

New records of the ant genus *Camponotus* (Hymenoptera, Formicidae) from Mongolia: discovery of the subgenus *Myrmentoma*

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ABSTRACT. Currently, seven species of *Camponotus* are known from Mongolia, with three belonging to the subgenus *Camponotus* and two belonging to each of the subgenera *Myrmentoma* and *Tanaemyrmex*. Two species, *Camponotus (Myrmentoma) lameerei* and *C. (M.) quadrinotatus*, are herein recorded as new to the Mongolian ant fauna. These species belong to the *C. fallax* group. The specimens of *C. quadrinotatus* from Mongolia well agreed with the Japanese specimens examined in structure, sculpture and pilosity, but had paler color pattern than in the latter. An identification key to the workers of the genus *Camponotus* known from Mongolia is provided. Currently, a total of 75 ant species are known from Mongolia.

Keywords *Myrmentoma*, subgenus, oases, desert, Umnugobi aimag, Palaearctic region

Citation Ulykpan Aibek, Tserensambuu Ulzii, Seiki Yamane & Maxim Yu. Proshchalykin (2024). New records of the ant genus *Camponotus* (Hymenoptera, Formicidae) from Mongolia: discovery of the subgenus *Myrmentoma*. *Asian Myrmecology* 17: e017002

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Communicating Editor Mark Wong

INTRODUCTION

The genus *Camponotus* Mayr, 1861 is the second most speciose taxon among genera of Formicidae, comprising 43 subgenera, 1087 valid species and 411 subspecies, with the highest diversity in the tropics (Dhadwal & Bharti 2023; Bolton, 2024a,b). Members of this genus are distributed throughout the world, including the Arctic (Salata et al., 2019). Eight subgenera and more than 170 species are known from the Palaearctic region, and most of them occur in the Mediterranean and Turanian regions (Radchenko, 1997; Salata et al., 2023).

The subgenus *Myrmentoma* of the genus *Camponotus* comprises 58 species distributed mostly in the southern Holarctic region, with 33 species from the Palaearctic (Bolton, 2024a). The species of the subgenus *Myrmentoma* from the Asian Palaearctic are reviewed by Radchenko (1996).

Ants have strong influences on ecosystems, especially in arid regions. However, little is known about the ants of the vast steppe and desert regions of Central Asia (Pfeiffer et al., 2003). Pfeiffer et al. (2007) published a checklist of the Mongolian ants and recorded four *Camponotus*

species: three species in the subgenus *Camponotus*, and one species in the subgenus *Tanaemyrmex*.

The climate of Mongolia is harsh continental with sharply defined seasons, characterized by high annual and diurnal temperature fluctuations and low rainfall. The southern part of the country is made up of semi-desert and desert ecosystems. Average annual air temperatures are around 8.5°C in the desert, and -7.8°C in the high mountainous areas. The annual precipitation amount averages at 200 - 220 mm for the whole country, ranging from 38.4 mm in the extreme (desert region) south to 120 mm in the semi-desert ecosystems (Namkhainyam 2014).

Aibek & Yamane (2009) taxonomically revised the genus *Camponotus* in Mongolia. They reported three species of the subgenus *Camponotus* (*C. aterrimus* Emery, 1895, *C. sachalinensis* Forel, 1904, *C. saxatilis* Ruzsky, 1895) from forest and steppe habitats, and two species of the subgenus *Tanaemyrmex* (*C. tashcumiri*, Tarbinsky, 1976, *C. turkestanus* André, 1982) from desert, and desert-steppe habitats, presenting a revised key to species. Herewith, we record two species of the subgenus *Myrmentoma* from Mongolia for the first time, both inhabiting the desert ecosystem.

