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Article

New data on *Marantelophus iranicus* and *Empitrombium makolae* (Acari: Erythraeidae, Microtrombidiidae)

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ABSTRACT
Additional morphometric and other data are provided for larvae of *Marantelophus iranicus* (Trombidiformes: Erythraeidae) collected ectoparasitic on *Carpocoris coreanus* (Hemiptera: Pentatomidae) and from soil and litter (off-host) in South Khorasan Province (Chahkand, Giuk, Khan and Shahrestanak villages, Birjand), Iran. A key to the genera of larval Abrolophinae and larval species of *Marantelophus* of the world is presented. Moreover, the family Chironomidae is recorded as the host of *Empitrombium makolae* (Trombidiformes: Microtrombidiidae) for the first time.

KEYWORDS: Birjand, Chahkand, Giuk, Khosf, Darmiyan, Pentatomidae.

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INTRODUCTION

The subfamily Abrolophinae Witte, 1995 (Trombidiformes: Erythraeidae) comprises of seven genera based on larvae or adults and larvae, *Abrolophus* Berlese, 1891 [P, L], *Grandjeanella* Southcott, 1961 [L], *Pussardia* Southcott, 1961 [L], *Harpagella* Southcott, 1996 [L], *Nagoricanella* Haitlinger, 2009 [L], *Marantelophus* Haitlinger, 2011 [L] and *Pukakia* Clark, 2014 [L] (Mąkol and Wohltmann 2012; Clark 2014; Kamran and Alatawi 2015) among which, the genus *Marantelophus* consists of 12 species based on larvae only. Larval *Marantelophus* are known as parasites of Hemiptera, Thysanoptera and Psocoptera (see Table 1). Up to now, only three species of the genus *Marantelophus* have been recorded from Iran as follows: *M. rudaensis*, *M. iranicus* and *M. ostovani*. Classification of some species, recently revised, led to new combination and new synonymies; *Marantelophus bella* (Zhang, 1996) were transferred to the genus *Nagoricanella* by Saboori *et al.* (2016). *Marantelophus sanandajensis* Hakimitabar & Saboori, 2015 and *M. kamalii* (Saboori & Atamehr, 2000) were synonymized by Haitlinger (2016) with *M. rudaensis* and *M. iranicus*, respectively.

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In this paper, we present new morphological data for *M. iranicus* larvae, and *Carpocoris coreanus* Distant is recorded as host of this species for the first time. A key to the genera of larval Abrolophinae and one for world species (larvae) of *Marantelophus* are included. The family Chironomidae is recorded as host of *Empitrombium makolae* Sevsay & Karakurt, 2013 for the first time.

Table 1. The known species of *Marantelophus* and their hosts.

Species	Host	Distribution	References
M. miyatakei (Kawashima, 1958)	*Homotoma radiatum* (Homotomidae), *Trioza* spp. (Triozidae) (Hemiptera: Sternorrhyncha)	Japan	Kawashima (1958); Mąkol and Wohltmann (2012); Haitlinger and Šundić (2018)
M. trifarius (Shiba, 1976)	off-host	Malaysia	Shiba (1976); Mąkol and Wohltmann (2012); Haitlinger and Šundić (2018)
M. rudaensis (Haitlinger, 1986)	unidentified Thysanoptera and Aphididae	Greece, Iran, Moldova, Poland, Saudi Arabia, Switzerland, Turkey	Haitlinger (1986); Mąkol and Wohltmann (2012); Kamran and Alatawi (2015); Haitlinger (2016)
M. iranicus (Haitlinger & Saboori, 1996)*	off-host	Iran	Haitlinger and Saboori (1996); Saboori and Atamehr (2000); Haitlinger (2011); Mąkol and Wohltmann (2012); Haitlinger and Šundić (2014); Haitlinger (2016)
M. multisetosus (Zhang & Goldarazena, 1996)	*Thrips tabaci* in flower of *Galium aparine*, larvae and an adult of *Odontothrips ignobilis*, females of *Tenothrips frici*, a larva of undetermined Aeolothripidae (Thysanoptera)	Croatia, Greece, Hungary, Romania, San Marino, Spain, Turkey, Ukraine	Zhang and Goldarazena (1996); Haitlinger (2011); Mąkol and Wohltmann (2012)
M. ostovani (Haitlinger & Saboori, 1996)	undetermined Aphididae	Iran	Haitlinger and Saboori (1996); Haitlinger (2011); Mąkol and Wohltmann (2012)
M. haitlingeri (Goldarazena & Zhang, 1997)	undetermined Heteroptera in flower of *Galium mollugo*	Spain	Goldarazena and Zhang (1997); Haitlinger (2011); Mąkol and Wohltmann (2012)
M. ainae (Haitlinger, 2002)	off-host	Spain	Haitlinger (2002); Haitlinger (2011); Mąkol and Wohltmann (2012)
M. emanueli (Haitlinger, 2010)	off-host	Turkey	Haitlinger (2010); Mąkol and Wohltmann (2012); Kamran and Alatawi (2015)
M. alaperti Haitlinger, 2011	off-host	Indonesia	Haitlinger (2011); Mąkol and Wohltmann (2012)
M. hieronimi (Haitlinger & Łupicki, 2013)	off-host	Italy	Haitlinger and Łupicki (2013); Mąkol and Wohltmann (2012); Haitlinger and Šundić (2018)
M. dubifurcatus Xu, Yi & Jin, 2017	*Cacopsylla* (Hemiptera: Sternorrhyncha: Psyllidae) and Psocoptera	China	Xu *et al*. (2017)

* This species was collected ectoparasitic on *Carpocoris coreanus* (Hemiptera: Pentatomidae) in this study.

MATERIAL AND METHODS

Three specimens of *Marantelophus iranicus* were extracted from soil and litter by a Berlese funnel,

one ectoparasitic larva was detached from the abdomen of *C. coreanus* Distant (Hemiptera: Heteroptera: Pentatomidae) and two ectoparasitic larva of *Empitrombium makolae* were detached from the abdomen of an unidentified nematoceran fly (Diptera: Chironomidae) by an insect pin under a stereomicroscope. Mites were cleared in lactic acid or lactophenol and mounted on glass microscope slides using Hoyer's medium (Walter and Krantz 2009). Measurements (given in micrometers, µm) were calculated using a CH30 Olympus microscope and figures were drawn by a BX51 Olympus microscope equipped with a drawing tube and magnification changer. Lengths of leg tarsi were measured without the stalk and pretarsus. The terminology and abbreviations are adapted from Wohltmann *et al.* (2006), Saboori *et al.* (2009) and Wohltmann and Mąkol (2012).

