

New faunistic data on ants (Hymenoptera: Formicidae) of the southern part of Montenegro

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Abstract. In spring 2013, we sampled ants from 14 localities in the southern part of Montenegro. Four different collection methods were applied: direct sampling, litter sifting, pitfall trapping and baiting. We present a list of 62 collected ant species, five of which are new records for the country: *Camponotus gestroi*, *C. honaziensis*, *Lasius nitidigaster*, *Temnothorax* sp. 1, and *T.* sp. 2. Some of the recorded species are discussed, including a rare subspecies *Crematogaster auberti savinae*. A short informal description for two unidentified *Temnothorax* species is given.

Key words: ants, Montenegro, Balkan Peninsula, faunistics

Izvleček. Novi favnistični podatki o mravljah (Hymenoptera: Formicidae) južnega dela Črne gore – Spomladi leta 2013 smo vzorčili mravlje na 14 lokalitetah v južnem delu Črne gore. Uporabljene so bile štiri različne metode nabiranja: direktno vzorčenje, sejanje stelje, postavljanje talnih pasti in nastavljanje vab. Predstavljamo seznam 62 nabranih vrst mravelj, od katerih jih je pet novih najdb za državo: *Camponotus gestroi*, *C. honaziensis*, *Lasius nitidigaster*, *Temnothorax* sp. 1 in *T.* sp. 2. Obravnavamo nekatere najdene vrste, vključno z redko podvrsto *Crematogaster auberti savinae*, in podajamo kratek neformalen opis za dve neidentificirani vrsti rodu *Temnothorax*.

Ključne besede: mravlje, Črna gora, Balkanski polotok, favnistika

Introduction

In recent years, relevant checklists of the ants from several countries of the Balkan Peninsula have been published, i.e. for Bulgaria (Lapeva-Gjonova et al. 2010), Croatia (Bračko 2006), Greece (Legakis 2011, Borowiec & Salata 2012, 2013), Republic of Macedonia (Bračko et al. 2014), Slovenia (Bračko 2007), and Turkey (Kiran & Karaman 2012). Similarly, the ant fauna of Montenegro was reviewed by Karaman (2011a) in a detailed catalogue, based on the previous literature data and new material from the country. Here, 140 species are listed. The same author also analysed the zoogeographical composition and vertical distribution of the ants in the Mediterranean and oro-Mediterranean Montenegro (Karaman 2011b). The sampling of Montenegrin ants became more systematic in the last 30 years, but like before, the majority of the collections originate from the southern part of the country, which is largely influenced by the Mediterranean climate. Considering the high richness of the myrmecofauna in the Balkan region and especially in the Mediterranean area, additional studies on ants from this part of the country can still yield important faunistic records.

We present new faunistic investigation of the ants of Montenegro, based on the collected material from several sites in the southern part of the country in spring 2013, during the Biology Students Research Camp held in Buljarica near Petrovac.

Materials and methods

Ants were sampled between 28. 4. and 4. 5. 2013 at 14 localities in the southern part of Montenegro (Tab. 1, Fig. 1). The majority of the studied localities lie in the areas that are largely influenced by the Mediterranean climate (Vujević 1956), except the localities 1-3 in Lovćen Mountain, which is characterised by continental-alpine climate (Karaman 2011b).

Four different collection methods were applied: direct sampling, litter sifting, pitfall trapping and baiting.

- Direct sampling: At all localities we searched for ant nests and individual ants on the ground, in leaf litter, under stones, in dead wood, and on tree trunks and twigs. Usually, nests were opened by short hoe and specimens collected by hands or aspirator.
- Litter sifting: In forest or scrubby habitats at the localities 4, 6, 9, 11 and 14 (see Tab. 1), leaf litter was collected from several places on the ground and put in the sifter with 1 x 1 cm wire mesh. The sifted material was placed on a white sheet and ants were collected.
- Pitfall trapping: We used 7 cm diameter plastic pots and placed them in the ground with propylene glycol as the killing agent. Ten traps were set 10 m apart in one line at each of the localities 4, 5 and 6. The traps were collected after six (locality 5) or five (localities 4 and 6) days (see Tab. 1).
- Baiting: The baits, which were placed a few meters from each pitfall trap at the localities 4, 5 and 6, consisted of peanut butter on a small piece of paper and left for one to two hours prior to gathering.