MATERIALS AND METHODS

The materials were collected from two sites in Umnugobi aimag (province), southern part of Mongolia, which belongs to the desert region (Fig. 1). The first site was the Zuunmod - Zulganai oasis, Gurvantes soum (district): 43° 35' N, 100° 02' E, 1049 m above sea level. We collected ants from living *Populus* trees in small deciduous forest. The second site was in Tsagaan Tolgoi springs, Khanbogd soum: 43° 10' N, 107° 09' E, 1172 m above sea level. The specimens were found on a living *Ulmus* tree in an open semi-desert steppe. The distance between the two sites is more than 500 km. Ants were sampled by hand collection in

the summer of 2018 and 2020. All specimens were preserved in 96 % EtOH. Morphological observations were performed using a Motic SMZ-168 stereomicroscope. Images were taken with a Canon EOS 7D Mark II with a Canon 100 mm Macro lens and processed using Zerene Stacker and Adobe Photoshop CC 2019 software. The specimens are deposited in the Department of Biology, National University of Mongolia, in the Institute of Biology, Mongolian Academy of Sciences, and SKY Collection, Kitakyushu, Japan.

Measurements were taken for five workers of each species using a Moticam camera, and recorded to the nearest 0.01 mm. All measurements are expressed in millimeters to the second decimal place.

An insufficient number of large workers were collected, so small and medium sized workers were used for measurements. Descriptions are also provided for large workers.

The abbreviations used for the measurements and indices are as follows:

TL	Total length, measured from the anterior margin of the head to the tip of gaster in stretched specimens.
HL	Maximum head length in full-face view, measured from the anterior clypeal margin to the midpoint of a line drawn across the posterior margin of head.
HW	Maximum head width in full-face view.
SL	Scape length excluding the basal constriction and condylar bulb.
ML	Mesosomal length measured from the point at which the pronotum meets the cervical shield to the posterior margin of metapleuron in profile.
PW	Maximum width of pronotum in dorsal view.
SI	Scape index, SL/HW
CI	Cephalic index, HW/HL

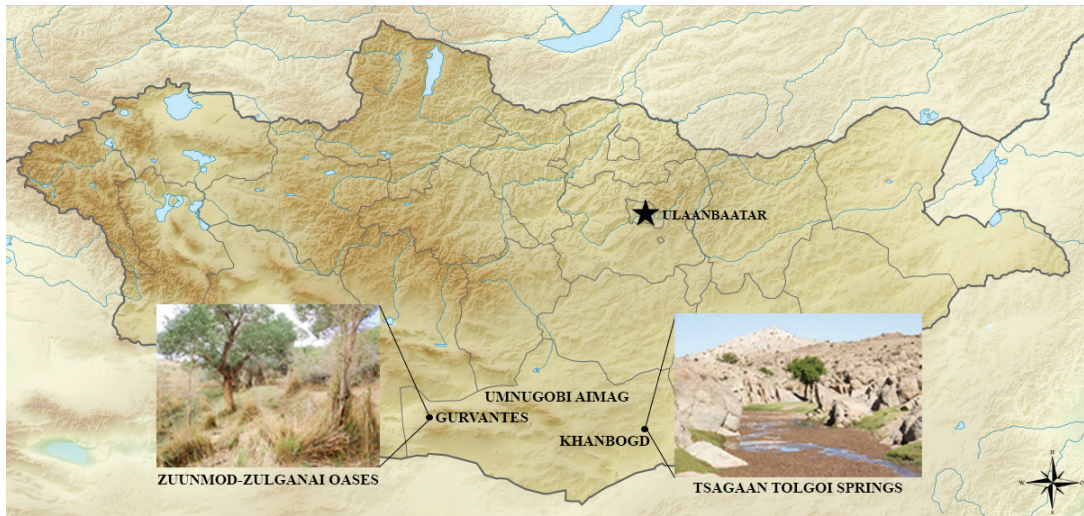


Fig. 1. Location of collection sites in Umnugobi aimag, Mongolia (map source: https://commons.wikimedia.org/wiki/File:Relief_map_of_Mongolia.png)

RESULTS

Camponotus fallax group of the subgenus *Myrmentoma* Forel, 1912

The *Camponotus fallax* group is characterized by a small to moderate body size, regularly arched dorsal outline of mesosoma (sometimes with a shallow concavity between mesonotum and propodeum), propodeum with straight dorsal outline, with posterodorsal corner more or less angulate, shiny surface of mesosoma and gaster, and short and never dense pubescence hairs on the gaster (Salata et al., 2019). The workers vary in size, though are not clearly dimorphic; intermediates between the largest and smallest workers are here designated “medium” workers. Although no detailed morphometric study exists on the worker size variation, worker size does not appear to show a bimodal pattern.

