РОССИЙСКАЯ АКАДЕМИЯ НАУК
Южный научный центр

RUSSIAN ACADEMY OF SCIENCES
Southern Scientific Centre

Кавказский Энтомологический Бюллетень

CAUCASIAN ENTOMOLOGICAL BULLETIN

Том 22. Вып. 1
Vol. 22. Iss. 1

Ростов-на-Дону
2026

New data on the distribution and bionomics of the little-known ant species *Temnothorax brauneri* (Ruzsky, 1905) (Hymenoptera: Formicidae) with description of previously unknown gynes

© D.M. Shevchenko[1, 2], Z.M. Yusupov[3, 4]

[1]D.I. Ivanovsky Academy of Biology and Medicine of Southern Federal University, Stachki Avenue, 194/1, Rostov-on-Don 344090 Russia. E-mail: cheff7627d@gmail.com
[2]Federal Research Centre the Southern Scientific Centre of the Russian Academy of Sciences, Chekhov Avenue, 41, Rostov-on-Don 344006 Russia
[3]Tembotov Institute of Ecology of Mountain Territories of the Russian Academy of Sciences, Inessa Armand Street, 37a, Nalchik 360051 Russia. E-mail: yzalim@mail.ru
[4]Institute of Systematics and Ecology of Animals of Siberian Branch of the Russian Academy of Sciences, Frunze Street, 11, Novosibirsk 930091 Russia

Abstract. *Temnothorax brauneri* (Ruzsky, 1905) is a little-known ant species (Hymenoptera: Formicidae) of the *sordidulus* species-complex, belonging to the intrageneric *nylanderi* group. Until now, almost nothing was known about its biology, ecology, and distribution. New records of the species in the North Caucasus and Transcaucasia are presented: in Russia (Adygea, Krasnodar Region), Abkhazia, and Georgia (Adjara). The ecology of the species, its altitudinal distribution, and nesting habits are described. Polygynous colonies of *T. brauneri* are found for the first time. Gynes of the species are described using morphological characters and morphometric data. The species' association with ancient relict elements of the Caucasian flora and possible pathways of its colonization of the North Caucasus are discussed.

Key words: ants, *Temnothorax*, distribution, polygyny, nesting behaviour, Colchic forests, Caucasus.

Новые данные о распространении и биологии малоизученного вида муравьев *Temnothorax brauneri* (Ruzsky, 1905) (Hymenoptera: Formicidae) с описанием ранее неизвестных самок

© Д.М. Шевченко[1, 2], З.М. Юсупов[3, 4]

[1]Академия биологии и медицины имени Д.И. Ивановского Южного федерального университета, пр. Стачки, 194/1, Ростов-на-Дону 344090 Россия. E-mail: cheff7627d@gmail.com
[2]Федеральный исследовательский центр Южный научный центр Российской академии наук, пр. Чехова, 41, Ростов-на-Дону 344006 Россия
[3]Институт экологии горных территорий имени А.К. Темботова Российской академии наук, ул. Инессы Арманд, 37а, Нальчик 360051 Россия. E-mail: yzalim@mail.ru
[4]Институт систематики и экологии животных Сибирского отделения Российской академии наук, ул. Фрунзе, 11, Новосибирск 930091 Россия

Резюме. *Temnothorax brauneri* (Ruzsky, 1905) – малоизученный вид муравьев (Hymenoptera: Formicidae) из комплекса *sordidulus*, относящийся к внутриродовой группе *nylanderi*. До настоящего времени практически ничего не было известно о его биологии, экологии и распространении. Представлена информация о новых находках вида на Северном Кавказе и в Закавказье: на территории России (Адыгея, Краснодарский край), в Абхазии и в Грузии (Аджария). Описаны экология вида, его высотное распространение и особенности гнездования. Впервые у *T. brauneri* обнаружены полигинные семьи. Описаны самки вида с использованием внешних признаков и морфометрических данных. Обсуждаются взаимосвязь вида с древними реликтовыми элементами кавказской флоры и возможные пути проникновения на Северный Кавказ.

Ключевые слова: муравьи, *Temnothorax*, распространение, полигиния, особенности гнездования, колхидские леса, Кавказ.

Introduction

The genus *Temnothorax* Mayr, 1861 comprises small representatives of the family Formicidae, with a body length of 2–4 mm. They occur on all continents except Australia and Antarctica. The modern fauna includes more than 500 species [Bolton, 2025]. In the Palaearctic region, about 300 species are known [Catarineu et al., 2017; Galkowski, Cagniant, 2017; Sharaf et al., 2017; Salata, Borowiec, 2019, 2022; Tinaut, Reyes-López, 2020; Arcos González, 2021; Báthori et al., 2024a, b; Qian, Xu, 2024; Csősz et al., 2025; Schifani et al., 2025a, b; Zięcina et al., 2025a, b]. In Europe, these ants can be regarded as one of the better-studied taxa. However, knowledge of *Temnothorax* species inhabiting the Caucasian region remains fragmentary. Previously, the authors published original data on the species diversity and distribution of Caucasian *Temnothorax* [Dubovikoff, Yusupov, 2017; Yusupov, 2022; Shevchenko, Yusupov, 2024].

Temnothorax brauneri (Ruzsky, 1905) is a member of the *sordidulus* species-complex, which belongs to the larger intrageneric *nylanderi* group [Radchenko, 1995;

Research Article / Научная статья
DOI: https://doi.org/10.5281/zenodo.18414724

Csősz et al., 2015]. Members of this group are distributed mainly in the Ponto-Mediterranean region and have distinctive morphological features, such as a reticulate or rugose sculpture on the head and mesosoma, a petiole with a steeply sloping peduncle, and the first abdominal tergite usually bearing a dark posterior band. They are generally associated with various forest habitats; they usually nest in rocks, under stones, and in dry twigs [Salata, Borowiec, 2019].

