Persian J. Acarol., 15(2): 150202.

https://www.persianacarology.org

Research Article https://biotaxa.org/pja https://doi.org/10.22073/pja.150202

Melicharid mites (Acari: Mesostigmata: Melicharidae) of Iran, with a key to species

Jalil Hajizadeh

Department of Plant Protection, Faculty of Agricultural Sciences, University of Guilan, Rasht, Iran; E-mail: hajizadeh@guilan.ac.ir

Received:
30 August, 2025
Accepted:
30 December, 2025
Published:
15 April, 2026

Subject Editor:
O. Joharchi

ABSTRACT

Mites of the family Melicharidae (Acari: Mesostigmata), known from Iran, are listed, based on the literature and new records for six species, taken from samples collected in the Guilan Province, northern Iran. A total of 15 species belonging to three genera, *Melichares* Hering, *Orthadenella* Athias-Henriot and *Proctolaelaps* Berlese, are reported, the most common species being *P. pygmaeus* and *P. intermedius*. Information on their ecological and geographic distribution in Iran and elsewhere is provided for each species. Diagnosis for examined species is presented. A dichotomous key for the identification of the species reported in Iran is provided.

KEYWORDS

Ascoidea, *Melichares*, *Orthadenella*, *Proctolaelaps*, taxonomy

CITE: Hajizadeh, J. (2026) Melicharid mites (Acari: Mesostigmata: Melicharidae) of Iran, with a key to species. *Persian Journal of Acarology*, 15(2): 150202. https://doi.org/10.22073/pja.150202

INTRODUCTION

Melicharidae Hirschmann, 1962 is composed of free-living mites found in a wide range of habitats and hosts, including soil, litter, plants, nests of birds, mammals and bumble bees, rotten wood, bark beetle galleries and stored food. Some melicharid species are often associated with mycophagous beetles and found on wood attacked by various fungi. Phoretic associations with other insects and other animals have been reported. Most studied melicharid species have been shown to be predators, but some feed on fungal spores and tissues, pollen and nectar while the feeding habits of some melicharids is unknown (Samšiňák 1960; Westerboer 1963; Bregetova 1977; Karg 1993; Mašán 1998; Gwiazdowicz 2007; Moraza and Lindquist 2016; Trach *et al.* 2019; Joharchi *et al.* 2021a, b; Mašán *et al.* 2021).

Up to the mid-1960's, melicharid mites were classified as a subfamily or tribe (Hirschmann 1962; Lindquist and Evans 1965). They are presently considered a separate family in the Ascoidea (Moraes *et al.* 2016). The family is distinguished by the following characteristics: fixed cheliceral digit usually with 1–20 teeth in addition to apical hook, pilus dentilis most commonly expanded into a membranous lobe (instead of being setiform), movable digit with 0–3 teeth in addition to apical tooth; usually with a ventral pointed structure (mucro) near the base; idiosoma elongate to ovoid, podonotal and opisthonotal shields usually fused, sternal shield usually with three pairs of setae and two pairs of lyrifissures, posterior margin truncate to deeply concave, seta *st4* and lyrifissures *iv3* inserted in metasternal plates or in the unsclerotized cuticle; genital shield posterior margin usually truncate to convex, bearing setae *st5*; anal shield usually oval or elliptical, anal opening usually not enlarged, most often bearing only circumanal setae (in some genera, with small ventrianal shield, bearing 1–3 pairs of setae); exceptionally with separate ventral and anal shields in *Proctogastrolaelaps* McGraw and Farrier; peritreme usually extending at least to

level of s2; peritrematic shield usually fused anteriorly with dorsal shield, posteriorly free or narrowly fused to exopodal shield beside coxa IV; spermatheca laelapid-type, indistinct in some genera (Lindquist *et al.* 2009; Moraes *et al.* 2016).

The number of melicharid species considered as valid in the catalogue published in 2016 was 206 in 11 genera (Moraes *et al.* 2016). Currently based on the family database, Melicharidae includes 14 genera and over 236 described species (Santos *et al.* 2025). Only 15 melicharid species have been reported from Iran, including one in *Melichares* Hering, two in *Orthadenella* Athias-Henriot and 12 in *Proctolaelaps* Berlese. These are: *Melichares agilis* Hering, 1838, *Orthadenella lawrencei* (Evans, 1957), *O. multipilisaccula* Ostovan & Faraji, 2014, *Proctolaelaps aurora* (Vitzthum, 1925), *P. bickleyi* (Bram, 1956), *P. brevipilis* (Westerboer, 1963), *P. cossoides* Faraji, Sakenin-Chelav & Karg, 2007, *P. fiseri* Samšiňák, 1960, *P. holoventris* Moraes *et al.*, 2016, *P. hystricoides* Lindquist & Hunter, 1965, *P. intermedius* Athias-Henriot, 1959, *P. longisetosus* (Postner, in Westerboer 1963), *P. pygmaeus* (Müller, 1859), *P. regalis* De Leon, 1963 and *P. scolyti* Evans, 1958 (Riahi and Nemati 2024).

The objectives of this work are to list the melicharid species reported so far from Iran, to provide information on habitat and regional distribution of each species, diagnostic characteristics for examined species and to provide a dichotomous key for their identification.

MATERIAL AND METHODS

New collection records are presented based on examination of samples of plants, soil, rotten wood, stored materials, manure, and litter from Guilan Province, northern Iran. Each soil or litter sample consisted of about 2 kg of material taken down to a depth of 15 cm. Mites were extracted from samples using a Berlese funnel or direct examinations of plant material under a stereomicroscope. Specimens were sorted and preserved in 70% ethanol, cleared in Nesbitt's fluid and mounted on microscope slides using Hoyer's medium. All measurements are given in micrometres. The lengths and widths of the idiosoma were taken from the anterior to posterior margins along the midline, lengths of shields were measured along their midlines and widths, at their widest point. Notations of body structures and idiosomal chaetotaxy follow Lindquist and Evans (1965) as slightly modified by Lindquist (1994). Terminology of other anatomical structures follows Evans and Till (1979). Melicharid identification was done using relevant taxonomic keys and papers (Evans 1958; Chant 1963; Karg 1985, 1988, 1993; Faraji *et al.* 2007; Hajizadeh *et al.* 2010; Ostovan and Faraji 2014; Abo-Shnaf and Moraes 2016; Moraes *et al.* 2016; Mašán 2022). A literature search of the melicharids so far reported from Iran was done using electronic and printed data sources. Information on world distribution and habitats occupied by the species is based on Moraes *et al.* (2016) and Santos *et al.* (2025). Examination and illustration of species was done with the use of a phase and interference contrast microscope (Olympus Optical Co., Ltd, Tokyo, Japan) equipped with a camera (Canon, EOS Kiss X5; Japan) and a drawing tube. Voucher specimens were deposited in the Acarology Laboratory, Department of Plant Protection, Faculty of Agricultural Sciences at University of Guilan, Rasht, Iran.

RESULTS

During this study, six species namely *Orthadenella multipilisaccula*, *Proctolaelaps fiseri*, *P. holoventris*, *P. intermedius*, *P. pygmaeus* and *P. scolyti* were determined from specimens newly collected in Guilan Province, as subsequently presented.

TAXONOMY

Family Melicharidae Hirschmann, 1962

Genus *Melichares* Hering, 1838

Melichares agilis Hering, 1838

Melichares agilis Hering, 1838: 620

Distribution and habitat

Iran, Guilan Province, host not mentioned, probably associated with stored mites (Sepasgozarian 1978; Kamali *et al.* 2001; Riahi and Nemati 2024). Reported from Brazil, Germany, Hungary, The Netherlands, Poland and Türkiye, in house dust, litter, moss, stored products and dried fruits.

Remark

Although the habitat of this species is stated as "livestock" in the lists of Iranian Acari, but it has been reported as a predator of storage mites of the superfamily Acaroidea by Sepasgozarian (1978).

Genus *Orthadenella* Athias-Henriot, 1973

Orthadenella lawrencei (Evans, 1958)

Proctolaelaps (*Neojordensia*) *lawrencei* Evans, 1958: 205

Distribution and habitat

Iran, East Azarbaijan Province, forests of Arasbaran region, soil leaf-litter and plant debris; Mazandaran Province, Amol, soil (Sakenin-Chelav *et al.* 2006; Riahi and Nemati 2024). Reported from Europe, in grassland, humus, litter, moss, soil and Cave (unspecified substrate).

Remark

A re-examination of the specimens reported as *O. lawrencei* by Javadpour *et al.* (2018) from Rudsar in Guilan Province showed that they belong to *O. multipilisaccula* Ostovan & Faraji, 2014. Ostovan and Faraji (2014) pointed out that the records of *O. lawrencei* from Iran should be considered as doubtful.