Camponotus (Myrmentoma) lameerei Emery, 1898 (Figs. 2A, 2B, 2C.)

Camponotus marginatus var. *lameerei* Emery, 1898: 150. Type locality: Uzbekistan.

Small and medium workers measurements (n=5): TL: 4.27-6.05, HL: 1.08-1.54, HW: 0.91-1.34, SL: 1.25-1.57, PL: 1.42-1.87, PW: 0.79-1.08, SI (average): 1.37 (small worker), 1.17 (medium worker), CI (average): 0.84 (small worker), 0.87 (medium worker).

Worker description (large worker).

Structure. Head in full face view, trapezoidal, as long as or slightly longer than broad, with posterior margin widely concave, posterolateral corner round, lateral margin almost straight, tapering to anterior. Eye relatively large, located at posterior half of head. Frontal carina short, reaching level of half-length of eye. Antenna 12 segmented; scape slender and surpassing posterior margin of head by one-quarter of its length. Clypeus almost as long as broad, medially convex, without distinct median longitudinal carina; its anterior margin convex, medially notched. Mandible broad and subtriangular, its masticatory margin with five teeth. In profile view, dorsal outline of mesosoma almost constantly arched throughout, without metanotal groove, and propodeal declivity gently sloping; propodeal junction only very weakly obtuse-angled. With mesosoma in dorsal view, pronotum flat, wide, almost two-thirds of head width; mesonotum and propodeum continuously narrowing posteriorly. In profile view, metapleuron completely fused to mesopleuron and propodeal side; propodeal spiracle located close to propodeal declivity. Petiolor node in dorsal view slightly wider than dorsal face of propodeum; in profile view compressed and tapered apicad; anterior margin convex, posterior margin almost straight, dorsal margin broadly convex; in posterior view triangularly convex.



Fig. 2. *Camponotus lameerei* (medium worker). 2A. Body in profile view. 2B. Body in dorsal view. 2C. Head in full-face view.

Sculpture. Surrounding of antennal socket, frons, vertex, and pronotum with weak microsculpture. Area between frontal carina and eye extensively with micropunctuation or microsculpturation; other parts of head dorsum sparsely and weakly punctate and shiny; punctuation denser and coarser on ventral face. Antennal scape weakly shiny; pedicel and flagellum densely microsculptured and dull. Clypeus entirely microsculptured and dull, sparsely with large punctures. Mandible extensively punctate sparsely, with very weak striation. Pronotum and lateral face of mesosoma microsculptured or micropunctate; mesonotum and propodeal dorsum with finer sculpture and rather

shiny. Legs with very superficial sculpture and shiny. Gastral tergites superficially microsculptured, shiny, with scattered pits bearing setae.

Pilosity. Head including mandible extensively with standing hairs; lateral margin of head in full-face view with numerous short standing hairs; hairs on posterior portion of clypeus, frontal lobe and median portion of vertex slightly longer; anterior margin of clypeus medially with 3 stout long hairs; dorsum and venter of head including mandible with sparse pubescent hairs that are very short and appressed. Antennal scape with many short appressed hairs but without standing hairs; pedicel and flagellum with dense suberect hairs

that are extremely short. Pronotum without standing hairs or with a few relatively short standing hairs; mesonotum without standing hairs or with a pair of rather long hairs; propodeum with 2-3 pairs and petiole with 3-4 pairs of long hairs; pronotum, mesonotum and propodeal dorsum sparsely with short appressed pubescent hairs. Fore-coxa anteriorly and posteriorly, mid and hind coxae ventrally, and ventral face of femora of all legs basally with a few standing hairs; entire legs with short appressed pubescence. Gastral tergites and sternites with long standing hairs and dense pubescence.

