

Some mesostigmatic mites from Iran with their world distribution

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Abstract: Edaphic Mesostigmata are important, because these feed on arthropods and other invertebrates which may affect natural equilibrium of other living micro-organisms. In order to study the fauna of mesostigmatic mites, samples of soil and litter were collected from different parts of Esfahan region. Mites were extracted by means of Berlese funnel, cleared in Lactic acid and mounted in Hoyer's medium. In this research, the world and Iranian distribution of species with some information about their habitats are provided. Two genera and 3 species were recorded as new records for Iran mite fauna that are marked by an asterisk. The list of identified genera and species is as follows:

Ascidae: *Arctoseius cetratus* (Sellnick, 1940), *A. pristinus** Karg, 1962, *A. venustus* (Berlese, 1917), *Gamasellodes bicolor* (Berlese, 1918); **Blattisociidae:** *Lasioseius sugawarai* Ehara, 1964, *L. youcefi* Athias-Henriot, 1959; **Melicharidae:** *Proctolaelaps pygmaeus* (Muller, 1860); **Parholaspididae:** *Proparholaspulus angustatus** Ishikawa, 1987 **Trachytidae:** *Uroseius traegardhi** (Hirschmann & Zirngiebl-Nicol, 1969).

Keywords: Acari, Mesostigmata, Soil, World distribution, Iran

Introduction

The Mesostigmata are a group of mites (Acari) comprising a great diversity of vertebrate parasites-symbionts of insects, and for the most part, free-living predators. Soil, litter, plants, dung and decaying wood are all inhabited by a range of free-living mesostigmatic mites (Walter *et al.*, 1998; Halliday, 2000; Beaulieu and Weeks, 2007). The order mesostigmata is divided into three suborders. The suborder Monogynaspida includes a multitude of free-living and parasitic species that occur in countless terrestrial, marine and freshwater habitats throughout the world. This suborder includes five cohorts. Gamasina cohort comprises most of the described species of

mesostigmata. The Gamasina is considered to comprise four subcohorts and 10 superfamilies (Lindquist *et al.*, 2009).

Mites of the family Ascidae are commonly found in soil and litter, among other habitats, where they may play an important role as predators of other mites, other arthropods and nematodes (Halliday *et al.*, 1998; Lindquist *et al.*, 2009; Walter, 1988; Walter *et al.*, 1993). They are also among the gamasine mites which are useful as biological indicators of soil conditions and changes in soil ecosystems (Karg and Freier, 1995; Minero *et al.*, 2009). Based on Krantz and Walter (2009) the family Ascidae includes two subfamilies; the Arctoseiinae and the Ascinae and the melicarines, blattisociines and platyseiines are excluded from this family. The Melicharidae has been classified as a subfamily or a tribe in previous accounts, but now it is treated as a separate family.

Many species of melicharids are predatory, others have adopted to feeding on fungi, pollen,

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and nectar, and one is reported to be parasitic on cockroaches (Lindquist *et al.*, 2009).

The Blattisociidae is a diverse group that has adopted to a broad spectrum of terrestrial, arboreal, and subaquatic habitats. This family includes two subfamilies, the Platyseinae and Blattisociinae. The family Parholaspididae comprises 11 genera of moderately to heavily sclerotized predatory mites that often are found in forest litter, soil, decaying vegetable matter, moss, and tree holes (Lindquist *et al.*, 2009). There are sporadic and in some case incomplete and poor information about the fauna of these families in Iran and also world distribution of their members. In this paper data is provided for some species that have been collected in this survey.

Materials and Methods

Materials were collected from different microhabitats in some parts of Esfahan region during 2011-2012. Mites were extracted from the soil and litter samples by use of Berlese funnels. The specimens were collected in beakers of 75% ethanol, and then fixed on permanent slides in Hoyer's medium. The list of species is presented by different families and related genera, including information about diagnosis, world distribution, records in Iran with new records in this survey. Species' microhabitat and the details of the findings encompass date of collection, locality, microhabitats or hosts that were recorded.

