

# A TAXONOMIC REVISION OF THE *TEMNOTHORAX GRAECUS* SPECIES-GROUP (HYMENOPTERA: FORMICIDAE) FROM GREECE

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**Abstract.**— A review of the Greek members of the *Temnothorax graecus* species-group revealed two species new to science: *T. mytilenes* **sp. nov.** (Greece: Lesbos, Samos, Kos and Rhodes, and Türkiye: Ayvalık Peninsula) and *T. phaetoni* **sp. nov.** (endemic to Cyclades). Additionally, the diagnoses and redescriptions are provided for *T. aeolius* (Forel, 1911), *T. graecus* (Forel, 1911), and *T. smyrnensis* (Forel, 1911). Lectotypes are designated for *Leptothorax bulgaricus* subsp. *graecus* Forel, 1911, *Leptothorax bulgaricus* subsp. *aeolius* Forel, 1911, and *Leptothorax bulgaricus* subsp. *smyrnensis* Forel, 1911. All members of the *graecus* species-group are associated mostly with moderately humid to arid deciduous forests or Mediterranean bushes. A dichotomous key to the *graecus* species-group from Greece is given.



**Key words.**— Myrmicinae, new species, taxonomy, Balkans

## INTRODUCTION

The genus *Temnothorax* Mayr, 1861, with 459 valid species and 35 valid subspecies, is one of the most species-rich ant genera in the Palearctic region (Bolton 2023). Its diversity centers are located in the Mediterranean region, southern parts of the USA, and the

Greater Antilles (Salata & Borowiec 2019, Prebus 2021, Bolton 2023). Members of this genus inhabit a wide range of habitats, from tropical rainforests and hot deserts to boreal forests. Most often, they nest in small cavities, such as rock crevices, hollow dead twigs, and dry acorns. Approximately 40% of all *Temnothorax* species are known from the Mediterranean region (sensu Vigna Taglianti *et al.* 1999) and, due to their diversity, have been recently a subject of thorough

studies (Csősz *et al.* 2015, 2018, Radchenko *et al.* 2015, Salata & Borowiec 2015, Galkowski & Lebas 2016, Catarineu *et al.* 2017, Galkowski & Cagniant 2017, Sharaf *et al.* 2017, Salata *et al.* 2018, Salata & Borowiec 2019, 2022, Tinaut & Reyes-López 2020, Arcos González 2021, Schifani *et al.* 2022), which resulted in recognizing several unformal species-groups and descriptions of species new to science.

The *Temnothorax graecus* species-group was for the very first time defined by Salata & Borowiec (2019) and referred to the Balkan species characterized by the following set of characters: 12-segmented antennae, usually distinctly darkened club, lack of the metanotal groove, mostly yellow body colouration, the first gastral tergite with the broad dark posterior band and yellow spot at its base, very short to short and triangular to needle-shaped propodeal spines, rounded in profile or obtusely angulate petiolar node, head centrally more or less smooth and shiny and laterally with longitudinal ridges (head sculpture various from head almost entirely smooth and shiny to mostly sculptured with a smooth area reduced to a broad medial stripe), and finally mesosoma laterally with moderate sculpture of longitudinal ridges.

All known members of the *graecus* species-group were originally described as subspecies of *T. bulgaricus* (Forel, 1892) (Forel 1911). However, Salata & Borowiec (2019), based on the morphological differences between these taxa, assigned *T. bulgaricus* to a separate group consisted of species with strongly reduced and indistinct propodeal spines and always low and obtuse petiolar node. Currently, the *graecus* species-group covers species recorded predominantly from the Balkans and the Aegean region. Based on the literature, there are three described valid species of the *graecus* group: *T. graecus* (Forel, 1911), described based on specimens collected in Greece from Patras (Peloponnese, Achaia), Amaroussia nr Athens (Attica) and Corfu (Ionian Islands); *T. aeolius* (Forel, 1911), described from Coccarinali and Cordelio near Smyrna (= İzmir) in Türkiye, and *T. smyrnensis* (Forel, 1911), described from Coccarinali near Smyrna (= İzmir) in Türkiye. One taxon, unavailable to nomenclature, *Lepthothorax bulgaricus* subsp. *smyrnensis* v. *ionia* Forel, 1911 was described from Türkiye, Ayvalık Peninsula near Mytilene (Greece, Lesbos) but according to the original description it was collected in Smyrna (= İzmir) in a pile of firewood imported from terra typica.

Based on the recent inventory of the material collected from various regions of Greece, we concluded that there are five Balkan species belonging to the *graecus* species-group: *T. aeolius* and *T. graecus* with rather wide range distribution covering Greece (mainland and insular territories) and other Balkan countries; *T. smyrnensis* and *T. mytilenes* sp. nov.

known from the eastern part of the Aegean Region, and *T. phaeloni* sp. nov. that appears to be endemic to Cyclades. Below, we describe two species new to science, and additionally provide photographic documentation and a key to all members of the *graecus* species-group known from Greece.

## MATERIAL AND METHODS

Examined specimens are housed in the following collections:

MHNG – Museum d’Histoire Naturelle, Geneve, Switzerland;

MNHW – Museum of Natural History, University of Wrocław, Poland.

Specimens were compared using standard methods of comparative morphology. All measurements were made in  $\mu\text{m}$  using a pin-holding stage, permitting rotations around X, Y, and Z axes. A Nikon SMZ18 stereomicroscope was used at a magnification of  $\times 100$  for each character. Photographs were taken using a Nikon SMZ 1500 stereomicroscope, Nikon D5200 camera and Helicon Focus software. All given label data of type specimens are in original spelling, presented in square brackets; a vertical bar (|) separates data on different rows and double vertical bars (||) separate labels. Images of type specimens are available online on AntWeb ([www.AntWeb.org](http://www.AntWeb.org)) and are accessible using the unique identifying specimen codes provided in the description sections.

The pilosity inclination degree follows that used in Wilson (1955). Appressed ( $0-5^\circ$ ) hairs run parallel or nearly parallel to the body surface. Decumbent hairs stand  $5-20^\circ$ , subdecumbent hair stands  $20-60^\circ$ , suberect  $60-80^\circ$ , and erect  $80-90^\circ$  from the surface (as per Fig. 3 Wilson 1955).

Measurements (Partially after Csősz *et al.* 2018):

- CL – maximum length of head capsule in median line, the head must be carefully tilted to the position with the true maximum, excavations of hind vertex and / or clypeus, if any, reduce CL;
- CWb – maximum width of head capsule, measured posterior to the eyes;
- EL – maximum diameter of the compound eye;
- 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; if the transition point is not well defined, use dorsal view and take the center of the dark-shaded borderline between pronotal slope and pronotal shield as anterior reference point);
- MW – pronotal width, maximum mesosoma width;

- 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;
- PEL – diagonal petiolar length in lateral view; measured from anterior corner of subpetiolar process to dorso-caudal corner of caudal cylinder;
- PEW – maximum width of petiole;
- 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 – postpetiole length, the longest anatomical line that is perpendicular to the posterior margin of the postpetiole and is between the posterior postpetiolar margin and the anterior postpetiolar margin;
- PPW – maximum width of postpetiole;
- SL – maximum straight line scape length excluding the articular condyle;
- 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 to the center of real stigma opening that may be positioned eccentrically;
- CS – cephalic size; the arithmetic mean of CL and CW.
- Abbreviations:
- q. – gyne,
- w. – worker.

## RESULTS

### Synopsis of members of the *Temnothorax graecus* species-group known from Greece

*Temnothorax aeolius* (Forel, 1911)  
*Temnothorax graecus* (Forel, 1911)  
*Temnothorax mytilenes* sp. nov.  
*Temnothorax phaetoni* sp. nov.  
*Temnothorax smyrnensis* (Forel, 1911)

### Key to *Temnothorax graecus* species-group known from Greece

1. Petiolar node very low to low and regularly rounded in profile, PEL/PEH ratio 1.53–1.58 (Figs 2, 15). Antennal club always partly brown ..... 2
- . Petiolar node usually higher, subangulate in profile, its dorsum convex and acute or straight and sloping posteriorly, PEL/PEH ratio 1.40–1.55 (Figs 5, 6, 9, 12). Antennal club yellow or partly brown ..... 3

2. Mesosoma, in lateral view, with dorsum slightly convex; medial frons and vertex predominantly smooth and with sparse and thin rugulae and indistinct costulae; mesosoma laterally with dense rugulae and indistinct costulae and smooth interspaces; dorsally with sparser and thicker rugocostulae (Figs 1–3) ..... *Temnothorax aeolius*
- . Mesosoma, in lateral view, with dorsum straight; medial frons and vertex predominantly smooth and with sparse and thin costulae; pronotum with thick and sparse costulae with smooth interspaces, mesonotum and propodeum with denser and thinner rugocostulae (Figs 14–17) ... *Temnothorax smyrnensis*
3. Antennal club partly brown. Petiolar node with convex and acute dorsum (Figs 5, 6) ..... *Temnothorax graecus*
- . Antennal club yellow (Figs 9, 12). Petiolar node with straight and sloping posteriorly dorsum ..... 4
4. Femora yellow; medial frons and vertex shiny and with sparse to dense rugocostulae; propodeal spines short, in form of triangular denticles (Figs 11–13) ..... *Temnothorax phaetoni* sp. nov.
- . Swollen part of femora bright brown to brown; medial frons and vertex with dense and thin costulae and only sometimes the central part of frons with slightly sparser sculpture; propodeal spines moderately long, in form of thin spines (Figs 8–10) ..... *Temnothorax mytilenes* sp. nov.

