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Research Article

Ants of the genus *Camponotus* Mayr, 1861 (Hymenoptera: Formicidae) in the Kaz Mountains, Turkey, with descriptions of sexuals of *Camponotus candiotes* Emery, 1894 and *Camponotus ionius* Emery, 1920

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Abstract: The *Camponotus* fauna of the Kaz Mountains was examined horizontally and vertically, from 175 to 1600 m a.s.l. Materials were collected from 20 different localities and 11 different habitats between 2001 and 2003. In all, 14 species belonging to 3 subgenera (*Colobopsis* Mayr, *Myrmentoma* Forel, and *Tanaemyrmex* Ashmead) were found. The hitherto unknown sexuals of *C. candiotes* Emery and *C. ionius* Emery are described for the first time.

Key words: *Camponotus*, sexuals, description, key, Kaz Mountains, Turkey

Kaz Dağları (Türkiye) *Camponotus* Mayr, 1861 (Hymenoptera: Formicidae) Cinsi Karıncaları ile *Camponotus candiotes* Emery, 1894 ve *Camponotus ionius* Emery, 1920 eşey bireylerinin deskripsiyonları

Özet: Bu çalışmada, Kaz Dağları *Camponotus* faunası 175-1600 m.'ler arasında horizontal ve vertikal olarak çalışılmıştır. 2001-2003 yıllarında, 20 farklı lokalite ve 11 farklı habitattan materyal toplanmıştır. 3 altcinse (*Colobopsis* Mayr, *Myrmentoma* Forel, *Tanaemyrmex* Ashmead) ait 14 tür bulunmuştur. *C. candiotes* Emery ve *C. ionius* Emery'un şimdiye kadar bilinmeyen eşey bireyleri ilk defa tanımlanmıştır.

Anahtar sözcükler: *Camponotus*, eşey bireyleri, tanımlama, anahtar, Kaz Dağları, Türkiye

Introduction

The genus *Camponotus* is the largest ant genus in the world, consisting of over 1500 described species and subspecies (Bolton et al., 2006). It is represented in the Palaearctic region by more than 200 taxa. *Camponotus* is also the most populous genus in Turkey, with 38 taxa (34 species and 4 subspecies). Of these, 13 taxa were originally recorded without a precise locality or were only mentioned once in old publications and have not been recorded again. Most

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of these dubious records are of questionable legitimacy and were given from Western Anatolia. Moreover, despite the fact that the Western Anatolia region consists of 11 main mountains, (Madra, Yunt, Aydın, Menteşe, Honaz, Türkmen, Emir, Murat, Kaz, Samanlı, and Uludağ), the species of the genus *Camponotus* were only recorded from 2: Uludağ Mountain (2541 m a.s.l.) and the Samanlı Mountains (1601 m a.s.l.). Nonetheless, the importance of the Kaz Mountains (designated as a national park in 1993), which has served as an refugium for fauna that escaped from Europe during glacial periods (Demirsoy, 2002), has resulted in investigations of the mammal, reptile, and amphibian fauna in recent years (Yiğit et al., 2006; Hür et al., 2008). On the other hand, there are no records of ants or the *Camponotus* fauna of the Kaz Mountains as yet. The aim of the present study was to investigate the genus *Camponotus* and record the occurrence of dubious *Camponotus* species in the Kaz Mountains (Figure 1), which have variable climates (e.g. Mediterranean, Black Sea, and steppic) and vegetation types. The results will expand our knowledge of the general distribution of the species of this genus. A key to the workers, queens, and males of the recorded species is provided.

Materials and methods

The Kaz Mountains form the border between the Marmara and Aegean regions of Turkey, and are the meeting point of 2 major phytogeographic regions: the Euro-Siberian and Mediterranean. As a result, Mediterranean vegetation is more prevalent on the southern slopes, while Black Sea vegetation is more widespread on the northern and northwestern slopes. The region's overall vegetation structure is composed of forest community, shrub vegetation, and high mountain steppe. Extensive red pine (*Pinus brutia* Tenore) forests are widespread on the southern slopes up to 850 m a.s.l. and on the northern slopes up to 400 m a.s.l., whereas above these elevations *P. brutia* forest is replaced with black pine (*P. nigra* Arnold) forest. In disturbed areas of black pine forests, secondary forests have developed, in which oak species (*Quercus cerris*

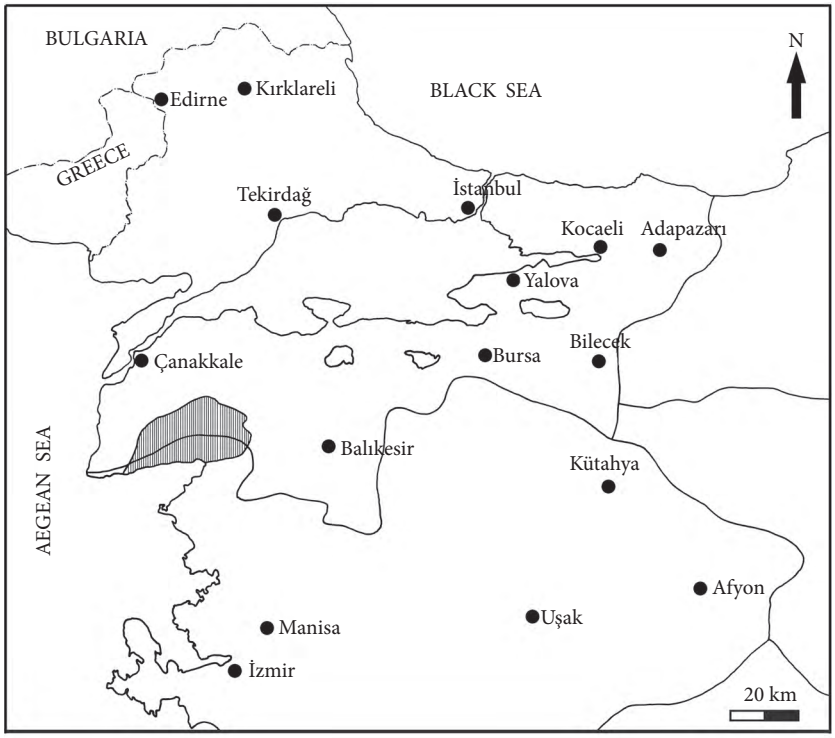

Figure 1. Location of the Kaz Mountains in Western Anatolia.

L var. *cerris, Q. frainetto* Tenore, and *Q. petraea* Liebl. subsp. *iberica* [Steven ex. Bieb.] Krassiln) are predominant. Black pine forests are also interrupted by endemic fir forest (*Abies nordmanniana* Mattf. subsp. *equi-trojani* [Ascher. et Sint.] Coode et Cullen) and beech forest (*Fagus orientalis* Lipsky). The areas in which forest destruction is extensive are represented by shrub vegetation, whereas areas at altitudes above 1500 m a.s.l. are characterized by high mountain steppe specific to Mediterranean mountains (Özel, 1999).

