Journal of Insect Biodiversity and Systematics
ISSN: 2423-8112
2026 | 12 (02), 327–336
Website: https://jibs.modares.ac.ir
Contents list: https://www.biotaxa.org/jibs
https://doi.org/10.48311/jibs.12.02.327

Original Article

Remarks on the genera *Sphaerotarsus* Womersley, 1936 and *Hirstiosoma* Womersley, 1934 (Acari: Smarididae), with a new distributional record of *Hirstiosoma latreillei* (Grandjean, 1947) from northern Iran

Masoud Hakimitabar | **Milad Davari**

Department of Horticulture and Plant Protection, College of Agriculture, Shahrood University of Technology, Shahrood, Iran; miladdavari1985@gmail.com

Corresponding author: Masoud Hakimitabar | Hakimitabar@shahroodut.ac.ir

https://zoobank.org/urn:lsid:zoobank.org:FB27D82F-F3F4-4C9D-A194-CDB3A312179C

Academic Editor
Javad Noei

Received
August 15, 2025

Revised
February 11, 2026

Accepted
February 13, 2026

Published online
February 21, 2026

ABSTRACT. In this study, we provide a larval stage redefinition of the two genera *Hirstiosoma* and *Sphaerotarsus* (Trombidiformes: Smarididae) and new data on the larva of *Hirstiosoma latreillei* (Grandjean, 1947) collected from the soil and leaf litter of a section of the Hyrcanian forests near the Tilek village, Sari County, Mazandaran Province, Iran. Prior to this study, a single specimen of *H. latreillei* was collected from Asalem city in Guilan Province, Iran. The considerable distance between the previous sampling site and the collection locality in the present study suggests that *H. latreillei* is likely distributed not only across the forests of the northern Alborz Mountains in Iran but also in adjacent countries situated between Iran and Europe, such as Türkiye. Furthermore, given the altitudinal range of the collection sites in Gijav village, Asalem city, Guilan Province, and the current study, as well as those reported from European localities, it can be inferred that the occurrence of this species is not altitude–dependent. Collecting the larval host of this species may provide critical insights into its host specificity and broader geographic distribution. A revised version of the identification key to smaridid genera is presented here, incorporating updated definitions for the genera *Sphaerotarsus* and *Hirstiosoma*. In addition, a key to the larval species of *Hirstiosoma* worldwide is provided.

KEYWORDS: Erythraeidae, Hirstiosomatinae, Identification key, New record, Prostigmata, Trombidiformes

Citation: Hakimitabar, M. & Davari, M. (2026) Remarks on the genera *Sphaerotarsus* Womersley, 1936 and *Hirstiosoma* Womersley, 1934 (Acari: Smarididae), with a new distributional record of *Hirstiosoma latreillei* (Grandjean, 1947) from northern Iran. *Journal of Insect Biodiversity and Systematics*, 12 (02), 327–336.

INTRODUCTION

Parasitengona belongs to the Trombidiformes order and the Prostigmata suborder and includes one of the largest groups of Acari. There are seven superfamilies of terrestrial parasitengone mites: Allotanaupodoidea Zhang & Fan, 2007 contains family Allotanaupodidae Zhang & Fan, 2007; Amphotrombidoidea Zhang, 1998 with family Amphotrombiidae Zhang, 1998; Calyptostomatoidea Oudemans, 1923 with family Calyptostomatidae Oudemans, 1923; Erythraeoidea Robineau–Desvoidy, 1828 contains two families Erythraeidae Robineau Desvoidy, 1828 and Smarididae Vitzthum, 1929; Tanaupodoidea Thor, 1935 with family Tanaupodidae Thor, 1935; Trombidioidea Leach, 1815 with three epifamilies Trombelloidae Thor, 1935 with familes Audyanidae Southcott, 1987, Chyzeriidae Womersley, 1954, Johnstonianidae Thor, 1935, Neotrombidiidae Feider, 1955 and Trombellidae Thor, 1935; Trombiculoidae Ewing, 1929 (= Trombiculoidea *sensu* Wen, 1999) with family Trombiculidae Ewing, 1929 and Trombidioidae Leach, 1815 with families Achaemenothrombiidae Saboori, Wohltmann &

ISSN 2423-8112 – **Published by** Tarbiat Modares University | **Owner** The Entomological Society of Iran

Hakimitabar, 2010, Microtrombidiidae Thor, 1935, Neothrombiidae Feider, 1959, Podothrombiidae Thor, 1935 and Trombidiidae Leach, 1815 and Yurebilloidea Southcott, 1996 with family Yurebillidae Southcott, 1996 (Costa et al. 2024).

