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Myrmica ants
(Hymenoptera: Formicidae)
of the Old World

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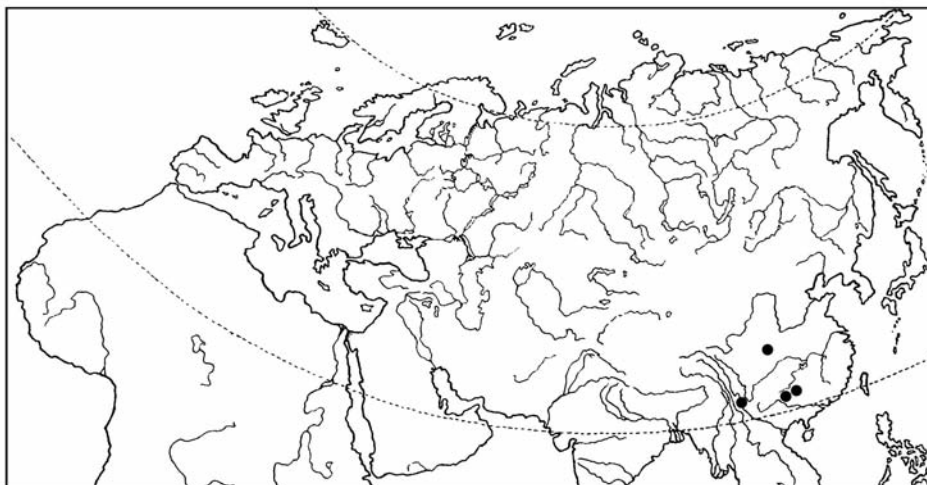
Distribution (Map 28). The species is known from the central and southern China (Guangxi, Shaanxi and Yunnan Provinces).

Etymology. *M. draco*: this species is named for the dragon of Chinese mythology. Draco is a Latin word derived from the Greek δράκων (dracon or dragon).

Notes. Originally Radchenko et al. (2001) placed *M. draco* to the *ritae* species group. We discussed how the taxonomic position of this species is somewhat obscure because it shares features of both the *ritae*- and *boltoni*-complexes of this group: *M. draco* has sculpture of the alitrunk that is typical for the species from the *ritae*-complex, but sculpture of its head and waist similar to species from the *boltoni*-complex (see also Radchenko and Elmes 1998). However, after our more recent discovery of some similar new species from northern Vietnam, *M. yamaneii* (Radchenko and Elmes, 2001) and *M. schoedli* (Radchenko et al., 2006), we recognized a separate *draco*-complex, which contains these three species.

The males of *M. draco* have a long scape. Previously males were known only of *M. serica* and *M. indica*, both of which have short scape and we assumed that this might be true for all *ritae*-group species. Until males from more species are discovered and described we can not take this discrepancy any further. However, we speculate that males of all the species from the *draco*-complex have long scapes while those of the *ritae*-complex are short; in which case we would probably separate the *ritae*-group into two groups.

Ecology. Little is known about ecology of this species, except that it nests under rotten wood, in the soil, in forests at altitudes of about 2000 m a.s.l.



Map 28. Distribution of *M. draco*.

***Myrmica dshungarica* Ruzsky, 1905**
(Figs 72–74)

Myrmica rugosa subsp. *dshungarica* Ruzsky, 1905: 661, w, Kazakhstan; Kuznetsov-Ugamsky 1927: 191, w, q, m.

Myrmica smythiesii dshungarica: Emery 1908a: 169, 1921: 42; Weber 1947: 458.

Myrmica dshungarica: Arnoldi 1976: 551; Tarbinsky 1976: 29, w, q, m; Marikovsky 1979: 165; Radchenko 1994b: 41, 1994c: 137, 1994e: 73; Bolton 1995: 278; Schultz et al. 2006: 206, *nec* Wheeler G. C. and Wheeler J. 1953: 123.

Myrmica laevinodis var. *minuta* Ruzsky, 1905: 670, w, Tajikistan (unresolved junior primary homonym of *Myrmica minuta* Say, 1836: 294); Weber 1947: 455. Synonymy by Radchenko 1994e: 73; confirmed here.

Myrmica rubra laevinodis var. *minuta*: Emery 1908a: 170; 1921: 39 (unavailable name).

Myrmica minuta: Arnoldi 1976: 548; Bolton 1995: 281.

Leptothorax svartshevskii Karawajew, 1916: 500, w, q; Bolton 1995: 245. Synonymy by Radchenko 1994e: 73; confirmed here.

Myrmica (Myrmica) rugulosa var. *ruginodiformis* Karawajew, 1929: 204, w, q, m, Kyrgyzstan; Weber 1948: 307. Synonymy by Arnoldi 1976: 551; Radchenko 1994e: 73; Bolton 1995: 282; confirmed here.

Myrmica minuta subsp. *iskanderi* Arnoldi, 1976: 548, w, m, Tajikistan, Uzbekistan; Bolton 1995: 279. Synonymy by Radchenko 1994e: 73; confirmed here.

Myrmica minuta subsp. *tarbinskii* Arnoldi, 1976: 549, w, m, Kyrgyzstan; Bolton 1995: 284. Synonymy by Radchenko 1994e: 73; confirmed here.

Myrmica rugosa subsp. *smythiesi*: Ruzsky 1905: 659; Kuznetsov-Ugamsky 1927: 193, misidentifications.