Erythraeidae Robineau-Desvoidy, 1828
Abrolophinae Witte, 1995
Genus *Marantelophus* Haitlinger, 2011

Marantelophus iranicus (Haitlinger & Saboori, 1996) [L]

Hauptmannia iranica Haitlinger & Saboori, 1996: 120.
Grandjeanella kamalii Saboori & Atamehr, 2000: 2.
Marantelophus kamalii (Saboori & Atamehr, 2000): Haitlinger 2011: 50; Haitlinger and Šundić 2014: 40.
Marantelophus iranicus: Haitlinger 2016: 1189.

Diagnosis

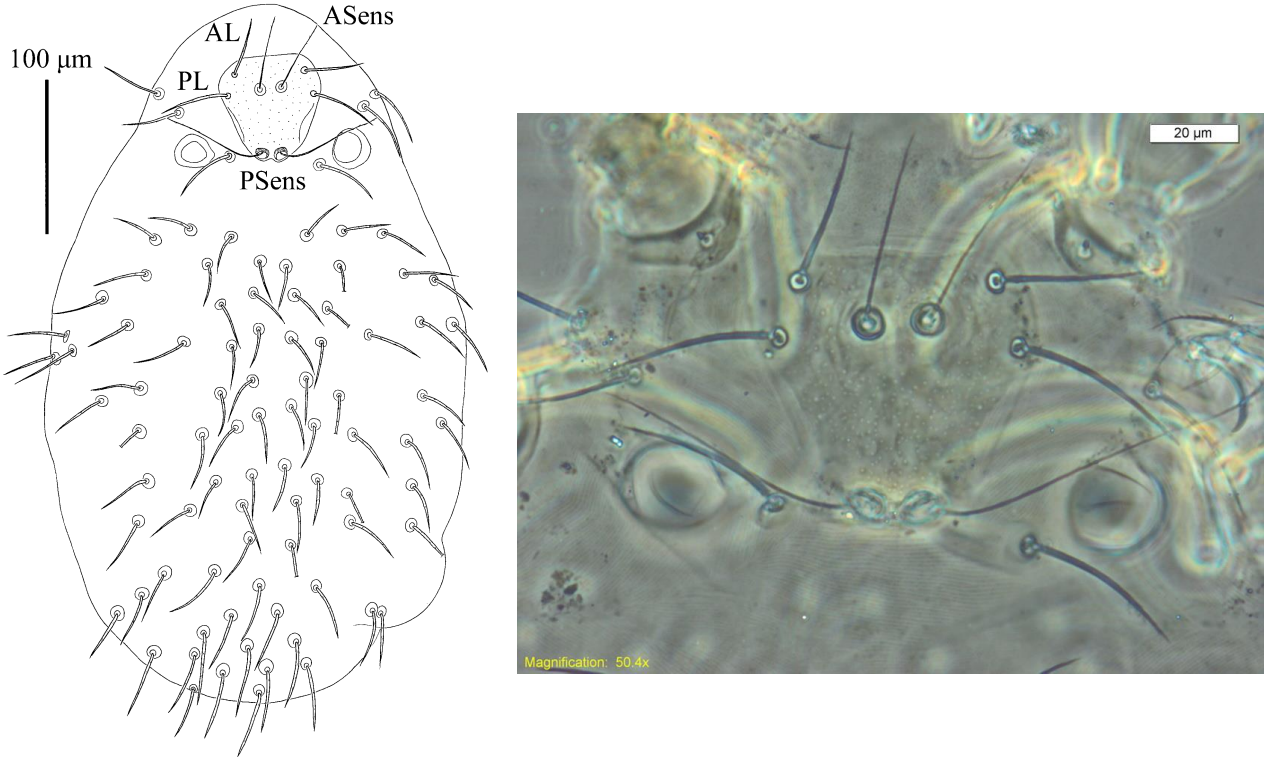
fn BFe 5-5-5; fn TFe 8-5-5; fn Ge 11-9-9; fn Ti 13-13-13; fn Ta 25-21-22; ISD 27–42.