Results

Family Ascidae

Genus *Arctoseius* Thor, 1930

Arctoseius cetratus (Sellnick, 1940)

Diagnosis. Setae *J2*, *Z1*, *Z2*, and *S1*, *S2* short, not reaching the bases of following setae (Gwiazdowicz, 2007). Posterior half of dorsal shield with longitudinal garland of puncta between *J* and *Z* setae, peritremes extending anteriorly to mid-level of coxa II (Halliday *et al.*, 1998).

World distribution. North America (Chant, 1963); Europe (Bregetova, 1977; Karg, 1993; Salmane and Heldt, 2001; Kaluz and Fenda, 2005); Western Europe (Bregetova, 1977); Russia: soil (Petrova, 1982; Makarova, 2000); Western Siberia (Davydova and Nikolsky, 1986); Middle Ural (Russia): fallow land (Khomjakov, 1988); Australia: dung-baited, pitfall trap, New South Wales: cow dung, Victoria: compost (Halliday *et al.*, 1998); Poland: nest of Greater spotted Eagle (*Aquila clanga*) (Gwiazdowicz *et al.*, 2000), soil (Seniczak *et al.*, 2000), rotten wood, leaf litter and other microhabitats (Gwiazdowicz and Klemt, 2004), sod, stuffing from nests of (*Larus ridibundas*) (Gwiazdowicz and Kmita, 2004), litter, rot wood, moss (Gwiazdowicz and Matysiak, 2004), litter, rotting wood, sod, meadow, bark beetles galleries (Gwiazdowicz, 2007), Nests of formicidae (*Formica polyctena*), (*Lasius niger*) (Gwiazdowicz, 2008a), associated with Scolytidae (Gwiazdowicz, 2008b), soil (Gabrys *et al.*, 2008); Sakhalin and Kuril Islands: manure (Marchenko and Mapyehko, 2002); Slovakia: various habitats (Kaluz and Fenda, 2005), nests of mound-building mouse (*Mus spicilegus*) (Masan and Stanko, 2005), birds nests (Fenda and Schniererova, 2010); Central Argentina: Soil (Bedano and Ruf, 2007); Northern Taiga (Makarova, 2009); Finland: pine forest, seashore, meadow, dry meadow, ant hills, compost, dung (Huhta *et al.*, 2010); Saudi Arabia: fruit and timber trees (Al-Atawi, 2011); Austria: roots and soil of plants (Wissuwa *et al.*, 2012).

Iran Records. Following Nemati *et al.* (2012a).

New Records. Soil of different parts of Esfahan: 31.iii.2012, Abshar street; 21.iii.2011, 12.iii.2012, Bagh-daryache street; 28.iii.2011, Bishe-habib park; 10.iii.2012, Khayam street; 25.iii.2011, Khomeinishahr; 03.iii.2011, Khoram street; 28.iii.2011, Marnan park; 04.iv.2012, Mirzataher street; 12.iii.2012, 11.iv.2012, Moshtagh street; 29.iii.2011, Nazhvan park; 25.iii.2012, Ordibehesht street; 06.iv.2012, Takhtpolad graveyard.

***Arctoseius pristinus* Karg, 1962**

Diagnosis. All of the dorsal setae short, tines of epistome with fine, often barely distinguishable branching, genital shield not widened posteriorly (Bregetova, 1977).

World distribution. Central Europe (Bregetova, 1977; Karg, 1993; Kaluz and Fenda, 2005); Slovakia (Kaluz and Fenda, 2005); Finland: alpine, compost, dung (Huhta et al., 2010).

New Records. Soil of different parts of Esfahan: 17.iii.2012, 4.iv.2012, Atash street; 12.iii.2012, Bagh-daryache street; 19.iii.2012, Bostan kodak park; 19.iii.2012, Khayam street; 31.iii.2012, Moshtagh street; 10.iii.2012, 05.viii.2011, 25.iii.2012, Ordibehesht street; 25.iii.2012, Saeb street; 06.iv.2012, Takhtpolad graveyard; 10.iii.2012, 14.iii.2012, Vahid street.