The name *brauneri* was introduced by Ruzsky [1905] when describing two workers collected in western Transcaucasia (Bagdati, Imereti Region, Georgia – coll. M.D. Ruzsky in 1905, and the vicinity of Krasnaya Polyana, Krasnodar Region, Russia – coll. A.A. Brauner in 1902), which he described as *Leptothorax serviculus* var. *brauneri*, now used in combination *Temnothorax brauneri* (Ruzsky, 1905). The specimens studied by M.D. Ruzsky were lost, which led Radchenko [1995] to propose designating a worker specimen from the collections of K.V. Arnoldi (vicinity of Kutaisi, Imereti Region, Georgia, 1930; collection of the Zoological Museum of Moscow State University (Moscow, Russia)) as the neotype of *T. brauneri*. For a long time, knowledge of the species was limited to the morphology of worker specimens. The description of males was published by Radchenko [1995] based on individuals found in the mountain forests of Adjara (Chakvistavi village, Georgia). The description of gynes has not been yet published.

Current data on the distribution of *T. brauneri* are based only on records of this species published in the works of Ruzsky [1905], Arnoldi [1977], and Radchenko [1995]. Arnoldi [1977] stated that the species' range is restricted to the western part of Transcaucasia. Some researchers have suggested a broader distribution of *T. brauneri* within the Caucasian Isthmus [Radchenko, 1995; Borowiec, 2014].

Data on the biological characteristics of the species are extremely fragmentary. It is known that Ruzsky [1905] found the worker at the base of a beech tree located on the edge of a cliff (vicinity of Bagdati, western Georgia). In the same locality, he recorded several other ant species – *Dolichoderus quadripunctatus* (Linnaeus, 1771), *Lasius alienus* (Foerster, 1850), *Aphaenogaster subterranea* (Latreille, 1798), and *Temnothorax unifasciatus* (Latreille, 1798) – all of which are common in the mountain forests of western Transcaucasia. Arnoldi [1977] stated that *T. brauneri* nests in soil and leaf litter. Radchenko [1995] suggested that this species may also occur in mountain meadows. Modern faunistic reviews [Gratiashvili, Barjadze, 2008; Dubovikoff, Yusupov, 2017] emphasize that new information on the bionomics of *T. brauneri* is completely lacking. The paper presents new data on the distribution and bionomics of the poorly studied ant *T. brauneri* as well as the description of a previously unknown gynes.

Material and methods

The specimens were collected in the Republic of Adygea and Krasnodar Region (Russia), the Gagra, Gudauta, and Sukhum districts (Abkhazia), and the Autonomous Republic of Adjara (Georgia) during the period from 2012 to 2024. The primary method employed was hand collection and excavation of ant nests. Additionally, soil pitfall traps and light UV traps were used. Ants were preserved in 96% ethanol and later mounted on cardboard plates. When polygynous colonies were found, gynes and workers were placed in standard test-tube incubators and maintained under laboratory conditions at room temperature for six months. Each incubator contained one gyne and several workers. The ants were fed with glucose syrup and small dead insects.

Photographs were obtained using a Motic BA210 microscope with plan-apochromatic objectives (10× and 20×) and a Panasonic Lumix G7 digital camera. Focus-stacking was processed using Helicon Focus 8.1.0. Final image processing and preparation of the plates were carried out in Adobe Photoshop CC 2015. The species distribution map was created using QGIS 3.42.0. In total, over 500 specimens from 43 localities were examined. The material is deposited in the collections of the Zoological Museum of Moscow State University (ZMMU, Moscow, Russia), the Zoological Institute of the Russian Academy of Sciences (ZISP, St Petersburg, Russia), and the Zoological Museum of the Department of Zoology of Southern Federal University (ZMSU, Rostov-on-Don, Russia). A part of the material is temporarily kept in the private collections of D.M. Shevchenko (PCSH) and Z.M. Yusupov (PCZY) and will later be deposited in the aforementioned museums. All measurements are given in millimeters (accurate to 0.01 mm) in the sequence arithmetic mean ± standard deviation (minimum, maximum) and follow standard measurements of Csősz et al. [2015, 2018].

Measurements:

CL – maximum cephalic length in median line.

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.

FL – maximum distance between the frontal lobes.

FRS – minimum distance between the frontal carinae.

MH – mesosoma height. In workers: measured in profile from the imaginary line connecting uppermost points of promesonotum and propodeum perpendicularly to the lowermost point of mesopleuron; in gynes: the same measured, only uppermost points of scutum or scutellum and lowermost point of katepisternum.

ML – mesosoma length from caudalmost point of propodeal lobe to transition point between anterior pronotal slope and anterior propodeal shield (preferentially measured in lateral view).

MW – maximum mesosoma width; pronotal width in workers and scutum width in gynes.

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 petiolar spiracle to dorsocaudal corner of caudal cylinder. Do not erroneously take as reference point the

dorso-caudal corner of the helcium, which is sometimes visible.

PEH – maximum petiole height. The chord of ventral petiolar profile at node level is the reference line perpendicular to which the maximum height of petiole 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.

PoOC – postocular distance. Use a cross-scaled ocular micrometer and adjust the head to the measuring position of HL. Caudal measuring 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 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 propodeal spiracle and the subspinal excavation measured in lateral view (i.e. the same view that is applied to measure ML). Note: in lateral view propodeal spiracle and the caudal margin of propodeal declivity might not be in the same focal level, hence slight adjust 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 dorsofrontal view, since the wider 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, a smallest distance at 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 centre refers to the midpoint defined by the outer cuticular ring but not to the centre of 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 same position as SPBA.

The following abbreviations are given in the "Material" section for ant castes: "w" for worker, "g" for gyne and "m" for male.