Material examined

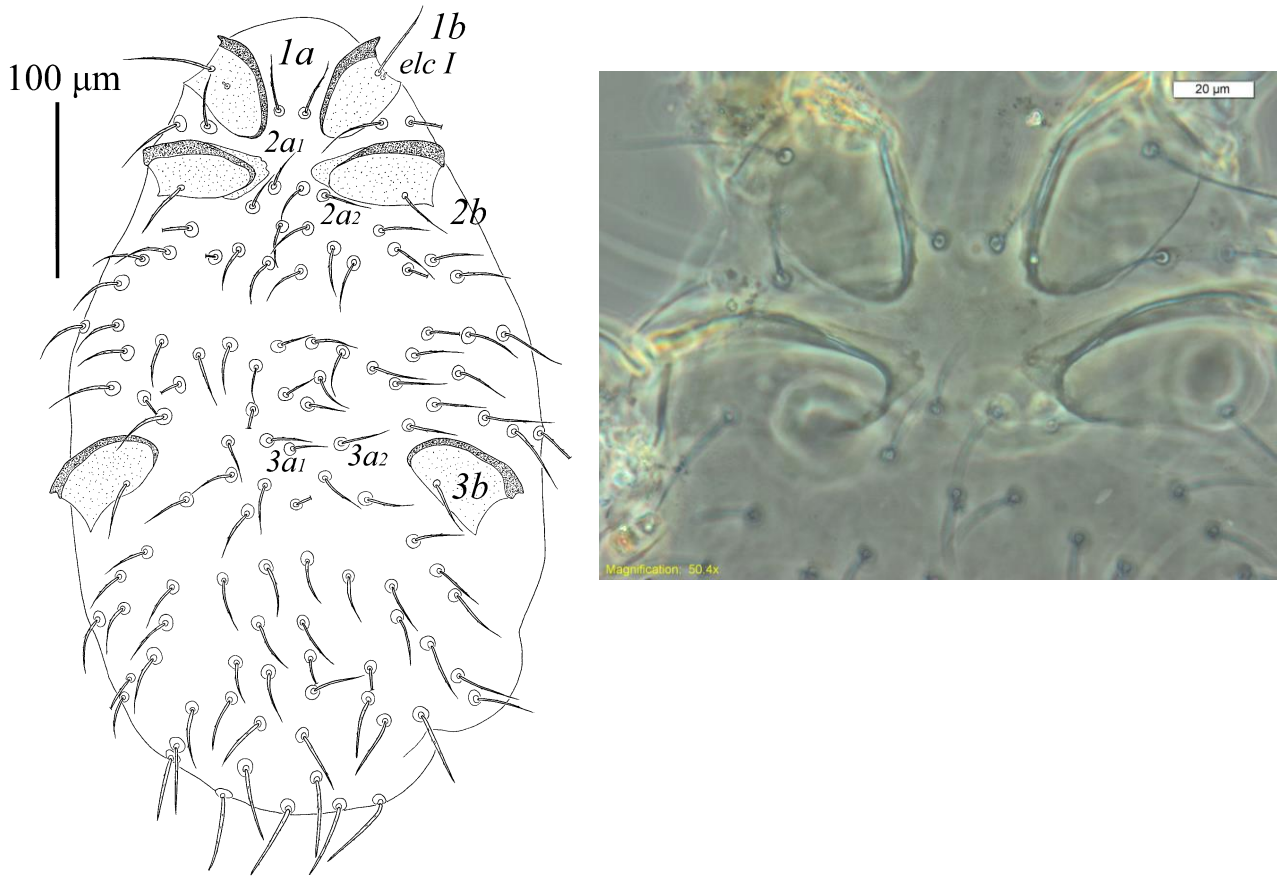
One (ARS-20220503-2a) larva was collected ectoparasitic on *C. coreanus* (Hemiptera: Pentatomidae), IRAN: South Khorasan Province, Birjand city, Khosf region, Shahrestanak village (33° 15.39′ N, 59° 43.03′ E, 2111 m a.s.l.), 17 June 2020, one larva (ARS-20220503-2b), from Darmiyan region, Khan village (32° 41.57′ N, 59° 13.58′ E, 1893 m a.s.l.), from soil and litter, 10 July 2020, coll. Mahnaz Kohansal; one larva (ARS-20220503-2c), from Giuk village (32° 47.31′ N, 59° 07.33′ E, 1961 m a.s.l.) from soil and litter, 17 May 2019, and one larva (ARS-20220503-2d), from Chahkand village (32° 49.55′ N, 59° 09.37′ E, 1716 m a.s.l.) from soil and litter, 31 May 2019, coll. Javad Noei. Two specimens (ARS-20220503-2a–b) are deposited in the Acarological Collection, Jalal Afshar Zoological Museum, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran, and two specimens (ARS-20220503-2c–1d) are deposited in the Acarological Collection, Acarological Society of Iran, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran.

Some details about the gnathosoma (cheliceral blade, anterior hypostomalae, dorsal surface of cheliceral bases, palpal supracoxal seta), dorsal and ventral surface of idiosoma (present small plates, supracoxal seta on Coxa I, a punctate area attached to the coxae II) are not mentioned and illustrated in Haitlinger and Saboori (1996) and Saboori and Atamehr (2000). Based on the material examined in the present study, complementary data to the species characteristics are as follows:

Dorsum (Figs. 1, 2) – Dorsum of idiosoma with 87–88 barbed setae of which three pairs are around the scutum (two pairs lateral to scutum and anterior to eyes, and one pair between eyes and scutum). All dorsal setae with fine barbs and arising from small plates. Scutum triangular in shap, punctate, with two pairs of sensilla (ASens and PSens) and two pairs of normal setae (AL and PL). PSens longer than ASens, both barbed at distal one-third. AL and PL subequal, both barbed. Posterolaterally on each side of scutum one eye (diameter 25–27).



Figures 1–2. *Marantelophus iranicus* (larva) – 1. Dorsal view of idiosoma; 2. Scutum.

