SOME BIOLOGICAL AND ECOLOGICAL REMARKS ON *TRICHOUROPODA ORBICULARIS*, A PEST OF HARVESTED MAIZE GRAINS AND A LARVIPAROUS UROPODID MITE (ACARI: MESOSTIGMATA: UROPODINA)

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ABSTRACT: Morphological features and geographic distribution of *Trichouropoda orbicularis* are given and larva, deutonymph and adults of the species are described with original figures. Larviparity is reported for the species first time. Larva is extracted by microoperation from the body of female and then studied. It is emphasized that the species is a stored food mite and contaminate harvested maize grains.

KEY WORDS: Acari, Uropodina, *Trichouropoda orbicularis*, larviparity, Turkey

Hirschmann and Wiśniewski (1986, 1987, 1988, 1989, 1993) extensively studied the cosmopolitan genus *Trichouropoda*, which is includes 394 species (Wiśniewski, 1998).

Some uropodid specimens from corn threshing were collected in the Artvin, Rize and Trabzon provinces in Turkey. Among these materials, *Trichoropoda orbicularis* was new for the Turkish acarofauna (Özkan et al., 1988; 1994). Examinig the species, it was realized that females were apparently larviparous and containing about 2 small larvae in the body cavity. Here, the larva, deutonymph and adults of the species were described, based on our specimens, and presented additional morphological data for comparison with other populations.

MATERIALS AND METHOD

Samples were collected using standard methods for acarological studies. Specimen collection, extraction, preservation and preparation for examination were discussed by Bal (2005), and Bal & Özkan (2006). All measurements are in μm. Specimens are mounted in Hoyer's medium and examined with a Nikon E-600 compound microscope equipped with differential interference contrast and phase contrast systems.

The speciemens were deposited in Bal's mite collection, Erzincan Education Faculty, Erzincan, Turkey.

Systematics

Trichouropoda orbicularis (C. L. KOCH, 1839) - sensu HIRSCHMANN and WIŚNIEWSKI, 1988

Synonyms:
Notaspis orbicularis C.L. KOCH, 1839
Uropoda krameri G. Canestrini, 1882
Urodinychus krameri Trägardh, 1912
Urodinychus (Leiodinychus) krameri (G. Canestrini, 1882) – sensu Berlese, 1917
Leiodinychus orbicularis (C. L. Koch, 1882) – sensu Błoszyk, 1984

Female

Idiosoma oval, 720 long, 580 wide, slightly narrowed at the front end, well chitinized and brown. Dorsal plate intact, and surrounded an entire marginal plate, both plates with web-like patterns, and all dorsal-shields setae short, thorn-like, not reaching insertion of following setae (Figure 1A).

Epigynial shield 275 long and 180 wide, helmet-like, anterior prolongation spear-like, the shield begins behind coxae IV and ends in the space coxa I. Surface of the epigynial shield with a web-like pattern, and its inner surface denticled superficially at anterior half. Anterior prolongation of the peritremes starts at the level of coxae II, twisted between coxae II-III, its anterior prolongation hook-like and directed inner ward, and the stigmatal openings end with a very short prolongation. Surface of the sternal plate bears a web-like pattern and five pairs of short setae (*st1, st2, st3, st4, st5*). Ventral plates and all pedofossae with web-like ornamentation (Figures 1B, 2I). Pedofossal groove distinct and well developed. Anal opening 40 long and 27.7 wide. All ventral setae short and thorn-like, about 13 long. Postanal seta present and resembling the other ventral setae. Distance between coxae II, III and IV: 115, 165, 212 respectively (Figures 1B, 4).

Chelicerae with nodus, multidentate, the movable digit 30 μm, middle part 120 μm (Figure 2A). Setae *h1* thorn-like, almost reaching the end of the lacinae; setae *h2, h3* and *h4* branched. Corniculus three-pronged, with blunt ends. Hypostomal constrictions between *h3-h4* (Figures 2B, C, D); Epistome with a pyramid-like base, with gradually shortented denticles, the anterior part long, without denticles and dager-like (Figure 2 H). Tritosternum cup-shaped basally, bearing a denticle medio-laterally, and lacina with denticles laterally and splitted two feathered ends (Figures 2 E-F). Palps as in Figure 2 J.

Coxa I large, tarsi on all legs bear a pairs of digits at tip of ambulacral prolongation; setae on legs thorn-like, but some branched. All femora bear a membranous chitin flap (Figures 3 A-D).