Temnothorax brauneri (Ruzsky, 1905) (Figs 1–8, 11)

Material. Russia. Krasnodar Region, Sochi District: 6 w (PCZY), Caucasian Nature Reserve, "Chernorech'ye" cordon, edge of deciduous forest, pitfall traps, 43°55′60″N / 40°41′00″E, 700 m, 15.06–3.07.2017 (Yu.A. Chumachenko); 1 w (PCZY), Khosta vill., yew-box tree grove, ash-linden forest, in underwood, 43°31′55″N / 39°52′27″E, 147 m, 9.05.2018 (Z.M. Yusupov); 23 w (PCZY), the same locality, hornbeam forest, in underwood, 43°31′47″N / 39°52′31″E, 98 m, 9.05.2018 (Z.M. Yusupov); 28 w (PCZY), 1.7 km SE of Vorontsovka vill., Sochi National Park, headwaters of Kudepsta River, hornbeam forest, nest in soil under a stone, 43°36′30″N / 39°56′05″E, 393 m, 28.09.2018 (Z.M. Yusupov); 54 w, 1 g (PCZY), Khosta vill., yew-box tree grove, in soil, in rock crack, 21.05.2019 (Z.M. Yusupov); 3 w (PCZY), Kalinovoe Lake env., beech forest, in leaf litter, 43°37′33″N / 39°52′59″E, 370 m, 6.10.2019 (Z.M. Yusupov); 23 w (PCZY), Solokhaul vill. env., ash-hornbeam forest with boxwood, forest edge, on tree trunks, 43°47′51″N / 39°40′51″E, 207 m, 15.05.2021 (Z.M. Yusupov); 17 w (PCZY), Kashtany vill. env., beech-hornbeam forest, on tree trunks, 43°32′13″N / 39°53′51″E, 252 m, 16.05.2021 (Z.M. Yusupov). Republic of Adygea, Maykop District: 36 w (PCZY), Kamennomostskiy vill. env., oak forest with rhododendron, in leaf litter, 44°17′00″N / 40°09′00″E, 652 m, 29.07.2011 (Z.M. Yusupov); 5 w (PCZY), Bzykha River gorge, broad-leaved forest (oak, maple, hornbeam, etc.), in leaf litter, 44°06′00″N / 40°07′00″E, 591 m, 31.07.2011 (Z.M. Yusupov); 1 w (PCZY), left bank of Kuzhetka River, oak-hornbeam forest, on shrub, 44°09′48″N / 39°49′31″E, 449 m, 3.07.2018 (Z.M. Yusupov); 10 w (PCZY), the same place, in underwood and on trees, 23.05.2019 (Z.M. Yusupov); 18 w, 6 g (ZMMU), Dakhovskaya Cossack vill. env., rocky slope with calcite outcrops, park oak forest (Quercus petraea), nest in limestone outcrops, 44°14′32″N / 40°10′23″E, 740 m, 25.06.2023 (D.M. Shevchenko); 1 w (ZMMU), Caucasian Nature Reserve, Guzeripl vill., "Leopard Slope", dark coniferous fir forest with oak and beech admixture, from trunks and fallen trees, 43°59′44″N / 40°08′30″E, 730 m, 28.06.2023 (D.M. Shevchenko); 1 w, 1 g (PCSH), Granitnoe Gorge, Belaya River floodplain, on rocky slope, on stones and tree trunks, 44°09′48″N / 40°08′29″E, 520 m, 19.06.2024 (D.M. Shevchenko); 13 w, 7 g (PCSH), Medved' Mt., slope, wet beech-hornbeam forest, under limestone stone, 44°09′05″N / 40°08′50″E, 1000 m, 27.06.2024 (D.M. Shevchenko); 6 w, 1 g (PCSH), Monakh Mt., mixed forest (pine, oak, maple), nest in sand under stone at base of pine trunk, 44°07′17″N / 40°06′46″E, 1060 m, 28.06.2024 (D.M. Shevchenko).

Abkhazia. Gagra District: 5 w, 1 g (PCZY), Bzyb River gorge, broad-leaved forest, in leaf litter, 43°15′25″N / 40°23′46″E, 90 m, 9.08.2013 (Z.M. Yusupov); 1 w (PCZY), Myussera River gorge, broad-leaved forest, in leaf litter, 43°10′05″N / 40°27′41″E, 42 m, 9.08.2013 (Z.M. Yusupov); 16 w (PCZY), Pitsundo-Myussera Nature Reserve, Ambara River gorge, moist oak forest with Pontic rhododendron, on trees, 43°09′18″N / 40°28′53″E, 43 m, 11.08.2013 (Z.M. Yusupov); 5 w (PCZY), Ritsa National Relic Park, along Yupshara River, moist deciduous forest, on boulder, 43°25′21″N / 40°30′02″E, 336 m, 16.08.2013 (Z.M. Yusupov); 1 w (PCZY), Western Gumista River gorge, alder forest, in leaf litter, 43°06′28″N / 41°00′18″E, 340 m, 3.05.2021 (Z.M. Yusupov); 8 w, 1 g (PCZY), Ritsa National Relic Park, Ritsa Lake env., fir-beech forest, on stones, 43°28′25″N / 40°32′25″E, 886 m, 8.05.2021 (Z.M. Yusupov); 15 w (PCZY), Ritsa National Relic Park, below Ritsa Lake, beginning of Chabgar cornice, hornbeam forest, on trees and stones, 43°26′51″N / 40°32′53″E, 644 m, 8.05.2021 (Z.M. Yusupov); 132 w, 1 g (PCZY), Ritsa National Relic Park, Gega River gorge, on scree, nest in stone crack, 43°26′06″N / 40°26′34″E, 536 m, 10.05.2021 (Z.M. Yusupov); 9 w (PCZY), Ritsa National Relic Park, Bzyb River gorge, above-floodplain terrace, beech forest, on trees, shrubs and stones, 43°21′53″N / 40°29′28″E, 160 m, 12.05.2021 (Z.M. Yusupov); 5 w (PCZY), Myussera River gorge, oak forest, on trees, 43°10′18″N / 40°27′40″E, 38 m, 13.05.2021 (Z.M. Yusupov); 1 w (PCZY), Ritsa National Relic Park, Yupshara Canyon, Yupshara River gorge, forb-grass meadow, on tree trunk, 43°24′58″N / 40°27′58″E, 281 m, 14.05.2021 (Z.M. Yusupov).

Georgia. Autonomous Republic of Adjara: Kobuleti Municipality: 14 w (PCZY), Chakhati vill. env., near Kintrishi Nature Reserve, mixed broad-leaved forest, on trees, 41°47′57″N / 41°56′53″E, 316 m, 19.06.2014 (Z.M. Yusupov); 3 w (PCZY), 7 km SE of Kobuleti, Kintrishi River gorge, edge of broad-leaved forest, in leaf litter, 41°48′06″N / 41°52′29″E, 46 m, 22.06.2014 (Z.M. Yusupov); 18 w (PCZY), Mtirala National Park, mixed broad-leaved forest, on trees and in leaf litter, 41°40′55″N / 41°51′46″E, 342 m, 24.06.2014 (Z.M. Yusupov); 5 w, 1 g (PCZY), the same place, nest in soil, 24.06.2014 (Z.M. Yusupov); Khelvachauri Municipality: 6 w (PCZY), Batumi env., Chorokh River valley, broad-leaved forest, on trees, 41°34′24″N / 41°40′33″E, 287 m, 18.08.2015 (Z.M. Yusupov).