Orthadenella multipilisaccula Ostovan & Faraji, 2014 (Figs 1–4)

Orthadenella multipilisaccula Ostovan & Faraji, 2014: 605

Differential diagnosis (female)

Idiosoma oval, dorsal shield 400–432 long and 260–288 wide in middle part; with medium size setae, not reaching to the bases of following setae; presternal region with two pairs of sclerotized and elongated platelets; ventral shields reticulated; ventrianal shield subcordate with six pairs of setae (*JV1*–*JV4*, *ZV2*, *ZV3*); anterior ends of peritreme reaches near setae *z1*; soft idiosomal cuticle with three pairs of setae (*ZV4*, *ZV5*, *JV5*); epistome trifid; digits of chelicerae relatively long and narrow, fixed digit with 15–16 teeth, movable digit tridentate; corniculi horn-like; deutosternal groove with seven rows of denticles; subcapitular setae needlelike, with similar thickness; spermatheca with cylindrical sacculus foemineus covered with setiform protrusions.

Material examined

Rudsar (37° 8' 0" N, 50° 17' 0" E, 19 m a.s.l.), October, 10, 2015, two females; Rasht (37° 17' 0" N, 49° 35' 0"E, 17 m a.s.l.), June, 7, 2015, two females; Talesh County, Gisoum forest (37° 39' 49" N, 49° 01' 18" E, 45 m a.s.l.), October, 10, 2012, two females; Rasht, Saravan forest (37° 04' 57" N, 49° 39' 14" E, 60 m a.s.l.), June 5, 2021, two females; all collected from soil.

Distribution and habitat

Iran, Mazandaran Province, Babolsar (Ostovan and Faraji 2014); Guilan Province (this study); all from soil.

Figures 1–4. *Orthadenella multipilisaccula* (female) – **1.** Body, dorsal view; **2.** Body, ventral view; **3.** Epistome, **4.** Spermathecal apparatus. Scale bar 200 μm for 1 and 2; 12 μm for 3; 30 μm for 4.

Genus *Proctolaelaps* Berlese, 1923

Proctolaelaps aurora (Vitzthum, 1925)

Lasioseius (*Lasioseius*) *aurora* Vitzthum, 1925: 21

Distribution and habitat

Iran, East Azarbaijan Province, Tabriz; Fars Province, Jahrom; Markazi Province, Saveh; all from soil (Kamali *et al.* 2001; Riahi and Nemati 2024). Also reported from Australia, Brazil, China, Costa Rica, Fiji, Indonesia, Japan and USA, in soil, bird nests, plants and rotten materials.

Proctolaelaps brevipilis (Westerboer, 1963)

***Garmania* (*Garmania*) *brevipilis* Westerboer, 1963: 384**

Distribution and habitat

Iran, Fars Province, Kazerun, stored onions and potatoes; honeybee hives; Marvdasht and Darab in soil; Shiraz, on potato, zucchini, flour and on the floor of an insectary; Markazi Province, Arak Region, in soil; Tehran Province, Tehran, associated with *Scolytus multistriatus* (Marsh) (Kamali *et al.* 2001; Granpayeh and Ostovan 2014; Memarzadeh *et al.* 2022; Riahi and Nemati 2024). Also reported from Australia, Asia, Europe, South and North America, in litter, soil, under the bark of living coniferous and elm trees, on dead trees, in insect colonies and on hummingbird feeders.

Proctolaelaps bickleyi (Bram, 1956)

***Garmania bickleyi* Bram, 1956: 292**

Distribution and habitat

Iran, Qom Province, soil, dung, compost, litter, lawns, shrubs and trees (Riahi and Nemati 2024). Also reported from Germany and Poland, in bark beetle gallery and yeast flakes and water.

Proctolaelaps cossoides Faraji, Sakenin-Chelav & Karg, 2007

***Proctolaelaps cossoides* Faraji, Sakenin-Chelav & Karg, 2007: 107**

Distribution and habitat

Iran, Mazandaran Province, Amol, soil and debris (Faraji *et al.* 2007).

Proctolaelaps fiseri Samšiňák, 1960 (Figs 5–8)

***Proctolaelaps fiseri* Samšiňák, 1960: 297**

Differential diagnosis (female)

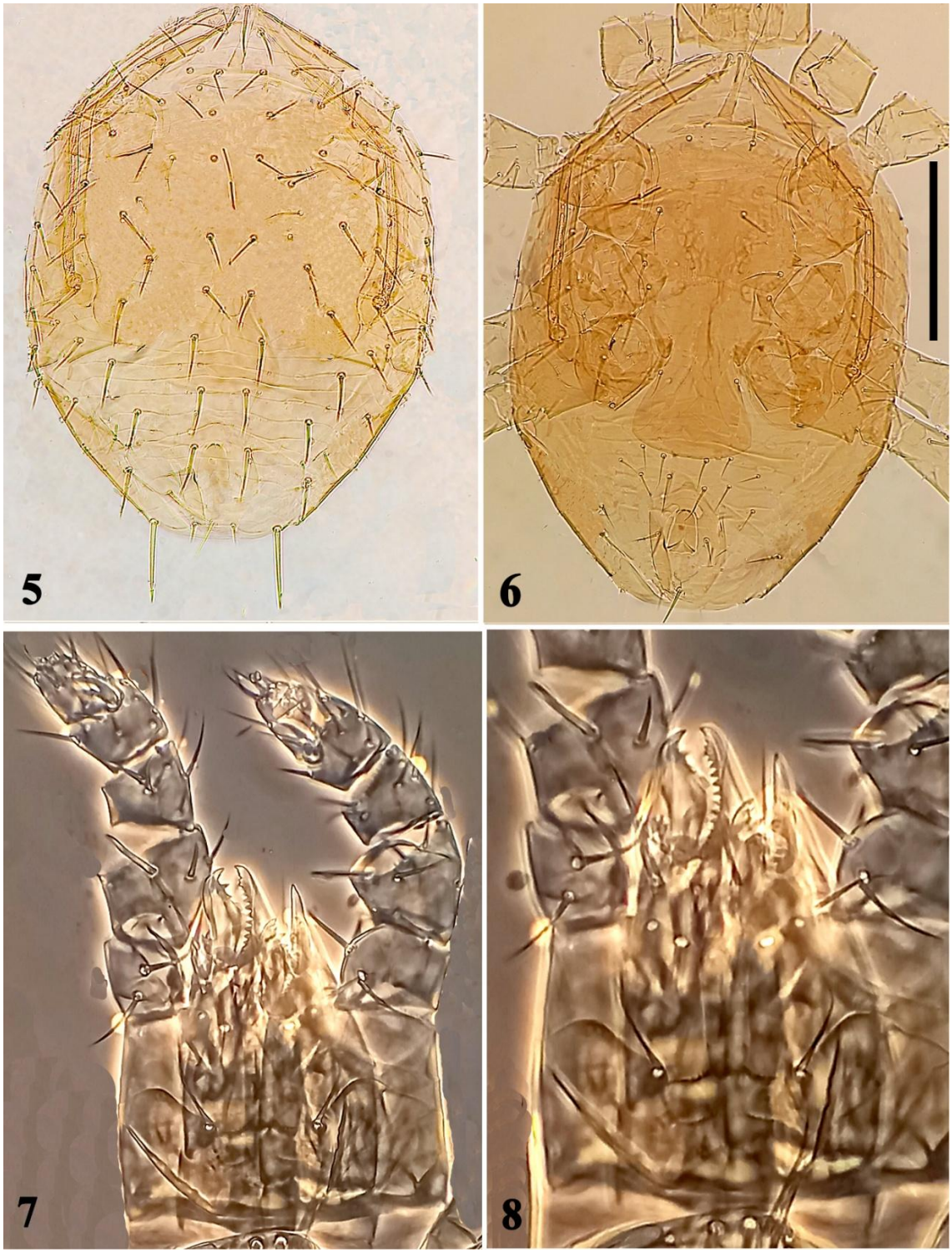
Idiosoma oval, dorsal shield 440 long and 310 wide in middle part, reticulated, area between setae *j5*, *z5* and *j6* smooth, soft idiosomal cuticle with 14 pairs of setae; sternal shield reticulated, posterior margin with median convexity; epigynal shield reticulated, anterior margin broadly rounded; anal shield oval, widest in medial part; anal pore large; anterior ends of peritreme reaches near setae *z1*; deutosternal groove with six rows of denticles, subcapitular setae needlelike, with similar thickness; epistome trifid; fixed cheliceral digit usually with 15–17 teeth, movable digit tridentate.

Material examined

Rasht, University of Guilan campus (37° 11' 44" N, 49° 38' 30" E, 28 m), August 5, 2015, collected on body of rove beetle (Staphylinidae), one female.

Distribution and habitat

Iran, Fars Province, Darab, soil; Guilan Province, Rasht, on the body of Staphylinidae beetles (Karami *et al.* 2017; Memarzadeh *et al.* 2022). Also reported from Canada, China, Dominican Republic, Europe, Russia and USA, in insect galleries, litter, moss, under pine bark, rotten woods and on small beetles.



Figures 5–8. *Proctolaelaps fiseri* (female) – **5.** Idiosoma, dorsal view; **6.** Idiosoma, ventral view; **7.** Gnathosoma; **8.** Subcapitulum. Scale bar 140 μm for 5 and 6; 60 μm for 7; 50 μm for 8.