The localities studied in the Kaz Mountains can be grouped into 11 different habitats: brook side (*Quercus* spp., *P. brutia*, *Platanus orientalis* L., and *Ulmus* spp.), bushes (*Q. coccifera* L. bushes), fir forest (*A. nordmanniana* subsp. *equi-trojani*), fruit orchard (*Malus domestica* Borkh. and *Prunus persica* L.), maquis (*Quercus* spp. and *Juniperus* spp.), mixed forests (*P. sylvestris* L. and *P. nigra*, *P. nigra, Castanea sativa* Mill., and *P. orientalis*, and *Quercus* spp. and *Juniperus* spp.), oak forest (*Quercus* spp.), olive forests (*Olea europaea* L.), pine forests (*P. brutia* and *P. nigra*), town center, and village center.

The materials were collected from the Kaz Mountains between 2001 and 2003. Small ant specimens were collected with an aspirator and large specimens were collected by hand. Localities, altitudes, habitat types, study dates, and geographic coordinates are shown in Table 1. The numbers given for each species in the following section represent the localities shown in Table 1; geographic distribution is given in the direction from west to east. The study material is stored at the Biology Department of Trakya University. Various morphometrics of the sexuals of *C. candiotes* Emery and *C. ionius* Emery were measured, and the following indices were calculated (Tables 2 and 3).

Morphometrics: HL: head length, from the anterior point of the median lobe of the clypeus to the midpoint of the occipital margin; HW: head width, maximum width behind the posterior margin of the eye; EL: eye length; SL: antennal scape length, excluding the basal condyle; CL: clypeus length, maximum length, including the posterior lobes (if present); CW: clypeus width, maximum width of the clypeus between the tentorial pits; AL: alitrunk length, diagonal length of the alitrunk laterally from the anterio-dorsal margin of the alitrunk to the posterior margin of the lobe of the metapleura; AH: alitrunk height, from the upper level of the mesonotum to the lower margin of the mesopleura; FFL: maximum length of the front femora; FFW: maximum width of the front femora.

Indices: CI (cephalic): HL/HW; SI1 (antennal scape 1): SL/HL; SI2 (antennal scape 2): SL/HW; CLI (clypeal): CW/CL; FFI (front femora): FFW/FFL; AI (alitrunk): AL/AH; EI (eye): EL/HL.

Results

The collected species with ecological and some morphological notes, and geographic distributions are given below.

***Camponotus* (*Myrmentoma*) *aegaeus* Emery, 1915**

Material examined: 1: ☿ ☿ ; **2**: ☿ ; **5**: 15 ☿ ☿ ; **6**: 16 ☿ ☿ ; **7**: 22 ☿ ☿ ; **9**: ☿ ☿ ; **13**: 4♀♀: 2♀♀: **16**: ☿ ; **18**: ☿ ☿ ; **19**: 10 ☿ ☿ ; **20**: 2 ☿ ☿ .

Remarks: Nests were in the soil, often under stones. *C. aegaeus* was collected from 7 habitats: bushes, brook side, maquis, mixed (*P. sylvestris* and *P. nigra*) and oak forests, olive forests, and pine forests (*P. brutia* and *P. nigra*), from 200 to 800 m a.s.l. *C. aegaeus* is a species of the group *kiesenwetteri* that was described by Radchenko (1997b) and it is differentiated from other members of the group *kiesenwetteri* by having a thin petiolar scale, which is thick in *C. libanicus* André, 1881, and absence of a mesopropodeal groove, which is present in *C. boghossiani* Forel, 1911 and *C. kiesenwetteri* (Roger, 1859).

Geographic distribution: Crete, Dodecanese Islands, and Turkey.

***Camponotus* (*Myrmentoma*) *boghossiani* Forel, 1911**

Material examined: 10: 6 ☿ ☿ .

Remarks: Workers were collected from stone surfaces. This species was collected from *P. nigra* forest openings at 1200 m a.s.l. *C. boghossiani* is similar to *C. kiesenwetteri*; however, the former is easily differentiated from the latter by the absence of small denticles at the posterior margin of the propodeum.

Table 1. Localities studied in the Kaz Mountains.

Loc. No.	Locality	Coordinates	a.s.l. (m)	Habitat	Date
1.	Çanakkale–Bayramiç–Çalıdağ village	N 39°44′ E 26°33′	600	Mixed forest	07.07.2001
2.	Çanakkale–Bayramiç	N 39°48′ E 26°36′	175-300	Fruit orchard, Mixed forest, Oak forest, Town center	08-09.07.2001/ 22-24.05.2002
3.	Çanakkale-Bayramiç-Yeşilköy village	N 39°50′ E 26°50′	400-900	Fruit orchard, Oak forest	08.07.2001
4.	Çanakkale –Evciler–Ayazma	N 39°45′ E 26°47′	400	Mixed forest	09.07.2001
5.	Çanakkale–Bayramiç–Yassıbağ village	N 39°44′ E 26°40′	310-440	Pine forest, Village center	10.07.2001/ 13.05.2003
6.	Balıkesir–Edremit–Hanlar village	N 39°35′ E 27°01′	350	Pine forest	16.07.2001
7.	Balıkesir–Edremit–Hacıaslanlar village	N 39°38′ E 27°04′	300-360	Brook side	19.09.2001
8.	Balıkesir–Altınoluk–Doyran village	N 39°35′ E 26°42′	330-500	Maquis, Pine forest	20.09.2001
9.	Balıkesir–Edremit–Zeytinli–Pınarbaşı village	N 39°39′ E 26°57′	510-1200	Pine forest, Oak forest	21-22.09.2001
10.	Çanakkale–Evciler–Çırpılar village	N 39°48′ E 26°52′	1200-1350	Pine forest, Fir forest	23.05/23-24.08.2002
11.	Çanakkale–Çan–Bardakçılar village	N 39°55′ E 26°58′	250	Oak forest	24.05.2002
12.	Çanakkale–Ayvacık	N 39°36′ E 26°24′	450	Pine forest	25.05.2002
13.	Balıkesir–Edremit–Altınoluk	N 39°34′ E 26°44′	240	Olive forests	25.05.2002
14.	Balıkesir–Edremit–Sarıkız Hill	N 39°41′ E 26°55′	1600	Pine forest	21.08.2002
15.	Çanakkale–Yenice–Kalkım–Handere	N 39°81′ E 27°22′	320	Brook side	21.08.2002
16.	Çanakkale–Ayvacık–Kırca village	N 39°37′ E 26°33′	320	Oak forest	22.08.2002
17.	Çanakkale–Ayvacık–Süleymanköy village	N 39°38′ E 26°26′	300	Pine forest	22.08.2002
18.	Çanakkale–Ayvacık–Dibekli village	N 39°37′ E 26°28′	300	Bushes	23.08.2002
19.	Çanakkale–Ayvacık–Uzunalan village	N 39°40′ E 26°35′	400	Brook side	23.08.2002
20.	Çanakkale–Bayramiç–Külcüler village	N 39°48′ E 26°46′	237	Pine forest	13.05.2003

Table 2. Measurements (in mm) and indices of the *Camponotus candiotes* sexuals.