Description of gyne. Measurements (n = 7): CL 0.724 ± 0.026 (0.703, 0.771), CS 0.683 ± 0.017 (0.669, 0.716), CWb 0.641 ± 0.01 (0.63, 0.661), PoOC 0.272 ± 0.011 (0.258, 0.283), EL 0.205 ± 0.01 (0.196, 0.221), FL 0.276 ± 0.011 (0.266, 0.293), FRS 0.263 ± 0.01 (0.252, 0.281), SL 0.525 ± 0.017 (0.502, 0.558), MH 0.652 ± 0.017 (0.631, 0.681), ML 1.157 ± 0.043 (1.096, 1.225), SPST 0.207 ± 0.019 (0.189, 0.238), SPL 0.131 ± 0.005 (0.126, 0.14), PEH 0.293 ± 0.013 (0.278, 0.32), PPH 0.289 ± 0.017 (0.265, 0.316), NOH 0.13 ± 0.01

(0.115, 0.14), NOL 0.21 ± 0.011 (0.196, 0.229), PPL 0.204 ± 0.019 (0.187, 0.243), MW 0.691 ± 0.026 (0.662, 0.732), SPBA 0.297 ± 0.019 (0.28, 0.336), SPWI 0.295 ± 0.013 (0.28, 0.316), SPTI 0.275 ± 0.016 (0.257, 0.297), PL 0.302 ± 0.021 (0.276, 0.344), PEW 0.222 ± 0.012 (0.21, 0.243), PPW 0.289 ± 0.022 (0.266, 0.319).

Indices: CL/CWb 1.130 ± 0.032 (1.095, 1.175), PoOC/CL 0.375 ± 0.012 (0.366, 0.396), FL/CS 0.405 ± 0.009 (0.394, 0.416), FRS/CS 0.385 ± 0.009 (0.373, 0.394), SL/CS 0.769 ± 0.012 (0.746, 0.779), EL/CS 0.301 ± 0.012 (0.29, 0.319), ML/CS 1.695 ± 0.082 (1.557, 1.813), PEH/CS 0.43 ± 0.024 (0.389, 0.47), PL/CS 0.443 ± 0.033 (0.409, 0.506), NOH/CS 0.191 ± 0.018 (0.16, 0.208), NOL/CS 0.307 ± 0.013 (0.293, 0.331), PPH/CS 0.424 ± 0.026 (0.39, 0.465), PPL/CS 0.3 ± 0.029 (0.276, 0.357), SPST/CS 0.303 ± 0.027 (0.272, 0.343), SPL/CS 0.192 ± 0.009 (0.177, 0.207), MW/CS 1.013 ± 0.046 (0.934, 1.076), PEW/CS 0.325 ± 0.017 (0.308, 0.357), PPW/CS 0.424 ± 0.034 (0.372, 0.469), SPBA/CS 0.435 ± 0.028 (0.41, 0.494), SPWI/CS 0.433 ± 0.02 (0.399, 0.456), SPTI/CS 0.403 ± 0.026 (0.358, 0.431).

Head relatively short (CL/CWb 1.13), with widely rounded occipital corners and a straight or feebly convex occipital margin (Fig. 3). Clypeus convex, its anterior margin straight or broadly rounded, without a median notch. Eyes large, oval (EL/CS 0.301), longer than the genae. Frontal lobes slightly extended, so that the distance between their outer margins is slightly greater than, or almost equal to, the width of the frons. Antennal scape relatively long, reaching or almost reaching the occipital margin of the head (SL/CS 0.769). Masticatory margin of mandibles with 5 teeth, the apical and preapical ones being the largest. The entire surface of the head covered with thin, dense, longitudinal, and sinuous rugae. The areas between the rugae bear foveoreticulate sculpture (Fig. 4). Clypeus smooth and shiny, with very fine longitudinal rugae in the central part and along the edges. Temples and genae with coarser, reticulate rugae. Antennal sockets with circular rugae as thin as those on the head. The central part of the frons with sparser rugae, the interspaces between them smooth and shiny. Mandibles with sparse, punctate rugae.

Mesosoma of medium length, rather low, propodeal spines of medium to short length (SPST/CS 0.303), acute, widened at the base, and directed straight backwards (Fig. 2). Petiole high with relatively long peduncle. Petiolar node sharply elongated towards the apex and narrowly rounded, so that its dorsal plane is poorly defined. Postpetiole high, broadly rounded, equal in height to or slightly lower than the petiole. Pronotum with thin, longitudinal, sinuous rugae, the spaces between the rugae bear microreticulate sculpture. Scutum with the same thin, dense, sinuous, and longitudinal rugulose as the pronotum, but the spaces between the wrinkles smooth and shiny (Fig. 6). In some specimens, the scutum has areas with reduced sculpture, the surface of which is smooth and shiny. Scutellum smooth and shiny, with sparse, interrupted longitudinal rugae located mainly along the edges. Metanotum with thin, short, transverse rugae. Propodeum with variable sculpture: the entire posterior (sloping) part with dense microreticulation and sparse rugae. In lateral aspect, it bears frequent longitudinal and sinuous rugae, as well as numerous microreticulate sculptures. Areas of the metasternal lobes and at the base of the propodeal spines smooth and shiny. Anepisternum and katepisternum smooth and shiny, with thin longitudinal rugae. In lateral aspect, petiole and postpetiole with dense microreticulate sculpture and sinuous rugulose. Abdomen smooth and shiny (Fig. 2).

Head, mesosoma, petiole, postpetiole, and gaster covered with fairly numerous erect and suberect hairs of varying length. Antennae with only short appressed hairs; legs with both short and long erect and suberect hairs. The entire body is uniformly coloured, ranging from brown to almost black. Head and gaster darker; antennae, mandibles, and legs lighter than the rest of the body. At the base of the first gastral tergite there is a small, light spot with indistinct borders; in some specimens, this spot may be faintly visible.