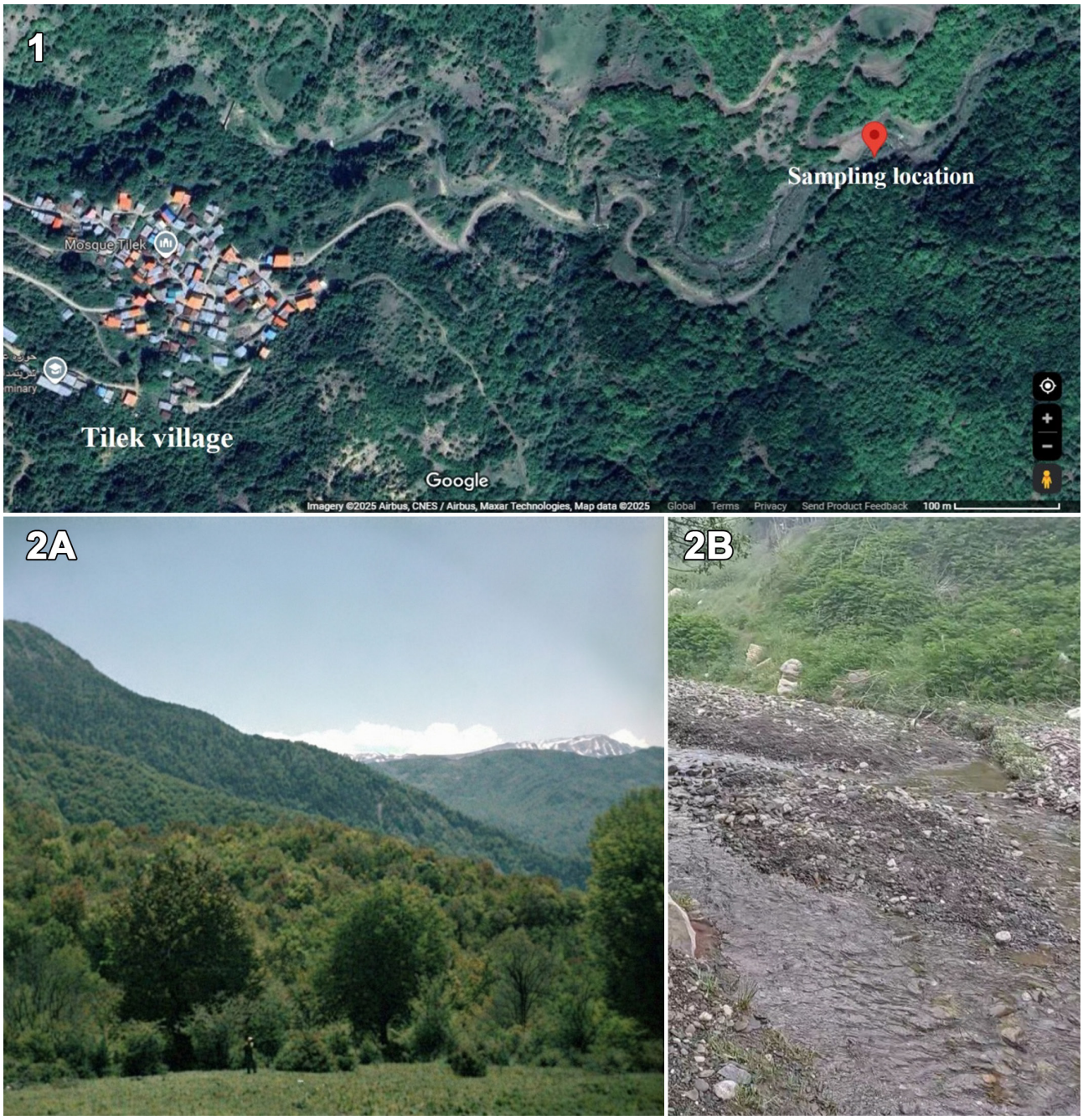
One of them, Erythraeoidea Robineau–Desvoidy, 1828 includes two families, Erythraeidae Robineau-Desvoidy, 1828 and Smarididae Vitzthum, 1929. Unlike most terrestrial Parasitengona mites (e.g., chiggers and erythraeids), which are primarily known from their parasitic and easily collected larval stages, the systematics of Smarididae are mostly based on post–larval instars. Costa et al. (2021) investigated the phylogenetic relationships within Smarididae using 50 morphological characters derived from both larval and post–larval stages. In their study, they described two new species, established the genus *Southcottiana*, transferred two species from *Sphaerotarsus* to *Hirstiosoma*, and provided identification keys for the larval genera of Smarididae as well as for species of *Trichosmaris* (including both larval and post–larval instars). Based on their findings, the family Smarididae currently comprises six genera: *Smaris* Latreille, 1796; *Fessonia* Heyden, 1826; *Southcottiana* Costa, Welbourn, Klimov and Pepato, 2021; *Trichosmaris* Southcott, 1963; *Sphaerotarsus* Womersley, 1936; and *Hirstiosoma* Womersley, 1934.

Some of the characters considered for phylogenetic analysis by Costa et al. (2021) are not constant and high–weight characters. For example, Leg III/Idiosoma length may vary depending on feeding, which can alter the length of the idiosoma. Therefore, it is recommended that phylogenetic analyses should be conducted using traits with higher diagnostic value and molecular–based phylogenies to confirm the results. At present, the definitions proposed by Wohltmann (2010) and Southcott (1961) are currently recommended (with some modifications) for the genera *Hirstiosoma* and *Sphaerotarsus*, respectively. To date, 13 species of the genus *Hirstiosoma* have been described from different regions of the world (Montenegro, Italy, Poland, Spain, France, Austria, Finland and Hungary, Mexico, Papua new Guinea, Malaysia, Australia, Tasmania, new Zealand, China and Iran) as follows: *H. amfilohijei* Haitlinger & Šundić, 2017, *H. baenai* (Mayoral & Barranco, 2017), *H. copiolarum* (Southcott, 1948), *H. furtadoi* (Shiba, 1976), *H. querca* (Yazdanpanah, Saboori & Hakimitabar, 2016), *H. sadafae* (Amin, Khanjani & Nadri, 2020) and *H. tibetensis* Xu & Jin, 2022 which described based on larvae only; *H. bolivari* Southcott, 1963, *H. novaehollandiae* Womersley, 1936, *H. scalare* Womersley, 1934, *H. tasmaniensis* Womersley & Southcott, 1941 solely based on active post–larval instars and *H. ampulligera* (Berlese, 1887) and *H. latreillei* (Grandjean, 1947) described from both larval and post–larval stages and *Sphaerotarsus* comprising four species, *S. allmani* Womersley, 1936, *S. claviger* Womersley & Southcott, 1941, *S. womersleyi* Southcott, 1946 described based on active post–larval instars and *S. leptopilus* described based on larval and post larval stages which all species collected from Australia (Mąkol & Wohltmann 2012; Costa et al. 2021; Amin et al. 2020; Xu et al. 2022).