Male

Idiosoma 720-740 long, 570-600 wide; epigynial shield horseshoe-shaped and placed between coxae II-III, surrounded by an arch posteriorly; opercular opening 62,5 long and 52,5 wide. Sternal plate large and with five pairs of setae (*st1, st2, st3, st4, st5*), thorn-like and straight; sternal setae in line, but *st5* and *st5'* close to each other. All ventral plates with a web-like pattern, including surface of genital cover. Sternal patterns horizontal. Sexual dimorphisme occurs hypostomal setae; *h2* short and knife-like, *h3* smooth and fairly long, *h1* smooth, and *h4* pilose (Figure 3B). Other morphological features, setal arrangement, body shape and patterns as in females (Figure 5).

Deutonymph

Idiosoma 560-580 long, 450-490 wide. Hypostomal setae *h2-h4* branched and pilose. All idiosomal plates with web-like pattern (Figure 6); all dorsal and ventral setae thorn-like (Figures 6A, B); sternal plate anvil-like, and bearing five pairs of setae (*st1, st2, st3, st4, st5*). Ventrianal plate setae *V2, V3, V4, V6* and *V8* occurs on the plate, but *V7 - V7'* arise out of soft leathery integument of sternal and anal plates. Anal plate boat in shape and postanal seta present. Distance between coxae II, III and IV: 97, 150, 195, respectively. Coxa I large, placed close to each other; pedofossae distinct, well developed. Anterior peritreme prolongation twisted, long, its posterior part straight and short (Figure 6B).

Larva

Idiosoma 390 long, 285 wide; podonotal plate lancet-like; pygidial shield half moon-like; peripheral platelets of the podonotal plate larger than central ones; margins of platelets indented or smooth; leathered area ornamented with bead-like small tubercles. Podonotal plate with five pairs of setae (*i2, i3, i4, i5, z2*), and five pairs of setae (*i1, s2, z1, s5, s7*) also occur laterally on anterior half of the body. Setae *i1, s2, z1, s5* branched and pilose, however all the other posterior setae not branched, short, smooth and thorn-like. One pair of setae (*I2*) arises on leathered area between posterior and pygidial plates; setae *S2, S3, S4, S5, I3, I4, I5* and *Z4* laterally from posterior leathered area (Figure 7A).

Sternal plate in two parts, setae *v1* located on the anterior ventral platelet. Posterior sternal plate rectangular, with setae *v2* and *v3*; a pair of inguinalia situated behind coxae III; setae *V2* and *V6* arise from ventral leathered area; setae *S2, S3, S4, Z3, S5, I5* arise from leathered area laterally; setae *V4, V6* and postanal seta (*U*) thorn like and not branched. Peritremae not clear. Surface of ventral plate ornamented with bead-like small tubercles (Figure 7A).

Examined Materials and localities

Artvin province: (41° 166′ N, 41° 833′ E), 9.IX.1993, 3 ♀ 2 ♂, 1 DN., each female bearing two larvae or two eggs; from corn, *Zea mays,* threshing.
Rize province: (41° 005′ N, 40° 527′ E), 19.V.2005, 1 ♀♀, female bearing two larvae, 1 ♂♂, from corn, *Zea mays,* threshing.
Trabzon province: (40° 957′ N, 39° 906′ E), 9.V.2003, 5 ♀♀, 3 ♂♂, 2 DN.; each female bearing two larvae or two eggs; *Zea mays*.
Samples were some wet.
Altitude: 100-300 m. a.s.l.

Distribution: *Trichouropoda orbicularis* is distributed in *Palearctic region* (Belgium, Germany, France, Great Britain, Iceland, Netherlands, Austria, Poland, Romania, Czech Republic, Slowakia, Ukraina, Hungaria, Algeria, Italy, Spain), *Oriental region* (India) and *Ethiopian region* (Congo) (Hirschmann and Wiśniewski, 1993).

The species is new for the Turkish fauna.