## Species accounts

### *Temnothorax aeolius* (Forel, 1911) (Figs 1–3)

*Leptothorax bulgaricus* subsp. *aeolius* Forel, 1911: 334 (w.).

*Temnothorax aeolius*: Borowiec & Salata 2018a: 7 (North Aegean: Samos), Borowiec *et al.* 2021: 26 (Dodecanese: Rhodes).

**Type material.** *Temnothorax aeolius* (Forel, 1911), lectotype (present designation, w.): *L. bulgaricus* | For. | v. *aeolius* | type Forel | Cordelio pr. Smyrne | (Forel) || Typus || v. *L. aeolius* | Forel || Coll. | A. Forel || ANTWEB | CASENT0909016 (MHNG), examined.

**Other material.** Greece. Central Macedonia: 1w. (pin), Halkidiki, Agios Mamas salines, 04.09.2009, 40.21666, 23.33333, 4 m, coll. L. Borowiec (MNH). South Aegean: 3w (pin), Kos, Zia, 07.07.2015, 36.84555, 27.20493, 328 m, coll. S. Salata (MNH); 1w. (pin), Rhodes, Villanova (Paradeisi), 12.04.1934, 36.40037, 28.08308, 18 m (MNH); 4w (pin). North Aegean: Samos, 1.4 km E of Pythagoreio, 02.06.2017, 37.69538, 26.95837, 50 m, coll. L. Borowiec (MNH).

**Type localities.** Türkiye: Cordelio near Smyrna (= İzmir). The original description lists also syntypes collected from Coccarinali but after the lectotype

designation this locality should not be considered as locus typicus.

**Diagnosis.** *Temnothorax aeolius* differs from all remaining members of the *graecus* species-group by a combination of the following characters: very low and regularly rounded petiolar node; short and stout mesosoma; indistinctly darkened antennal club; medial frons and vertex shiny with sparse and thin rugulae and indistinct costulae; short propodeal spines, in form of triangular denticles; mesosoma laterally with dense rugulae and indistinct costulae with smooth interspaces; dorsally with sparser and thicker rugocostulae (dorsal pronotum often only with sparse and thick costulae and shiny interspaces).

**Notes.** *Temnothorax aeolius* and *T. smyrnensis* differ from remaining members of the *graecus* species-group in presence of low to very low and regularly

rounded petiolar node. While *Temnothorax aeolius* differs from *T. smyrnensis* in presence of short and stout mesosoma, predominantly smooth medial frons and vertex with sparse and thin rugocostulae, and entire mesosoma rugocostulate.

**Redescription.** Worker (n=9): CL:  $0.6 \pm 0.06$  (0.52–0.69); CWb:  $0.5 \pm 0.05$  (0.45–0.57); SL:  $0.44 \pm 0.05$  (0.37–0.52); EL:  $0.14 \pm 0.02$  (0.11–0.17); ML:  $0.71 \pm 0.09$  (0.57–0.84); SPST:  $0.11 \pm 0.01$  (0.09–0.13); PEH:  $0.19 \pm 0.02$  (0.15–0.22); PEL:  $0.29 \pm 0.04$  (0.21–0.35); PPH:  $0.19 \pm 0.02$  (0.16–0.2); PPL:  $0.17 \pm 0.01$  (0.14–0.18); MW:  $0.35 \pm 0.03$  (0.3–0.39); PEW:  $0.15 \pm 0.01$  (0.13–0.17); PPW:  $0.21 \pm 0.02$  (0.18–0.23); CS:  $0.55 \pm 0.05$  (0.49–0.63); CS/SL:  $1.26 \pm 0.05$  (1.18–1.31); CS/ML:  $0.79 \pm 0.03$  (0.75–0.85); CS/SPST:  $4.92 \pm 0.47$  (4.19–5.55).

**Colour.** Body yellow to orange; antennal club indistinctly darker, brownish; sometimes sides posterolateral



Figures 1–2. Worker of *Temnothorax aeolius* (Forel, 1911). (1) – dorsal, (2) – lateral. Scale bars = 0.5 mm.





Figure 3. Worker of *Temnothorax aeolius* (Forel, 1911). Head (scale bar = 0.5 mm).

from eyes also with slightly darker, brownish coloration; first gastral tergite with narrow bright brown band posteriorly (Figs 1–3). **Head.** Slightly elongate, sides below and above eyes gently convex, occipital corners regularly rounded, occipital margin of head convex (Fig. 3). Anterior margin of clypeus distinctly convex, medial notch absent. Eyes moderate and oval. Antennal scape short, in lateral view slightly curved, gradually widening posteriorly, funiculus long, club 3-segmented (Fig. 3). Scape with short and sparse costae, shiny, covered with thin, dense, decumbent to suberect setae. Mandibles rounded with thick and sparse striae, shiny. Clypeus shiny and predominantly smooth with sparse and short costulae. Frontal carinae short, slightly extending beyond frontal lobes. Antennal fossa deep and rugulose with additional costulae that arch posterolaterally. Frontal lobes narrow, smooth (Fig. 3). Medial frons and vertex with rugulae and indistinct costulae. Frons laterally, genae and sides posterolateral from eyes with denser and thicker rugulae or rugocostulae; interspaces between rugae and costulae smooth and shiny. Sides of head with very short and sparse adpressed pubescence, sides of

frons, vertex and occipital area with erect, pale, short and thick setae (Figs 1–3). **Mesosoma.** Short and stout, distinctly arched in profile. Metanotal groove absent. Pronotum convex on sides. Propodeal spines short, in form of triangular denticles (Fig. 2). Lateral sides of mesosoma with dense rugulae and indistinct costulae and smooth interspaces; dorsum with sparser and thicker rugocostulae and smooth interspaces; dorsal pronotum often only with sparse and thick rugulae and shiny interspaces. Entire mesosoma with erect, pale, moderately long and thick setae (Figs 1–2). **Petiole.** In lateral view low, with moderately elongate peduncle, node very low and regularly rounded, whole surface rugoreticulate. Dorsal surface with sparse, short, erect setae (Figs 1–2). **Postpetiole.** In lateral view regularly convex, sides rounded on the whole surface reticulocostulate, surface appears slightly less rugose than surface of petiole. Dorsal surface with sparse, moderately long, erect setae (Figs 1–2). **Gaster.** Smooth and shiny, with erect, thin, pale setae (Figs 1–2). **Legs.** Moderately elongate, femora swollen in the middle, tibiae widened from base to  $\frac{3}{4}$  length, surface of legs covered with sparse, adpressed to decumbent hairs.

**Biology.** Lowland species known from sites at an altitude 4–50 m. Workers were shaken off from maguis bushes to entomological umbrella in suburban area and from saline plants close to seacoast.

**Distribution.** The majority records of *Temnothorax aeolius* come from the Aegean Region: Greece (Kos, Rhodes, Samos) and Türkiye (İzmir Province). But it was also recorded from Greek mainland (Halkidiki) and Bulgaria (Lapeva-Gjonova & Borowiec 2022). Its presence in Israel (Borowiec 2014) needs confirmation as this record has no confirmation in literature.

***Temnothorax graecus* (Forel, 1911)**  
(Figs 4–7)

*Leptothorax bulgaricus* subsp. *graecus* Forel, 1911: 336 (w.q.).

*Temnothorax graecus*: Borowiec & Salata 2017: 223 (Peloponnese: Messinia), 2018b: 8 (Ionian Islands: Zakynthos), 2018c: 10 (Central Greece: Euboea), 2021: 13 (Peloponnese: Achaia).

**Type material.** *Temnothorax graecus* (Forel, 1911), lectotype (present designation, w.): *L. bulgaricus* | For. | r. *graecus* | type Forel | Patras ... | ... (Forel) || Lectotype | *Leptothorax graecus* | Forel, 1911 top specimen | det. A. Schulz & M. Verhaagh 1999 || Typus || r. d. *graecus* | Forel || Coll. | A. Forel || ANTWEB | CASENT0909017 (MHNG), examined; paralectotype (w.): the same pin as lectotype, bottom specimen (MHNG), examined; paralectotypes (2w.): Typus || *L. bulgaricus* | For. | r. *graecus* | Forel | type | Amaroussia | p. Athenes (Forel) || coll. | A. Forel (MHNG), examined.

