. Based on the literature data the subspecies *mayri* inhabits the entire Balkan Peninsula and spread eastward to the West Anatolia (Aktac, 1976) and islands in the Ionian Sea (Baroni Urbani, 1971).

*C. sordidula mayri* has been treated as a junior synonym of *C. sordidula* (Agosti & Collingwood 1987, Atanasov & Dlusskij, 1992, Bolton et al., 2006) or as a valid subspecies (Baroni Urbani, 1971; Karaman, 1999). Our collections of the subspecies *mayri* from Montenegro and Macedonia did not fit the descriptions of this subspecies given by Zimmermann (1934) and Emery (1926). According to these two authors, the colour of the body is brown to black and the dorsal sculpture of the thorax is smooth. However, we observed the variations in the colour of the body and the dorsal sculpture of the thorax in workers. The colour varies from brown to dark-brown, and to almost black. The thorax is shiny dorsally, but it is not completely smooth; some of its parts are covered with fine, irregular rugae. In addition, the scapes in female reach the occipital border (Emery previously described that they are not reach occipital border, and the head is not quadrate

(CI= 107-111). In males the size of the head is not so much wider than long (CI= 108-114 opposite to the Emery's observation CI=150), as Emery mentioned. If some of the workers would fit the description of Zimmermann and Emery, than either the females or the males, or both collected from the same nest did not fit their description.

Based on our observations we can conclude that the delimitation of subspecies from the type species is based on the morphological characters that are very variable across the range of *C. sordidula*. Therefore, we believe that as such, those characters can not be considered valid taxonomical characters. Our measurements suggest that var. *mayri* is junior synonym of *sordidula sordidula*.

**Key to the worker caste of the Genus *Crematogaster* of Southern European Species**

**1.** Petiole node quadrate in dorsal view .....**2**

- Petiole node trapezoidal narrowing from front to rear in dorsal view ……...**3**

**2.** SI < 88. General colour of the body dark brown to almost black ……***C. sordidula*** (Nylander, 1849)

- SI > 88. Scape longer than in *C. sordidula*. General colour of the body reddish. South-east France, the Esterel Massif ……..……...***C. esterelana*** Bernard, 1978

**3.** Dorsum of alitrunk smooth without a prominent keel ……..…..**4**

- Dorsum of alitrunk sculptured with more or less prominenet promesonotal keel …**6**

**4.** Body colour dark brown to black. ……....**5**

- Head and thorax dark red, abdomen darker, almost black ….***jehovae*** Forel, 1907

**5.** Propodeal spines long, thin, equal in thickness from the base to near the top, the top sharp-pointed ……..……...……***auberti auberti*** Emery, 1869

- Propodeal spines short, massive, with broad base and sharp pointed apex; slightly divergent in dorsal view, slightly upcurved in profile; clypeus and genae without longitudinal striae. East Adriatic coast ……....***auberti savinae*** Zimmermann, 1934

- Propodeal spines somewhat shorter than in type species. General colour black, mandibles redish, legs and antenae brown. Median furrow on postpetiole is less developed than in type worker. Andalusia (Spain) …….***auberti vogti*** Emery, 1909

- Propodeal spines very short, with broad base and blunt apex; clypeus slightly striated, but shiny. Spain…… ***fuentei*** Mennozi, 1922

**6.** Occipital border of the head emarginate. Propodeal spines strongly developed. Eyes placed in the middle of the head ……***lorteti*** Forel, 1910

- Occipital border of the head more or less rounded. Eyes placed closer to the occipital border ……**7**

**7.** Body colour is not uniformly dark brown to black ……...**8**

- Entire body uniformly dark brown to black ……..……..**11**

**8.** Entire body uniformly yellow or dark yellow. Appressed pubescence between eyes with hairs spaced by a distance slightly longer than their lenght ……..……..…***gordani*** Karaman, 2008

- Abdomen black, head and alitrunk more or less reddish. Appressed pubescence between eyes with hairs spaced by a distance equal or slightly shorter than their lenght ……..……**9**

**9.** Head paller than the rest of the body, usually dark yellow to reddish, alitrunk and petiole nodes dark redbrown ……...***scutellaris*** (Oliver, 1792)

- Head and alitrunk of different colour ……..……**10**

**10.** Head, alitrunk and petiole reddish, postpetiole usually darker, but never black. Gaster black. Frontal triangle smooth and shiny ……..…..***schmidti*** (Mayr, 1853)