Comparison. Gynes and workers of *T. brauneri* can be easily distinguished from all three currently known species of the *nylanderi* group inhabiting the forests of the Caucasus – *T. crasecundus* Seifert, Csősz, 2015, *T. korbi* (Emery, 1924), and *T. parvulus* (Schenck, 1852) – primarily by their uniformly dark brown to black body colouration (Figs 1–8), as the latter species usually have yellowish (*T. korbi*, *T. crasecundus*) to yellowish-brown (*T. parvulus*) colouration both in workers and gynes. Gynes of *T. brauneri* can also be separated from *T. korbi* by much longer propodeal spines, and from *T. crasecundus* and *T. parvulus* by much longer scape, which in *T. brauneri* reaches or almost reaches the occipital margin of the head. Among the members of the *sordidulus* species-complex, the workers and gynes of *T. brauneri* are most similar to *T. artvinensis* Seifert, 2006, which was described from northeastern Turkey [Seifert, 2006] and in fact may represent a junior synonym of *T. brauneri*. However, resolving this issue definitively requires examination of the type material and detailed morphometric analyses. The remaining species of the *sordidulus* species-complex are geographically isolated from the range of *T. brauneri* and do not occur in sympatry with it.

Bionomics. Records of *T. brauneri* have always been associated with mountain areas, predominantly broad-leaved forests. In the Northwestern Caucasus, in the middle reaches of the Belaya River, the species occurred in humid beech-hornbeam and oak forests (Maykop District, Adygea, Russia) (Fig. 9); in the valley of the Bolshaya Laba River (urban-type settlement Mostovskoy, Krasnodar Region, Russia), it was common in ash-hornbeam and ash-lime forests with an undergrowth of boxwood. Under similar conditions, *T. brauneri* was found in the gorge of the Bzyb River (Gagra District, Abkhazia) and in the territory of Adjara, Georgia in broad-leaved oak and mixed forests (Fig. 10). In fir-beech and dark coniferous forests with admixtures of beech and oak, the species was recorded in the Ritsa Lake basin (Gudauta District, Abkhazia) and at the confluence of the Malchepa and Belaya Rivers (Guzeripl', Adygea, Russia). It was noted that fir or spruce forests without admixtures of broad-leaved trees were not inhabited by these ants.

Temnothorax brauneri usually nests in rock crevices and under stones, in tree trunks and branches, and less frequently – in the soil. As a rule, this species forms small colonies consisting of a single gyne and 30–40 workers. At the end of June-early July, alates appear in the nests, usually numbering no more than 10–15. The alates remain in the nest until mid-July, and the nuptial flight occurs from mid-July to early August. Workers forage during the daytime, being most active in sunny and windless weather. Foraging is usually carried out within a radius of several meters from the nest entrance. The ants typically forage singly, less often in pairs, performing tandem running.

Two atypical nests of *T. brauneri* were discovered in the valley of the middle reaches of the Belaya River in July 2023 and 2024. One of them, containing more than 10 gynes and about 90 workers, was found on the Skalisty Range near Dakhovskaya Cossack village (Maykop District, Adygea, Russia) (Dakhovskaya Cuesta). The nest consisted of three chambers arranged within the fissures of a small, eroded limestone boulder and interconnected by narrow passages.

Figs 1–8. *Temnothorax brauneri*.

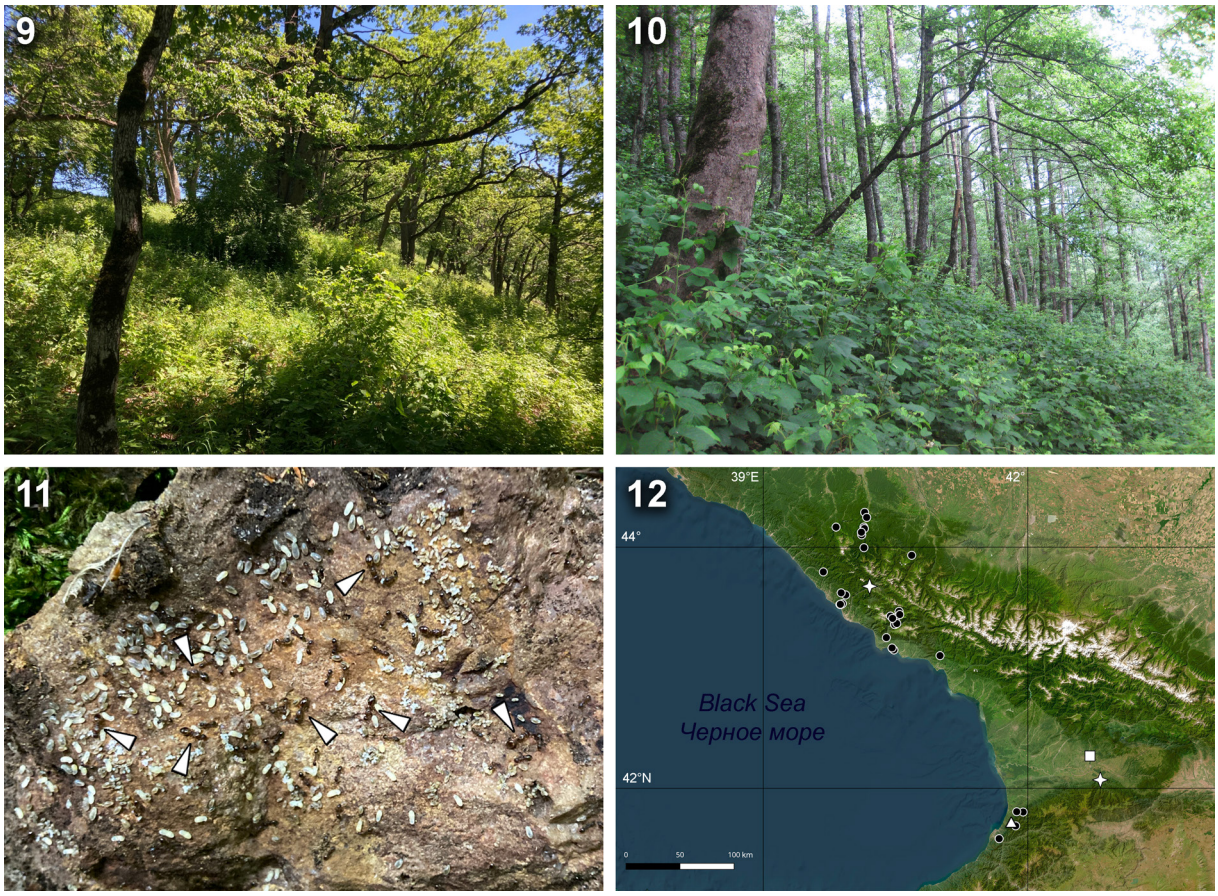
1–4, 6 – gyne; 5, 7–8 – worker; 3, 5 – head, frontal view; 4 – microsculpture of the head surface between the inner eye margin and the paramedian vertex; 6 – mesosoma, dorsal view. Scale bars: 1–2 – 1 mm; 3, 7–8 – 0.5 mm; 4, 6 – 0.2 mm; 5 – 0.4 mm.

