

Taxonomic review of the genus *Camponotus* (Hymenoptera, Formicidae, Formicinae) from Mongolia

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Abstract. The genus *Camponotus* from Mongolia is taxonomically revised. We recognise five species, three in the subgenus *Camponotus* and two in the subgenus *Tanaemyrmex*. *Camponotus* (*Tanaemyrmex*) *tashcumiri* is new to the ant fauna of Mongolia. For *C. (C.) aterrimus* we give important recognition characteristics that were not mentioned in the previous literature. The species of the subgenus *Camponotus* (*aterrimus*, *sachalinensis*, *saxatilis*) are found in the forest, forest steppe, mountain steppe and steppe, while the species of the subgenus *Tanaemyrmex* (*tashcumiri*, *turkestanus*) occur in the desert, especially in Gobi desert.

Introduction

The Mongolian ants (Formicidae) have been studied mainly by European and Russian entomologists from mid-twentieth century (e.g., Dlussky, 1965; Dlussky and Pisarski, 1970; Pfeiffer *et al.*, 2003; Pisarski, 1969a, b; Pisarski and Krzysztowiak, 1981; Radchenko, 2005; Seifert, 2000). Recently Pfeiffer *et al.* (2007) published a critical checklist of the Mongolian ants based on all the previous publications and recently collected materials. Four *Camponotus* species are recorded in this list, i.e., three species in the subgenus *Camponotus* and one in the subgenus *Tanaemyrmex*. In Mongolia the latter subgenus has been almost exclusively known from the desert area of southwestern part. The specimens collected by us in Terelj (Tuv aimag) and identified by Dr. A. Radchenko as *C. japonicus aterrimus* Emery (see <http://www.antbase.net/mongolia/htdocs/formicinae/235388.html>) are most probably *C. saxatilis*. The information on the nesting sites of '*C. japonicus*' (Yamane and Aibek 2007) was also based on misidentification. They mentioned colonies found in rotting wood, dead stumps and from under stones or logs,

but these sites are quite different from those found in the Japanese populations of *C. japonicus* (e.g., Japanese Ant Database Group, 2003). Our 2008 expedition to eastern Mongolia (Dornod aimag) revealed the occurrence of the true *C. japonicus aterrimus* in this area. We found some useful recognition characteristics for this form during inspection of our material. In spite of our intensive surveys in north-central Mongolia at locations such as Bogdkhaan, Khonin Nuga (Khentei Mts.), Hustai, etc. only a few specimens of this form were found, while two other species (*C. herculeanus sachalinensis* Forel and *C. saxatilis* Ruzsky) were quite common (e.g., Aibek *et al.* 2006). From southwestern part we collected a *Tanaemyrmex* species that has never been recorded from Mongolia. On this occasion we revise the Mongolian species of *Camponotus* mainly based on the material collected by us. At the same time we give new information about nesting habits of these species.

Materials and methods

Most of the material used in this paper was collected by us during 2003–2008 in north-central, eastern and southwestern parts of Mongolia (Fig. 1). Ants were sampled by general collection and colony

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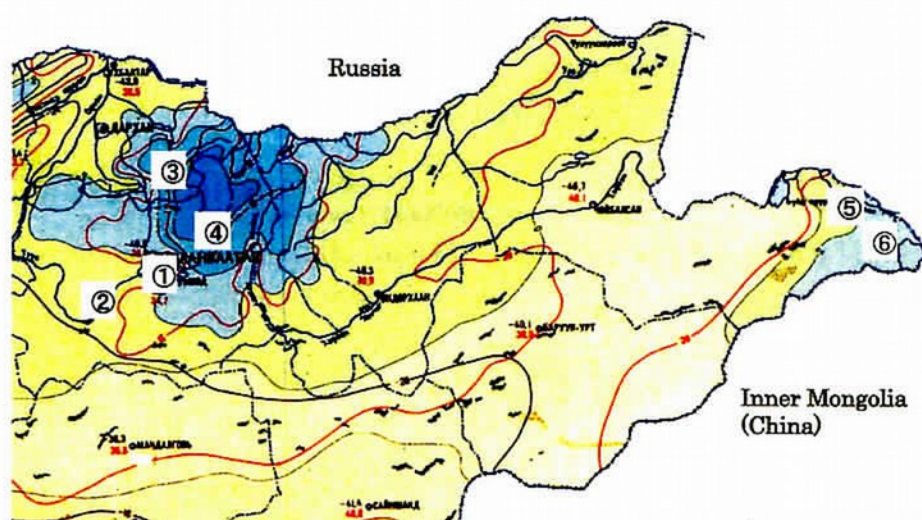


Fig. 1. Map of north-central and eastern Mongolia. ① Bogdkhaan N.P., Tuv aimag, ② Hustai N.P., Tuv aimag, ③ Khonin Nuga, Hentei Mts., Tuv aimag, ④ Terelj N.P., Tuv aimag, ⑤ Halkh gol sum, Dornod aimag, ⑥ Numrug, Dornod aimag.

search. Specimens of *Camponotus japonicus aterimus* were directly compared with the type material and Japanese specimens of *C. japonicus* to decide its status.

Genus *Camponotus* Mayr, 1861

Camponotus Mayr, 1861:35. Type species: *Formica ligniperda* Latreille, 1802: 88, by subsequent designation of Bingham 1903: 347; Bolton, 2003: 27, 112.

Camponotus is one of the largest genera in the World, comprising 46 subgenera and no less than 1,000 species, with the highest diversity in the tropics (Bolton, 1995a,b). Eight subgenera and more than 100 species are known from the Palaearctic region (Radchenko, 2005).