- Head, alitrunk and petiole nodes dark redbrown. Frontal triangle shiny, with 3-4 weak longitudinal striae……..……... ***ionia*** Forel, 1911

**11.** Body generally almost black. Propodeal spines short, their length is not clearly longer than their basal width ……..……..……...***laestrygon*** Emery, 1869

- Body generally dark brown. Lenght of propodeal spines is clearly longer than their basal width ……..**12**

**12.** Body lenght 4.0-4.5 mm. Propodeal spines long and narrow ……..…… ***algirica*** (Lucas, 1849)

- Body lenght 2.9-3.4 mm. Propodeal spines shorter than in *algirica* ……..……..……..***montenigrinus*** Karaman, 2008

## Distribution

Genus *Crematogaster* is distributed in the southern and central parts of Montenegro, in the areas with mediterranean and submediterranean climate [in the zones where the tree of *Olea europea* is found either as autochtone or allochtone element, as mentioned by Santschi (1937)]. The most common species are

*C. schmidti* and *C. sordidula.* Both species are found along the entire Adriatic coast of Montenegro, and in central parts of the country they are common in areas with significant influence of the mediterranean climate. Other species [*C. gordani*, *C. montenigrinus, C. ionia, C. auberti savinae* and *C. jehovae*] are more or less rare, and were collected only sporadically in the central part of Montenegro and the Adriatic coast.

*Crematogaster sordidula* tolerates the widest altitude range, colonies were found from the sea level to 1183 m a.s.l. [at the top of the mountain Vrsuta]. *Crematogaster montenigrinus* was found only at two localities, both below 50 m altitude. Most of the colonies of other species were found below 500 m a.s.l., with *C. schmidti* sporadically extending its range up to 800 m altitude (Vrmac Hill in the Boka Kotorska Bay, Kuči in the Podgorica region).

The northernmost locality of the genus is the upper part of Morača river canyon, about 100 km away from the coastal line, and at 660 m a.s.l (Ljuta village). We discovered several nests of *C. schmidti* there. Such deep inland distribution of the genus is explained by the climatic conditions of the canyon. This canyon is under direct influence of the mediterranean climate that enters the canyon via the Skadar Lake and extends northward following the river Moraca. One worker of the *C. schmidti* was found in the material collected on Durmitor Mountain (at 1450 m a.s.l.). Because no long lasting colonies were ever found in that region we believe that this species is not native for the region.

## Conclusion

Our investigation confirms that *Crematogaster sordidula mayri* is junior synonym of *C. sordidula sordidula*. Findings of *Crematogaster lorteti* (subgenus *Atopogyne*) in Montenegro (Petrov, 2000) is not confirmed by our extensive field collections. *C. lorteti* is described from Syria (Forel, 1910), and was reported from the mediterranean part of the Orient (Santschi, 1934) and Palestina (Wheeler & Mann, 1916). So far, the species has not been reported for any other locality in the Balkan Peninsula. Therefore, considering the present known distribution of the species, we conclude that *C. lorteti* is not present in Montenegro.

## Özet

### Crna Gora (Karadağ)'da *Crematogaster* Lund, 1831 (Hymenoptera: Formicidae) cinsine ait yeni bilgi: Bölüm II: *Crematogaster auberti savinae* Zimmermann, *1934* erkeklerinin deskripsiyonu

*Crematogaster auberti savinae* Zimmermann, 1934 erkekleri ilk kez tanıtılmış ve bu alt türün işçileri de yeniden tanıtılmıştır. *Crematogaster sordidula mayri* (Mayr, 1853) erkekleri *C. sordidula sordidula* (Nylander 1849)'nun sinonimi olarak tanıtılmıştır. *Crematogaster* cinsinin (*C. gordani* Karaman 2008, *Crematogaster ionia* Forel 1911, *C.*

*montenigrinus* Karaman 2008, *C. schmidti* (Mayr 1853a), *C. auberti savinae* Zimmermann 1934, *C. jehovae* Forel 1907 ve *C. sordidula* (Nylander 1849) Crna Gora (Karadağ)'daki coğrafi dağılımı sunulmuştur.

Güney Avrupa'daki bütün *Crematogaster* türlerine ait işçi bireylerine dayalı teşhis anahtarları oluşturulmuştur.

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