



Original article (Orijinal araştırma)

Description of *Podothrombium sultanae* sp. nov. (Trombidiformes: Podothrombiidae) from Türkiye and an updated key to species¹

Türkiye'den *Podothrombium sultanae* sp. nov. (Trombidiformes: Podothrombiidae)'nin tanımı ve türlere ilişkin güncellenmiş bir anahtar

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Abstract

Members of Parasitengona belong to the suborder Prostigmata and are one of the important groups of terrestrial mites. They are ectoparasitic in their larval stage whereas their post-larval forms feed on different arthropods as free-living predators. The genus *Podothrombium* Berlese, 1910 (Trombidiformes: Podothrombiidae) has 19 described species globally, with only two species currently known from Türkiye. This paper describes a new member of this genus, *Podothrombium sultanae* sp. nov., from Murat Mountain, Kütahya, Türkiye in 2023. Larvae of this species, collected from moss and leaf litter 1181 m a.s.l on Murat Mountain, are described, illustrated and an updated key to species of *Podothrombium* worldwide (larva) has been added. It is recommended that further investigations be conducted to understand the distribution of these mites and their roles in the environment in Türkiye.

Keywords: Acari, larva, Murat Mountain, Prostigmata, terrestrial Parasitengona

Öz

Prostigmata alt takımında yer alan Parasitengona türleri karasal akarların önemli gruplarından biridir. Larva döneminde ektoparazitler, larva sonrası formları ise serbest yaşayan avcılar olarak farklı eklembacaklılarla beslenirler. *Podothrombium* Berlese, 1910 (Trombidiformes: Podothrombiidae) cinsinin dünyada tanımlanmış 19 türü bulunmaktadır ve şu anda Türkiye'den sadece iki türü bilinmektedir. Bu çalışmada, Türkiye, Kütahya, Murat Dağı'ndan 2023 yılında bu cinsin yeni bir üyesi olan *Podothrombium sultanae* sp. nov. tanımlanmaktadır. Murat Dağı'ndaki 1181 m yükseklikteki yosun ve yaprak döküntülerinden toplanan bu türün larvaları, tanımlanmış, çizilmiş ve dünyadaki *Podothrombium* türleri (larva) için güncellenmiş bir anahtar eklenmiştir. Bu akarların Türkiye'de dağılımının ve çevre üzerindeki rollerinin anlaşılması için daha ileri araştırmaların yapılması önerilmektedir.

Anahtar sözcükler: Akar, larva, Murat Dağı, Prostigmata, karasal Parasitengona

The Zoobank code for the paper: urn:lsid:zoobank.org:pub:96A04B08-5AE4-41E0-B2B3-726AF923A434

The Zoobank code for the species: urn:lsid:zoobank.org:act:89C9C65C-3596-4BE9-8D58-926452C18213

¹ This study was supported by Aydın Adnan Menderes University, Türkiye, Grant Project No: ZRF-22006.

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Received (Alınış): 21.12.2023

Accepted (Kabul ediliş): 05.01.2024

Published Online (Çevrimiçi Yayın Tarihi): 05.01.2024

Introduction

The genus *Podothrombium* Berlese, 1910 (Trombidiformes: Podothrombiidae) was established on the basis of larval and post-larval forms. The only other genus of the family Podothrombiidae Thor, 1935 namely *Kurilothrombium* Mağol, 1999 was similarly established solely on the basis of post-larval forms (Mağol & Marusik, 1999; Mağol & Wohltmann, 2012). Nineteen species of *Podothrombium* have been described worldwide based on the larvae (Saboori et al., 2015). Saboori et al. (2015) presented a key to the larval species of *Podothrombium* but *Podothrombium manolatesicus* Haitlinger, 2006 was not included. No new species from this genus has been described since 2016.