Remarks

T. orbicularis is collected from the provinces of Artvin, Rize and Trabzon on the coast of the eastern Black Sea Region, Turkey. Annual average temperature of this region ranges between 13-15˚C. With the oreographic precipitation caused by air masses from the north and northwest, the region shows the features of ocean-climate due to East Black Sea Mountains range up to 3000 meters high. This region is the wettest region in Turkey, and annual average precipitation varies from 1500 to 2500 mm. The general composition of the forests is made up of *Fagus orientalis, Carpinus orientalis, Prunus laurocerasus, Rhododendron caucasucus, R. ponticus, Tilia rubra, Castanea sativa, Acer platanoides, Ulmus campestris, Ulmus montana, Quercus petraea, Lonicera caucasica, Vibirnum lantana, Buxus sempervirens, Taxus baccata, Sorbus torminalis, Ribes beibersteinii, Euonymus europaeus, Ostrya carpinofolia, Corylus avellana*, *Rubus* sp. and some ferns. Cultural plants such as cor, tea, hazelnut grow in the fields at the height of 1500 meters on this coastal zone. The flora in the form of scrub and arboreal is dominant under the high level damp climatic conditions. The forests of spruce trees exist only in this region of Turkey. The region has alkali soil characteristics, while dark brown forest soil has appeared (Atalay and Mortan, 2003).

Larviparity is an interesting phenomenon in Uropodid mites. Four larviparous mites are reported from Uropodina, so far. *Trichouropoda orbicularis* is the fifth report for larviparity, no other record has been recorded for Uropodid mites. Two species of *Trichouropoda* (*T. obscura*, *T. ovalis*) were reported as larviparous by Kielczewski and Wiśniewski in (1977). Zugalev collected one *Macrodinychus* female

containing about 30 larvae in her body cavity, on May 1965. Bregetova first reported that females of mites of the genus *Macrodinychus* are apparently larviparous, at Acarological Congrees in Saalfaden in 1974 (Kielczewski and Wiśnewski, 1977). Recently, some larviparous or viviparous *Macrodinychus bregetovae* specimens have been collected from Turkey by Bal (2005). A *Macrodinychus* species, *Macrodinychus* (*M.*) *paraguayensis* Hirschmann 1975, collected by Balogh, was larviparous. Also, females of this species were containing about 30 small larvae in the body cavity.

Turkish specimens agree with other given Paleartic specimens, but deutonymphs are predominant, and a ventrianal setae is present additionally. Females of Turkish specimens are larviparous and contain two larvae in their body cavites (Fig. 4).

Bloszyk (1999) noted that *T. orbicularis* prefer unstable microhabitats (especially nests of birds), and Slovak specimens especially collected from nests of birds (personal communication with Dr. Mašán). Bloszyk (1999) says it would probably be phoretic species. It is possible that the species eat waste material of birds there.
As a final note for the species, each female bears two larvae or eggs; egg 275 long and 175 wide, and the size of the larva appropriate for birth. Pregnant females indicate that Larvae are give birth in the months December and January.

Abbreviations

bp: base part; *h1-h4*: hypostomal setae; Co: corniculus; DN.: deutonymph; fd: fixed digit; md: chelicer movable digit; mp: chelicer middle part; i-I: dorsocentral setae series; la: lacina; no: nodus; Pe: Peritrema; PN.: protonymph; r-R: marginal setae series; s-S lateral setae series; U: posterioanal seta; v-V: ventral setae series; z-Z: mediolateral setae series.

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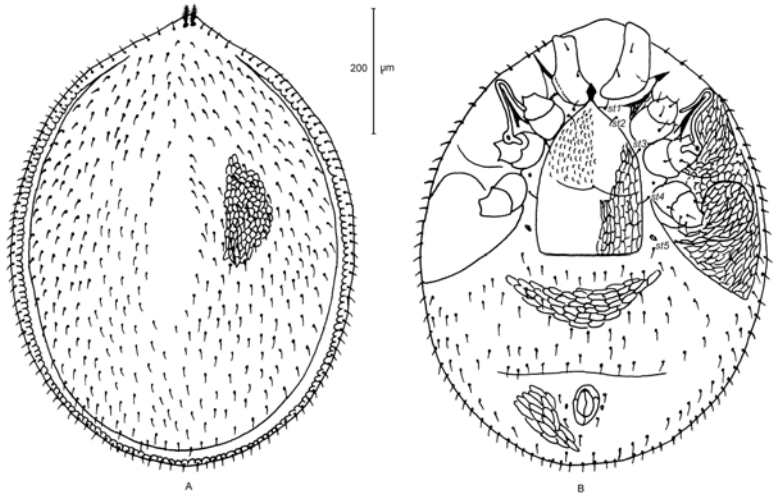

Figure 1. A) *Trichouropoda orbicularis*: Dorsal view of female; B) Ventral view of female.