The purpose of this article is to provide additional metric data on larvae *H. latreillei* based on specimens collected from Mazandaran Province, northern Iran, and prepare a key to larval species of *Hirstiosoma* of the world and an updated definition of the genera *Hirstiosoma* and *Sphaerotarsus*.

MATERIAL AND METHODS

Mite larvae were extracted using a Berlese–Tullgren funnel and were preserved in 75% alcohol, cleared in Nesbitt's fluid, and mounted on microscope slides using Faure's medium (Walter & Krantz, 2009). Measurements were calculated using a BX51 Olympus microscope. Measurements are given in micrometres (µm). The terminology and abbreviations are adapted from Wohltmann et al. (2006) and Wohltmann (2010). All specimens (accession number: JAZM–AC–Sm–05a–5g) are deposited in the Acarological Collection, Jalal Afshar Zoological Museum, Faculty of Agriculture, University of Tehran, Karaj, Iran. Mite specimens were collected from the soil and leaf litter of a section of the Hyrcanian forests (Figs 1, 2A). The Hyrcanian forest is characterized by temperate deciduous broadleaved vegetation, with *Fagus orientalis* (oriental beech) comprising 32.7% of its total volume. Coniferous species are notably absent from this ecosystem. A seasonal stream (Fig. 2B), situated about 15 meters from the sampling site, was actively flowing during the period of collection.



Figures 1–2. Sampling localities. **1.** Satellite image of sampling area; **2A.** Habitat and collecting site of *Hirstiosoma latreillei* in Mazandaran Province, Iran; **2B.** Seasonal river near the collecting site of *Hirstiosoma latreillei*.

RESULTS

Class Arachnida Lamarck, 1801

Order Trombidiformes Reuter, 1909

Superfamily Erythraeoidea Oudemans, 1902

Family Smarididae Vitzthum, 1929

Subfamily Hirstiosomatinae Southcott, 1946

Genus *Sphaerotarsus* Womersley, 1936

Type species. *Sphaerotarsus allmani* Womersley, 1936, by original designation; *Type locality:* Bathurst, New South Wales, Australia; *Type status*: Active postlarval form (deutonymph and adult).

Diagnosis (larva, updated Southcott 1961)**.** Hirstiosomatine mite with dorsal scutum transverse trapezoid shape, ASens placed anterior to AL bases and PSens bases arise behind PL bases, sternal setae *1a* and *3a* present. fn Cx I–III = 1–1–1; fn Tr I–III = 1–1–1; fn BFe I–III = 2–2–2; fn TFe I–III=5–5–5; Tarsi I–III each with two falciform and laterally distinctly ciliate claws, and one falciform empodium with small ciliations; palptibial claw apically divergent and bifurcate, absence of a dorsolateral spine halfway along the palpal tibial claw, basally with accessory tooth; hypostomal setae *as* nude and *bs* barbed, length of *bs* is almost twice as much as *as*; palpal supracoxala present.

Genus *Hirstiosoma* Womersley, 1934

Type species. *Hirstiosoma scalaris* Womersley, 1934; *Type locality*. Victor Harbour, along the Hindmarsh River, South Australia; *Type status*. Active postlarval form (deutonymph and adult).

Diagnosis (larva, updated Wohltmann 2010)**.** Hirstiosomatine mite with dorsal scutum vertical trapezoid shape; ASens place anterior to AL bases and PSens bases arise behind PL bases; sternal setae *1a* and *3a* present; fn Cx I–III = 1–1–1; fn Tr I–III = 1–1–1; fn BFe I–III = 2–2–2; fn TFe I–III = 5–5–5; Tarsi I–III each with two falciform, laterally distinctly ciliate claws, and one falciform empodium with small ciliations; palptibial claw not distinctly bifurcate and with only a narrow split at the apical end with no separation of elements in most species or palpal tibial claw divergent and bifurcate (*H. baenai* and *H. querca*) and presence of a dorsolateral spine halfway along the palpal tibial claw, basally with accessory tooth; hypostomal setae *as* and *bs* barbed, semi–equal (longer or shorter); palpal supracoxala present. As shown in Tables 1 and 3, in some specimens, *as* is shorter than *bs*. We modified the 5th couplet cited in the key to genera of Smarididae (larvae) by Costa et al. (2021) as follows:

– Length of posterior hypostomalae (*bs*) is almost twice as much as anterior hypostomalae (*as*), *as* nude, scutum transverse trapezoid shape (wider than long). .....***Sphaerotarsus***

– *as* and *bs* semi–equal (longer or shorter), *as* barbed, scutum vertical trapezoid shape (longer than wide) (Fig. 4). ..... ***Hirstiosoma***

Hirstiosoma latreillei (Grandjean, 1947)

Smaris latreillei Grandjean, 1947:19; *Clipeosoma jupiter* Southcott, 1961:445, nom. nov., pro *Smaris latreillei* Grandjean, 1947, [L]. Synonymized by Wohltmann 2010:361; *Hirstiosoma latreillei*: Gabryś et al. 2009:26; Wohltmann 2010:361, 363; ***Type locality*****.** Périgueux, France.

