

Multioppia (Multioppia) biciliata sp. n. new species of oribatid mites from Iran (Acari: Oribatida: Oppiidae)

M.A. Akrami,¹ S.R. Bastan²

¹Department of Plant Protection, College of Agriculture, Shiraz University, Shiraz; ²Department of Plant Protection, College of Agriculture, Rasht Branch, Islamic Azad University, Rasht, Iran

Abstract

A new oribatid mite species of the family Oppiidae, *Multioppia (Multioppia) biciliata* sp. n. is described from Arak, Markazi province, central-western Iran. The new species is characterized by the rounded rostrum; strongly elbowed rostral setae; long sensilli with oblong head, dilated unilaterally, ciliated bilaterally with 15-16 long cilia on outer and 8 short cilia on inner edge; long, thick and bilaterally ciliate notogastral setae; smooth genital and ciliate epimeral, aggenital, anal and adanal setae. An identification key to Iranian species of *Multioppia* is presented.

Introduction

The oribatid mite genus *Multioppia* belonging to the subfamily Multioppiinae of the family Oppiidae was proposed by Hammer (1961) with Peruvian species *Multioppia radiata* Hammer, 1961 as the type species and has, until now, been represented by 48 species that collectively have a cosmopolitan (except the Antarctic region) distribution (Subías, 2014). Pérez-Íñigo (1982) distinguished three species groups of the genus on the basis of the sensillar branches: *radiata*, with 12 or more barbs; *wilsoni*, with 9-11 barbs; *amazonica*, with 8 or less barbs.

Subías and Balogh (1989) considered shape of the sensillus and instituted the following subgenera: *Multioppia*, with fusiform, ciliate or pectinate sensillus; *Multilanceoppia*, with lanceolate, ciliate sensillus; *Furculoppia*, with pectinate sensillus and bifurcate branches. Vasiliu and Ivan (2009) considered the distribution of the anterior notogastral setae in relation to lyrifissure *im* and also the shape of the rostral setae and proposed two subgenera: *Multioppia*, with three normal setae in front of *im* and arched rostral setae; *Hammeroppia*, with four setae, in front of *im* and strongly elbowed rostral setae.

This genus can easily be distinguished from other genera of the subfamily Multioppiinae Balogh, 1983 by the presence of 12 pairs of notogastral setae (excluding one pair of alveoli of setae *c*), paraanal lyrifissure *iad*, shape of sensilli, not globular or radiate-ciliate, absence of notogastral heterotrichy and usually presence of three pairs of sigillae in interbothridial region (Balogh & Balogh, 1992; Ermilov & Pešić, 2011).

In the course of a faunistic survey of oribatid mites of Arak, Markazi province, three species belonging to the genus *Multioppia* were collected: *Multioppia (Hammeroppia) insulana* Pérez-Íñigo, 1982, *Multioppia (H.) wilsoni laniseta* Moritz, 1966 and a hitherto unknown species which is named as *Multioppia (Multioppia) biciliata* sp. n. The Iranian fauna of *Multioppia* has included four species: *Multioppia (M.) radiata* Hammer, 1961, *Multioppia (M.) stellifera* Hammer, 1961 (Haddad Irani-Nejad *et al.*, 2000); *Multioppia (M.) pakistanensis* Hammer, 1977 (Khanjani & Kamali, 2000); *Multioppia (H.) wilsoni wilsoni* Aoki, 1964 (Haddad Irani-Nejad *et al.*, 2003) and *Multioppia (H.) wilsoni laniseta* Moritz, 1966 (Akrami & Subías, 2007). *Multioppia (M.) biciliata* sp. n. is described in the present paper as new to science and *Multioppia (H.) insulana* recorded for the first time from Iran. An identification key to Iranian species of *Multioppia* is presented.

Correspondence: Mohammad Ali Akrami, Department of Plant Protection, College of Agriculture, Shiraz University, Shiraz, Iran.
E-mail: akrami@shirazu.ac.ir

Key words: Oribatida; Oppiidae; *Multioppia*; new species; Iran.