Studies on terrestrial parasitengone of Türkiye are in progress. Many parts of the country are yet to be investigated, and it seems the number of terrestrial Parasitengona is more than those reported hitherto. Only two species of *Podothrombium* are reported from Türkiye: *Podothrombium filipes* (Koch, 1837) reported by Adil & Sevsay (2014) and Sevsay (2015), and *Podothrombium macrocarpum* Berlese, 1910 reported by Doğan et al. (2015) and Sevsay (2017). Both species were reported from larval and post-larval instars (Adil & Sevsay, 2014; Doğan et al., 2015).

A new species of *Podothrombium* from Murat Mountain, Kütahya, Türkiye based on larvae is described below and incorporated into a global key to the genus.

Materials and Methods

Collection and preparation of specimens

Larval specimens were collected in the summer of 2023 in Murat Mountain, Gediz, Kütahya Province of Türkiye. Moss and leaf litter samples were transferred in plastic bags to the laboratory for extraction of mites by Berlese funnel. Four specimens of interest were preserved in ethanol (75%). These specimens were then cleared with Nesbitt's solution, mounted in Hoyer's medium on microscope slides (Walter & Krantz, 2009), and examined using an Axiolmager A2 microscope (Carl Zeiss AG, Jenna, Germany) equipped with differential interference and phase contrast illumination to make measurements and prepare illustrations. Measurements (in μm) are given for holotype followed by paratypes in parentheses, with the terminology and abbreviations used in accordance with Mağol & Wohltmann (2000) and Saboori et al. (2009).

Results

Family Podothrombiidae Thor, 1935

Genus *Podothrombium* Berlese, 1910

Podothrombium sultanae sp. nov. (Figures 1-4)

Diagnosis (larva)

First row of dorsal idiosomal setae with less than 12 regularly arranged setae; IP < 1550, Ta I with 14-18 eupathidia and Ta I-II with two solenidia.

Description

Dorsum (Figure 1a). Idiosoma 727 (596-675) long and 543 (422-527) wide. Prodorsal scutum punctate with three pairs of normal setae (AM, AL and PL) and one pair of sensilla (S). AL finely and sparsely barbed whereas AM and PL distinctly barbed. AL and PL thicker than AM and S. Sensilla smooth in all specimens except holotype which has one barb. AL with one shaft line. Two pairs of eyes lateral to posterolateral angles of scutum, each pair situated on punctate sclerite 43×26 ($40-45 \times 25-27$); diameter of anterior pair 18 (17-21) and posterior one 15 (12-15). Scutellum punctate, with two barbed setae and

deeply concave posterior border, anterior border almost straight and lateral borders slightly convex. Hysterosoma dorsally with 38 (38-39); fD = 8(+2), 8, 8-9, 6, 6. All dorsal setae arise from punctate platelets.

Venter (Figure 1b). Ventral surface with barbed setae 3a; beyond coxae III 26 (20-22) barbed setae (fV = 20-26) and anus, all ventral setae arising from platelets. Coxa I with two long barbed setae. Urstigma placed between coxae I and II. Coxae II and III each with one barbed setae. All coxae punctate.

Gnathosoma (Figure 2). Palpal setal formula (fPp) = 0-B-N-NNN-2B6N ω ζ . Palpal femur with one barbed and palpal genu with one nude seta. Palptibia with three nude setae of which one is thick, and one entire terminal claw. Palptarsus with two barbed and six nude setae, one eupathidium and one solenidion. Cheliceral base 68 (60-69) long; cheliceral blade slightly curved, 16 (15-18) long with one subterminal tooth. Seta cs nude, 8 (7-8) long and subcapitular seta (bs) long with few barbs, 35 (32-37) long.

Legs (Figures 3 & 4). Segmentation formula: 6-6-6. Leg setal formula. Leg I: Ta-2 ω , 0-1 ϵ , 14-18 ζ , 30-37n; Ti-2 ϕ , 1 κ , 5n; Ge-2 σ , 1 κ , 4n; Fe-5n; Tr-1n. Leg II: Ta-2 ω , 1 ϵ , 2-3 ζ , 22-26n; Ti-2 ϕ , 5n; Ge-1 σ , 1 κ , 3n; Fe-4n; Tr-1n. Leg III: Ta-19-22n; Ti-5 n; Ge-1 σ , 3n; Fe-4n; Tr-1n. Only the holotype has a famulus on Ta I and three eupathidia only on one side on Ta I.