All collected ants were preserved in 70% ethanol.

Table 1. Description of localities, date and collecting methods of ants in Montenegro (abbreviations of the collecting methods: DS – direct sampling, LS – litter sifting, PT – pitfall trapping, B – baiting).

Tabela 1. Opis lokalitet, datum in metode nabiranja mravelj v Črni gori (okrajšave metod nabiranja: DS – direktno vzorčenje, LS – sejanje stelje, PT – postavljanje talnih pasti, B – nastavljanje vab).

Locality number	Locality	Coordinates, altitude	Habitat	Date	Collecting method
1	W of Žanjev Do, Lovćen	42°25.04'N, 18°47.66'E, 910 m	dry scrubby and rocky slope with some trees	1.5.2013	DS
2	1 km E of Žanjev Do, Lovćen	42°25.03'N, 18°48.38'E, 1120 m	dry grassland, scrub, mixed forest	1.5.2013	DS
3	W of Ivanova Korita, Lovćen	42°23.00'N, 18°49.61'E, 1310 m	rocky grassy slope, deciduous forest	1.5.2013	DS
4	0.5 km W of Kaluđerac, Petrovac	42°11.85'N, 18°57.43'E, 60 m	dry scrub with some trees, grove	29.4. – 4.5.2013	DS, LS, PT, B
5	E of Kaluđerac (S of the main road), Petrovac	42°11.84'N, 18°58.16'E, 10 m	grassland	28.4. – 4.5.2013	DS, PT, B
6	E of Kaluđerac (N of the main road), Petrovac	42°11.92'N, 18°58.18'E, 40 m	deciduous forest	29.4. – 4.5.2013	DS, LS, PT, B
7	Buljarica (Campsite Jadran turs), Petrovac	42°11.75'N, 18°58.60'E, 10 m	lawn, grove, road verge	28.4., 30.4., 4.5.2013	DS
8	2 km SE of Buljarica, Petrovac	42°10.90'N, 18°59.41'E, 40 m	scrub, grassland, wet grove	2.5.2013	DS
9	1.5 km S of Bukovik, Virpazar	42°13.09'N, 19°1.41'E, 570 m	deciduous forest, grassland	30.4.2013	DS, LS
10	1.5 km NW of Godinje, Virpazar	42°14.09'N, 19°6.35'E, 100 m	dry scrubby and rocky slopes	30.4.2013	DS
11	0.5 km NE of Godinje, Virpazar	42°13.47'N, 19°7.01'E, 10 m	wet deciduous forest, field path	30.4.2013	DS, LS
12	0.5 km NE of Stari Bar, Bar	42°5.88'N, 19°8.36'E, 180 m	dry scrub, rocky slopes	2.5.2013	DS
13	0.5 km S of Berislavci, Podgorica	42°17.64'N, 19°12.87'E, 10 m	grassland with hedges	3.5.2013	DS
14	1 km S of Pikal, Cijevna River Canyon, Podgorica	42°23.75'N, 19°22.82'E, 100 m	dry pasture/ grassland, scrub, grove, river bank	3.5.2013	DS, LS

