

A review of the Iranian Cheyletidae (Acari: Prostigmata)

by Andre V. BOCHKOV^{1,2}, Masoud HAKIMITABAR³ & Alireza SABOORI³

¹ Museum Zoology, University of Michigan, 1109 Geddes Ave., An Arbor, Michigan 48109, USA (e-mail : bochkov@umich.edu)

² Zoological Institute, Russian Academy of Sciences, Universitetskaya embankment 1, St. Petersburg 199034, Russia (e-mail : prostigmata@zin.ru).

³ Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran (e-mails : hakimitabar@yahoo.com; saboori@ut.ac.ir)

Abstract

Two species of the family Cheyletidae (Acari: Prostigmata), *Lepidocheyla gracilis* VOLGIN, 1963 and *Cheletomimus vescus* (QAYYUM & CHAUDHRI, 1979), are recorded from Iran for the first time. Both sexes of the latter species are re-described. A key to the 18 genera and 28 species known from Iran is provided.

Keywords: mites, Cheyletidae, Iran, fauna

Introduction

The cosmopolitan family Cheyletidae (Acari: Prostigmata) includes more than 360 predacious and parasitic species arranged in 73 genera (BOCHKOV & FAIN, 2001). About 78% of these species are predators, while the remaining taxa are permanent parasites of mammals and birds (BOCHKOV, 2004).

Up to now, the list of these mites from Iran included 26 species in 17 genera (VERCAMMEN-GRANDJEAN & RACK, 1968; BOCHKOV & MALIKOV, 1996; FATHIPOUR *et al.*, 1999; ARDESHIR *et al.*, 2000; FAIN & ARDESHIR, 2000; MEHRNEJAD & UECKERMANN, 2001; BOCHKOV *et al.*, 2001; for a complete bibliography of Iranian authors see KAMALI *et al.*, 2001; AHADIYAT *et al.*, 2004). As most cheyletid genera are distributed worldwide (BOCHKOV, 2004), more records could be expected from Iran, and herein we add two more species that are new for Iran, *Lepidocheyla gracilis* VOLGIN, 1963 and *Cheletomimus vescus* (QAYYUM & CHAUDHRI, 1979). The latter was poorly described and is known only from the type specimens (FAIN *et al.*, 2003). Therefore we re-describe both sexes of *C. vescus* and provide a key to all known Iranian cheyletids, along with their recently recognized synonymies, to avoid possible confusion in the future.

Methods

In the descriptions the leg and idiosomal chaetotaxy follows GRANDJEAN (1939, 1944) as interpreted by KETHLEY (1990), with a single exclusion. In our opinion, setae *4c sensu* KETHLEY (setae of coxae IV) are actually agenital setae, as was suggested by GRANDJEAN for the family Stigmaeidae (1944). All measurements are in micrometers (μm). The family system follows BOCHKOV & FAIN (2001).

Systematics

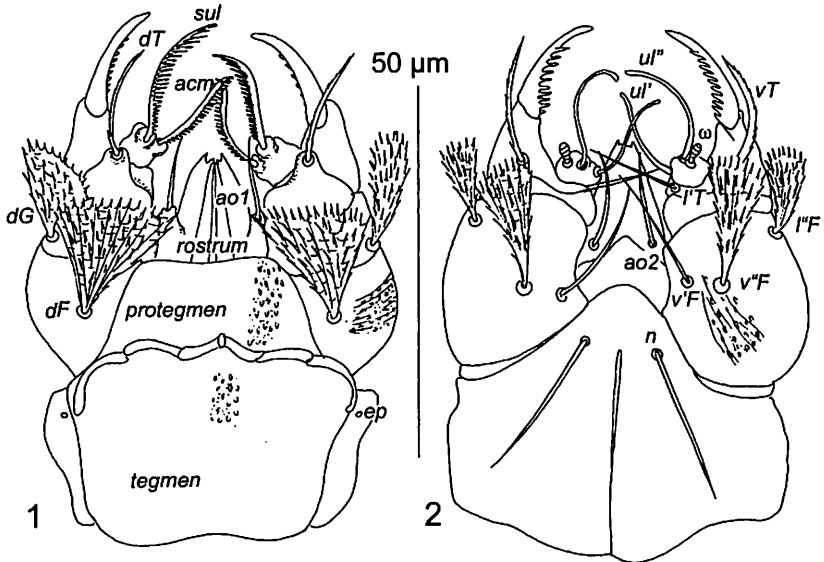
Cheletomimus (H.) vescus (QAYYUM & CHAUDHRI, 1979)

Hemicheyletia vescus QAYYUM & CHAUDHRI, 1979: 167-169.