IP = 1486 (1392-1506)

The distal end of all legs has two lateral claws with a median claw-like empodium. Table 1 presents all relevant measurements.

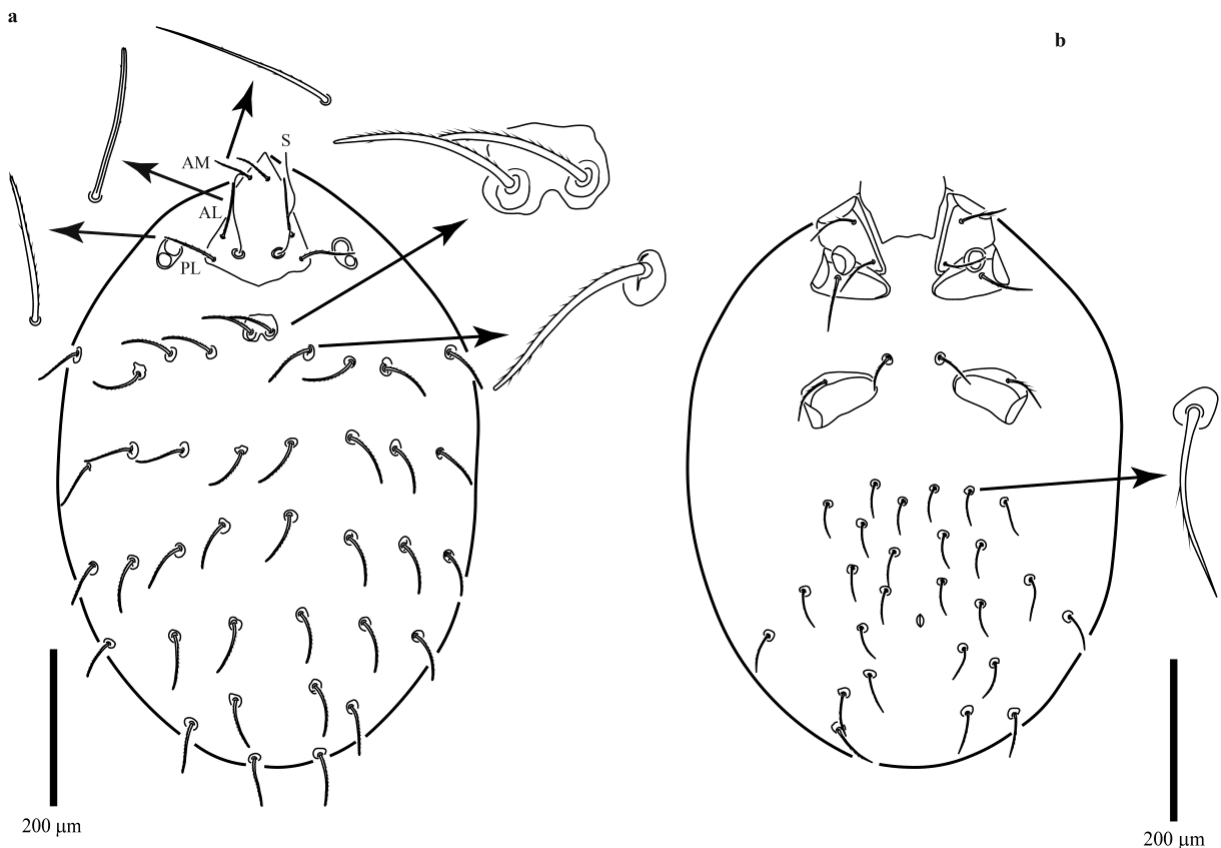


Figure 1. Idiosoma of *Podothrombium sultanae* sp. nov. larva: a) dorsal and b) ventral views with some setae shown in detail.