Most species are large with a great size variation in the worker caste, the smallest workers generally measuring more than 5 mm in total body length and the largest ca. 11–12 mm for the temperate species. In the Mongolian species the dorsal outline of the alitrunk is evenly convex and metanotal groove is absent or very weak. The antennae are inserted just

behind the posterior clypeal margin. The antenna is 12-segmented in the worker and queen, and 13-segmented in the male. The maxillary palp is 6-segmented, and the labial palp 4-segmented. Ocelli are absent in the worker, and small but distinct in the queen and male. Foraging activity of species of the subgenus *Camponotus* is seen in the daytime or throughout a day, while members of the subgenus *Tanaemyrmex* are principally nocturnal.

Key to Mongolian species of *Camponotus*

1. Whole body black or blackish brown (sometimes partly reddish). Masticatory margin of mandible with 5 teeth. Clypeus usually without a distinct median carina, rarely with a weak carina. Head of major worker (mandibles excluded) broader than long. Gastral tergites with appressed pubescence.
..... Subgenus *Camponotus*.... 2
- Whole body yellow or brownish yellow. Masticatory margin of mandible with 7 teeth (Figs. 11, 12). Clypeus with a distinct median carina. Head of major worker (mandibles excluded) as long as broad or distinctly longer than broad. Gastral tergites apparently without appressed

- pubescence..... **Subgenus *Tanaemyrmex***.... 4
2. Propodeum posteriorly with rather fine standing hairs down to midlength of its posterior (declivous) face (Fig. 2). In the smallest workers the dorsal outline of alitrunk in profile almost constantly arched throughout (Fig. 2). Even in larger workers basal half of mandible lacking striae (striae if any very feeble) (Fig. 9). With head in full-face view clypeus anteriorly tending to protrude often as a short lobe.
..... ***C. (C.) aterrimus* Emery**
 - Propodeum posteriorly with thicker standing hairs that are generally restricted to the upper third of its posterior face (Figs. 4–6). In the smallest workers propodeum in profile with a distinct steep posterior slope (Figs. 4, 5). In larger workers nearly whole mandible distinctly striate (Fig. 10). With head in full-face view clypeus anteriorly not produced beyond the anterolateral angles of gena. 3
 3. Propodeal declivity, petiole, legs and antennal flagellum (in smaller workers often alitrunk extensively) reddish brown. Gastral tergites with sparse and short pubescence; appressed hairs only 2–3 times as long as distance between them..... ***C. (C.) sachalinensis* Forel**
 - Body almost wholly black; legs and antennal flagellum often with a reddish tinge. Gastral tergites with dense and long pubescence; appressed hairs 4–6 times as long as distance between them..... ***C. (C.) saxatilis* Ruzsky**
 4. Gena and ventral surface of head without standing hairs (Fig. 7). Dorsal face of propodeum shallowly convex in larger workers. Mid- and hind tibiae below with sparse, suberect hairs. Mandibular teeth gradually decreasing in size from the apical to the basal tooth, with basalmost (7th) tooth smallest (Fig. 11).
..... ***C. (T.) turkestanus* André**
 - Ventral surface of head with long standing hairs; gena with a few short, standing hairs (Fig. 8). Dorsal face of propodeum shallowly concave in larger workers. Mid- and hind tibiae below densely with almost appressed hairs.

Mandible with the 5th tooth smallest.
..... ***C. (T.) tashcumiri* Tarbinsky**

***Camponotus (Camponotus) aterrimus* Emery, 1895**
Figs. 2, 13, 18, 19

Camponotus pennsylvanicus var. *aterrimus* Emery, 1895: 478. Type locality: E. Siberia (Russia).

Camponotus herculeanus L. subsp. *japonicus* Mayr var. *aterrima* (sic) Emery: Karavaiev, 1912: 594–595.

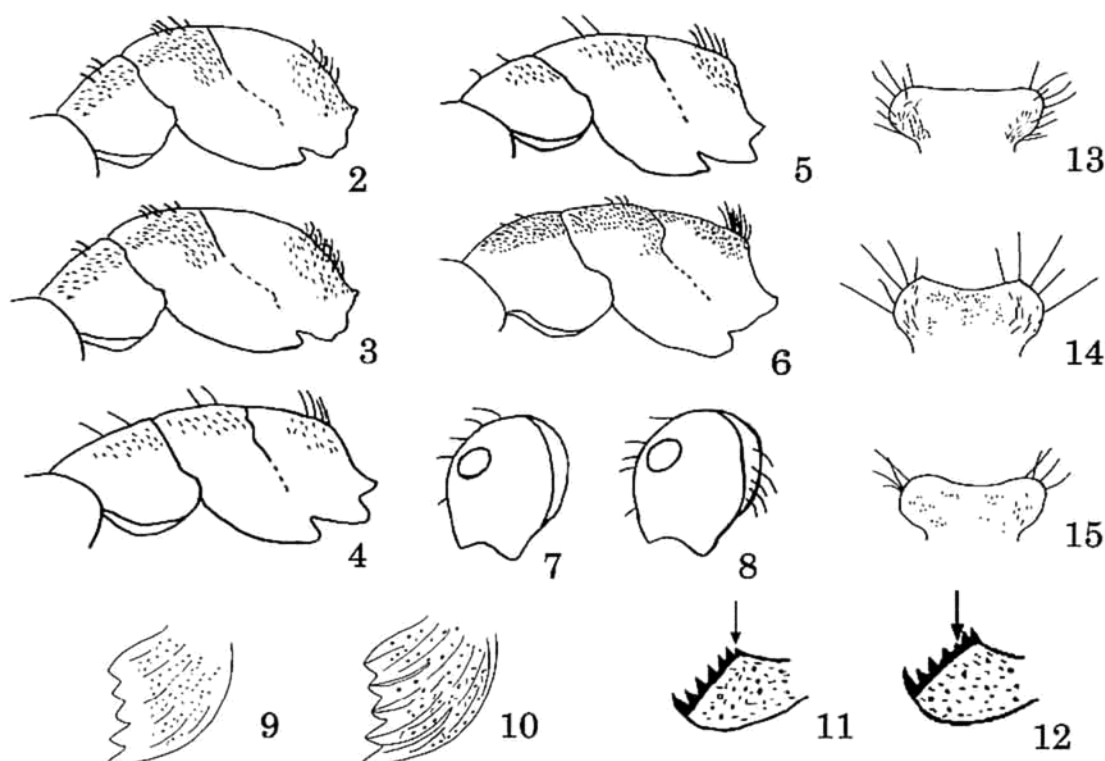
Camponotus herculeanus aterrimus: Ruzsky, 1915: 419–420.