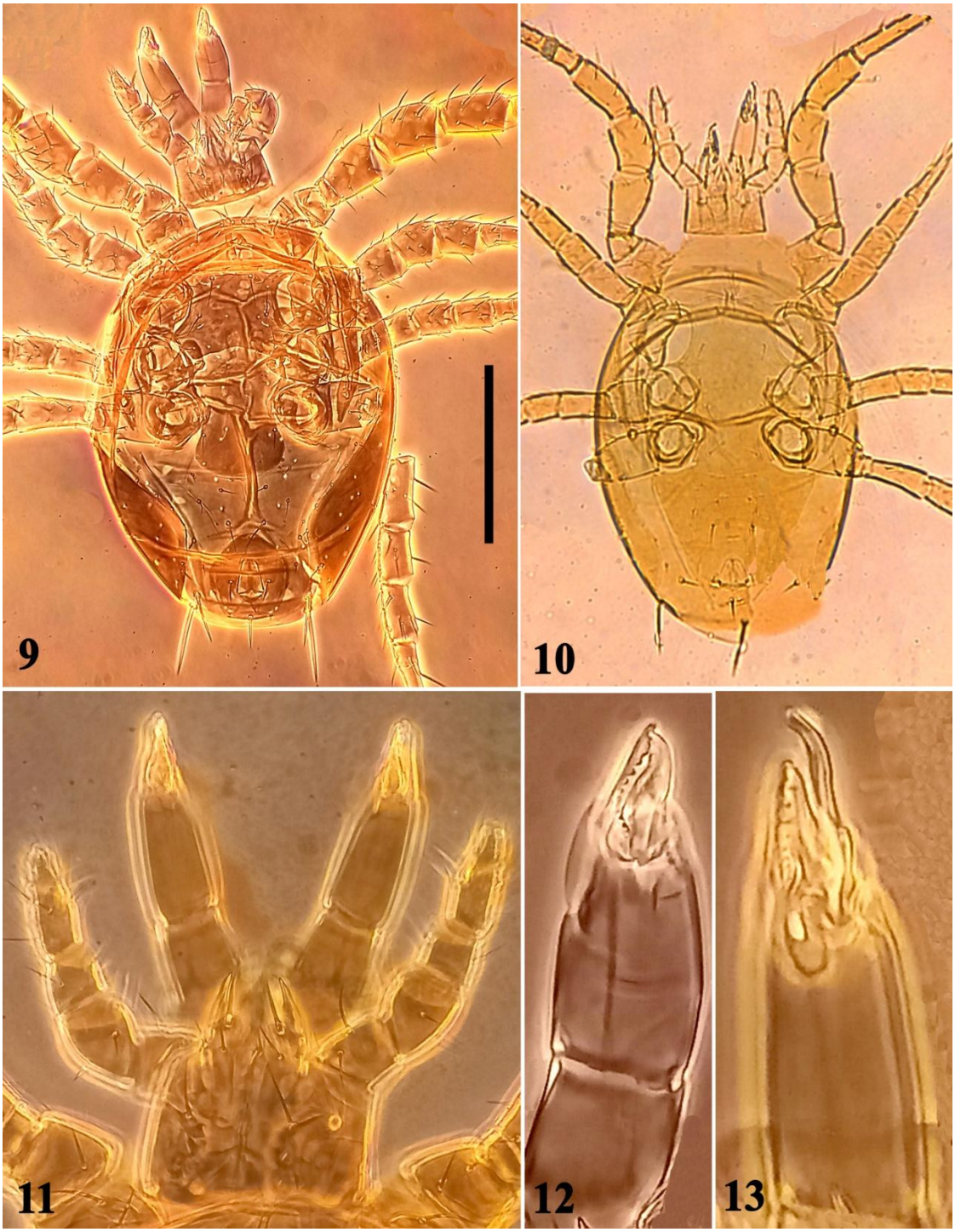
Proctolaelaps holoventris Moraes *et al.*, 2016 (Figs 9–13)

Proctolaelaps holoventris Moraes, Britto, Mineiro & Halliday, 2016: 212

Differential diagnosis (female)

Idiosoma oval, dorsal shield 395 long and 287 wide; with 44 pairs of setae; most dorsal shield setae of uniform length and shape, aciculate, smooth except *Z5* stout and longest; podonotal region of the dorsal shield with transverse striae; unsclerotized lateral cuticle without setae; all setae of venter idiosomal shield aciculate and smooth, except *JV5* and post-anal seta, stout; presternal region transversely striate,

with a pair of ellipsoidal punctuate anterior region; sternal shield mostly reticulated; genital shield with few longitudinal striae; anal shield mostly smooth, with a few arched anterolateral striae; opisthogaster with 10 pairs of setae on unsclerotized cuticle; with two pairs of metapodal plates, the most internal smaller; peritreme extending forward to level of *z1*; spermathecal apparatus distinguishable as a mostly unsclerotized pair of tubule; anteromedian region of epistome triangular, with margin denticulate; with two transverse lines of denticles near base; fixed cheliceral digit with 12 teeth and large antiaxial membranous lobe; movable digit with three teeth; hypostome with *h1* slightly thicker than *h2*, *h3* and *sc*; legs I-IV pretarsi each with a pair of claws and pulvillus with three rounded lobules; leg IV without macrosetae. *Proctolaelaps holoventris* is the only species of genus *Proctolaelaps* that its male has a holoventral shield.



Figures 9–13. *Proctolaelaps holoventris* – **9.** Female, ventral view of body; **10.** Male, ventral view of body; **11.** Female gnathosoma, **12.** Female chelicera; **13.** Male chelicera. Scale bar 170 µm for 9; 180 µm for 10; 80 µm for 11; 35 µm for 12; 25 µm for 13.

Distribution and habitat

Iran, Guilan Province, Rasht, *Oxalis acetosella* leaves; Rasht, in associated with beetles of the families Chrysomelidae, Carabidae, and Staphylinidae collected from light traps (Ghasemi and Hajizadeh 2021; Hajizadeh and Hosseini 2022). Also reported from Egypt, in debris, litter and soil.

Proctolaelaps hystricoides Lindquist & Hunter, 1965

Proctolaelaps hystricoides Lindquist & Hunter, 1965: 22

Distribution and habitat

Iran, Ardabil Province, Moghan Plain, on cotton plants; Fars Province, Jahrom, in soil (Kamali *et al.* 2001; Riahi and Nemati 2024). Also reported from Canada, Russia, Slovakia and USA, in bark, gallery of bark beetles and rotten woods.

Proctolaelaps intermedius Athias-Henriot, 1959 (Figs 14–17)

Proctolaelaps intermedius Athias-Henriot, 1959: 166

Proctolaelaps ventrianalis Karg, 1971: 239. Synonymy with *P. intermedius* by Mašán (2022).

Differential diagnosis (female)

Idiosoma oval, dorsal shield 280 long and 156 wide at widest level; dorsal shield mostly smooth, dorsal setae with medium size, not reaching bases of following setae; presternal platelets weakly transversely lineate; sternal shield with deep incision in anteromedial; epigynal shield long, with one pair of longitudinal lines near lateral margins; ventrianal shield long, anteriorly expanded, reaching to posterior margin of epigynal shield, with one or two pairs of preanal setae (*JV1* and *JV2*) and cicumanal setae; anus large; anterior ends of peritreme reaches near setae *z1*; soft idiosomal cuticle with 12 pairs of setae; epistome trifid, medial branch slightly shorter than lateral branches; fixed cheliceral digit usually with 15 teeth, movable digit tridentate; deutosternal groove with six rows of denticles; setae *h1* thickened, more robust than *h2* and *h3* setae.

Material examined

Guilan Province Langarud, (37° 11' 28" N, 50° 09' 20" E), July 5, 2015, soil, one female. Rasht (37° 16' 28" N, 49° 35' 20" E), June 5, 2007, stored rice, and rice debris, three females; Anzali (37° 28' 15" N, 49° 28' 12" E), June 8, 2007, rice dust and debris, one male.