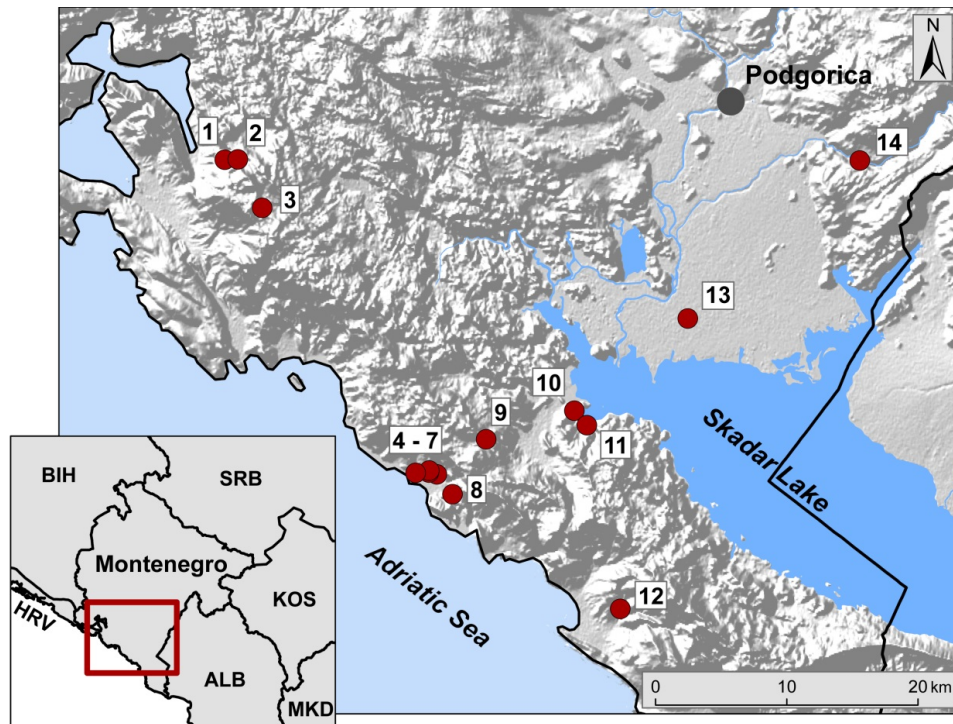


Figure 1. Map of Montenegro with the localities where ants were sampled in spring 2013 (locality numbers are explained in Tab. 1).

Slika 1. Zemljevid Črne gore z lokalitetami, kjer je spomladi 2013 potekalo vzorčenje mravelj (številke lokalitet so pojasnjene v Tab. 1).

The following taxonomic literature was used for the identification of the species: Borowiec & Salata (2013), Csősz & Markó (2004), Csősz & Schulz (2010), Csősz et al. (2007, 2014), Radchenko & Elmes (2010), Seifert (1992, 2007, 2012a, 2012b), Seifert & Schultz (2009), Zimmermann (1934). If available, we also compared our samples with high quality images of the type specimens on the AntWeb website (<http://www.antweb.org>).

Measured characters of two *Temnothorax* species are defined as follows:

CL: maximum cephalic length, measured in a straight line from the anterior-most point of median clypeal margin to the mid-point of the posterior margin of the head

CS: cephalic size; arithmetic mean of CL and CW

CW: maximum cephalic width across eyes

SL: maximum straight line scape length excluding articular condyle

Results

A list of 62 ant species from four subfamilies collected in southern Montenegro and their localities is presented in Tab. 2. For some of the species we give notes in the discussion section.

Table 2. Ant species recorded in southern part of Montenegro in spring 2013. Locality numbers are explained in Tab. 1. New species for the country are marked with an asterisk *.

Tabela 2. Vrste mravelj, najdene v južnem delu Črne gore spomladi 2013. Številke lokalitet so pojasnjene v Tab. 1. Nove vrste za državo so označene z zvezdico *.