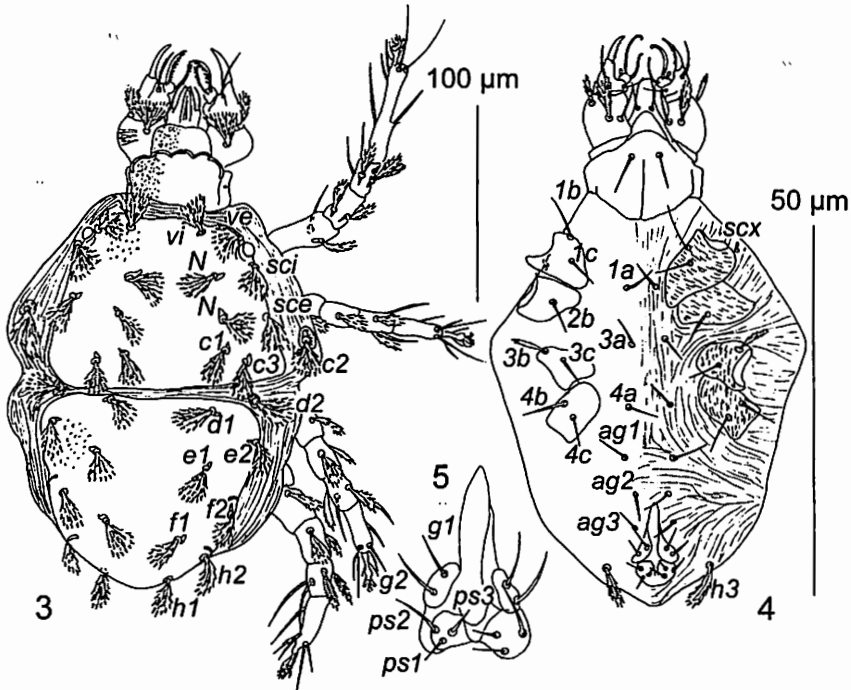
Hemicheyletia laguncula RASOOL & CHAUDHRI, 1979: 4-5.

Cheletomimus (Hemicheyletia) vescus, FAIN *et al.*, 2003: 38.

Female (3 specimens, Figs 1-9). Gnathosoma 56-65 long and 65-70 wide (Figs 1, 2). Palpal claw with 9-10 teeth. Setae *d* and *v* of palpal tibia thickened, serrate. Palpal femur 35-40 long and 25-27 wide. Setae *v'* and *l''* of palpal femur fan-like, *v'* filiform. Peritremes with 3 pairs of links. Tegmen and protegmen distinctly granulated. Rostrum conical, about 15 long and 20 wide. Idiosoma 220-230 long and 170-180 wide (Figs 3, 4). All dorsal setae fan-like, subequal in length, about 17 long and 15 wide. Dorsal shields distinctly granulated, covering almost all dorsal surface of idiosoma. Median setae of dorsal shields the same shape as lateral setae. Propodonotal shield 105-110



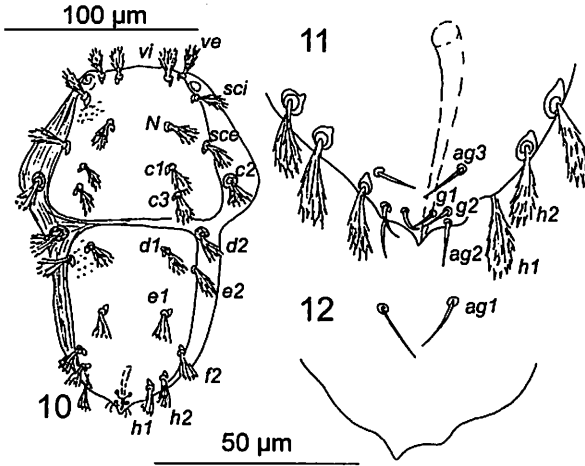
Figs 1-2. *Cheletomimus vescus* QAYYUM & CHAUDHRI, 1979, female. 1: gnathosoma dorsally. 2: same, ventrally.