***Arctoseius venustus* (Berlese, 1917)**

Diagnosis. Epistome tri-ramous, margin of epistome pointed, setae Z5 same length as J5 or slightly longer, setae in row R simple, pair of presternal plates present (Gwiazdowicz, 2007).

World distribution. Switzerland (Airoldi et al., 1989); Europe (Karg, 1993; Kaluz and Fenda, 2005); England and Wales: associated with yew (Skorupski and Luxton, 1998); Slovakia (Kaluz and Fenda, 2005), nests of mound-building mouse (*Mus spicilegus*) (Masan and Stanko, 2005); Austria: roots and soil of plants (Wissuwa et al., 2012).

Iran Records. Following Nemati et al. (2012a).

New Records. Soil of different parts of Esfahan: 21.iii.2011, Atash street; 19.iii.2011, Bostan kodak park; 3.iii.2011, Khoram street; 27.iii.2011, Marnan bridge; 24.iv.2011, Saeb street.

Genus *Gamasellodes* Athias-Henriot, 1961***Gamasellodes bicolor* (Berlese, 1918)**

Diagnosis. Ventral idiosoma with a ventrianal shield with three circum-anal setae and at least one pair of ventri-anal setae, peritreme long, extending to coxa I, humeral setae r3 of approximately same length as other setae on podonotal shield (Gwiazdowicz, 2007). Anterior margin of ventrianal shield broadly rounded, shield

widest along its middle one-third, at level near anus (Halliday et al., 1998).

World distribution. Tanzania (Hurlbutt, 1971); New York (United states): birds nests (Baker et al., 1976); Norway (Mehl, 1979); Europe (Karg, 1993; Salmane and Heldt, 2001); England and Wales, associated with yew (Skorupski and Luxton, 1998); Latvia: coastal meadow (Salmane, 1999), washed ashore material, dunes (Salmane, 2001a), primary dunes (Salmane, 2001b), associated with *Aphylophorales* fungi from dead or live tree trunks (Salmane, 2005), under the bark, in the frass, rotting wood, mosses and lichens on the tree trunks and stumps (Salmane, 2007); Poland: nests of white-tailed sea Eagle (*Haliaeetus albicila*) (Gwiazdowicz et al., 2000), soil (Seniczak et al., 2000), nests of red-backed shrike (*Lanius collurio*) (Tryjanowski et al., 2001), rotten wood, leaf litter and other microhabitats (Gwiazdowicz and Klemm, 2004), litter, rot wood, moss (Gwiazdowicz and Matysiak, 2004), litter, sod (Gwiazdowicz and Kmita, 2004), litter, fruiting bodies, bark beetles galleries, sod, moss, rotting wood (Gwiazdowicz, 2007), Nests of formicidae (*Formica polyctena*), (*Lasius niger*), (*Formica rufa*), (*Lasius flavus*), (*Lasius fuliginosus*) (Gwiazdowicz, 2008a), associated with Scolytidae (Gwiazdowicz, 2008b), soil (Skorupski et al., 2008), rotting wood (Gwiazdowicz, 2010); South Africa, North and South America, India, Israel (Bhattachary and Sanyal, 2002); Hungary: soil, litter (Salmane and Kotschan, 2005a), litter (Salmane and Kotschan, 2005b); Central Argentina: soil (Bedano and Ruf, 2007); Alabama: citrus orchards (Fadamiro et al., 2009); Northern Taiga (Makarova, 2009); Finland: pine forest, spruce forest, deciduous forest, seashore, meadow, dry meadow, dead wood, ant hills, compost, dung (Huhta et al., 2010); Slovakia: birds nests (Fenda and Schmiererova, 2010); Turkey: *Canna indica*, *Crocus ancyrensis*, *Crocus biflorus*, *Iris* sp, wild mushroom (Cakmak et al., 2011); Austria: roots and soil of plants (Wissuwa et al., 2012).