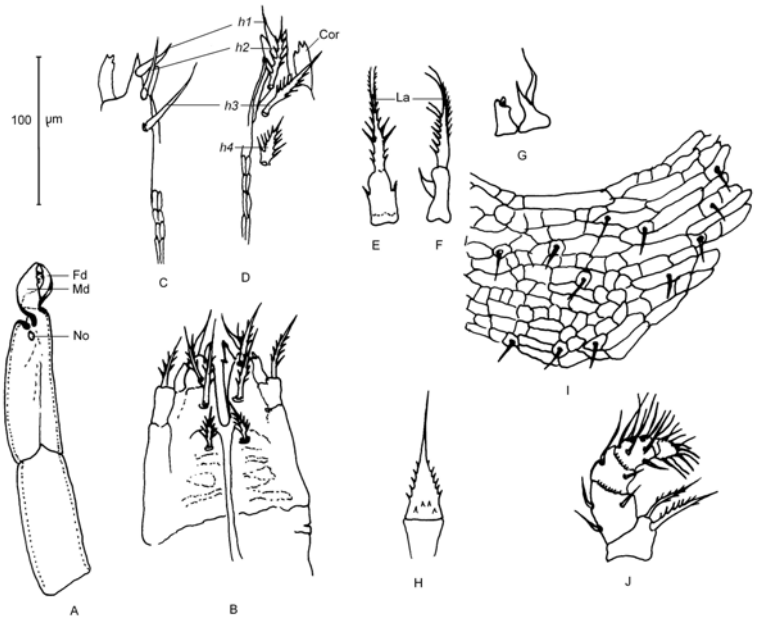

Figure 2. *Trichouropoda orbicularis*: female; A) Chelicera, B) Ventral view of gnathosoma, C) Lateral view of gnathosoma of male, D) Lateral view gnathosoma of female, E) Ventral view of tritosternum, F) Lateral view of tritosternum, G) Lateral view of *h1* and corniculus, H) Epistome of female, I) Ornementation of ventrianal plate and ventral setae, J) Palp of female.

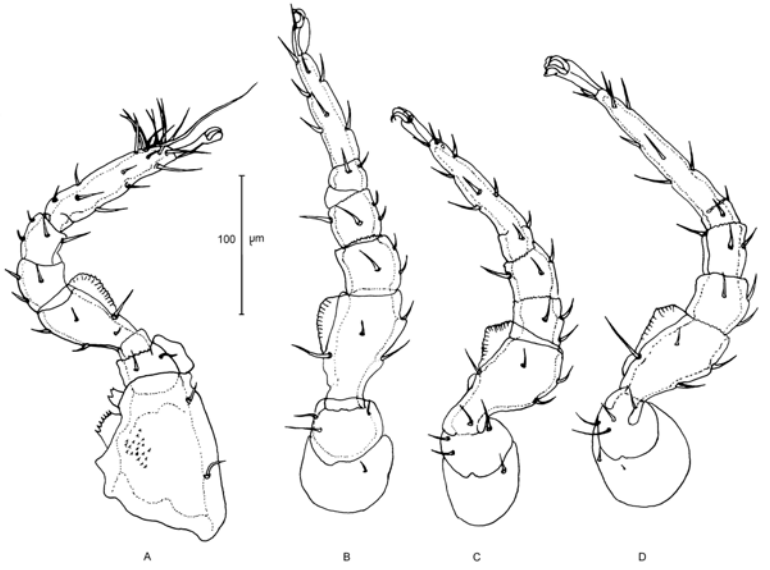

Figure 3. *Trichouropoda orbicularis*: male; A) Leg I, B) Leg II, C) Leg II, D) Leg IV

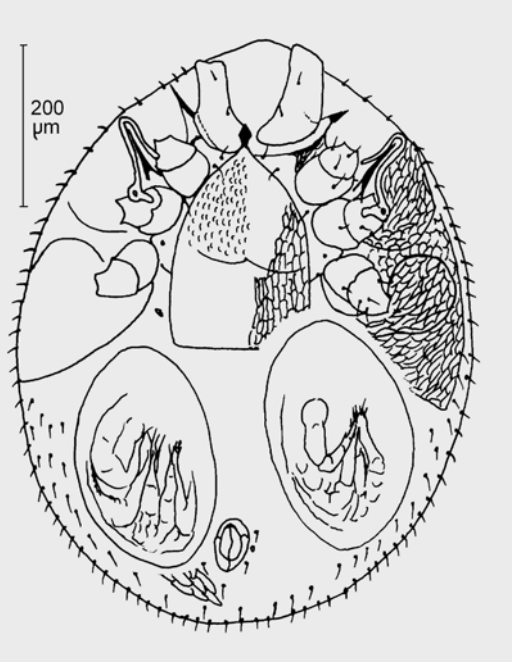

Figure 4. *Trichouropoda orbicularis*: Ventral view of female and larviparous larvae.