Figs 3-5. *Cheletomimus vescus* QAYYUM & CHAUDHRI, 1979, female. 3: dorsally. 4: ventrally. 5: vulva. Scale lines 100 μm (Figs 3, 4) and 50 μm (Fig. 5).

long and 130-140 wide, bearing 4 pairs of lateral setae (*vi*, *ve*, *sci*, *sce*), and 4 pairs of median setae (*c1*, *c3*, two neutrichial). Setae *c2* situated on small separate plates. Setae *d2* situated off hysteronotal shield. Hysteronotal shield unbroken, 105-110 long and 120-125 wide, bearing 3 pairs of lateral (*e2*, *f2*, *h2*) and 4 pairs of median (*d1*, *e1*, *f1*, *h1*) setae. Dorsal interscutal areas striate-granulate. Setae *h3* fan-like, situated ventrally. Setae *3b* lanceolate, other ventral setae, including *ps3*, filiform. Leg chaetotaxy depicted in Figs 6-9. Tibia I with 5 setae (*d*, *l'* and *l''* lanceolate and *v'*, *v''* serrate, filiform). Solenidion of tarsus II situated ventrally. Tibiae II-IV with 4 setae (*d*, *l''* - lanceolate, *v'*, *v''* filiform serrate). Genu IV with 2 lanceolate setae (*d*, *l'*). Seta *v* filiform on femora I-II and lanceolate on femur III.

Homeomorphic male (1 specimen, Figs 10-12). Gnathosoma 60 long and 55 wide, the same structure as in female. Idiosoma 175 long and 115 wide. Propodonotal shield 70 long and 70 wide, bearing 4 pairs of lateral setae (*vi*, *ve*, *sci*, *sce*) and 3 pairs of median setae (*c1*, *c3*, neutrichial). Setae *c2* situated on small separate plates. Setae *d2* situated off hysteronotal shield. Hysteronotal shield 80 long and 60 wide, bearing 3 pairs of median setae (*d1*, *e1*, *h1*) and 3 pairs of lateral setae (*e2*, *f2*, *h2*). Two pairs of genital (*g1-2*), 3 pairs of agenital (*ag1-3*) filiform setae present.



Figs 10-12. *Cheletomimus vescus* QAYYUM & CHAUDHRI, 1979, male. 10: idiosoma dorsally. 11: opisthosoma dorsally. 12: same, ventrally. Scale lines 100 µm (Fig. 10) and 50 µm (Figs 11, 12).

Lepidocheyla gracilis VOLGIN, 1963

Lepidocheyla gracilis VOLGIN, 1963: 940-944.

Material examined: One female, IRAN: Tehran Prov., Karaj, Eshtehard, 35° 43' 15" N, 050° 22' 20" E, cotton field, manure (extracted with BERLESE'S funnel), 26. VII. 2004 (Coll. M. HAKIMITABAR).

Distribution: Ukraine, Tajikistan, Turkmenia, Israel (VOLGIN, 1978; FAIN & BOCHKOV, 2001), Iran (new record).

Key to the Cheyletidae of Iran (females)

Remarks: (i) *Cheletomimus binus* TSENG, 1973, recorded by FATHIPOUR *et al.* (1999) is actually *inquirendae* (FAIN *et al.*, 2003), as it was described from nymphs, probably of *Cheletomimus berlesei* (OUDEMANS, 1904).

(ii) *Psorergates simplex* (TYRRELL, 1883) listed among the Cheyletidae by KAMALI *et al.* (2001) belongs to the family Psorergatidae (Acari: Cheyletoidea).

(iii) *Acaropsellina sollers* (KUZIN, 1940) was incorrectly identified by FATHIPOUR *et al.* (1999) as *A. docta* (BERLESE, 1906). The genus *Acaropsellina* is represented in Iran by the widely distributed *A. sollers* (ARDESHIR *et al.*, 2000).