Type localities and type specimens. *Myrmica rugosa* subsp. *dshungarica*: “Местонахожд.: Семиреченская обл., долина р. Юй-Тас, южн. склон Джунгарск. Алатау, выс. 1000 м., близ границы альпийских лугов, 29.VII.1902 (Сапожников)” [Localities: Semirechenskaya Prov., valley of riv. Juj-Tas, southern slope of Dzhungarian Alatau, alt. 1000 m, near border of alpine meadows, 29.vii.1902, leg. Saposhnikov]. *Myrmica laevinodis* var. *minuta*: “Местонахожд.: Памир, Андеманьин, перевал на Памирском плоскогории, рабочие, 28.VI.95 (Богоявленский)” [Localities: Pamir, Andermanyn, pass on Pamir Plateau, workers, 28.vi.95, leg. Bogoyavlensky]. *Leptothorax svartshevskii*: “Киргиз-ата Ферганской обл., 10.VII.14, Б. Сварчевский, около 2 десятков рабочих и 4 крылатых самки” [Kirgiz-ata, Fergana Prov., 10.vii.14, leg. B. Svarchevsky, about 20 workers and 4 alate gynes]. *Myrmica rugulosa* var. *ruginodiformis*: “Karkara, östlich von Issyk-kul, am Oberlauf des Flusses Kegeni (Nebenfluss von Ili), etwa 1950 Meter hoch, Gebirgsteppe mit *Festuca*, 16.VIII.1925 (Nr. 4003), N. Kuznetsov, ww, 2 q und mm”. *Myrmica minuta* subsp. *iskanderi*: “Гиссарский хребет, Алай. Голотип (w), 20 паратипов, аллотип (m): Искандер-Куль (О. Крыжановский); Джиргиталь, w, m (он же), Алайский хребет (Г. Длусский, Ю. Тарбинский), Юго-Западный Узбекистан, Байсун-Тау (Арнольди – 1942)” [Gissarsky Range, Alai. Holotype (w), 20 paratypes, allotype (m): Iskander-Kul', leg. O. Kryzhanovsky; Dzhirgital', w, m (same collector), Alaisky Range, leg. G. Dlussky and Yu. Tarbinsky; SW Uzbekistan, Bajsun-Tau, leg. Arnoldi, 1942]. *Myrmica minuta* subsp. *tarbinskii*: “Таласский хребет, голотип (w) и 3 паратипа (Ю. Тарбинский); хребет Каржантау (Обухова)” [Talassky Range, holotype (w) and 3 paratypes, leg. Yu. Tarbinsky; Karzhantau Range, leg. Obukhova].

Material examined. **Lectotype** of *Myrmica dshungarica*, w (designated here), “Семиреченская обл., 1902, М. Р., Сапожников” [Semirechenskaya Prov., 1902, M. R., leg. Saposhnikov], “*Myrmica dshungarica* Ruz. w” (both labels written by Ruzsky's own hand), “Lectotypus, design. K. Arnoldi” (MOSCOW); **paralectotype**: 1 w “Семиреченская обл., 1902, М. Р., Кожевников” [Semirechenskaya Prov., 1902, M. R., leg. Kozhevnikov], “*M. dshungarica* M. Ruzskij det.”, “*Myrmica dshungarica* Ruz. w” (all three labels written by Ruzsky's own hand), “Lectotypus *Myrmica dshungarica* Ruz. design. Arnoldi” (see Notes below) (MOSCOW); 1 w, “*Myrmica dshungarica* Ruz. w Semiretschinsk, Alatau, M. R.” (written by Ruzsky's own hand) (GENOA); **lectotype** of *Myrmica laevinodis* var. *minuta*, w (designated by Arnoldi 1976), “Андеманьин, VI. 95, Богоявленский” [Andermanyn, vi.95, leg. Bogoyavlensky] (both labels written by Ruzsky's own hand), “? *Myrmica laevinodis* var. *minuta*”, “Lectotypus, design. K. Arnoldi” (MOSCOW); **syntypes** of *Leptothorax svartshevskii*: 19 w, 4 q, “Киргиз-ата, Ферганск., Сварчевский” [Kirgiz-ata, Fergana Prov., leg. Svarchevsky], “4241 Coll. Karawajewi”,

“*Leptothorax svartzevskii* [Sic!] Karaw. typus” (KIEV, MOSCOW); **syntypes** of *Myrmica rugulosa* var. *uginodiformis*: 8 w, 2 q, 9 m, “Каркара, Кузнецов” [Karkara, leg. Kuznetsov], “4003 Coll. Karawajewi”, “*Myrmica rugulosa uginodiformis* Karawajew typus”, “Syntypus *Myrmica rugulosa uginodiformis* Karaw.” (KIEV, MOSCOW); **holotype** of *Myrmica minuta* subsp. *iskanderi*, w, “Iskander-Kul, 16.VIII.36, O. Kryzhanovskij”, “Holotype *Myrmica minuta* subsp. *iskanderi* K. Arnoldi” (MOSCOW); **paratypes**: 1 w, 4 m, “Джиргиталь, Таджик., 11.VIII.36, O. Крыжановский” [Dzhirgital’, Tajikistan, 11.viii.36, O. Kryzhanovsky]; 1 w, “Кашка-су, 30 км W Сарыташ, Алайская долина, 63–341, VI.1963, Г. Длусский” [Kashka-su, 30 km W Sarytash, Alai valley, 63–341, vi.1963, G. Dlussky]; 6 w, “Iskander-Kul, 16.viii.36, O. Kryzhanovskij”; 2 w, “No. 6221”; 1 w, 1 m (male without head), “No. 6222”; 2 w, “No. 6224”; 9 w, “No. 6225” (MOSCOW); **non-type material**: about 50 w, 7 q and 8 m from Middle Asian Mts.

