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A contribution to the knowledge of cheyletid mites of Iran with redescription of *Eucheyletia flabellifera* (Michael, 1878) (Prostigmata: Cheyletidae)

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ABSTRACT

The cheyletid mites collected from Guilan province in Northern Iran were investigated. A total of 16 species were determined. Of these, *Eucheyletia flabellifera* (Michael, 1878) is a new record for the Iranian cheyletid mite fauna. Herein, we provide an expanded description, including illustrations of the adult female of this species based on the Iranian material. A tabulated checklist for cheyletid mites recorded from Iran is also provided.

Keywords Acari, Cheyletidae, *Eucheyletia*, Iran, redescription
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Introduction

The family Cheyletidae (Acariformes: Cheyletoidea) presently includes over 440 species in 75 genera (Zhang *et al*. 2011; Bochkov and Abramov 2016). About 78% of cheyletid species are free-living predators, while the remaining species are permanent parasites of mammals and birds. The predatory species occupy a wide variety of habitats including patchy or ephemeral substrates requiring dispersal by phoresy on insects or vertebrates (Bochkov and Oconnor 2004). Some of them are free-living predators inhabiting plants, soil and plant debris while some representatives of this family are also quite important for agriculture and the health of humans and domestic animals (Volgin 1969; Fain *et al*. 1982; Bochkov and Fain 2001). Prior to this study 42 species from 21 genera of cheyletid mites were recorded from Iran (Kamali *et al*. 2001; Bochkov *et al*. 2005; Doğan *et al*. 2011; Hajizadeh *et al*. 2011; Ardeshir 2017; Paktinat-Saeij *et al*. 2017). In this article, we recorded 16 cheyletid mite species from Guilan Province (37°16′38.64″N, 49°35′20.4″E), Northern Iran. Among these identified species, *Eucheyletia flabellifera* (Michael, 1878) is a new record for the Iranian cheyletid mite fauna.

The genus *Eucheyletia* was erected by Baker (1949) with *Eucheyletia bishoppi* Baker, 1949 collected from USA (California) as the type species. Twenty species were included in this genus by Gerson *et al*. (1999). Actually, six of these species namely *E. nindota* Corpuz-Raros, 1988; *E. womersleyi* Volgin, 1963; *E. reticulata* (Cunliffe, 1962); *E. funisciuri* Fain, 1972; *E. kivuensis* Fain, 1972 and *E. tanzaniensis* Fain, 1972 were transferred to other genera (Fain and Bochkov 2001a). Also *E. asiatica* Volgin, 1963 and *E. oregonensis* Smiley and Whitaker, 1981 are synonyms of *E. bishoppi* Baker, 1949 and *E. taurica* Volgin, 1961 is a synonyms of

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E. flabellifera (Fain and Bochkov 2001a). Fain and Bochkov (2001a) provided a key to ten species of the genus *Eucheyletia* based on female specimens. Finally, *Eucheyletia omissa* Xia, Liang and Zhu, 2004 was described based on specimens collected from China (Xia *et al*. 2004).

Michael's (1878) description and drawings of *E. flabellifera*, lack measurements of the median dorsal setae of some cheyletids which can take on strange shapes. With the microscopes of Michael's time it may have not been possible to observe such fine detail, because it is only by observing their small setal bases that they can be recognized as true setae. Oudemans (1906) redescribed *E. flabellifera*, including male specimens for the first time. He used specimens in Michael's collection from England and Austria for his study. According to Oudemans' figures and description, dorsal median setae are also absent in the female, no measurements given (except length and width), and no terminology and setal notations are provided. Volgin (1969, 1987) confirmed the absence of dorsal median setae in the descriptions of Michael (1878) and Oudemans (1906) but admitted that they are probably present. Volgin (1969, 1987) described a new species, *E. taurica* with broadly fan-shaped median dorsal setae but Fain & Bochkov (2001) considered it a junior synonym of *E. flabellifera*. The Iranian specimens fit all these re-descriptions except for some small morphological differences that are pointed out which could have easily been overlooked. In this paper, we redescribed the adult female completely based on Iranian specimens. In addition, a tabulated checklist for cheyletid species found in Iran is provided.

Materials and methods

This study was conducted in Guilan Province, Northern Iran, searching for cheyletid mites during the period 2015-2017. The mites were extracted from stored materials like rice flakes, barn and barley, soil samples, plant foliage, decayed plant material, rotten wood, bird nests, livestock and poultry manure by placing them in a Berlese/Tullgren funnel or directly removed after examination under a stereomicroscope. Mites were cleared in Nesbitt's solution and mounted in Hoyer's medium on microscope slides. The mites were examined under 1000× magnification of an Olympus BX51 phase contrast and a differential interference contrast microscope (Olympus Optical Co; LTD; Japan). All drawings were prepared with the help of a 1.25X Olympus camera lucida (Olympus Optical Co; LTD; Japan). Body length measurements represent the distance between the anterior tip of rostrum and the posterior end of idiosoma; width was measured at the broadest point of the idiosoma. Leg measurements are from trochanter to pretarsus. The terminology and setal notations used follow those of Fain (1979) and Bochkov (2008). All measurements are given in micrometers (μm). Voucher material for each species were preserved as slide-mounted specimens and will be deposited in Acarology Laboratory, Department of Plant Protection, Faculty of Agricultural Sciences, University of Guilan, Iran. The checklist of Iranian Cheyletidae is arranged alphabetically according to genera and based on the first official report of each species from Iran. Further reports of species are not mentioned in this checklist.

Results

During this study, 16 species in eight genera, five tribes and one subfamily belonging to the family Cheyletidae were determined from specimens collected in Guilan province Northern Iran. Of these, *Eucheyletia flabellifera* (Michael, 1878) is recorded from Iran for the first time, an expanded description, including illustrations of the adult female is provided based on the Iranian material. A tabulated checklist is also provided for 42 cheyletid mite species belonging to 22 genera found in Iran (Table 1).

Table 1 Checklist of the Iranian cheyletid mite species.

