

Gylippus (Gylippus) erseni sp. n. (Solifugae: Gylippidae: Gylippinae), a New Solifuge Species from Turkey

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Abstract: A new solifuge species, *Gylippus (Gylippus) erseni* sp. n., is described and illustrated from Mount Karadağ, Karaman Province, Turkey. It belongs to the subfamily Gylippinae (Solifugae: Gylippidae). The description is based on both males and females.

Key words: Solifugae, camel spiders, Gylippidae, *Gylippus (Gylippus)*, new species, Turkey.

Introduction

The small arachnid order Solifugae, commonly known as solifuges, solifugids, camel spiders and sun spiders, consists of 1106 described species belonging to 139 genera and 12 families (BIRD et al. 2015, BIRD & WHARTON 2015). The subfamily Gylippinae Roewer is a small subfamily within the family Gylippidae characterised by their unique strap-like male flagellum partially fused with the sclerotised area of the immovable cheliceral finger and associated with strong spine-like setae as well as female genital opercula distinctly differentiated from other abdominal sternites and specifically variable (MUMA 1976, BIRD et al. 2015). Twenty-seven gylippid species belonging to five genera are distributed in Southern Africa, the Middle East and Central Asia (HARVEY 2003, ERDEK 2015). To date, 19 species belonging to the genus *Gylippus* Simon, 1879 have been described. They are divided into four subgenera. The nominotypical subgenus *Gylippus* is known by six species, namely *G. (G.) afghanensis* Roewer, 1960 (Afghanistan), *G. (G.) cyprioticus* Lawrence, 1953 (Cyprus), *G. (G.) quae-stiunculus* Karsch, 1880 (Turkey), *G. (G.) shulowi* Turk, 1948 (Israel), *G. (G.) syriacus* (Simon, 1872) (Cyprus, Iraq, Israel, Syria, Turkey) and *G. (G.) yerohami* Levy & Shulov, 1964 (Israel) (HARVEY 2003).

In this article, a new species belonging to the nominotypical subgenus *Gylippus* Simon, 1879 is described and illustrated on the basis of both males and females from Mount Karadağ, Karaman Province, Central Anatolia, Turkey.

Materials and Methods

Most specimens were sampled using pitfall traps set on Mount Karadağ, an extinct volcano in the Karaman Province, Turkey. The sampling was conducted in the following periods: end of June – October 2012, beginning of July – end of October 2013 and mid-April – July 2015. Specimens were also found under stones, in piles of rocks, masonry, or wood and under the bark of bushes. After collection, the specimens were transferred to 70% ethanol. The specimens were examined and illustrated using a Canon EOS 70D digital camera. Cheliceral terminology follows BIRD et al. (2015) in referencing cheliceral dentition. Measurements are given in millimetres and specimens are deposited in the solifuge collection of the Zoological Museum of Sinop University, Turkey (ZMSU). The distribution map was created using ArcGIS (version 10.3.1).

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Results

Gylippus (Gylippus) erseni sp. n.