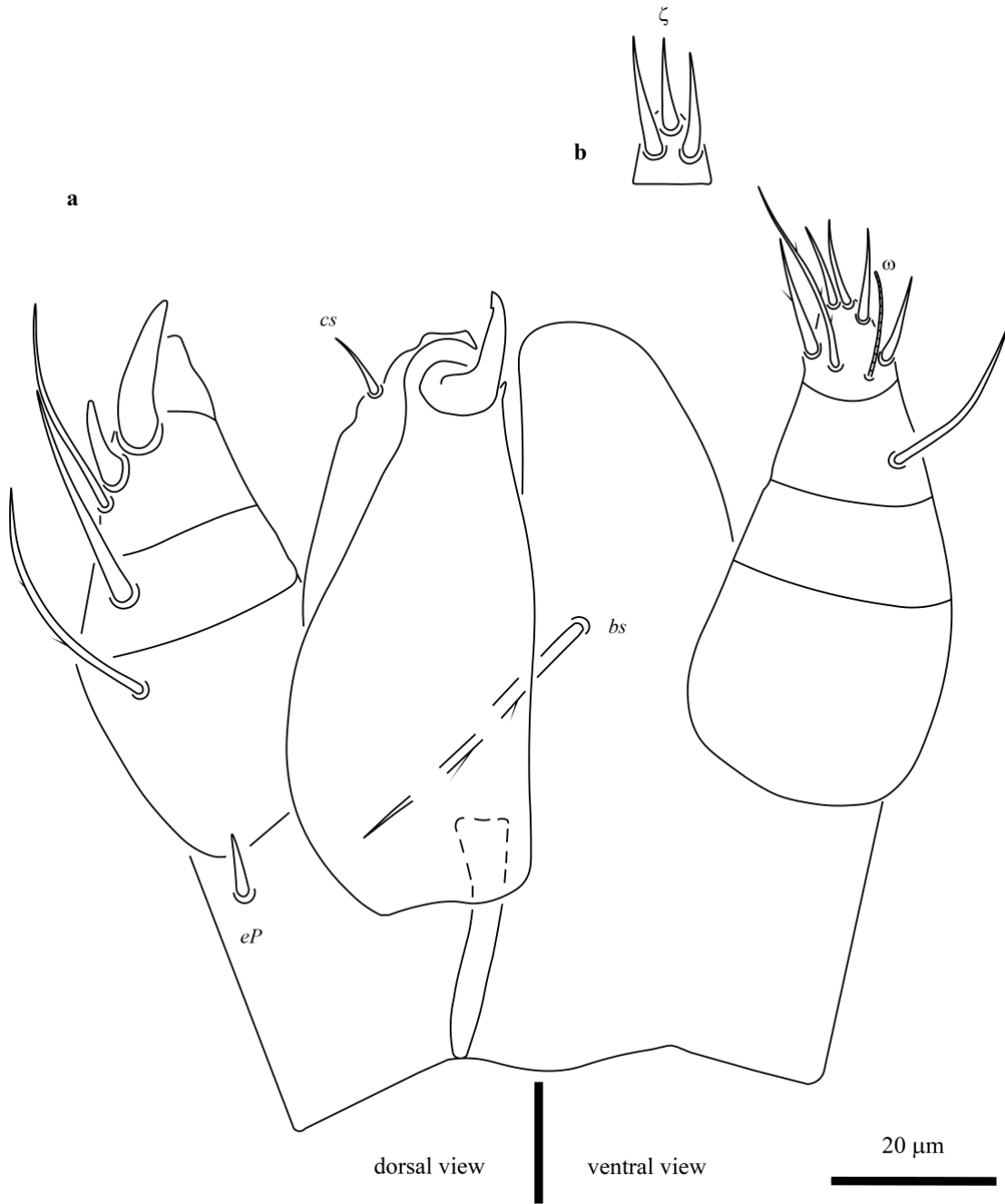


Figure 2. Gnathosoma of *Podothrombium sultanae* sp. nov. larva: a) dorsal (left) and ventral (right) view and b) palpal tarsus in dorsal view.