No.	Species	Related references
1	*Acaropsella kulagini* (Rohdendorf)	Khanjani and Kamali, 1993
2	*Acaropsella volgini* (Gerson)	Baharloo *et al.*, 2006
3	*Acaropsellina docta* (Berlese)	Kamali, 1990
4	*Acaropsellina sollers* (Kuzin)	Fathipour *et al.*, 1999
5	*Bak iranica* Paktinat-Saeij *et al.*	Paktinat-Saeij *et al.*, 2017
6	*Caudacheles khayae* Gerson	Haghighi and Ostovan, 2011
7	*Caudacheles lieni* Tseng	Ahadiyat *et al.*, 2004
8	*Chelacheles michalskii* Samsinak	Ostovan and Kamali, 1997
9	*Chelacheles strabismus* Baker	Hajizadea *et al.*, 2011
10	*Cheletogenes ornatus* (Canestrini and Fanzago)	Khalilmanesh, 1972
11	*Cheletogenes scaber* Qayyum and Chaudhri	Sahraeian *et al.*, 2006
12	*Cheletomimus berlesei* (Oudemans)	Fathipour *et al.*, 1999
13	*Cheletomimus binus* Tseng	Faraji and Kamali, 1993
14	*Cheletomimus* (*Hemicheyletia*) *congensis* (Cunliffe)	Khanjani and Kamali, 1993
15	*Cheletomimus* (*Hemicheyletia*) *bakeri* (Ehara)	Mohajeri *et al.*, 1995
16	*Cheletomimus* (*Hemicheyletia*) *vescus* (Qayyum and Chaudhri)	Bochkov *et al.*, 2005
17	*Cheletomimus* (*Hemicheyletia*) *wellsi* (Baker)	Ostovan and Kamali, 1997
18	*Cheletomorpha lepidopterorum* (Shaw)	Hajizadeh *et al.*, 2011
19	*Cheletonella vespertilionis* Womersley	Dogan *et al.*, 2011
20	*Cheyletiella parasitovorax* (Mégnin)	Modares Aval, 2012
21	*Cheyletiella yasguri* Smiley	Kamali *et al.*, 2001
22	*Cheyletus bidentatus* Fain and Nadchatram	Ardeshir, 2017
23	*Cheyletus cacahuamilpensis* Baker (= *Cheyletus baloghi* Volgin)	Sahraeian *et al.*, 2006
24	*Cheyletus carnifex* Zachvatkin = (*Cheyletus aversor* Rohdendorf)	Faraji and Kamali, 1993
25	*Cheyletus eruditus* (Schrank)	Mosaddegh, 1997
26	*Cheyletus kuznetzovi* Bochkov and Khaustov	Dogan *et al.*, 2011
27	*Cheyletus malaccensis* Oudemans	Sepasgozarian, 1978
28	*Cheyletus malayensis* Cunliffe	Sepasgozarian, 1978
29	*Cheyletus trouessarti* Oudemans	Sepasgozarian, 1978
30	*Cunliffella bulgarica* (Volgin)	Bochkov *et al.*, 2005
31	*Cunliffella variegata* (Barilo) [Sic] *Cunlifella variegate* Ardeshir and Nematollahi	Ardeshir and Nematollahi, 2008
32	*Eucheyletia flabellifera* (Michael) (=*Eucheyletia taurica* Volgin)	This study
33	*Eucheyletiella faini* Bochkov and Malikov	Bochkov and Malikov, 1996
34	*Eutogenes frater* Volgin (=*Eutogenes africanus* Wafa and Soliman)	Darvishzadeh and Kamali, 2002
35	*Hypopicheyla elongata* Volgin	Hadad Iraninejad *et al.*, 2005
36	*Hypopicheyla mirabilis* (Volgin)	Bochkov *et al.*, 2005
37	*Lepidocheyla gracilis* Volgin	Bochkov *et al.*, 2005
38	*Microcheyla parvula* Volgin	Beyzavi and Ostovan, 2011
39	*Neoeucheyla iranica* Fain and Ardeshir	Fain and Ardeshir, 2000
40	*Nodele calamondin* Muma	Bochkov *et al.*, 2001
41	*Paracheyletia pyriformis* (Banks)	Faraji and Kamali, 1993
42	*Zachvatkiniola reticulata* (Cunliffe)	Bochkov *et al.*, 2001

Redescription of *Eucheyletia flabellifera* (Michael, 1878)

Subfamily: Cheyletinae Leach, 1815

Tribe: Cheyletini Leach, 1815

Genus *Eucheyletia* Baker, 1949

Cheyletus flabellifera Michael, 1878: 135

Cheyletia flabellifera (Michael) Oudemans, 1906: 127
Eucheyletia flabellifera (Michael) Baker, 1949: 295; Volgin, 1987: 155

Diagnosis (female) — This species has typical characters of the genus, including the presence of cloudlike setae, and the absence of lens-like eyes. Body (including gnathosoma) 624 (542 – 708) long; gnathosoma 216 (190 – 240) long, 180 (170 – 190) wide; idiosoma 409 (352 – 480) long, 359 (312 – 400) wide; propodosomal shield 165 (156 – 180) long, 228 (180 – 280) wide; hysterosomal shield 196 (180 – 208) long, 245 (220 – 260) wide; palp 148 (140 – 160) long; palp femur with equal length and width 75 (66 – 84), strongly swollen on outer side and concave on inner side. Ventral seta on palpal genua (l''G) hair-like 36 (30 – 41) long. Length of legs I-IV: 298 (280 – 320); 218 (200 – 240); 260 (240 – 280); 298 (280 – 320). Guard setae (ft) of solenidion (ωI) 24 (22 – 28) long and slightly shorter than solenidion 30 (28 – 32) long. Dorsolateral setae of idiosoma fan-like, dorsomedian one's cloud-like. Claws on tarsi I notably shorter than those on tarsi of other legs, tarsi I and II each bears a solenidion, this solenidion is dorsal on tarsus I (ωI) and antero-ventral on tarsus II (ωII). Tibia I about 1.5-1.6 times shorter than tarsus I; its width/length ratio is 1:3. Tibia and genu I carry dorsal solenidion (φI and σI) each. Tibia III-IV bearing two serrate, hair- like setae, and two fan-like setae.