Coloration. Head, antenna, mesosoma and legs extensively pale brown to reddish brown; lower gena and mandible dark reddish brown; vertex partly often with same tinge; gaster black.

Smaller workers tend to have a more elongate head (CI 0.84 in average), with the posterior margin almost straight or shallowly convex in full-face view. Antennal scape relatively longer than in larger workers, extending the posterior margin of head by one-third its length. Clypeus more transverse than in larger workers.

Material examined. Zuunmod – Zulganai oasis, Gurvantes soum, Umnugobi aimag, Mongolia, 28. VII. 2018, Leg. U. Aibek, Ts. Ulzii and Sk. Yamane: UAI-18-26, UAI-18-27, UAI-18-28; MG18-SKY-31.

Distribution. Turkmenistan, Uzbekistan, Kyrgyzstan, South Kazakhstan, and Mongolia (new record).

Ecology. This species occurs at altitudes 1000-1050 m in Mongolia. It inhabits oases and deciduous riparian forest in desert and semi-desert ecosystems. Nests are built on living trees (*Populus euphratica* Oliv.), probably in tunnels and under bark.

Comments. This species inhabits the gardens, groves, and floodplain forests at altitudes from 700 to 1700 m in Kyrgyzstan. Nests are built in dry or hollow trunks of deciduous trees: elm, poplar, wild pear, apricot, wild apple, and willow (Tarbinsky, 1976).

We found this species in southern Mongolia, which is the easternmost border of the species range.

Camponotus (Myrmentoma) quadrinotatus Forel, 1886 (Figs. 3A, 3B, 3C.)

Camponotus marginatus var. *quadrinotatus* Forel, 1886: 142. Type locality: Japan.

Camponotus quadrinotatus: Ruzsky, 1926: 109; Bolton, 1995: 119.

Small and medium workers measurements (n=5): TL: 4.45-6.22, HL: 1.27-1.47, HW: 1.02-1.39, SL: 1.31-1.51, PL: 1.53-1.89, PW: 0.87-1.04, SI (average): 1.28 (small worker), 1.08 (medium worker), CI (average): 0.81 (small worker), 0.94 (medium worker).

Worker description (large worker).

Structure. Head in full face view, rectangular, slightly longer than broad, with posterior margin shallowly concave, posterolateral corner round, lateral margin weakly convex, tapering anteriorly. Eye relatively large, located at posterior half of head. Frontal carina short, reaching level of half-length of eye. Antenna 12-segmented; scape slender, surpassing posterior margin of head by one-quarter of its length. Clypeus slightly longer than broad, anteriorly convex, with anterior margin medially notched, without distinct median carina. Mandible broad and subtriangular, its masticatory margin with five teeth. In profile view, dorsal outline of mesosoma weakly convex, interrupted by shallow metanotal groove; propodeal junction bluntly angled and declivity gently sloping. With mesosoma in dorsal view, pronotum flat, wide, almost two-thirds of head width; mesonotum and propodeal dorsum continuously narrowing posteriorly. Petiolator node in profile view compressed and tapered apically; anterior margin convex, posterior margin almost straight; in posterior view with dorsolateral corner round and dorsal margin medially straight.

Sculpture. Head extensively and densely microscopically sculptured, with sparse small punctures and dull; area around posterolateral corner rather shiny. Mandible punctate, with distinct striation, and dull. Almost entire mesosoma and anterior face of petiole microscopically and densely sculptured, only weakly shiny; propodeal declivity and posterior face of petiole with very fine transverse puncto-striation. Legs essentially smooth and shiny; sculpturation very superficial. Gaster dorsally with dense microscopic sculpture and rather dull, while ventrally more shiny.