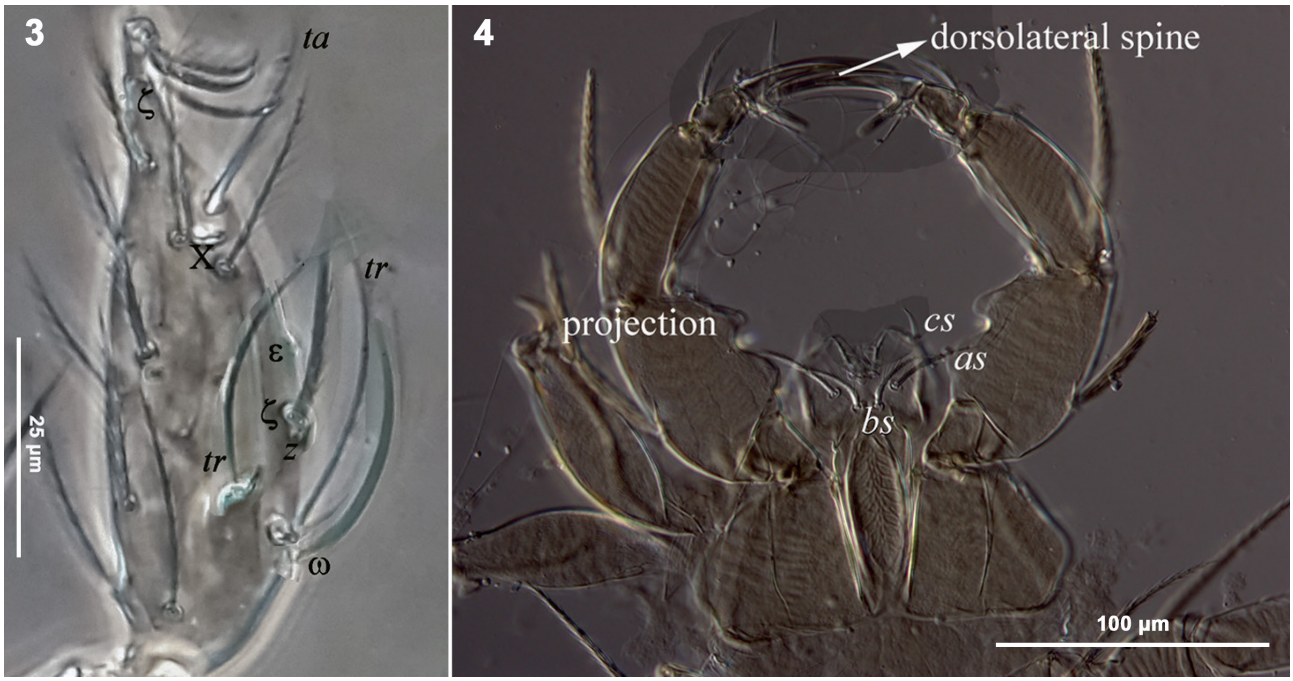
Figs 3 & 4

Distribution. France, Austria, Finland, Hungary, and Poland. Also, one specimen was collected from soil in a forest in Gijave village, Asalem city, Guilan province, northern Iran (Wohltmann 2010; Noei et al. 2013).

Material examined. Seven Larvae (JAZM–AC–Sm–05a–5g) were collected from soil and litter in a forest near the Tilek village, Chahardangeh Rural District, Sari County, Mazandaran Province, Iran (36˚07'39"N 53˚35'45"E, 1470 m a.s.l.) (Fig. 1); 11 July 2020, leg.: Milad Davari and one larva, which was collected from Guilan province and deposited in the Acarological collection, Jalal Afshar Zoological Museum, College of Agriculture, University of Tehran, Karaj, Iran.

Diagnosis (Larva)**.** fn Ge I–III = 6–8–8; fn Ti I–III = 10–15–15; fSol=I (0–4–3–1), II (0–0–2–1), III (0–0–1–0); four and two trichobothria on Ti I and Ge I, respectively; Ti III > 380.

The result of this study showed that this species is distributed in the northern regions of Iran (Guilan and Mazandaran provinces). Hence, we consider it important to conduct further studies on these species throughout Iran to gain a better understanding of their host spectrum and geographic distribution. *Hirstiosoma latreillei* surely can be found in additional regions of Iran, as it has already been collected from Guilan province and now from Mazandaran province. This species can be found in other countries, as it has already been collected from European countries and seems to be distributed in the western Palaearctic.



Figures 3–4. *Hirstiosoma latreillei* (Grandjean, 1947). **3.** Tarsus I (JAZM–AC–Sm–05c); **4.** Gnathosoma (JAZM–AC–Sm–05c).

Leg segmentation formula. 7–7–7. Leg setal formula: **Leg I:** Ta–19n, 2ζ, 1z, 1ω, 1ε, 1*ta*, 1x, 2*tr* (Fig. 3); Ti–10n (9n in one side of symmetry axis in Guilan specimen), 3ϕ, 1da, 1 , 4*tr*; Ge– 6n, 4σ, 1k, 2*tr*; TFe–5n; BFe–2n; Tr–1n; Cx–1n; **Leg II:** Ta–19–20n, 1ω, 1ζ; Ti–15n (14n in one side of symmetry axis in Guilan specimen), 2ϕ; Ge–8n, 1k; TFe–5n; BFe–2n; Tr–1n; Cx–1n; **Leg III:** Ta– 19n, 1ζ; Ti–15n, 1ϕ; Ge–8n; TFe–5n; BFe–2n; Tr–1n; Cx–1n. The meristic data are completely compatible with those reported by Wohltmann (2010).

Key to the species of *Hirstiosoma* (larva) of the world

1 Odontus without a dorsolateral spine halfway along the palpal tibial claw. **2**
– Odontus with a dorsolateral spine halfway along the palpal tibial claw. **3**

2 Ti I with 12 normal setae and 3 trichobothria, Ge I with 6 normal setae and 2 trichobothria. ..... ***H. querca* (Yazdanpanah, Saboori & Hakimitabar, 2016)** [Distribution: Iran]
– Ti I with 8 normal setae and 6 trichobothria, Ge I with 4 normal setae and 4 trichobothria. ..... ***H. baenai* (Mayoral & Barranco, 2017)** [Distribution: Spain]

3 ASens significantly setulose throughout the length. **4**
– ASens setulose about the distal half. **6**

4 Ta I 125–126; Ti I 249–259. ..... ***H. sadafae* (Amin, Khanjani & Nadri, 2020)** [Distribution: Iran]
– Ta I < 75; Ti I < 175. ..... **5**

5 W 71–74; AL 64–66; PL 69–71. ..... ***H. tibetensis* Xu & Jin, 2022** [Distribution: China]
– W 63; AL 86; PL 86. ..... ***H. furtadoi* (Shiba, 1976)** [Distribution: Malaysia]