Redescription

Dorsum (Fig. 1A) — Dorsum of idiosoma with two large separate shields. Eyes absent. Propodosomal shield wider than long, trapezoidal, with nine pairs of granular cloud-like dorsomedian setae, 38 (36 – 40) long, 41 (36 – 44) wide and four pairs rather large marginal fan-like setae (vi, ve, sci, sce). Setae c2 fan-like situated ventrally. Outer lumbar setae (l1) located between propodosomal and hysterosomal shields. Hysterosomal shield bearing eight pairs of granular cloud-like dorsomedian setae, 36 (30 – 40) long, 39 (35 – 43) wide and three pairs of fan-like setae (l2, l3, l4) laterally. Two pairs of setae (l5, d5) situated off hysterosomal shield. Lengths of setae: vi 54 (48 – 60), ve 48 (40 – 60), sci 47 (40 – 51), sce 54 (48 – 64), c2 54 (52 – 58), l1 58 (54 – 66), l2 51 (44 – 60), l3 46 (40 – 54), l4 40 (36 – 45), l5 36 (33 – 40), d5 33 (30 – 36). Distances between dorsal setae: vi-vi 129 (120 – 144), ve-ve 208 (168 – 240), sci-sci 230 (207 – 240), sce-sce 263 (252 – 280), vi-ve 41 (36 – 45), ve-sci 42 (36 – 48), sci-sce 75 (72 – 80), l1-l1 219 (204 – 240), l2- l2 195 (184 – 208), l3-l3 142 (120 – 160), l4-l4 129 (120 – 140), l5-l5 104 (93 – 120), d5-d5 42 (40 – 45), l1-l2 56 (48 – 68), l2-l3 60 (56 – 64), l3-l4 42 (40 – 45), l4-l5 34 (28 – 40), l5-d5 29 (24 – 35).

Venter (Fig. 1B) — Ventral surface of idiosoma finely striate, bearing three pairs of setaceous intercoxal setae (1a, 3a, 4a). Genitoanal area with two pairs of genital setae (g1 and g2), three pairs of aggenital setae (ag1, ag2 and ag3) and three pairs of pseudoanal setae (ps1, ps2 and ps3). Aggenital setae ag3 arising closer to genital setae (g1 and g2) than aggenital setae ag2. All ventral setae setaceous, excluding fan-like pseudoanal setae ps2 that is longer than other pseudoanal setae (ps1 and ps3). Lengths of setae: 1a 15 (12 – 20), 3a 19 (16 – 22), 4a 19 (16 – 22), g1 24 (20 – 27), g2 24 (22 – 26), ag1 20 (16 – 24), ag2 24 (18 – 28), ag3 24 (20 – 30), ps1 24 (21 – 28), ps2 30 (27 – 32), ps3 24 (21 – 28). Distances between ventral setae: 1a-1a 47 (40 – 60), 3a-3a 57 (44 – 72), 4a-4a 61 (48 – 72), g1-g1 26 (20 – 40), g2-g2 32 (28 – 36), ag1-ag1 53 (48 – 57), ag2-ag2 28 (20 – 33), ag3-ag3 59 (56 – 60), ps1-ps1 32 (30 – 33), ps2-ps2 26 (24 – 27), ps3-ps3 17 (15 – 18), 1a-3a 57 (52 – 64), 3a-4a 59 (56 – 65), 4a- ag1 59

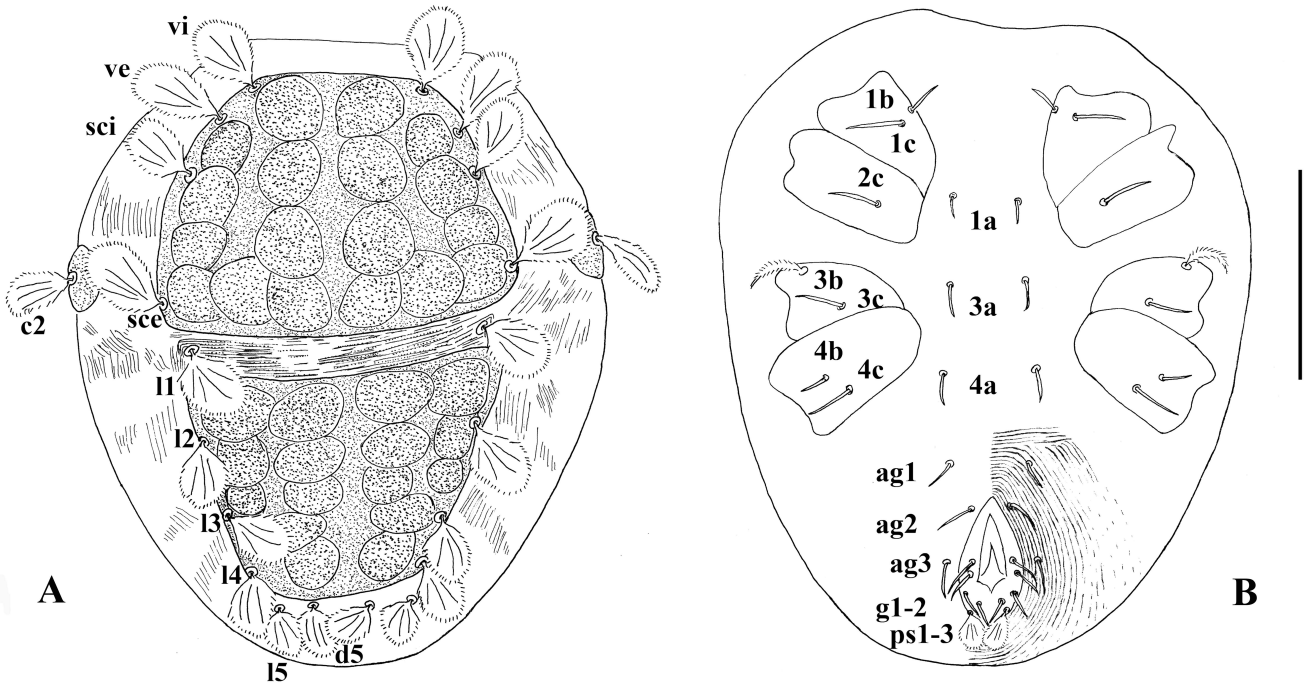


Figure 1 *Eucheyletia flabellifera* (Michael, 1878) (Adult female): A – Dorsal view of idiosoma; B – ventral view of idiosoma. Scale bar: 150 µm.

