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First record of *Temnothorax mongolicus* (Pisarski, 1969) (Hymenoptera, Formicidae) from Irkutskaya Oblast of East Siberia, Russia

Первая находка *Temnothorax mongolicus* (Pisarski, 1969) (Hymenoptera, Formicidae) в Иркутской области

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Ключевые слова: муравьи, *Temnothorax*, фауна, промеры, метод главных компонент, Восточная Сибирь.

Abstract. *Temnothorax mongolicus* (Pisarski, 1969), previously known from the type localities in Zabaikalskii Krai, Amurskaya Oblast and Primorskii Krai, is registered from Olkhon Island in Irkutskaya Oblast of Russia for the first time. Multivariate analysis of morphometric data confirmed that newly found specimens from the Irkutskaya Oblast are conspecific with the type specimens of *T. mongolicus* (Pisarski). Specimens from the new locality are compared with the specimens from the Zabaikalskii Krai. Ecological characteristics and biotopic distribution of the species are provided.

Резюме. *Temnothorax mongolicus* (Pisarski, 1969), ранее известный в России только по типовым местонахождениям в Забайкальском крае, Амурской области и Приморском крае, впервые обнаружен на острове Ольхон в Иркутской области. Многофакторный анализ морфометрических данных подтвердил, что вновь обнаруженные образцы из Иркутской области и типовые экземпляры *T. mongolicus* (Pisarski) конспецифичны. Для этого вида впервые даётся сравнение экземпляров из Забайкальского края с экземплярами из Иркутской области, приводится экологическая характеристика и данные о биотопическом распределении.

Introduction

Temnothorax Mayr, 1861 is the richest and most diverse genus of ants in the Palearctic, belonging to the tribe Crematogastrini Forel, 1893, subfamily Myrmicinae Lepeletier de Saint-Fargeau, 1835. More than 450 recent species are known worldwide, distributed in all continents except Australia [Prebus, 2021; Bolton, 2022]. Of these, about 300 species are found in Palearctic, mainly in the southern regions [Agosti, Collingwood, 1987; Radchenko, 1994a, b, 1995a, b, c, 1996; Seifert, 1996; Cagniant, Espadaler, 1997; Terayama, Onoyama, 1999; Radchenko, 2005; Csősz et al., 2015; Seifert, Csősz, 2015; Salata et al., 2018; Salata, Borowiec, 2019; Gonzalez, 2021; Schifani et al., 2022]. At the same time, the fauna of ants of the genus *Temnothorax* Mayr in many areas of the Palearctic remains poorly studied, and the actual number of species will be much larger [Seifert, 2006; Schulz et al., 2007]. Currently, 35 species of this genus are known in Russia [Dubovikoff, Yusupov, 2017; unpublished data by Yusupov].

Currently, six species of the genus, *T. kaszabi* (Pisarski, 1969), *T. mongolicus* (Pisarski, 1969), *T. nassonovi* (Ruzsky, 1895), *T. serviculus* (Ruzsky, 1902), *T. tuberum* (Fabricius, 1775) and *T. usunkul* (Ruzsky, 1924), are known for the territory of Siberia. The latter species is known only from the description and is close to *T. nassonovi* (Ruzsky). However, it is currently impossible to verify the validity of the latter taxon since Ruzsky's material has been lost. Almost all species listed above are associated mainly with steppe landscapes or dry, sparse forests.

Currently, three species, *T. nassonovi* (Ruzsky), *T. serviculus* (Ruzsky) and *T. tuberum* (Fabricius), are known from the Irkutskaya Oblast [Ruzsky, 1936; Antonov, Pleshanov, 2008]. However, Ruzsky's reference to *T. tuberum* (Fabricius) in East Siberia seems doubtful and most likely refers to either *T. kaszabi* (Pisarski) or *T. mongolicus* (Pisarski).

Materials and methods

The material was collected by the first author (I.A. Antonov) in July 2014 in the territory of the Irkutskaya Oblast (Russia, East Siberia) (Fig. 1). In addition, we studied comparative material in the collection of the Federal Scientific Center for Biodiversity of Terrestrial Biota of East Asia, FEB of the RAS, Vladivostok (FSC), as well as material collected last year in the Zabaikalskii Krai (A.A. Gurina, R.Yu. Dudko), and type material of *T. mongolicus* (Pisarski) was borrowed from the Hungarian Natural History Museum, Budapest, Hungary. Z.M. Yusupov has done morphometric measurements in non-type material, and S. Csősz has measured the type specimens.