Figs. 1-3, Table 1

Material examined. Holotype: ♂ (ZMSU/Sol-Gyl:1001), Karaman Province, 9 km west of Dinek Village, Karadağ Mountain (37°23'21"N; 33°08'18"E), 2186 m a.s.l., 15.04.2015–15.07.2015, pitfall trap (leg. E.A. Yağmur). Paratypes: ♂, 2♀, 1 juv. (ZMSU/Sol-Gyl:1002) same data as holotype; 2♂, 2♀, 6♀ subadult, 7 juv. (ZMSU/Sol-Gyl:1003), Karaman Province, 9 km west of Dinek Village, Karadağ Mountain (37°23'21"N; 33°08'18"E), 2186 m a.s.l., 10.06.2015–10.07.2015, pitfall trap (leg. E.A. Yağmur); 2♀, 1♀ subadult (ZMSU/Sol-Gyl:1004), Karaman Province, 9 km west of Dinek Village, Karadağ Mountain (37°23'20"N; 33°08'18"E), 2100 m a.s.l., 01.09.2012 (leg. E.A. Yağmur); 3♀, 2♀ subadult, 14 juv. (ZMSU/Sol-Gyl:1005), Karaman Province, 9 km west of Dinek Village, Karadağ Mountain (37°23'25.4"N; 33°08'16.2"E), 2192 m a.s.l., 21.06.2012–27.08.2012, pitfall trap (leg. E.A. Yağmur); 1♀, 1♀ subadult, 14 juv. (ZMSU/Sol-Gyl:1006), Karaman Province, 9 km west of Dinek Village, Karadağ Mountain (37°23'25.4"N; 33°08'16.2"E), 2192 m a.s.l., 27.08.2012–28.10.2012, pitfall trap (leg. E.A. Yağmur); 1♂, 1♀ (ZMSU/Sol-Gyl:1007), Karaman Province, Ayrancı District, 14 km south-west of Kayaönü Village, Yüglükdağı Hill (37°00'57"N; 33°46'48"E), 1942 m a.s.l., 28.05.2016 (leg. S. Anlaş, S. Örgel & S. Yaman); 1♂, 1♀ subadult (ZMSU/Sol-Gyl:1008), Karaman Province, Kazımkarabekir District, Hacibaba Mountain, Mastad Pass, 4 km north of Muratdede Village (37°11'34.8"N; 32°50'02.5"E), 1742 m a.s.l., 21.06.2012–28.07.2012, pitfall trap (leg. E.A. Yağmur); 1♂, 2♀ (ZMSU/Sol-Gyl:1010), same data, 01.07.2013–01.10.2013, pitfall trap (leg. E.A. Yağmur).

Etymology. The new species is named after Dr. Ersen Aydın Yağmur who has conducted important arachnological research in Turkey and has generously helped in collecting solifuges as well as for his friendship.

Diagnosis. Presence of dorsally situated one retrolateral manus spiniform seta, one flagellar complex of spiniform seta and 4-6 retrolateral manus setae on the fixed cheliceral finger in males. Anteriorly, the retrolateral manus seta is characteristically long (Fig. 2 A-B) [ROEWER (1933) recognised this retrolateral manus seta a second retrolateral manus spiniform seta in males]. Equally rounded bulges on genital sternites in females as within the subgenus *Gylippus*.

The subgenus *Gylippus* is similar and close to the subgenus *Paragylippus*, differentiated from it by the particular shape of the male cheliceral flagellum. Males belonging to the subgenus *Gylippus* have slightly upwardly raised flagellum but males belonging to *Paragylippus* have characteristic S-shaped flagellum; in addition, the chelicerae and propeltidium in the subgenus *Gylippus* are laterally wider than those in *Paragylippus* (at dorsal view).

Further comparisons with drawings and descriptions in the literature of the known species of the subgenus *Gylippus* indicate the differences in the male cheliceral flagellum and female genital structure between the specimens presented in this study and the known *G. (Gylippus)* spp.

Gylippus (G.) erseni sp. n. is similar in morphology to *G. (G.) syriacus* (Simon, 1872) and *G. (G.) quaestiunculus* Karsch, 1880. It can be distinguished from these two species by the following combination of characters: shape of the male cheliceral flagellum, shape of the retrolateral manus spiniform seta and the flagellar complex spiniform seta, shape and number of the femoral spiniform setae on the pedipalps, more differentiated genital sternites

Table 1. Measurements of *Gylippus (Gylippus) erseni* sp. n. (♂ holotype / ♀ paratype, in mm).

	Length			Width		
Total	18.59 / 21.04			-		
Chelicerae	4.86 / 5.71			1.88 / 2.11		
Propeltidium	3.27 / 3.13			4.08 / 4.86		
Appendages	Total (with coxa)	Femur	Tibia	Metatarsus	Tarsus	Claw
Palp	15.06/13.89	4.51/3.64	3.31/3.09	2.65/2.65	1.32/1.27	—
Leg I	13.23/11.75	2.98/2.26	3.05/2.80	2.15/2.00	1.49/1.42	0.18/0.12
Leg II	10.58/10.30	2.09/2.07	2.04/1.95	1.54/1.36	0.80/0.67	0.69/0.83
Leg III	13.91/12.60	2.98/2.46	3.01/2.74	2.11/1.81	1.01/0.81	0.80/0.90
Leg IV	19.50/18.46	4.17/4.00	4.35/4.00	3.01/2.71	1.50/1.30	1.05/1.14