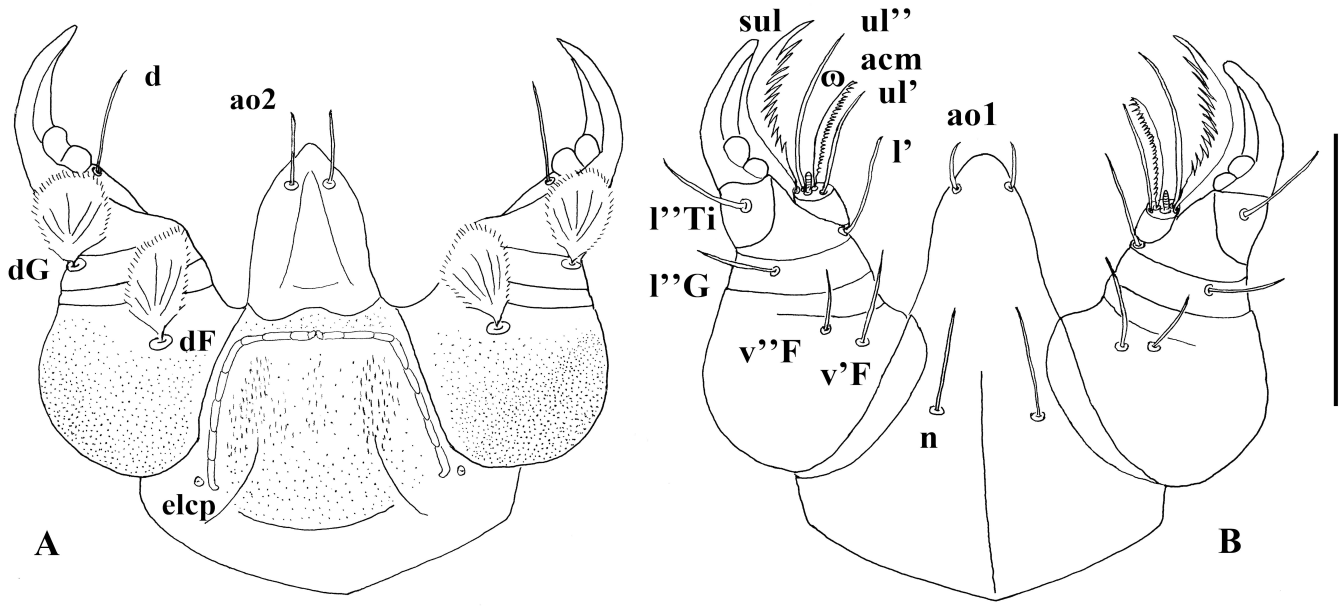


Figure 2 *Eucheyletia flabellifera* (Michael, 1878) (Adult female): A – Dorsal view of gnathosoma; B – ventral view of gnathosoma. Scale bar: 133 µm.