Distribution (Map 29). Mountain ranges of Dzhungarian Alatau, Tien-Shan and Pamiro-Alaj on the territory of Kazakhstan, Kyrgyzstan, Uzbekistan and Tajikistan.

Etymology. *M. dshungarica*: named from Dshungaria with the adjectival suffix for nouns *ica* (from the Greek *ικο*) = belonging to, to indicate that the type specimens were taken in the Dshungarian Alatau (mountains) of eastern Kazakhstan. Modern Dshungaria (Dzhungaria) is a region lying mostly within Xinjiang province of northeast China and extending into western Mongolia and eastern Kazakhstan. *M. minuta*: from the Latin word (F.) *minuta* = small, to indicate its small size. *Leptothorax svartshevskii*: this species most probably was dedicated to Prof. Boris Alexandrovich Svarchevsky (1872–1930), the well-known Russian freshwater zoologist, one of the founders of the Irkutsk University. *M. ruginodiformis*: name a combination of the Latin words *ruga* = wrinkle, *nodus* = knot or lump and the suffix *formis* = to be in the shape of, or form, to describe its petiole node. *M. iskanderi*: named after Iskander Kul (lake) in Tajikistan, the type locality, which itself was dedicated to Iskander (Alexander the Great). *M. tarbinskii*: dedicated to the well known Soviet myrmecologist Prof. Yury Serafimovich Tarbinsky (1937–2003), who collected the type material. Tarbinsky published “The ants of Kirgizia” in 1976 and was the Head of the Entomological Department of the Institute of Zoology in Frunze (now Bishkek, Kirgizia).

Notes. Arnoldi (1976) placed *M. dshungarica* to the “*rubra-smythiesii*” species group, and Radchenko (1994b) – to the *rubra*-group. Now we consider that this species represents a different group – the *dshungarica*-group (see also Radchenko and Elmes 2001b). It is similar to, and often hard to distinguish from several sympatric *Myrmica* species, e.g. *M. juglandeti* and *M. ferganensis*, but differs from them by its shorter and somewhat higher petiole, distinctly convex side of head, etc.

The main diagnostic features of *M. dshungarica* are quite variable compared to many *Myrmica* species and this no doubt provoked different authors to describe the quite large number of infraspecific forms. Direct comparison of the types of all taxa now attributed to this species (see above) shows that although there are minor differences, the range of characters (including morphometrics) overlap so we found it impossible to clearly define even a pair of “sister” species. Moreover, the males where they are known for the “subspecies”, are practically identical. Therefore, we believe that the earlier decisions to synonymise all the names mentioned above under *M. dshungarica* are correct. Thus, *M. dshungarica* appears to be a widely distributed species in the mountains of Middle Asia that is fragmented into many isolated populations. Commonly in such mountain regions isolated populations evolve small morphological variations, in the case of *M. dshungarica* these are not yet sufficiently different to consider any population as separate subspecies.

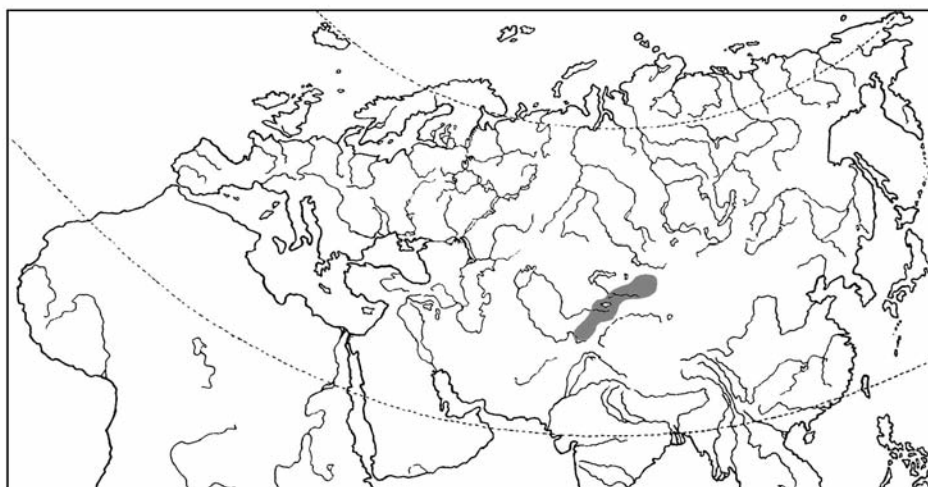
We found in MOSCOW 2 workers on separate pins that were determined by Ruzsky as *M. dshungarica*. Each pin has one of Arnoldi’s labels saying “Lectotypus, design. Arnoldi”,

but he never published any data concerning a lectotype of *M. dshungarica*. Equally confusingly the specimens have the same collection data except for a different collector's name: Kozhevnikov instead Saposhnikov. We can not explain this discrepancy; possibly it is just a printing error but on the other hand, Prof. Kozhevnikov also collected material in Middle Asia, maybe even working together with Prof. Saposhnikov, and could equally well have provided material for Ruzsky. Another specimen had one of Ruzsky's labels reading "Semirechenskaya Prov., 1902, M. R., leg. Saposhnikov"; as this fully corresponds with the description of *M. dshungarica* (see above) we designate this specimen as the lectotype. We designate the second specimen that has Ruzsky's label "Semirechenskaya Prov., 1902, M. R., leg. Kozhevnikov", as a paralectotype; recently we found one more paralectotype worker in Emery's collection (GENOVA).