A Garmin eTrex 30 GPS navigator was used to register the coordinates of ant nests in Olkhon Island (Irkutskaya Oblast). The collected ant specimens were fixed and stored in 1.5 ml Eppendorf microtubes filled with 95 % ethanol.

Part of the collected material was mounted; the rest is stored in 95 % ethanol and is in the collection fund of the Institute of Ecology of Mountain Territories A.K. Tembotov of the RAS, Nalchik (IEMT), as well as in the entomological collection of The Core Facilities Center «Bioresource Center» at the Siberian Institute of Plant Physiology and Biochemistry SB RAS, Irkutsk, Russia.

The photographs of the specimen have been made using the MC-2-ZOOM stereoscopic microscope with a ToupCam 9.0 MP video eyepiece (Fig. 2, 3). All measurements are given in millimeters (accurate to 0.01 mm) and follow standard measurements [Csősz et al., 2015].

Measurements: **CL:** maximum cephalic length in median line; the head must be carefully tilted to the position with the actual maximum. Excavations of the hind vertex and/or clypeus reduce CL. **CS:** cephalic size; the arithmetic mean of CL and CWb (CL+CWb)/2). **CWb:** maximum width of head capsule, measured just posterior to the eyes. **EL:** maximum diameter of the eye, measured in lateral view. **FRS:** distance of the frontal carinae immediately caudal of the posterior intersection points between the frontal carinae and the lamellae dorsal to the torulus. If these dorsal lamellae do not laterally surpass the frontal carinae, the deepest point of scape corner pits may be taken as the reference line. These pits take up the inner corner of the scape base when the scape is fully switched caudad and produce a dark triangular shadow in the lateral frontal lobes immediately posterior to the dorsal lamellae of the scape joint capsule. **ML:** mesosoma length from caudalmost point of the propodeal lobe to the transition point between anterior pronotal slope and anterior propodeal shield (preferentially measured in lateral view; if the transition point is not well defined, use dorsal view and take the center of the dark-shaded borderline between

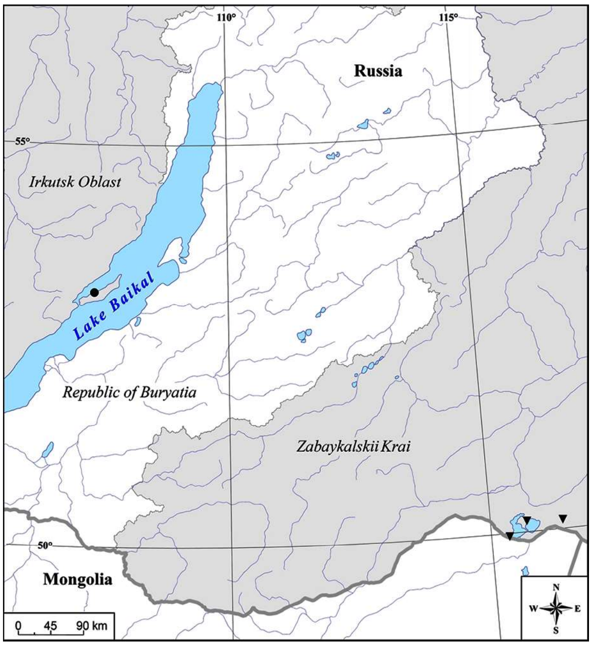

Fig. 1. Locality map of *Temnothorax mongolicus* (Pisarski, 1969) in the region of the Lake Baikal. Designations: new record is marked with a circle, known localities — with triangles.