**Other material.** **Greece. Central Greece:** 10w. (2 pin, 8 EtOH), Euboea, 1.2 km NW of Gerontas, 10.06.2018, 38.45885, 23.808, 405 m, coll. L. Borowiec (MNHw); 4w (2 pin, 2 EtOH), Euboea, 3.8 km N of Gimno, 09.06.2018, 38.47484, 23.89673, 400 m, coll. L. Borowiec (MNHw); 1w. (pin), Euboea, Steni Dirfyos, 10.06.2018, 38.58703, 23.84533, 480 m, coll. L. Borowiec (MNHw); 8w. (4 pin, 4 EtOH). **Central Macedonia:** Pieria, Paralia Panteleimonas, 11.05.2019, 40.01657, 22.58971, 3 m, coll. L. Borowiec (MNHw); 9w. (2 pin, 7 EtOH), Pieria, road to P. Poroi loc. 1, 17.05.2019, 39.97963, 22.61563, 110 m, coll. L. Borowiec (MNHw); 7w. (EtOH), Pieria, road to P. Poroi loc. 2, 17.05.2019, 39.97627, 22.61146, 185 m, coll. L. Borowiec (MNHw). **Ionian Islands:** Cephalonia, 800 m S of Kateleios, 09.06.2029, 20 m, 38.07066, 20.75329, coll. L. Borowiec (MNHw); 2w. (EtOH), Cephalonia, Kremmidi, 09.06.2029, 285 m, 38.09048, 20.74471, coll. L. Borowiec (MNHw); 2w. (EtOH), 1w. (pin), Corfu, E of Nymfes, 09.06.2013, 39.75047, 19.8057, 179 m, coll. L. Borowiec (MNHw); 4w. (1 pin, 3 EtOH), Lefkada, Dragano, 11.06.2021, 38.6805, 20.57827, 374 m, coll. C. Lebas (MNHw); 1w. (pin), Lefkada, Platistoma (Litrovio), 13.06.2021, 38.74364, 20.66595, 495 m, coll. C. Lebas

(MNHw); 2w. (pin), Lefkada, Sivos, 12.06.2021, 38.67013, 20.64747, 228 m, coll. C. Lebas (MNHw); 11w. (9 pin, 2 EtOH), Zakynthos, 1.2 km N of Vasilikos, 05.05.2018, 37.72456, 20.97786, 30 m, coll. L. Borowiec (MNHw); 1w. (pin), Zakynthos, 1.2 km SE of Loucha, 09.05.2018, 37.78617, 20.73706, 445 m, coll. L. Borowiec (MNHw); 3w. (1 pin, 2 EtOH), Zakynthos, 1.3 km W of Lithakia, 07.05.2018, 37.71999, 20.81293, 235 m, coll. L. Borowiec (MNHw); 2w. (1 pin, 1 EtOH), Zakynthos, 150 m N of Elies, 06.05.2018, 37.90154, 20.67653, 345 m, coll. L. Borowiec (MNHw); 12w. (6 pin, 6 EtOH), Zakynthos, 330 m S of Stimies, 07.05.2018, 37.69009, 20.79988, 245 m, coll. L. Borowiec (MNHw); 1w. (pin), Zakynthos, Ag. Joannis, 05.05.2018, 37.72924, 20.94553, 165 m, coll. L. Borowiec (MNHw). **Peloponnese:** 2w. (pin), Lakonia, Geraki, 20.05.2018, 37.05041, 22.70803, 725 m, coll. C. Lebas (MNHw); 1w. (pin), Messinia, 2 km E of Kalamata, 12.06.2016, 37.01863, 22.15626, 65 m, coll. L. Borowiec (MNHw); 16w. (pin), Messinia, Kalamata, old Centre, 11.06.2016, 37.04617, 22.11691, 60 m, coll. L. Borowiec (MNHw); 4w. (pin), Messinia, Kalamata, railway park, 11.06.2016, 37.03157, 22.11004, 8 m, coll. L. Borowiec (MNHw). **Cyclades:** 4w. (pin), Naxos, above Eggares, 03.07.2016, 37.116, 25.4447, 60 m, coll. S. Salata (MNHw); 3w. (pin), Naxos, Amiki Bay, 30.06.2016, 37.1328, 25.4338, 6 m, coll. S. Salata (MNHw); 10w. (pin), Naxos, Demeter Temple vic., 02.07.2016, 37.027, 25.4288, 110 m, coll. S. Salata (MNHw); 5w. (pin), Naxos, Mesi Potamia, 01.07.2016, 37.0675, 25.4444, 150 m, coll. S. Salata (MNHw). **Western Greece:** 1w. (pin), Achaia, 8.5 km S of Diakopto, 30.05.2018, 38.1192, 22.166, 475 m, coll. C. Lebas (MNHw); 1w. (pin), Achaia, Mt. Skolis, 2.9 km S of Charavagi, 19.06.2021, 37.96003, 21.58319, 483 m, coll. L. Borowiec (MNHw).

**Type locality.** Greece: Patras (Peloponnese). The original description lists also syntypes (now paralectotypes) collected from Amaroussia nr Athens (Attica) and Corfu (Ionian Islands) but after the lectotype designation these localities should not be considered as locus typicus. The specimen designated as lectotype already has been chosen by Schulz & M. Verhaagh and bears label “Lectotype | *Leptothorax graecus* | Forel, 1911 Top specimen | det. A. Schulz & M. Verhaagh 1999” but the designation of this lectotype has never been published. Thus, we confirm the proposed designation in this work.

**Diagnosis.** *Temnothorax graecus* differs from all remaining members of the *graecus* species-group by a combination of the following characters: moderately high petiolar node with dorsum convex and acute; low and elongated mesosoma; brown antennal club and sometimes femora with brownish diffusion; medial frons and vertex predominantly smooth and shiny with sparse to dense and thin costulae; propodeal spines short to moderately long, in form of thin spines and

rarely with wider base; pronotum laterally with dense and thick costulae and smooth to indistinctly rugulate interspaces, dorsally costulate to rugocostulate with smooth interspaces; mesonotum and propodeum rugocostulate with finer sculpture on their dorsal surfaces.

**Notes.** *Temnothorax graecus* differs from *T. aeolius* and *T. smyrnensis* in presence of moderately high petiolar node with convex and acute dorsum, and short to moderately long propodeal spines in form of thin spines; from *T. phaetoni* and *T. mytilenes* in presence of moderately high petiolar node and always brown antennal club.

**Redescription.** Worker (n=10): CL:  $0.66 \pm 0.03$  (0.64–0.75); CWb:  $0.55 \pm 0.03$  (0.52–0.62); SL:  $0.48 \pm 0.05$  (0.41–0.58); EL:  $0.16 \pm 0.01$  (0.15–0.18); ML:  $0.79 \pm 0.06$  (0.68–0.92); SPST:  $0.14 \pm 0.02$  (0.1–0.17); PEH:  $0.2 \pm 0.02$  (0.17–0.23); PEL:  $0.31 \pm 0.02$  (0.28–0.33); PPH:

$0.2 \pm 0.02$  (0.17–0.23); PPL:  $0.18 \pm 0.03$  (0.13–0.23); MW:  $0.38 \pm 0.03$  (0.36–0.45); PEW:  $0.17 \pm 0.01$  (0.15–0.19); PPW:  $0.23 \pm 0.02$  (0.21–0.25); CS:  $0.6 \pm 0.03$  (0.58–0.69); CS/SL:  $1.27 \pm 0.11$  (1.15–1.49); CS/ML:  $0.77 \pm 0.05$  (0.72–0.9); CS/SPST:  $4.41 \pm 0.7$  (3.53–5.8).

**Colour.** Body dark yellow to brownish orange; antennal club and sides posterolateral from eyes brown; first gastral tergite with wide brown band posteriorly; sometimes femora with brownish diffusion (Figs 4–7). **Head.** Subrectangular, sides below eyes straight, sides above eyes slightly rounded, occipital corners regularly rounded, occipital margin of head straight or slightly concave (Figs 4–7). Anterior margin of clypeus distinctly convex, medial notch absent. Eyes moderate and oval. Antennal scape short, in lateral view slightly curved, gradually widening posteriorly,



Figures 4–5. Worker of *Temnothorax graecus* (Forel, 1911), typical form. (4) – dorsal, (5) – lateral. Scales bar = 0.5 mm.





Figures 6–7. Worker of *Temnothorax graecus* (Forel, 1911). (6) – lateral (pale form), (7) – head. Scale bars = 0.5 mm.

funiculus long, club 3-segmented (Fig. 7). Scape with short and sparse costae, shiny, covered with thin, dense, decumbent to suberect setae. Mandibles rounded with thick and sparse striae, shiny. Clypeus shiny and predominantly smooth with sparse and short costulae. Frontal carinae short, slightly extending beyond frontal lobes. Antennal fossa deep and rugulose with additional costulae that arch posterolaterally.

Frontal lobes narrow, smooth (Fig. 7). Medial frons and vertex predominantly smooth and shiny with sparse to dense and thin costulae. Frons laterally and genae with dense and thin costulae with smooth to indistinctly rugulose interspaces. Sides posterolateral from eyes with thick and sparse rugocostulae and smooth interspaces. Sides of head with very short and sparse adpressed pubescence, sides of frons, vertex and



occipital area with erect, pale, short and thick setae (Figs 4–7). **Mesosoma.** Elongated and low, distinctly arched in profile. Metanotal groove absent. Pronotum convex on sides. Propodeal spines short to moderately long, in form of thin spines (Figs 4–6). Lateral sides of pronotum with dense and thick costulae, interspaces smooth to indistinctly rugulate; dorsal pronotum costulate to rugocostulate with smooth interspaces; mesonotum and propodeum rugocostulate, their dorsal surfaces with finer sculpture and sometimes only costulate with indistinctly rugulate interspaces. Entire mesosoma with erect, pale, moderately long and thick setae (Figs 4–6). **Petiole.** In lateral view moderately high, with moderately elongate peduncle, node moderately high with dorsum convex and acute, whole surface rugoreticulate. Dorsal surface with sparse, short, erect setae (Figs 4–6). **Postpetiole.** In lateral view regularly convex, sides rounded on the whole surface reticulocostulate, surface appears slightly less rugose than surface of petiole. Dorsal surface with sparse, moderately long, erect setae (Figs 4–6). **Gaster.** Smooth and shiny, with erect, thin, pale setae (Figs 4–6). **Legs.** Moderately elongate, femora swollen in the middle, tibiae widened from base to  $\frac{3}{4}$  length, surface of legs covered with sparse, adpressed to decumbent hairs.