Camponotus japonicus aterrimus: Kupyanskaya, 1990: 170–171, 1995: 353.

Camponotus aterrimus: Ruzsky, 1926: 108.

Worker. Body length 6–11 mm. With head in full-face view clypeus anteriorly often produced as a short lobe. Frons between frontal carinae very finely micropunctate; macropunctures, if any, inconspicuous and confined to lateral zone close to frontal carina. Masticatory margin of mandible with five teeth. In the smallest workers the dorsal outline of alitrunk in profile almost constantly arched throughout, without a distinct steep slope posteriorly on propodeum. Body densely microsculptured and dull, with head laterally weakly shining. Mandible weakly to rather strongly shining except in extreme basal part, punctate but without distinct striation in basal half even in larger workers. Occipital margin of head without standing hairs; clypeus and frons with long curved standing hairs. Ventral surface of head posteriorly with a few (2–4) short erect hairs. Alitrunk dorsally with long standing hairs; propodeum posteriorly with rather fine standing hairs down to midlength of its posterior (declivous) face. Gastral tergites abundantly with long standing hairs; second tergite with 8–14 standing hairs. Gastral tergites with sparse short pubescence; appressed hairs only 2–2.5 times as long as distance between them. Body black, with anterior part of head and mandible often reddish brown; legs also sometimes tinged with reddish brown.

Queen and male: not available among the material



Figs. 2–15. Characters used. 2–4: Alitrunk of small workers in profile. 2, *Camponotus (Camponotus) aterrimus*; 3, *C. (C.) japonicus* from Japan; 4, *C. (C.) sachalinensis*. 5: *C. (C.) saxatilis*. 6: Alitrunk of large worker of *C. sachalinensis* in profile. 7–8: Head in ventrolateral view. 7, *Camponotus (Tanaemyrmex) turkestanus*; 8, *C. (T.) tashcumiri*. 9–10: Left worker mandible. 9, *C. aterrimus*; 10, *C. saxatilis*. 11–12: Masticatory margin of left worker mandible. 11, *C. turkestanus*; 12, *C. tashcumiri*. 13–15: Posterior view of male petiole, showing upper margin. 13, *C. japonicus*; 14, *C. sachalinensis*; 15, *C. saxatilis*.

from Mongolia. For the male petiole of *C. japonicus*, see Fig. 13).

Taxonomic remarks. *Camponotus aterrimus* can be separated from *C. sachalinensis* and *C. saxatilis* by the following characteristics: 1) in the smallest worker the dorsal outline of alitrunk in profile almost constantly arched throughout (Fig. 2); 2) propodeum with standing hairs down to the midlength of its posterior face (Fig. 2); 3) even in the larger workers the mandible basally without striae (Fig. 9); 4) clypeus often produced anteriorly as a short lobe. Kupyanskaya (1990, 1995) has treated this form as a subspecies of *C. japonicus*. Pfeiffer *et al.* (2007) considered (but not clearly stated) *aterrimus* as a junior

synonym of *japonicus*. We treat *C. aterrimus* as a distinct species since the gastral pubescence in the worker is distinctly shorter and sparser than in *C. japonicus* (see also Emery, 1895). In other respects, including nesting habits, these two are not separable. Since any of previous papers on Asian *Camponotus* did not mention the most important recognition characteristics of *C. japonicus* + *C. aterrimus* (1 and 2 mentioned above), previous records of *C. aterrimus* from Mongolia should be reexamined.

The queen and male are not available for the Mongolian population of *C. aterrimus*. In the single syntype queen of *C. aterrimus* from Russia the clypeus is anteriorly produced as a short lobe as in

the queen of *C. japonicus*; these two are distinguished from *C. sachalinensis* and *C. saxatilis* by this and the following additional characteristics: gastral tergites with denser and longer pubescence; appressed hairs in length subequal to the distance between them or more; anterior part of the head, mandible and legs reddish. In the male *C. japonicus* is separated from *C. sachalinensis* and *C. saxatilis* by the following characteristics: 1) Seen from back the upper margin of petiole almost straight, with dorso-lateral corners round, but petiole posterodorsally weakly produced at the middle, 2) In both the queen and male the forewings almost wholly transparent, only slightly infuscated along the anterior margin.

Specimens examined. *Syntype material.* 1 minor worker, Raddefka, Amur, Russia; 1 major worker and 1 alate queen, Marsagan, Siberia orientalis, Russia (Museo Civico di Storia Naturale "Giacomo Doria", Genova). *Non-type material.* Siberia orientalis, Amur (w); China Daba, leg. Csiki (w); Halkh gol sum, Dornod aimag, E. Mongolia, 24 VII 2008, UAI-08-135 (w); MG08-SKY- 41 (w) & Ulzii08-150 (w); Numrug, Dornod aimag, E. Mongolia, 24-25 VII 2008, U. Aibek, Sk. Yamane & Ulzii (w); Khushuut Valley, Hustai N.P., Tuv aimag, North-central Mongolia, UAI-07-90 (w); Khurkhree Valley, Bogdkhaan N.P. ca. 1550 m alt., Tuv aimag, NC Mongolia, 9 VII 2007, Q-7 I Cam (w).