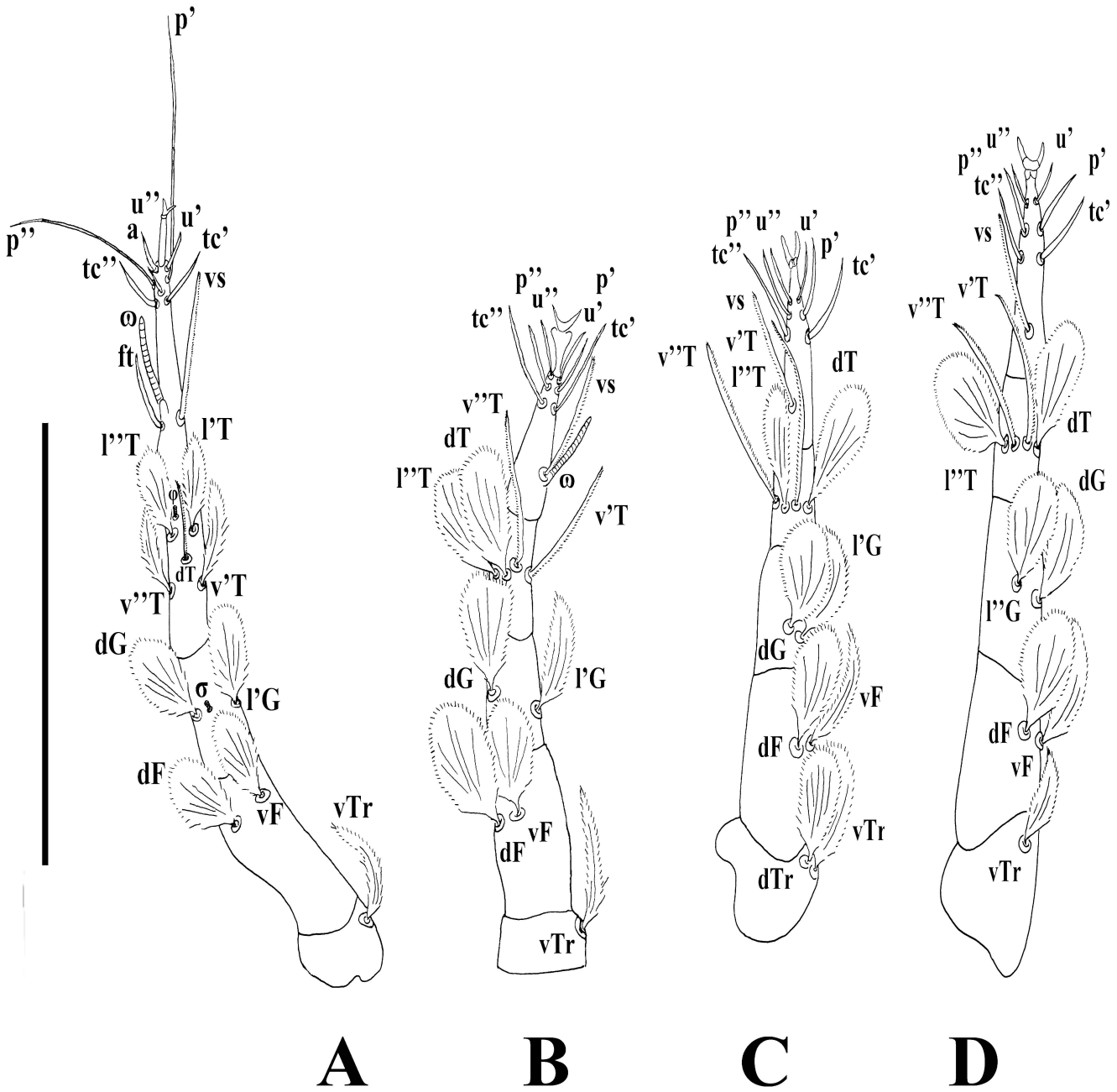


Figure 3 *Eucheyletia flabellifera* (Michael, 1878). (Adult female): A – Leg I; B – Leg II; C – Leg III; D – Leg IV. Scale bar: 175 µm for A; 160 µm for B; 172 µm for C; 171 µm for D.

(52 – 65), ag1-ag2 31 (21 – 36), ag2-ag3 39 (34 – 45), g1-g2 8 (6 – 10), g1-ag3 22 (21 – 24), g2-ag3 20 (18 – 22).

Gnathosoma (Figs. 2A-B) — Peritremes forming an inverted U, composed of eight pairs of fairly strong chambers. Dorsum of gnathosoma with pair of very small supracoxal setae elcp (measurement impossible). Venter of gnathosoma bearing subcapitular setae n 49 (48 – 50), adoral setae ao1 19 (16 – 21) and ao2 33 (30 – 36). Distance between ao1-ao1 31 (27 – 36), ao2-ao2 15 (12 – 20), n-n 48 (46 – 50). Palp setal formula as follows: trochanter without seta; femora with one fan-like (dF) and two smooth setaceous setae (v'F, v''F); genua with one fan-like (dG) and one smooth setaceous setae (l''G); tibiae with three smooth setaceous setae (dTi, l'Ti, l''Ti); tibial claw strong 64 (60 – 69) long and two basal teeth; tarsi with two comb-like eupathidia (acm, sul), outer comb (sul) about as long as claw, with 13 tines distributed throughout inner surface; inner comb (acm) almost straight, with approximately 25 tines, two smooth setaceous setae (ul', ul'') and one solenidion (ω).

Legs (Figs. 3A-D) — Legs with fan-like, smooth setaceous and serrate setae. Leg I–IV setal formulae: tarsus 9 + solenidion ω1 (tc', tc'', a'', u', u'', p', p'', ft smooth, vs apically serrate) −7 + solenidion ω1I (tc', tc'', u', u'', p', p'' smooth, vs apically serrate) −7−7 (tc', tc'', u', u'', p', p'' smooth, vs apically serrate); tibia 5+ solenidion φI (l'T, l''T, v'T, v''T fan-like, dT serrate) −4−4−4 (l''T, dT fan-like, v'T, v''T serrate); genu 2+ solenidion σI (dG, l'G fan-like) −2−2−2; femur 2−2−2−2 (dF, vF fan-like); trochanter 1−1−2−1 (fan-like); coxa 2 (1b, 1c smooth hair-like) 1 (2c smooth setaceous) 2 (3b fan-like, 3c smooth setaceous) 2 (4b, 4c smooth setaceous).

Material examined — Four females, stored rice and decayed rice bran; 2 females, soil of pine forest, Rasht (37°17′0″N, 49°35′0″E, alt. -7 m), 27 May 2016, 19 May 2016; 5 females, stored rice and decayed rice bran; 1 female, rotten wood, Sangar (37°10′42″N, 49°41′38″E, alt. 31 m), 9 June 2016, 2 August 2016; 1 female, poultry waste, Koochesfahan (37°28′11″N, 49°77′32″E, alt. 0 m), 15 June 2016; 6 females, decayed plant material, Khomam (37°23′21″N, 49°39′30″E, alt. -17 m), 25 July 2017.

Remarks — There are some morphological differences between our specimens and those used in Oudemans' (1906) redescription. In Iranian specimens the body (including gnathosoma) and idiosoma are clearly longer (624 versus 480 for body and 409 vs. 360 for idiosoma). Oudemans' redescription lacks setal measurements, terminology and notations. For example, no mention is made there of the solenidia of tarsi II (ωII), tibia and genua I (φI and σI); neither are the two pairs of intercoxal setae (3a, 4a), pair of coxa I setae (1b), pair of coxa IV setae (4b) and number of genital, aggenital and pseudoanal setae. Examination of the Iranian specimens revealed that the redescription also contains some errors. For example, guard seta (ft) of tarsus I is 1.5 times longer than solenidion (ωI) in the redescription, versus guard seta (ft) shorter than solenidion (ωI) in Iranian specimens.

Collection records

Tribe: Acaropsellini Bochkov and Fain, 2001

Genus*: Acaropsellina* Summers, 1976

Acaropsellina docta (Berlese, 1886)

Material examined — Three females, bran and dust of rice warehouse, Rasht (37°17′0″N, 49°35′0″E, alt. -7 m), 27 May 2016; 1 female, stored rice and decayed rice bran, Sangar (37°10′42″N, 49°41′38″E, alt. 31 m), 22 July 2016, collected by S. Salarzehi.