In the original paper describing *M. minuta* subsp. *iskanderi* (Arnoldi 1976: 549), under the section on characteristics of the material and type localities, the printed symbol for "worker" was misprinted as "female"; in fact, K. Arnoldi did not described queens of this form and the holotype is a worker.

G. Wheeler and J. Wheeler (1953) described larvae of *M. dshungarica* (noted by Bolton 1995). However, Wheeler and Wheeler wrote that they studied "six larvae from Siberia" (*loc. cit.*, p. 123). If this locality is correct, then those larvae could not be *M. dshungarica* but could be one of any Siberian species from the *lobicornis*-group.

Ruzsky (1905) recorded for Dzhungarsky Alatau *M. smythiesii*. It is now known that this species is restricted to the Himalayan region and almost certainly Ruzsky's old record is a misidentification. Kuznetsov-Ugamsky (1927: 192, 193) made a study of *M. dshungarica* and he was also of the opinion that Ruzsky's record was a misidentification. Additionally, he described four infrasubspecific forms of *M. dshungarica*: var. *dentata* (m), var. *subacuta* (m), var. *infusata* (w), and var. *brevispina* (w); all this material seems lost. Tarbinsky (1976) and Radchenko (1994e) referred this material to *M. dshungarica*, but according to the fourth Edition of the International Code of Zoological Nomenclature (1999) these names are unavailable (quadrinomens).



Map 29. Distribution of *M. dshungarica*.

***Myrmica gallienii* Bondroit, 1920**

(Figs 91–93)

Myrmica gallienii Bondroit, 1920a: 150, w, France (also described as a new by Bondroit, 1920b: 302); Finzi 1926: 90 (misspelled as *gallieni*).

Junior synonym of *M. sulcinodis*: Bernard 1967: 121.

Revived from synonymy: Collingwood 1978: 67; 1979: 48, q, m; Agosti and Collingwood 1987a: 53, 1987b: 268; Seifert 1988: 9; Atanassov, Dlussky 1992: 91; Radchenko 1994b: 42, 1994c: 143, 1994d: 76; Seifert 1994: 13; Bolton 1995: 279; Seifert 1996: 228; Radchenko et al. 1997: 487; Della Santa 2000: 171; Czechowski et al. 2002: 24; Radchenko et al. 2002: 418; Radchenko, Czechowska and Czechowski 2004: 47; Seifert 2007: 203, *nec* Wei C. et al. 2001: 561; Chang and He 2001: 26, misidentifications.

Myrmica rugulosa limanica Arnoldi, 1934: 162, w, q, m, Ukraine; Karawajew 1934: 75; Weber 1948: 307. Synonymy by Collingwood 1979: 48; Seifert 1988: 9; Radchenko 1994d: 76; Bolton 1995: 280; confirmed here.

Myrmica limanica: Arnoldi 1968a: 1170; 1970: 1840.

Myrmica jacobsoni Kutter, 1963: 133, w, q, m, Latvia, Estonia; Kutter 1977: 65. Synonymy by Collingwood 1979: 48; Seifert 1988: 9; Radchenko 1994d: 76; Bolton 1995: 280; Della Santa 2000: 171; confirmed here.

Myrmica limanica subsp. *jacobsoni*: Arnoldi 1970: 1840; Pisarski 1975: 11.

Myrmica limanica subsp. *obensis* Arnoldi, 1970: 1840, w, m, Russia; Bolton 1995: 281. Synonymy by Radchenko 1994d: 76; confirmed here.

Myrmica rolandi: Jacobson 1940: 145, misidentification.

Myrmica bergi: Sadil 1952: 244, misidentification.

Type localities and type specimens. *M. gallienii*: “Haute-Marne: Latrecy (Le François)”. *M. limanica*: “Ost Ukraine, District Charkov, Mittellauf von Donetz”. *M. jacobsoni*: “3 w, 4 q und 2 defekte m. Ein weiteres m, 1 q und 3 w. Umgebung des Kanjersees am Meerbusen bei Riga, Strandwiesen und feuchte Triften auf der Insel Oesel, ferner weitere nordestländische Inseln, die Nordküste Estlands und die Umgebung von Pänurme. Die Art scheint also im nördlichen Balticum weit verbreitet zu sein”.

Material examined. **Lectotype** of *M. gallienii*, w (designated here), “Latrecy Ht. Marne”, “Coll. R. I. Sc. N. B. France”, “type”, “R. I. Sc. N. B. I. G. 21.400”, “*Myrmica gallienii* Bondr. Type”, “TYPE” (BRUSSELS); **paralectotype**, w with the same labels as lectotype (BRUSSELS); **lectotype** of *M. limanica*, w (upper specimen on the pin with 3 w, designated here), “1503, Zmiev, Kharkov, IX.26, Бишкін [Bishkin], Arnoldi”, “*M. rugulosa limanica* Arn., Arnoldi det., Holotyp.” (see Notes below) (MOSCOW); **paralectotypes**: 44 w, 10 q, 17 m, “Змиев, Харьк., бор, IX.29, (Арн.)” [Zmiev, Kharkov Prov., pine forest, ix.29 (Arn.)], No. 4437, 4456, 4458, 4461, 4505, 4506, 4509, 5322, 5323, 5324, 5325 (MOSCOW); 5 w, 2 m, “Лиман, Змиевск. р. Арнольди” [Liman, Zmiev Distr. Arnoldi], “5468 Coll. Karawajewi”, “*Myrmica rugulosa* subsp. *limanica* Arnoldi typ.”, “Paratypus *Myrmica rugulosa* subsp. *limanica* Arnoldi”; 2 w, 1 m, “5323 Змиев, Лиман, IX. 1931, К. Арнольди” [Zmiev, Liman, ix.1931, K. Arnoldi], “5625 Coll. Karawajewi”, “*Myrmica rugulosa* subsp. *limanica* Arnoldi typ.”, “Paratypus *Myrmica rugulosa* subsp. *limanica* Arnoldi” (KIEV); **syntypes** of *M. jacobsoni*, 3 w, 1 q, 1 m, “Littland, 18.8.36, H. Jacobson” (MOSCOW); **non-type material**: > 200 w, > 50 q and m from whole area.