Distribution. Zabaikale, East Kazakhstan, North China, South Siberia, Mongolia.

Bionomics. We collected this species in eastern part (Dornod aimag) of Mongolia from two colonies; in Numrug located close to Inner Mongolia foraging workers were commonly found. It inhabits open sites at relatively low altitudes between 600- 800 m. Nests were constructed in soil and the burrow was dug directly from the ground surface just as in cases observed for *C. japonicus* in Japan. Our material contains a few specimens of this species from north-central part (Bogdkhaan and Hustai). Yasumatsu and Brown (1957) correctly pointed out that *Camponotus japonicus* (including *aterrimus*) always nests underground.

Camponotus (Camponotus) sachalinensis Forel, 1904

Figs. 4, 14, 17

Camponotus herculeanus var. *sachalinensis* Forel, 1904: 381(14). Type locality: Sakhalin (Russia).

Camponotus herculeanus sachalinensis: Ruzsky, 1926: 108; Collingwood, 1976: 306; Kupyanskaya, 1990: 166-167, 1995: 353; Radchenko, 1996: 1203, 1997a: 555-556; Radchenko, 2005: 158.

Camponotus sachalinensis: Collingwood, 1981: 29; Bolton, 1995b: 121; Japanese Ant Database Group, 2003: 31.

Worker. Large species with a marked size variation; body length ranging from 7 to 11 mm. With head in full-face view clypeus anteriorly not produced beyond the level of anterolateral angles of gena, usually without a distinct median carina, rarely with a weak carina. Mandible broad and subtriangular; its masticatory margin with five teeth. In the smallest workers propodeum in profile with a steep posterior slope that is more or less distinctly demarcated from dorsal face. Body densely with fine microsculpture; lateral part of head, alitrunk, and legs weakly shining. Frons between frontal carinae with several large punctures along each carina, and many smaller punctures in median part in addition to micropunctuation (macropunctures less pronounced in smaller individuals). In larger workers mandible except in extreme basal portion distinctly striate but weakly shining. Occipital margin of head without standing hairs; clypeus, frons, vertex, ventral part of head, and alitrunk with long standing hairs. Propodeum posteriorly with relatively thick standing hairs that are generally restricted to the upper third of its posterior face. Tergites and sternites of gaster with long standing hairs. Gastral tergites with sparse and short pubescence; appressed hairs only 2-3 times as long as distance between them. Fore-coxa anteriorly and posteriorly, fore-femur ventrally, and mid- and hind coxa ventrally with standing hairs. Body black. Propodeal declivity, petiole, legs and antennal flagellum (in smaller workers often alitrunk extensively)



Figs. 16–19. Nesting sites. 16, Nest of *Camponotus (Camponotus) saxatilis* in hard dead wood on the ground (Khonin Nuga); 17, Nest of *C. (C.) sachalinensis* in dead standing tree (Khonin Nuga); 18, Entrance of *C. (C.) atterimus* nest (Halkh gol sum); 19, Habitat (grassland) of *C. (C.) atterimus* (Numrug).

reddish brown.

Queen. Body length 14–16 mm. Petiole in profile apically very acute and its anterior slope with a blunt angle in its lower part. Body wholly very finely sculptured and shining. Occipital margin of head without standing hairs; clypeus, frons, ventral surface of head posteriorly, alitrunk, and gaster with long standing hairs. Metanotum with more than 4 standing hairs. Standing hairs on gastral tergites tending to be shorter than in *C. saxatilis*. Pubescence on gastral tergites short and sparse; distance between appressed hairs subequal to hair length. Body wholly black, but legs often tinged with red. Forewing light brown, with the apical zone only slightly darker.

Male. Mongolian material is not available. The following description is based on two Japanese and one Russian specimens. Body length 9–12 mm. Occipital corners of head round. Upper margin of petiole seen in posterior view widely and deeply concave at mid-

dle (Fig. 14), with lateral portion tapering apically seen in profile. Scutellum not shining seen in dorsal view. Pubescence on gastral tergites short and sparse; distance between appressed hairs subequal to hair length. Body wholly black, but in the Japanese specimens side of mesosoma and legs more or less reddish. Forewing almost transparent, with anterior zone very weakly infuscated.

Taxonomic remarks. Various authors have treated this form as a subspecies of *C. herculeanus* or as a distinct species. Collingwood (1981) first raised this form to distinct species rank, but he did not mention any difference between the two. Radchenko (2005) argued that it is a subspecies of *C. herculeanus*, since *sachalinensis* and the typical form differ only in coloration, and intermediate specimens can be collected in Altai and Tuva. He mentioned that the two forms are indistinguishable also in the queen and male. The typical *C. herculeanus* is distinctly bicol-

ored; especially in the queen caste the lateral part of mesonotum, whole propodeum, petiole and legs are reddish brown, while the queen of *sachaliensis* is almost wholly black except for legs. In the typical form, even the major worker has reddish brown alitrunk, petiole and legs, while the major worker of *sachalinensis* has a wholly black alitrunk; only propodeal declivity, petiole and legs are tinged with brown or red. Furthermore, in the worker of the typical form from Finland the pubescence on gastral tergites is longer and denser than in *sachalinensis*. Although the difference is minor, we tentatively follow Collingwood (1981) and Bolton (1995a) for the above-mentioned reason (see also Japanese Ant Database Group, 2003 for the Japanese population).