Measurements and indices	*C. candiotes* (queen) n = 22		*C. candiotes* (male) n = 17	
	Range	Mean	Range	Mean
Measurements				
HL	1.52-1.66	1.56	0.79-0.93	0.86
HW	1.30-1.50	1.46	0.76-0.91	0.84
EL	0.37-0.46	0.43	0.29-0.37	0.35
SL	1.12-1.24	1.18	0.81-0.94	0.88
AL	2.53-2.87	2.71	1.76-2.19	1.99
AH	1.59-1.84	1.72	1.11-1.45	1.28
CL	0.45-0.60	0.54	0.21-0.27	0.24
CW	0.57-0.71	0.63	0.36-0.43	0.38
FFW	0.33-0.44	0.37	0.19-0.25	0.22
FFL	1.12-1.21	1.18	1.01-1.20	1.12
Indices				
CI	1.05-1.08	1.07	1.01-1.04	1.03
SI_1	0.72-0.79	0.76	0.99-1.04	1.02
SI_2	0.78-0.85	0.81	1.04-1.06	1.05
CLI	1.04-1.32	1.19	1.58-1.63	1.61
AI	1.53-1.66	1.58	1.54-1.57	1.56
FFI	0.29-0.39	0.31	0.19-0.21	0.20
EI	0.24-0.29	0.28	0.40-0.41	0.40

Table 3. Measurements (in mm) and indices of the *Camponotus ionius* male.

Measurements and indices	*C. ionius* (male) n = 4	
	Range	Mean
Measurements		
HL	1.36-1.43	1.40
HW	1.07-1.19	1.15
EL	0.46-0.50	0.48
SL	1.77-1.83	1.85
AL	2.91-3.37	3.08
AH	2.13-2.29	2.18
CL	0.37-0.38	0.38
CW	0.50-0.56	0.53
FFW	0.42-0.48	0.45
FFL	2.17-2.26	2.21
Indices		
CI	1.19-1.27	1.22
SI_1	1.26-1.35	1.31
SI_2	1.51-1.71	1.59
CLI	1.36-1.47	1.41
AI	1.36-1.47	1.41
FFI	0.18-0.22	0.20
EI	0.33-0.35	0.34

Geographic distribution: Dodecanese Islands, North Aegean Islands, and Turkey.

***Camponotus* (*Myrmentoma*) *candiotes* Emery, 1894**

Material examined: 1: ☿ ☿ ; **4**: 21 ☿ ☿ : 1♀; **5**: 17 ☿ ☿ , 2♀♀; **6**: ☿ ☿ ; **7:** 12 ☿ ☿ , 5♀♀; **8**: 19 ☿ ☿ , 18♀♀, 9♂♂; **9**: ☿ ☿ , 1♀; **12**: ☿ ☿ , 1♀; **16**: ☿ ☿ , 1♀: 8♂♂; **19**: ☿ ☿ .

Remarks: Nests were under stones and inside dry pine branches. *C. candiotes* was collected from brook side, mixed forests (*P. sylvestris* and *P. nigra*, and *P. nigra*, *Castanea* spp., and *P. orientalis*), oak forest, and pine forests (*P. brutia* and *P. nigra*), from 320 to 800 m a.s.l.

Kiran and Aktaç (2006) recorded workers and males of *C. candiotes* for the first time from Turkey from the Samanlı Mountains (from 500 to 950 m a.s.l.), but they did not describe the male of the species, which was unknown at that time. The descriptions of the queen and male are given below.

Geographic distribution: Greece, Crete, Dodecanese Islands, and Turkey.

Description of the queen (Figure 2a and b) (measurements and indices in Table 2)

Head slightly longer than broad (CI: 1.05-1.08; mean CI: 1.07), in frontal view slightly narrowed from dorsal margin to anterior margin, dorsal margin of head straight or slightly convex; anterior and posterior margins of clypeus notched medially; mandibles with 5 teeth; eyes positioned in the upper half of head; antennae 12-segmented, antennal scape ovoid, and thickening at the apex and surpassing dorsal margin of head distinctly. Mesosomal characters same as *C.*

lateralis (Oliver), but more slender (AL: 2.53-2.87; mean AL: 2.71; AH: 1.59-1.84; mean AH: 1.72). Dorsal margin of propodeum equal in length to its declivity. Petiole in profile slightly tapering to dorsal margin, anterior face convex, posterior face almost straight, and in frontal view dorsal margin slightly convex or straight. All sides of head covered with erect hairs or sometimes occipital corners only with decumbent hairs; antennal scape with abundant erect hairs (not fewer than 10); antennal scape and funicular segments covered with densely appressed pubescence; femora and tibiae covered with thick decumbent pubescence; dorsal margin of petiole with very short erect pubescence, and each dorsal corner and lateral side with 4-5 long erect hairs.

Head and alitrunk dark reddish-brown to brown, gaster dark reddish-brown; antennal scape, legs, petiole, mandibles, and flagellum dark rust red; entire body shiny.

Description of the male (Figure 2c and d) (measurements and indices in Table 2)

Head slightly longer than broad (CI: 1.01-1.04; mean CI: 1.03), lateral sides of head almost parallel in front of eyes, dorsal margin of head convex; in frontal view anterior clypeal margin almost straight or slightly convex, without median notch, posterior margin notched medially and concave, in profile clypeal carinae strongly prominent; mandibles without teeth; eyes positioned to middle and lateral sides of head; antennae 13-segmented, antennal scape surpassing dorsal margin of head almost by 1/3 of its length. Mesosomal characters same as *C. lateralis*, but more slender (AL: 1.76-2.19; mean AL: 1.99; AH: 1.11-1.45; mean AH: 1.28). Petiole in profile tapering to dorsal margin, anterior face straight or slightly convex, basal half of posterior face straight, upper half quite convex and in frontal view dorsal margin slightly concave. All sides of head covered with erect hairs; genae with no fewer than 7, short erect hairs; gula with long erect hairs; antennal scape covered with abundant erect hairs; dorsal corners and lateral sides of petiole with 4-5 long hairs.

Entire body black, sometimes head and gaster brownish; legs dark brownish, flagellum brownish, and mandible chestnut; entire body shiny.