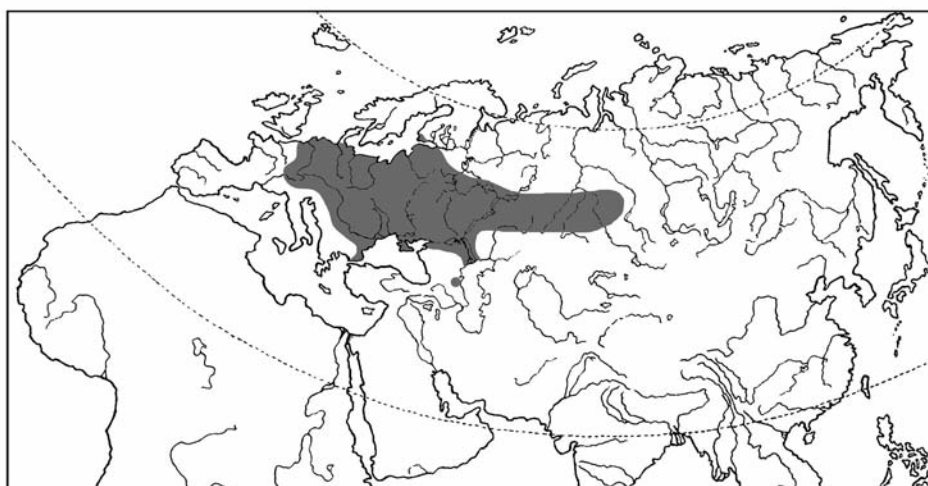
Distribution (Map 38). Central and East Europe, southern Finland, Caucasus, West Siberia (but not China, see Notes below).

Etymology. *M. gallienii*: almost certainly named for the controversial World War I French General Joseph Gallieni (1849–1916) who won an early victory over the Germans “that saved Paris”. To some people, probably including Bondroit, who may have served under him, Gallieni was the “Hero of the Marne” (type locality of the species). *M. limanica*:

almost certainly this name derives from one of the type localities, the village of Liman, nr Zmiev in the Kharkiv distr. of East Ukraine. The Ukrainian and Russian word liman (transferred by the Turks from the original Greek) means an estuarine lake (often freshwater) and Liman village is situated close to a series of large lakes. Thus the name might be appropriate to the ecological preference of this species. *M. jacobsoni*: dedicated to the collector, the famous Russian entomologist and coleopterist Georgiy Georgievich Jacobson (1871–1926) of St-Petersburg, who worked in the Zoological Museum (now Zoological Institute of the Russian Academy of Science). *M. obensis*: named for the Ob' river that flows north through the West Siberian plain of Russia, combined with the Latin suffix *ensis* = place of origin. *M. chersonensis* (unavailable name, see Notes below): from the name of Cherson (Kherson) with the Latin suffix *ensis* = place of origin, to indicate that the type locality was the Kherson region of southern Ukraine. *M. strandi* (unavailable name, see Notes below): named for Prof. E. Strand – Arnoldi (1934: 165) wrote: “Diese Ameise ist zur Ehre des hochverdienten Herrn Prof. Dr. E. Strand benannt”.

Notes. Direct comparison of the types of all described species confirms earlier established synonymy (see above). There have been two records of this species for China, but these are misidentifications: we examined specimens identified as “*M. gallienii*” by Wei C. et al. (2001) and Chang and He (2001), and are certain that they are *M. kurokii*.

M. gallienii belongs to the *bergi*-complex of the *scabrinodis* species group (see Radchenko and Elmes 2004). Its antennal scape is smoothly bent at the base in an almost ideal curve with no trace of a ridge or carina. It resembles sympatric *M. bergi*, female castes differing from the latter by their distinctly longer propodeal spines, lower postpetiole and lighter body colour, while males well differ by their shorter scape. *M. gallienii* workers could also be confused with those of *M. rugulosa*, but the scape of the latter is somewhat more angularly curved at the base, and the head dorsum has much more developed reticulation. Additionally, the second funicular segment of the males of *M. gallienii* is more than 1.5 times longer than the third one, while in *M. rugulosa* it is shorter, less than 1.5 longer than the third one (see also Key, Chapter 5.1, 5.2).



Map 38. Distribution of *M. gallienii*.

Arnoldi (1934) did not designate the holotype of *M. rugulosa limanica*; as a result, all type specimens should be considered as syntypes. However, we found in MOSCOW the specimen, labelled by Arnoldi as “holotype”, and we designate this specimen as the lectotype. Also, Arnoldi (1970) referred to *M. limanica* the unavailable names *M. rugulosa limanica* nat. *chersonensis* Arnoldi, 1934 and *M. rugulosa limanica* nat. *strandii* Arnoldi, 1934, both forms were described from the southern Ukraine. Radchenko (1994d) referred them to *M. gallienii*; we examined “syntypes” of these forms, preserved in MOSCOW and KIEV and confirm that undoubtedly these specimens are *M. gallienii*.