Рис. 1. Карта мест находок *Temnothorax mongolicus* (Pisarski, 1969) в Байкальском регионе. Обозначения: новая находка показана кружком, известные ранее находки — треугольниками.

pronotal slope and pronotal shield as anterior reference point). **MW:** maximum mesosoma width; this is in worker pronotal width. **NOdL:** anterior length of petiole measured in dorsal view. Distance from the center of the anteriormost seta pit on the petiolar node to the level of the constriction of articulation condyle with propodeum. Measuring requires a change of focus from above (seta pit) to below (constriction). The dorsal view is achieved when the dorsalmost point of the anterior petiolar peduncle at the level of its strongest constriction and the dorsalmost point of the caudal petiolar margin are at the same focal level. **NOH:** maximum height of the petiolar node, measured in lateral view from the uppermost point of the petiolar node perpendicular to a reference line set from the petiolar spiracle to the imaginary midpoint of the transition between dorso-caudal slope and dorsal profile of caudal cylinder of the petiole. **NOL:** length of the petiolar node, measured in lateral view from the petiolar spiracle to the dorsocaudal corner of the caudal cylinder. Do not erroneously take as a reference point the dorso-caudal corner of the helcium, which is sometimes visible. **PEH:** maximum petiole height. The chord of the ventral petiolar profile at the node level is the reference line perpendicular to which the maximum petiole height is measured. **PEW:** maximum width of petiole. **PL:** total petiole length measured in dorsal view; distance between the dorsalmost point of caudal petiolar margin and the dorsalmost point of anterior petiolar peduncle at the transversal level of its strongest constriction. Positioning of petiole as in NOdL. **PoOC:** postocular distance. Use a cross-scaled ocular micrometer and adjust the head to the measuring position of HL. Caudal measuring

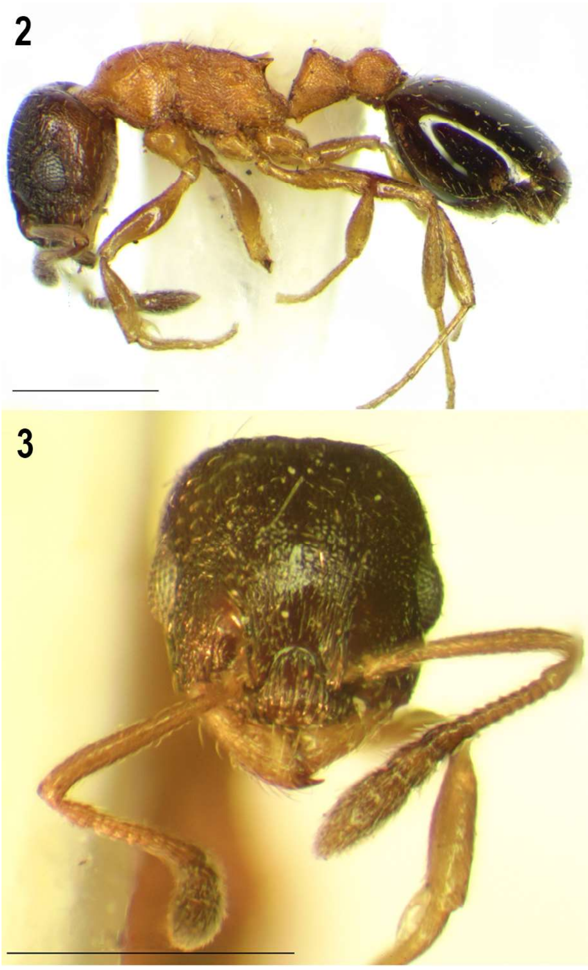

Fig. 2–3. Details of morphology of *Temnothorax mongolicus* (Pisarski), collected from Irkutskaya Oblast. 2 — general appearance in lateral view; 3 — head, frontal view. Scale bars 0.5 mm.

Рис. 2–3. Детали строения экземпляра *Temnothorax mongolicus* (Pisarski), собранного в Иркутской области. 2 — общий вид сбоку; 3 — голова, спереди. Масштабные линейки 0,5 мм.