Рис. 1–8. *Temnothorax brauneri*.

1–4, 6 – самка; 5, 7–8 – рабочий; 3, 5 – голова, фронтально; 4 – микроскульптура поверхности головы между усиковой ямкой и верхним краем глаза; 6 – мезосома, дорсально. Масштабные линейки: 1–2 – 1 мм; 3, 7–8 – 0.5 мм; 4, 6 – 0.2 мм, 5 – 0.4 мм.

It was located in a stand of park-like oak forest occupying a debris (astructural) slope of southern exposure near the lower edge of the cuesta cliff (Fig. 9). This well-insolated slope was situated on the windward side of the ridge, which intercepts fogs and rain clouds. Therefore, along with intense surface heating, regular circulation of moist air masses occurred here, maintaining high air humidity.

The second atypical nest was found in the vicinity of the Nikel' settlement (Maykop District, Adygea, Russia), in the northern part of the Dakhovskaya Crystalline Massif. *Temnothorax brauneri* was recorded on the upper slope of the ridge (1000 m a.s.l.) under the canopy of a moist beech-hornbeam forest. The nest, consisting of a single large chamber containing more than 20 gynes and about 100 workers, was discovered inside a local accumulation of stones partially covered by leaf litter (Fig. 11). As in the previous case, the rock outcrop housing the nest was surrounded by a sparse tree stand. The site was well-insolated during daylight hours (south-western slope exposure). The high humidity of this locality was indicated by the presence of plant species demanding high atmospheric and soil moisture – Matteuccia struthiopteris (L.) Tod., 1866, Asplenium trichomanes L., 1753, and well-developed liverworts. Seven gynes from this colony, each placed individually with a group of workers in incubators, laid their first eggs within two weeks. During the following two months, each "colony" produced from three to ten workers, while one gyne produced two workers and three males.



Figs 9–12. Habitats, polygynous colony and distribution of *Temnothorax brauneri*.

9 – park-like oak forest at the lower edge of the Dakhovskaya Cuesta (environs of the Dakhovskaya Cossack village, Adygea, Russia); 10 – beech-hornbeam forest, environs of the Batumi City (Adjara, Georgia); 11 – the opened nest, arrows indicate gynes (environs of the Nikel' settlement, Adygea, Russia); 12 – distribution map, white stars show localities indicated in the original description (M.D. Ruzsky, A.A. Brauner leg.), white square – type locality by neotype (K.V. Arnoldi leg.), white triangle – male locality (A.G. Radchenko leg.), black circles – new localities.

Рис. 9–12. Местообитания, полигинная семья и распространение *Temnothorax brauneri*.

9 – парковый дубовый лес у нижней границы Даховской куэсты (окрестности станицы Даховской, Адыгея, Россия); 10 – буково-грабовый лес (окрестности Батуми, Аджария, Грузия); 11 – вскрытое гнездо, стрелки указывают на самок (окрестности пос. Никель, Адыгея, Россия); 12 – белые звездочки обозначают местонахождения, указанные в первоописании (сборы М.Д. Рузского, А.А. Браунера), белый квадрат – типовое местонахождение по неотипу (сборы К.В. Арнольди), белый треугольник – местонахождение самца (сборы А.Г. Радченко), черные круги – новые местонахождения.

Distribution. The material examined allows for a more precise delineation of the distribution of *T. brauneri*. This species inhabits a substantial part of the Western Caucasus. To the north, it reaches latitude 44°16′N (Kamennomostskiy village, Adygea, Russia; northern macro-slope of the Greater Caucasus). The southern limits correspond to latitude 41°34′N (vicinity of the Batumi City, Adjara, Georgia; southeastern section of the Colchic lowland). The longitudinal extent of the species range lies between 39°40′E and 42°49′E, bounded in the west by the locality near Solokhaul village (Krasnodar Region, Russia) and in the east by the type locality near Bagdati Town (Imereti Region, Georgia). The altitudinal range of *T. brauneri* varies across different parts of its distribution. In the northern part of the Western Caucasus (Adygea, Russia), it was recorded in the mid-mountains at elevations ranging from 450 to 1060 m a.s.l. On the southern macro-slope (Krasnodar Region, Russia; Abkhazia; Adjara, Georgia), *T. brauneri* was found from 38 to 886 m a.s.l.

Discussion

All records of *T. brauneri* are confined to the western part of the Caucasus, where the species occurs within the belt of humid broad-leaved forests (Fig. 12). It is likely that from the Colchic forests of western Transcaucasia, the species spreads to the northern macro-slope of the Greater Caucasus through a depression in the main ridge near the Lago-Naki Plateau, known as the Colchic Gate. At this section, the watershed elevations do not exceed 1200–1600 m a.s.l., and therefore there is no orographic barrier separating the broad-leaved forests of the southern and northern macro-slopes, which allows Colchic faunal elements to penetrate into the Northwestern Caucasus.

The species exhibits relatively broad ecological plasticity, inhabiting a variety of habitats throughout its range, from humid beech-hornbeam and mixed forests to park-like oak forests and rocky outcrops. In forested habitats, *T. brauneri* tends to occupy open areas such as

clearings, forest glades, and sparsely wooded sections with low canopy cover. Apparently, the optimal conditions for the species occur in well-heated locations with the highest levels of ambient humidity.