World Distribution — Italy and Netherlands (Volgin, 1987); British Isles (Baker and Craven, 2003); Egypt (Negm and Mesbah, 2014); Iran (Kamali, 1990).

Acaropsellina sollers (Kuzin, 1940)

Material examined — One female and one male, stored rice and decayed rice bran, Roudsar (37°8′0″N, 50°17′0″E, alt. -19 m), (Hajizadeh *et al*., 2011).

World Distribution — Holarctic: England, Scotland, Russia, USA (Hughes, 1976); Greece (Eliopoulos and Papadoulis, 2001); Iraq (Mahmood, 1992); Iran (Hajizadeh *et al*., 2011).

Tribe: Bakini Volgin, 1969

Genus: *Chelacheles* Baker, 1958

Chelacheles strabismus Baker, 1958

Material examined — Thirty-eight females, stored rice and decayed rice bran, Anzali (37°28′N, 49°280′E, alt. -36 m), (Hajizadeh *et al.*, 2011).

World Distribution — Portugal (Bochkov and Oconnor, 2004); Iran (Hajizadeh *et al*., 2011).

Tribe: Cheletogenini Volgin, 1969

Genus: *Cheletogenes* Oudemans, 1905

Cheletogenes ornatus (Canestrini and Fanzago, 1876)

Material examined — One female, decayed plant material, Koochesfahan (37°28′11″N, 49°77′32″E, alt. 0 m) 2 August 2016, collected by S. Salarzehi; 3 females, leaf of citrus, Langarud (37°11′0″N, 50°9′0″E, alt. 25 m), (Jalilirad, 2013).

World Distribution — Cosmopolitan (Volgin, 1987; Summers and Price 1970).

Tribe: Cheletomorphini Bochkov and Fain, 2001

Genus: *Cheletomorpha* Oudemans, 1904

Cheletomorpha lepidopterorum (Shaw, 1794)

Material examined — Nine females, stored rice and decayed rice bran; 3 females, raspberry leaf; 2 females, soil; 2 females, manure; 1 female, poultry waste; 1 female, leaf of grape, Rasht (37°17′0″N, 49°35′0″E, alt. -7 m), 27 May. 2016, 28 October 2016, 23 September 2016, 9 November 2016; 2 females, decayed plant material, Sangar (37°10′42″N, 49°41′38″E, alt. 31 m), 9 June. 2016; 2 females, stored rice and decayed rice bran, Koochesfahan (37°28′11″N, 49°77′32″E, alt. 0 m), 15 June 2016; 1 female, stored rice and decayed rice bran, Khomam (37°23′21″N, 49°39′30″E, alt. -17 m), 30 October. 2016; 1 female, manure, Lashtnesha (37°36′44″N, 49°85′78″E, alt. 24 m), 16 November 2016; 1 female, stored rice and decayed rice bran, Shaft (37°9′24″N, 49°24′26″E, alt. 47 m), 4 July. 2016; 1 female, citrus leaf; 1 female, cedar leaf, Lahijan (37°12′0″N, 50°0′0″E, alt. 2 m), 1 December 2016, 16 October 2016; 1 female, bran and dust of rice warehouse, Emamzadeh Hashem (37°01′27″N, 49°37′32″E, alt. 115 m), 3 November 2016; 2 females, soil, Astane-ye-Ashrafiyeh (37°15′54″N, 49°56′40″E, alt. -2 m), 6 November 2016; 1 female, bran and dust of rice warehouse; 1 female, stored rice and decayed rice bran, Anzali (37°28′N, 49°280′E, alt. -36 m), 27 October 2016, collected by S. Salarzehi; 2 females, stored rice and decayed rice bran, Sowme'e-Sara (37°18′0″N, 49°18′0″E, alt. 20 m); 14 females, stored rice and decayed rice bran, Masal (37°21′47″N, 49°7′58″E, alt. 44 m); 4 females, stored rice and decayed rice bran, Roudsar (37°8′0″N, 50°17′0″E, alt. -19 m), (Noei, 2007).

World Distribution — Cosmopolitan (Volgin, 1987; Summers and Price 1970).

Tribe: Cheyletini Leach, 1815

Genus: *Cheletomimus* Oudemans, 1904

Cheletomimus berlesei (Oudemans, 1904)

Material examined — Two females, leaf citrus, Langarud (37°11′0″N, 50°9′0″E, alt. 25 m), (Jalilirad, 2013).

World Distribution — Italy (Oudemans, 1904); Russian, Israel, USA, (Volgin, 1987); Iran (Jalilirad, 2013).

Cheletomimus (*Hemicheyletia*) *congensis* (Cunliffe, 1962)

Material examined — One female, stored rice and decayed rice bran, Lashtnesha (37°36′44″N, 49°85′78″E, alt. 24 m), 12 June 2017, collected by S. Salarzehi

World Distribution — Congo (Cunliffe 1962); Pakistan (Rasool and Chaudhri, 1979); Philippines (Corpuz-Raros, 1998); Iran (Khanjani and Kamali, 1993).

Cheletomimus (*Hemicheyletia*) *wellsi* (Baker, 1949)

Material examined — One female, soil and fig leaf, Khomam (37°23′21″N, 49°39′30″E, alt. -17 m) 19 July 2017, collected by S. Salarzehi. Three females, soil of citrus garden, Chaboksar, (36°58′0″N, 50°35′0″E, alt. 216 m); 3 females, soil and weed of citrus garden, Kelachay (37°4′44″N, 50°23′43″E, alt. -20 m); 1 female, citrus leaf, Langarud (37°11′0″N, 50°9′0″E, alt. 25 m), (Jalilirad, 2013).

World Distribution — Cosmopolitan (Fain *et al*., 2002; Dogan and Ayyildiz, 2004).