Pilosity. Dorsum of head with 3 pairs of standing hairs (rarely additional pair present on vertex); venter with a few standing hairs; lateral margin of head in full-face view without erect hairs; entire head covered with very short sparse pubescence. Antennal scape with short appressed pubescent hairs; flagellum densely covered with much shorter suberect hairs. Clypeus anteriorly with 3 short stout decumbent hairs, posteriorly with a pair of standing hairs. Mandible with a few decumbent hairs on outer margin apically. Pronotum lack in standing hairs; mesonotum with a pair of and propodeum around posterodorsal corner 2-3 pairs of standing hairs; mesosoma mainly on dorsum covered with sparse appressed pubescence; pubescent hairs shorter than distance between them. Anterior face of fore-coxa with 3-4 rather long standing hairs; mid- and hind- coxae ventrally with few shorter hairs; hind-femur ventrally with few standing hairs; all tarsi ventrally with suberect stout hairs. Petiole laterally with 2-3 pairs of standing hairs. Gastral tergites I-IV each with several standing hairs anteriorly, and a row of such hairs at posterior margin; sternites and apex with similar hairs.

Coloration. Mandible, clypeus, gena, anterior part of frons, lateral sides of mesonotum reddish brown; antennal scape yellowish brown; posterior part of head, propodeum, petiole black; gaster brownish black; pronotum and legs yellowish. First and second gastral tergites each with pair of yellowish white markings.

Smaller workers tend to have a more elongate head (CI 0.81 in average), with the posterior margin straight to shallowly convex. Clypeus distinctly broader than long. Outer margin of the eye touches the lateral margin of the head or slightly breaking it. Antennal scape relatively much longer than in larger workers, surpassing the posterior margin of the head by two-fifths or more.

Material examined. Tsagaan tolgoi springs, Khanbogd soum, Umnugobi aimag, Mongolia. 16. VI. 2020, Leg. Ts. Ulzii: Ulzii-20-42.

Distribution. China, Korea, Japan, Russian Far East, and Mongolia (new record).

Ecology. This species occurs at altitudes 1100-1200 m in Mongolia. It inhabits the deciduous riparian trees in rocky semi-desert ecosystem. Nests are built on living trees (*Ulmus pumila L.*), in tunnels and under bark.

Comments. In structure, sculpture and pilosity the Mongolian specimens well agreed with the Japanese specimens examined. However, body color pattern differs among populations from Japan, Korea, Russian Far East, Mongolia and India. For example, in the Japanese population workers are more melanic, with the mesosoma sometimes entirely blackish (even the gaster rarely without yellow markings) and the legs dark reddish brown (Terayama et al., 2014; Yamane, personal observation based on the material from Miyagi-ken and Kanagawa-ken, Honshu, and Miyazaki-ken, Kyushu). In the Korean population, the body color pattern is also variable and rather melanic specimens are not rare (Dong, 2017). In the Mongolian population, the pronotum and legs are light brown, the clypeus and mesopleuron slightly brownish, and yellow markings on the gaster are large. Also, the species inhabits in different kinds of forest in Russia and North Korea (black fir, deciduous, cedar-broad-leaved mixed forests) (Kupyanskaya, 1995; Radchenko, 2005), while the Mongolian population lives in the dry and hot open semi-desert ecosystem. In Japan, this species inhabits sparse forest and forest edge, and nests in dead (decayed) parts of tree trunk, under bark, and in dead twigs on trees (Imai et al., 2003; Terayama et al., 2014).

Key to species of *Camponotus* found in Mongolia (workers)

(based on Aibek & Yamane, 2009)

1. Anterior margin of clypeus medially not emarginate, entire 2
- Anterior margin of clypeus medially emarginate **Subgenus *Myrmentoma*** 6
2. 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*** 3