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Materials and methods

Arak, the capital of Markazi province, situated in central-western Iran and is surrounded by mountains in the south, west, and east. The city is located in adjacency two important cities: Qom and Isfahan. Its average altitude is 1750 m above sea level and is 260 km from the capital, Tehran. Arak has a continental climate that is, in general, relatively cold and dry. Its weather is warm and dry in summer, windy and cool in autumn, cold and snowy in winter, and mild in spring. The maximum temperature may raise up to 35°C in summer and may fall to below -25°C in winter. The average rainfall is around 350 mm per year and the annual relative humidity is 46%. This city is one of the main industrial cities of Iran, possessing many plants for heavy industries especially for the metal and machinery industries. The main agricultural products are grain, barley and fruits, which are grape, apple, walnut and almond.

During 2004-05, soil and litter samples were taken from the surface to a soil depth of 10 cm under different plants in Arak. Oribatid mites were extracted from soil samples in Berlese-Tullgren funnels set over jars of 75% ethanol. Mites were removed, cleared in lactophenol and mounted in Hoyer's medium on glass microscope slides. The slides were placed in an oven at 45°C for two weeks and then the specimens were examined using a light microscope (Zeiss Standard 20). Figures were made using a drawing tube attached to the microscope. All body measurements are presented in micrometers (μm). Body length was measured from the tip of the rostrum to the posterior edge of the notogaster, and body width refers to the maximum width of the notogaster in dorsal aspect.

Taxonomy

Family Oppiidae Sellnick, 1937

Genus *Multioppia* Hammer 1961

Type species. *Multioppia radiata* Hammer 1961

Multioppia (Multioppia) biciliata sp. n. (Figures 1 and 2)

MATERIAL EXAMINED. Holotype (male) and four paratypes (two females; two males) collected from soil of weeds and litter of various plants, Arak, City Park and Hosein Abad village (34°42' N, 49°29' E), Markazi province, central-western Iran, 1803 m above sea level, 12 November 2004 and 21 May 2005, legit S. R. Bastan. The holotype and paratypes are deposited in the Acarological Collection of the Department of Plant Protection, Shiraz University, Iran.

INTEGUMENT. Yellowish brown in colour. Body surface smooth, exobothridial region ornamented with minute granules.

MEASUREMENTS. Holotype: Body length 321, width of notogaster 137; paratypes (n=4): Body length 300-332, width of notogaster 125-142. Males and females similar in size.

PRODORSUM (Figure 1A and C). Rostrum rounded and entire; mid-dorsal surface of rostrum with a curved ridge extended to margins of rostrum; rostral setae (*ro*) inserted dorsally, situated close to each other, connected at their base by a fine chitinous line, proximally divergent, strongly elbowed at 2/3 along their length, and distally convergent, the proximal divergent part densely ciliate; a thin transverse ridge crosses the prodorsum behind the insertions of the rostral setae; lamellar setae (*le*) slightly shorter than rostral ones, directed anteromedially, bilaterally ciliate; interlamellar setae (*in*) little shorter than lamellar setae, directed upwards, bilaterally ciliate; exobothridial setae (*ex*) nearly as long as interlamellar setae, barbed unilaterally; middle part of prodorsum containing lamellar and interlamellar setae surrounded by an almost square frame of weak lamellar and interlamellar lines; sensilli (*ss*) with long, narrow and smooth stalk and head oblong, dilated unilaterally, bearing 15-16 long cilia on outer and about eight short cilia on inner edge; bothridia round, directed anterolaterad; three pairs of muscle sigillae situated between the interlamellar setae and some anterior to each bothridium.