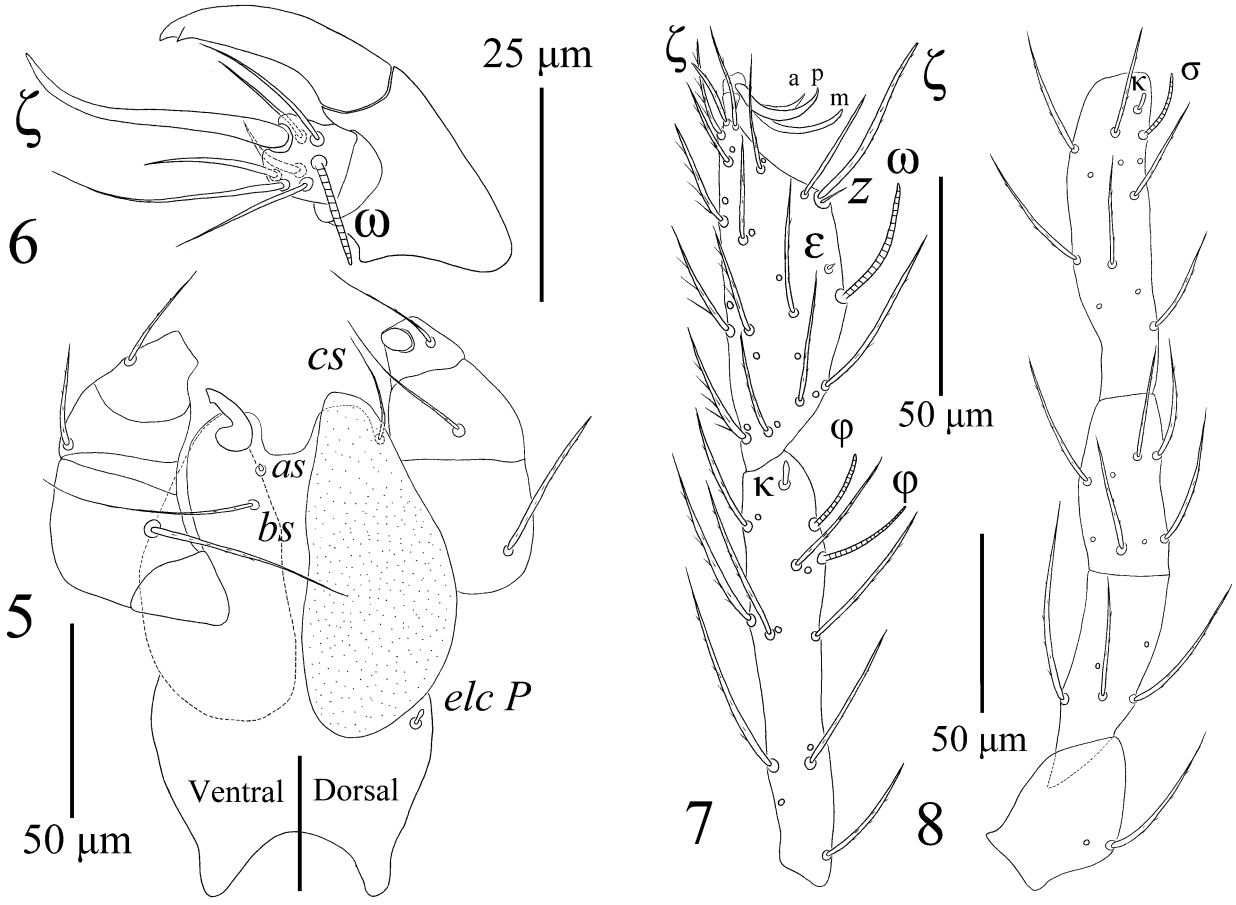


Figures 3–4. *Marantelophus iranicus* (larva) – 3. Ventral view of idiosoma; 4. Punctated area attached to the coxae II.

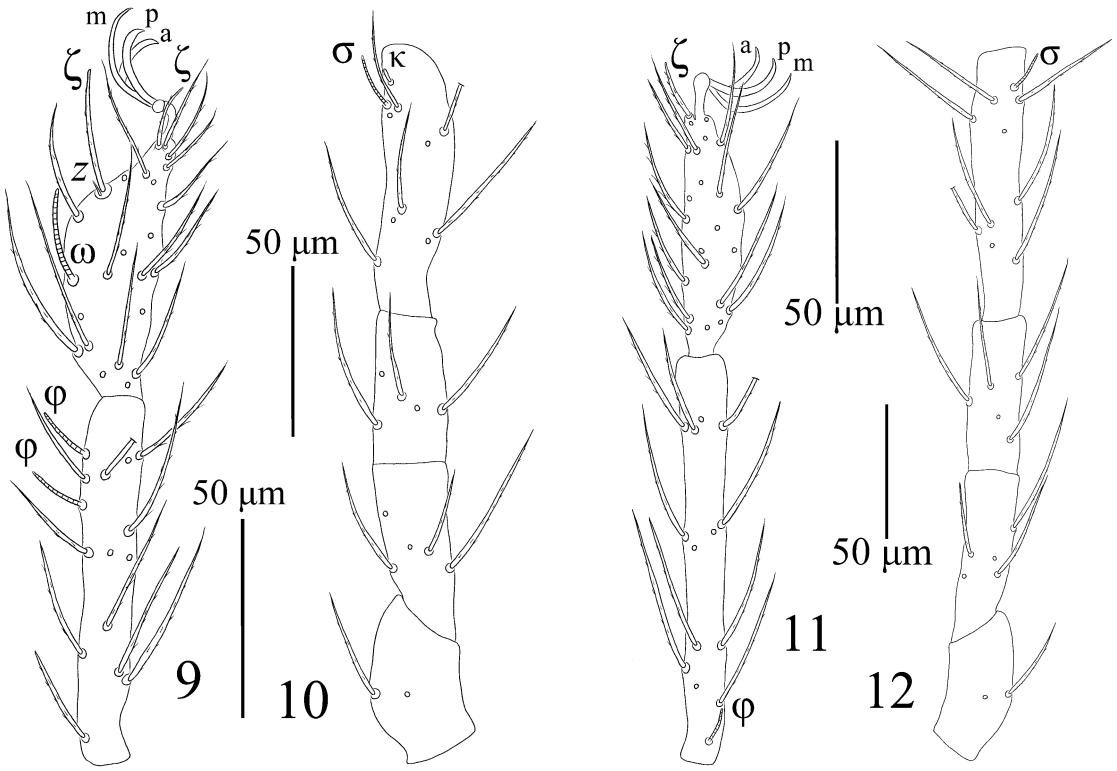
Venter (Figs. 3, 4) – Idiosoma ventrally with five pair of sternal setae (*1a*, *2a*$_1$, *2a*$_2$, *3a*$_1$, *3a*$_2$) and four barbed setae between coxae I and II; 47–49 setae between coxae II and III (excluding *2a*$_1$, *2a*$_2$, *3a*$_1$ and *3a*$_2$), a punctate area is attached to the coxae II; 45–50 setae behind coxae III (excluding *3a*$_1$ and *3a*$_2$), all ventral setae with fine barbs, pointed, and arising from small plates. Each leg coxa with one barbed seta. A peg-like supracoxal seta (*elcI*) present on coxa I, 3–5 long. NDV = 181–184.

Gnathosoma (Figs. 5, 6) – Cheliceral bases punctate on dorsal surface, cheliceral base 85–91 long; cheliceral blade slightly curved, 20 long, with a subterminal tooth. Subcapitulum with a barbed galealae (*cs*) and two hypostomalae, anterior (*as*) minute and posterior barbed (*bs*); palp femur 35–37 long, with one dorsal and one ventral seta, both barbed and palp genu 21–25 long, with one dorsal and one ventral seta, both barbed. Palp tibia 22–25 long, with three setae including two barbed, and one nude conical seta (i.e. thick accessory claw); palpal tibial claw bifurcate 25–28; palp tarsus 10 in length, with six nude setae, one solenidion and one eupathidium; fPp = 0-BB-BB-BBN$_2$-6Nωζ. Palpal supracoxal seta (*elcP*) peg-like, 3–4 long.