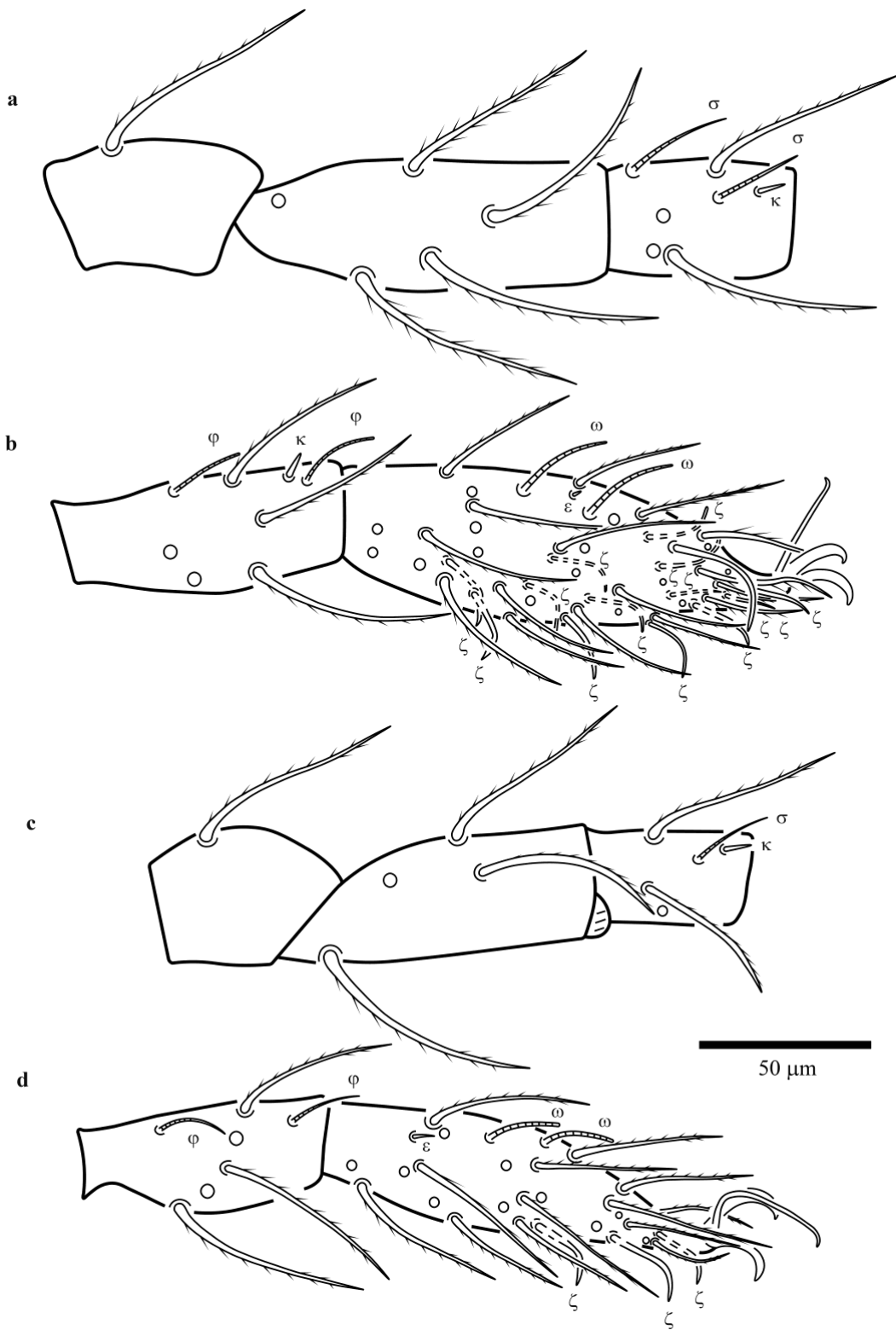


Figure 3. Legs I and II of *Podothrombium sultanae* sp. nov. larva: a) Tr-Ge I, b) Ti and Ta I, c) Tr-Ge II, and d) Ti and Ta II.

