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Unveiling a new record: *Abrolophus norvegicus* (Thor, 1900) (Trombidiformes: Erythraeidae) from Iran

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The genus *Abrolophus* (Acari: Erythraeidae) comprises a diverse group of predatory mites known for their ecological significance and wide geographical distribution (Zhang 2011). *Abrolophus* larvae are divided into two groups on the basis of the presence or absence of a comb-like seta on the palpal tarsus (Hakimitabar and Davari 2025; Wohltmann and Mąkol 2012). Iran, situated at the crossroads of several biogeographic zones, harbors a remarkably diverse mite fauna. However, *Abrolophus* has received limited attention in acarological surveys conducted in the country. Previous records of *Abrolophus* species from Iran are scarce, and many regions remain unexplored, leaving significant gaps in our understanding of their distribution and diversity. So far, five species have been reported from Iran, of which four species belong to *Abrolophus* species with comb-like seta on their palptarsus, *A. bochkovi* Hakimitabar, Saboori & Fadaei, 2020, *A. iraninejadi* Saboori & Hajiqanbar, 2005, *A. ederleae* Hakimitabar, 2025, *A. khanjanii* (Haitlinger & Saboori, 1996) and one species belongs to *Abrolophus* species without a comb-like seta on their palptarsus, *A. hajiqanbari* Noei, 2022 (Haitlinger and Saboori 1996; Saboori and Hajiqanbar 2005; Hakimitabar *et al.* 2020; Noei 2022; Çobanoğlu *et al.* 2023; Hakimitbar and Davari 2025). Wohltmann and Mąkol (2012) redescribed *A. norvegicus* (Thor, 1900) based on specimens obtained by laboratory rearing from field-collected females and field collected larvae at different localities in Norway, Finland, Germany, Poland and Italy. The specific status of *A. norvegicus* is discussed and they selected a female of *A. norvegicus*, collected in northern Germany as neotype. This species was collected from 32 European countries.

Five larvae (JAZM-AC-Er-058a, b, c, d, e) were collected from soil collected from the base of Lavender Mountain Lily (*Ixiolirion tataricum* (Pall.), Amaryllidaceae) (Figs 1A and B) and were extracted by Berlese funnels; leg. D. Bastani-Rad in Panj Pariz mountain, Deh-e Khvajeh village, Pariz District of Sirjan County, Kerman province, Iran (29° 51 92" N, 56° 01' 60" E, altitude 2642 m a.s.l.) on 10 May 2024. The collection site is located within a semi-arid mountainous region characterized by rocky slopes, sparse vegetation, and seasonal herbaceous flora. The soil was sandy-loamy with moderate organic content, and the dominant plant species at the sampling point was *I. tataricum*, growing in open, sun-exposed patches at approximately 2,100 meters elevation.

After extraction, mites were preserved in 75% ethanol, then cleared in Lactic acid and mounted in Hoyer's medium on microscope slides (Walter and Krantz 2009). Measurements were calculated using a BX51 Olympus microscope equipped with a drawing tube. Measurements are given in micrometers (µm). The terminology and abbreviations are adapted from Wohltmann *et al.* (2006) and Saboori *et al.* (2009). All specimens are deposited in the Acarological Collection, Jalal Afshar Zoological Museum (JAZM),

Faculty of Agriculture, University of Tehran, Karaj, Iran.