***Camponotus* (*Myrmentoma*) *gestroi* Emery, 1878**

Material examined: 2: ☿ ; **13**: 5 ☿ ☿ ,♀.

Remarks: Nest was in the soil at the foot of olive forests and workers were on trees. *C. gestroi* was collected from maquis and olive forests, from 200 to 240 m a.s.l. Kıran and Aktaç (2006) recorded *C. gestroi* from 420 m a.s.l. from olive forests in the Samanlı Mountains. *C. gestroi* has not been recorded from

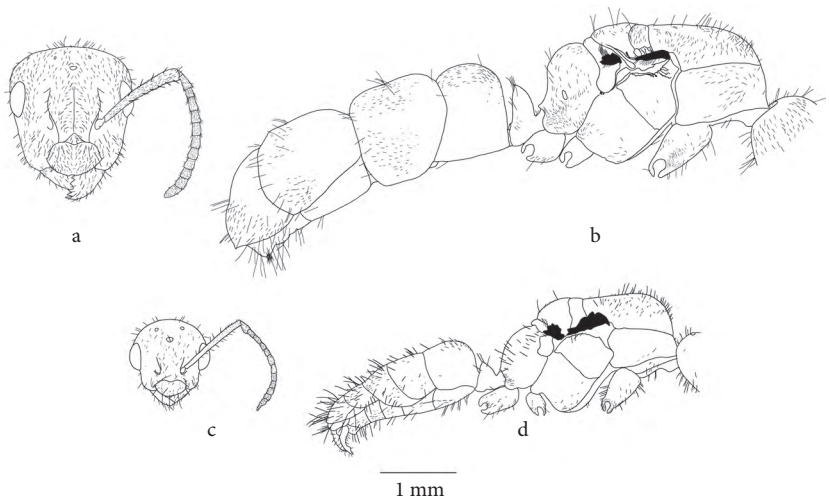

Figure 2. *Camponotus candiotes* (a-b queen); a- head (frontal view), b- mesosoma, petiole and gaster (in profile); (c-d male); c- head (frontal view), d- mesosoma, petiole and gaster (in profile).

above 450 m a.s.l. in Western Anatolia; however, Aktaç (1988) recorded *C. gestroi* from Eastern Anatolia, from 1250 to 2100 m a.s.l.

Geographic distribution: Northwest Africa, southern Europe, Turkey, Israel, Iraq, and South Transcaucasia.

***Camponotus* (*Myrmentoma*) *kiesenwetteri* (Roger, 1859)**

Material examined: 8: ☿ ☿ ,♀; **13**: 2 ☿ ☿ ,♀.

Remarks: Nests were under stones and in the soil. *C. kiesenwetteri* was collected from maquis, olive forest, and *P. brutia* forest, from 240 to 500 m a.s.l. This species generally inhabits dry grassy areas and thin forests (Radchenko, 1997b).

Geographic distribution: Greece, Crete, Cyclades Islands, Dodecanese Islands, Turkey, and Cyprus.

***Camponotus* (*Myrmentoma*) *lateralis* (Olivier, 1791)**

Material examined: 1: ☿ ☿ , 2♀♀; **2**:16 ☿ ☿ ; **3**:♀♀,♀, **4**: ☿ ☿ , 3♀♀; **5**: ☿ ☿ , 2♀♀; **6**: 3♀♀; **7**: ☿ ☿ , 11♀♀, 3♂♂; **8**: ☿ ☿ ,♀; **9**: ☿ ☿ , 5♀♀, 3♂♂: **11**: ☿ ☿ ,♀; **12**: 7 ☿ ☿ ; **13**: 2 ☿ ☿ ; **15**: ☿ ☿ ; **16**: ☿ ☿ ; **19**: 13 ☿ ☿ .

Remarks: Nests were under stones, in a decayed log, in a stone crevice, and under moss on tree trunks. This species was collected from brook side, oak forest, mixed forests (*P. sylvestris* and *P. nigra*, *P. nigra*, *Castanea* spp., and *P. orientalis*, and *Quercus* spp. and *Juniperus* spp.), olive forests, and pine forests (*P. brutia* and *P. nigra*), from 240 to 1050 m a.s.l. Although Cagniant (1996) recorded *C. lateralis* from the Moroccan coast to 2200 m a.s.l., Bernard (1968) reported that this species rarely exceeds 900 m a.s.l. We observed this species from only 1 locality (at 1050 m a.s.l.) above 900 m a.s.l. in the Kaz Mountains. *C. lateralis* is noted as a diurnal (Bernard, 1968; Schembri and Collingwood, 1981), and a crepuscular and nectarivore species (Baroni Urbani, 1978).

Geographic distribution: Northwest Africa, central and southern Europe, Turkey, Crimea, Israel, Lebanon, Syria, Caucasia, and Kopetdag.

***Camponotus* (*Myrmentoma*) *piceus* (Leach, 1825)**

Material examined: 1: 2♀♀; **2**: ☿ ; **11**: 2 ☿ ☿ ; **13**:♀.

Remarks: Nests were under stones. Czechowski et al. (2002) noted this species as xerothermophilous, inhabiting steppes and open dry mountain slopes, and rarely found in light and dry forests. Unlike Czechowski et al. (2002), we generally collected this species from light and arid forests, such as oak forest and olive forests, and also from maquis and humid mixed forest (*P. sylvestris* and *P. nigra*), from 200 to 600 m a.s.l. *C. piceus* is a crepuscular and nectarivore species (Baroni Urbani, 1978).

Geographic distribution: Northwest Africa, central and southern Europe, Turkey, the south of Eastern Europe, the Middle East, Caucasia, and North Kazakhstan.

***Camponotus* (*Tanaemyrmex*) *aethiops* (Latreille, 1798)**

Material examined: 1: ☿ ☿ ; **2**:19 ☿ ☿ ; **3**: 6 ☿ ☿ ; **5**: 21 ☿ ☿ , 16 ♂♂; **8**: 2♀♀; **9**: ☿ ☿ , 7♀♀; **10**: ☿ ☿ ,♀, 20 ♂♂; **11**: 25 ☿ ☿ ; **12**: ☿ ☿ ; **14**: ☿ ☿ , 4♀♀: ♂; **15**: 11 ☿ ☿ , 2♀♀, 5♂♂; **16**: 7♀♀; **17**: ☿ ☿ ; **18**: 8 ☿ ☿ ; **19**: 7 ☿ ☿ .

Remarks: Nests were under stones. This species is ecologically the most tolerant species and was collected from 15 of the 20 localities and 8 of the 11 habitats, from 200 to 1600 m a.s.l. *C. aethiops* is a xerophile and nectarivore species (Baroni Urbani, 1978). There are different reports of the activity time of *C. aethiops*. Baroni Urbani (1978), Espadeler (1986), and Collingwood and Prince (1998) noted *C. aethiops* as a nocturnal, diurnal, and crepuscular species, respectively. According to our findings, diurnal or crepuscular activity is more likely; unlike *C. aethiops*, nocturnal species are often light colored.