point: median occipital margin; frontal measuring point: median head at the level of the posterior eye margin. **PPH:** maximum height of the postpetiole in lateral view measured perpendicularly to a line defined by the linear section of the segment border between dorsal and ventral petiolar sclerite. **PPL:** maximum length of the postpetiole measured in a lateral view perpendicular to the straight section of lateral postpetiolar margin. **PPW:** maximum width of postpetiole. **SL:** maximum straight line scape length excluding the articular condyle. **SPL:** minimum distance between the center of the propodeal spiracle and the subspinal excavation measured in lateral view (i.e., the same view applied to measure ML). Note: in the lateral view, the propodeal spiracle and the caudal margin of propodeal declivity might not be at the same focal level; hence, a slight adjustment might be necessary while measuring SPL between the two endpoints. **SPBA:** the smallest distance of the lateral margins of the spines at their base. This should be measured in the dorsofrontal view since the broader parts of the ventral propodeum do not interfere with the measurement in this position. If the lateral margins of spines diverge continuously from the tip to the base, the smallest distance at the base is not defined. In this case, SPBA is measured at the level of the bottom of the interspinal meniscus. **SPST:** distance between the center of propodeal stigma and spine tip. The stigma center refers to the midpoint defined by the outer cuticular ring but not the center of the real stigma opening that may be positioned eccentrically. **SPTI:** the distance of spine tips in dorsal view; if spine tips are rounded or truncated, the centers of spine tips are taken as reference points. **SPWI:** maximum distance between outer margins of spines; measured in the same position as SPBA.

Abbreviations used in the text (w. – workers).

Multivariate statistics. We analyzed the morphometric data of 23 worker specimens (4 paratype specimens and 19 newly collected *Temnothrax* Mayr workers). Note: Though 26 workers have been measured, three were omitted from the analyses due to missing data. Determining species identity has been done by describing the relative position of new samples and type specimens of *T. mongolicus* (Pisarski). We used shape Principal component analysis [sPCA; Baur, Leuenberger, 2011] for ordination, eliminating the data's size variance. We concluded species identity from the relative position and distribution of the specimens measured in this study within the two-dimensional morphospace (PC1, PC2).

The present work is registered in ZooBank (www.zoobank.org) under LSID urn:lsid:zoobank.org:pub:7AF3865B-AE5D-4195-9B44-01DF740E5FD5.

Results and discussion

The Principal component analysis did not find convincingly separated clusters in the data (Fig. 4). All cases are distributed in a single cluster; however, it is noteworthy that the type specimens from the Zabaikalskii Krai, are concentrated on the left side, while the newly found specimens from Irkutskaya Oblast appear at the right side of the cloud without evidence of apparent separation. This pattern might be ascribed to geographical distances rather than indicating heterospecifity. Two trits, SPST (the longest distance between the center of propodeal stigma and spine tip) and SPBA (the smallest distance of the lateral margins of the spines at their base) differ between the type material and the specimens from Irkutskaya Oblast: the type series exhibit slightly shorter spine and wider SPBA. Because the other traits do not differ, we hold that the differences in the propodeal spine traits might come from intraspecific variance.

Temnothorax mongolicus (Pisarski, 1969)

Leptothorax serviculus mongolicus Pisarski, 1969b: 299, Figs 5–10 (Mongolia);

Temnothorax mongolicus (Pisarski, 1969): Bolton, 2003: 271.

Material. ***Russia, Zabaikalskii Krai:*** 2 w — Chandant, S slope of the hill, 10.VII.1977, A. Kupyanskaya leg.; 5 w — 25 km N of Solovievsk, dry steppe, 21.VII.1977, A. Kupyanskaya leg.; 3 w — Gazimurovsky district, 4 km W village Gazimurovsky Zavod, 51.51260° N, 118.26060° E, h~814 m a.s.l., forb meadow on the slope E exposition, 12–20.VI.2022, A.A. Gurina, R.Yu. Dudko leg.; ***Irkutskaya Oblast:*** 2 w — Olkhonsky district, Island Olkhon, 5.2 km SW of Yalga village, ep. 279, 53.122570° N, 107.111310° E, h ~ 510 m a.s.l., nest in soil, under stone, 2.VII.2014, I. Antonov leg.; 5 w — idem, 12.2 km SW of Yalga village, ep. 380, 53.080480° N, 107.029320° E, h ~ 564 m a.s.l., nest in soil, 10.VII.2014, I. Antonov leg.; 5 w — 12.2 km SW of Yalga village, ep. 343, 53.080470° N, 107.029270° E, 560 m a.s.l., site №31, nest in soil, 10.VII.2014, I. Antonov.

Distribution. Russia: Irkutskaya Oblast, Zabaikalskii Krai, Amurskaya Oblast, and Primorskii Krai; Mongolia; China (Hebei); North Korea.

Ecology. *T. mongolicus* (Pisarski) inhabits steppes, dry meadows, and dry, sunlit sparse forests; nests are built in soil.