**Biology.** Lowland and highland species known from sites at an altitude 3–725 m. Workers were shaken off from Mediterranean shrubs in area with limestone rocks, in stream valleys with plane trees, from bushes at roadsides in cypress forest, and shrubs around olive plantations. Foraging workers were observed on limestone rocks in quarries and hills and marble walls in urban parks. Nest were observed in limestone rock crevice in hill inside urban park.

**Distribution.** *Temnothorax graecus* is known in Greece from the mainland regions (Achaia and Peloponnese), Euboea, Ionian Islands and Cyclades. Additionally, its presence was confirmed from Bulgaria (Lapeva-Gjonova & Borowiec 2022) and the Republic of North Macedonia (Bračko *et al.* 2014). The historical records from Serbia (Petrov & Collingwood 1992), Türkiye (Kiran & Karaman 2020), Croatia (Müller 1923) and Italy (Müller 1921) need verification.

***Temnothorax mytilenes* sp. nov.**  
(Figs 8–10)

*Lepthothorax bulgaricus* subsp. *smyrnensis* v. *ionia* Forel, 1911: 336 (Türkiye, Ayvalık Peninsula), unavailable name.

*Temnothorax* cf. *bulgaricus*: Bračko *et al.* 2016: 29 (Eastern Macedonia and Thrace: Xanthi, Evros).

*Temnothorax* cf. *smyrnensis* sp. 1: Borowiec & Salata 2018a: 9 (North Aegean: Samos).

*Temnothorax* cf. *ionia*: Borowiec *et al.* 2021: 26 (South Aegean: Kos, Rhodes).

**Type material.** **Holotype.** 1w. (pin): GREECE, Dodecanese, Rodos | n. Arhipoli loc. 2, 194 m | 36.26546 N/ 28.06688 E | 4 V 2015, L. Borowiec || Collection L. Borowiec | Formicidae | LBC-GR01697 || (MNHW). **Paratypes.** 1w.: the same data as holotype; 23w. (pin): GREECE, Dodecanese, Rodos | Petaloudes, 240 m | 36.33567 N/ 28.06264 E | 8 v 2015, L. Borowiec || Collection L. Borowiec | Formicidae | LBC-GR01759 || (MNHW, MHNG).

**Other material.** **Greece. North Aegean:** 1w. (pin), Lesbos, Ipsilometopo, 11.06.2015, 39.32012, 26.24461, 485 m, coll. L. Borowiec (MNHW); 2w. (pin), Lesbos, n. Ahladeri, 10.06.2015, 39.15958, 26.29292, 9 m, coll. L. Borowiec (MNHW); 5w. (pin), Samos, 1 km NE of Kallithea, 04.06.2017, 37.74111, 26.5893, 300 m, coll. L. Borowiec (MNHW); 1w. (pin), Samos, 1 km W of Platanos, 06.06.2017, 37.74023, 26.73481, 335 m, coll. L. Borowiec (MNHW); 3w. (pin), Samos, 1.3 km E of Pythagoreio, 02.06.2017, 37.69441, 26.95728, 60 m, coll. L. Borowiec (MNHW); 1w. (pin), Samos, 500 m SW of Manolates, 05.06.2017, 37.78207, 26.8212, 380 m, coll. L. Borowiec (MNHW); 1w. (pin), Samos, Pandroso, 08.06.2017, 37.73165, 26.82803, 670 m, coll. L. Borowiec (MNHW); 1w. (pin), Samos, ad. Agios Konstantinos, 22.06.2022, 37.80039, 26.82795, 35 m, coll. L. Borowiec (MNHW); 13w. (EtOH), Samos, 800 m SW of Agios Konstantinos, 22.06.2022, 37.80322, 26.81245, 122 m, coll. L. Borowiec (MNHW); 2w. (pin), 1w. (pin), Samos, 1 km S of Agios Konstantinos, 22.06.2022, 37.79592, 26.82898, 74 m, coll. L. Borowiec (MNHW); 7w. (EtOH), Samos, 3.47 km NE of Marathokampos, 23.06.2022, 37.74451, 26.7222, 351 m, coll. L. Borowiec (MNHW); Samos, 1.4 km E of Nikoloudes, 20.06.2022, 37.76372, 26.68012, 239 m, coll. L. Borowiec (MNHW); 2w. (EtOH), Samos, ad. Sourides, 23.06.2022, 37.76094, 26.71541, 159 m, coll. L. Borowiec (MNHW); 1w. (EtOH), Samos, Potami river valley, 24.06.2022, 37.78529, 26.66994, 50 m, coll. L. Borowiec (MNHW). **South Aegean:** 11w. (pin), Kos, Aspri Petra, 06.07.2015, 36.71857, 26.9741, 236 m, coll. S. Salata (MNHW); 3w. (pin), Kos, Plaka, 06.07.2015, 36.78917, 27.0671, 53 m, coll. S. Salata (MNHW); 1w. (pin), Kos, Zia, 07.07.2015, 36.84555, 27.20493, 328 m, coll. S. Salata (MNHW); 4w. (pin), Rhodes, 5 Km E of Profitis Ilias, 19.03.2002, 36.274, 27.978, 500 m, coll. A. Schulz (MNHW); 1w. (pin), Rhodes, Kopriss Hill n. Masari, 05.05.2015, 36.17493, 28.0439, 59 m, coll. L. Borowiec (MNHW); 15w. (5 pin, 10 EtOH), Rhodes, Petaloudes, 08.05.2015, 36.33567, 28.06264, 240 m, coll. L. Borowiec (MNHW). **Türkiye. Balıkesir:** 1w. (pin, CASENT0909020), Ayvalık Peninsula, 39.33333, 26.66667 (MHNG).

**Type locality.** Greece, Dodecanese, Rhodes, n. Arhipoli, 36.26546, 28.06688, 194 m.

**Etymology.** Named after Mytilene (Ancient Greek: Μυτιλήνη) a mythological princess of Lesbos. Mytilene is also an eponym of the city at Lesbos that is



Figures 8–9. Worker of *Temnothorax mytilenes* sp. nov. (8) – dorsal, (9) – lateral. Scale bars = 0.5 mm.

mentioned in the very first historical record of the species under unavailable name *Leptothorax bulgaricus smyrnensis ionia* Forel, 1911.

**Diagnosis.** *Temnothorax mytilenes* sp. nov. differs from all remaining members of the *graecus* species-group by a combination of the following characters: low and subangulate petiolar node with dorsum straight and sloping posteriorly; low and elongated mesosoma; yellow antennal club and bright brown femora; medial frons and vertex with dense and thin costulae and only sometimes the central part of frons with slightly sparser sculpture; propodeal spines moderately long, in form of thin spines; mesosoma with thin and dense rugocostulae and rugulose to smooth

interspaces, dorsal mesosoma often with weaker sculpture.

**Notes.** *Temnothorax phaetoni* sp. nov. and *T. mytilenes* sp. nov. differ from the remaining members of the *graecus* species-group in presence of entirely yellow antennal clubs and subangulate petiolar node with straight and sloping posteriorly dorsum. While *T. mytilenes* sp. nov. differs from *T. phaetoni* sp. nov. in low and elongated mesosoma, always bright brown femora, entirely costulate medial frons and vertex, and moderately long and thin propodeal spines.

**Description.** Worker (n=10): CL:  $0.65 \pm 0.04$  (0.58–0.72); CWb:  $0.54 \pm 0.05$  (0.44–0.61); SL:  $0.46 \pm 0.03$  (0.41–0.5); EL:  $0.15 \pm 0.02$  (0.11–0.17); ML:  $0.78 \pm$

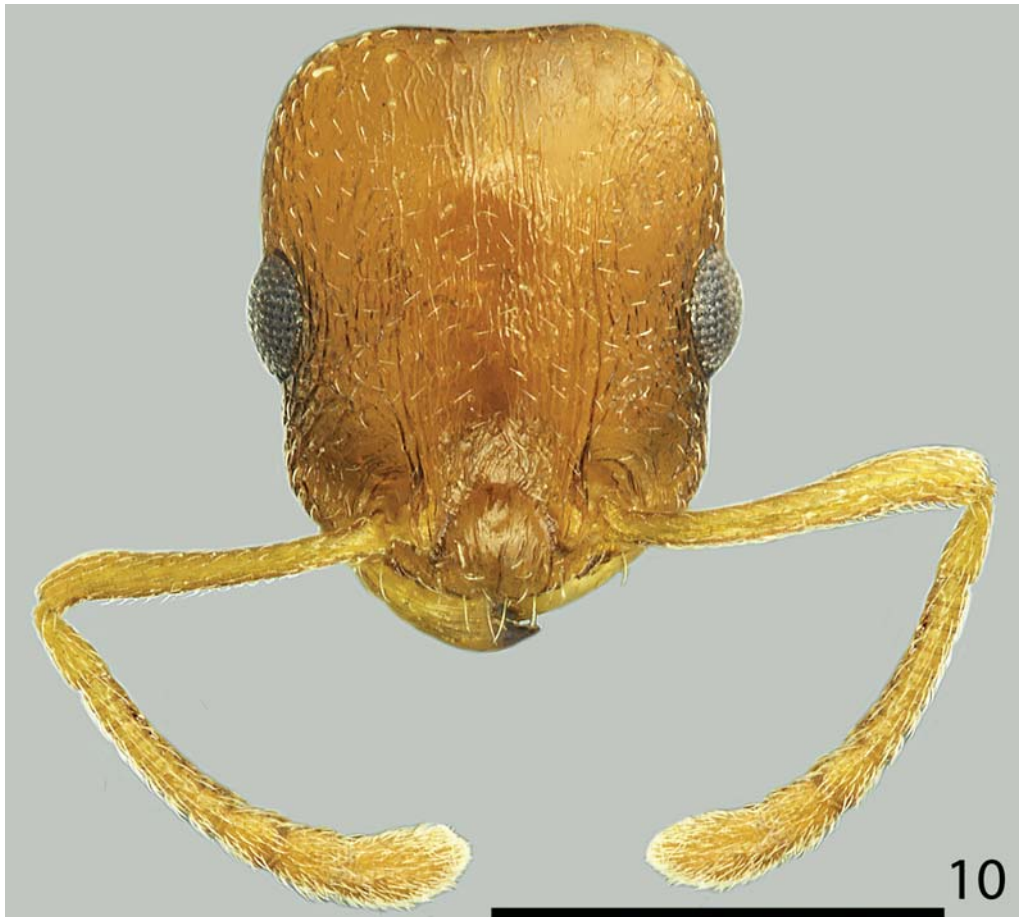


Figure 10. Worker of *Temnothorax mytilenes* sp. nov. Head (scale bar = 0.5 mm).