Species	Localities
Subfam. PONERINAE	
<i>Ponera testacea</i> Emery, 1895	11
Subfam. MYRMICINAE	
<i>Aphaenogaster epirotes</i> (Emery, 1895)	4, 6, 8, 12, 14
<i>Aphaenogaster subterranea</i> (Latreille, 1798)	14
<i>Crematogaster auberti savinae</i> Zimmermann, 1934	14
<i>Crematogaster schmidti</i> (Mayr, 1853)	4, 6, 7, 9, 11, 13, 14
<i>Crematogaster sordidula</i> (Nylander, 1849)	4, 6, 10, 12
<i>Messor</i> cf. <i>structor</i> (Latreille, 1798)	4, 5, 7, 8, 11
<i>Messor wasmanni</i> Krausse, 1911	5, 7, 8, 12, 14
<i>Monomorium monomorium</i> Bolton, 1987	5, 13
<i>Myrmecina graminicola</i> (Latreille, 1802)	4, 6, 11
<i>Myrmica hellenica</i> Finzi, 1926	5, 13
<i>Myrmica sabuleti</i> Meinert, 1861	8, 9
<i>Pheidole pallidula</i> (Nylander, 1849)	4, 5, 6, 7, 10, 14
<i>Solenopsis fugax</i> (Latreille, 1798)	4, 5, 6, 8, 9, 13, 14
<i>Temnothorax affinis</i> (Mayr, 1855)	1, 11
<i>Temnothorax crassispinus</i> (Karavaiev, 1926)	3
<i>Temnothorax exilis</i> (Emery, 1869)	9
<i>Temnothorax flavicornis</i> (Emery, 1870)	4, 8
<i>Temnothorax</i> near <i>interruptus</i> (Schenck, 1852)	4, 6, 14
<i>Temnothorax lichtensteini</i> (Bondroit, 1918)	1, 2, 6, 8, 9, 14
<i>Temnothorax nigriceps</i> (Mayr, 1855)	1
<i>Temnothorax rogeri</i> Emery, 1869	6, 9
<i>Temnothorax rottenbergii</i> (Emery, 1870)	3
<i>Temnothorax sordidulus</i> (Müller, 1923)	1
<i>Temnothorax unifasciatus</i> (Latreille, 1798)	1, 2, 3, 9, 11, 13
<i>Temnothorax</i> sp. 1 *	4, 6, 8
<i>Temnothorax</i> sp. 2 *	13
<i>Tetramorium</i> cf. <i>caespitum</i> (Linnaeus, 1758)	1, 3, 4, 6, 7, 8, 9, 11, 13
<i>Tetramorium diomedea</i> Emery, 1908	14
<i>Tetramorium moravicum</i> Kratochvíl, 1941	7, 9
<i>Tetramorium semilaeve</i> André, 1883	10, 12, 14

Species	Localities
Subfam. DOLICHODERINAE	
<i>Bothriomyrmex communistus</i> Santschi, 1919	12
<i>Dolichoderus quadripunctatus</i> (Linnaeus, 1771)	4, 5, 6, 7, 8, 9, 12
<i>Liometopum microcephalum</i> (Panzer, 1798)	14
<i>Tapinoma erraticum</i> (Latreille, 1798)	1, 4, 5, 7, 10, 11, 12, 14
Subfam. FORMICINAE	
<i>Camponotus aethiops</i> (Latreille, 1798)	4, 5, 8, 9, 10, 14
<i>Camponotus dalmaticus</i> (Nylander, 1849)	4, 6, 8, 9, 11
<i>Camponotus fallax</i> (Nylander, 1856)	1, 4, 7
<i>Camponotus gestroi</i> Emery, 1878 *	14
<i>Camponotus honaziensis</i> Karaman & Aktaç, 2013 *	12, 14
<i>Camponotus lateralis</i> (Olivier, 1792)	6, 8
<i>Camponotus piceus</i> (Leach, 1825)	1, 3, 4, 5, 8, 9, 11
<i>Camponotus truncatus</i> (Spinola, 1808)	1, 2, 6, 7, 9, 13
<i>Camponotus vagus</i> (Scopoli, 1763)	6, 7, 9, 11, 13
<i>Cataglyphis nodus</i> (Brullé, 1832)	10, 12
<i>Formica cunicularia</i> Latreille, 1798	2, 7, 9, 11
<i>Formica gagates</i> Latreille, 1798	1, 9, 11
<i>Formica pratensis</i> Retzius, 1783	1
<i>Formica rufibarbis</i> Fabricius, 1793	2
<i>Lasius alienus</i> (Förster, 1850)	1
<i>Lasius emarginatus</i> (Olivier, 1792)	1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
<i>Lasius fuliginosus</i> (Latreille, 1798)	13
<i>Lasius lasioides</i> (Emery, 1869)	6, 14
<i>Lasius myops</i> Forel, 1894	1
<i>Lasius nitidigaster</i> Seifert, 1997 *	11
<i>Lasius paralienus</i> Seifert, 1992	2, 5, 9, 11, 13
<i>Lasius platythorax</i> Seifert, 1991	8, 11, 13
<i>Lepisiota nigra</i> (Dalla Torre, 1893)	12
<i>Plagiolepis pygmaea</i> (Latreille, 1798)	1, 4, 5, 6, 9, 10, 11, 12, 14
<i>Plagiolepis taurica</i> Santschi, 1920	1, 2, 3, 10
<i>Plagiolepis xene</i> Stärcke, 1936	6
<i>Prenolepis nitens</i> (Mayr, 1853)	9