Distribution and habitat

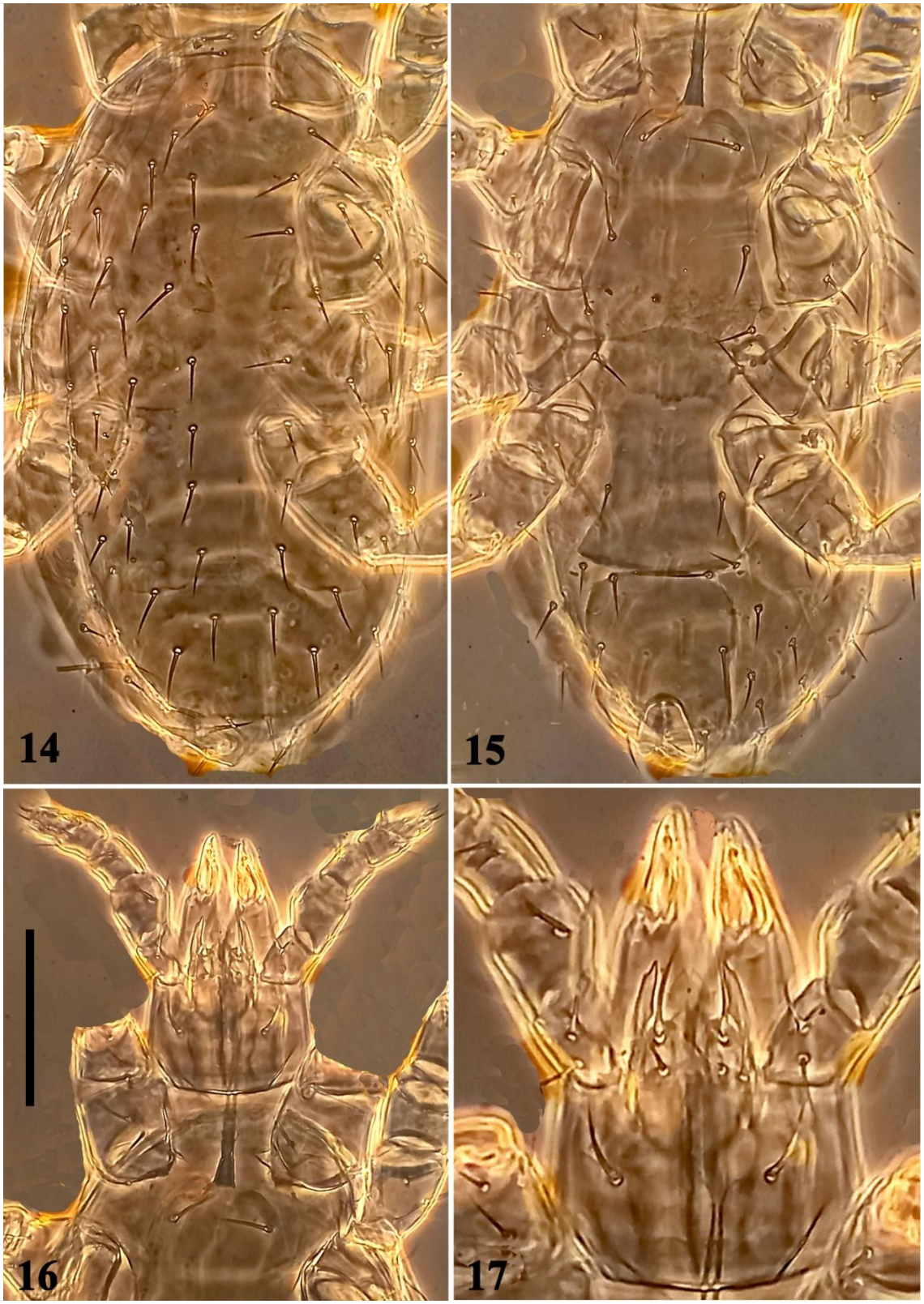
Iran, Ardabil Province, Moghan Plain, on cotton plants; Fars Province, Jahrom, in soil (Kamali *et al.* 2001; Riahi and Nemati 2024). Also reported from Canada, Russia, Slovakia and USA, in bark, gallery of bark beetles and rotten woods.

Proctolaelaps longisetosus (Postner, 1963)

Lasioseius longisetosus Postner, 1951: 98

Distribution and habitat

Iran, Ardabil Province, Meshkinshahr, Shahbil Region, nests of *Bombus armeniacus* Radoszkowski (Riahi and Nemati 2024). Also reported from Germany, Kazakhstan, Russia and Slovakia, in soil, excrements and bee nests.



Figures 14–17. *Proctolaelaps intermedius* (female) – **14.** Idiosoma, dorsal view, **15.** Idiosoma, ventral view; **16.** Gnathosoma; **17.** Subcapitulum. Scale bar 65 µm for 14 and 15; 25 µm for 16; 15 µm for 17.

Proctolaelaps pygmaeus (Müller, 1859) (Figs 18–21)

Gamasus pygmaeus Müller, 1859: 30

Differential diagnosis (female)

Idiosoma oval, dorsal shield 380 long and 250 wide at widest level, area between setae *j5*, *z5* and *j6*

smooth; dorsal setae relatively long; presternal region transversely striate; sternal shield finely ornamented in anterior half; epigynal shield smooth; anal shield lemon-shaped, anus large; anterior ends of peritreme reaches near setae *z1*; epistome bifurcate, with serrate to spiny anterior margin, margin between branches usually with some denticles or small spines; fixed cheliceral digit with six conspicuous teeth on proximal region, followed by 4−6 minute terminal teeth; movable digit bidentate; deutosternal groove with six rows of denticles, setae *h1* thickened, more robust than *h2* and *h3* setae.

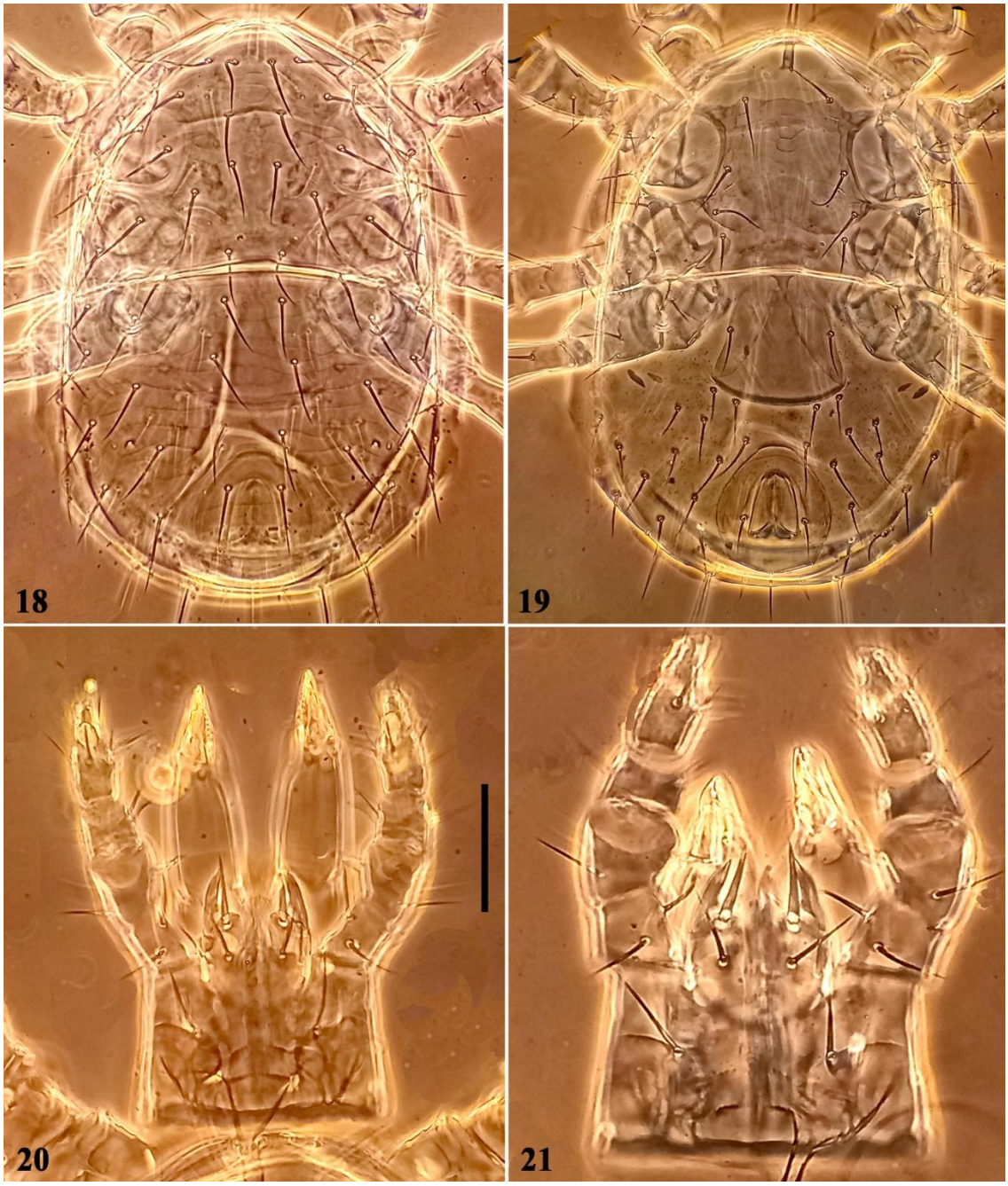
Material examined

Sangar County, Gil-e Pardesar village (37° 12' 32" N, 49° 39' 50" E, 22 m a.s.l.), June 14, 2007, one female; Shaft County, Baba Rekab village (37° 01' 35" N, 49° 25' 22" E), August 10, 2007, one female; Rasht City, University of Guilan campus (37° 11' 44" N, 49° 38' 30" E, 28 m a.s.l.), July 2, 2007, one female; Rasht, Pir Bazar village (37° 19' 57" N, 49° 28' 59" E, 18 m a.s.l.), July, 21, 2019, five females, all from soil; Fuman (37° 13' 48" N, 49° 17' 24" E, 20 m a.s.l.), July 5, 2009, on Rubus sp. leaves, two females; Rasht, Esfahani Educational Institute (37° 11' 47" N, 49° 39' 9" E, 26 m a.s.l.), April 8, 17 and 24, 2019, on *Pelargonium zonale* L. (Geraniaceae) leaves, six females; on *Oxalis acetosella* L. (Oxalidaceae) leaves, six females; Rasht, Omesheh village (37° 12' 3" N, 49° 38' 55" E, 25 m a.s.l.), July 28, 2019, soil, six females; Rasht, Bijar Boneh village (37° 18' 10" N, 49° 39' 10" E, 6 m a.s.l.), April 25, 2019, on *Cucumis sativus* L. (Cucurbitaceae) leaves, four females; Rasht, Keshel Varzal village (37° 10' 59" N, 49° 38' 42" E, 34 m a.s.l.), March, 24, 2019, on *Solanum lycopersicum* L. (Solanaceae) leaves, four females and three males; Guilan Province, Rasht, Pir Kola Chah village (37°16' 36"N, 49° 37' 30" E), August, 10, 2015, six females; Sowme'eh Sara, (37° 30' 49" N, 49° 31' 78" E), October, 15, 2016, all from rice hulls; six females; Sangar city, (37° 10' 42" N, 49° 41' 38" E), August, 7, 2015, soil, two females; Sangar city, Sarvandan village (37° 10' 42" N, 49° 41' 38' E), September, 3 2015, one female; Sangar city, Eslamabad (Shaqaji) village (37° 22' 22" N, 49° 20' 14" E) , October, 17, 2016, two females, all from manure.