0.06 (0.66–0.88); SPST:  $0.15 \pm 0.02$  (0.12–0.19); PEH:  $0.21 \pm 0.02$  (0.19–0.26); PEL:  $0.31 \pm 0.04$  (0.27–0.39); PPH:  $0.2 \pm 0.02$  (0.17–0.24); PPL:  $0.16 \pm 0.01$  (0.13–0.18); MW:  $0.37 \pm 0.03$  (0.32–0.42); PEW:  $0.16 \pm 0.02$  (0.14–0.2); PPW:  $0.23 \pm 0.03$  (0.2–0.28); CS:  $0.59 \pm 0.04$  (0.51–0.67); CS/SL:  $1.3 \pm 0.02$  (1.24–1.33); CS/ML:  $0.76 \pm 0.02$  (0.73–0.79); CS/SPST:  $4.11 \pm 0.39$  (3.21–4.54).

**Colour.** Body dark yellow to orange; sides posterolateral from eyes with brownish shade; middle and hind femora bright brown; first gastral tergite with wide brown band posteriorly (Figs 8–10). **Head.** Subrectangular, sides below and above eyes straight, occipital corners regularly rounded, occipital margin of head straight or slightly concave (Figs 8–10). Anterior margin of clypeus distinctly convex, medial notch absent. Eyes moderate and oval. Antennal scape short, in lateral view slightly curved, gradually widening posteriorly, funiculus long, club 3-segmented (Fig. 10). Scape with short and sparse costae, shiny, covered with thin, dense, decumbent to suberect setae. Mandibles rounded with thick and sparse striae, shiny. Clypeus shiny and predominantly smooth with sparse and short

costulae. Frontal carinae short, slightly extending beyond frontal lobes. Antennal fossa deep and rugulose with additional costulae that arch posterolaterally. Frontal lobes narrow, smooth (Fig. 10). Medial frons and vertex with dense and thin costulae, sometimes the central part of frons with slightly sparser costulae. Frons laterally, genae and sides posterolateral from eyes with dense and thin rugae or rugocostulae with smooth interspaces. Sides of head with very short and sparse adpressed pubescence, sides of frons, vertex and occipital area with erect, pale, short and thick setae (Figs 8–10). **Mesosoma.** Elongate, distinctly arched in profile. Metanotal groove absent. Pronotum convex on sides. Propodeal spines moderately long, in form of thin spines (single specimens have sometimes propodeal spines shorter and with wider base) (Figs 8–9). The whole surface with thin and dense rugocostulae with rugulose to smooth interspaces; dorsal mesosoma often with weaker sculpture. Entire mesosoma with erect, pale, moderately long and thick setae (Figs 8–9). **Petiole.** In lateral view low, with moderately elongate peduncle, node low and subangulate with dorsum



straight and sloping posteriorly, whole surface rugoreticulate. Dorsal surface with sparse, short, erect setae (Figs 8–9). **Postpetiole.** In lateral view regularly convex, sides rounded, on the whole surface reticulocostulate, surface appears slightly less rugose than surface of petiole. Dorsal surface with sparse, moderately long, erect setae (Figs 8–9). **Gaster.** Smooth and shiny, with erect, thin, pale setae (Figs 8–9). **Legs.** Moderately elongate, femora swollen in the middle, tibiae widened from base to  $\frac{3}{4}$  length, surface of legs covered with sparse, adpressed to decumbent hairs.

**Biology.** Lowland and highland species known from sites at an altitude 9–670 m. Workers were shaken off from shrubs and small trees in pine forest, around pastures, insides stream valleys with plane trees and in ruderal area. Nests were observed under moss on stones in pine and deciduous forests.

**Distribution.** *Temnothorax mytilenes* sp. nov. has rather narrow distribution range limited to the Aegean Region. So far, its presence was confirmed from Greece (Lesbos, Samos, Kos and Rhodes) and Türkiye (Ayvalık Peninsula).

***Temnothorax phaetoni* sp. nov.**  
(Figs 11–13)

**Type material. Holotype.** 1w. (pin): GREECE, Cyclades, Naxos | vic. Zeus Cave, 650 m | 37.0341 N/25.4991 E | 1 VII 2016, S. Salata || Collection L. Borowiec | Formicidae | LBC-GR02241 (MNH).

**Paratypes.** 1w. (pin), the same data as holotype (MNH); 8w. (pin): GREECE, Cyclades, Naxos | Moni, 20 m | 37.0814 N/25.4932 E | 4 VII 2016, S. Salata || Collection L. Borowiec | Formicidae | LBC-GR02241 (MNH, MHNG); 1w. (pin): Greece, Cyclades, Naxos, | Zeus Cave, 620 m, | 37.0345, 25.4993, 28-05- | 2022, S. Salata, CYC079 || Collection MNHW | Formicidae | MNHW-GR0354 (MNH); 1w. (pin): Greece, Cyclades, Naxos, | Zas loc 1., 580 m, 37.0394, | 25.5105, 28-05-2022, S. | Salata, CYC082 || Collection MNHW | Formicidae | MNHW-GR03160 (MNH); 2w. (pin): Greece, Cyclades, Naxos, | Oros Fanari loc 1., 560 m, | 37.0896, 25.5112, 29-05- | 2022, S. Salata, CYC086 || Collection MNHW | Formicidae | MNHW-GR03168 (MNH); 3w. (pin), GREECE, Cyclades, Naxos | Lionas, 20 m | 37.1370 N/25.5855 E | 4 VII 2016, S. Salata || Collection L. Borowiec | Formicidae | LBC-GR02631 (MNH); 4w. (pin), GREECE, Cyclades, Naxos | Aliki, 15 m | 36.9799 N/25.3880 E | 4 VII 2016, S. Salata || Collection L. Borowiec | Formicidae | LBC-GR02243 (MNH, MHNG).

**Other material. Greece. Cyclades:** 3w. (pin), Andros, Gavrio, 2006–Apr–Nov, 37.88111, 24.74639, 8m (MNH); 18w. (pin): Naxos, 1.8 km S of Ligaridia, 2006–Apr–Nov, 37.04, 25.57194, 60 m (MNH); 2w.

(pin), 1w. (EtOH), Amorgos, Langeda loc. 2, 01.06.2022, 36.90639, 26.00321, 306 m., coll. S. Salata & B. Blaimer (MNH); 2w. (pin), 2w. (EtOH), Amorgos, Langeda loc. 3, 01.06.2022, 36.907, 26.0074, 355 m., coll. S. Salata & B. Blaimer (MNH); 15w. (pin), 4w. (EtOH), Amorgos, Agia Anna Chapel, 03.06.2022, 36.7888, 25.7862, 127 m., coll. S. Salata & B. Blaimer (MNH); 20w. (pin), 1w. (EtOH), Amorgos, Shipwreck of Olympia, 03.06.2022, 36.7871, 25.7561, 17 m., coll. S. Salata & B. Blaimer (MNH).

**Type locality.** Greece, South Aegean, Naxos, Zeus Cave vic., 37.0341, 25.4991, 650 m.

**Etymology.** Named after Phaethon (Ancient Greek: Φαέθων), the mythological son of Helios and Oceanid nymph Clymene, whose name can be translated as “the shining/radiant (one)” and by this refers to the bright and shining body of the new species.

**Diagnosis.** *Temnothorax phaetoni* sp. nov. differs from all remaining members of the *graeus* species-group by a combination of the following characters: low and subangulate petiolar node with dorsum straight and sloping posteriorly; short and stout mesosoma; yellow antennal club; medial frons and vertex shiny and with sparse to dense rugocostulate, sculpture on vertex usually sparser than on frons; propodeal spines short, in form of subangulate denticles; mesosoma laterally with thick and sparse costulae and smooth to rugulose interspaces, dorsally with sparse and thick rugae with smooth to rugulose interspaces.

**Notes.** *Temnothorax phaetoni* sp. nov. and *T. mytilenes* sp. nov. differ from the remaining members of the *graeus* species-group in presence of entirely yellow antennal clubs and subangulate petiolar node with straight and sloping posteriorly dorsum. While *T. phaetoni* sp. nov. differs from *T. mytilenes* sp. nov. in short and stout mesosoma, always yellow femora, medial frons, and vertex with sparse to dense rugocostulae, and short propodeal spines in form of triangular denticles.