1. Eupathidia of palpal tarsus *sul* and *acm* (or only *sul*) comb-like. Palpal

- claws curved laterally. Claws of tarsi II-IV present. Setae *h2* subequal in length to other lateral hysteronotal setae. Free-living mites 4
- Eupathidia *sul* and *acm* of palpal tarsi without comb-like teeth. Palpal claws curved dorso-ventrally. Tarsal claws of all legs absent. Setae *h2* distinctly longer than other lateral hysteronotal setae. Parasites of Lagomorpha or Carnivora 2
Cheyletiellini VOLGIN, 1961
2. Peritremes with 14-15 pairs of segments. Lateral segments with inner projections. Propodonotal shield with 2 pairs of median setae, *c1* and *c3*. Parasites of Leporidae and Carnivora 3
Cheyletiella CANESTRINI, 1886
- Peritremes with 6-10 pairs of segments. Lateral segments without projections. Setae *c1* and *c3* absent. Parasites of Ochotonidae
E. faini BOCHKOV et MALIKOV, 1996
Euchyletiella VOLGIN, 1969
3. Setae *d1* and *d2* subequal in length. Solenidion of genu I globosely inflated. Parasites of rabbits .. *Cheyletiella parasitivorax* MÉGNIN, 1878
- Setae *d2* 1.5-2 times longer than *d1*. Solenidion of genu I bifurcate. Parasites of dogs *Cheyletiella yasguri* SMILEY, 1965
4. Pretarsus of tarsus I present, bearing claws and empodium 6
- Pretarsus of tarsus I absent 5
Cheletogenini VOLGIN, 1969
5. Palpal claws with projections. Eyes present
C. ornatus (CANESTRINI & FANZAGO, 1876)
Cheletogenes OUDEMANS, 1905
- Palpal claws smooth. Eyes absent *E. frater* VOLGIN, 1958
(= *E. africanus* Wafa & SOLIMAN, 1968)
Eutogenes Baker, 1949
6. Guard seta (*ft*) of solenidion $\omega 1$ on tarsi I filiform 10
- Guard seta (*ft*) of solenidion $\omega 1$ on tarsi I lanceolate or fan-like 7
7. Solenidion $\omega 1$ situated in basal or median part of tarsus I. Guard seta (*ft*) situated immediately behind solenidion $\omega 1$ 8
Cheyletiini VOLGIN, 1969
- Solenidion $\omega 1$ situated in apical part of tarsus I. Guard seta (*ft*) situated far behind solenidion $\omega 1$ *C. lieni* TSENG, 1977
Caudacheles GERSON, 1968
8. Palpal femur with five setae. Eupathidium *ul'* of palpal tarsus not inflated. Median area of dorsal shields completely covered by setae looking like flattened and granulated plates. Tibia I with four setae and short solenidion *H. mirabilis* VOLGIN, 1955
Hypopicheyla VOLGIN, 1969
- Palpal femur with four setae. Eupathidium *ul'* of palpal tarsus globosely inflated. Dorsal shields in median parts covered by fan-like or cloud-like