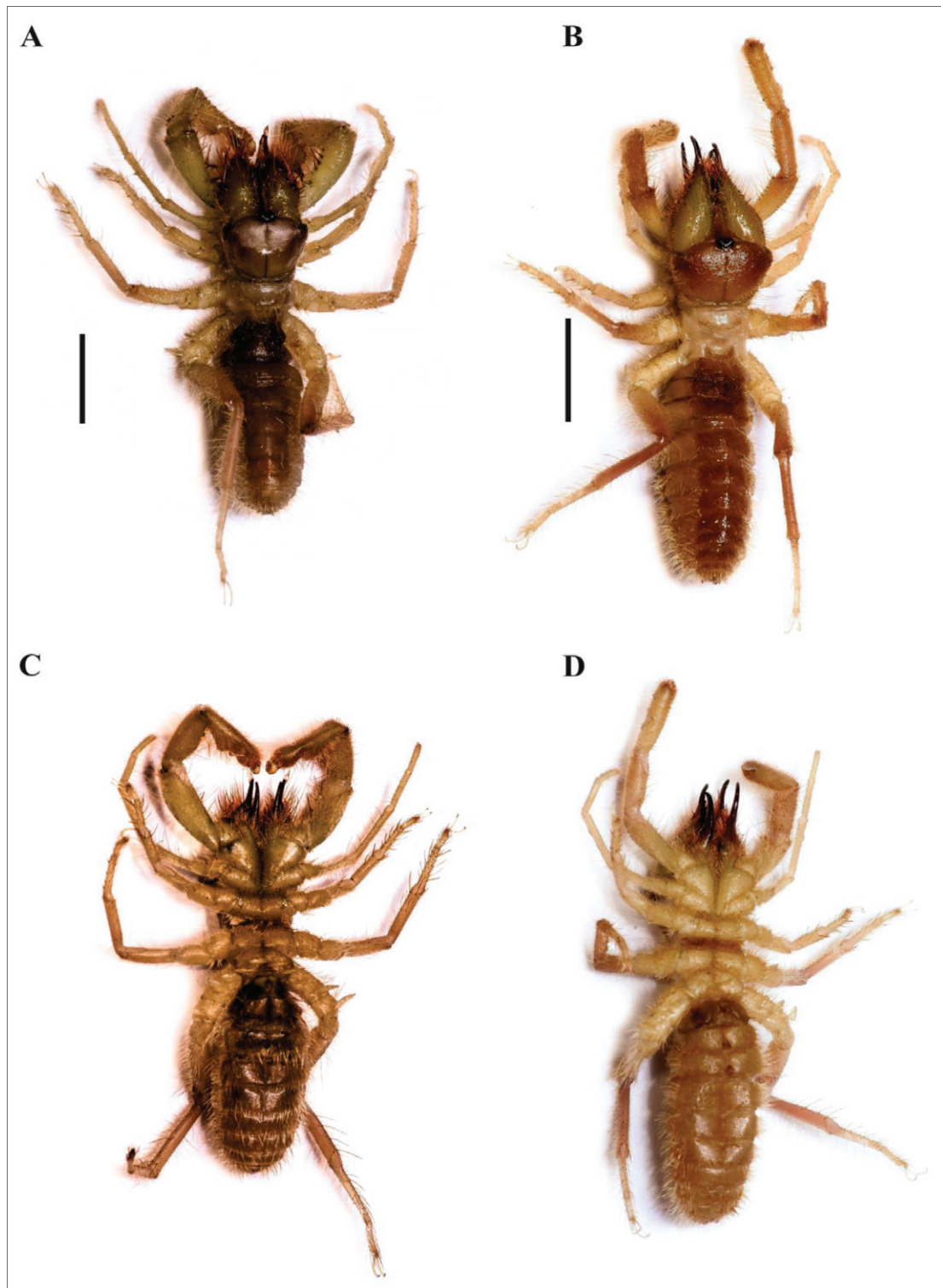


Fig. 1. *Gylippus (Gylippus) erseni* sp. n. (A, C) ♂ holotype. (B, D) ♀ paratype: (A, B) general dorsal view. (C, D) general ventral views. Scale bars: 5 mm.