Discussion

The 62 species that we found during our one week field work in southern Montenegro represent a relative high number compared to 140 species known so far for the country. Five species are new records for the country, i.e. *Camponotus gestroi*, *C. honaziensis*, *Lasius nitidigaster*, *Temnothorax* sp. 1., and *T.* sp. 2. Three other species (*Temnothorax exilis*, *T. flavicornis* and *T. rogeri*) had previously been recorded in Montenegro only from a single site. This indicates that the ants of the southern part of the country are still not sufficiently known despite the fact that the past investigations were most intense here.

In southern Montenegro, the altitude changes drastically. The coastal plain is very narrow and mountain ranges abruptly rise over 1,500 m a.s.l. (Lovćen, Orjen and Rumija Mountains). As shown by Karaman (2011b), the number of registered ant species and their zoogeographical composition change rapidly with the altitude in the southern part of the country. Among our collected species from the sites at the coast and from the lowland area around Lake Skadar and Cijevna River Canyon, the species with a southern European/Mediterranean distribution prevail. At Lovćen, most of these species are absent and the fauna has similar composition as in central Europe. The species, which stands out the most from the ants collected at Lovćen, is *Temnothorax rottenbergii*, an Apenino-western Balkan species, found at the altitude of 1,310 m (locality 3). However, the record at this altitude is not surprising as it had been already reported by Karaman (2011a) from Vrsuta (Rumija Mountain) at 1,183 m a.s.l.

Three most frequently collected species were *Lasius emarginatus*, *Plagiolepis pygmaea* and *Tapinoma erraticum*, which were found in more than half of the localities. Twenty-two species were recorded at a single locality only, five of them at the locality 1 and five at 14. We consider the locality 14 (Cijevna River Canyon) especially interesting as we collected two species new for Montenegro there (*Camponotus gestroi* and *C. honaziensis*) and a rare subspecies *Crematogaster auberti savinae*. This is probably characteristic of the site with several different habitats and the fact that the Cijevna River Canyon is known as significant glacial refugium as already shown in floristic studies (Bulić et al. 2008). Thus, this is the northernmost known locality of *C. gestroi* in the Balkan Peninsula, where the species has so far been recorded from southwestern Bulgaria (Lapeva-Gjonova et al. 2010), central and southern Republic of Macedonia (Bračko et al. 2014) and Greece (Borowiec & Salata 2012).