Legs (Figs. 7–12) – Leg segmentation formula 7-7-7. Leg setal formula: Leg I: Ta– 1ω, 1ε, 2ζ, 1*z*, 25n (24n in one specimen ARS-20220503-2d); Ti– 2φ, 1κ, 13n; Ge– 1σ, 1κ, 11n; TFe– 8n; BFe– 5n; Tr– 2n; Cx– 1n (Figs. 7–8). Leg II: Ta– 1ω, 2ζ, 1*z*, 21n (20n in one side of symmetry axis in ARS-20220503-2a); Ti– 2φ, 13n; Ge–1σ, 1κ, 9n; TFe– 5n; BFe– 5n; Tr– 2n; Cx– 1n (Figs. 9–10). Leg III: Ta– 1ζ, 22n (21n in one side of symmetry axis in two specimens, ARS-20220503-2b, 2c); Ti– 1φ, 13n; Ge– 1σ, 9n; TFe– 5n; BFe– 5n; Tr– 2n; Cx– 1n (Figs. 11–12). Each leg tarsus with lateral falciform claws and a claw-like empodium. Metric data are given in Table 2.



Figures 5–8. *Marantelophus iranicus* (larva); 5. Dorsal view (right) and ventral view of gnathosoma (left); 6. Ventral view of palpal tarsus; 7. Ti–Ta I; 8. Tr–Ge I.



Figures 9–12. *Marantelophus iranicus* (larva) – 9. Ti–Ta II; 10. Tr–Ge II; 11. Ti–Ta III; 12. Tr–Ge III.

Table 2. Metric and some meristic data for *M. iranicus* (larva) from South Khorasan Province (present study); from Noshahr, Iran [Haitlinger (2016)]; from Uromieh (Urmia), Iran [(Saboori and Atamehr (2000)]; and from Montenegro [Haitlinger and Šundić (2014)].

Character	1a	1b	1c	1d	Present study N = 4	Noshahr (Holotype)	Uromieh (Urmia) N = 2	Montenegro N = 6
IL	440	700	292	470	292–700	320	297–440	304–485
IW	265	460	185	310	185–460	167	198–308	215–373
SD	65	62	52	62	52–65	42	58–61	49–58
W	66	62	63	62	62–66	70	66	59–65
AW	45	45	45	46	45–46	48	44–47	39–46
PW	55	52	52	55	52–55	58	60	53–58
MA	19	20	17	20	17–20	-	-	-
AA	14	13	15	15	13–15	16	14	13–16
SB	11	11	12	11	11–12	10	13–14	11–13
ISD	42	40	27	37	27–42	30	41	32–38
AP	14	17	10	13	10–17	14	14–19	11–17
AL	39	40	35	37	35–40	26	36	30–41
PL	44	45	37	42	37–45	34	44–49	43–53
ASens	45	47	43	47	43–47	23	40–41	25–36
PSens	66	68	67	65	65–68	50	69–77	42–58
DS min.	27	27	27	27	27	25	30	20
DS max.	42	41	42	45	41–45	46	44	46
1a	32	30	32	32	30–32	24	22–25	23–31
1b	47	47	42	47	42–47	44	41–46	41–50
2a₁	25	27	27	26	25–27	-	-	15–22
2a₂	27	27	27	25	25–27	-	-	-
2b	35	41	37	40	35–41	32	33–36	32–43
3a₁	25	30	25	25	25–30	-	-	-
3a₂	28	30	25	22	22–30	-	-	-
3b	30	31	30	32	30–32	29	22	26–36
GL	130	130	122	127	122–130	120	124–192	116–131

Table 2. Continued.

Character	1a	1b	1c	1d	Present study N = 4	Noshahr (Holotype)	Uromieh (Urmia) N = 2	Montenegro N = 6
PaScFed	40	37	42	40	37–42	37	38~	39–47
PaScFev	55	60	55	55	55–60	-	44–49	-
PaScGed	30	32	30	32	30–32	29	22~–33	29–35
PaScGev	27	30	27	30	27–30	30	33?	-
cs	32	32	35	32	32–35	23	-	21–30
as	3	3	3	3	3	16	-	-
bs	46	41	35	35	35–46	32	27?– ~50	28–42
Ta I*	77	77	77	77	77	47?	74–77	66–74
Ti I	99	90	82	88	82–99	55	69–74	68–80
Ge I	87	82	84	86	82–87	61	74–77	56–68
TFe I	50	45	46	50	45–50	35	36–38	35–38
BFe I	62	65	55	61	55–65	41	44–47	40–54
Tr I	47	47	45	47	45–47	29	42	32–41
Cx I	57	65	57	62	57–65	45	50–52	57–62
Leg I	479	471	446	471	446–479	306?	396–400	-
Ta II*	65	67	65	65	65–67	62	66–74	57–68
Ti II	87	87	72	83	72–87	57	63–74	66–78
Ge II	77	75	72	75	72–77	57	66–69	55–64
TFe II	43	41	40	45	41–45	31	30–33	33–38
BFe II	57	55	52	52	52–57	40	36–41	40–49
Tr II	50	48	47	47	47–50	38	36–41	36–42
Cx II	66	66	60	62	60–66	48	55	60–70
Leg II	445	439	408	429	408–445	333	365–374	-
Ta III*	75	75	70	70	70–75	68	74–77	66–73
Ti III	122	122	102	117	102–122	84	96–102	92–108
Ge III	100	92	91	95	91–100	71	77–79	67–80
TFe III	57	52	52	53	52–57	41	41–44	42–46
BFe III	70	72	65	67	65–72	44	47	48–57
Tr III	56	55	50	52	50–56	39	41–42	39–45
Cx III	62	65	53	62	53–65	50	58	61–69
Leg III	542	533	483	516	483–542	397	437–446	-
IP	146	144	133	1416	1337–1466	1036	1202–1216	-
fD	87	87	88	87	87–88	90	120	109–134
fV	50	48	48	45	45–50	56	43	44
Setae between Cx II–III	47	47	47	49	47–49	48	56	-
NDV	184	182	183	181	181–184	~194	219	-

* Tarsi were measured without the stalk and pretarsus.

