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Article

Redescription of six species of the genus *Typhlodromus* Scheuten (Acari: Phytoseiidae: Typhlodrominae) recorded from some regions of Western and North–Western Iran

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Abstract

Collects of Phytoseiidae species of the genus *Typhlodromus* Scheuten have been carried out in some regions of Western and North–Western Iran from 2008–2011. This paper presents the redescription of six species belonging to two subgenera *Typhlodromus* (*Anthoseius*) De Leon and *Typhlodromus* (*Typhlodromus*) Scheuten (each with three species, respectively): *T.* (*A.*) *bagdasarjani* Wainstein & Arutunjan, *T.* (*A.*) *kerkirae* Swirski & Ragusa, *T.* (*A.*) *khosrovensis* Arutunjan, *T.* (*T.*) *phialatus* Athias–Henriot, *T.* (*T.*) *leptodactylus* Wainstein and *T.* (*T.*) *tubifer* Wainstein. It is the first record of *T.* (*T.*) *phialatus* Athias–Henriot for the Iranian phytoseiid fauna. This paper also provides an identification key of the species of the genus *Typhlodromus* in Iran.

Key words: predatory mite, *Anthoseius*, *Typhlodromus,* new record, Iran.

Introduction

The genus *Typhlodromus* Scheuten is characterized by the number of setae on the lateral margins of podoscutum (presence of the setae *z3*, *s6*, absence of *Z1*) (Chant 1985). This genus, with approximately 400 valid species is a phytoseiid genus including the highest number of species (Tixier *et al.* 2010; Denmark & Evans 2011; Hernandes *et al.* 2011). About 25 valid species were recorded from Iran and some of them are commonly found (Daneshvar & Denmark 1982; Faraji *et al.* 2007, 2012; Ueckermann *et al.* 2009; Jafari *et al.* 2011; Asali Fayaz *et al.* 2012). Several studies have dealt with this genus: Chant and Yoshida-Shaul (1987), Tixier *et al.* (2010), Denmark (1992), Hernandes *et al.* (2011), Uekermann *et al.* (2008), Uekermann & Loots (1988). In the present study six phytoseiid species, *T.* (*A.*) *bagdasarjani* Wainstein & Arutunjan, 1967, *T.* (*A.*) *kerkirae* Swirski & Ragusa, 1976, *T.* (*A.*) *khosrovensis* Arutunjan, 1971, *T.* (*T.*) *phialatus* Athias–Henriot, 1960, *T.* (*T.*) *leptodactylus* Wainstein, 1961, *T.* (*T.*) *tubifer* Wainstein, 1961, collected from aerial parts of plants especially trees, are redescribed. Some points

of morphological variation in the redescriptions herein provided could be helpful for improving identification and assessing intraspecific variations.

Material and Methods

The specimens were collected from aerial plant parts (beating method), in three provinces (Ardabil, Hamedan and Kurdistan) which are located in Western and North–Western Iran. The mites were directly mounted on slides in Hoyer's medium (Walter & Krantz 2009) under a stereomicroscope. All Phytoseiidae specimens were examined under an Olympus BX51 microscope (Differential Interference Contrast). A camera lucida apparatus attached to the microscope was used for detailed illustrations. Measurements are provided to allow comparisons with specimens of the same species from other parts of the world (based on literature and not on the observations of type material); they are presented in micrometers (μm). The number of teeth of each cheliceral digit does not include the apical tooth. The classification system used follows that of Chant and McMurtry (2007). Setal nomenclature and idiosomal setal pattern used are those of Lindquist and Evans (1965), as adapted by Rowell *et al*. (1978) and Chant and McMurtry (1994), respectively. Organotaxy follows the nomenclature proposed by Athias–Henriot (1975). All specimens were collected by B. Asali Fayaz; they have been deposited in the Collection of the Acarology Laboratory, University of Bu–Ali Sina (CALBS), Hamedan, Iran.