Distribution and habitat

Iran, Bushehr Province, dried insects; Chaharmahal va Bakhtiyari Province, museum insect specimens, associated with fungi, ants and ant nests; East Azarbaijan Province, Arasbaran forests, Garmanab, soil and plant debris; Fars Province, Kazerun, stored onion and potato, Marvdasht, Shiraz and Larestan, all from soil, Shiraz, Potato, zucchini, flour and the floor of insectary, Marvdasht, Islamic Azad University, soil and decayed coniferous plants, Darab, soil and foliage of cotton fields, Doroodzan, Shiraz, associated with insectary cultures, soil and debris, Shiraz, Eram Garden and Darab, all from soil; Guilan Province, different rejoins, soil, warehouses, manure and decaying plants, on plants, Sowme'eh Sara, on raspberry shrubs, rice hulls, Rasht, plant leaves, Pir Kola Chah village, rice hulls, Sangar, Sarvandan and Eslamabad village, soil, manure, stored products, debris, plant foliage and wood, Omesheh and Pir Bazar village, soil, Bijar Bonch village, *Cucumis sativus* L., leaves, Keshel Varzal village, *Solanum lycopersicum* L., leaves; Hamedan Province, on Fabaceae plants; Isfahan Province, Najaf Abad, Shahreza, Isfahan and Rezvanshahr, all from soil; Kerman Province, Sirjan, Zeidabad, Gostueyeh, Mani, Sarcheshmeh, Shahrebabak, soil, Bam, associated with scarab and carabid beetles, soil, Kerman, cow manure, Sirjan, Rafsanjan and Shahr-e-Babak, soil, manure and leaf litter, Rafsanjan, Kerman and Mahan, all from soil; Khuzestan Province, Dezful, associated with barley, lentils, dried insects, date palm and citrus trees; Lorestan Province, Babazeid and Mehdiabad Districts, soil, Khorramabad, orchard, oak forest and manure; Mazandaran Province, associated with *Gryllus* sp. (Gryllidae); North Khorasan Province in the nests of *Tapinoma* sp. (Formicidae); Qom Province soil, dung, compost and plant-litters, lawns, shrubs, farms, forests, orchards and parks; Razavi Khorasan Province, Mashhad, stored foods, soil and manure; Semnan Province, Tooyehdarvar village, soil and decaying plant, Forat village and Damghan, soil; Tehran Province, Tehran, soil; West Azarbaijan Province, Urmia, house dust, leaves and soil, Miandoab Plain, foliage and soil of sugarbeet; Yazd Province, soil; Zanjan Province, soil, rotten wood, fungi, litter and dung (Habibpour *et al.* 2002; Hajizadeh *et al.* 2010; Kazemi and Rajaei 2013; Tajmiri and Hajizadeh 2013; Arjomandi *et al.* 2013; Kadkhodaei *et al.* 2013; Masnavipour *et al.* 2014; Hasanvand *et al.* 2014; Maleki *et al.* 2016; Mohammad-Doustaresharaf *et al.* 2016; Abbaspour *et al.* 2017; Mojaz and Kazemi

2020; Khalili-Moghadam 2022; Karbasian *et al.* 2022; Riahi and Nemati 2024). Also reported from Asia, Africa, Australia, Europe and USA, in soil, bark beetle gallery, associated with insects, manure, rotten wood, stored products, nest of birds, nest of mammals, in caves, roots, decay matter, humus, litter, rotten leaves and fruits, on low growing vegetation and moss.



Figures 18–21. *Proctolaelaps pygmaeus* (female) – **18.** Idiosoma, dorsal view; **19.** Idiosoma, ventral view; **20.** Gnathosoma; **21.** Subcapitulum. Scale bar 85 µm for 18 and 19; 50 µm for 20; 60 µm for 21.

Proctolaelaps regalis De Leon, 1963

Proctolaelaps regalis De Leon, 1963: 197

Distribution and habitat

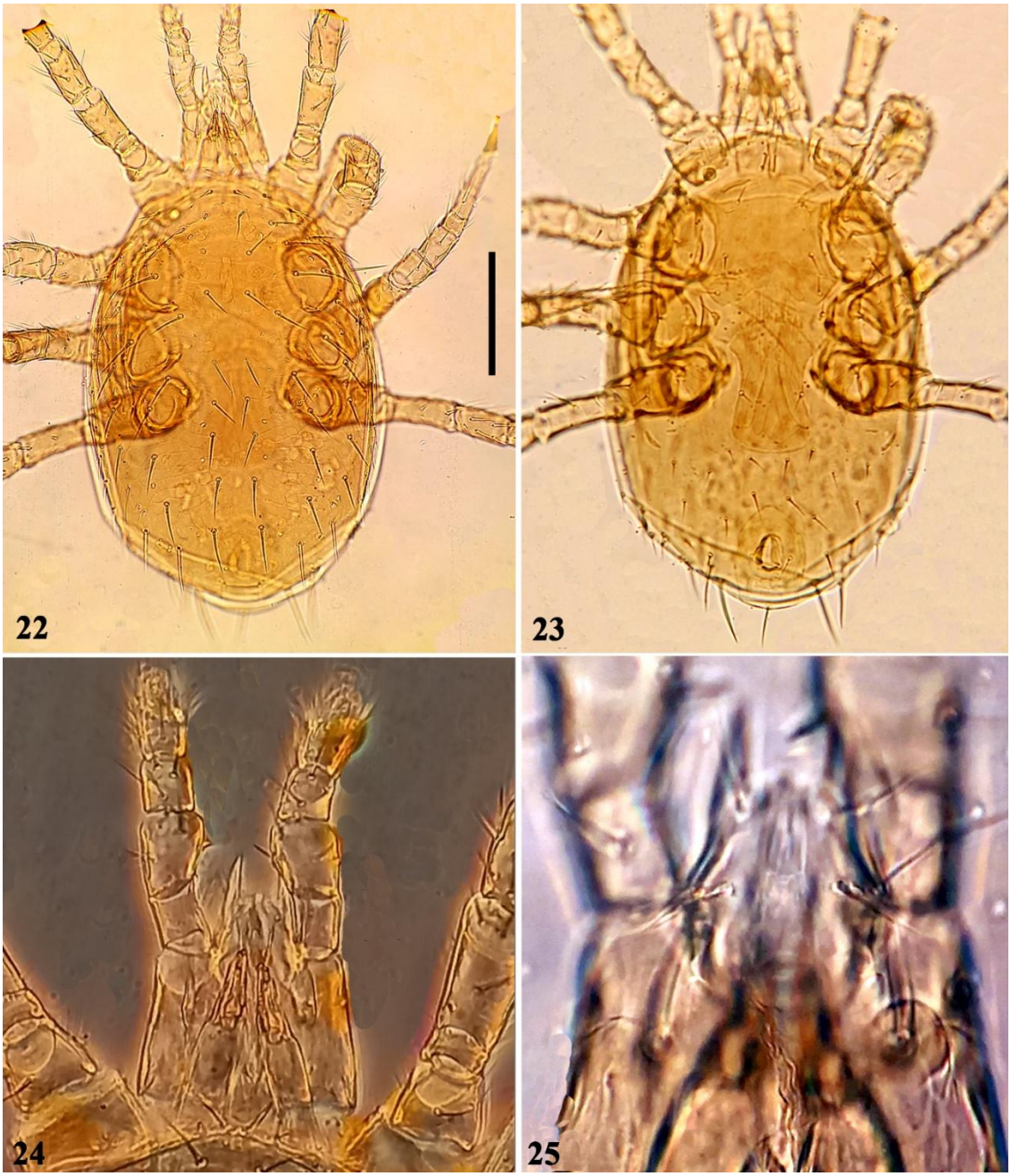
Iran, Alborz Province, Karaj, stored products; Fars Province, Kazerun, stored products; Kuzestan Province, associated with date palm trees (Kamali *et al.* 2001; Riahi and Nemati 2024). Aso reported from USA, in soil of citrus tree and fallen fruits.