Specimens examined. Bogdkhaan N.P. 1550 m alt., Tuv aimag, NC. Mongolia, 27 VI 2003, MG03-SKY-05 (w); same loc., 28 VI 2003, UAi03-65 (w); same loc., 8 VII 2007, Ulzii-07-45(w, m) 9 VII 2003, MG03-SKY-83(w); same loc., 16 VII 2003, Sk. Yamane leg., (q); same loc., 12 VII 2007, UAi-07-38 (q); same loc., 12 VII 2008, UAi-08-72 (w); same data, Ulzii-132 (w); same data Sk. Yamane leg.; Gorkhi, Terelj 1250 m alt., Tuv aimag, NC. Mongolia, 29 VI 2003, MG03-SKY-40 (w); same data, UAi-03-53 (w); same loc. 30 VI 2003, Sk. Yamane leg (q); same loc., 1 VII 2003, Sk. Yamane leg (w); Khonin Nuga, 930 m alt., Khentii Mts., Selenge aimag, N. Mongolia, 13 VIII 2004, MG04-SKY-90 (w); Khentii Mts. Selenge aimag, 14 VIII 2004, MG04-SKY-126 (w); Dalbaa, Huvsgul aimag, 5 VII 2007, Bayartogtokh leg. (w, q); Numrug, Dornod aimag, E. Mongolia, 25 VII 2008, U. Aibek leg. (q).

Distribution. East Siberia, Mongolia, Russian Far East, Northeast China, North Korea, and Japan.

Bionomics. This boreal species generally lives at altitudes above 1200–1300 m in Mongolia. It inhabits different kinds of forest (larch, birch and pine) and mountain meadows. Nests are built in rotten wood, stumps and tree hollows, and under logs partly in soil. Males and winged queens are seen in July in nests, and some dealated queens were collected outside the nest in late June to July.

Camponotus (Camponotus) saxatilis Ruzsky, 1895

Figs. 5, 10, 15, 16

Camponotus herculeanus saxatilis Ruzsky, 1895: 7.

Type locality: Povoljè (Russia).

Camponotus saxatilis: Ruzsky, 1926: 108; Kupyanskaya, 1990: 167–169, 1995: 353; Bolton, 1995b: 122; Radchenko, 1996: 1203, 1997a: 557; 2005: 160.

Camponotus japonicus: Yasumatsu and Brown, 1957: 49 (part).

Worker. Large species, with body length ranging from 7 to 12 mm. Clypeus anteriorly not produced beyond the level of anterolateral angles of gena. Mandible broad and subtriangular; masticatory margin with five teeth. Even in the smallest workers propodeum in profile with a steep posterior slope that is more or less demarcated from dorsal face. Body finely microsculptured and dull. Frons between frontal carinae with several large punctures along each carina, and smaller and very superficial punctures along median line (macropunctures confined to area close to frontal carina and indistinct in smaller individuals). In larger workers whole mandible distinctly striate and dull. Occipital margin of head without standing hairs; clypeus, frons, ventral surface of head posteriorly, alitrunk, and gaster with long, curved yellowish standing hairs. Propodeum posteriorly with rather thick standing hairs that are generally restricted to the upper third of its posterior face. Clypeus, gena, and alitrunk with short pubescence; appressed hairs as long as distance between them. Gastral tergites with dense and long pubescence; appressed hairs 4–6 times as long as distance between them. Pilosity on legs almost same as in *C. sachalinensis*. Body almost wholly black; legs and antennal flagellum often with a reddish tinge.

Queen. Body length 14–17 mm. Petiole in profile apically very acute; its anterior slope with a blunt angle in its lower part. Mandible striate, slightly shining. Head and propodeum dull; mesoscutum, scutellum, and gaster smooth, shining. Occipital margin of head without standing hairs; clypeus, frons, ventral surface of head posteriorly, alitrunk, and

gaster with long standing hairs. Metanotum with less than 4 standing hairs (rarely 4) or without standing hairs. Standing hairs on gastral tergites tending to be longer than in *C. sachalinensis*. Pubescence on gaster very short and sparse. Body wholly black. Forewing more strongly infuscated than in *C. sachalinensis*, with its anterior zone much darker than in the latter.

Male. Body length 10–12 mm. Head elongate, in anterior half parallel-sided. Posterior outline of head between eyes in full-face view evenly and roundly convex. Scutellum and propodeal dorsum weakly sculptured and shining. Upper margin of petiole seen in posterior view widely but only shallowly concave in the middle, with lateral angles rounded (Fig. 15). Pubescence on gastral tergites sparse and short. Body wholly black; tibiae and tarsi often slightly reddish. Forewing transparent with anterior zone rather strongly darkened.

Taxonomic remarks. Yasumatsu and Brown (1957) did not separate this species from *C. japonicus* (but see below for the recognition characteristics of the two forms). In the worker this species is easily distinguished from *C. sachalinensis* by the almost wholly black body, and long and dense pubescence on gastral tergites; in the male by the shallower apical concavity of petiole with rounded lateral angles. In the queen the two species are very similar, but the metanotum has constantly fewer standing hairs (usually less than 4) in *C. saxatilis*. In both the queen and male, the forewing of *C. saxatilis* is more strongly infuscated, with its anterior zone rather strongly darkened.