6 SD < 55, each AL and PL < 55. ..... ***H. copiolara* (Southcott, 1948)** [Distribution: Papua New Guinea]
– SD > 75, each AL and PL > 80. ..... **7**

7 Ge I with 11σ. ..... ***H. ampulligera* (Berlese, 1887)** [Distribution: Italy, Poland]
– Ge I with 4σ. **8**

8 Ge I with 4 trichobothria and 4 normal setae, Ti I with 5–8 normal setae. ..... ***H. amfilohijei* Haitlinger & Šundić, 2017** [Distribution: Montenegro]
– Ge I with 2 trichobothria and 6 normal setae, Ti I with 10 normal setae. ..... ***H. latreillei* (Grandjean, 1947)** [Distribution: Austria, Finland, France, Hungary, Iran, Poland]

Table 1. The differences between *H. latreillei* and other species are mentioned in Table 2.

Characters	Present Study							Wohltmann (2010)(N=5)	Noei et al. (2013)(N=1)	Character	Present Study							Wohltmann (2010)(N=5)	Noei et al. (2013)(N=1)
	5a	5b	5c	5d	5e	5f	5g				5a	5b	5c	5d	5e	5f	5g		
SD	107	92	92	95	–	–	108	90–95	94	DS	50–86	50–87	51–83	56–100	47–105	53–112	53–76	–	–
W	85	82	84	92	–	–	82	80–85	69	Ta I	102	99	107	100	97	98	101	95–100	97
AW	52	51	52	60	–	–	56	54–64	54	Ti I	290	294	290	282	285	288	291	230–250	280
PW	64	66	65	73	–	–	70	69–75	64	Ge I	231	241	247	251	232	242	238	200–223	228
SBa	9	7	8	9	–	8	9	8–10	10	TFe I	175	178	178	173	168	172	170	145–155	171
SBp	12	11	11	13	9	9	14	15–20	10	BFe I	150	153	155	158	154	149	161	133–140	153
ISD	42	42	46	46	–	43	42	–	–	Tr I	56	49	50	54	45	47	50	50–56	50
AP	24	22	25	23	–	24	27	–	–	Cx I	56	57	58	54	52	53	58	52–64	45
AL	113	114	116	114	115	120	118	95–100	104	Leg I	1060	1071	1085	1072	1033	1049	1069	–	1024
PL	111	111	114	108	110	106	112	92–100	92	Ta II	104	128	127	130	124	127	128	122–134	121
ASens	BR	54	53	63	55	55	56	43–50	47	Ti II	287	318	327	314	305	313	319	255–280	302
PSens	71	80	76	88	79	85	80	72–80	69	Ge II	232	188	189	184	177	184	190	150–160	173
Palp Tr	32	27	32	33	22	24	32	18–22	30	TFe II	175	154	156	155	153	164	154	125–137	151
Palp Fe	80	75	66	74	77	78	72	80–85	84	BFe II	146	185	165	183	184	184	189	155–163	191
Palp Ge	73	75	79	74	76	76	77	70–72	74	Tr II	55	48	55	51	49	57	48	55–60	50
Palp Ti	22	26	23	24	22	22	26	20–22	17	Cx II	71	65	63	68	68	62	65	63–70	62
Odontus	60	63	62	64	61	63	65	56–60	59	Leg II	1070	1086	1082	1085	1060	1091	1093	–	1050
Palp Ta	11	14	15	19	15	15	15	14–17	22	Ta III	154	151	150	147	144	147	156	145–155	146
1a	68	75	84	79	76	77	83	–	–	Ti III	437	444	450	445	431	443	438	380–390	428
1b	90	92	91	99	92	91	99	–	–	Ge III	251	255	257	253	249	257	251	220–231	243
2b	64	59	62	–	–	–	62	–	–	TFe III	221	231	224	232	216	218	233	185–196	218
3a	50	53	53	51	51	48	50	–	–	BFe III	185	191	193	189	183	194	185	155–163	191
3b	47	55	45	49	46	49	47	–	–	Tr III	49	41	50	50	52	42	45	50–55	52
GL	117	116	112	BR	–	–	115	–	–	Cx III	65	65	52	55	59	55	60	57–63	59
cs	16	15	15	16	–	16	16	–	–	Leg III	1362	1378	1376	1371	1334	1356	1368	–	1337
as	33	39	39	36	–	–	34	–	–	IP	3492	3535	3543	3528	3427	3496	3530	–	3411
bs	34	37	37	36	–	–	32	–	–										

In specimens JAZM–AC–Sm–05e and 05f, it was not possible to measure certain characters due to the unfavorable position of the scutum and gnathosoma; BR – Broken.

Table 2. Some metric and meristic data of larvae of *Hirstiosoma* species.