Proctolaelaps scolyti Evans, 1958 (Figs 22–25)

Proctolaelaps (*Proctolaelaps*) *scolyti* Evans, 1958: 201

Differential diagnosis (female)

Idiosoma oval, dorsal shield 450 long and 300 wide at widest level; dorsal shield reticulate, dorsal setae with medium length; presternal area with a pair of weakly sclerotized platelets; sternal shield with fine reticulation; epigynal shield reticulate; anal shield small, oval, anus relatively large; anterior ends of peritreme reaches near setae *z1*; soft cuticle of idiosoma with 15 pairs of setae; anterior margin of epistome serrate or denticulate; fixed cheliceral digit usually with 15 teeth, movable digit tridentate; deutosternal groove with seven rows of denticles; setae *h1*, *h2* and *h3* similar in thickness.



Figures 22–25. *Proctolaelaps scolyti* (female) – **22.** Body, dorsal view; **23.** Body, ventral view; **24.** Gnathosoma; **25.** Subcapitulum. Scale bar 125 μm for 22 and 23; 50 μm for 24; 40 μm for 25.

Material examined

Rasht, Emamzadeh Hashem (37° 01' 19" N, 49° 37' 19" E), August 17, 2016, collected from rotten

pomegranate, one female.

Distribution and habitat

Iran, Kordestan Province, honeybee hives; Semnan Province, Forat village, soil mixed with weeds, Tazareh village, decaying matter of an alive poplar with woodborer galleries; Guilan Province, Rasht, Emamzadeh Hashem, rotten fruit of pomegranate (Kamali *et al.* 2001; Karami *et al.* 2017; Riahi and Nemati 2024). Also reported from Europe, Egypt and Russia, in soil, bark, galleries of bark beetles, under bark of fallen trees and bird nests.

Key to genera and species of Melicharidae reported from Iran (females)

1. Fixed cheliceral digit with setiform pilus dentilis; with ventrianal shield; peritrematic plate broadly fused with exopodal plate next to coxa IV ..... ***Orthadenella*** 2
– Fixed cheliceral digit with membranous lobe instead of setiform pilus dentilis; ventral and anal shields usually either separate or ventral shield absent; peritrematic shield posteriorly free or narrowly fused with exopodal shield 3
2. Sacculus of spermatheca swollen and bladder-shaped; *Z5* 53–59 μm long..... ***O. lawrencei***
– Sacculus of spermatheca cylindrical; *Z5* 60–65 μm long ..... ***O. multipilisaccula***
3. Opisthonotal region with 15 pairs of setae; peritrematic shield not fused or fused anteriorly by a narrow bridge with dorsal shield ..... ***Melichares agilis***
– Opisthonotal region with 18–22 pairs of setae; peritrematic shield well fused anteriorly with dorsal shield ..... ***Proctolaelaps*** 4
4. Ventrianal shield, bearing *JV1* and *JV2*, in addition to circumanal setae..... ***P. intermedius***
– Anal shield, bearing only circumanal setae 5
5. Tectum with numerous teeth 6
– Tectum with three teeth 11
6. Dorsal setae short (except *Z5*), shorter than the distance to next setae in series ..... ***P. regalis***
– Dorsal setae long, most of them reach to the next setae in series 7
7. Lateral idiosomal soft cuticle with at most one pair of setae (*UR*) ..... ***P. holoventris***
– Lateral idiosomal soft cuticle with more than one pair of setae..... 8
8. Soft idiosomal cuticle with at least 13 pairs of setae 9
– Soft idiosomal cuticle with less than 13 pairs of setae 10
9. Soft idiosomal cuticle with 13 pairs of setae; anal shield with anterior bulbous projection ..... ***P. bickleyi***
– Soft idiosomal cuticle with 15 pairs of setae; anal shield without anterior bulbous projection..... ***P. scolyti***
10. Lateral idiosomal soft cuticle with 4 pairs of setae (*R1*−*R4*); dorsal setae conspicuously elongate, with setae *J4* reaching beyond posterior margin of dorsal shield) ..... ***P. longisetosus***
– Lateral idiosomal soft cuticle with 4−5 pairs of setae (*R6* on or off the shield); dorsal setae shorter, with setae *J4* not reaching posterior margin of dorsal shield ..... ***P. pygmaeus***
11. Most dorsal setae longer than the distance to the next setae in series ..... ***P. aurora***
– Most dorsal setae shorter than the distance to the next setae in series 12
12. Tectum elongate, its medial prong conspicuously longer than lateral prongs; dorsal shield with five pairs of *R*-setae (*R1-R5*); area between setae J5 without denticulate transverse rows 13
– Tectum basally broad, its prongs of similar lengths or medial prong only slightly longer than lateral prongs; dorsal shield with four pairs of *R*-setae (*R1-R4*); area between setae *J5* with 1–2 denticulate transverse rows 14
13. Dorsal shield conspicuously and evenly reticulate, with jigsaw-like pattern anteromedially; medial prong of tectum thin, tapering into a simple point; setae *SV3* present (soft idiosomal cuticle with 16 pairs of setae); dorsal shield, 360–440 μm long ..... ***P. cossoides***
– Dorsal shield weakly and unevenly ornamented, especially marginally; anteromedial surface smooth

or finely reticulate posteriorly, without specific jigsaw-like pattern; medial process of tectum robust and slightly broadened apically, usually with 2−3 terminal denticles; setae *SV3* absent (soft idiosomal cuticle with 15 pairs of setae); dorsal shield, 410–500 µm long ..... ***P. brevipilis***

14. Area between setae *j5*, *z5* and *j6* mostly reticulate; soft idiosomal cuticle with 15 pairs of setae; hypognathal groove with seven rows of denticles ..... ***P. hystricoides***

– Area between setae *j5*, *z5* and *j6* mostly smooth; soft idiosomal cuticle with 14 pairs of setae; hypognathal groove with six rows of denticles ..... ***P. fiseri***

DISCUSSION

Melicharid species have shown diverse habitats, including soil, litter, plants, rotten wood, stored food and nests of birds, mammals and insects. Most studied melicharid species have been shown to be predators (Mašán 1998; Gwiazdowicz 2007; Trach *et al.* 2019; Joharchi *et al.* 2021a, b; Mašán *et al.* 2021). Some species of genus *Proctolaelaps*, for example *P. bickleyi*, *P. deleoni* Nawar *et al.*, *P. dendroctoni* Lindquist & Hunter, *P. drosophilae* Karg *et al.*, *P. fiseri*, *P. lewisi* (Garman & McGregor), *P. pygmaeus*, *P. regalis*, *P. xyloteri* Samšiňák, have been mentioned to have potential as biological control agents (Moraes *et al.* 2015). Fifteen melicharid species belonging to three genera (one in *Melichares*, two in *Orthadenella* and 12 in *Proctolaelaps*) have been found in Iran. Two of these (*O. multipilisaccula* and *P. cossoides*) were originally described from this country. The fact that only three genera are represented is not surprising, considering that most genera of this Melicharidae are composed of few species (except for *Proctolaelaps* with 151, *Tropicoseius* with 38, *Rhinoseius* with 11 and *Mucroseius* with 9 species), and most of them have a limited worldwide distribution. However, further research may increase those numbers considerably.

ACKNOWLEDGEMENTS

I wish to express my gratitude to Dr. Bruce Halliday (CSIRO Australia) for sending the required papers, Dr. Gilberto José de Moraes and Dr. Frédéric Beaulieu for their valuable comments and suggestions to improve the paper quality.

Author contributions: The author has read and agreed to the published version of the manuscript.

Funding: This research was funded by the University of Guilan (Rasht, Iran)

Availability of data and materials: Data are available upon request from the author.

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

Consent for publication: NA.

Competing interests: NA.

Generative AI statement: The author declares no use of Gen AI in the creation of this manuscript.

REFERENCES

Abbaspour, P., Sadeghi Nameghi, H. & Fekrat, L. (2017) Soil inhabiting mesostigmatic mites (Acari: Mesostigmata) in Mashhad Province. *Journal of Crop Protection*, 30(4): 744–753.

Abo-Shnaf, R.I.A. & Moraes, G.J. de (2016) *Proctolaelaps* species (Acari: Mesostigmata: Melicharidae) from Egypt, with description of a new species and complementary descriptions of other five species. *Zootaxa*, 4162: 479–503. https://doi.org/10.11646/zootaxa.4162.3.4

Arjomandi, E., Kazemi, S. & Afshari, A. (2013) Fauna and diversity of the manure inhabiting Mesostigmata (Acari) in Kerman County, South Eastern Iran. *Persian Journal of Acarology*, 2: 253–263. https://doi.org/10.22073/pja.v2i2.9958

Athias-Henriot, C. (1959) Phytoseiidae et Aceosejidae (Acarina, Gamasina) d'Algerie. III Contribution aux Aceosejinae. *Bulletin de la Société d'Historie Naturalle de L'Afrique du Nord,* 50: 158–195.