For some of the recorded species we give additional notes:

- *Bothriomyrmex communistus*: According to the recent revision of the genus *Bothriomyrmex* (Seifert 2012b), two species are distributed in the Balkan Peninsula, i.e. *B. communistus* and *B. corsicus* Santschi, 1923, the first being more common in this territory. We conclude that at least some records of this genus cited for Montenegro as *B. adriacus* Santschi, 1922 in Karaman (2011a) refer to *B. communistus*.
- *Camponotus honaziensis*: This is a recently described species from Turkey (Karaman & Aktaç 2013). Borowiec & Salata (2013) noted that it is the same species as already introduced by Seifert (2007) under informal name *C. lateralis* sp. 2 and which seems to be widely distributed in the Mediterranean.

- *Crematogaster auberti savinae*: *Crematogaster* specimens collected at the locality 14 correspond with the description of *C. auberti savinae* Zimmermann, 1934. It was described from Savina near Herceg Novi in Montenegro. It is known from Podgorica and few localities along the coast of Montenegro (Karaman 2011a), as well as from Dalmatia in Croatia (Zec et al. 2011). It is well distinguished from the nominative subspecies by the different shape of propodeal spines and the different sculpture. Since the taxonomic situation in the genus *Crematogaster* is still not well resolved, it is very likely that this subspecies could be raised to a species rank. The colony was found nesting in an oak twig at the edge of a grove.
- *Messor* cf. *structor*: In European »*Messor structor*«, two clades (lineages A and B) with unclear status exist (Schlick-Steiner et al. 2006a), and there are two morphologically more or less distinguishable forms within lineage B (Bračko et al. 2014), both found by us in southern Montenegro.
- *Temnothorax* near *interruptus*: At least one undescribed species different from the more northerly distributed *T. interruptus* occurs in the Balkan Peninsula (Borowiec & Salata 2013, Bračko et al. 2014). We suppose that the records cited in Karaman (2011a) under *T. interruptus* also belong to this undescribed species.
- *Temnothorax rogeri*: This name was treated as a junior synonym of *T. recedens* (Nylander, 1856) in recent taxonomic literature. Borowiec & Salata (2013) showed that *T. rogeri* is well distinguished from *T. recedens* and can be treated as a good species. The record of *T. recedens rogeri* mentioned by Zimmermann (1934) for Montenegro certainly belongs to this species.
- *Temnothorax* sp. 1: We collected three individual workers from three closely situated localities (4, 6, 8) that could not be attributed to any known European *Temnothorax* species. Therefore we give here a brief informal description of this unidentified species: colour of whole body yellowish, antennal clubs not darker than rest of funiculus, only posterior part of first gaster tergite with a dark band and in one specimen femora slightly infuscate; head dorsum, mesosoma and waist densely reticulate and matt, weak rugulae may be present on head, anterior and lateral parts of mesosoma; seen in profile, mesosoma flat, with a very shallow metanotal groove; propodeal spines short to medium-sized (similar to those of *T. unifasciatus*); petiole in profile with almost straight frontal face and relatively low, dorsally widely convex node, petiolar peduncle with large dorsolateral corners; CS 593 ± 56.50 [533, 645], CW/CL 0.90 ± 0.01 [0.89, 0.90], SL/CW 0.76 ± 0.01 [0.75, 0.77] (n=3, values given as: mean \pm standard deviation, minimum and maximum values in square brackets, CS in μm).
- *Temnothorax* sp. 2: We collected three individual workers from the locality 13 that could not be attributed to any known European *Temnothorax* species. Therefore we give here a brief informal description of this unidentified species: colour of whole body yellowish, antennal clubs not darker than rest of funiculus, only posterior part of first gaster tergite with a narrow, slightly darker band, which is interrupted in the middle; head dorsum with mostly reticulate sculpture, which is diluted in the central part of the head, mesosoma with irregular and longitudinal rugosity and reticulate microsculpture; seen in profile, mesosoma convex, without metanotal groove; propodeal spines long and thin (similar to those of *T. affinis*); petiole in profile with slightly concave frontal face and relatively low, dorsally straight to slightly convex node; CS 669 ± 15.13 [652, 681], CW/CL 0.93 ± 0.02 [0.91, 0.94], SL/CW 0.75 ± 0.02 [0.73, 0.76] (n=3, values given as: mean \pm standard deviation, minimum and maximum values in square brackets, CS in μm).