NOTOGASTER (Figure 1A and B). Notogaster elongate oval and narrow, anteriorly rounded and narrowed posteriorly, dorsosejugal furrow convex; 12 pairs of notogastral setae moderately long, thick and bilaterally distinctly ciliate; setae *c* represented only by their alveoli; centrodorsal setae (*da*, *dm* and *lp*) slightly shorter than others; setae *la* and *lm* inserted more posterior to *da* and *dm* respectively; *dm* at level of lyrifissure *im*; *lm* posterolaterad of this lyrifissure; *lp* almost mid-distance between levels of *dm* and *dp*, slightly anterior to level of *h*₃; *dp* in line with *h*₂; *h*₁-*h*₂-*h*₃ aligned parallel to margin of notogaster; all lyrifissures (*ia*, *im*, *ip*, *ih*, *ips*) elongate, arranged typically for the genus. Opisthosomal gland opening (*gla*) located lateroposteriorly to lyrifissures *im*, far from to it.

VENTRAL REGION (Figure 1B, D, E). Gnathosoma normal for genus; hypostomal setae moderately long, ciliated unilaterally; epimeral region with a number of large and round muscle sigillae; apodemes *I*, *II*, *sj* and *IV* well developed; epimeral setal formula (I-IV) 3-1-3-3; epimeral setae mostly short, thin and bilaterally ciliate, *3c* and *4c* longest; genital plates with five pairs of smooth setae (three inserted on anterior half and two on posterior half of the plates), one pair of aggenital, two pairs of anal and three pairs of adanal setae; *ad*₁ situated in postanal and *ad*₃ in preanal position near *ag*; aggenital, anal and adanal setae bilaterally ciliate; anogenital region smooth with few small sigillae situated posterolaterad of each epimeral seta *4b*; space between anal and genital apertures three times as long as genital aperture; *iad* fissures paraanal, adjacent to anal plates in level of *ad*₂; discidia triangular, with pointed tip, distinctly curved posteriorly.

LEGS (Figure 2). Leg setation normal for the family. All legs with one smooth claw. All setae (except famulus) on podomeres ciliate. Formulae of leg setation including famulus (trochanter to tarsus): I (1-5-2-4-20) II (1-5-2-4-13) III (2-3-1-3-11) IV (1-2-2-3-10) and the formulae of solenidia: I (1-2-2) II (1-1-2) III (1-1-0) IV (0-1-0). On tarsus I solenidion ω_1 slightly shorter than ω_2 , ω_1 thickened, blunt-ended, ω_2 setiform; famulus ε short and slender, situated proximal to ω_1 ; tibia I with two setiform solenidia, φ_2 about half the length of φ_1 ; genu I with solenidion σ slightly longer than dorsolateral setae. On tarsus II solenidion ω_1 nearly as long as ω_2 , both shorter than most of tarsal setae, thickened and blunt-ended; φ and σ on tibia and genu II nearly as long as φ_1 and σ on leg I, respectively. Tibiae III and IV with short solenidia φ , conspicuously shorter than tibial dorsolateral setae. On leg III solenidion σ very short, about half length of dorsal seta.