Specimens examined. Terelj 1250 m alt., Tuv aimag, NC. Mongolia, N 47° 54' E 107° 23', 8 VII 1997, Martin Pfeiffer leg. (w); same loc., 29 VI 2003 Sk. Yamane leg. (q); same loc., 30 VI 2003, MG03-SKY- 38 (m); same loc., MG03-SKY- 39 (q); same loc., 1 VII 2003, MG03-SKY- 41 (w, q, m); same loc., MG03-SKY- 43 (w, m); same data UAI03- 28 (q); Bogdkhaan N.P., 1550 m alt., Tuv aimag, NC. Mongolia, 28 VI 2003, MG03-SKY- 19 (w); same loc., 25 VI 2003, K. Ulykpan leg. (w); same loc., 12 VII 2008, Sk. Yamane leg., (w), same data U. Aibek leg., (w); same loc., 16 VII 2008, MG03-SKY- 24

(w); same loc., 22 VII 2007, UAI-07-22 (q); Khandgait, Jiver Mt., 1650 m alt., Ulaanbaatar, 7 VIII 2004, Sk. Yamane leg. (w); same data, UAI03-54 (w); Hustai N.P., 1850 m alt., Tuv aimag, NC. Mongolia, 4 VII 2003, MG03-SKY- 69 (w); Khonin Nuga, 930 m alt., Khentii Mts., Selenge aimag, N. Mongolia, 12 VIII 2004, MG04-SKY- 71 (w); same data UAI04-68 (w); same loc., 13 VIII 2004, MG04-SKY- 94 (w); Khentii Mts., Selenge aimag, N. Mongolia, 14 VIII 2004, MG04-SKY- 125 (w); Numrug, Dornod aimag, E. Mongolia, 25 VII 2008, MG08-SKY- 56 (w); same data, UAI-08-143 (w); same data, Ulzii08-156 (w).

Distribution. Russia (from Volga and Kama rivers to Far East), Mongolia, North Korea.

Bionomics. The species mostly inhabits open sites (forest steppe, mountain steppe, forest edge, grassland), and is also met in different kinds of forest (larch, birch, mixed forests). Nests are built mainly in dead wood (rotten wood, fallen wood, dead standing tree, base of dead tree) and under stone (partly in soil). Yamane and Aibek (2007) gave a picture (Fig. 3) of a nest of *C. japonicus*, but the species should be *C. saxatilis*. Nuptial flight is seen in July and August (15 July 2007, U. Aibek leg.).

Camponotus (Tanaemyrmex) tashcumiri

Tarbinsky, 1976

Figs. 8, 12

Camponotus tashcumiri Tarbinsky, 1976: 158. Type locality: Kirgizia. Radchenko, 1997b: 810–811.

Worker (small to medium-sized). Body length 5–7 mm. Eye smaller than in *C. turkestanus*; with head in profile distance between posterior margin of eye and posterolateral corner of head equal to or longer than maximum length of eye. Clypeus weakly convex anteriorly in small specimens; median carina present but blunter than in *C. turkestanus*. Mandible broad and subtriangular, with 7 teeth on its masticatory margin; 5th tooth the smallest. Antennal scape of larger workers relatively shorter. Dorsal face of propodeum shallowly concave in the medium-sized worker. Whole body smooth and relatively shining.

Posterior margin of head and antennal scape without standing hairs. Ventral surface of head sparsely with long standing hairs; gena with a few (2–4) short, standing hairs. Pronotum and mesonotum each dorsally with a pair of standing hairs; gaster with long curved standing hairs. Gastral tergites apparently without appressed pubescence. Mid- and hind tibiae below with dense, almost appressed hairs; femur without pubescence. Body and legs wholly yellow, with head and antennae slightly darker; mandible reddish brown. Largest worker is not available.

Queen and male: not available among the material from Mongolia.

Taxonomic remarks. In the Asian *Tanaemyrmex* some other species (*barbatus*, *turkestanicus*, *baldacci*, *fellah* etc.) also have the ventral surface of the head with standing hairs and scape without standing hairs. Among them *C. barbatus* is a very hairy and black species; the head is extensively covered with standing hairs. In *C. baldacci* the ventral surface of the head has short, sparse standing hairs; the alitrunk and anterior half of the gaster are yellow or brownish yellow and the remainder part of the gaster is blackish brown. *Camponotus fellah* has similar structural and hair conditions to those of *C. baldacci*, but the body is wholly black. In conclusion *C. tashcumiri* is separable from all the Asian species with standing hairs on the ventral surface of the head by a combination of the occurrence of standing hairs on the gena and wholly yellowish body.

Specimens examined. Zarmin Gobi, Gobi-Altai aimag, 7 viii 2003, U. Aibek (w).

Distribution. Kirgizia, Southwestern Mongolia.

Bionomics. This species was collected in Gobi desert only once. Nocturnal in activity.

Camponotus (Tanaemyrmex) turkestanus André,
1982

Figs. 7, 11

Camponotus sylvaticus var. *turkestanus* André,
1882: 145; Type locality: Turkestan.

Camponotus turkestanus André: Emery, 1925: 101
(combination in *C. (Tanaemyrmex)*); Collingwood, 1961: 74; Tarbinskii, 1976: 145, 156–157;

Radchenko, 1996: 1201; 1997b: 810–811.

Worker (small to medium-sized). Body length 6–9 mm. Eye large and laterally convex; with head in profile distance between posterior margin of eye and posterolateral corner of head usually shorter than maximum length of eye. Clypeus with anterior margin almost straight, with a distinct median carina. Mandible broad, subtriangular; masticatory margin with 7 teeth, which gradually decrease in size from apex to base, with the basalmost (7th) tooth smallest. Antennal scapes long, extended beyond posterior margin of head by its 1/3–1/2 length. Dorsal face of propodeum in profile shallowly convex in medium-sized workers. Whole body smooth (sculpture very feeble), relatively shining. Occipital margin and ventral surface of head, gena and antennal scape without standing hairs. Eye without hairs. Clypeus, frons, alitrunk and gaster with long curved standing hairs. Fore coxa and femur below with a few erect hairs; mid- and hind tibiae below with sparse suberect hairs; femora without pubescence. Gastral tergites apparently without appressed pubescence. Head and antennae yellowish brown; mandible reddish brown; alitrunk, gaster and legs yellow. The largest worker is not available.