Genus: *Cheyletus* Latreille, 1796

Cheyletus cacahuamilpensis Baker, 1949

Material examined — One female, stored rice and decayed rice bran, Kuchesfahan (37°28′11″N, 49°77′32″E, alt. 0 m), 15 June 2016; 1 female, soil, Sangar (37°10′42″N, 49°41′38″E, alt. 31 m), 2 August 2016; 1 female, soil, Rostamabad (36°53′54″N, 49°29′26″E, alt. 400 m), 26 October 2016; 4 females, stored rice and decayed rice bran, Khomam (37°23′21″N, 49°39′30″E, alt. -17 m), 30 October 2016; 3 females, bran and dust of warehouse, Emamzadeh Hashem (37°01′27″N, 49°37′32″E, alt. 115 m), 2 November 2016, collected by S. Salarzehi.

World Distribution — Mexico, Crimea, Ukraine, Algeria, South Africa, Peru (Fain and Bochkov, 2001b); Iran (Mirfakhraii, 1994).

Cheyletus carnifex Zachvatkin, 1935

Material examined — Forty five females, stored rice and decayed rice bran; 1 female, poultry waste; 3 females, pine shells; 1 female, box leaf; 1 female, bran and dust of rice warehouse; 1 female, rotten wood, Rasht (37°17′0″N, 49°35′0″E, alt. -7 m), 22 July 2016, 3 September 2016, 3 July 2016, 18 May 2016, 22 October 2016, 9 June 2016; 22 females, stored rice and decayed rice bran; 12 females, rotten wood, 6 females, decayed plant material, Sangar (37°10′42″N, 49°41′38″E, alt. 31 m), 9 June 2016; 1 female, decayed plant material, Loolman (37°04′23″N, 49°54′13″E, alt. 0 m), 15 June 2016; 1 female, rotten wood; 20 females, stored rice and decayed rice bran, 9 June 2016, Kuchesfahan (37° 28′ 11″N, 49°77′32″E, alt. 0 m), 15 June 2016, 2 August 2015, 29 February 2017; 1 female, citrus leaf; 1 female, pigeon waste, Lashtnesha (37°36′44″N, 49°85′78″E, alt. 24 m), 22 July 2016, 17 November 2016; 1 female,

soil, Astane-ye-Ashrafiyeh (37°15′54″N, 49°56′40″E, alt. -2 m), 6 November 2016; 1 female stored rice and decayed rice bran, Anzali (37°28′N, 49°280′E, alt. -36 m), 27 October 2016; 1 female, Turkey waste, Shaft (37°9′24″N, 49°24′26″E, alt. 47 m), 4 July 2016; 1 female, stored rice and decayed rice bran, Sowme'e-Sara (37°18′0″N, 49°18′0″E, alt. 20 m), 22 November 2016; 1 female, stored rice and decayed rice bran, Chaboksar (36°58′0″N, 50°35′0″E, alt. 216 m), 29 September 2015, collected by S. Salarzehi.

World Distribution — Holarctic: Tajikistan, Mongolia, Ukraine, Uzbekistan, Kirghizia (Zachvatkin, 1935; Fain and Bochkov, 2001b); Czech Republic, USA (Hughes, 1976); Iran, (Faraji and Kamali, 1993).

Cheyletus eruditus (Schrank, 1781)

Material examined — Forty females, stored rice and decayed rice bran; 1 female, decayed plant material; 1 female, rotten fig fruit; 1 female, maize flour; 2 females, rotten wood, Rasht (37°17′0″N, 49°35′0″E, alt. -7 m), 19 May 2016, 29 August 2016, 3 November 2016, 5 March 2017; 12 females, stored rice and decayed rice bran; 4 females, rotten wood, Sangar (37°10′42″N, 49°41′38″E, alt. 31 m), 9 June 2016, 4 August 2016; 4 females, manure, Kuchesfahan (37°28′11″N, 49°77′32″E, alt. 0 m), 15 June 2016; 5 females, stored rice and decayed rice bran, Loolman (37°04′23″N, 49°54′13″E, alt. 2300 m), 15 June 2016; 3 females, soil of citrus garden, Emamzadeh Hashem (37°01′27″N, 49°37′32″E, alt. 115 m), 10 August 2016; 1 female, stored rice and decayed rice bran; 1 female, poultry waste, Shaft (37°9′24″N, 49°24′26″E, alt. 47 m), 10 August 2015, 4 July 2016; 1 female, soil, Astane-ye-Ashrafiyeh (37°15′54″N, 49°56′40″E, alt. -2 m), 6 November 2016; 1 female, manure, Lashtnesha (37°36′44″N, 49°85′78″E, alt. 24 m), 22 July 2016; 1 female, garden soil, Lahijan (37°12′0″N, 50°0′0″E, alt. 2 m), 22 November 2016, collected by S. Salarzehi. Six females, stored rice and decayed rice bran, Sowme'e-Sara (37°18′0″N, 49°18′0″E, alt. 20 m); 6 females, stored rice and decayed rice bran, Masal (37°21′47″N, 49°7′58″E, alt. 44 m), 1 female, stored rice and decayed rice bran, Anzali (37°28′N, 49°280′E, alt. -36 m), (Noei, 2007).

World Distribution — England (Griffiths, 1960); Canada (Liscombe and Watters, 1962); Japan (Sinha, 1968); Afrotropical (Fain, 1979); Taiwan (Tseng, 1979); Croatia (Pagliarini, 1979); China (Lung-Shut, 1984); Iran (Mosaddegh, 1997).