Iran Records. Following Nemati *et al.* (2012a).
New Records. Esfahan, soil, 2011.iii.19, Bostan koodak park; 2011.iii.27, Marnan bridge, soil.

Family Blattisociidae

Genus *Lasioseius* Berlese, 1916

Lasioseius sugawarai Ehara, 1964

Diagnosis. Length of $Z3 = 2/3$ the distance between $Z3$ and $S5$, median point of epistome as long as the lateral branches, the three branches as long as wide, macrochaetae on leg IV = 35, $Z5 = 47$ (Christian and Karg 2006).

World distribution. Japan (Ehara, 1964), associated with Millipedes (Ishikawa, 1986), (Christian and Karg, 2006), soil, litter (Takaku and Sasaki, 2007).

Iran Records. Following Nemati *et al.* (2012b).

New Records. Esfahan, soil, 13.vii.2011, Marnan park .

Lasioseius youcefi Athias Henriot, 1959

Diagnosis. Holodorsal shield lacking two pairs of setae in row *J*, some setae on dorsal shield serrate (Gwiazdowicz, 2007). Many of the setae on the dorsal shield and the postanal setae with a short pubescence (Bregetova, 1977).

World distribution. Africa, Southern and Northern Africa (Athias-Henriot, 1959; Karg, 1993); Western Europe, Crimea (Ukraine), Gorkiy oblast, Trans-caucasia, Latvia, Transcarpathia (Bregetova, 1977); North America (Walter and Lindquist, 1989); Europe (Karg, 1993); Latvia: coastal meadow (Salmane, 1999), inland and coastal meadow, spruce stand, bogs, mosses, nests of birds (Salmane, 2001a), soil (Salmane, 2001b), associated with *Aphylophorales* fungi from dead or live tree trunks (Salmane, 2005), under bark and in rotting wood of (*Alnus incana*), (Salmane, 2007); South Africa: clover and Oxalis sp, grass, capeweed cultivated lawn, irrigated pasture (Halliday, 2005); Poland: bark beetles galleries, nests of birds, litter, moss (Gwiazdowicz, 2007); Italy (Plumari, 2009); Austria: roots and soil of plants (Wissuwa *et al.*, 2012).

Iran Records. Following Nemati *et al.* (2012b).

New Records. Soil of different parts of Esfahan: 06.ix.2011, Asgarie street; 19.iii.2011, Bostan koodak park; 21.iii.2011, Kohandej street; 13.vi.2011, Marnan park; 04.ix.2011, Nazhvan park; 04.ix.2011, Ordibehesht street; 06.iv.2012, Takhtpolad graveyard.

Family Melicharidae

Genus *Proctolaelaps* Berlese, 1923

Proctolaelaps pygmaeus (Müller, 1860)

Diagnosis. Anal shield pear-shaped, anus large, $j4$ approximately same length as $z4$, hypostomal $C1$ setae distinctly thicker than other setae on gnathosoma, anterior margin of epistome curved and irregularly denticulate, fixed-digit of chelicerae with 4-7 large proximal teeth and curved row of 3-5 small distal teeth (Gwiazdowicz, 2007; Halliday *et al.*, 1998).