- setae. Tibia I with five setae and short solenidion 9
9. Rostrum slightly narrower than rostral shield. Rostral shield with straight anterior margin. Peritremes arc-like
N. iranica FAIN & ARDESHIR, 2000
Neoeucheyla RADFORD, 1950
- Rostrum about 2 times narrower than rostral shield. Rostral shield with widely rounded anterior margin. Peritremes arch-like with concave apex
C. bulgarica (VOLGIN, 1955)
Cunliffella VOLGIN, 1969
10. Palpal tarsi with two comb-like eupathidia, *acm* and *sul* 13
- Palpal tarsi with one comb-like eupathidium, *sul* 11
Acaropsellini BOCHKOV & FAIN, 2001
11. Dorsal shields of idiosoma distinctly sclerotized. Coxae I-II and III-IV situated close to each other. Opisthosoma longer than distance between coxae II and III. Tarsus I without dorso-apical knob 12
- Propodonal shield indistinct, hysteronotal shield absent. Coxae I-II and III-IV situated far from each other. Opisthosoma shorter than distance between coxae II and III. Tarsus I with dorso-apical knob
C. michalskii SAMSINAK, 1962
Chelacheles BAKER, 1958
12. Setae *c2* filiform. Hysteronotal shield with five-six pairs of setae
A. sollers (KUZIN, 1940)
Acaropsellina SUMMERS, 1976
- Setae *c2* lanceolate. Hysteronotal shield with eight pairs of setae
A. kulagini (ROHDENDORF, 1940)
Acaropsella VOLGIN, 1969
13. Palpal femur with three-four setae. Legs I moderately elongated. Tibia I distinctly shorter than tarsus I. Setae *vs* of tarsus I situated almost at the same level as solenidion $\omega 1$ 14
Cheyletini LEACH, 1815
- Palpal femur with five setae. Legs I extremely long, about 1.5 times longer than legs IV. Tarsus and tibia I subequal in length. Setae *vs* of tarsus I situated distinctly anterior to solenidion $\omega 1$
C. lepideptorum (SHAW, 1794)
Cheletomorphini BOCHKOV & FAIN, 2001
Cheletomorpha OUDEMANS, 1904
14. Eyes present 21
- Eyes absent 15
15. Tibia I with five setae and short solenidion. Hysteronotal shield bearing one-three pairs of median setae or none. In the Iranian species, median setae of dorsal shields distinctly shorter than lateral setae. Dorsal shields without reticulated ornamentation 16
Cheyletus LATREILLE, 1796

- Tibia I with four setae and short solenidion. Hysteronotal shield bearing four pairs of median setae. Median setae fan-like, subequal in length to lateral setae. Dorsal shields with distinct reticulate ornamentation
..... *Z. reticulata* (CUNLIFFE, 1962)
..... *Zachvatkiniola* VOLGIN, 1969
- 16. Dorsal shields without median setae. Guard seta (*ft*) of solenidion ω 1 on tarsus I rudimentary 19
- Dorsal shields with transparent flag-like or cloud-like median setae (sometimes indistinct or broken). Guard seta (*ft*) on tarsus I longer than solenidion ω 1 17
- 17. Setae *d*2 situated off hysteronotal shield 18
- Setae *d*2 situated on hysteronotal shield
..... *Cheyletus cacahuampensis* BAKER, 1949
..... (= *C. baloghi* VOLGIN, 1969)
- 18. Peritremes M-shaped. Hysteronotal shield with three pairs of median setae
..... *Cheyletus trouessarti* OUDEMANS, 1902
..... (= *C. furibundus* ROHDENDORF, 1940, *C. praedabundus* KUZIN, 1940, *C. truculentus* VOLGIN, 1949, *C. woodroffei* JEFFREY, 1979)
- Peritremes M-shaped. Hysteronotal shield with one pair of median setae
..... *Cheyletus carnifex* ZACHVATKIN, 1935
..... (= *C. aversor* ROHDENDORF, 1940,
C. acarophagus ZAHER et SOLIMAN, 1967,
C. allactaga FAIN & LUKOSCHUS, 1981,
C. zaheri HASSAN & RAKHA, 1982)
- 19. Femur IV with one seta 20
- Femur IV with two setae *Cheyletus eruditus* (SCHRANK, 1781)
..... (= *C. strenuus* OUDEMANS, 1904, *C. mortelmansi* FAIN, 1972,
C. desitus QAYYUM & CHAUDHRI, 1977)
- 20. Propodonotal and hysteronotal shields subequal in length. Distance between these shields less than 1/2 length of *d*2. Setae *e*2 situated far behind the anterior margin of hysteronotal shield
..... *Cheyletus malayensis* CUNLIFFE, 1962
- Propodonotal shield 1.5 times or longer than hysteronotal shield. Distance between these shields and length of setae *d*2 almost subequal. Setae *e*2 situated almost on anterior margin of hysteronotal shield
..... *Cheyletus malaccensis* Oudemans, 1903
..... (= *C. vorax* OUDEMANS, 1903, *C. fortis* OUDEMANS, 1904,
C. polymorphus VOLGIN, 1949, *C. rohdendorfi* ZACHVATKIN, 1949,
C. egypticus ELBADRY, 1969, *C. avidus* QAYYUM & CHAUDHRI, 1977,
C. baridos AKBAR, RAHI & CHAUDHRI, 1988, *C. ayyazi* AKBAR, AHEER &
CHAUDHRI, 1993, *C. infensus* AKBAR, AHEER & CHAUDHRI, 1993,
C. phantosis AKBAR & AHEER, 1994, *C. wahndoensis* AKBAR &
AHEER, 1994, *C. mianiensis* FAROOQ, AKBAR & QURESHI, 2000,
C. rafiquiensis FAROOQ, AKBAR & QURESHI, 2000)