Conclusions

Temnothorax mongolicus (Pisarski) was described by B. Pisarski based on working specimens from Mongolia as *Leptothorax serviculus mongolicus* (Pisarski) [Pisarski, 1969], elevated to species rank by A. Radchenko [Radchenko, 1994b]. Subsequently, it was also found in Zabaikalskii Krai, Amurskaya Oblast, and Primorskii Krai of Russia, North Korea, and China [Kupyanskaya, 1990; Radchenko, 2004, 2005; Zhou et al., 2010; Kupyanskaya, 2011, 2012; Guénard, Dunn, 2012]. In July 2014, one of the authors of the article (I.A. Antonov) discovered this species for the first time in the Irkutskaya Oblast from the Olkhon Island in the small turf grass and fescue steppe (Fig. 1). The nests were built in the soil. Olkhon is the largest Baikal Island, which lies on the northwestern shore of Lake Baikal. According to the nature of the vegetation, the island is divided into two parts, forest and steppe. Steppes are developed mainly in the southwestern part of the island on rocky hills and at the extreme northeastern tip (Cape Khoboy) [Agafonova et al., 1991]. The sites of *T. mongolicus* (Pisarski) found in Olkhon Island are the northernmost in East Siberia. It is also likely that this species is found in Buryatia.

Another interesting detail in the biology of this species, which has not been previously noted, is the cohabitation of *T. mongolicus* (Pisarski) and *T. nassonovi* (Ruzsky) in the same nest. So, out of two nests samples of *T. mongolicus* (Pisarski) from the Zabaikalskii Krai collected by A.N. Kupyanskaya, one nest was together with *T. nassonovi* (Ruzsky), out of three nests of *T. mongolicus* (Pisarski) from the Irkutskaya Oblast collected by I.A. Antonov, two were together with *T. nassonovi* (Ruzsky). In addition, in the material from pitfall traps from the Zabaikalskii Krai collected by A.A. Gurina and R.Yu. Dudko), *T. mongolicus* (Pisarski) and *T. nassonovi* (Ruzsky) are also present together. That is, out of five nest samples presented in this study, three were with *T. nassonovi* (Ruzsky). At the moment, unfortunately, we cannot accurately answer the question of the reason of the cohabitation, further research of the biology of these two ant species, especially in the regions where they are occurring together is needed.

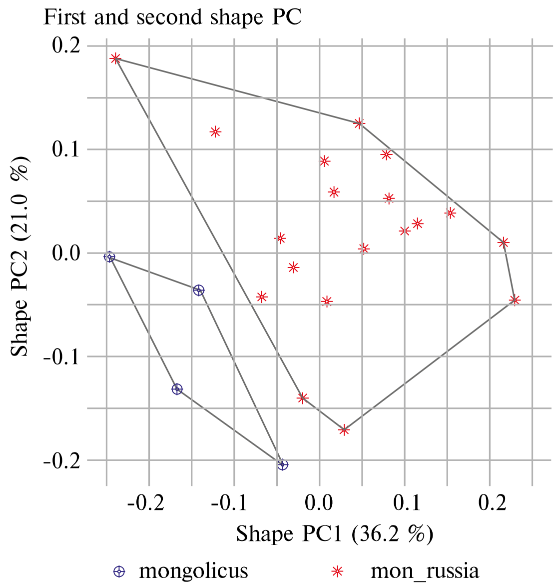

Fig. 4. Multivariate analysis of measurements of *Temnothorax mongolicus* (Pisarski) specimens.

Рис. 4. Многомерный анализ промеров экземпляров *Temnothorax mongolicus* (Pisarski).

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References

Agafonova T.A., Anisimova O.A., Epova V.I. 1991. [Ecological complexes of dendrophagous insects in coniferous forests of Olkhon Island] // Problemy ekologii lesov Pribaykal'ya. Irkutsk: SIFIBR SO AN SSSR. P.149–170. [In Russian].

Agosti D., Collingwood C.A. 1987. A provisional list of the Balkan ants (Hym. Formicidae) with a key to the worker caste. II. Key to the worker caste, including the European species without the Iberian // Bulletin de la societe entomologique Suisse. Vol.60. P.261–293.