Queen and male: not available among the material from Mongolia.

Taxonomic remarks. This species is easily distinguished from *C. (Tanaemyrmex) tashcumiri* by the following characteristics: mandibular teeth gradually decreasing in size from the apical to the basal, with the basalmost (7th) tooth the smallest (in the latter 5th tooth the smallest) (Fig. 11 vs. 12); ventral surface of head, and gena without standing hairs (Fig. 7); mid- and hind tibiae below with sparse suberect hairs.

Specimens examined. Bayan-Zag, N 44°10' E 103°42', 31 VII 1997, M. Pfeiffer leg. 113 (w); same loc., 2 VIII 1997, M. Pfeiffer leg. 137 (w); Eej Hairkhan Mts., Gobi-Altai aimag, 5 V 2005, U. Aibek leg. (w); Baga Gazryin Chuluu, South-Gobi aimag, 5 VIII 2005, U. Aibek leg. (w).

Distribution. Middle Asia, Kazakhstan, Afghanistan, Iran, Talysh, Mongolia.

Bionomics. This species inhabits desert habitat in southwestern part, and is mainly found in Gobi desert. Pfeiffer *et al.* (2003), however, recorded this species in steppe of Zorgor, north-central Mongolia. Nocturnal in activity.

Discussion

The three species of the subgenus *Camponotus*, i.e., *C. aterrimus*, *C. sachalinensis*, and *C. saxatilis* are separable from each other using the newly introduced characters. *Camponotus aterrimus* is most closely related to *C. japonicus* occurring in Japan, and possibly in the Korean Peninsula. However, they have rather different conditions of the gastral pubescence that indicate specific difference. As pointed out by Radchenko (2005), *C. sachalinensis* is most closely related to the Euro-West Siberian *C. herculeanus*, while *C. saxatilis* is confined to northeastern part of the Palearctic region but absent from Japan and the Kurile Islands. Thus, these three species are northern Palearctic in distribution but show different patterns of range. On the other hand, the two *Tanaemyrmex* species most probably originate from West/Central Asia through a wide dry zone lying between North Africa and Mongolia. Thus the *Camponotus* fauna of Mongolia comprises two distinct elements.

Camponotus aterrimus was collected only from the grassland (Fig. 19), while *C. sachalinensis* and *C. saxatilis* mainly inhabit the forest and forest steppe. We found two underground nests of *C. aterrimus* with entrances on the ground surface (Fig. 18); this condition is very similar to that observed in the Japanese *C. japonicus* (see also Yasumatsu and Brown, 1957). *Camponotus sachalinensis* and *C. saxatilis* mainly nest in rotting wood, dead stumps of trees and tree hollows, and also under stones (Figs. 16, 17). Among the nests of *C. sachalinensis* only one was located in soil. No nest record is available for the two *Tanaemyrmex* species in Mongolia.

Acknowledgements. We thank Dr. Martin Pfeiffer of Ulm University (Germany) for his useful comments to an earlier draft of the manuscript. Dr. Fabio Penati of

Museo Civico di Storia Naturale "Giacomo Doria" (Italy) kindly loaned us types of *Camponotus pennsylvanicus aterrimus* Emery. Cordial thanks are also due to Ms. Jargalsaikhan Purevdelger and Mr. Tserensambuu Ulzii, (National University of Mongolia), and Ms. Etsuko Yamane (Kagoshima-shi, Japan) for their kind cooperation and help during the fieldwork. This work was supported by the Japan Society for the Promotion of Science (Ronpaku Program: MECS 10731).

References

- Aibek U., Sonomdavga Ch. and Yamane Sk. 2006. A preliminary survey on the species composition and nesting habitats of ants in the Bogdkhaan Mountain region, North Central Mongolia. *ANET Newsletter*, (8): 11–15.
- André E. 1882. *Species des Hyménoptères d'Europe et d'Algérie*, 2: 81–152. Beaune.
- Bingham, C. T. 1903. *The Fauna of British India, Including Ceylon and Burma*. Hymenoptera, Vol. II. 506 pp., 1 pl. Taylor and Francis, London.
- Bolton B. 1995a. A taxonomic and zoogeographical census of the extant ant taxa (Hymenoptera, Formicidae). *Journal of Natural History*, 29: 1037–1056.
- Bolton B. 1995b. *A New General Catalogue of the Ants of the World*. 504 pp. Harvard University Press, Cambridge/London.
- Bolton B. 2003. Synopsis and classification of Formicidae. *Memoirs of the American Entomological Institute*, 71: 1–370.
- Collingwood C. A. 1961. The Third Danish expedition to Central Asia. Zoological Results 27. Formicidae (Insecta) from Afghanistan. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening*, 123: 51–79.
- Collingwood C. A. 1976. Ants (Hymenoptera, Formicidae) from North Korea. *Annales Historico-Naturales Musei Nationalis Hungarici*, 68: 295–309.
- Collingwood C. A. 1981. Ants (Hymenoptera: Formicidae) from Korea. 2. *Folia Entomologica*