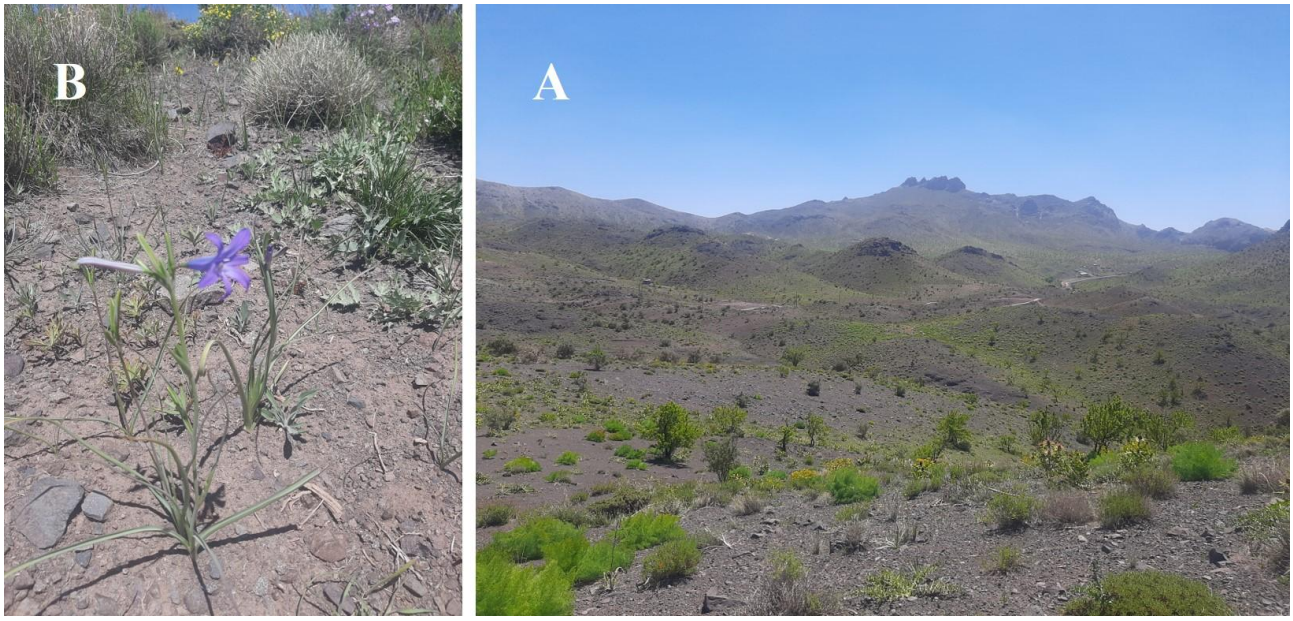

Figure 1. Sampling localities. **A.** Habitat and collecting site of *Abrolophus norvegicus* in Kerman Province, Iran; **B.** Lavender Mountain Lily plant where soil collected.

***Abrolophus norvegicus* (Thor, 1900)**

Ritteria norvegica Thor, 1900: 7.

Hauptmannia brevicollis Oudemans, 1910: 109.

Abrolophus norvegicus (Thor, 1900): Gabryś and Mąkol 1994: 129.

Hauptmannia brevicollis: Haitlinger 2007.

Abrolophus neobrevicollis Zhang & Goldarazena, 1996: 127.

Hauptmannia striata Saboori, Šundic & Pešic, 2011: 64.

Hauptmannia dagmarae Haitlinger, 2012: 42.

Distribution

Andorra, Austria, Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Iceland, Ireland, Latvia, Liechtenstein, Lithuania, Moldova, Norway, Poland, Portugal (Madeira), Romania, Russia, Slovakia, Slovenia, Sweden, The Netherlands, Ukraine, Spain (Zhang and Goldarazena 1996 as *Abrolophus neobrevicollis*), Montenegro (Saboori *et al.* 2011 as *Hauptmannia striata*), Italy (Haitlinger 2012 as *Hauptmannia dagmarae*) and **Iran (new record)**.

Diagnosis (larva)

Palpal femur without projection; palpal tibial claw bifurcate and accessory claw entire (not bifurcate); cheliceral bases punctated and striated; Ti III 74–108.

Measurements (presented in μm) are given in Table 1.

Wohltmann and Mąkol (2012) in addition to recording metric data for adult specimens, they also assessed both metric and meristic characters (the number of setae on most of the leg segments varies and has a range) of the laboratory-reared larvae. Their findings revealed that the greatest degree of variation occurred in the metric parameters and in the number of normal setae on the idiosoma (fD formula) and particularly on the genua and tibiae of legs I–III. In contrast, other morphological traits especially the number, shape, and position of specialized setae remained largely consistent. Minor differences in measurement ranges were observed among populations from different geographic locations but the overall values showed substantial overlap across all examined characters.

Table 1. Biometric and some meristic data of *Abrolophus norvegicus* larva.