**Description.** Worker (n=10): CL:  $0.61 \pm 0.04$  (0.55–0.66); CWb:  $0.49 \pm 0.03$  (0.43–0.55); SL:  $0.44 \pm 0.03$  (0.38–0.5); EL:  $0.13 \pm 0.01$  (0.11–0.16); ML:  $0.69 \pm 0.08$  (0.55–0.81); SPST:  $0.12 \pm 0.01$  (0.1–0.13); PEH:  $0.2 \pm 0.02$  (0.17–0.23); PEL:  $0.28 \pm 0.03$  (0.24–0.34); PPH:  $0.18 \pm 0.02$  (0.14–0.2); PPL:  $0.16 \pm 0.01$  (0.14–0.18); MW:  $0.35 \pm 0.04$  (0.29–0.41); PEW:  $0.14 \pm 0.02$  (0.11–0.17); PPW:  $0.2 \pm 0.02$  (0.16–0.23); CS:  $0.55 \pm 0.03$  (0.49–0.6); CS/SL:  $1.24 \pm 0.03$  (1.19–1.29); CS/ML:  $0.8 \pm 0.05$  (0.73–0.89); CS/SPST:  $4.7 \pm 0.31$  (4.23–5.15).

**Colour.** Body yellow; usually head slightly darker than the rest of the body and sides posterolateral from eyes with brownish shade; first gastral tergite with wide bright brown band posteriorly (Figs 11–13). **Head.** Subrectangular, sides below and above eyes straight, occipital corners regularly rounded, occipital



Figures 11–12. Worker of *Temnothorax phaetoni* sp. nov. (11) – dorsal, (12) – lateral. Scale bars = 0.5 mm.

margin of head straight or slightly concave (Figs 11–13). Anterior margin of clypeus distinctly convex, medial notch absent. Eyes moderate and oval. Antennal scape short, in lateral view slightly curved, gradually widening posteriorly, funiculus long, club 3-segmented (Fig. 13). Scape with short and sparse costae, shiny, covered with thin, dense, decumbent to suberect setae. Mandibles rounded with thick and sparse striae, shiny. Clypeus shiny and predominantly smooth with sparse and short costulae. Frontal carinae short, slightly extending beyond frontal lobes. Antennal fossa deep and rugulose with additional costulae that arch posterolaterally. Frontal lobes narrow, smooth (Fig. 13). Medial frons and vertex shiny and with sparse to

dense rugocostulate, sculpture on vertex usually sparser than on frons. Frons laterally, genae and sides posterolateral from eyes with sparse and thick rugocostulae with smooth to indistinctly rugulose interspaces. Sides of head with very short and sparse adpressed pubescence, sides of frons, vertex and occipital area with erect, pale, short and thick setae (Figs 11–13). **Mesosoma.** Short and stout, distinctly arched in profile. Metanotal groove absent. Pronotum convex on sides. Propodeal spines short, in form of triangular denticles (Figs 11–12). Lateral sides of mesosoma with thick and sparse costulae and smooth to rugulose interspaces; dorsal mesosoma with weaker sculpture, with sparse and thick rugae with smooth to rugulose

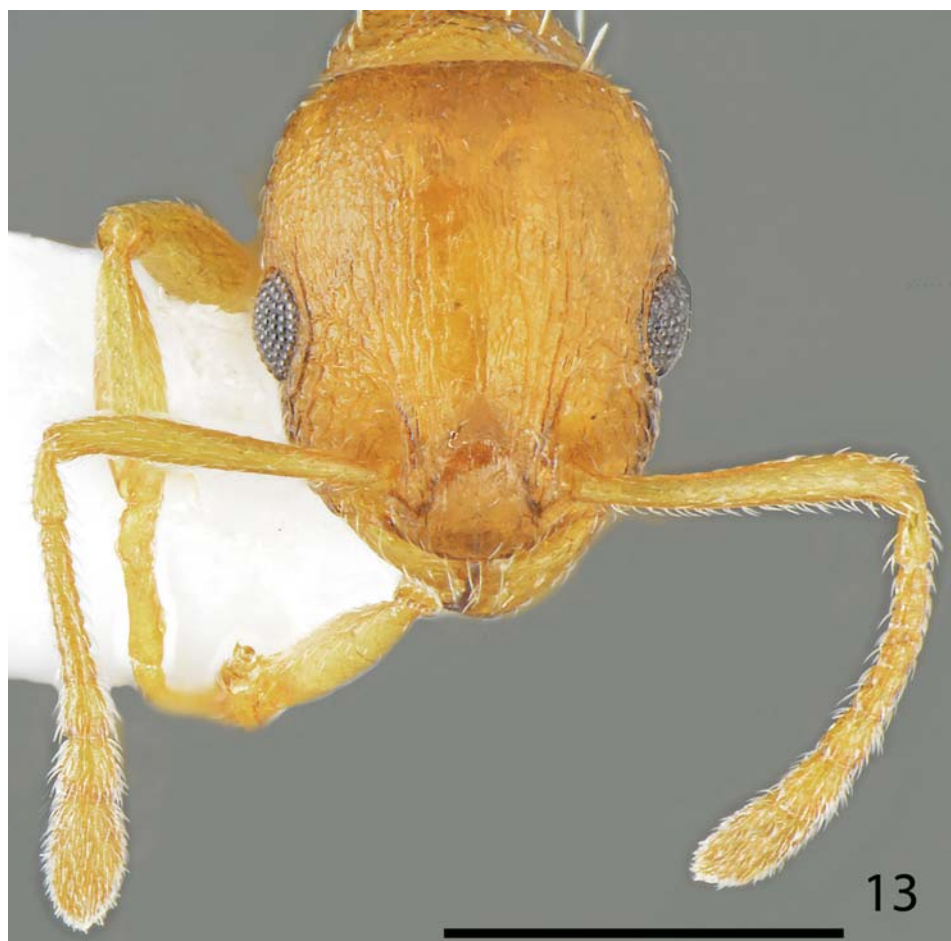


Figure 13. Worker of *Temnothorax phaetoni* sp. nov. Head (scale bar = 0.5 mm).

interspaces. Entire mesosoma with erect, pale, moderately long and thick setae (Figs 11–12). **Petiole.** In lateral view low, with moderately elongate peduncle, node low and with dorsum straight and sloping posteriorly, whole surface rugoreticulate. Dorsal surface with sparse, short, erect setae (Figs 11–12). **Postpetiole.** In lateral view regularly convex, sides rounded, on the whole surface reticulocostulate, surface appears slightly less rugose than surface of petiole. Dorsal surface with sparse, moderately long, erect setae (Figs 11–12). **Gaster.** Smooth and shiny, with erect, thin, pale setae (Figs 11–12). **Legs.** Moderately elongate, femora swollen in the middle, tibiae widened from base to  $\frac{3}{4}$  length, surface of legs covered with sparse, adpressed to decumbent hairs.

**Biology.** Species known from sites at an altitude 8–650 m. Workers were shaken off from herbs and shrubs in phrygana and vegetation growing along the roads and paths. Usually, the vegetation was covering arid and sandy soil. The nests were found in dry tree twigs placed under trees and bushes.

**Distribution.** Most likely *T. phaetoni* sp. nov. is endemic to Cyclades with presence confirmed from Naxos, Amorgos, and Andros.

#### *Temnothorax smyrnensis* (Forel, 1911) (Figs 14–17)

*Leptothorax bulgaricus* subsp. *smyrnensis* Forel, 1911: 335 (w.q.)  
*Temnothorax smyrnensis*: Borowiec & Salata 2018a: 9 (North Aegean: Samos), Borowiec *et al.* 2021: 27 (South Aegean: Kos), 2022: 10 (Eastern Macedonia and Thrace: Samothraki).

**Type material.** *Temnothorax smyrnensis* (Forel, 1911), lectotype (present designation, w.): *L. bulgaricus* For. | *v. smyrnensis* | For. | Cocarinali | Smyrne (types) | (Forel) || *r. L. smyrnensis* | Forel || Coll. | A. Forel || Typus || ANTWEB | CASENT0909019 (MHNG), examined.

**Other material.** **Greece. South Aegean:** 5w. (pin), Kos, Kardamena-Pili rd. loc. 2, 07.07.2015, 36.83822, 27.15887, 133 m, coll. S. Salata (MNHV); 3w. (pin), Kos,