Geographic distribution: Northwest Africa, central and southern Europe, the south of Eastern Europe, Turkey, the Middle East, Iraq, Iran, Caucasia, Kopetdag, Kazakhstan, Central Asia, and Afghanistan.

***Camponotus* (*Tanaemyrmex*) *baldaccii* Emery, 1894**

Material examined: 13: ☿ ☿ ; **20**: 8 ☿ ☿ .

Remarks: Nests were under stones, in garden walls, and in the soil at the foot of trees. This species was collected from 237 to 240 m a.s.l. in olive forests and *P. brutia* forest.

Geographic distribution: Greece, Crete, Dodecanese Islands, Turkey, Syria, and Saudi Arabia.

***Camponotus* (*Tanaemyrmex*) *ionius* Emery, 1920**

Material examined: 6: 19☿☿, 2♀♀, 7♂♂; **8**: 11☿☿; **13**: 4☿☿.

Remarks: Nests were under stones and workers in olive forests. This species was collected from 240 to 350 m a.s.l. in maquis, olive forest, and *P. brutia* forest. Aktaç (1976), who revived its status to species, recorded the species from Bodrum in southwestern Anatolia at the same altitudes and habitats, suggesting that this species does not exceed 400 m a.s.l.

Geographic distribution: former Yugoslavia, Greece, Bulgaria, Cyclades Islands, Dodecanese Islands, North Aegean Islands, and Turkey.

Description of the male (Figure 3a-c) (measurements and indices in Table 3)

Head distinctly longer than broad (CI: 1.19-1.27; mean CI: 1.22), lateral sides of head parallel in front of eyes, dorsal margin of head quite convex; in frontal view anterior margin of clypeus forms subrectangular plate beyond genal margins, convex, dorsal margin almost straight and not notched medially, in profile clypeal carinae slightly protuberant, or prominent; eyes positioned slightly to posterior half of the head; antennae 13-segmented, antennal scape surpassing the dorsal margin of the head by 1/2 of its length; between scutum and scutellum a slight depression present, dorsal margin of propodeum quite convex, its declivity almost straight; petiolar scale in profile slightly tapering to dorsal margin, anterior face straight, posterior face convex and in frontal view dorsal margin concave (Figure 3c). Dorsal margin of head covered with erect hairs; genae with 4-6 short erect hairs; gula with dense, long, erect hairs; first 2/3 of scutum covered with dense, short, erect hairs, posterior part with 4-10 longer erect hairs; scutellum with 8-10 long erect hairs; lateral sides of propodeum covered with long erect hairs; the extensor surface of hind tibiae in profile with 15-20 short, thick erect hairs; gaster with dense decumbent pubescence and their length almost equal or slightly shorter than distance between them.

Entire body dark reddish-brown, dark brown; genae, clypeus, and mandibles yellowish-red, funicular segments yellow, legs and genitalia reddish; head and alitrunk densely punctured and opaque, gaster reticulate and semi-shiny.

***Camponotus* (*Tanaemyrmex*) *oertzeni* Forel, 1889**

Material examined: 9: 23☿☿.

Remarks: Nest was under stone. This species was found at 510 m a.s.l. in *P. nigra* forest. *C. oertzeni* was recorded from Turkey only by Radchenko (1997a), without mentioning the exact locality. *C. oertzeni* has been found in the Kaz Mountains and the existence of the species in Turkey was confirmed in the present study. *C. oertzeni* is easily differentiated from *C. aethiops* (a species common in Turkey) by its reddish body color and slender body.

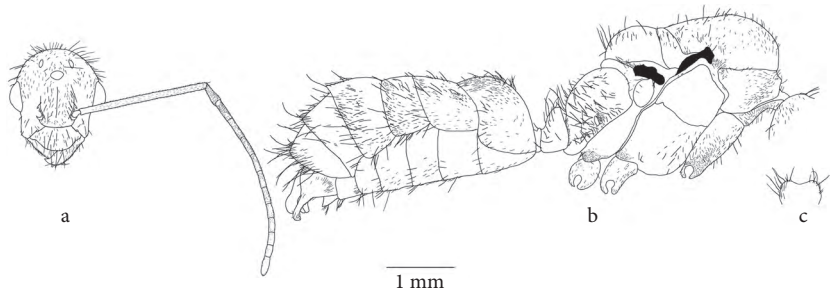

Figure 3. *Camponotus ionius* male; a- head (frontal view), b- mesosoma, petiole and gaster (in profile), c- petiole (posterior view).

Geographic distribution: Montenegro, Greece, Dodecanese Islands, North Aegean Islands, Turkey, Iran, and South Transcaucasia.

***Camponotus* (*Tanaemyrmex*) *samius* Forel, 1889**

Material examined: 1: ☿ ☿, ♂♂; **5**: 27 ☿ ☿; **7**: ☿; **9**, ☿ ☿; **11**: ☿ ☿; **12**: ☿; **17**: ☿ ☿; **19**: ☿ ☿.

Remarks: Nests were under stones and in the soil. This species was collected from 4 habitats: brook side, oak forest, mixed (*P. sylvestris* and *P. nigra*) and pine forests (*P. brutia* and *P. nigra*), from 250 to 800 m a.s.l. *C. samius* is a nocturnal species (Atanassov and Dlussky, 1992). According to Bolton (1995) and Bolton et al. (2006), sexuals of *C. samius* are unknown: however, Atanassov and Dlussky (1992) recorded the species from Bulgaria and described the queen and male of the species, confirming that the sexuals of the species are known.

Distribution: Sicily, former Yugoslavia, Greece, Bulgaria, Turkey, and Afghanistan (?).

***Camponotus* (*Tanaemyrmex*) *sanctus* Forel, 1904**

Material examined: 2: ☿; **12**: ☿; **13**: ☿ ☿; **20**: 2 ☿ ☿.

Remarks: Nests were under stones. *C. sanctus* was collected from maquis and *P. brutia* forest, from 175 to 450 m a.s.l.

Geographic distribution: Greece, Bulgaria, Crete, Dodecanese Islands, North Aegean Islands, Turkey, Cyprus, the Middle East, Iran, and Afghanistan.

***Camponotus* (*Colobopsis*) *truncatus* (Spinola, 1808)**

Material examined: 3: ☿; **9**: ☿ ☿; **11**: ☿ ☿; **16**: ☿ ☿; **21**: 6 ☿ ☿.