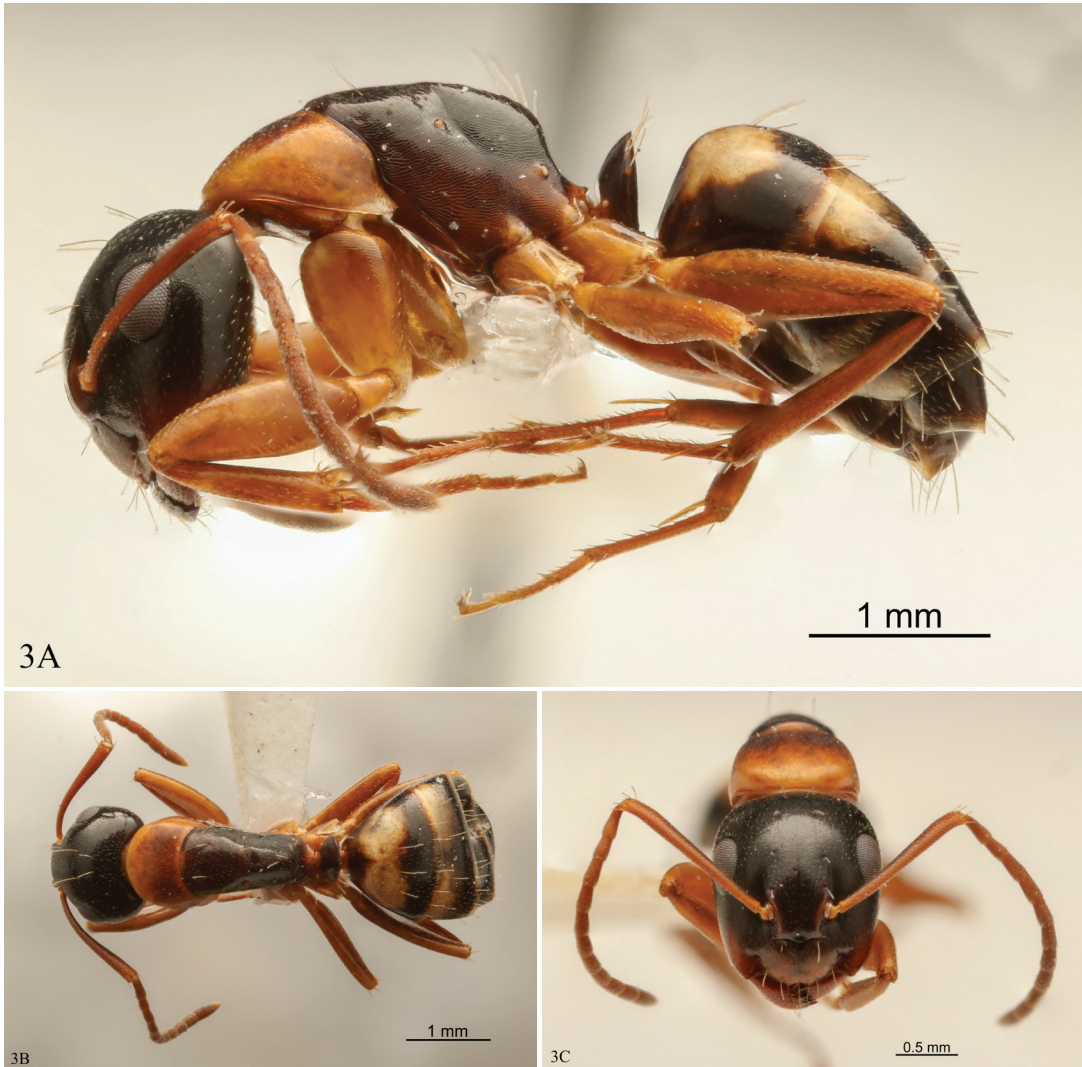


Fig. 3. *Camponotus quadrinotatus* (medium worker). 3A. Body in profile view. 3B. Body in dorsal view. 3C. Head in full-face view.

- Whole body yellow or brownish yellow. Masticatory margin of mandible with 7 teeth. 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*** 5
3. Propodeum posteriorly with rather fine standing hairs down to midlength of its posterior (declivous) face. In the smallest workers the dorsal outline of alitrunk in profile view almost constantly arched throughout. Even in larger workers basal half of mandible lacking striae (striae if any very feeble).