Cheyletus malaccensis Oudemans, 1903

Material examined — Thirty five females and 5 males, stored rice and decayed rice bran; 6 females, soil; 2 females, decayed plant material; 2 females, poultry waste; 5 females, rotten fruit of fig; 2 females, grape leaf; 2 females, box leaf; 1 female, citrus leaf; 1 female, purple leaf; 1 female, raspberry leaf; 6 females, rotten wood; 1 female, maize flour; 2 females, dust of the storehouse; 2 females, Rasht (37°17′0″N, 49°35′0″E, alt. -7 m), 9 August 2015, 17 May 2016, 12 July 2016, 23 August 2016, 23 September 2016, 29 October 2016, 29 February 2017, 5 March 2017, 18 May 2017; 30 females and 2 males, stored rice and decayed rice bran; 12 females and 1 male, manure; 8 females, poultry waste; 3 females, pigeon waste; 12 females, rotten wood; 5 females, decayed plant material; 3 females, soil, Sangar (37°10′42″N, 49°41′38″E, alt. 31 m), 9 June 2016, 2 August 2016, 15 February 2017; 25 females and 3 males, stored rice and decayed rice bran; 8 females, manure; 5 females, poultry waste; 7 females, rotten wood; 3 females, decayed plant material; 2 females, soil, Kuchesfahan (37°28′11″N, 49°77′32″E, alt. 0 m), 15 June 2016, 06 August 2016, 27 October 2016; 5 females, manure; 1 females, soil, Loolman (37°04′23″N, 49°54′13″E, alt. 0 m), 15 June 2016, 27 October 2016; 15 females and 1 male, stored rice and decayed rice bran; 3 females, soil; 2 females, citrus leaf; 5 females, manure; 1 female, poultry waste, Lashtnesha (37°36′44″N, 49°85′78″E, alt. 24 m), 22 July 2016, 12 June 2017; 2 females, stored rice and decayed rice bran; 1 female, decayed plant material, Khoshkebijar (37°28′11″N, 49°77′32″E, alt. -28 m), 12 June 2017; 5 females,

stored rice and decayed rice bran; 2 females, manure, Khomam (37°23′21″N, 49°39′30″E, alt. -17 m), 2 June 2015, 30 October 2016, 1 December 2016; 40 females and 5 males, stored rice and decayed rice bran; 14 females and 2 males, manure, Fuman (37°13′48″N, 49°17′24″E, alt. 20 m), 23 May 2015; 8 females, stored rice and decayed rice bran; 1 female, poultry waste; 6 females, Turkey waste, shaft (37°9′24″N, 49°24′26″E, alt. 47 m), 3 July 2016; 6 females, citrus leaf; 1 female, soil of garden; 1 female, poultry waste; 1 female, soil of oak tree; 3 females, chaff and dust of rice warehouse, Emamzadeh Hashem (37°01′27″N, 49°37′32″E, alt. 115 m), 10 August 2016, 3 November 2016; 2 females, stored rice and decayed rice bran, Masal (37°21′47″N, 49°7′58″E, alt. 44 m), 3 March 2015; 1 female, decayed plant material, Hashtpar (37°42′14″N, 48°56′27″E, alt. 29 m), 21 February 2017; 1 female, soil, Rostamabad, (36°53′54″N, 49°29′26″E, alt. 400 m), 26 October 2016; 25 females and 6 males, stored rice and decayed rice bran, Lahijan (37°12′0″N, 50°0′0″E, alt. 2 m), 30 May 2015; 8 females, stored rice and decayed rice bran, 1 female, manure, Anzali (37°28′N, 49°280′E, alt. -36 m), 11 May 2015, 10 November 2016; 1 female, soil, Roudsar (37°8′0″N, 50°17′0″E, alt. -19 m), 29 September 2015; 1 female, soil, Siahkal (37°9′10″N, 49°52′15″E, alt. 200 m), 25 June 2015; 30 females and 1 male, stored rice and decayed rice bran, Rezvanshahr (37°33′4″N, 49°8′22″E, alt. 15 m), 27 June 2015; 15 females, stored rice and decayed rice bran; 1 female, soil, Sowme'e-Sara (37°18′0″N, 49°18′0″E, alt. 20 m), 22 November 2016; 1 female, stored rice and decayed rice bran; 1 female, soil, Astane-ye-Ashrafiyeh (37°15′54″N, 49°56′40″E, alt. -2 m), 15 November 2016; 3 females, soil of olive garden, Rudbar (36°48′26.5″N, 49°24′48.5″E, alt. 1050 m), 13 October 2016; 1 female, soil, Talesh (37°80′08″N, 48°90′30″E, alt. 50 m), 15 November 2016; 1 female, soil, Daylaman (36°88′83″N, 49°90′64″E alt. 2200 m) 25 June 2015, collected by S. Salarzehi.

World Distribution — Cosmopolitan (Fain and Bochkov 2001b).

Cheyletus malayensis Cunliffe, 1962

Material examined — Two females, poultry waste; 1 female, manure, Koochesfahan (37°28′11″N, 49°77′32″E, alt. 0 m), 15 June 2016; 2 females, decayed plant material, Sangar (37° 10′ 42″ N, 49° 41′ 38″ E, alt. 31 m), 8 June 2016, 2 August 2015, collected by S. Salarzehi.

World Distribution —Russia, Hawaii (Summers and Price, 1970); Malaysia (Cunliffe, 1962); Philippines (Corpuz-Raros, 1988); Iran (Sepasgozarian, 1978).

Cheyletus trouessarti Oudemans, 1903

Material examined — Two females rice barn, Rasht (37°17′0″N, 49°35′0″E, alt. -7 m), (Ardeshir, 2017).

World Distribution — England (Griffiths, 1960); Peru (Caceres and Fain, 1977); Taiwan (Tseng, 1979); Malaysia (Fain and Nadchatram, 1980); China (Lung-Shut, 1984); Netherlands (Volgin, 1987); Greece (Eliopoulos and Papadoulis, 2001); Czech Republic (Stejskal *et al*., 2003); Iran (Ardeshir, 2017).

Genus: *Eucheyletia* Baker, 1949

Eucheyletia flabellifera (Michael, 1878)

Material examined — Like as redescription section.

Remark — This is first record of *Eucheyletia flabellifera* from Iran.

World Distribution — Belgium, Germany, England, Poland (Fain and Bochkov 2001a).

Genus: *Zachvatkiniola* Volgin, 1969

Zachvatkiniola reticulata (Cunliffe, 1962)

Material examined — One female, stored rice and decayed rice bran, Khomam (37°23′21″N, 49°39′30″ E, alt. -17 m) 19 July 2017, collected by S. Salarzehi.

World Distribution — Russia (Volgin, 1969); Iran (Bochkov *et al*., 2001).

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