Characters	*H. amfilohijei*	*H. baenai*	*H. copiolarum*	*H. furtadoi*	*H. querca*	*H. ampulligera*	*H. latreillei*	*H. sadafae*	*H. tibetensis*
SD	78–86	90–95	54	79	99–104	80–90	90–108	107–109	74–76
W	76–84	63–72	52	63	82–84	70–74	80–92	86–89	71–74
ISD	31–41	–	–	–	45	–	42–46	46–49	32–33
AP	19–23	–	–	–	27–32	–	22–27	27–31	21–23
AL	96–104	113–120	49	86	92–111	94–100	95–120	118–121	64–66
PL	90–92	110–124	52	86	92–99	95–105	92–114	92–122	69–71
ASens	34–48	50–59	26	36	57	40–44	43–63	51–60	34–35
PSens	65–66	81–92	40	50	82–101	62–79	71–88	90–98	51–54
Odontus	46–57	41–54	–	–	–	50–55	56–65	–	–
cs	12–17	11–14	–	–	10–12	–	15–16	13	11–12
as	21–32	41–45	–	–	40–42	–	33–39	43–47	23–25
bs	23–30	32–45	–	–	40–42	–	32–37	45–47	21–25
Ta I	80–101	108–117	–	73	101–119	90–100	95–107	125–126	69–70
Ti I	225–281	212–243	–	172	238–255	195–220	230–294	249–259	170–174
Leg I	809–1023	850–958	–	–	877–974		1024–1085	996–1000	619–640
Ta II	95–120	117–142	–	–	111–116	100–112	104–134	123–124	81–82
Ti II	227–283	99–247	–	–	228–252	223–235	255–327	239–259	179–181
Leg II	780–1009	769–903	–	–	831–900	–	1050–1093	890–908	642–657
Ta III	119–143	117–142	–	–	134–144	124–130	144–156	157	101–104
Ti III	308–395	293–328	–	–	332–356	290–312	380–450	337–350	247–252
Leg III	1003–1285	1011–1149	655	–	1094–1171	–	1334–1378	1152–1189	844–846
IP	2592–3317	2631–3010	–	–	2802–3042	–	3411–3543	3038–3097	2105–2143
Asens, PSens	small setules distally	small setules distally	small setules distally	setulose throughout	small setules distally	small setules distally	small setules distally	setulose throughout	setulose throughout
fn Ti I	2–3ϕ,1κ, 1da, 5–7tr, 5–8n	3ϕ, 1κ, 1da, 6tr, 8n	–	–	3ϕ, 1κ, 1da, 3tr, 12n	3ϕ, 1κ, 1da, 4tr, 10n	3ϕ, 1κ, 1da, 4tr, 10n	10n, 4tr, 3ϕ, 1da , 1κ	8n, 6tr, 3ϕ, 1da , 1κ
fn Ti II	2ϕ, 14–15n	2ϕ, 15n	–	–	2ϕ, 15n	2ϕ, 15n	2ϕ, 15n	15n, 2ϕ	14n, 2ϕ
fn Ti III	1ϕ, 15n	1ϕ, 15n	–	–	1ϕ, 15n	1ϕ, 15n	1ϕ, 15n	15n, 1 ϕ	14n, 1 ϕ
fn Ge I	4tr, 4σ, 4n	4tr, 16–20σ, 1κ, 4n	–	–	2tr, 12–16σ (12–13σ in paratypes), 1κ, 6n	2tr, 11σ, 1κ, 6n	2tr, 4σ, 1κ, 6n	6N, 2tr, 13–14σ, 1κ	4N, 4tr, 4σ, 1κ
fn Ge II	8n	8n	–	–	8n, 1κ	8n, 1κ	8n, 1κ	8n	8n
fn Ge III	9n	8n	–	–	8n	8n	8n	8n	8n
Sources	Haitlinger & Šundić 2017	Mayoral & Barranco 2017	Southcott 1948	Shiba 1976	Yazdanpanah et al. 2016	Wohltmann 2010	Wohltmann 2010	Amin et al. 2020	Xu et al. 2022

Table 3. Length of *as* and *bs* setae in two species of the genus *Hirstiosoma*.

	H. amfilohijei			*H. baenai*					
	Holotype	**Paratype 1**	**Paratype 2**	**Holotype**	**Paratype 1**	**Paratype 4**	**Paratype 5**	**Paratype 6**	**Paratype 7**
as	32	21	25	41	41	45	41	41	45
bs	30	27	23	36	45	41	45	32	36

DISCUSSION

Costa et al. (2021) revised the taxonomy of mites within the family Smarididae, proposing significant changes to the classification of several genera. They affirmed that Southcott's (1961) diagnostic criteria remain applicable for distinguishing species of the genus *Sphaerotarsus*. Prior to this, Mayoral & Barranco (2017), referencing Southcott (1961), Wohltmann (2010), and Yazdanpanah et al. (2016), had emphasized the morphological similarity between *Sphaerotarsus* and *Hirstiosoma*, noting that the morphology of the palpal tibial claw is an important character to identify these genera (palptibial claw apically divergent and bifurcate in *Sphaerotarsus* vs. palptibial claw not distinctly bifurcate and with only a narrow split at the apical end without separation of elements in *Hirstiosoma* (Fig. 4)).

Through phylogenetic analysis of selected Smarididae species, Costa et al. (2021) concluded that *Sphaerotarsus* comprises four valid species of which only *S. leptopilus* was described based on larval and post–larval stages. Consequently, *Hirstiosoma baenai* and *H. querca* were transferred from *Sphaerotarsus* to *Hirstiosoma*, and *Sphaerotarsus monticolus* was reassigned to the genus *Southcottiana*. In their revised identification key for Smarididae genera, Costa et al. (2021) designated the morphology and relative length of the anterior (*as*) and posterior hypostomal setae (*bs*) as the principal diagnostic characters to distinguish *Sphaerotarsus* from *Hirstiosoma*, as follows: *as* setae nude and shorter than *bs* setae in *Sphaerotarsus* (vs. *as* setae barbed and subequal to *bs* setae in *Hirstiosoma*). This character is confirmed in *S. leptopilus,* but it is not present in some species of *Hirstiosoma*.

Hirstiosoma latreillei belongs to the family Smarididae, which is known for morphological and physiological characters that cause minimal water loss, representing clear adaptations to xeric environments. The habitat of *H. latreillei* typically consists of forest leaf litter, where moisture and organic matter provide suitable conditions for development. Moreover, its habitats are characterized by warm and at least periodically dry conditions (Wohltmann et al. 2001). Additionally, *Hirstiosoma* requires a chilling period before eggs develop into prelarvae and subsequently larvae (Wohltmann 2010).