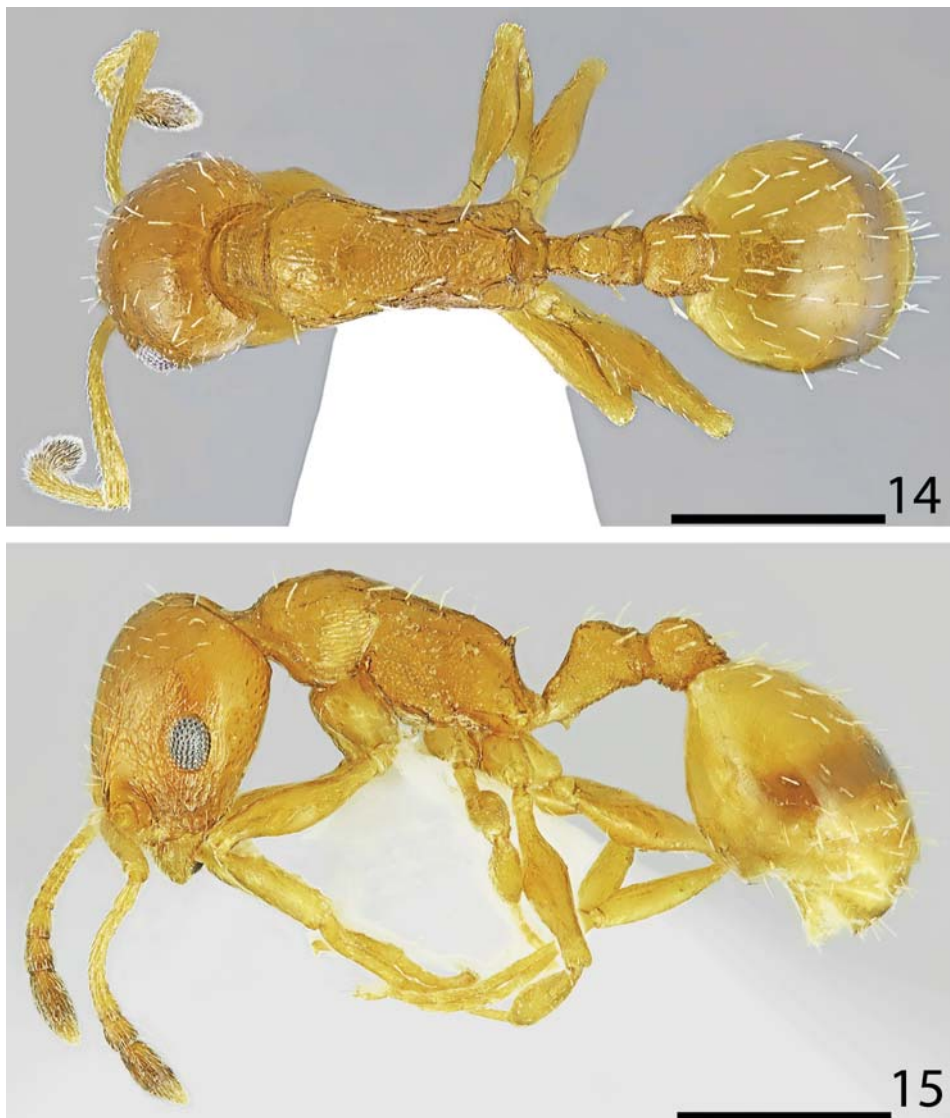


Zia-Ag. Dimitrios rd. loc. 2, 08.07.2015, 36.85047, 27.21447, 301 m, coll. S. Salata (MNH); 3w. (pin), Kos, Zia, 07.07.2015, 36.84555, 27.20493, 328 m, coll. S. Salata (MNH). **North Aegean:** 1w. (pin), Samos, 760 m N of Mavratzei, 03.06.2017, 37.72534, 26.86054, 265 m, coll. L. Borowiec (MNH); 7w. (pin), Samos, 1.4 km E of Pythagoreio, 02.06.2017, 37.69538, 26.95837, 50 m, coll. L. Borowiec (MNH); **Eastern Macedonia and Thrace:** 1w. (pin), Evros, Alexandroupolis, 13.06.2022, 40.8509, 25.87136, 20 m, coll. C. Lebas (MNH); Eastern Macedonia and Thrace: 1w. (pin), Samothrace, Fiona gorge loc. 1, 13.06.2022, 40.48029, 25.64593, 94 m, coll. C. Lebas (MNH).

**Type locality.** Türkiye: Coccirinali near Smyrna (= İzmir).

**Diagnosis.** *Temnothorax smyrnensis* differs from all remaining members of the *graecus* species-group by a combination of the following characters: low and rounded petiolar node; low and elongated mesosoma; bright brown antennal club; medial frons and vertex predominantly smooth and with sparse and thin costulae; propodeal spines short, in form of triangular denticles; pronotum with thick and sparse costulae with smooth interspaces, mesonotum and propodeum with denser and thinner rugocostulae and smooth to indistinctly rugulose interspaces.

**Notes.** *Temnothorax aeolius* and *T. smyrnensis* differ from remaining members of the *graecus* species-group in presence of low to very low and regularly rounded petiolar node. While *T. smyrnensis* differs



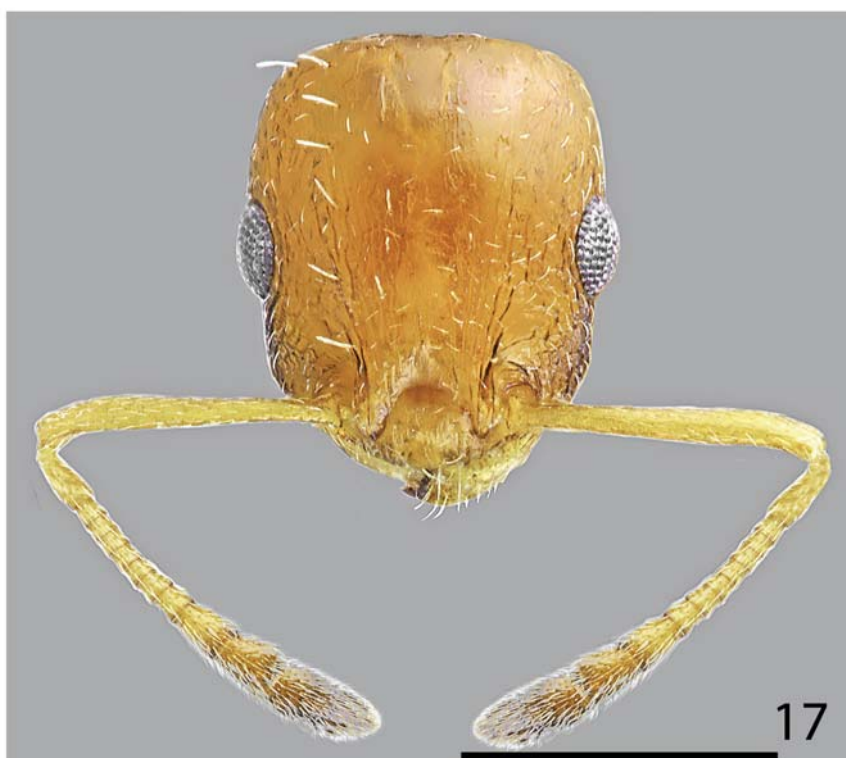
Figures 14–15. Worker of *Temnothorax smyrnensis* (Forel, 1911), typical form. (14) – dorsal, (15) – lateral. Scale bars = 0.5 mm.

from *T. aeolius* in presence of low and elongated mesosoma, predominantly smooth medial frons and vertex with sparse and thin costulae, presence of thick and sparse costulae on pronotum, and rugocostulate mesonotum and propodeum.

**Redescription.** Worker (n=10): CL:  $0.64 \pm 0.05$  (0.55–0.69); CWb:  $0.54 \pm 0.05$  (0.46–0.59); SL:  $0.48 \pm 0.04$  (0.43–0.54); EL:  $0.16 \pm 0.02$  (0.13–0.18); ML:  $0.75 \pm 0.06$  (0.65–0.82); SPST:  $0.12 \pm 0.01$  (0.11–0.13); PEH:

$0.19 \pm 0.02$  (0.17–0.21); PEL:  $0.3 \pm 0.03$  (0.27–0.34); PPH:  $0.19 \pm 0.02$  (0.16–0.21); PPL:  $0.16 \pm 0.02$  (0.13–0.19); MW:  $0.37 \pm 0.04$  (0.31–0.41); PEW:  $0.16 \pm 0.02$  (0.13–0.18); PPW:  $0.22 \pm 0.02$  (0.19–0.24); CS:  $0.59 \pm 0.035$  (0.51–0.64); CS/SL:  $1.22 \pm 0.04$  (1.17–1.29); CS/ML:  $0.78 \pm 0.03$  (0.75–0.84); CS/SPST:  $4.82 \pm 0.38$  (4.46–5.73).

**Colour.** Body dark yellow to orange; sides postero-lateral from eyes with brownish shade; antennal clubs



Figures 16–17. Worker of *Temnothorax smyrnensis* (Forel, 1911). (16) – lateral (specimen with long propodeal spines), (17) – head. Scale bars = 0.5 mm.

bright brown; first gastral tergite with narrow brown band posteriorly (Figs 14–17). **Head.** Subrectangular, sides below and above eyes straight, occipital corners regularly rounded, occipital margin of head slightly convex (Figs 14–17). Anterior margin of clypeus distinctly convex, medial notch absent. Eyes moderate and oval. Antennal scape short, in lateral view slightly curved, gradually widening posteriorly, funiculus long, club 3-segmented (Fig. 17). Scape with short and sparse costae, shiny, covered with thin, dense, decumbent to suberect setae. Mandibles rounded with thick and sparse striae, shiny. Clypeus shiny and predominantly smooth with sparse and short costulae. Frontal carinae short, slightly extending beyond frontal lobes. Antennal fossa deep and rugulose with additional costulae that arch posterolaterally. Frontal lobes narrow, smooth (Fig. 17). Medial frons and vertex predominantly smooth and with sparse and thin costulae. Frons laterally, genae and sides posterolateral from eyes with thicker rugocostulae and smooth to indistinctly rugulose interspaces. Sides of head with very short and sparse adpressed pubescence, sides of frons, vertex and occipital area with erect, pale, short and thick setae (Figs 14–17). **Mesosoma.** Elongate, distinctly arched in profile. Metanotal groove absent. Pronotum convex on sides. Propodeal spines short, in form of triangular denticles (Figs 14–15); rarely propodeal spines narrow and moderately long (Fig. 16). Pronotum with thick and sparse costulae with smooth interspaces; mesonotum and propodeum with denser and thinner rugocostulae with smooth to indistinctly rugulose interspaces. Entire mesosoma with erect, pale, moderately long and thick setae (Figs 14–16). **Petiole.** In lateral view low, with moderately elongate peduncle, node low and rounded, whole surface rugoreticulate. Dorsal surface with sparse, short, erect setae. **Postpetiole.** In lateral view regularly convex, sides rounded, on the whole surface reticulocostulate, surface appears slightly less rugose than surface of petiole. Dorsal surface with sparse, moderately long, erect setae (Figs 14–16). **Gaster.** Smooth and shiny, with erect, thin, pale setae (Figs 14–16). **Legs.** Moderately elongate, femora swollen in the middle, tibiae widened from base to  $\frac{3}{4}$  length, surface of legs covered with sparse, adpressed to decumbent hairs.