Antonov I.A., Pleshanov A.S. 2008. [Landscape ecological complexes of ants in Baikalian Siberia] // Sibirskii Ekologicheskii Zhurnal. Vol.15. No.1. P.53–57. [In Russian, with English summary].

Baur H., Leuenberger C. 2011. Analysis of Ratios in Multivariate Morphometry // Systematic Biology. Vol.60. No.6. P.813–825. https://doi.org/10.1093/sysbio/syr061.

Bolton B. 2022. An online catalog of the ants of the world. Accessed 20.VIII.2022. http://antcat.org.

Cagniant H., Espadaler X. 1997. Les *Leptothorax*, *Epimyrma* et *Chalepoxenus* du Maroc (Hymenoptera: Formicidae). Clé et catalogue des espèces // Annales de la Société Entomologique de France (Nouvelle série). Vol.33. No.3. P.259–284. https://doi.org/10.1080/21686351.1997.12277888.

Csősz S., Heinze J., Mikó I. 2015. Taxonomic Synopsis of the Ponto-Mediterranean ants of *Temnothorax nylanderi* species-group // PLoS ONE. Vol.10. No.11. P.e0140000. https://doi.org/10.1371/journal.pone.0140000.

Dubovikoff D.A., Yusupov Z.M. 2017. 69. Family Formicidae – Ants // Annotated Catalogue of the Hymenoptera of Russia. Vol.I. Symphyta and Apocrita: Aculeata. Saint Petersburg: Russian collection Saint Petersburg. P.197–210.

Gonzalez J.A. 2021. Description of *Temnothorax estel* sp. nov. (Hymenoptera: Formicidae), with a review of the Iberian species of the *sordidulus* species-complex // Zootaxa. Vol.5005. No.2. P.145–160. https://doi.org/10.11646/zootaxa.5005.2.2

Guénard B., Dunn R.R. 2012. A checklist of the ants of China // Zootaxa. Vol.3558. No.1. P.1–77. https://doi.org/10.11646/zootaxa.3558.1.

Kupyanskaya A.N. 1990. [The ants (Hymenoptera, Formicidae) of the Far East of the USSR]. Vladivostok: DVO AN SSSR. 258 p. [In Russian].

Kupyanskaya A.N. 2011. [Characteristics of the distribution of ants (Hymenoptera: Formicidae) in the Russian Far East] // Key to the insects of Russian Far East. Additional volume. Analysis of the fauna and general index of the names. Vladivostok: Dalnauka. P.116–129. [In Russian].

Kupyanskaya A.N. 2012. [61. Family Formicidae — Ants] // Annotated catalogue of the insects of Russian Far East. Vol.I. Hymenoptera. Vladivostok: Dalnauka. P.423–433. [In Russian].

Pisarski B. 1969. Myrmicidae und Formicidae. Ergebnisse der zoologischen Forschungen von Dr. Z. Kaszab in der Mongolei (Hymenoptera) // Faunistische Abhandlungen. Bd.2. No.29. S.295–316.

Prebus M. 2021. Taxonomic revision of the *Temnothorax salvini* clade (Hymenoptera: Formicidae), with a key to the clades of New World *Temnothorax* // PeerJ. Vol.9. P.e11514. https://doi.org/10.7717/peerj.11514.

Radchenko A.G. 1993(1994). [New species of ants of the genus *Leptothorax* (Hymenoptera, Formicidae) from southern and eastern Palearctic] // Zhurnal Ukrains'koho Entomolohichnoho Tovarystva. Vol.1. No.2. P.23–34. [In Russian, with English summary].

Radchenko A.G. 1994. [Identification table for ants of the genus *Leptothorax* (Hymenoptera, Formicidae) from central and eastern Palearctic] // Zoologichesky zhurnal. Vol.73. Nos 7–8. P.146–158. [In Russian, with English summary].

Radchenko A.G. 1995a. [A review of the ant genus *Leptothorax* (Hymenoptera, Formicidae) of the central and eastern Palearctic. Communication 1. Subdivision into groups. Groups *acervorum* and *bulgaricus*] // Vestnik Zoologii. No.6. P.22–28. [In Russian, with English summary].