The climatic conditions at the sampling site in the present study, located in Mazandaran Province, as well as those at the site previously reported in Asalem city by Noei et al. (2013), are consistent with those of European regions where *H. latreillei* has been previously recorded. This similarity is primarily due to the presence of a required chilling period before egg development across all these areas. Additionally, forest vegetation is a common feature among these habitats. A nearby seasonal river at the mite collection site in Mazandaran dries up during certain months, further indicating the region's periodic dryness. Moreover, the considerable distance between the previous sampling site and the current collection locality in the present study suggests that *H. latreillei* is likely distributed not only across the forested regions of the northern Alborz Mountains in Iran but also in adjacent countries situated between Iran and Europe, such as Türkiye. Furthermore, considering the altitudinal range of the collection sites –from Gijav village near Asalem city, Guilan province (although the geographical coordinates provided in the original article do not precisely match the actual location of the village, suggesting a possible discrepancy in geospatial referencing; if accepted, Gijav village is at 194 m a.s.l., but if the coordinates are correct, the altitude is 489 m), and from the current study site at 1470 m, as well as those reported from European localities, it can be inferred that the occurrence of this species is not dependent on altitude. Collecting the larval hosts of this species may provide critical insights into its host specificity and wider geographic distribution.

There are differences in metric data between Iranian and European specimens, such as Ti III (> 420 vs. 380–390) and Ti I (> 280 vs. 230–250), which we considered intraspecific variations. These differences may be attributed to variations in vegetation cover and habitat elevation, which can influence the hosts of this species.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: M. Hakimitabar and M. Davari: designed the study; M. Hakimitabar provided resources, supplies, and lab space and oversaw the research; M. Davari: collected the specimens and prepared a manuscript; M. Hakimitabar re-examined the specimens and revised the manuscript. The authors read and approved the final version of the manuscript. The authors read and approved the final version of the manuscript.

FUNDING

This research received no specific grant from any funding agencies.

AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the Acarological Collection, Jalal Afshar Zoological Museum, Faculty of Agriculture, University of Tehran, Karaj, Iran, and are available from the curator upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included arthropod material, and all required ethical guidelines for the treatment and use of animals were strictly adhered to in accordance with international, national, and institutional regulations. No human participants were involved in any studies conducted by the authors for this article.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

GENERATIVE AI STATEMENT

The authors declare that no generative AI tools were used for content generation or data analysis in the preparation of this manuscript.

ACKNOWLEDGMENTS

We are grateful to anonymous referees and the subject editor for their useful comments, which greatly improved the manuscript.

REFERENCES

Amin, M.R., Khanjani, M. & Nadri, A.R. (2020) A new species of the genus *Sphaerotarsus* (Acari: Parasitengonina: Smarididae) from Iran. *Systematic & Applied Acarology*, 25 (11), 1963–1968. https://doi.org/10.11158/saa.25.11.3

Costa, S., Welbourn, C., Klimov, P. & Pepato, A. (2021) Integrating phylogeny, ontogeny and systematics of the mite family Smarididae (Prostigmata, Parasitengona): Classification, identification key, and description of new taxa. *Systematic and Applied Acarology,* 26 (6), 85–123. https://doi.org/10.11158/saa.26.1.6

Costa, S.G.S., Tolstikov, A., Saboori, A., Batista–Ribeiro, D., Noei, J., Harvey, M.S., Shaw, M.D., Klimov, P.B., Zhang, Z.-Q. & Pepato, A.R. (2024) A comprehensive molecular phylogeny of the terrestrial Parasitengona (Acariformes, Prostigmata) provides insights into the evolution of their metamorphosis, invasion into aquatic habitats and classification. *Molecular Phylogenetics and Evolution*, 199, 108–147. https://doi.org/10.1016/j.ympev.2024.108147

Gabryś, G., Roland, E., Mąkol, J. & Lehtinen, P.T. (2009) Erythraeoidea (Acari: Prostigmata: Parasitengona) of Finland – state of knowledge and new data. *Zeszyty Naukowe Uniwersytetu Przyrodniczego we Wrocławiu*, *Biologia i Hodowla Zwierząt*, 58, 572, 21–28.

Grandjean, F. (1947) Étude sur les Smarisidae et quelques autres Erythroides (Acariens). *Archives de Zoologie Experimentale et Generale*, 85 (1), 1–126

Haitlinger, R. & Sundic, M. (2017) *Hirstiosoma amfilohijei* sp. nov. (Trombidiformes: Smarididae) from Montenegro. *Turkish Journal of Zoology*, 41, 940–945. https://doi.org/10.3906/zoo–1611–15

Mąkol, J. & Wohltmann, A. (2012) An annotated checklist of terrestrial Parasitengona (Actinotrichida: Prostigmata) of the world, excluding Trombiculidae and Walchiidae. *Annales Zoologici*, 62 (3), 359–562. https://doi.org/10.3161/000345412X656671

Mayoral, J. & Barranco, P. (2017) Description of a new species of *Sphaerotarsus* (Acari: Parasitengonina: Smarididae) and new record for the fauna of Europe. *Systematic & Applied Acarology,* 22 (5), 622–628. https://doi.org/10.11158/saa.22.5.2

Noei, J., Saboori, A., Šundić, M., Hajizadeh, J. & Pešić, V. (2013) A new species and two new records of larval mites (Acari: Prostigmata; Erythraeidae, Smarididae) from northern Iran and Montenegro. *Systematic & Applied Acarology*, 18 (3), 263–272. https://doi.org/10.11158/saa.18.3.9

Shiba, M. (1976) Taxonomic investigation on free living Prostigmata from the Malay Peninsula. *Nature and life in Southeast Asia,* 7, 83–299.

Southcott, R. (1948) Larval Smarididae (Prostigmatana) from Australia and New Guinea. *Proceedings of the Linnean Society of New South Wales,* 72, 252–264.

Southcott, R.V. (1961) Studies on the systematics and biology of the Erythraeoidea (Acarina), with a critical revision of the genera and subfamilies. *Australian Journal of Zoology*, 9 (3), 367–610. https://doi.org/10.1071/ZO9610367

Walter, D.E. & Krantz, G.W. (2009) Collecting, rearing, and preparing specimens. In: Krantz, G.W. & Walter, D.E. (eds) *A Manual of Acarology.* Third Edition. Lubbock, Texas Tech University Press, pp. 83–96.