The morphological, distributional, and biological characteristics of *T. brauneri* described above suggest that this species belongs to an ancient faunal complex associated with relict humid subtropical forests of the Mediterranean, a small part of which, the Colchic forests, are preserved in the Western Caucasus. According to traditional views [Vulf, 1944], the formation of such forests occurred in the Paleogene within the proto-Anatolia. Therefore, considering the possible synonymy of *T. brauneri* and *T. artvinensis*, it is likely that *T. brauneri* may also occur in the Pontic broad-leaved forests of northeastern Asia Minor.

Polygyny is not typical for the genus *Temnothorax*. However, several reports describe polygynous colonies in *T. tuberum* (Fabricius, 1775) and *T. interruptus* (Schenck, 1852) [Seifert, 2018]. There is also an interesting case of colonies containing multiple reproductive gynes in the genus *Leptothorax* Mayr, 1855. Heinze and Gratiashvili [2015] discovered a large number of colonies of *L. scamni* Ruzsky, 1905 near the Abastumani village (Georgia), each containing 2 to 13 dealate gynes. However, dissection of their ovaries showed that only a single individual in each nest possessed a developed reproductive system and functioned as the egg-laying female. Although the authors did not conduct laboratory experiments with the gynes, they concluded that functional monogyny occurred in these *L. scamni* colonies, where non-reproductive gynes performed worker ant role. Gill et al. [2009] stated that certain populations of *L. acervorum* (Fabricius, 1793) include both functionally monogynous and truly polygynous colonies, indicating that multiple reproductive queens can coexist within a single nest. The aforementioned studies note that colonies with functional monogyny are typically characterized by a single physogastric gyne, while the remaining ones have less developed abdomens. In contrast, in truly polygynous colonies, all gynes are of similar size. In the *T. brauneri* colonies examined, all dealate females were of similar size and no physogastric individual was observed. Moreover, all selected gynes produced worker offspring, indicating that they were mated and reproductively active. These observations allow us to conclude that *T. brauneri* forms truly polygynous colonies.

Acknowledgements

The authors are cordially grateful to Dr G.B. Bakhtadze (ZMSU) for some important corrections. We are also thankful to the anonymous reviewers for their valuable comments and corrections during the preparation of the manuscript.

The study was supported by the state project 125011200139-7 of the Southern Scientific Centre of the Russian Academy of Sciences and by the Southern Federal University Development Program "Priority 2030", project of the Laboratory of Post-Pyrogenic Ecosystems (SP-11-25-04) for D.M. Shevchenko, and by the Federal Fundamental Scientific Research Programme for 2026–2030 (No. FWGS-2026-0008) for Z.M. Yusupov.

References

Arcos González J. 2021. Description of *Temnothorax estel* sp. nov. (Hymenoptera: Formicidae), with a review of the Iberian species of the *sordidulus* species-complex. *Zootaxa*. 5005(2): 145–160. DOI: 10.11646/zootaxa.5005.2.2

Arnoldi K.V. 1977. New and little-known ant species of the genus *Leptothorax* Mayr (Hymenoptera, Formicidae) in the European part of the USSR and the Caucasus. *Entomologicheskoe obozrenie*. 56(1): 198–204 (in Russian).

Báthori F., Heinze J., Trindl A., Seifert B., Herczeg G., Csősz S. 2024a. Host-switching events are not always the driver of speciation in social parasites: a case study in *Temnothorax* (*Myrmoxenus*) ants (Hymenoptera, Formicidae). *Journal of Zoology*. 322(3): 221–231. DOI: 10.1111/jzo.13140

Báthori F., Seifert B., Heinze J., Kiran K., Karaman C., Csősz S. 2024b. Taxonomy of the Palearctic socially parasitic *Temnothorax* (*Myrmoxenus*) ants (Hymenoptera: Formicidae). *PLoS ONE*. 19(10): e0308712. DOI: 10.1371/journal.pone.0327682

Bolton B. 2025. An online catalog of the ants of the world. Available at: http://antcat.org (accessed 20 October 2025).

Borowiec L. 2014. Catalogue of ants of Europe, the Mediterranean Basin and adjacent regions (Hymenoptera: Formicidae). *Genus*. 25(1–2): 1–340.

Catarineu C., Barberá G.G., Reyes-López J.L. 2017. A new ant species, *Temnothorax ansei* sp. n. (Hymenoptera: Formicidae) from the arid environments of south-eastern Spain. *Sociobiology*. 64(2): 138–145. DOI: 10.13102/sociobiology.v64i2.1274

Csősz S., Heinze J., Mikó I. 2015. Taxonomic synopsis of the Ponto-Mediterranean ants of *Temnothorax nylanderi* species-group. *PLoS ONE*. 10(11): e0140000. DOI: 10.1371/journal.pone.0140000

Csősz S., Alicata A., Báthori F., Galkowski C., Schifani E., Yusupov Z., Herczeg G., Prebus M.M. 2025. Integrative taxonomy reveals inflated biodiversity in the European *Temnothorax unifasciatus* complex (Hymenoptera: Formicidae). *Zoologica Scripta*. 54(1): 33–49. DOI: 10.1111/zsc.12690

Csősz S., Salata S., Borowiec L. 2018. Three Turano-European species of the *Temnothorax interruptus* group (Hymenoptera: Formicidae) demonstrated by quantitative morphology. *Myrmecological News*. 26: 101–119.

Dubovikoff D.A., Yusupov Z.M. 2017. 69. Family Formicidae – ants. *In:* Annotated catalogue of the Hymenoptera of Russia. Vol. 1. Symphyta and Apocrita: Aculeata. *Proceedings of the Zoological Institute of the Russian Academy of Sciences*. Supplement 6: 197–210. DOI: 10.31610/trudyzin/2017.supl.6.5

Galkowski C., Cagniant H. 2017. Contribution à la connaissance des fourmis du groupe *angustulus* dans le genre *Temnothorax* (Hymenoptera, Formicidae). *Revue de l'Association Roussillonnaise d'Entomologie*. 26(4): 180–191.