Bernard (1967) erroneously considered *M. gallienii* as a junior synonym of *M. sulcinodis*.

Ecology. *M. gallienii* is widespread in Central Europe, where it is associated with wet meadows, lake and pond shores. In some habitats, particularly in Poland and probably Belarus, it can be the dominant species, but throughout most of its range colonies are not common or at best they are restricted to very small areas of habitat. Colonies of *M. gallienii* can easily be mistaken for those of *M. rubra* in the field because in warm wet grassland both have quite populous, polygynous colonies and often construct quite large earth solaria. Furthermore, although these two ants are easily separated using a microscope, it is not so easy for inexperienced myrmecologists armed only with a hand lens in the field. One of the best “tips” is to observe the way in which workers walk: *M. gallienii* tend to walk slightly slower, hold their antenna more at right-angles to their head and have a distinctly darker and square head than *M. rubra*, which have more shiny heads and tend to hold their scape and antenna more forward. Unfortunately, ecological data for these two species were sometimes confounded in the excellent ecological studies by Joanna Pętal and co-workers (e.g. Pętal 1967). The distribution of *M. gallienii* in Poland and Germany was characterized by Czechowska and Czechowski (1998) and by Munch and Engels (1994), who described how colonies of this species live on floating reedbeds, this indicates that they might be well adapted to flooding in much the same way as the related *M. bergi*.

Elmes and Pętal (1990) gave colony population data for *M. gallienii* (under the synonymised name *M. limanica jacobsoni*) from the Strzeleckie Meadows (wet abandoned meadow) near Warsaw, Poland, sampled for 6 years. There were on average fewer workers (640) than in a typical *M. rubra* colony and queens varied from year to year, annual means ranging from > 5 to about 2 per colony, which is less than in a typical *M. rubra* nest (see ecological notes on that species). Most interestingly the data indicated that during the course of a year (the active season May–September) the number of queens in the total population fell by 60% being replaced by newly recruited queens. Seppä (1996) working on a different population showed that co-existing queens had very low relatedness to each other, which is consistent with high mortality and general recruitment within a population. However, over the 6 year period that the Strzeleckie Meadows were studied, recruitment never quite matched queen loss, so that the average number of queens per colony gradually declined. This was interpreted as indicating the gradual decreasing suitability of the meadow to support the population as it gradually scrubbed-over, becoming increasingly more suitable for *M. rubra*, which also lived on the site. There have been few laboratory studies of this species other than a brief report of its chemical secretions (Jackson et al. 1989).

Sexuals are produced in early summer and nuptial flights and subsequent queen recruitment takes place in August. It is interesting to note that in several Polish populations we observed that a considerable number of gynandromorphs were present in many nests

that of *M. tulinae*. This would make a single worker very hard to identify with high confidence. Fortunately the males of *M. kozakorum* well differ from those of *M. sabuleti* by their much shorter scape, and differ from *M. scabrinodis* and *M. tulinae* by the much shorter hairs on their tibiae and tarsi; however, they are hardly distinguishable from the males of *M. specioides* (see also Key, Chapter 5.2).

Ecology. Although *M. kozakorum* is a species of the Steppe Zone, within that biome it is normally found in intrazonal, relatively wet and shaded places (small woods, meadow-like associations around lakes, etc.). It appears to be fairly tolerant of high soil salinity often being found in scrub on the margins of salt lakes, however it does not appear to have evolved a highly adapted behaviour to such habitats as for example is seen in *M. bergi* (see Notes to that species). We suspect that it forages in the patches of shaded vegetation and does not compete with *M. bergi* in the fully exposed open conditions. It is most common in the small relatively open oak woods that develop in shallow depressions in the steppe, and on the edges of larger lakes, these become flooded in periods of high rainfall and the shade helps retain the soil moisture. Here colonies are quite small, at most a few hundred workers, and nests are usually built in the soil under small rotten branches, pieces of bark or even leaves. The nuptial flight is in August–September.

***Myrmica kozlovi* Ruzsky, 1915**

(Fig. 143)

Myrmica kozlovi Ruzsky, 1915: 435, w, Tibet; Emery 1921: 37; Menozzi 1939: 294; Weber 1947: 470; Collingwood 1970: 374; Radchenko 1994b: 42; Bolton 1995: 280; Radchenko and Elmes 2001b: 259.

Myrmica kozlovi subsp. *mekongi* Ruzsky, 1915: 437, w, Tibet; Emery 1921: 37; Menozzi 1939: 294; Weber 1947: 471; Bolton 1995: 281, **syn. nov.**

Myrmica kozlovi subsp. *subbrevispinosa* Ruzsky, 1915: 437, w, Tibet; Emery 1921: 37; Menozzi 1939: 294; Weber 1947: 472; Bolton 1995: 284, **syn. nov.**

Myrmica kozlovi subsp. *subalpina* Ruzsky, 1915: 438, w, Tibet; Emery 1921: 37; Menozzi 1939: 294; Bolton 1995: 283, **syn. nov.**

Myrmica kozlovi subsp. *ruzskyi* Weber 1947: 471 (unresolved junior primary homonym of *Myrmica kozlovi* subsp. *ruzskyi* Kiseleva, 1925: 76 and not necessary proposed replacement name for *Myrmica kozlovi* var. *subalpina* Ruzsky, 1915: 438; see also Notes to *Myrmica kurokii*). Synonymy by Bolton 1995: 282 (as synonym of *M. kozlovi* var. *subalpina*); synonym of *M. kozlovi*: **syn. nov.** (see Notes below).