21. Palpal femur with four setae, genu with one seta. Legs I shorter than idiosoma 23
 - Palpal femur with three setae, genu with two setae. Legs I subequal or longer than idiosoma 22
22. Palpal claws with numerous projections. Lateral setae of dorsal shields fan-like, median setae dendrite-like. Guard seta (*ft*) of tarsus I rudimentary *P. pyriformes* (BANKS, 1904)
Paracheyletia VOLGIN, 1955
 - Palpal claws with single basal projection. Lateral and median setae of dorsal shields thickened, rod-like. Guard seta (*ft*) of tarsus I distinctly developed *N. calamondin* MUMA, 1964
Nodele MUMA, 1964
23. Hysteronotal shield paired or unpaired (absent in some species), but without deep lateral incisions. Posterior margin of opisthosoma widely rounded. Pseudoanal setae *ps3* situated ventrally or terminally, behind level of posterior margin of hysteronotal shield 24
Cheletomimus OUDEMANS, 1904
 - Hysteronotal shield unpaired, with pair of deep lateral incisions between metapodosoma and opisthosoma. Opisthosoma bluntly pointed posteriorly. Pseudoanal setae *ps3* situated dorso-laterally, above level of posterior margin of hysteronotal shield *L. gracilis* VOLGIN, 1963
Lepidocheylea VOLGIN, 1963
24. Hysteronotal shield unpaired 25
 - Hysteronotal shield paired ... *Cheletomimus berlessei* (OUDEMANS, 1904)
25. Median setae of dorsal shields fan-like, similar in shape to lateral setae ..
 26
 - Median setae of dorsal shields staghorn-like
 *Cheletomimus wellsii* (BAKER, 1949)
26. Tibia I with four setae and short solenidion 27
 - Tibia I with five setae and short solenidion
 *Cheletomimus vescus* QUAYYUM et CHAUDHRI, 1979
 (= *Hemicheyletia laguncula* RASOOL & CHAUDHRI, 1979)
27. Dorsal shields with indistinct punctuation. Propodonotal shield with three pairs of median setae. Median setae of hysteronotum always situated on hysteronotal shield. Ratio of length/width of hysteronotal shield 1.4/1 ...
 *Cheletomimus congensis* (CUNLIFFE, 1962)
 (= *Hemicheyletia lacinia* RASOOL & CHAUDHRI, 1979)
 - Dorsal shields with distinct punctuation. Propodonotal shield with two pairs of median setae. Median setae of hysteronotum situated off or on hysteronotal shield. Ratio of length/width of hysteronotal shield 1/1.2 ...
 *Cheletomimus bakeri* (EHARA, 1962)
 (= *Hemicheyletia tumidus* QUAYYUM & CHAUDHRI, 1979)

Acknowledgements

Authors cordially thank Prof. URI GERSON (Hebrew University, Israël) for careful reviewing this MS. This research was partly supported by the grant from the "Center of Excellence of Plant Protection" (AS and MH).