Athias-Henriot, C. (1973) Observations sur les genres *Neojordensia* Evans et *Orthadenella* n.g. en Europe Occidentale (Gamasides, Dermanyssina, Ascidae). *Acarologia*, 15: 18–32.

Berlese, A. (1923) Centuria sesta di Acari nuovi. *Redia*, 15: 237–262.

Bram, R.A. (1956) A new predatory mite from insect culture. *Proceedings of the Entomological Society of Washington*, 58: 292–294.

Bregetova, N.G. (1977) Family Aceosejidae Baker and Wharton, 1952 (sensu Evans, 1958). *In*: Ghilyarov, M.S. & Bregetova, N.G. (Eds.), *Key to the soil-inhabiting mites. Mesostigmata*. Nauka, Leningrad, pp. 169–226. [in Russian]

Chant, D.A. (1963) The subfamily Blattisociinae Garman (= Aceosejinae Evans) (Acarina: Blattisociidae Garman) (= Aceosejidae Baker and Wharton) in North America, with descriptions of new species. *Canadian Journal of Zoology*, 41: 243–305. https://doi.org/10.1139/z63-025

De Leon, D. (1963) New genus and twelve new species of mites from Mexico and southeast United States (Acarina: Blattisociidae). *The Florida Entomologist*, 46: 197–207. https://doi.org/10.2307/3493632

Evans, G.O. (1957) An introduction to the British Mesostigmata (Acarina) with keys to families and genera. *Journal of the Linnean Society, Zoology*, 43: 203–259. https://doi.org/10.1111/j.1096-3642.1957.tb01552.x

Evans, G.O. (1958) A revision of the British Aceosejinae (Acarina: Mesostigmata). *Proceedings of the Zoological Society of London*, 131: 177–229. https://doi.org/10.1111/j.1096-3642.1958.tb00685.x

Evans, G.O. (1963) Observations on the chaetotaxy of the legs in the free-living Gamasina (Acari: Mesostigmata). *Bulletin of the British Museum (Natural History), Zoology*, 10: 277–303. https://doi.org/10.5962/bhl.part.20528

Evans, G.O. & Till, W.M. (1979) Mesostigmatic mites of Britain and Ireland (Chelicerata: Acari-Parasitiformes). An introduction to their external morphology and classification. *Transactions of the Zoological Society of London*, 35: 139–270. https://doi.org/ 10.1111/j.1096-3642.1979.tb00059.x

Faraji, F., Sakenin-Chelav, H. & Karg, W. (2007) A new species of *Proctolaelaps* Berlese from Iran (Acari: Ameroseiidae). *Abhandlungen und Berichte des Naturkundemuseums Görlitz*, 78: 107–112.

Ghasemi, A. & Hajizadeh, J. (2021) Some new records of mesostigmatid mites (Acari: Mesostigmata) associated with greenhouse plants from Iran. *Journal of Biological Studies*, 4(1): 24–40. https://doi.org/10.62400/jbs.v4i1.5611

Granpayeh, S. & Ostovan, H. (2014) Mites recorded from insectary cultures in the Shiraz region of Iran. *International Research Journal of Applied and Basic Sciences*, 8(5): 612–616.

Gwiazdowicz, D.J. (2007) *Ascid mites (Acari, Mesostigmata) from selected forest ecosystems and microhabitats in Poland*. Wydawnictwo Akademii Rolniczej Im. Augusta Cieszkowskiego, Poznań, 248 pp.

Habibpour, B., Kamali, K. & Meidani, J. (2002) Insects and mites associated with stored products and their arthropod parasites and predators in Khuzestan Province (Iran). *Integrated Protection of Stored Products IOBC Bulletin*, 25(3): 89–91.

Hajizadeh, J. & Hosseini, R. (2022) Introduction of mites collected from light traps in Rasht city. *Plant Pest Research*, 12(1): 1–13. https://doi.org/10.22124/iprj.2022.5602

Hajizadeh, J., Faraji, F. & Rafati Fard, M. (2010) Ascidae (Acari: Mesostigmata) of Guilan Province, a new genus and four species records for the Iranian mite fauna and a key to the North of Iran ascid species. *Iranian Journal of Plant Protection Science*, 40(2): 35–50.

Hasanvand, I., Rahmati, M., Jafari, S., Pourhosseini, L., Chamaani, N. & Louni, M. (2014) Fauna of some mesostigmatic mites (Acari: Mesostigmata) in Khorramabad region, Lorestan Province, Iran. *International Journal of Advanced Biological and Biomedical Research*, 2(12): 2867–2873.

Hering, E. (1838) Die Krätzmilben der Thiere und einige verwandte Arten, nach eigenen Untersuchungen beschrieben. *Nova Acta Physico-Medica Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum*, 18: 573–624.

Hirschmann, W. (1962) Gangsystematik der Parasitiformes. Teil 5. Gamasiden Rücken haar besttimmung stafeln von 260 *Typhlodromus*- Arten der Erde. Gänge, Chaetotaxie Porotaxie, Mundwerkzeuge von *Typhlodromus* und verwandten Gattungen von *Proctolaelaps*, *Melichares*, *Lasioseius*, *Iphidozercon*, *Sejus*,

Rhodacarellus, *Rhodacarus*, *Gamasellus*, *Veigaia*, *Macrocheles ivanovi*. Erstversuch der Aufstellung eines Gangsystems der Gamasiden aufgrund der Gnathosoma-unterseite. *Acarologie. Schriftenreihe für Verglenchende Milbenkunde*, 5: 1–56.

Javadpour, M., Hajizadeh, J. & Hosseini, R. (2018) Blattisociid mites of Guilan province of Iran with a checklist for Iranian blattisociid mites (Mesostigmata: Blattisociidae). *Entomofauna*, 13: 697–710.

Joharchi, O., Döker, I. & Khaustov, A.A. (2021a) Rediscovery of two gamasid mites (Acari: Mesostigmata) associated with beetles in Western Siberia, Russia. *International Journal of Acarology*, 47: 327–338. https://doi.org/10.1080/01647954.2021.1912178

Joharchi, O., Marchenko, I.I., Döker, I. & Khaustov, V.A. (2021b) A new species of the genus *Proctogastrolaelaps* McGraw & Farrier (Acari: Melicharidae) from the Far East of Russia, and contributions to knowledge of this genus. *Zootaxa*, 5072(4): 380–388. https://doi.org/10.11646/zootaxa.5072.4.5

Kadkhodaei, F., Nemati, A. & Kocheili, F. (2013) Some mesostigmatid mites from Iran with their world distribution. *Journal of Crop Protection*, 2(2): 127–138.

Kamali, K., Ostovan, H. & Atamehr, A. (2001) *A catalog of mites and ticks (Acari) of Iran*. Islamic Azad University Scientific Publication Center, 192 pp.

Karami, F., Hajizadeh, J. & Ostovan, H. (2017) Fauna of Ascoidea (except Ameroseiidae) in Guilan Province, Iran with two new species record for Iran mite's fauna. *Linzer Biologische Beiträge*, 42(9): 1309–1321.

Karbasian, M., Jalali Zand, A., Ostovan, H. & Soleiman Nejadian, E. (2022) Edaphic Mesostigmata mites in central Iran: Twelve new country and local records. *Iranian Journal of Animal Biosystematics (IJAB),* 18(2): 109–120. https://doi.org/10.22067/ijab.2022.76689.1031

Karg, W. (1985) Die Raubmilbengattung *Proctolaelaps* Berlese, 1923. *Zoologische Jahrbücher Abteilung für Systematik, Ökologie und Geographie der Tiere,* 112: 185–206.

Karg, W. (1988) Eine neue Raubmilbenart der Gattung *Proctolaelaps* Berlese, 1923 (Acarina, Parasitiformes) am Grossen Obstbaumsplintkäfer (*Scolytus* (*Eccoptogaster*) *mali* Bechest.). *Archiv für Phytopathologie und Pflanzenschutz,* 24: 515–517. https://doi.org/10.1080/03235408809437850

Karg, W. (1993) Acari (Acarina), Milben. Parasitiformes (Anactinochaeta). Cohors Gamasina Leach. Raubmilben. 2. Überarbeitete Auflage. *Die Tierwelt Deutschlands*, 59: 1–523.

Kazemi, S. & Rajaei, A. (2013) An annotated checklist of Iranian Mesostigmata (Acari), excluding the family Phytoseiidae. *Persian Journal of Acarology*, 2(1): 63–158. https://doi.org/10.22073/pja.v2i1.9950

Khalili-Moghadam, A. (2022) Partial faunistic study of mesostigmatid mites (Acari: Mesostigmata) associated with ants (Hymenoptera: Formicidae) in Chaharmahal va Bakhtiyari Province. *Plant Pest Research*, 12(2): 51–60. https://doi.org/10.22124/iprj.2022.5794

Lindquist, E.E. (1994) Some observations on the chaetotaxy of the caudal body region of gamasine mites (Acari: Mesostigmata), with a modified notation for some ventrolateral body setae. *Acarologia*, 35: 323–326.