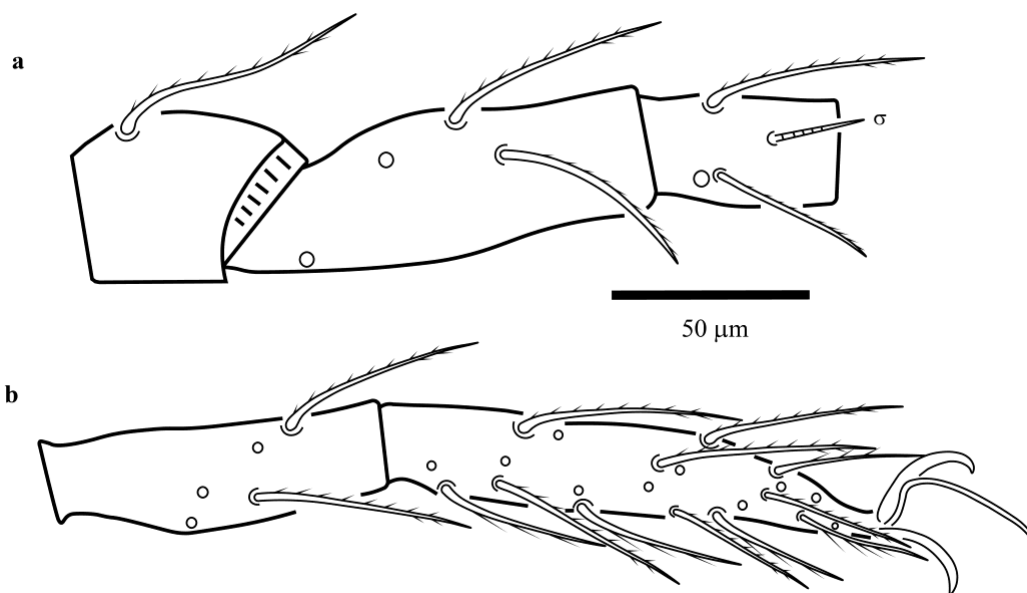


Figure 4. Leg III of *Podothrombium sultanae* sp. nov. larva: a) Tr-Ge III and b) Ti and Ta III.

Table 1. Measurements (µm) of *Podothrombium sultanae* sp. nov. larvae: a) holotype; and b-d) paratypes

Character	a	b	c	d	Range	Character	a	b	c	d	Range
IL	727	596	675	599	596-727	3a	54	52	52	54	52-54
IW	543	422	527	466	422-543	3b	61	62	60	56	56-62
AW	90	77	90	87	77-90	Ta I (L)	130	137	128	126	126-137
PW	115	107	108	107	107-115	Ta I (H)	42	36	39	39	36-42
AA	24	21	22	26	21-26	Ti I	87	85	73	77	73-87
SB	53	52	50	54	50-54	Ge I	55	59	55	51	51-59
ASB	109	118	117	115	109-118	Fe I	108	114	103	107	103-114
PSB	41	30	31	33	30-41	Tr I	51	42	38	45	38-51
SD	150	148	148	148	148-150	Cx I	85	66	73	100	66-100
W	136	128	129	126	128-136	Leg I	516	503	470	506	470-516
AP	31	24	23	25	23-31	Ta II (L)	116	122	112	111	111-122
MA	75	78	77	73	73-78	Ta II (H)	31	26	32	30	26-32
AL	65	61	58	62	58-65	Ti II	75	75	64	66	64-75
PL	72	67	69	66	66-72	Ge II	43	50	46	43	43-50
AM	55	61	51	67	51-67	Fe II	89	93	82	91	82-93
S	133	105	125	146	105-146	Tr II	44	51	45	46	44-51
SL	70	52	59	60	52-70	Cx II	94	95	86	92	86-95
SS	26	28	26	35	26-35	Leg II	461	486	435	449	435-486
HS	32	36	33	36	32-36	Ta III (L)	133	132	128	125	125-133
LSS	45	46	42	51	42-51	Ta III (H)	26	25	22	24	22-26
DS	56-73	48-67	52-68	56-77	48-77	Ti III	86	92	81	86	81-92
PDS	57-66	62-70	60-66	63-70	57-70	Ge III	51	54	53	52	51-54
cs	8	8	8	7	7-8	Fe III	102	94	92	97	92-102
bs	35	36	32	37	32-37	Tr III	48	59	46	53	46-59
1a	55	52	61	56	52-61	Cx III	89	86	87	90	86-90
1b	64	62	56	62	56-64	Leg III	509	517	487	503	487-517
2b	65	69	57	71	57-71	IP	1486	1506	1392	1458	1392-1506