References

- AHADYAT, A., OSTOVAN & SABOORI, A., 2004. - Mites associated with *Scolytus amygdali* GUERIN-MONEVILLE, 1874 in Karaj region. In: *Proceedings of the 16th Iranian Plant Protection Congress, 28 Aug.-1 Sept.*, University of Tabriz, Iran. p. 251.
- ARDESHIR, F., GEORGES-GRIDELET, D.S., GROOTAERT, P., TIRRY, L. & WAUTHY, G. 2000. - Preliminary observations on mites associated with stored grain in Iran. *Belgian Journal of Entomology*, 2: 287-293.
- BOCHKOV, A.V. 2004. - Mites of the family Cheyletidae (Acari: Prostigmata): phylogeny, distribution, evolution and analysis of host-parasite relationships. *Parazitologiya (St. Petersburg)*, 38: 122-138. (In Russian with English summary).
- BOCHKOV, A.V. & FAIN, A. 2001. - Phylogeny and system of the Cheyletidae (Acari : Prostigmata) with special reference to their host-parasite associations. *Bulletin de l'Institut royal des Sciences naturelles de Belgique*, 71: 5-36.
- BOCHKOV, A.V., FAIN, A., & ARDESHIR, F., 2001. - Redescription of *Nodele calamondin* MUMA, 1964 (Acari Cheyletidae). *Bulletin de la Societe royale Belge d'Entomologie*, 137: 123-126.
- BOCHKOV, A.V. & MALIKOV, V.G., 1996. - *Eucheyletiella faini* sp.n. (Acari:Cheyletidae), a new species of parasitic mites from *Ochotona rufescens* (GRAY) (Lagomorpha, Ochotonidae), *Acarina*, 4: 43-48.
- FAIN, A. & ARDESHIR, F., 2000. - Notes on the genus *Neoeucheyla* RADFORD, 1950 (Acari: Cheyletidae) with description of a new species from Iran. *International Journal of Acarology*, 26: 329-334.
- FAIN, A. & BOCHKOV, A.V. 2001. - A review of some cheyletid genera (Acari : Prostigmata) with descriptions of new species. *Acarina*, 9: 47-95.
- FAIN, A., BOCHKOV, A.V. & CORPUZ-RAROS, L.A. 2002. - A revision of the *Hemicheyletia* generic group (Acari: Cheyletidae). *Bulletin de l'Institut royal des Sciences naturelles de Belgique*, 72: 27-66.
- FATHIPOUR, Y., KAMALI, K. & OSTOVAN, H. 1999. - Mites of the family Cheyletidae (Acari, Prostigmata) collected from several parts of Iran and a key for their identification. *Modarres Agricultural Science*, 1: 65-77.
- GRANDJEAN, F. 1939. - Les segments postlarvaires de l'hystérosoma chez les oribates (Acariens). *Bulletin de la Societe Zoologique de France*, 64: 273-284.
- GRANDJEAN, F. 1944. - Observations sure les Acariens de la famille des Stigmaeidae. *Archives des Sciences physiques et naturelles*, 26: 103-131.
- KAMALI, K., OSTOVAN, H. & ATAMEHR, A. 2001. - A catalog of mites & ticks (Acari) of Iran. *Islamic Azad University Scientific Publication Center*, 196 pp.
- KETHLEY, J.B. 1990. - Acarina: Prostigmata. (Actinedida). In: D.L. DINDAL (ed.), *Soil Biology Guide*. Wiley and Sons, New York, USA, pp. 667-754.
- MEHRNEJAD, M.R. & UECKERMANN, E.A. 2001. - Mites (Arthropoda, Acari) associated with pistachio trees (Anacardiaceae) in Iran (I). *Systematic and Applied Acarology Special Publications*, 6: 1-12.
- QAYYUM, H. A. & CHAUDHRI, W.M., 1979. - Mites of the genus *Hemicheyletia* (Acarina: Cheyletidae) described from Pakistan. *Pakistan Journal of Zoology*, 11: 167-172.

- RASOOL, A. & CHAUDHRI, W.M., 1979. - Two new species of the genus *Hemicheyletia* VOLGIN (Acarina: Cheyletidae) from Pakistan. *Pakistan Entomologist*, 1: 1-6.
- VERCAMMEN-GRANDJEAN, P.H. & RAK, H. 1968. - *Cheyletiella yasguri* SMILEY, 1965, a parasite of dogs in United States and a hyperparasite of a hippoboscid in Iran (Acarina: Cheyletidae). *Annales de Parasitologie Humaine et Comparee*, 43: 405-412.
- VOLGIN, V.I. 1963. - [Two new genera of the predaceous mites of the family Cheyletidae (Trombidiformes)]. *Entomologicheskoe obozrenie*, 42: 935-944. (In Russian)
- VOLGIN, V.I. 1978. - [Family Cheyletidae LEACH, 1815]. In: M.S.GILYAROV (ed.), [*A key of the soil-inhabiting mites. Trombidiformes*]. Nauka, Moscow, USSR, pp. 172-201. (In Russian).