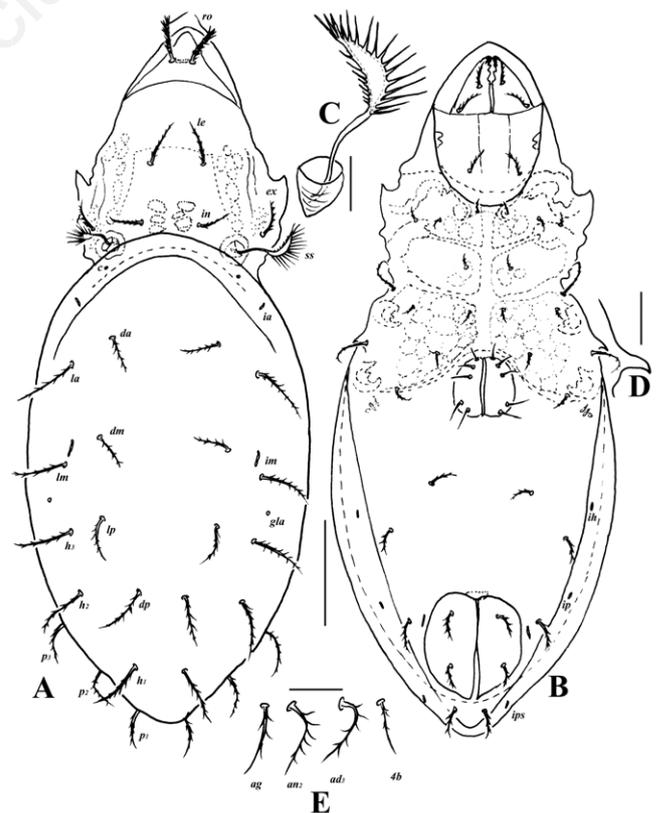


Figure 1. *Multioppia (Multioppia) biciliata* sp. n. (holotype). A) dorsal view; B) ventral view; C) sensillum and bothridium; D) discidium; E) aggenital (*ag*), anal (*an*₂), adanal (*ad*₃) and epimeral (*4b*) setae. Scale bar (A, B) 50 μm , scale bar (C, D, E) 10 μm .



Figure 2. *Multioppia (Multioppia) biciliata* sp. n. (holotype), chaetotaxy of legs I-IV. A) leg I, right; B) leg II, left; C) leg III, right; D) leg IV, right. Scale bar 25 μ m.

DIAGNOSIS. Body size 300-332×125-142; rostrum entire, not incised, rounded at tip; lamellar and translamellar lines weakly developed; rostral setae strongly elbowed; sensilli with long, narrow and smooth stalk and head oblong, dilated unilaterally, bilaterally ciliate with 15-16 long cilia on outer and 8 short cilia on inner edge; notogastral setae long, thick, bilaterally ciliate; all ventral setae other than genital setae ciliate.

ETYMOLOGY. The specific name *biciliata* refers to the shape of the notogastral setae, which are ciliated bilaterally.

REMARKS. *Multioppia (M.) biciliata* sp. n. is unique among the known species of *Multioppia* by the combination of the following features, namely the strongly elbowed rostral setae; bilateral ciliation of sensilli, lamellar, interlamellar, notogastral, and all ventral setae other than genital setae and also distribution of the anterior notogastral setae versus lyrifissures *im*.

Identification key to the Iranian species of *Multioppia* Hammer

1 Four setae (*la*, *da*, *lm* and *dm*) in front of lyrifissure *im*; notogastral setae *dm* situated at level of *lm*.....2

- Three setae (*la*, *da* and *dm*) in front of lyrifissure *im*; notogastral setae *dm* situated anteromedial of *lm*.....4
- 2 Notogastral setae unilaterally ciliate.....*Multioppia (Hammeroppia) wilsoni laniseta*
- Notogastral setae smooth or with minute cilia3
- 3 Notogastral setae smooth; lamellar setae equal in length to interlamellar setae *Multioppia (H.) wilsoni wilsoni*
- Notogastral setae with few minute cilia; lamellar setae shorter than interlamellar setae;.....*Multioppia (H.) insulana*
- 4 Notogastral setae bilaterally ciliate*Multioppia (Multioppia) biciliata* sp. n.
- Notogastral setae smooth5
- 5 Notogastral seta *la* situated at level of *dm*; *dm* situated closer to *da* than to *dp*.....*Multioppia (M.) stellifera*
- Notogastral seta *la* situated equidistant between *da* and *dm*; *dm* situated mid-distant between *da* and *dp*6
- 6 Sensillar head with 11 cilia; the second transverse row of interbothridial muscle sigilla with three sigilla*Multioppia (M.) pakistanensis*
- Sensillar head with 16-17 cilia; the second transverse row of interbothridial muscle sigilla with two sigilla*Multioppia (M.) radiata*

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