Remarks: Nests were inside dry oak branches and workers were found on trees. This species was collected from brook side habitat, fruit orchard, oak forest, and village center, from 300 to 1050 m a.s.l. *C. truncatus* is a crepuscular and nectarivore species (Baroni Urbani, 1978) living in small colonies and often in oak trees.

Geographic distribution: Northwest Africa, central and southern Europe, Finland, Turkey, Crimea, the Middle East, Caucasia, and Kopetdag.

Key to the species of *Camponotus* in the Kaz Mountains, Turkey

Workers

1. Front of head truncated anteriorly in soldiers; dorsal margin of propodeum in profile concave.....***truncatus***
- Front of head not truncated anteriorly in major workers; dorsal margin of propodeum in profile straight or at least slightly concave.....**2**
2. Anterior margin of clypeus extending forward to form a subrectangular plate beyond genal margins, without median notch; alitrunk in profile evenly convex, without mesopropodeal groove (Figure 4a).....**3**
- Anterior margin of clypeus without subrectangular plate beyond genal margins, notched medially (Figure 4b); alitrunk in profile with deep mesopropodeal groove (Figure 4c and d) or at least with distinct suture (Figure 4e).....**8**
3. Gaster with dense long pubescence, hairs longer than distance between them; femora with dense decumbent pubescence.....**4**
- Gaster with sparse short pubescence, hairs at most as long as the distance between them; femora without decumbent pubescence.....**5**
4. Genae with short, erect hairs; base of gaster lighter than its posterior part.....***samius***
- Genae without erect hairs; gaster unicolored, black.....***ionius***
5. Genae with short erect hairs.....**6**
- Genae without erect hairs.....**7**
6. Body color black.....***aethiops***
- Head and alitrunk reddish.....***oertzeni***
7. Gula with at least sparse erect hairs.....***baldaccii***
- Gula without erect hairs or with 2 hairs near foramen in major workers.....***sanctus***
8. Body unicolored, black.....**9**
- Body bicolored, head and alitrunk at least partly red, gaster black or darker than head and alitrunk.....**13**
9. Entire body densely sculptured, opaque.....**10**

- At least gaster much less sculptured, more or less shiny.....**12**

10. Alitrunk in profile without mesopropodeal groove, only with distinct suture (Figure 4e).....***aegaeus***

- Alitrunk in profile with mesopropodeal groove (Figure 4c and d).....**11**

11. Posterior margin of propodeum with small denticles.....***kiesenwetteri***

- Posterior margin of propodeum without denticles (Figure 4d).....***boghossiani***

12. Mesopropodeal groove absent, with distinct suture; petiole thin, especially in major workers, tapering to dorsal margin in profile.....***gestroi***

- Mesopropodeal groove deep; petiole thick, not tapering to dorsal margin in profile.....***piceus***

13. Head, antennal scape, and alitrunk with dense erect hairs (Figure 4b and c); propodeal dorsum with short subdecumbent hairs.....***candiotes***

- Head, antennal scape and alitrunk with sparse erect hairs; propodeal dorsum without subdecumbent hairs.....***lateralis***

Queens

1. Front of head truncated anteriorly.....***truncatus***

- Front of head not truncated anteriorly.....**2**

2. Anterior margin of clypeus extending forward to form a subrectangular plate beyond genal margins, without median notch.....**3**

- Anterior margin of clypeus without subrectangular plate beyond genal margins, notched medially (Figure 5a and b).....**7**

3. Genae without erect hairs.....**4**

- Genae with erect hairs.....**5**

4. Body unicolored, black; gula with dense, long, erect hairs.....***ionius***

- Body color different, base of gaster and at least some parts of alitrunk yellowish; gula with sparse, long, erect hairs.....***sanctus***

5. Base of gaster yellowish red, posterior part of gaster black; body length 14.5 mm.....***samius***

- Entire gaster unicolored; body length not longer than 13.5 mm.....**6**

6. Body length 10 mm; dorsal margin of propodeum tight, sloping face of propodeum twice as long as dorsal margin of propodeum; head almost shiny.....***oertzeni***

- Body length 11-13.5 mm; dorsal margin of propodeum broad, sloping face of propodeum shorter than twice the length of its dorsal margin; head opaque.....***aethiops***

7. Body unicolored, black.....**8**

- Body color different, some parts of head and alitrunk at least reddish or dark reddish-brown.....**11**

8. Body densely sculptured, opaque.....**9**

- Body smooth or slightly reticulate, shiny.....**10**

9. Petiole densely sculptured, opaque; occipital corners of head with dense erect hairs (Figure 5a); extensor surface of mid tibiae with at least 5 erect hairs.....***kiesenwetteri***

- Petiole finely sculptured, shiny; occipital corners of head with sparse erect hairs (Figure 5b); extensor surface of mid tibiae without erect hairs.....***aegaeus***

10. Petiole high and thin, tapering to dorsal margin.....***gestroi***

- Petiole rather thick (Figure 5c), not tapering to dorsal margin.....***piceus***

11. Lateral sides and dorsal margin of head with erect hairs, antennal scape with dense, short, erect hairs; smaller species, HW ≤ 1.50, AL ≤ 2.87 mm (Figure 2a and b, Table 2.....***candiotes***

- Lower parts of head with erect hairs, antennal scape with sparse, short, erect hairs; larger species HW ≥ 1.79, and AL ≥ 3.02 mm.....***lateralis***

Males

1. The first funicular segment twice as long as broad; head and gaster brown, alitrunk yellow.....***truncatus***
- The first funicular segment length different; body color different.....**2**
2. Anterior margin of clypeus extending forward to form subrectangular plate beyond genal margins; head distinctly longer than broad (Figures 3a and 5d).....**3**
- Anterior margin of clypeus not extending forward beyond genal margins; head at most slightly longer than broad (Figures 2c and 5e)....**7**
3. Occipital corners of head with very dense erect hairs (Figure 5d).....***samius***
- Occipital corners of head bare or with sparse erect hairs.....**4**
4. Head and alitrunk opaque.....**5**
- Head and alitrunk shiny.....**6**
5. Body color reddish brown, dark brown; larger species, body length > 7.5 mm (Figure 3b)....***ionius***
- Body color black; smaller species, body length 6 mm.....***oertzeni***
6. Genae with erect hairs; smaller species, body length 6 mm.....***aethiops***
- Genae without erect hairs; larger species, body length 10-11 mm.....***sanctus***
7. Head and alitrunk densely sculptured, opaque....**8**
- Head and alitrunk finely sculptured, subopaque or shiny.....**9**
8. Petiole densely sculptured, opaque; dorsal margin of petiole concave.....***kiesenwetteri***
- Petiole finely sculptured, shiny; dorsal margin of petiole deeply concave (Figure 5f).....***aegaeus***
9. Dorsal margin of petiole deeply concave; head and alitrunk densely reticulate, subopaque.....***gestroi***
- Dorsal margin of petiole at most slightly concave; head and alitrunk finely reticulate, shiny.....**10**
10. Occipital corners of head with erect hairs (Figure 2c).....**11**
- Occipital corners of head without erect hairs (Figure 5f).....***lateralis***
11. Larger species, body length 6-7.5 mm.....***piceus***
- Smaller species, body length < 6 mm (Figure 2d).....***candiotes***

Discussion

In the present study 14 species were recorded from the Kaz Mountains. Of these, 7 species belong to the *Myrmentoma*, 6 species belong to the *Tanaemyrmex*, and 1 species belongs to the *Colobopsis* subgenera. These 14 species constitute 50% of the 28 taxa of the genus previously recorded from Western Anatolia. This is an expected result for the area of the Kaz Mountains that was studied (Figure 1), which constitutes a small part of Western Anatolia.