in females. SIMON (1879: Pl. III, Fig. 15) illustrated that retrolateral manus spiniform seta/chelicera in *G. (G.) syriacus*, which is similar to the new species but its flagellum was oval and indented proximally; in addition, retrolateral spiniform seta is not evident. According to the drawing by KARSCH (1880: Fig.25),

flagellum is upwardly raised and thinner interiorly, protruding on both sides in *G. (G.) quaestiunculus*, unlike the flagellum of new species. The drawings by KRAEPELIN (1901: Figs. 101-102) show that the flagellum of *G. (G.) syriacus* raises upwards and takes oval shape distally; this author has described the fla-

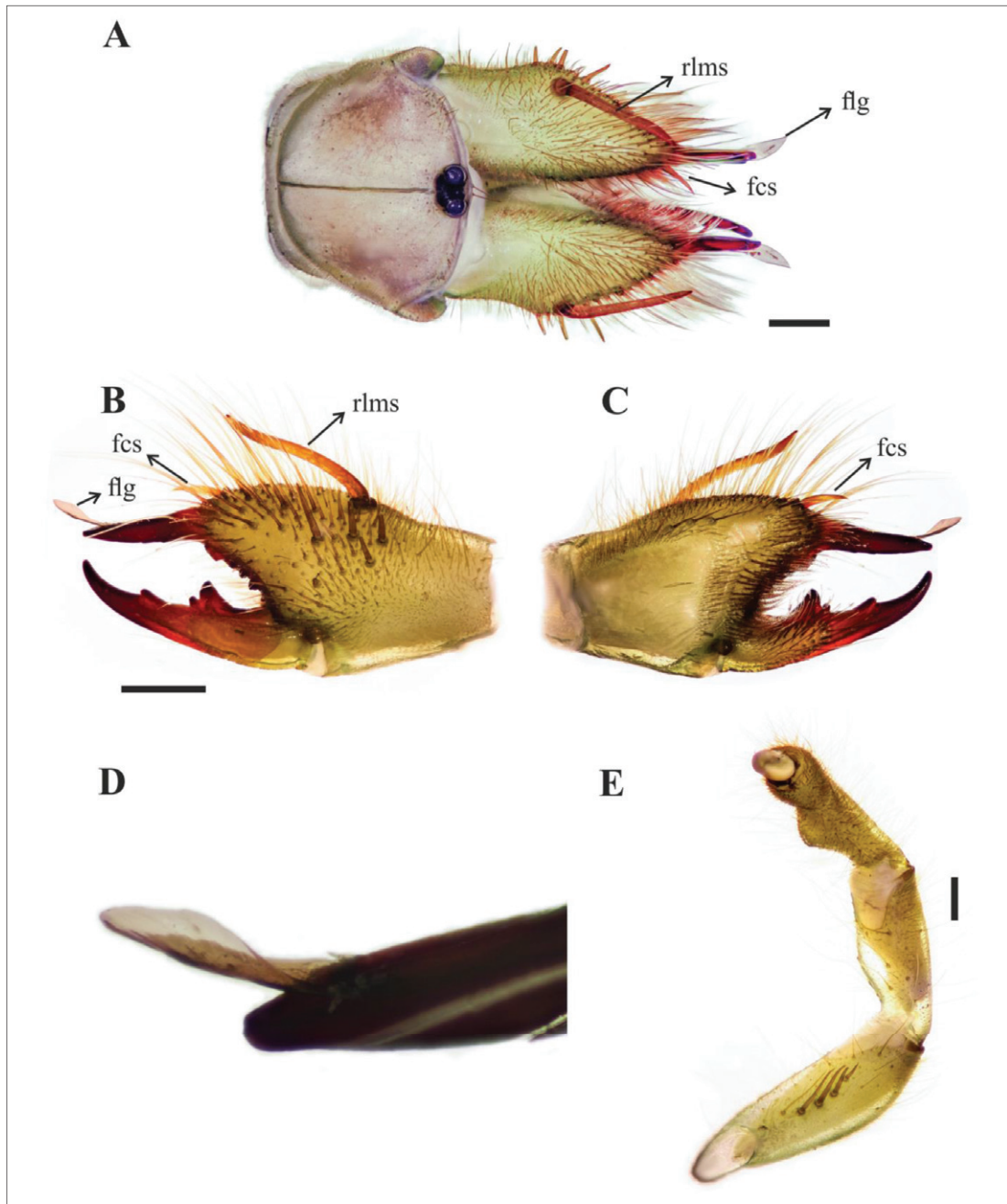


Fig. 2. *Gylippus (Gylippus) erseni* sp. n. ♂ holotype: **(A)** chelicerae and propeltidium, dorsal view. **(B)** sinistral chelicera, retrolateral view. **(C)** sinistral chelicera, prolateral view. **(D)** flagellum view. **(E)** dextral pedipalp. Scale bars: 1 mm. Abbreviations: fcs – flagellar complex spiniform seta, flg – flagellum, rlms – retrolateral manus spiniform seta.

gellum of *G. (G.) quaestiunculus* as having the shape of a question mark or cobra-like shape. According to BIRULA (1905: Fig. 5), retrolateral manus spiniform seta/chelicera in *G. (G.) quaestiunculus* is smaller than in the new species. In *G. (G.) quaestiunculus*, the flagellar complex spiniform seta is located close to tip of chelicera and bends inwardly. This bending is similar with that in the new species. However, in *G. (G.) quaestiunculus*, the numbers of femoral spines on each pedipalp are equal (four) but two of them are proximally thicker than the others. In the

new species, three femoral spines of median position are prominent. ROEWER (1932: Fig. 140) showed that the flagellum of *G. (G.) quaestiunculus* is bent backwards and raising forwardly. Retrolateral manus spiniform seta is not curling upwards, unlikely this in the new species. Flagellar complex spiniform seta in *G. (G.) quaestiunculus* is thicker, longer and more bluntly terminating compared with that of the new species. According to the illustrations by ROEWER (1933: Figs. 228 A1, A2, B1, A4, B3), in *G. (G.) quaestiunculus*, unlike the new species, chelicera