Etymology. The species is named in honor of Dr. Sultan Çobanoğlu, emeritus professor of Ankara University, for her substantial contributions to the study of terrestrial Parasitengona in Türkiye.

Type material. Holotype (ARS-20231212-1a) and three paratypes (ARS-20231212-1b, 1c and 1d), came from moss and leaf litter collected by Firdevs Ersin in June 2023 in Murat Mountain, Gediz, Kütahya, Türkiye; 38° 58' 58.9" N, 29° 42' 28.1" E, 1,181 m. a.s.l., and have been deposited in the Acarological collection of Jalal Afshar Zoological Museum, Faculty of Agriculture, University of Tehran, Karaj, Iran.

Remarks

Podothrombium sultanae sp. nov. is a member of the species group with 7-10 setae on the first row of dorsal hysterosomal setae and IP < 1850. Five species share this feature: *P. filipes* occurring in all over Western Palearctic), *Podothrombium paucisetarum* Zhang & Xin, 1989 (occurring in China), *Podothrombium verae* Haitlinger, 1995 (occurring in Poland, Slovakia, and Slovenia), *Podothrombium manolatesicus* Haitlinger, 2006 (occurring in Greece) and *Podothrombium zlatarum* Saboori et al., 2015 (occurring in Montenegro) (Haitlinger, 1994, 1995, 2006a; Makol, 2005; Makol & Wohltmann, 2012; Saboori et al., 2015; Haitlinger & Šundić, 2016). The new species differs from *P. filipes* in nude seta on palpal genu (vs. barbed in *P. filipes*), nude setae on palpal tibia (vs. with at least one barbed seta), number of solenidia on palpal tarsus (1 vs. 2-3), placement of microseta on Ti I (prior to distal solenidion vs. after distal solenidion), and posterior border of scutellum (deeply concave vs. convex); from *P. paucisetarum* in number of normal setae on Ta I (30-37 vs. 14-17), on Ta II (22-26 vs. 14-16), on Ta III (19-22 vs. 14), number of eupathidia on Ta I (14-18 vs. 7-8), number of solenidia on Ta I (2 vs. 1), number of solenidia on Ta II (2 vs. 1), seta on palpal genu nude (vs. barbed in *P. paucisetarum*), shape of scutellum (deeply concave posterior border vs. convex posterior border), fV (20-26 vs. 34-40); from *P. verae* in number of barbed setae on palp tarsus (2 vs. 0), number of eupathidia on palp tarsus (1 vs. 2), number of solenidia on palp tarsus (1 vs. 2), number of eupathidia on Ta I (14-18 vs. 6-10), on Ta II (22-26 vs. 15-20), and solenidia on Ta I placed in the middle the segment (vs. near the basal ¼ of the segment), number of solenidia on Ta I (2 vs. 1), number of solenidia on Ta II (2 vs. 1); from *P. manolatesicus* in number of normal setae on Ta I (30-37 vs. 19), on Ta II (22-26 vs. 17), on Ta III (19-22 vs. 17), number of solenidia on Ta I (2 vs. 1), number of solenidia on Ta II (2 vs. 1), AM (barbed vs. nude), seta on palpal femur barbed (vs. nude), number of barbed setae on palp tarsus (2 vs. 0), Ti I (73-87 vs. 104), Fe I (82-93 vs. 128), Ti II (64-75 vs. 90), Fe II (82-93 vs. 118), Ti III (81-92 vs. 112), Fe III (92-102 vs. 130); and from *P. zlatarum* in setae on palpal femur barbed (vs. nude), number of barbed setae on palp tarsus (2 vs. 1), number of normal setae on papal tarsus (8 vs. 6), number of setae on H row (6 vs. 9-11), shape of scutellum (deeply concave posterior border vs. slightly concave or straight), Ta I (126-137 vs. 151-173), Fe I (82-93 vs. 124-136), Ta II (111-122 vs. 129-146), Fe II (82-93 vs. 101-116), Ta III (125-133 vs. 149-161), Ti III (81-92 vs. 99-106), Fe III (92-102 vs. 114-129), and IP (1392-1506 vs. 1672-1846).