The ant fauna of Turkey is represented by the following elements: Mediterranean, Balkanic, European, Euro-Caucasian, Euro-Siberian, cosmopolitan, steppic, and endemic (Aktaç and Kıran, 2007). Eight of the 14 species of the genus *Camponotus* are Mediterranean (including East Mediterranean), 4 species are Balkanic, 1 species is Euro-Caucasian, and 1 species is South European (Table 4). The Mediterranean element, which supports a large number of species of the ant fauna of Turkey, Greece, and Bulgaria, is also the most prevalent biogeographic element in the Kaz Mountains. The abundance of the Mediterranean elements can be explained by the location of the Kaz Mountains (Figure 1) and the ecological effects of the Mediterranean climate, and thus the abundance of Mediterranean vegetation in the Kaz Mountains. The Balkanic element (*C. aegaeus*, *C. boghossiani*, *C. candiotes*, and *C. ionius*), whose type localities are the Greek Islands and Turkey, is the second most populous biogeographic element in the Kaz Mountains. This is an expected result due to the distribution of the species and location of the Kaz Mountains. *C. samius* (South European element), which is a common species in Western Anatolia, is also found in the Kaz Mountains. The existence of *C. oertzeni* (Euro-Caucasian element) in the Kaz

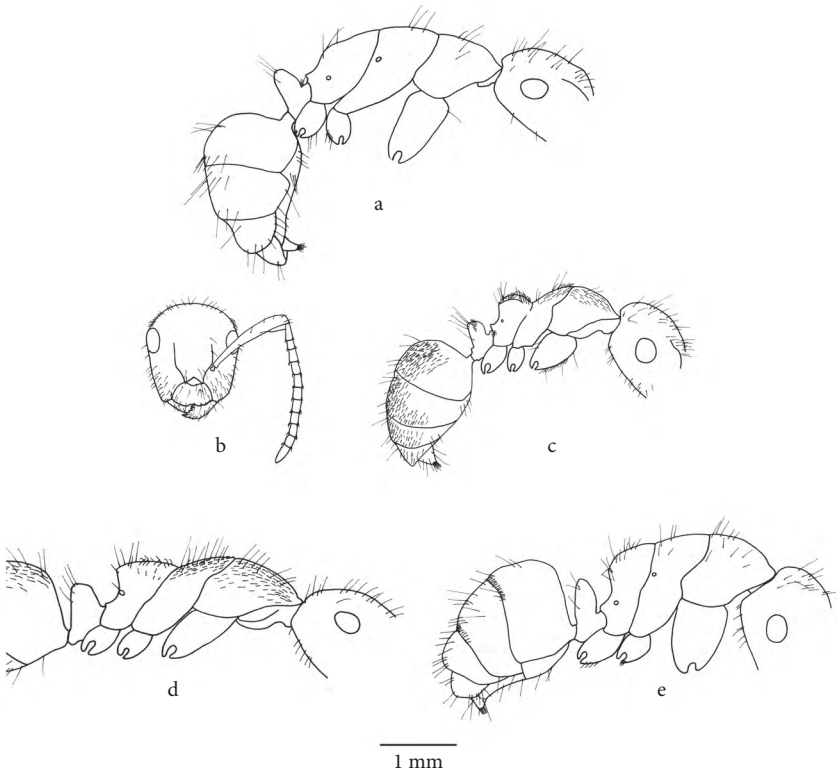

Figure 4. Workers: a- *Camponotus oertzeni*; alitrunk and gaster (in profile), b- *C. candiotes*; head (frontal view), c- *C. candiotes*; alitrunk and gaster (in profile), d- *C. boghossiani*; alitrunk and gaster (in profile), e- *C. aegaeus*; alitrunk and gaster (in profile).

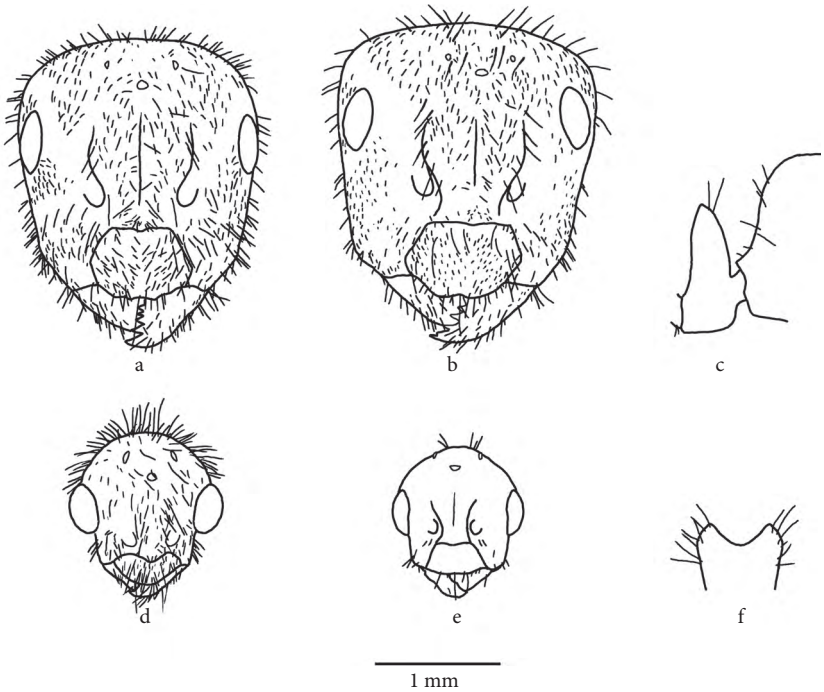

Figure 5. a- *Camponotus kiesenwetteri* queen; head (frontal view), b- *C. aegaeus* queen; head (frontal view), c- *C. piceus* queen; petiole (in profile), d- *C. samius* male; head (frontal view), e- *C. lateralis* male; head (frontal view), f- *C. aegaeus* male; petiole (posterior view).