Key to world genera of larval **Abrolophinae**

1. Dorsal scutum with posterior trichobothria well anterior to posterior pole 2
– Dorsal scutum with posterior trichobothria at the posterior pole 5
2. Scutum with three or more pairs of scutalae (3 + 3 or 4 + 3)..... *Pukakia* Clark, 2014
– Scutum with two pairs of scutalae (2 + 2)..... 3
3. fn Cx I–III 1-1-1 ..... *Grandjeanella* Southcott, 1961
– fn Cx I–III 1-2-2 4
4. Dorsal scutum Heart-shaped and PSens in anterior half, palpal tibial claw divided..... ..... *Pussardia* Southcott, 1961
– Dorsal scutum Bib-shaped and PSens in posterior half, palpal tibial claw acute, beak-like, undivided..... *Harpagella* Southcott, 1996
5. Palp genu with three setae ..... *Abrolophus* Berlese, 1891

– Palp genu with two setae 6
6. Scutum wider than long and various (slightly subquadrangle, sub-pentagonal to oval), not or slightly narrowed posteriorly, bases of posterior sensillary setae (SBp) well-separated ..... *Nagoricanella* Haitlinger, 2009
– Scutum longer than wide, usually triangular in outline and narrowing in posterior part, bases of posterior sensillary (SBp) setae close together ..... *Marantelophus* Haitlinger, 2011

Key to the larval species of *Marantelophus* of the world [after Xu *et al*. (2017)]

1. *bs* and PaScFev bifurcate, palpal tibial claw simple 2
– *bs* and PaScFev entire (not bifurcate), palpal tibial claw simple or bifurcate 3
2. W 199–112, PL 111–124, fD 50–60, four setae between coxae I and II, IP 1912–2131 .... *M. dubifurcatus* Xu, Yi and Jin, 2017
– W 66, PL 83, fD 30, IP 5573, six setae between coxae I and II ..... *M. trifarius* (Shiba, 1976)
3. PL 97, palpal tibial claw bifurcate ..... *M. miyatakei* (Kawashima, 1958)
– PL ≤ 82, palpal tibial claw simple or bifurcate 4
4. fn BFe 3-4-4 or 4-4-4 5
– fn BFe 5-5-5 10
5. fn BFe 3-4-4 ..... *M. ostovani* (Haitlinger & Saboori, 1996)
– fn BFe 4-4-4 6
6. fn TFe 5-5-5, six setae between coxae I and II, palpal tibial claw simple .... *M. emanueli* (Haitlinger, 2010)
– fn TFe otherwise, four setae between coxae I and II, palpal tibial claw simple or bifurcate 7
7. fn TFe 7-5-5, ... 8
– fn TFe otherwise 9
8. PL 82, AL 58, palpal tibial claw simple, fD 96 ..... *M. alaperti* Haitlinger, 2011
– PL 32–36, AL 30–34, palpal tibial claw bifurcate, fD 63..... *M. ainae* (Haitlinger, 2002)
9. fn TFe 8-5-5, PL 74, AL 56, Ti I with 12 normal setae, fD 148 .... *M. hieronimi* (Haitlinger & Łupicki, 2013)
– fn TFe 8-(6 or 7)-6, PL 30–42, AL 22–30, Ti I with 15 normal setae, fD 46–62..... ..... *M. rudaensis* (Haitlinger, 1986)
10. SD 83, W 86, PL 67, AL 54, Ti III 140, Ti I with 14 normal setae .... *M. haitlingeri* (Goldarazena & Zhang, 1997)
– SD ≤ 65, W ≤ 70, PL ≤ 49, AL ≤ 40, Ti III ≤ 122, Ti I with 13 normal setae..... 11
11. ISD 49–57, fD 160 ..... *M. multisetosus* (Zhang & Goldarazena, 1996)
– ISD ≤ 42, fD ≤ 134 ..... *M. iranicus*[*] (Haitlinger & Saboori, 1996)

[*] Based on Saboori and Atamehr (2000), Haitlinger and Šundić (2014), Haitlinger (2016), and present study.

Remarks

Clark (2014) described the genus *Pukakia* and transferred the genera *Harpagella* and *Pussardia* to Abrolophinae. An identification key to larval species of *Marantelophus* was presented by Xu *et al*. (2017), followed by the transfer of *Abrolophus hieronimi*, *Hauptmannia miyatakei* and *H. trifarius* to this genus by Haitlinger and Šundić (2018). Most host species of *Marantelophus* are Hemiptera and Thysanoptera: *C. coreanus* (Hemiptera: Pentatomidae) is a new host-association record for this genus.

The systematic status of *M. iranicus* was discussed by Haitlinger (2016). Originally it described as *Hauptmannia iranica* from plants (off-host) based on a single specimen from Noshahr, Iran (Haitlinger and Saboori 1996) and Haitlinger (2016) presented corrected metric and meristic data for the holotype (Table 2). It was collected (as *Grandjeanella kamalii*) as free-living on *Phaseulus*

vulgaris L. (Fabaceae) from Uromieh (Urmia), Iran (Saboori and Atamehr, 2000). This species was also sampled from herbaceous plants (off-host) in Montenegro (Table 2) and Italy by Haitlinger and Šundić (2014) and Haitlinger (2016), respectively. Haitlinger (2016) mentioned that the specimens recorded from Greece, Hungary, San Marino and Ukraine as *M. multisetosus* belong to *M. iranicus*. However, more studies should be done on these specimens.

The specimens collected in South Khorasan Province fit the data for the species given by Saboori and Atamehr (2000) and Haitlinger (2016) except for the length of Ti I (82–99 vs. 55–74), Ge I (82–87 vs. 61–77), BFe I (55–65 vs. 41–47), Ge II (72–77 vs. 57–69), TFe II (41–45 vs. 30–33), BFe II (52–57 vs. 36–41), Ge III (91–100 vs. 71–79), TFe III (52–57 vs. 41–44), BFe III (65–72 vs. 44–47), Tr III (50–56 vs. 39–42), IP (1337–1466 vs. 1036–1216), PaScFev (55–60 vs. 44–49), and the shorter *as* (minute vs. 16) and NDV (184 vs. 194–219), number of normal setae on Ta I (25 vs. 21), presence of companion seta (*z*) on Ta I and II (vs. absent).