Myrmica specularis Donisthorpe, 1929: 446, w, Tibet; Menozzi 1939: 293; Weber 1950: 224; Chapman and Capco 1951: 130. Synonymy by Radchenko and Elmes 2001b: 259; confirmed here.

Type localities and type specimens. *M. kozlovi*: “Местонахожд.: 1) прит. р. Дза-чю, Кам, басс. р. Голубой, 12–12000 и 13000', нач. V. 1901 (ww); 2) дол. р. Голубой, Кам, восточн. Тибет, III. 1901 (ww), (Козлов)” [Localities: 1) tributary of riv. Dza-chju, Kam, basin of riv. Yangtze, 12–12500 and 13000 feet, beginning of v.1901 (ww); 2) valley of riv. Yangtze, Kam, eastern Tibet, iii.1901 (ww), leg. Kozlov]. *M. kozlovi* subsp. *mekongi*: “Найдена в восточном Тибете, в верховьях р. Меконга. Местонахожд.: р. Бар-чю, басс. р. Меконга, Кам, 12.000', кон. IX. 1900 (рабочие), (Козлов)” [Found in the Eastern Tibet, in upper reaches of riv. Mekong. Localities: riv. Bar-chju, basin of riv. Mekong, Kam, 12,1000', end of ix.1900 (workers), leg. Kozlov]. *M. kozlovi* subsp. *subbrevispinosa*: “В коллекции П. К. Козлова нашелся один экземпляр раб. из восточного Тибета. Местонахожд.: дол. р. Голубой, Кам, вост. Тибет, III. 1901 (рабочий), (Козлов)” [In the collection of P. K. Kozlov was found one specimen, worker from

Eastern Tibet. Locality: valley of riv. Yangtze, Eastern Tibet, iii.1901 (worker), leg. Kozlov]. *M. kozlovi* subsp. *subalpina*: “Местонахожд.: дол. р. Голубой, Кам, вост. Тибет, III. 1901 (рабочий) (Козлов)” [Locality: valley of riv. Yangtze, Kam, Eastern Tibet, iii.1901 (worker), leg. Kozlov]. *M. specularis*: “Described from eight workers, Tibet, Gautsa, at a height of 13,000 ft., on April 5th, 1924 (Everest Expedition). There are also ten specimens in the British Museum Collection taken at Khamba Jong, Sikkim, 15–30.vii.03, at a height of 15,000–16,000 ft. (Tibet Expedition, 1903), which agree quite well with the above species with the exception of being not quite so dark. Type and paratypes in the British Museum Collection”.

Material examined. **Lectotype** of *M. kozlovi*, w (designated here), “пр. р. Дза-чю, Кам, Голубая, 12–13000’, Козлов, нач. III.01” [tributary of riv. Dza-chju, Kam, riv. Yangtze, 12–13000’, leg. Kozlov, beginning of iii.01] (PETERSBURG); **paralectotypes**: 34 workers with same labels as lectotype; 27 w, “дол. Голубой р., Кам, в. Тибет, Козлов, III.01” [valley of riv. Yangtze, Kam, Tibet, leg. Kozlov, iii.01]; 1 w, “р. Дза-чю, 11000’, Кам, бас. Голубой, Козлов, сеп. IV.01” [riv. Dza-chju, 11000’, Kam, basin of riv. Yangtze, leg. Kozlov, middle of iv.01]; 10 w, “р. Дза-чю, Голубая, 12–13000’, Козлов, нач. V.01” [riv. Dza-chju, riv. Yangtze, 12–13000’, leg. Kozlov, beginning of v.01] (PETERSBURG, MOSCOW, KIEV); **lectotype** of *M. kozlovi* subsp. *mekongi* (designated here), w, “р. Бар-Чю, 12000’, бас. Меконга, Кам, Козлов, кон. IX.00” [riv. Bar-chju, basin of riv. Mekong, Kam, end of ix.1900, leg. Kozlov], “*Myrm. kozlovi* sub. *mekongi* n. sub. M. Ruzsky” (MOSCOW); **paralectotypes**: 15 w with the same labels; 1 w, “речка Ба-чю (Sic!), 12 т’ Кам, б. Голубой р. Козлов 2–3.viii.00” [riv. Ba-chju (Sic!), 12,000’ Kam, basin of riv. Yangtze, leg. Kozlov, 2–3. viii. 00] (MOSCOW, PETERSBURG, KIEV); **holotype** of *M. kozlovi* subsp. *subbrevispinosa* “дол. Голуб. Р., Кам, в. Тибет, Козлов, III.01” [valley of riv. Yangtze, Kam, Eastern Tibet, leg. Kozlov, iii.01], “*M. kozlovi* v. *subbrevispinosa* n. var.” (MOSCOW) (see also Notes below); **holotype** of *M. specularis*, w, “Tibetan side of the Mt. Everest: Tibet, Gautsa, 13000 ft, 5.iv.1924 (Hingston)” (LONDON); **paratypes**: 4 workers with same labels (LONDON); **non-type material**: 2 w, SE Tibet, Dzogang, 9–14,000 ft, 1–21.ix.1936 (Tibet expedition, 1903); 7 w, India, Sikkim, Khamba Jong, 15–16,000 ft, 15–30.vii.[19]03 (LONDON).

Distribution (Map 60). Tibet, India (Sikkim), Nepal.