Table 4. The biogeographic classification of the *Camponotus* species in the Kaz Mountains. B- Balkanic; EC- Euro-Caucasian; EMD- East Mediterranean; MD- Mediterranean; SE-South European.

No.	Species	Element
1.	*Camponotus aegaeus*	B
2.	*Camponotus boghossiani*	B
3.	*Camponotus candiotes*	B
4.	*Camponotus gestroi*	MD
5.	*Camponotus kiesenwetteri*	EMD
6.	*Camponotus lateralis*	MD
7.	*Camponotus piceus*	MD
8.	*Camponotus aethiops*	MD
9.	*Camponotus baldaccii*	EMD
10.	*Camponotus ionius*	B
11.	*Camponotus oertzeni*	EC
12.	*Camponotus samius*	SE
13.	*Camponotus sanctus*	EMD
14.	*Camponotus truncatus*	MD

Mountains can be explained by the large diversity of habitats in the Kaz Mountains, which are situated at the meeting point of different phytogeographic regions, and the wide geographic distribution of the species (from Montenegro to Transcaucasia).

Furthermore, *C. aethiops*, previously recorded from Uludağ Mountain (Donisthorpe, 1950), and *C. aegaeus*, *C. aethiops*, *C. baldaccii*, *C. candiotes*, *C. gestroi*, *C. lateralis*, *C. piceus*, *C. samius*, *C. sanctus*, and *C. truncatus*, previously recorded from the Samanlı Mountains (Kıran and Aktaç, 2006), have also been found in the Kaz Mountains. This is an expected result, considering the similarities in altitude between the Kaz Mountains and the Samanlı Mountains. The difference regarding the Uludağ *Camponotus* fauna is primarily due to the sampling localities, because the majority of the species were collected from cryptic habits above 1600 m a.s.l.

Pine forests, oak forests, and olive forests, which have arid characteristics, are the most populous habitats, with 11, 7, and 7 species of the genus, respectively (Table 5). This result is not surprising when the ecological preferences of species of the genus *Camponotus*, which generally prefer arid and semi-arid areas (Paknia et al., 2008), are considered. Village center, town center, and fir forest are represented by only 1 species each (*C. truncatus*, *C. sanctus*, and *C. aethiops*, respectively), which is not surprising given that village centers and town centers are not suitable nesting habitats due to potential disturbance by human activity, and fir forest, which is very dense and humid, is not a preferred habitat for nesting by species of the genus *Camponotus*.

The hitherto unknown *C. candiotes* queen and male are differentiated from the *C. lateralis* queen and male by the erect hairs on all parts of the head (especially on occipital corners), abundant erect hairs on the scape, and their slender body. The *C. candiotes* queen is differentiated from the *C. piceus* queen by its reddish-brown to dark reddish-brown body color and slender body, while the *C. candiotes* male is differentiated from the latter by a slender body (body length < 6 mm). Furthermore, the *C. ionius* male is differentiated from the *C. samius* male by sparse erect hairs on the dorsal margin of the head, a thin and high petiole, and reddish-brown or dark brown body color, from the *C. aethiops* male by its opaque body, deep concavity of the dorsal margin of the petiole, and larger body (body length > 7.5 mm), from the *C. sanctus* male by its opaque body and reddish-brown, dark brown body color, and from the *C. oertzeni* male by its dark reddish-brown, dark brown body color, and larger body.

Most of the identified species from the Kaz Mountains have some morphological differences from the original descriptions of the species and previously collected specimens from Turkey. In some *C. aethiops* specimens, the dorsal margin of the propodeum is concave, which affects the convex shape of the alitrunk, and the alitrunk color is reddish-brown to dark reddish-brown, while the alitrunk is evenly convex and the body color is black in type specimens. According to Forel's original description, minor workers of *C. oertzeni* have a reddish-yellow alitrunk, brown head with brownish-yellow anterior margin and dark brown abdomen with a yellowish-brown front half. On the other hand, our specimens have a yellowish-red alitrunk, reddish head, and a dark reddish-brown gaster, with a reddish-brown front half of the first segment.

Table 5. Occurrence of the *Camponotus* species in habitats studied.

SPECIES HABITATS	Bushes	Brook side	Fir forest	Fruit orchard	Maquis	Mixed forests	Oak forest	Olive forests	Pine forests	Town center	Village center	Total habitat
Camponotus aegaeus	●	●			●	●	●	●	●			7
Camponotus boghossiani									●			1
Camponotus candiotes		●				●	●		●			4
Camponotus gestroi					●			●				2
Camponotus kiesenwetteri					●			●	●			3
Camponotus lateralis		●				●	●	●	●			5
Camponotus piceus					●	●	●	●				4
Camponotus aethiops	●	●	●	●	●	●	●		●			8
Camponotus baldaccii								●	●			2
Camponotus ionius					●			●	●			3
Camponotus oertzeni									●			1
Camponotus samius		●		●			●		●			4
Camponotus sanctus									●	●		2
Camponotus truncatus		●		●			●				●	4
Total species number in each habitat	2	6	1	2	6	5	7	7	11	1	1	

The body color of the *C. ionius* worker and queen is noted as black in the original descriptions. Unlike the original descriptions, the body color of 1 worker specimen that we collected is reddish-brown and also 1 queen has a dark reddish-brown head, reddish alitrunk with darker dorsum, and rust-red-brown gaster. We collected these specimens from *P. brutia* forest at 350 m a.s.l., where the other specimens are all black.

The antennal scapes of *C. lateralis* specimens collected from the Kaz Mountains and Spanish specimens sent by Xavier Espadaler from San Juan de la Pena-Huesca are expanded into a lobe at the base and differ from drawings by Kutter (1977), which are not expanded at the base. In addition, the gaster color of most of the *C. lateralis* workers is reddish-brown to black, with a reddish front half of the first segment, while in the original description the gaster is black. The entire propodeal dorsum of *C. gestroi* specimens generally have dense erect hairs, but in 1 specimen only the posterior margin of the propodeum is covered with erect hairs. This characteristic is accepted as a small variation, and we identified this specimen as *C. gestroi*.

In the original description of *C. boghossiani* the propodeum is described as cubic and its dorsal margin flat; however, the propodeums of our specimens are not cubic and their dorsal margins are convex. Despite the propodeal difference, the other characteristics of our specimens are similar to the original description of *C. boghossiani* and we identified these specimens as *C. boghossiani*. In addition, Forel (1911) reported the type locality of *C. boghossiani* as Aivaly Peninsula (Ayvalık-Balıkesir, Turkey), near Mitylène (Lesbos Island, Greece); however, Bolton (1995) and Bolton et al. (2006) reported the type locality of the species as Greece, which was probably a misinterpretation on their part. The type locality of the species has to be Turkey, as mentioned in Radchenko (1997b).

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