Radchenko A.G. 1995b. [A review of the ant genus *Leptothorax* (Hymenoptera, Formicidae) of the central and eastern Palearctic. Communication 2. Groups *tuberum*, *corticalis*, *affinis*, *clypeatus*, *alinae* and *singularis*] // Vestnik Zoologii. Nos 2–3. P.14–21. [In Russian, with English summary].

Radchenko A.G. 1995c. [A review of the ant genus *Leptothorax* (Hymenoptera, Formicidae) of the central and eastern Palearctic. Communication 3. Groups *nylanderi*, *korbi*, *nassonovi*, and *susamyri*] // Vestnik Zoologii. No.4. P.3–11. [In Russian, with English summary].

Radchenko A.G. 1996. [A review of the ant genus *Leptothorax* (Hymenoptera, Formicidae) of central and eastern Palearctic. Communication 4. Group *congruus*. Species of uncertain position. Zoogeographical characteristics] // Vestnik Zoologii. Nos 1/2. P.16–22. [In Russian, with English summary].

Radchenko A.G. 2004. A review of the ant genera *Leptothorax* Mayr and *Temnothorax* Mayr (Hymenoptera, Formicidae) of the eastern Palaearctic // Acta Zoologica Academiae Scientiarum Hungaricae. Vol.50. No.2. P.109–137.

Radchenko A.G. 2005. Monographic revision of the ants (Hymenoptera, Formicidae) of North Korea // Annales Zoologici. Vol.55. No.2. P.127–221.

Ruzsky M.D. 1936. [Ants of the Transbaikal region] // Trudy Biologicheskogo Nauchno-Issledovatel'skogo Instituta Tomskogo Gosudarstvennogo Universiteta. Vol.2. P.89–97. [In Russian].

Salata S., Borowiec L. 2019. Preliminary division of not socially parasitic Greek *Temnothorax* Mayr, 1861 (Hymenoptera, Formicidae) with a description of three new species // ZooKeys. Vol.877. P.81–131. https://doi.org/10.3897/zookeys.877.36320.

Salata S., Borowiec L., Trichas A. 2018. Taxonomic revision of the Cretan fauna of the genus *Temnothorax* Mayr, 1861 (Hymenoptera: Formicidae), with notes on the endemism of ant fauna of Crete // Annales Zoologici. Vol.68. No.4. P.769–809. https://doi.org/10.3161/00034541ANZ2018.68.4.004.

Schifani E., Prebus M.M., Alicata A. 2022. Integrating morphology with phylogenomics to describe four island endemic species of *Temnothorax* from Sicily and Malta (Hymenoptera, Formicidae) // European Journal of Taxonomy. Vol.833. No.143. P.143–179. https://doi.org/10.5852/ejt.2022.833.1891.

Schulz A., Heinze J., Pusch K. 2007. Description of two new *Temnothorax* species (Hymenoptera: Formicidae) from Italy // Zootaxa. Vol.1471. No.1. P.1–14. https://doi.org/10.11646/zootaxa.1471.1.1.

Seifert B. 1996. Ameisen: beobachten bestimme. Augsburg: Naturbuch-Verl. 352 p.

Seifert B. 2006. *Temnothorax saxonicus* (Seifert, 1995) stat. n., comb.n. — a parapatric, closely-related species of *T. sordidulus* (Müller, 1923) comb.n. and description of two new closely related species, *T. schoedli* sp.n. and *T. artvinense* sp.n., from Turkey (Hymenoptera: Formicidae) // Myrmecologische Nachrichten. Vol.8. P.1–12.

Seifert B., Csősz S. 2015. *Temnothorax crasecundus* sp. n. — a cryptic Eurocaucasian ant species (Hymenoptera: Formicidae) discovered by Near Centroid Clustering // ZooKeys. Vol.479. P.37–64. https://doi.org/10.3897/zookeys.479.8510.

Terayama M., Onoyama K. 1999. The ant genus *Leptothorax* Mayr (Hymenoptera: Formicidae) in Japan // Memoirs of the Myrmecological Society of Japan. Vol.1. P.71–97.

Zhou S., Huang J., Yu D., Liu Z. 2010. Eight new species and three newly recorded species of the ant genus *Temnothorax* Mayr (Hymenoptera: Formicidae) from the Chinese mainland, with a key // Sociobiology. Vol.56. No.1. P.7–26.

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