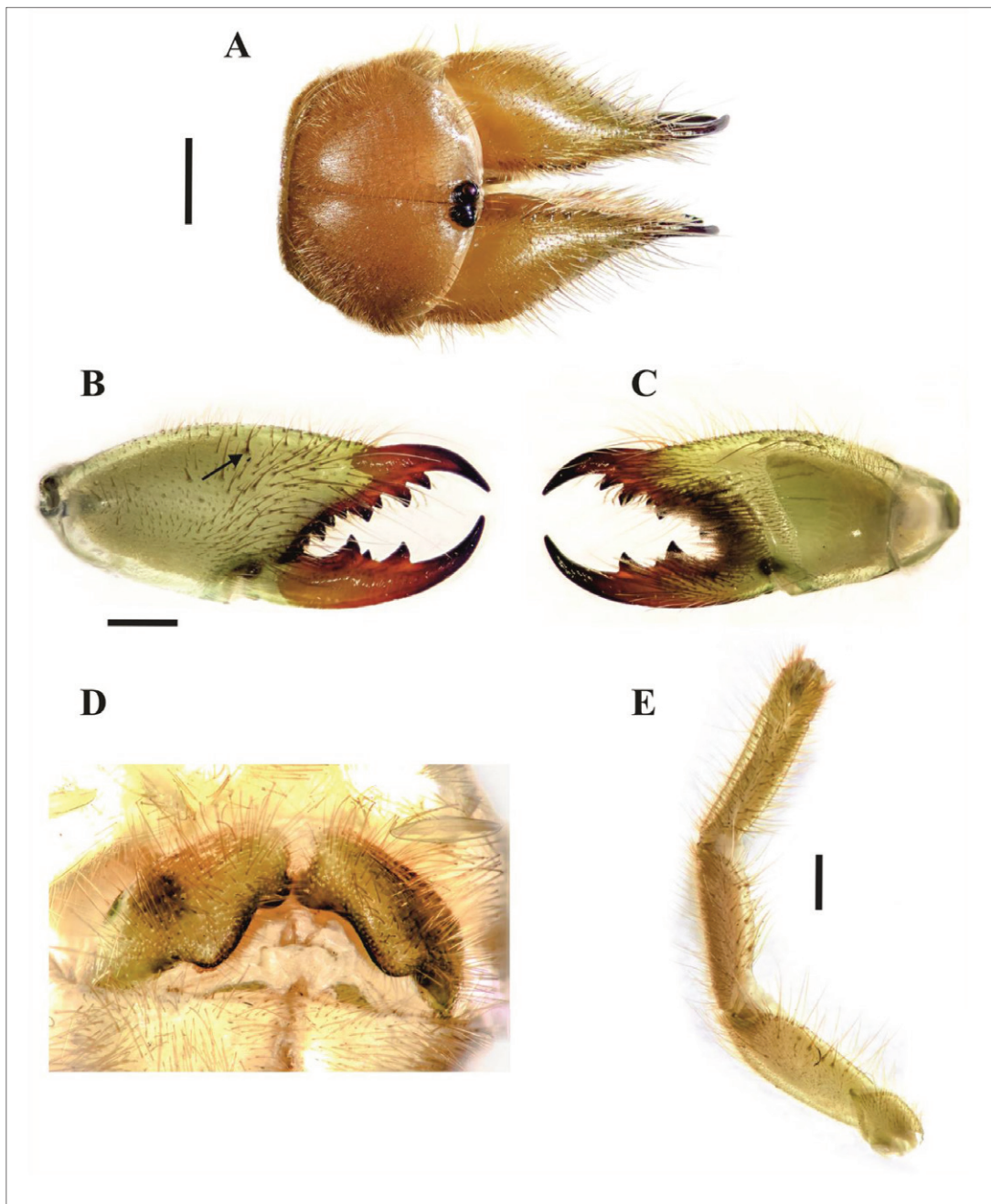


Fig. 3. *Gylippus (Gylippus) erseni* sp. n. ♀ paratype: (A) chelicerae and propeltidium, dorsal view. (B) dextral chelicera, retrolateral view. (C) dextral chelicera, prolateral view. (D) genital sternite, ventral view. (E) sinistral pedipalp. Scale bars: 1 mm. (Arrow shows the seta in female homologous to retrolateral manus spiniform seta in male).

prominently protrudes dorsolaterally and retrolateral spiniform setae are equally short except those close to retrolateral manus spiniform seta and cluster on that protrusion; flagellum is bent backwards and raises forwardly, becoming thinner distally. Genital lobes thicken from front to back and without indentation on both edges, unlike those in the new species. Flagellar complex spiniform seta locates and bends inwardly in new species. Retrolateral manus spiniform seta bends inwardly from the base in *G. (G.) syriacus* and flagellar complex spiniform seta locates and bends

outward; flagellum also raises upwards and distally bends outwards. Femoral spines on pedipalp are shorter than in *G. (G.) quaestiunculus* and in the new species. In addition, its pedipalpal tibia protrude inwards and genital lobes are bean-shaped and thinner underside than upperside.

Description of the male (holotype)

Colouration. General background pale yellowish. Mesopeltidium, metapeltidium and abdominal tergites laterally brownish-yellow, dorsomedially



Fig. 4. The habitat of *Gylippus (Gylippus) erseni* sp. n. (Mount Karadağ).

and ventromedially dark brown. Propeltidium cream brown, with brownish spots occurring with different pigment densities laterally, especially on the anterolateral propeltidial lobes. Legs generally pale brownish-yellow. Cheliceral fingers, retrolateral manus spiniform seta, flagellar complex spiniform seta and retrolateral manus setae reddish-brown and tips of the cheliceral fingers reddish-dark brown. Malleoli entirely light yellow (Figs. 1A, C; 2A-E).

Propeltidium. Entire surface covered with cream brown pigmentation in different density, dense perpendicular short hairs and several long curved hairs on the anterior and lateral edges. Ocular tubercle black, smooth and carrying a pair of long setae on its anterior edge; with a dark stripe behind the ocular tubercle (Fig. 2A).