**Biology.** Lowland species known from sites at an altitude 20–265 m. Workers were shaken off from herbs and shrubs in suburban area with maquis, streambank in Mediterranean oak forest, stream valley with deciduous forest. Single worker was collected on a tree trunk in urban park.

**Distribution.** *Temnothorax smyrnensis* appears to be endemic to the Aegean Region. So far, its known records come from Greece (islands Kos, Samos, Samothrace and urban park in coastal part of Greek Thrace) and Türkiye (İzmir Province).

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## 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. <https://doi.org/10.11646/zootaxa.5005.2.2>.
- Bolton, B. 2023. An online catalog of the ants of the world. <https://antcat.org> [accessed 21 February 2023].
- Borowiec, L. 2014. Catalogue of ants of Europe, the Mediterranean Basin and adjacent regions (Hymenoptera: Formicidae). Genus (Wrocław), 25(1–2): 1–340.
- Borowiec, L. and S. Salata. 2017. Ants of the Peloponnese, Greece (Hymenoptera: Formicidae). *Polish Journal of Entomology*, 86: 193–236. <https://doi.org/10.1515/pjen-2017-0013>.
- Borowiec, L., and S. Salata. 2018a. Notes on ants (Hymenoptera: Formicidae) of Samos Island, Greece. *Annals of the Upper Silesian Museum in Bytom, Entomology*, 27: 003. <http://doi.org/10.5281/zenodo.1481802>.
- Borowiec, L., and S. Salata. 2018b. Notes on ants (Hymenoptera: Formicidae) of Zakynthos Island, Greece. *Annals of the Upper Silesian Museum in Bytom, Entomology*, 27: 004. <http://doi.org/10.5281/zenodo.1481794>.
- Borowiec, L., and S. Salata. 2018c. Notes on ants (Hymenoptera: Formicidae) of the Euboea Island, Central Greece. *Annals of the Upper Silesian Museum in Bytom, Entomology*, 27: 005. <http://doi.org/10.5281/zenodo.1485235>.
- Borowiec, L., and S. Salata. 2021. Notes on ants (Hymenoptera: Formicidae) from Western Greece. *Annals of the Upper Silesian Museum in Bytom, Entomology*, 30: 005. <http://doi.org/10.5281/zenodo.5571258>.
- Borowiec, L., Wieczorek, K. and S. Salata. 2021. Review of ants (Hymenoptera: Formicidae) of the Dodecanese Archipelago, Greece. *Annals of the Upper Silesian Museum in Bytom, Entomology*, 30: 006. <http://doi.org/10.5281/zenodo.5571270>.
- Borowiec, L., Lebas, C. and S. Salata. 2022. Notes on ants (Hymenoptera: Formicidae) from three northern Aegean islands – Lemnos, Samothraki and Thasos. *Annals of the Upper Silesian Museum in Bytom, Entomology*, 31: 010. <http://doi.org/10.5281/zenodo.7346453>.



- Bračko, G., Wagner, H. C., Schulz, A., Gioahin, E., Matičič, J. and A. Tratnik. 2014. New investigation and a revised checklist of the ants (Hymenoptera: Formicidae) of the Republic of Macedonia. *North-Western Journal of Zoology*, 10(1): 10–24.
- Bračko, G., Kiran K., Karaman C., Salata S. and L. Borowiec. 2016. Survey of the ants (Hymenoptera: Formicidae) of the Greek Thrace. *Biodiversity Data Journal*, 4: e7945. <https://doi.org/10.3897/BDJ.4.e7945>.
- Catarineu, C., Barberá, G. G. and J. L. Reyes-López. 2017. A New Ant Species, *Temnothorax ansei* sp. n. (Hymenoptera: Formicidae) from the Arid Environments of South-eastern Spain. *Sociobiology*, 64(2): 138–145. <https://doi.org/10.13102/sociobiology.v64i2.1274>.
- Csősz, S., Heinze, J. and I. Mikó. 2015. Taxonomic Synopsis of the Ponto-Mediterranean Ants of *Temnothorax nylanderi* Species-Group. *PLoS ONE*, 10(11): e0140000. <https://doi.org/10.1371/journal.pone.0140000>.
- Csősz, S., Salata, S. and L. Borowiec. 2018. Three Turano-European species of the *Temnothorax interruptus* group (Hymenoptera: Formicidae) demonstrated by quantitative morphology. *Myrmecological News*, 26: 101–119.
- Forel, A. 1911. Fourmis nouvelles ou intéressantes. *Bulletin de la Société Vaudoise des Sciences Naturelles*, 47: 331–400.
- Galkowski, C. and H. Cagniant. 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.
- Galkowski, C. and C. Lebas. 2016. *Temnothorax conatensis* nov. sp., décrite des Pyrénées-Orientales (France) (Hymenoptera, Formicidae). *Revue de l'Association Roussillonnaise d'Entomologie*, 25: 80–87.
- Kiran, K. and C. Karaman. 2020. Additions to the ant fauna of Turkey (Hymenoptera, Formicidae). *Zoosystema*, 42: 285–329. <https://doi.org/10.5252/zoosystema2020v42a18>.
- Lapeva-Gjonova, A. and L. Borowiec. 2022. New and little-known ant species (Hymenoptera, Formicidae) from Bulgaria. *Biodiversity Data Journal*, 10: e83658. <https://doi.org/10.3897/BDJ.10.e83658>.
- Müller, G. 1921. Due nuove formiche della regione Adriatica. *Bollettino della Società Adriatica di Scienze Naturali in Trieste*, 27: 46–49.
- Müller, G. 1923. Le formiche della Venezia Giulia e della Dalmazia. *Bollettino della Società Adriatica di Scienze Naturali in Trieste*, 28: 11–180.
- Petrov, I. Z. and C. A. Collingwood. 1992. Survey of the myrmecofauna (Formicidae, Hymenoptera) of Yugoslavia. *Archives of Biological Sciences (Belgrade)*, 44: 79–91.
- Prebus, M. M. 2021. Taxonomic revision of the *Temnothorax salvini* clade (Hymenoptera: Formicidae), with a key to the clades of New World *Temnothorax*. *PeerJ*, 9: e11514. <https://doi.org/10.7717/peerj.11514>.
- Radchenko, A. G., Yusupov, Z. and E. B. Fedoseeva. 2015. Taxonomic notes for some Caucasian *Temnothorax* Mayr, 1861 species, with descriptions of three new species. *Caucasian Entomological Bulletin*, 11: 161–167.
- Salata, S. and L. Borowiec. 2015. Redescription of *Temnothorax antigoni* (Forel, 1911) and description of its new social parasite *Temnothorax curtisetosus* sp. n. from Turkey (Hymenoptera, Formicidae). *ZooKeys*, 523: 129–148. <https://doi.org/10.3897/zookeys.523.6103>.
- Salata, S. and L. Borowiec. 2019. Preliminary division of not socially parasitic Greek *Temnothorax* Mayr, 1861 (Hymenoptera, Formicidae) with a description of three new species. *ZooKeys*, 877: 81–131. <https://doi.org/10.3897/zookeys.877.36320>.
- Salata, S. and L. Borowiec. 2022. A review of the *Temnothorax anodontoides* species-group (Hymenoptera, Formicidae) from Greece. *ZooKeys* 1091:139–159. <https://doi.org/10.3897/zookeys.1091.79085>.
- Salata, S., Borowiec, L. and A. Trichas. 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*, 68: 769–808. <https://doi.org/10.3161/00034541ANZ2018.68.4.004>.
- Schifani, E., Prebus, M. M. and A. Alicata. 2022. Integrating morphology with phylogenomics to describe four island endemic species of *Temnothorax* from Sicily and Malta (Hymenoptera, Formicidae). *European Journal of Taxonomy*, 833: 143–179. <https://doi.org/10.5852/ejt.2022.833.1891>.
- Sharaf, M. R., Akbar, S. A., Al Dhafer, H. M., Gharbawy, A. and S. A. Aldawood. 2017. Taxonomy of the Myrmicine ant genus *Temnothorax* Mayr, 1861 (Formicidae: Myrmicinae) in the Arabian Peninsula. *European Journal of Taxonomy*, 280: 1–17. <https://doi.org/10.5852/ejt.2017.280>.
- Tinaut, A., and J. Reyes-López. 2020. Descripción de una nueva especie para la península ibérica: *Temnothorax alfacarensis* n. sp. (Hymenoptera, Formicidae). *Boletín de la Asociación Española de Entomología*, 44: 359–378.
- Vigna Taglianti, A., Audisio, P. A., Biondi, M., Bologna, M. A., Carpaneto, G. M., De Biase, A., Fattorini, S., Piatella, E., Sindaco, R., Venchi, A., and M. Zapparoli. 1999. A proposal for a chorotype classification of the Near East fauna, in the framework of the Western Palearctic region. *Biogeographia*, 20: 31–59. <https://doi.org/10.21426/B6110172>.
- Wilson, E. O. 1955. A monographic revision of the ant genus *Lasius*. *Bulletin of the Museum of Comparative Zoology*, 113: 1–201.