Character	Present Study					Wohltmann and Mąkol (2012)	Haitlinger (2012)	Saboori *et al.* (2011)
	1a	1b	1c	1d	1e			
SD	68	70	66	75	69	68–88	58-70	73-75
W	52	50	48	58	50	68–84	60-78	73-75
AW	31	40	33	37	38	42–57	39-51	46-52
PW	42	41	41	47	42	62–80	56-71	64-66
AA	11	12	11	11	10	16–21	10-15	10-15
SB	10	12	11	12	12	8–18	10-16	17-19
ISD	52	56	53	57	54	–	40-51	52-62
AP	27	32	41	30	25	–	14-19	14-22
AL	41	46	42	47	40	25–40	31-36	26-30
PL	40	43	35	38	37	44–63	39-45	42-47
ASens	32	33	32	47	37	28–50	22-28	33-42
PSens	70	63	71	73	72	52–89	54-65	50-63
DS	42-67	33-62	35-60	35-64	33-61	–	32-50	30-54
1a	41	37	40	33	41	–	38	27-32
2a	32	33	30	26	30	–	–	26-32
3a	25	24	27	27	25	–	–	26-30
1b	37	45	45	45	50	–	46–48	50-63
2b	30	30	28	28	35	–	–	25-35
3b	28	28	30	33	30	–	–	25-30
GL	103	98	105	103	105	–	–	114-121
as1	30	29	30	28	28	–	33	30-52
as2	4	4	5	4	5	–	5	–
bs	39	38	40	38	38	–	42	33-37
cs	18	20	17	17	19	22–42	22	27-35
Ta I (L)	62	65	59	63	59	56–75	56–69	62-66
Ti I	82	81	83	83	80	62–80	57–66	64-70
Ge I	78	77	74	75	75	58–75	62–70	62-67
TFe I	40	43	43	43	41	28–40	28–34	32-35
BFe I	55	55	51	51	56	35–57	39-50	35-50
Tr I	57	45	47	50	46	32–53	36-42	37-50
Cx I	53	51	43	52	56	48–65	48-63	52-60
Leg I	426	415	400	417	413	–	335–386	349-390
Ta II (L)	57	61	50	56	59	52–72	52–62	54-60
Ti II	77	73	41	74	74	56–79	52–65	52-67
Ge II	70	68	48	72	64	55–74	55–68	57-64
TFe II	37	37	37	37	35	24–36	26–31	27-32
BFe II	46	50	68	47	45	30–49	36–41	32-42
Tr II	37	46	73	41	50	37–51	42–45	42-50
Cx II	62	57	56	62	66	48–82	58–68	62-77
Leg II	385	391	373	389	393	284–417	327–379	346-378
Ta III (L)	52	57	56	62	57	52–72	53–65	55-61
Ti III	102	99	99	101	99	84–108	74–98	89-97
Ge III	79	83	83	83	82	68–88	67–78	74-79
TFe III	45	43	45	43	50	31–48	38–45	37-42
BFe III	56	53	53	50	52	37–52	40–47	28-45
Tr III	40	48	52	53	50	40–54	42–56	42-50
Cx III	65	56	56	64	63	53–83	57–69	52-71
Leg III	437	440	444	456	453	322–478	381–458	396-430
IP	1248	1246	0	0	0	–	–	1107-1195
fD	50	50	50	48	50	44–54	36–46	46
Intercoxalae I-II	4	4	4	4	4	4	4	4

Table 1. Continued.

Character	Present Study					Wohltmann and Mąkol (2012)	Haitlinger (2012)	Saboori *et al.* (2011)
	1a	1b	1c	1d	1e			
Intercoxalae II-III	12	15	12	16	12	14	8	16
Setae behind coxae III	20	26	20	24	20	20	20	19
fV	36	45	36	44	36	38	32	39

Variations in the number of setae are frequently observed among terrestrial Parasitengona (Southcott 1997; Mąkol and Łaydanowicz 2006). Consequently, it is essential to quantify the setae on both sides of the legs to ensure accurate morphological assessment. When species are reared under laboratory conditions, the optimal environmental parameters are often unknown, which may result in the expression of abnormalities or variability in meristic characters. Roland and Gabryś (2011) proposed that suboptimal rearing conditions could contribute to the emergence of such anomalies and malformations. Notably, similar morphological abnormalities have also been documented in field-collected larvae. While these may reflect geographic variation, environmental stressors (pollution) within the habitat are likely to play a significant role.

Leg segmentation formula: 7–7–7. Leg setal formula is as follows (There are not any abnormalities in any specimen). Leg I: Ta – 1ω, 1ε, 2ζ, 1z, 24n; Ti – 2φ, 1κ, 13n; Ge – 1σ, 1κ, 11n; TFe – 8n; BFe – 4n; Tr – 2n; Cx – 1n; Leg II: Ta – 1ω, 2ζ, 1z, 20n; Ti – 2φ, 13n; Ge – 1σ, 1κ, 9n; TFe – 5n; BFe – 4n; Tr – 2n; Cx – 1n; Leg III: Ta – 1ζ, 20n; Ti – 1φ, 13n; Ge – 1σ, 9n; TFe – 5n; BFe – 4n; Tr – 2n; Cx – 1n.

As previously noted for the genera *Leptus* (Saboori *et al.* 2020) and *Charletonia* (Hakimitabar and Saboori 2022), the number of setae on the leg segments, palps, and gnathosoma appears to be consistent within species of *Abrolophus*. However, to substantiate this observation, a comprehensive examination of all described species within the genus is required.

The presence of *A. norvegicus* in southeastern Iran (Sirjan, Kerman Province) suggests that its distribution may extend across additional regions of Iran and potentially span the area between Iran and European countries. Although the known hosts of *Abrolophus* species are insects from the suborder Sternorrhyncha - characterized by limited mobility - the occurrence of *A. norvegicus* in this region is noteworthy. This finding warrants further investigation, including targeted host collection, to elucidate the ecological and biogeographical factors underlying its presence.

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