- Hungarica*, **42**: 25–30.
- Dlussky G. 1965. Ants of the genus *Formica* L. of Mongolia and northeast Tibet (Hymenoptera, Formicidae). *Annales Zoologici*, **23**: 15–43.
- Dlussky G. and Pisarski B. 1970. Formicidae aus der Mongolei. Ergebnisse der Mongolisch-Deutschen Biologischen Expeditionen seit 1962. *Mitteilungen aus dem Zoologische Museum in Berlin*, **46**: 85–90.
- Emery C. 1895. Viaggio di Leonardo Fea in Birmania e regioni vicine. LXIII. Formiche di Birmania, del Tenasserim e dei Monti Carin, raccolte da L. Fea. *Annali del Museo Civico di Storia Naturale Giacomo Doria (Genova)*, (2)**14**(34): 450–483.
- Emery C. 1925. In Wytsman, P. *Genera Insectorum*. Hymenoptera, Fam. Formicidae, subfam. Formicinae. Fasc. **183**, 302 pp. Bruxelles.
- Forel A. 1904. Note sur les Fourmis du Musée zoologique de l'Académie Impériale des Sciences à St. Pétersbourg. *Ezhegodnik Zoologicheskogo Muzeia Imperatorskoi Akademii Nauk*, **8**: 368–389.
- Japanese Ant Database Group. 2003. *Ants of Japan*. 224 pp. Gakken, Tokyo.
- Karawaiev W. 1912. Ameisen aus dem paläarktischen Faunengebiet. *Russkoe Entomologicheskoe Obozrenie*, **12**: 581–596.
- Kupyanskaya A.N. 1990. [Ants of the Far East USSR.] 258 pp. Vladivostok. (In Russian.)
- Kupyanskaya A.N. 1995. Formicidae: in Lehr P. A. (ed.) [Key to the Insects of Russian Far East in Six Volumes. Vol. IV. Neuropteroidea, Mecoptera, Hymenoptera. Part 1], pp. 325–368. Far-East Science Center, Biological-Soil Institute AN SSSR. St. Petersburg: Nauka. (In Russian.)
- Mayr G. 1861. Die Europäischen Formiciden (Ameisen). 80 pp. Wien.
- Pfeiffer M., Chimedregzen L. and Ulykpan K. 2003. Community organization and species richness of ants (Hymenoptera/ Formicidae) in Mongolia along an ecological gradient from steppe to Gobi desert. *Journal of Biogeography*, **30**: 1921–1935.
- Pfeiffer M., Schultz R., Radchenko. A., Yamane Sk., Woyciechowski M., Aibek U. and Seifert B. 2007. A critical checklist of the ants of Mongolia (Hymenoptera/ Formicidae). *Bonner Zoologische Beiträge*, **55**: 1–8.
- Pfeiffer M. 2008. website: <http://www.antbase.net/mongolia>
- Pisarski B. 1969a. Fourmis (Hymenoptera, Formicidae) de la Mongolie. *Fragmenta Faunistica*, **15**: 221–236.
- Pisarski B. 1969b. Myrmicidae und Formicidae. Ergebnisse der zoologischen Forschungen von Dr. Z. Kaszab in der Mongolei (Hymenoptera). *Faunistische Abhandlungen Staatliches Museum für Tierkunde in Dresden*, **2**: 295–316.
- Pisarski B., Krzysztowiak L. 1981. Myrmicidae und Formicidae (Hymenoptera) aus der Mongolei, II. *Folia Entomologica Hungarica*, **42** (34): 155–166.
- Radchenko A. 1996. A key to the ant genus *Camponotus* (Hymenoptera, Formicidae) in Palearctic Asia. *Zoologicheskii Zhurnal*, **75**: 1195–1203.
- Radchenko A. 1997a. Review of ants from the genus *Camponotus* (Hymenoptera, Formicidae) of the Palearctic. The subgenus *Camponotus* s. str. *Zoologicheskii Zhurnal*, **76**: 554–564.
- Radchenko A. 1997b. Review of ants from the subgenera *Tanaemyrmex*, *Colobopsis*, *Myrmamblys*, *Myrmosericus*, *Orthonotomymex*, and *Paramyrmamblys* from the genus *Camponotus* (Hymenoptera, Formicidae) in the Asian Palearctic. *Zoologicheskii Zhurnal*, **76**: 806–815.
- Radchenko A. 2005. Monographic revision of the ants (Hymenoptera, Formicidae) of North Korea. *Annales Zoologici*, **55**: 127–221.
- Ruzsky M. 1895. [Faunistic investigations in eastern Russia. Toward the ant fauna of the east of Russia.] *Trudy Obshchestva Estestvoispytatelei pri Imperatorskom Kazanskom Universitete*, **28** (5): 1–32. (In Russian.)
- Ruzsky M. 1915. [On the ants of Tibet and the southern Gobi. From material collected by the expedition of Colonel P. K. Kozlov.] *Ezhegodnik Zoologicheskogo Muzeia Imperatorskoi Akademii Nauk*, **20**: 418–444. (In Russian.)
- Ruzsky M. 1926. [Systematic list of ants found in

- Siberia. 1. Review of species of the genera *Camponotus* (s. ext.) and *Formica* (s. str.).] *Izvestiya Tomskogo Gosudarstvennogo Universiteta*, **77**: 107–111. (In Russian.)
- Seifert B. 2000. A taxonomic revision of the ant subgenus *Coptoformica* Müller, 1923 (Hymenoptera, Formicidae). *Zoosystema*, **22**: 517–168.
- Tarbinsky Y. S. 1976. [The ants of Kirghizia (Hymenoptera, Formicidae).] 217 pp. Izdatel'stvo "ILIM", Frunze. (In Russian.)
- Wheeler, W. M. 1929. Some ants from China and Manchuria. *American Museum Novitates*, (**361**): 1–11.
- Yamane, Sk. and Aibek, U. 2007. Ants of Mongolia. *Nature and Insects*, **42**(5): 20–25. (In Japanese.)
- Yasumatsu K. and Brown, W. L. Jr. 1957. A second look at the ants of the *Camponotus herculeanus* group in Eastern Asia. *Journal of the Faculty of Agriculture, Kyushu University*, **11**: 45–51.

(Accepted June 13, 2009)