Chelicerae. Movable finger distally curved inward, fixed finger dorsoventrally flattened (Figs. 2C, D).

Dentition. Fixed finger with one shrunken distal tooth, one shrunken medial tooth, one proximal tooth, one retrofondal medial tooth, one retrofondal submedial tooth, one retrofondal proximal tooth and one profundal proximal tooth. Movable finger with one medial tooth, one submedial tooth and one proximal tooth. Fixed fingers without papillae.

Flagellar complex. Membranous flagellum upwardly raised and outward laterally; narrowing from lateral sides, lancet-shaped. Dorsal surface of flagellum with numerous epicuticular protrusions.

Retrolateral manus spiniform seta (1.834 mm) located dorsolaterally on the immovable finger and slightly curved upwards. Flagellar complex spiniform seta (0.503 mm) sickle-shaped, curved downwards.

Chelicera and cheliceral setal complex.

Retrolaterally on chelicera, six distinct retrolateral manus setae, four of which remarkably thick and the antero-distal seta evidently longer than the other retrolateral manus setae. Entire cheliceral surface covered with numerous filiform and bifurcate long hairs and filiform short hairs. Stridulatory apparatus smooth and located proximally on the inner side of each chelicera. Four prodorsal distal setae dorsal to the stridulatory plate.

Fixed finger proventral distal setae and movable finger prodorsal distal setae comprise several long plumose setae.

Abdomen. Entire surface covered with numerous, long bifurcated setae. Abdominal sternites without ctenidia.

Pedipalps. Metatarsus swollen. Metatarsal length/width=1.83 mm/1.34 mm. Pedipalps covered with numerous short and long hairs. Prolateral surface of femur with four brown, robust, thick spines shorter than the diameter of the femur and one long, thin, distinctive seta behind the spines (Fig. 2B).

Legs. Leg I spineless and tarsal claws well-developed. Metatarsi II and III with two spiniform setae dorsally. Leg surface covered with numerous, dense, thin long hairs.



Fig. 5. Distribution of *Gylippus (Gylippus) erseni* sp. n.

Description of the female (paratypes)

General body coloration reddish brown. Unlike in males, pedipalps not swollen and no distinctive spines, only covered with some sparse long and dense short thin hairs, with rare brownish pigmentation (Fig. 3B). Chelicerae and propeltidium uniformly rusty reddish brown (Fig. 3A). Chelicerae with thin and sparse hairs. Ocular tubercle black. Dentition (Figs. 3B, C): Fixed finger with one distal tooth, one medial tooth, one submedial tooth, one proximal tooth, one retrofondal medial tooth, one retrofondal submedial tooth, one retrofondal proximal tooth, one retrofondal subproximal tooth comprising four denticles and slightly smaller than the single distal. One profundal proximal tooth. Movable finger with one medial tooth, one submedial tooth, one proximal tooth. Prolateral side of chelicerae as in Fig. 3C. Genital sternites quite sclerotised, covered with long and dense setae and forming two distinct, hairy protuberant lobes on both sides of the genital opening. Protuberant lobes with dense dark brown pigments on some places, especially the inner edges (Fig. 3D).

Distribution. Mount Karadağ, Karaman Province, Turkey (Fig. 4-5).

Discussion

Five species belonging to three subgenera of the genus *Gylippus* have been reported from Turkey (HARVEY 2003, ERDEK 2015): *Gylippus (G.) quaestiunculus*, *Gylippus (G.) syriacus*, *Gylippus*

(*Hemigylippus*) *bayrami* Erdek, 2015, *Gylippus (Paragylippus) caucasicus koenigi* Birula, 1913 and *Gylippus (Paragylippus) monoceros* Werner, 1905. With the present description of *Gylippus (Gylippus) erseni* sp. n., the number of the species of the genus *Gylippus* in Turkey becomes six.

BIRD et al. (2015) have indicated that thickened seta in some females is homologous to retrolateral manus spiniform seta of males. We confirm this observation. The arrow in Fig. 3B shows the thin seta in a female specimen studied by us homologous to retrolateral manus spiniform seta in males.

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