Wohltmann, A. (2010) Notes on the taxonomy and biology of Smarididae (Acari: Prostigmata: Parasitengona). *Annales Zoologici*, 60 (3), 355–381. https://doi.org/10.3161/000345410X535361

Wohltmann, A., Witte, H. & Olomski, R. (2001) Patterns favouring adaptive radiation versus patterns of stasis in Parasitengonae (Acari: Prostigmata). In: Halliday, R.B., Walter, D.E., Proctor, H.C., Norton, R.A. & Colloff, M.J. (eds) *Proceedings of the 10th International Congress of Acarology*. July 16, 2011. CSIRO Publishing, Melbourne, pp. 83–99.

Wohltmann, A., Gabryś, G. & Mąkol, J. (2006) [2007] Terrestrial Parasitengona inhabiting transient biotopes. In: Gerecke, R. (ed.) *Süßwasserfauna von Mitteleuropa.* Vol. 7/2–1, *Chelicerata: Acari I.* München, Spektrum Elsevier, pp. 158–240. https://doi.org/10.1007/978-3-662-55958-1_6

Womersley, H. (1934) A revision of the Trombid and Erythraeid mites of Australia with descriptions of new genera and species. *Records of the South Australian Museum*, 5 (2), 179–254.

Womersley, H. (1936) Additions to the Trombidiid and Erythraeid Acarine fauna of Australia and New Zealand. *Journal of the Linnean Society of London*, 40 (269), 107–121. https://doi.org/10.1111/j.1096-3642.1936.tb01680.x

Womersley, H. & Southcott, R.V. (1941) Notes on the Smarididae (Acarina) of Australia and New Zealand. *Transactions of the Royal Society of South Au*stralia, 65 (1), 61–78.

Xu, S.-Y., Jin, D.-C., Guo, J.-J. & Yi, T.-C. (2022) Four new species of larval Erythraeoidea (Acari: Trombidiformes: Prostigmata) and three higher taxa new to China: genus *Hirstiosoma* and subfamily Hirstiosomatinae (Smarididae), and genus *Grandjeanella* (Erythraeidae: Abrolophinae). *Systematic & Applied Acarology*, 27 (9), 1813–1840. https://doi.org/10.11158/saa.27.9.10

Yazdanpanah, S., Saboori, A. & Hamikitabar, M. (2016) Description of a new species of *Sphaerotarsus* Womersley (Acari: Trombidiformes: Smarididae) based on larvae from Iran. *Systematic & Applied Acarology*, 21 (7), 868–877. https://doi.org/10.11158/saa.21.7.2

یادداشت‌هایی درباره دو جنس *Sphaerotarsus* Womersley, 1936 و *Hirstiosoma* Womersley, 1934 (Trombidiformes: Smaridiidae)، همراه با گزارش جدید از پراکنش گونه *Hirstiosoma latreillei* (Grandjean, 1947) در شمال ایران

مسعود حکیمی تبار و میلاد داوری

گروه باغبانی و گیاهپزشکی، دانشکدهٔ کشاورزی، دانشگاه صنعتی شاهرود، شاهرود، ایران

نویسندهٔ مسئول: مسعود حکیمی تبار | Hakimitabar@shahroodut.ac.ir

ویراستار علمی
جواد نوعی

دریافت: ۲۴ شهریور ۱۴۰۴

ویرایش: ۲۳ بهمن ۱۴۰۴

پذیرش: ۲۵ بهمن ۱۴۰۴

انتشار: ۰۲ اسفند ۱۴۰۴

چکیـده: در این مطالعه، بازتعریف مرحله لاروی دو جنس *Sphaerotarsus* و *Hirstiosoma* (Trombidiformes: Smaridiidae) ارایه شده و داده‌های جدیدی درباره لارو گونهٔ *Hirstiosoma latreillei* (Grandjean, 1947) که از خاک و لاشبرگ‌های جنگل‌های هیرکانی در نزدیکی روستای تیلک، شهرستان ساری، استان مازندران ایران جمع‌آوری شده، گزارش می‌شود. پیش از این پژوهش، تنها یک نمونه از *H. latreillei* در شهر اسالم، استان گیلان ایران جمع‌آوری شده بود. فاصله قابل توجه میان مکان نمونه‌برداری قبلی در ایران و مکان جمع‌آوری در مطالعه حاضر و همچنین کشورهای اروپایی که قبلا این گونه از آنجا گزارش شده، نشان می دهد که این گونه احتمالاً نه تنها در جنگل‌های رشته‌کوه البرز شمالی ایران، بلکه در کشورهای مجاور میان ایران و اروپا، مانند ترکیه نیز پراکنش دارد. افزون بر این، با توجه به دامنه ارتفاعی محل‌های جمع‌آوری در روستای گیجاو، شهر اسالم، استان گیلان و مطالعه کنونی، همچنین گزارش‌های مربوط به مناطق اروپایی، می‌توان نتیجه گرفت که حضور این گونه وابسته به ارتفاع نیست. جمع‌آوری میزبان لاروی این گونه می‌تواند دیدگاه‌های مهمی درباره تخصص میزبانی و پراکندگی جغرافیایی گسترده‌تر آن فراهم کند. بخشی از کلید شناسایی جنس‌های خانواده Smaridiidae اصلاح و دو جنس *Sphaerotarsus* و *Hirstiosoma* نیز بازتعریف شدند. کلید شناسایی گونه‌های لاروی جنس *Hirstiosoma* در جهان ارایه گردید.

واژگـان کلیدی: کلید شناسایی، گزارش جدید، پیش‌استیگمایان، مخملی‌سانان، Hirstiosomatinae، Erythraeidae