Microtrombidiidae Thor, 1935
Microtrombidiidae *incertae sedis*
Empitrombium Southcott, 1994

Empitrombium makolae Sevsay & Karakurt, 2013

Material examined

Two (ARS-20220503-3a, 3b) larvae were collected ectoparasitic on an unidentified nematoceran fly (Diptera: Chironomidae) from South Khorasan Province, Giuk village, 32° 47.31′ N, 59° 07.33′ E, 1961 m a.s.l. 8 July 2022 by J. Noei. The specimens are deposited in the Acarological Collection, Acarological Society of Iran, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran.

Figure 13. An unidentified nematoceran fly (Diptera: Chironomidae), the host of *Empitrombium makolae*.

Remarks

Empitrombium makolae was described based on active postlarval forms and larvae obtained from adult females under laboratory conditions by Sevsay and Karakurt (2013). Afterwards, Noei *et al*. (2015) recorded it from Guilan Province, northern Iran (off-host) with some corrections and new data for this species [Table 5 in Noei *et al*. (2015)]. It was also recorded (off-host) from South Khorasan Province, East of Iran (Noei 2017; Kohansal *et al*. 2022). In the present study, two specimens were collected ectoparasitic on an unidentified nematoceran fly (Diptera: Chironomidae) from South Khorasan Province (Fig. 13). The family Chironomidae is recorded as host of this species for the first time.

Sevsay and Karakurt (2013) have used the characters L and W for the length and width of idiosoma, respectively. They have not mentioned the length (SD) and width (W) of scutum based on Table 2 in their paper. Saberi-Riseh and Saboori (2020) have used length and width of idiosoma instead of the length and width of scutum, mistakenly in the identification key in their paper for *E. makolae* and *E. pesici*. Also, palpal tibia in *E. pesici* is without median constriction. For this reason, the corrected identification key is presented.

Key to larval species of *Empitrombium* of the world [after Saberi-Riseh & Saboori (2020) with corrections]

1. Idiosoma with network markings..*E. dictyostracum*[*] (Vercammen-Grandjean & Cochrane, 1974)
– Idiosoma without network markings.....2
2. Palpal tibia without median constriction..... *E. pesici* Saboori & Hakimitabar, 2009
– Palpal tibia with median constriction.....3
3. AW 82–101, PW 86–101, SB 52–62, AL 52–67..... *E. makolae*[**] Sevsay & Karakurt, 2013
– AW ≤ 69, PW ≤ 69, SB ≤ 43, AL ≤ 39.....3
4. Ta III ~100, Ge III ~33, Fe III ~53, IP ~876 ..... *E. littorale* (Michener, 1946)
– Ta III 69–78, Ge III 16–20, Fe III 37–40, IP 691–725 ...*E. prasadi* Saberi-Riseh & Saboori, 2020

[*] The metric data of *E. dictyostracum* fits to the data of *E. makolae* given by Sevsay and Karakurt (2013) and Noei *et al*. (2015) and more studies should be done for these species in future.
[**] Based on Sevsay & Karakurt (2013) and Noei *et al*. (2015).

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REFERENCES

Berlese, A. (1891) Acari, Myriapoda et Scorpiones hucusque in Italia reperta. Fasc. 59, No. 1.

Clark, J.M. (2014) New erythraeids (Parasitengona) from recent glacial outwash, Southern Alps, New Zealand; *Callidosoma*, *Momorangia*, *Grandjeanella*, and *Pukakia* gen. nov.; with a description of the deutonymph of *Callidosoma tiki*. *International Journal of Acarology*, 40: 174–204. DOI: 10.1080/01647954.2014.898697

Goldarazena, A. & Zhang, Z.-Q. (1997) First record of larval *Grandjeanella* (Acari: Erythraeidae) from Heteroptera and description of a new species from Spain. *Systematic and Applied Acarology*, 2: 231–236.

Haitlinger, R. (1986) The genus *Hauptmannia* Oudemans, 1910 (Acari, Prostigmata, Erythraeidae) in Poland. *Polskie Pismo entomologiczne*, 56: 181–191.

Haitlinger, R. (2002) Erythraeidae and Trombidiidae (Allothrombiinae) (Acari: Prostigmata) from Mallorca (Balearic Islands), with description of two new species. *Bolletin de la Sociedad de Historia Natural de Baleares*, 45: 191–197.

Haitlinger, R. (2009) A new genus and two new species of mites (Acari: Prostigmata: Erythraeidae) from Macedonia and the Republic of Cape Verde. *Zeszyty Naukowe Uniwersytetu Przyrodniczego we Wrocławiu, Biologia i Hodowla Zwierząt*, 58(572): 39–48.

Haitlinger, R. (2010) New records of mites (Acari: Prostigmata: Erythraeidae, Trombidiidae) from Turkey, with descriptions of four new species. *Zeszyty Naukowe Uniwersytetu Przyrodniczego we Wrocławiu, Biologia i Hodowla Zwierząt*, 60(577): 49–61.

Haitlinger, R. (2011) A new genus and four new species of erythraeid mites from Indonesia, with new records of the family (Acari: Prostigmata: Erythraeidae). *Revista Ibérica de Aracnología*, 19: 47–54.

Haitlinger, R. (2016) New records of mites from Cyprus, Kos (Greece) and Sicily (Italy) with notes on some Erythraeidae and Trombidiidae (Trombidiformes, Parasitengona). *Linzer Biologische Beitrage*, 48: 1187–1196.

Haitlinger, R. & Łupicki, D. (2013) A new species of *Abrolophus* (Acari: Prostigmata: Erythraeidae) and the first record of *Erythraeus* (*E.*) *picaforticus* from Sicily, Italy. *Persian Journal of Acarology*, 1: 41–47.

Haitlinger, R. & Saboori, A. (1996) Seven new larval mites (Acari, Prostigmata: Erythraeidae) from Iran. *Miscellanea Zoologica*, 19: 117–131.

Haitlinger, R. & Šundić, M. (2014) New records of mites (Acari: Prostigmata: Erythraeidae, Microtrombidiidae, Trombidiidae) from Albania and Montenegro, with re-description of *Abrolpophus kazimierae* (Haitlinger, 1986). *Acta Zoologica Bulgarica*, 66(4): 35–42.