- *Tetramorium* cf. *caespitum*: The study of Schlick-Steiner et al. (2006b) revealed that eight morphologically very similar species of the *T. caespitum/impurum* complex occur in Europe. We did not use a very demanding morphology-based cyber identification engine (Steiner et al. 2006) for the identification of our samples of this complex. By considering basic morphological characterization of the species given in Schlick-Steiner et al. (2006b), we presume that we found at least two different species, but for now we treat them under one name *T. cf. caespitum*.

Our one week of ant sampling in southern Montenegro showed that further investigations of myrmecofauna could result in obtaining important new data, as this part of the country comprises rich ant fauna in general due to its geographical position. But new records can also be expected for the central and northern parts of Montenegro, where the past investigations were somewhat scarce.

Povzetek

Raziskave favne mravelj Črne gore so postale v zadnjih tridesetih letih bolj sistematične, kljub temu pa večina podatkov izvira iz južnega dela države, ki je večinoma pod vplivom mediteranske klime. Karaman (2011a) je v katalogu favne mravelj Črne gore navedel 140 vrst. Naša favnistična raziskava je potekala od 28.4. do 4.5. 2013 na 14 lokalitetah v južnem delu države (Tab. 1, Sl. 1). Mravlje smo vzorčili s štirimi različnimi metodami: direktno na vseh lokalitetah, sejanje stelje na petih lokalitetah v gozdnih habitatih ali habitatih z grmičevjem, lovljenje s talnimi pastmi s propilen glikolom na treh lokalitetah (10 pasti na vsaki od treh lokalitet) in nastavljanje vab s kikirikijevim maslom na treh lokalitetah (10 vab na vsaki od treh lokalitet). Nabrane mravlje smo shranili v 70 % etanolu. Za identifikacijo smo uporabljali večinoma novejšo taksonomsko literaturo, če je bilo možno, pa smo naš material primerjali tudi z visoko kvalitetnimi fotografijami tipskih primerkov na spletni strani AntWeb (<http://www.antweb.org>). Skupaj smo v enem tednu vzorčenja nabrali 62 vrst mravelj iz 4 poddružin (Tab. 2). Od teh je bilo 5 vrst prvič najdenih v Črni gori, in sicer *Camponotus gestroi*, *C. honaziensis*, *Lasius nitidigaster*, *Temnothorax* sp. 1 in *T. sp. 2*. Najdba vrste *C. gestroi* v kanjonu reke Cijevne pomeni najbolj severno znano lokaliteto te vrste na območju Balkanskega polotoka. Med mravljami, ki smo jih nabrali na lokalitetah v obalnem območju in v nižinskem predelu okoli Skadarskega jezera ter kanjonu reke Cijevne, so prevladoval vrste z južnoevropsko/mediteransko razširjenostjo, medtem ko na območju Lovčena večine teh vrst nismo našli. Tri najpogostejše najdene vrste, nabrane na več kot polovici lokalitet, so bile *Lasius emarginatus*, *Plagiolepis pygmaea* in *Tapinoma erraticum*, 22 vrst pa smo našli le na eni lokaliteti. Za vrste *Bothriomyrmex communistus*, *Camponotus honaziensis*, *Crematogaster auberti savinae*, *Messor* cf. *structor*, *Temnothorax* near *interruptus*, *T. rogeri*, *T. sp. 1*, *T. sp. 2* in *Tetramorium* cf. *caespitum* podajamo krajše komentarje, za dve neidentificirani vrsti iz rodu *Temnothorax* pa tudi krajši neformalen opis. Naša raziskava kaže, da lahko kljub temu, da so mravlje južnega dela Črne gore najboljše raziskane, od tod dobimo še precej zanimivih novih podatkov.

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