Lindquist, E.E. & Evans, G.O. (1965) Taxonomic concepts in the Ascidae, with a modified setal nomenclature for the idiosoma of the Gamasina (Acarina: Mesostigmata). *Memoirs of the Entomological Society of Canada*, 47: 1–65. https://doi.org/10.4039/entm9747fv

Lindquist, E.E. & Hunter, P.E. (1965) Some mites of the genus *Proctolaelaps* Berlese (Acarina: Blattisociidae) associated with forest insect pests. *The Canadian Entomologist*, 97: 15–32. https://doi.org/10.4039/Ent9715-1

Lindquist, E.E., Krantz, G.W. & Walter, D.E. (2009) Order Mesostigmata. *In*: Krantz, G.W. & Walter, D.E. (Eds.), *A manual of acarology*. 3rd Edition. Texas Tech University Press, Lubbock, Texas, pp. 124–232.

Maleki, S., Ostovan, H., Baniameri, V. & Joharchi, O. (2016) Biodiversity of mesostigmatic soil mite fauna (Acari: Mesostigmata) of a City park located in Tehran, Iran. *Journal of Entomological Society of Iran*, 36(3): 181–194.

Mašán, P. (1998) Two new mesostigamatic mites (Acarina, *Proctolaelaps*, *Hypoaspis*) associated with erotylid

and melolonthine beetles (Coleoptera: Erotylidae, Scarabaeidae) from Slovakia. *Entomological Problems*, 29: 19–22.

Mašán P. (2022) The family Melicharidae (Acari, Mesostigmata) in Slovakia, with description of new species, annotated faunal synopsis and identification keys of species from Europe. *Zootaxa*, 5172: 1–449. https://doi.org/10.11646/zootaxa.5172.1.1

Mašán, P., Joharchi, O. & Abramov, V.V. (2021) A new genus and two new species of melicharid mites (Acari: Mesostigmata) associated with wood-destroying fungi and mycophagous erotylid beetles (Coleoptera: Erotylidae) in Europe. *Zootaxa*, 4980: 157–173. https://doi.org/10.11646/zootaxa.4980.1.10

Masnavipour, M., Kazemi, S., Latifi, M. & Ziaaddini, M. (2014) Fauna of edaphic mites of the subcohort Dermanyssiae (Mesostigmata: Gamasina) in northwestern area of Kerman Province. *Taxonomy and Biosystematics*, 20: 37–48.

Memarzadeh, S., Ostovan, H., Hesami, S. & Gheibi, M. (2022) Species diversity of mesostigmatic mites (Acari: Mesostigmata) in Darab region. *IAU Journal of Entomological Research*, 14(3): 214–235.

Mohammad-Doustaresharaf, M., Mirfakhraie, S., Zargaran, M.R. & Azimi, N. (2016) Species diversity of edaphic mesostigmatid mites (Acari: Mesostigmata) of Arasbaran forest. *Forest Research and Development*, 2(1): 85–96.

Mojaz, M. & Kazemi, S. (2020) Fauna of soil-inhabiting Mesostigmata (Acari) in Mahan city and new report of a subgenus and a species of the subfamily Pergamasinae (Parasitidae) from Iran. *Journal of Entomological Society of Iran*, 40(3): 255–266. https://doi.org/10.22117/JESI.2020.342870.1379

Moraes, G.J. de, Venancio, R., Santos, Victor, L.V. dos & Paschoal, A.D. (2015) Potential of Ascidae, Blattisociidae and Melicharidae (Acari: Mesostigmata) as biological control agents of pest organisms. *In*: Carrillo, D., Moraes, G.J. de & Peña, J.E. (Eds.), *Prospects for biological control of plant feeding mites and other harmful organisms*. Springer International Publishing, Switzerland, pp. 33–75. https://doi.org/10.1007/978-3-319-15042-0_2

Moraes, G.J. de, Britto, E.P.J., Mineiro, J.L.C. & Halliday, B. (2016) Catalogue of the mite families Ascidae Voigts & Oudemans, Blattisociidae Garman and Melicharidae Hirschmann (Acari: Mesostigmata). *Zootaxa*, 4112 (1): 1–299. https://doi.org/10.11646/zootaxa.4112.1.1

Moraza, M.L. & Lindquist, E.E. (2016) New species and biological data for the neotropical genus *Hispiniphis* (Acari: Mesostigmata: Melicharidae) associated with hispine beetles, genus *Cephaloleia*, in unfurled leaves of *Heliconia*. *Systematic and Applied Acarology*, 21(1): 85–118. https://doi.org/10.11158/saa.21.1.7

Müller, J. (1859) Beitrag zur Höhlenfauna Mährens. *Lotos, Zeitschrift für Naturwissenschaften*, 9: 26–33.

Ostovan, H. & Faraji, F. (2014) A new species of *Orthadenella* (Athias-Henriot) (Acari: Mesostigmata: Melicharidae) from Iran with comments on *O. lawrencei* (Evans). *International Journal of Acarology*, 40: 605–610. https://doi.org/10.1080/01647954.2014.966146

Postner, M. (1951) *Biologisch-Ökologische Untersuchungen an Hummeln und deren Nestern und biologische Beobachtungen an Hummelmilben*. Dissertation Universität Erlangen, Nürnberg, 106 pp.

Riahi, E. & Nemati, A. (2024) A catalogue of the Iranian Mesostigmata (Acari) excluding Phytoseiidae. *Persian Journal of Acarology*, 13(3): 521–718. https://doi.org/10.22073/pja.v13i3.83837

Sakenin-Chelav, H., Kamali, K., Ostovan, H. & Saboori, A. (2006) Some Ascidae mites from Iran (Mesostigmata). *In*: Bruin, J. (Ed.), *Abstract Book of 12th International Congress of Acarology*. Amsterdam, The Netherlands, p. 180.

Samšiňák, K. (1960) Über einige forstwirtschaftlich wichtige Milben der Gattung *Proctolaelaps* Berlese 1923. *Československá Parasilogie*, 7: 297–307.

Santos, J.C., Demite, P.R. & Moraes, G.J. de (2025) Melicharidae Database. Available from: http://www.lea.esalq.usp.br/acari/melicharidae (Accessed on 30.06.2025)

Sepasgozarian, H. (1978) *Stored pests of Iran and their control*. University of Tehran., Publication No. 1026, Tehran, 287 pp.

Tajmiri, P. & Hajizadeh, J. (2013) Some mesostigmatic mites on raspberry shrubs (*Rubus* spp.) in central area of Guilan Province, Iran. *Journal of Applied Research in Plant Protection*, 2(1): 15–25.

Trach, V.A., Marchenko, I.I. & Joharchi, O. (2019) Redescription of the female of bumblebee-associated gamasid mite *Proctolaelaps sibiriensis* (Davydova, 1988) (Acari: Mesostigmata: Melicharidae) from North Asia. *Acarologia*, 59: 531−541. https://doi.org/10.24349/acarologia/20194353

Vitzthum, H.G. (1925) Fauna Sumatrensis (Beitrag No. 5). Acarinae. *Supplementia Entomologica*, 11: 1–79.

Westerboer, I. (1963) Die Familie Podocinidae Berlese, 1916. Abschnitt IV. *In*: Stammer, H.-J. (Ed.), *Beiträge zur Systematik und Ökologie mitteleuropäischer Acarina. Band II. Mesostigmata I.* Akademische Verlagsgesellschaft Geest & Portig K.- G., Leipzig, pp. 179–450.

هرناهای ملیکارید (Acari: Mesostigmata: Melicharidae) ایران، همراه با کلید شناسایی گونه‌ها

جلیل حاجی زاده

گروه گیاه‌پزشکی، دانشکدهٔ علوم کشاورزی، دانشگاه گیلان، رشت، ایران؛ رایانامه: hajizadeh@ guilan.ac.ir

چکیده

هرناهای خانوادهٔ Melicharidae (Acari: Mesostigmata) شناسایی شده از ایران بر اساس اطلاعات موجود در منابع علمی و گزارش جدید شش گونه از نمونه‌های جمع‌آوری‌شده در استان گیلان، شمال ایران، فهرست شده‌اند. در مجموع پانزده گونه متعلق به سه جنس *Melichares* Hering، *Orthadenella* Athias-Henriot و *Proctolaelaps* Berlese گزارش شده‌اند، فراوانترین گونه‌ها *Proctolaelaps pygmaeus* و *Proctolaelaps intermedius* بودند. برای هر گونه اطلاعات مربوط به پراکندگی اکولوژیکی و جغرافیایی در ایران و سایر نقاط ارایه شده است. صفات افتراقی گونه‌های مورد بررسی ارایه شده است. کلید دو شقی برای شناسایی گونه‌های گزارش شده از ایران فراهم شده است.

واژگان کلیدی: Ascoidea، *Melichares*، *Orthadenella*، *Proctolaelaps*، آرایه‌شناسی

CITE: Hajizadeh, J. (2026) Melicharid mites (Acari: Mesostigmata: Melicharidae) of Iran, with a key to species. *Persian Journal of Acarology*, 15(2): 150202.
https://doi.org/10.22073/pja.150202

دریافت
۸ شهریور ۱۴۰۴
پذیرش
۹ دی ۱۴۰۴
انتشار
۲۶ فروردین ۱۴۰۵
دبیر تخصصی
/. جوهرچی