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. In the smallest workers propodeum in profile view with a distinct steep posterior slope. In larger workers nearly whole mandible distinctly striate. With head in full-face view clypeus anteriorly not produced beyond the anterolateral angles of gena. 4
4. Propodeal declivity, petiole, legs and antennal flagellum (in smaller workers often alitrunk ex-

tensively) reddish brown. Gastral tergites sparsely with short appressed pubescence; these 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 densely with long appressed pubescence; these hairs 4-6 times as long as distance between them.
 **C. (C.) saxatilis** Ruzsky
 5. Gena and ventral surface of head without standing hairs. 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.
 **C. (T.) turkestanus** André
 - Ventral surface of head with long standing hairs; gena with a few short, standing hairs. 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
 6. Posterior part of head reddish brown, and gaster entirely black. Lateral margin of head in full-face view with numerous short standing hairs.
 **C. (M) lameerei** Emery
 - Posterior part of head black, and gaster brownish black, with tergites I and II each with a pair of yellowish white markings. Lateral margin of head in full-face view without standing hairs.
 **C. (M) quadrinotatus** Forel

DISCUSSION

Currently, there are 7 species of the genus *Camponotus* reported from Mongolia, of which four are inhabitants of the desert and semi-desert ecosystems. Both newly recorded species are members of the subgenus *Myrmentoma* and belong to the *Camponotus fallax* group. Together with these species, the total number of ant species from Mongolia has increased up to 75.

Bayartogtokh et al. (2014) performed an analysis on biogeographical composition and spatial distribution patterns of ant assemblages in Mongolia. These authors found that a major part of the Mongolian ant fauna is associated with the mountain taiga and forest-steppe ecosystems, while a few species occur in the arid steppe, semi-desert and desert ecosystems. In Mongolia, due to

the high habitat heterogeneity, species diversity of ants in various areas may differ as a consequence of small microclimatic factors that can determine whether a species is present or absent within a location (Pfeiffer et al., 2003); thus, small-scale patterns of habitat distribution are important for ant life in Mongolia, especially in arid regions (Bayartogtokh et al., 2014).

The members of the subgenus of *Myrmentoma* were divided by Emery, (1925) and Radchenko (1997) into three groups: *Camponotus fallax* group, *C. lateralis* group, and *C. kiesewetteri* group. Radchenko (1997) listed the following 10 species as members of the *C. fallax* group, 7 of which are known from the Asian Palearctic region: *C. fallax* (Nylander, 1856), *C. jejuensis* Kim & Kim, 1986, *C. keihittoi* Forel, 1913, *C. kolthoffi* Stitz, 1934, *C. lameerei* Emery, 1898, *C. quadrinotatus* Forel, 1886, *C. tergestinus* Müller, 1921, and 3 species from the Oriental region: *C. himalayanus* Forel, 1893 (India, Nepal), *C. truebi* Forel, 1910 (Taiwan), *C. wroughtonii* Forel, 1893 (Nepal). The record of *C. quadrinotatus* from India (Dhadwal and Bharti, 2023) is somewhat doubtful because the head of the minor worker is too elongate.

Recently, Seifert (2019) revised of the members of the *Camponotus lateralis* group from Europe, Asia Minor and Caucasia. He removed the following species from this group: *C. abrahami*, *C. gestroi* Emery, 1878, *C. gestroi creticus* Forel, 1886. Also, Salata et al. (2019) made a review of the species of the *Camponotus kiesewetteri* group from Aegean region of the western part of Turkey. These authors placed the following species in the *Camponotus fallax* group: *C. abrahami* Forel, 1913, *C. gestroi* Emery, 1878, *C. gestroi creticus* Forel, 1886, *C. kurdistanicus* Emery, 1898, and *C. vogti* Forel, 1906. Thus, the *Camponotus fallax* group currently comprises eleven species and one subspecies in the Asian Palearctic region.

ACKNOWLEDGEMENTS

We thank Prof. Badamdorj Bayartogtokh (National University of Mongolia) for his useful comments to an earlier draft of the manuscript. This work was partly supported by the Advanced Research Project, National University of Mongolia (P16-1145), and the Science and Technology Foundation, Ministry of Education and Science, Mon-

golia. For M.Yu. Proshchalykin the research was carried out within the state assignment of Ministry of Science and Higher Education of the Russian Federation (theme No. 124012400285-7).

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ASIAN MYRMECOLOGY

A Journal of the International Network for the Study of Asian Ants

Communicating Editor: Mark Wong