Key to species of *Podothrombium* (larva)

1. The first row of dorsal setae with 16 or more setae	2
-The first row of dorsal setae with less than 12 setae	8
2. IP > 2000, SD > 220	<i>P. shellhammeri</i> Robaux, 1977
-IP < 1700, SD < 210	3
3. IP < 1200	4
-IP > 1400	5
4. NDV < 100, fV < 40, AL and AM nude	<i>P. crassicristatum</i> Feider, 1968
-NDV > 120, fV > 50, AL and AM barbed	<i>P. piriforme</i> Robaux & Schiess, 1982
5. NDV > 110	6
-NDV < 100	7
6. NDV 150, number of setae on first row of idiosoma 22-31	<i>P. karlovaicus</i> Haitlinger, 2003
-NDV 120, number of setae on first row of idiosoma < 16	<i>P. svalbardense</i> Oudemans, 1930
7. SD < 140	<i>P. sylvicolum</i> Zhang & Jensen, 1995
-SD > 150	<i>P. kordulae</i> Haitlinger, 1995
8. First row of dorsal setae with 4 setae	9
-First row of dorsal setae with 6-10 setae	10
9. Ta II-III with 14 normal setae, fD > 35	<i>P. exiguum</i> Fain & Ripka, 1998
-Ta II-III with 10 normal setae, fD < 30	<i>P. dbrenitum</i> Haitlinger, 2008
10. IP > 1950	11
-IP < 1850	12
11. IP > 2100, Ta I > 190, opisthogaster with 32 setae	<i>P. tymoni</i> Haitlinger, 1994
-IP < 2050, Ta I < 180, opisthogaster with 39 setae	<i>P. dariae</i> Haitlinger, 1995
12. First row of dorsal setae with 6 setae	13
-First row of dorsal setae with 7-10 setae	14
13. Ta I > 110, IP 1296	<i>P. pannonicum</i> Fain & Ripka, 1998
-Ta I < 100, IP 1130-1234.....	<i>P. xianicum</i> Haitlinger, 2006a
14. IP > 1600	15
-IP < 1550	17
15. Number of eupathidia on Ta I 6-10	<i>P. verae</i> Haitlinger, 1995
-Number of eupathidia on Ta I ≥ 12	16
16. Ta I with 19 normal setae	<i>P. manolatesicus</i> Haitlinger, 2006b
-Ta I with 30-41 normal setae	<i>P. zlatarum</i> Saboori Saboori, Pešić & Šundić, 2015
17. Ta I with 14-17 normal setae	<i>P. paucisetarum</i> Zhang & Xin, 1989
-Ta I with > 25 normal setae	18
18. IP < 1200, Palpal tarsus with 2-3 solenidia, Ta III 81-99	<i>P. filipes</i> (Koch, 1837)
-IP > 1350, Palpal tarsus with 1 solenidion, Ta III 125-133	<i>P. sultanae</i> sp. nov.

Note: *Podothrombium faeroense* Trägårdh, 1931 is not included due to insufficient data in its original description.

Acknowledgments

This research was funded by Aydın Adnan Menderes University, grant number ZRF-22006. We express our appreciation to Dr. Ali Rıza Ongun from Ege University, Türkiye for his assistance in collecting mite samples. We would like to thank Prof. Dr. Ian T. Riley for his editorial help in finalizing this manuscript for submission. We also thank three anonymous reviewers for their valuable comments that improved the quality of the manuscript.

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