Etymology. *M. kozlovi*: dedicated to Colonel Peter Kuzmich Kozlov (1863–1935), the outstanding Russian geographer and explorer, head of many expeditions to Central Asia (Mongolia, China, Tibet). *M. mekongi*: named after its type locality in Tibet, the upper catchment basin of the great river Mekong, which flows from Tibet to reach the sea in Vietnam. *M. subbrevispinosa*: from the Latin *brevis* = short and *spinosa* (F) = thorny with prefix *sub* = under, to presumably to indicate fairly short (but not extremely short) propodeal spines. It has no connection with the American species *M. brevispinosa* Wheeler, 1917. *M. subalpina*: from the Latin prefix *sub* = under or beneath or close and *alpina* = of the mountains, to indicate that it is a species of the sub-alpine habitat zone. *M. specularis*: Donisthorpe gave no indication as to why he chose this name which could have several roots: it could be derived from the Latin *specula* = “high place for observing” which might be related to the mountain habitat; or from the Latin *specus* = chasm, because Donisthorpe indicated the postpetiole “with somewhat deep longitudinal pits”; but most probably it is from the Latin *specularis* = “of a mirror” because Donisthorpe wrote that the surface between the propodeal spines is “smooth and shining” and he emphasised this feature in his comparison of the species with *M. ruginodis*.

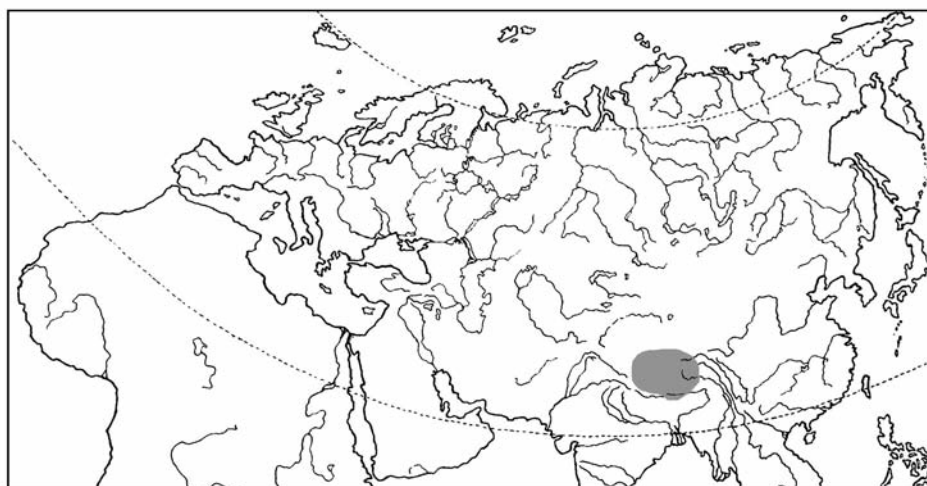
Notes. Originally, Radchenko (1994b) placed *M. kozlovi* in the *rugosa* species group but now we believe it belongs to the *kurokii*-group (Radchenko and Elmes 2001b).

Ruzsky (1915) described *M. kozlovi* from Eastern Tibet based on a reasonably large sample of workers, at the same time he described subspecies *mekongi* from a series of workers, while basing his descriptions of subspecies *subbrevispinosa* and *subalpina* on a single worker of each. We first compared the type specimens of *M. kozlovi* with those of

subsp. *mekongi* and found that workers of subsp. *mekongi* slightly differ from *M. kozlovi* by a more finely rugulose petiole and postpetiole, by a shorter scape (mean SI_1 0.76 and SI_2 0.86 vs. 0.80 and 0.90), and by a somewhat lighter colour. Although Ruzsky noted only one specimen of subsp. *subbrevispinosa* (see above), we located 2 additional workers in the MOSCOW collection. These have the same labels as the holotype and are practically indistinguishable from it, and could be treated as paratypes even if formally they do not belong to the type series. All these 3 specimens of subsp. *subbrevispinosa* have shorter propodeal spines than *M. kozlovi* (ESLI 0.23–0.26 vs. 0.30–0.34), but at the same time these data overlapped with subsp. *mekongi* (ESLI 0.25–0.31). We could not find the holotype of subsp. *subalpina* and it is probably lost. Based on the original description of the single worker it differs from *M. kozlovi* by the shape of its propodeal spines that are widened at the base and curved downwards (see Ruzsky 1915, fig. 23). We also examined the holotype and paratypes of *M. specularis* that differ from the types and non-type material of *M. kozlovi* only by a somewhat darker head, a slightly more massive petiolar node and by slightly coarser and more regular rugosity of the petiole and postpetiole.

From these studies we conclude that *M. kozlovi* is probably widespread in the Himalayan mountain system and isolated populations predictably can show morphological variations. Generally such minor differences between workers are insufficient to separate species; far more material, including sexual castes, would need to be collected and studied to confirm whether any of these forms can be considered as good subspecies or species. For now, we consider it best that all the above forms remain synonymised with *M. kozlovi*.

Weber (1947) considered the name *subalpina* Ruzsky, 1915 as a junior primary homonym of *Myrmica rubra* subsp. *brevinodis* var. *subalpina* Wheeler W. M., 1907 and proposed the replacement name – *M. kozlovi* subsp. *ruzskyi* (that was itself a junior primary homonym of *M. kozlovi* subsp. *ruzskyi* Kiseleva, 1925 – see notes to *M. kurokii*). However, Wheeler's (1907) name "*subalpina*" is unavailable (quadrinomen), and the first available use of this name is *Myrmica brevinodis* var. *subalpina* Wheeler W. M., 1917, which post-dates Ruzsky 1915. Hence, it was not necessary for Weber to proposed a replacement name



Map 60. Distribution of *M. kozlovi*.