World distribution. North America (Chant, 1963; Karg, 1971); Japan (Ehara, 1964); Europe, South Africa, Indonesia, Australia, New Zealand (Karg, 1971); New Zealand (Spain and Luxton, 1971); Norway: small mammals (Edler and Mehl, 1972), (Mehl, 1979), soil and tree hollows (Slomian *et al.*, 2005); Russia (Bregetova, 1977; Petrova, 1982); Poland (Haitlinger, 1983) (Haitlinger, 1989a,b), nests of greater spotted Eagle (*Aquila clanga*) (Gwiazdowicz *et al.*, 2000), nests of the red-backed shrike (*Lanius collurio*) (Tryjanowski *et al.*, 2001), litter, rotten wood, moss (Gwiazdowicz and Matysiak, 2004), soil, sand dune (Gwiazdowicz and Kmita, 2004), rotten wood, leaf litter and other microhabitat (Gwiazdowicz and Klemm, 2004), nests of white stork (*Ciconia ciconia*) (Bloszyk *et al.*, 2005), nests of birds, rotting wood, litter, fungal fruiting bodies, bark beetles galleries (Gwiazdowicz, 2007), soil (Gabrys *et al.*, 2008), bracket fungi (Gwiazdowicz, 2010); Western Siberia (Davydova and Nikolsky, 1986); Hungary: associated with small mammals (*M. arvalis*) (Ambrose, 1987); Middle Ural (Khomjakov, 1988); Egypt: in the house dust (Shoukry *et al.*, 1990); New South Wales: in bat guano, Queensland: on *Neogeoscapheus* sp. (Blaberidae), palm, orchid plants, on (*Rattus assimilis*), in artificial insect

diet, in cat faeces, metallactus colony, Western Australia: on pseudomys nanus (Halliday *et al.*, 1998); England and Wales: associated with yew (Skorupski and Luxton, 1998); Kuril Island: (*Microtus oeconomus*) (Rodentia, Cricetidae), walls of home aquarium above water level (Klimov, 1998); China (RuiYi *et al.*, 2000); New South Wales: Jenolan caves (Halliday, 2001); Latvia: fields, nests of wild birds (Salmane, 2001a), soil (Salmane 2001b), associated with *Aphylllophorales* fungi from dead or live trees and tree trunks (Salmane, 2005), in rotting (*Alnus incana*) wood, under bark of fallen (*Populus tremula*), in frass and under bark of (*Betula pendula*), in rotting wood from (*Quercus robur*) hole, jointly with (*Soronia grisea*) (Coleoptera, Nitidulidae) in yeasty sap of (*Betula pendula*), in frass and under bark of (*Betula pendula*) (Salmane, 2007); Sakhalin and Kuril Island: litter (Marchenko and Mapyehko, 2002); India (Chaudhury *et al.*, 2005); Slovakia: nests of mound-building mouse (*Mus spicilegus*) (Masan and Stanko, 2005), birds nests (Fenda and Schniererova, 2010); Northern Taiga (Makarova, 2009); Finland: decid forest, shore, compost, dung, alpine (Huhta *et al.*, 2010).

Iran Records. Iran (Sepasgozarian, 1971; Modares awal, 1994; Modares awal, 1997; Ostovan and Mosadegh; 1999); Fars, soil (Ostovan, 1993; Ostovan and Kamali, 1994; Amirazodi and Ostovan, 2012); Dezful, soil of citrus orchards (Malekzade *et al.*, 2000); Esfahan, soil of tree fruit orchards (Jalaeian *et al.*, 2004); Orumieh, potato fields (Mosavi *et al.*, 2004); Ahwaz, soil (Baharloo *et al.*, 2006); Bushehr, Chaharmahal-Bakhtiari and Khuzestan provinces, associated with insect (Nemati and babaeian, 2010); Gilan, soil (Hajizadeh *et al.*, 2010); Marvdasht, soil (Soleimani *et al.*, 2011); North-West of Kerman, soil (Masnavipour *et al.*, 2011); Shahreza, soil (Kavianpour *et al.*, 2011); Shiraz, soil (Montazeri *et al.*, 2011); Bam region, Ghale'e Asgar (Kerman province), soil and litter (Mehrzhad *et al.*, 2012); Darab region, soil and foliage of cotton fields (Khorsand *et al.*, 2012); Fars province, Doroodzan, soil

(Asadpoor *et al.*, 2012); Larestan region, cotton and wheat field (Khadempour *et al.*, 2012); Rafsanjan, Fruit trees, (Mohammadi *et al.*, 2012); Shiraz (Fars Province), associated with insectariums (samples taken from potato, zucchini, flour and the floor of insectariums) (Granpayeh *et al.*, 2012); Zanjan, soil (Zare *et al.*, 2012).