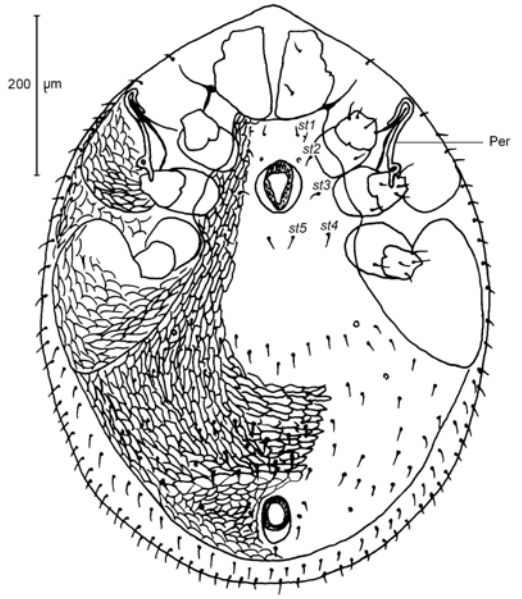

Figure 5. *Trichouropoda orbicularis*: Ventral view of male.

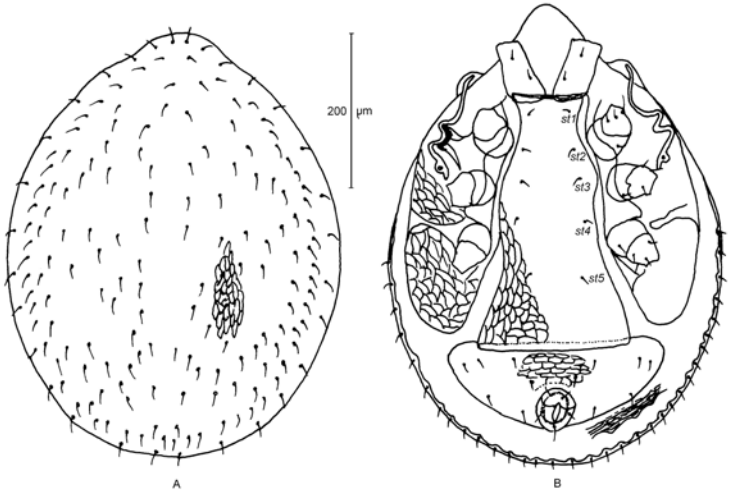

Figure 6. A) *Trichouropoda orbicularis*: A) Dorsal view of deutonymphe, B) Ventral view of deutonymphe.

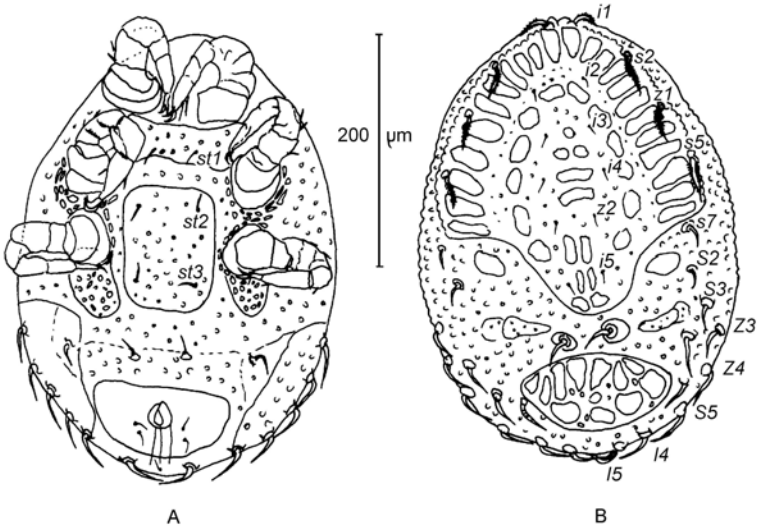

Figure 7. *Trichouropoda orbicularis*: A) Ventral view of larva, B) Dorsal view of larva.