Haitlinger, R. & Šundić, M. (2018) *Abrolophus marianopolicus* sp. nov. (Trombidiformes: Erythrae-idae) from Sicily, Italy with notes on other *Abrolophus* species. *Systematic & Applied Acarology*, 23(2): 353–359. DOI: 10.11158/saa.23.2.10

Hakimitabar, M., Ghobari, H. & Saboori, A. (2015) New ectoparasitic Abrolophine mites (Acari, Erythraeinae, *Marantelophus*) on thrips and aphids (Insecta) from Iran. *Acta Zoologica Academiae Scientiarum Hungaricae*, 61(3): 225–236. DOI: 10.17109/AZH.61.3.2.2015

Kamran, M. & Alatawi, F.J. (2015) New species and new records of subfamily Abrolophinae (Acari: Erythraeidae) from Saudi Arabia. *Systematic and Applied Acarology*, 20(2): 195–202. DOI: 10.11158/saa.20.2.6

Kawashima, K. (1958) Studies on larval erythraeid mites parasitic on arthropods from Japan (Acarina: Erythraeidae). *Kyushu Journal of Medical Science*, 9: 190–211.

Kohansal, M., Ramroodi, S., Noei, J. & Rakhshani, E. (2022) Study of terrestrial parasitengone mites (Trombidiformes: Prostigmata) in South Khorasan Province, Iran. *In*: Hakimitabar, M. & Sazmand, A. (Eds.), *Abstract book of the 4th International Persian Congress of Acarology*, 28–30 July, Mashhad, Iran, p. 44.

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

Noei, J. (2017) Taxonomic study of terrestrial Parasitengona (Acari: Prostigmata) ectoparasitic on arthropoda in Band-e Amirshah and Band-e Dareh regions in Birjand, Iran. *In*: Hajiqqnbar, H.

& Saboori, A. (Eds.), *Abstract book of the 3rd International Persian Congress of Acarology*, 23–25 August, Tehran, Iran, p. 31.

Noei, J., Saboori, A. & Hajizadeh, J. (2015) Three new species and two new records of the family Microtrombidiidae (Acari: Prostigmata) from Iran. *Systematic and Applied Acarology*, 20(6): 655–673. DOI: 10.11158/saa.20.6.8

Saboori, A. & Atamehr, A. (2000) *Grandjeanella kamalii* sp. nov. (Acari: Erythraeidae) from Iran with a key to world species. *Systematic and Applied Acarology*, 5: 1–8.

Saboori, A., Hakimitabar, M., Mohammadi, S. & Kazemi, S. (2016) Modification in the diagnosis of the genus *Nagoricanella* (Acari: Erythraeidae) with redescription of *N. bella* (Zhang, 1996). *Systematic and Applied Acarology*, 21(2): 245–254. DOI: 10.11158/saa.21.2.8

Saboori, A., Khaustov, A., Hakimitabar, M. & Hajiqanbar, H. (2009) A new genus and species of larval Erythraeinae (Acari: Prostigmata: Erythraeidae) from Ukraine and the taxonomic state of *Zhangiella*. *Zootaxa*, 2203: 22–30. DOI: 10.11646/zootaxa.2203.1.2

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.

Southcott, R.V. (1994) Revision of the larvae of the Microtrombidiinae (Acarina: Microtrombidiidae) with notes on life histories. *Zoologica*, 144: 1–155.

Southcott, R.V. (1996) On some Australian and other larval Callidosomatinae (Acari: Erythraeidae). *International Journal of Acarology*, 21: 253–278.

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

Stroiński, A., Felska, M. & Mąkol, J. (2013) A review of host-parasite associations between terrestrial Parasitengona (Actinotrichida: Prostigmata) and bugs (Hemiptera). *Annales Zoologici* 63(1): 195–221. DOI: 10.3161/000345413X669522

Walter, D.E. & Krantz, G.W. (2009) Collecting, rearing, and preparing specimens. *In*: Krantz, G.W. & Walter, D.E. (Eds.), *A manual of Acarology*. 3rd edition. Texas Tech University Press, Texas, USA, pp. 83– 96.

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

Wohltmann, A. & Mąkol, J. (2012) Morphology and life cycle of *Abrolophus norvegicus* (Thor, 1900) with notes on *Abrolophus* spp. (Actinotrichida: Prostigmata: Erythraeidae). *Annales Zoologici*, 62: 69–97.

Xu, S.-Y., Yi, T.-C. & Jin, D.-C. (2017) A new species of larval *Marantelophus* (Acari: Prostigmata: Erythraeidae) parasitic on insects from China. *Systematic and Applied Acarology*, 22(7): 1012–1021. DOI: 10.11158/saa.22.7.9

Zhang, Z.-Q. & Goldarazena, A. (1996) *Abrolophus* and *Grandjeanella* larvae (Acari: Erythraeidae) ectoparasitic on thrips (Thysanoptera: Thripidae). *Systematic and Applied Acarology*, 1: 127–144.

داده‌های جدید در مورد گونه‌های *Marantelophus iranicus* و *Empitrombium makolae* (Acari: Erythraeidae, Microtrombidiidae)

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چکیده

داده‌های ریخت‌سنجی اضافی و اطلاعات دیگر برای لاروهای *Marantelophus iranicus* (Trombidiformes: Erythraeidae) ارایه می‌شود که به صورت انگل بیرونی روی *Carpocoris coreanus* (Hemiptera: Pentatomidae) و از خاک و بقایای گیاهی (بدون میزبان) در ایران و از استان خراسان جنوبی (بیرجند-روستاهای چهکند، گیوک، خان و شهرستانک) جمع‌آوری شدند. کلید شناسایی برای مرحلهٔ لاروی جنس‌های زیرخانوادهٔ Abrolophinae و لاروی گونه‌های *Marantelophus* در دنیا ارایه می‌شود. همچنین، خانوادهٔ Chironomidae برای نخستین بار به عنوان میزبان گونهٔ *Empitrombium makolae* (Trombidiformes: Microtrombidiidae)، از ایران گزارش می‌شود.

واژگان کلیدی: بیرجند، چهکند، گیوک، خوسف، درمیان، Pentatomidae.

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