Records in this survey. Soil of different parts of Esfahan: 12.iii.2012, Bagh-daryache street; 29.iii.2012, Bostan Saadi street; 21.iii.2012, Kohandej street; 28.iii.2012, Marnan park; 05.viii.2011, 25.iii.2012, Ordibehesht street.

Family Parholaspididae

Genus *Proparholaspulus* Ishikawa, 1980

Proparholaspulus angustatus Ishikawa, 1987

Diagnosis. Dorsal shield entire, weakly reticulated, bearing 32 pairs of simple setae, *J1* shorter than *z1*, with two pairs of presternal shields, epyginal shield coalesced with ventri-anal shield, genitor-ventri-anal shield about twice longer than wide, epistome with elongate median extension and several short spines on either side, and without lateral elongate projections (Ishikawa, 1987).

World distribution. Philippine, litter (Ishikawa, 1987).

Record. Esfahan, soil, coll., A. Nemati, 2012.

Family Trachytidae

Genus *Uroseius* Berlese, 1888

Uroseius traegardhi Hirschmann and Zimgieble-Nicol, 1969

Diagnosis. Dorsal marginal setae (outside shield) inserted on a sclerotized band, metapodal shields short, oval, twice as long as wide, setae *c1*, *c2* short, subequal in length; *c1* slightly more dilated basally (Fain, 1998).

World distribution. Algeria, The Netherlands, France, Switzerland (Wisniewski and Hirshmann, 1993); North Africa, Europe (Fain, 1998).

Records. Esfahan, soil, 28.iii.2011, Marnan park.

Note: The uropodine mites of Iran with short information about their distribution and habitats have been reviewed by Kazemi and

Kontschan (2007). In their study they reported *Uroseius infirmus* (Berlese, 1887) without information about its distribution. Kazemi and Rajaei (2013) published an annotated checklist of Iranian Mesostigmata excluding the dubious species. Because they didn't mention this genus, so this is the first record of the genus *Uroseius* and *U. traegardhi* from Iran.

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برخی از کنه‌های راسته میان‌استیگمایان از ایران و پراکنش جهانی آنها

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چکیده: کنه‌های میان‌استیگمایان خاکزی از بندپایان و سایر بی‌مهرگانی تغذیه می‌کنند که ممکن است باعث تأثیر روی تعادل طبیعی موجودات زنده شده و از این جهت دارای اهمیت زیادی می‌باشند. به‌منظور مطالعه فون برخی از خانواده‌های راسته میان‌استیگمایان، نمونه‌هایی از خاک و گیاه‌خاک از مناطق مختلف شهرستان اصفهان جمع‌آوری شد. کنه‌ها با استفاده از قیف برلز استخراج و پس از شفاف شدن با اسید لاکتیک، از نمونه‌ها به کمک محلول هویر اسلاید دائمی تهیه شد. در این تحقیق پراکنش گونه‌ها در جهان و ایران همراه با اطلاعاتی در مورد زیستگاه آن‌ها ارائه شده است. ۲ جنس و ۳ گونه برای فون کنه‌های ایران جدید بوده و با علامت ستاره مشخص شده‌اند. جنس‌ها و گونه‌های شناسایی شده به شرح زیر می‌باشند:

Ascidae: *Arctoseius cetratus* (Sellnick, 1940), *A. pristinus** Karg, 1962, *A. venustulus* (Berlese, 1917), *Gamasellodes bicolor* (Berlese, 1918); **Blattisociidae:** *Lasioseius sugawarai* Ehara, 1964, *L. youcefi* Athias-Henriot, 1959; **Melicharidae:** *Proctolaelaps pygmaeus* (Muller, 1860); **Parholaspididae:** *Proparholaspulus angustatus** Ishikawa, 1987; **Trachytidae:** *Uroseius traegardhi** (Hirschmann & Zirngiebl-Nicol, 1969).

واژگان کلیدی: کنه‌ها، میان‌استیگمایان، خاک، پراکنش جهانی، ایران