Gill R.J., Arce A., Keller L., Hammond R.L. 2009. Polymorphic social organization in an ant. *Proceedings of the Royal Society B*. 276(1677): 4423–4431. DOI: 10.1098/rspb.2009.1408

Gratiashvili N., Barjadze Sh. 2008. Checklist of the ants (Formicidae Latreille, 1809) of Georgia. *In:* Proceedings of the Institute of Zoology. Vol. 23. Tbilisi: UNIVERSAL : 130–146. DOI: 10.15468/8zzmrd

Heinze J., Gratiashvili N. 2015. High skew in the Caucasus: functional monogyny in the ant *Leptothorax scamni*. *Insectes Sociaux*. 62(4): 385–392. DOI: 10.1007/s00040-015-0415-5

Qian Y.-H., Xu Z.-H. 2024. Taxonomy of the ant genera *Leptothorax* Mayr, 1855 and *Temnothorax* Mayr, 1861 (Hymenoptera: Formicidae) of China with descriptions of twenty-eight new species and a key to the known Chinese species. *European Journal of Taxonomy*. 936: 1–97. DOI: 10.5852/ejt.2024.936.2569

Radchenko A.G. 1995. Review of the genus *Leptothorax* (Hymenoptera, Formicidae) of Central and Eastern Palaearctic. Report 3. Groups *nylanderi*, *korbi*, *nassonovi* and *susamyri*. *Vestnik zoologii*. 29(4): 3–11 (in Russian).

Ruzsky M.D. 1905. The ants of Russia (Formicariae Imperii Rossici). Systematics, geography and data on the biology of Russian ants. Part I. *In:* Trudy Obshchestva estestvoispytateley pri Imperatorskom Kazanskom universitete. Tom 38. Vyp. 4–6 [Proceedings of the Society of Naturalists at the Imperial Kazan University. Vol. 38. Iss. 4–6]. Kazan: Typo-lithography of the Imperial University: 603 p. (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*. 877: 81–131. DOI: 10.3897/zookeys.877.36320

Salata S., Borowiec L. 2022. A review of the *Temnothorax anodontoides* species-group (Hymenoptera, Formicidae) from Greece. *ZooKeys*. 1091: 139–159. DOI: 10.3897/zookeys.1091.79085

Schifani E., Alicata A., Prebus M.M., Csősz S. 2025a. Integrative description of *Temnothorax siculus* sp. n.: a new ant species endemic to Sicily, Italy (Hymenoptera, Formicidae). *Diversity*. 17(4): 294. DOI: 10.3390/d17040294

Schifani E., Menchetti M., Csősz S., Vila R. 2025b. Inflated taxonomy in the West Mediterranean *Temnothorax algiricus* complex (Hymenoptera, Formicidae) revealed by quantitative morphology. *Zootaxa*. 5691(2): 257–276. DOI: 10.11646/zootaxa.5691.2.4

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*. 8: 1–12. DOI: 10.25849/myrmecol.news_008:001

Seifert B. 2018. The ants of Central and North Europe. Tauer: Lutra Verlags- und Vertriebsgesellschaft,. 408 p.

Sharaf M.R., Akbar S.A., Al Dhafer H.M., El-Gharbawy A., Aldawood A.S. 2017. Taxonomy of the Myrmicine ant genus *Temnothorax* Mayr, 1861 (Formicidae: Myrmicinae) in the Arabian Peninsula. *European Journal of Taxonomy*. 280: 1–17. DOI: 10.5852/ejt.2017.280

Shevchenko D.M., Yusupov Z.M. 2024. New records of the genus *Temnothorax* Mayr (Hymenoptera, Formicidae) in the Republic of Adygea. *In:* Materialy IX Vserossiyskoy konferentsii s mezhdunarodnym uchastiem, posvyashchennoy 300-letiyu Rossiyskoy akademii nauk, 35-letiyu nauchnoy shkoly chl.-korr. RAN A.K. Tembotova, 30-letiyu Instituta ekologii gornykh territoriy im. A.K. Tembotova RAN [Proceedings of the IX All-Russian conference with international participation dedicated to the 300th anniversary of the Russian Academy of Sciences, the 35th anniversary of the scientific school of the Corresponding Member of RAS A.K. Tembotov, the 30th anniversary of the Institute of Ecology of Mountain Territories named after A.K. Tembotov RAS (Nalchik, Russia, 23–27 September 2024)]. Nalchik: Tembotov Institute of Ecology of Mountain Territories of the Russian Academy of Sciences: 153–154 (in Russian).

Tinaut A., Reyes-López J. 2020. Descripción de una nueva especie para la península ibérica: *Temnothorax alfacarensis* n. sp. (Hymenoptera, Formicidae). *Boletín de la Asociación española de Entomología*. 44(3–4): 359–378.

Vulf E.V. 1944. Istoricheskaya geografiya rasteniy [Historical geography of plants]. Moscow – Leningrad: Academy of Sciences of the USSR. XIX + 546 p. (In Russian).

Yusupov Z.M. 2022. New records and additions to the ant fauna of the genus *Temnothorax* Mayr (Hymenoptera, Formicidae) from the European part of Russia and the Caucasus. *In:* Murav'i i zashchita lesa: Materialy XVI Vserossiyskogo mirmekologicheskogo simpoziuma [Ants and forest protection: Materials of the 16th All-Russian Myrmecological Symposium (Moscow, Russia, 27–31 August 2022)]. Moscow: KMK Scientific Press: 134–136 (in Russian).

Zięcina D., Salata S., Borowiec L. 2025a. Further additions to the taxonomy and distribution of the *Temnothorax graecus* and *T. aveli* species-groups (Hymenoptera: Formicidae) in Greece. *Annales Zoologici*. 75(2): 419–435. DOI: 10.3161/00034541ANZ2025.75.2.002

Zięcina D., Kiran K., Karaman C., Borowiec L., Salata S. 2025b. A taxonomic revision of the *Temnothorax kemali* species-group (Hymenoptera: Formicidae). *Annales Zoologici*. 75(3): 769–782. DOI: 10.3161/00034541ANZ2025.75.3.007

Received / Поступила: 31.10.2025
Accepted / Принята: 15.12.2025
Published online / Опубликована онлайн: 29.01.2026