Results

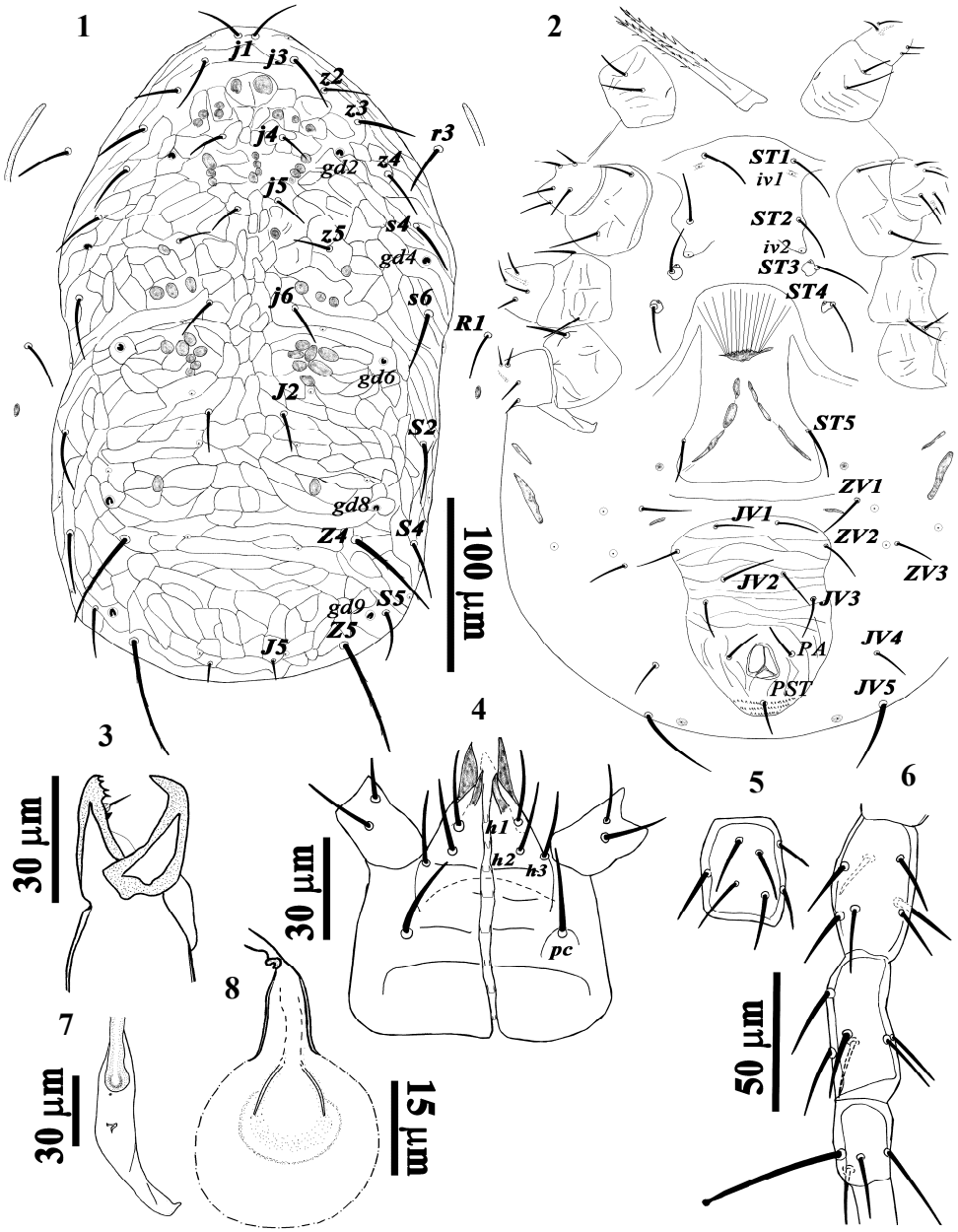
Subfamily Typhlodrominae Scheuten, 1857; Chant & McMurtry, 1994
Tribe Typhlodromini Wainstein, 1962
Genus *Typhlodromus* Scheuten, 1857
Subgenus *Anthoseius* De Leon, 1959

Typhlodromus (*Anthoseius*) *bagdasarjani* Wainstein & Arutunjan, 1967

Female (Figs. 1–8) (n= 38) (10 specimens measured). Idiosoma oval, length of body (excluding palp) 386 (360–405); (including palp) 586 (540–620), idiosomal setal pattern: 12A:8A/JV: ZV.

Dorsum (Fig. 1): Dorsal shield reticulated, 343 (320–360) long, 180 (170–189) wide at level of setae *s4*, with 18 pairs of smooth setae (except *Z4* and *Z5* serrated) and 10 pairs of lyrifissures and five pairs of gland pores (*gd2*, *gd4*, *gd6*, *gd8*, *gd9*). Length of dorsal setae as follows: *j1* 25 (22–28), *j3* 32 (30–35), *j4* 20 (18–25), *j5* 19 (18–22), *j6* 23 (20–25), *J2* 26(23–30), *J5* 10 (10–12), *z2* 22 (20–25), *z3* 27 (25–30), *z4* 29 (27–30), *z5* 19 (17–21), *Z4* 53 (50–55), *Z5* 66 (60–70), *s4* 32(29–35), *s6* 35 (33–37), *S2* 39 (34–38), *S4* 36 (30–40), *S5* 28 (25–33), *r3* 29 (25–32), *R1* 28 (24–31).

Gnathosoma (Figs. 3–4): Three pairs of smooth hypostomal setae, *h1* 24 (21–28), *h2* 22 (20–25) and *h3* 21 (15–25) long and palp coxa with a pair of smooth setae, *pc* 27(25–30). Hypostomal groove with eight rows of denticles, each with two denticles, corniculi distally pointed (Fig. 4); tectum convex 30 (26–33) wide (Fig. 4); fixed digit of chelicera 28 (25–30) long, with four teeth plus pilus dentilis 6 (5–6) long, movable digit 25 (22–26) long and toothless (Fig. 3).



Figures 1–8. *Typhlodromus* (*Anthoseius*) *bagdasarjani* (female). 1. Dorsal view of idiosoma; 2. Ventral view of idiosoma; 3. Chelicera; 4. Hypostome; 5. Genu II; 6. Genu–basitarsus IV; 7. Peritreme; 8. Spermatheca.

Venter (Fig. 2): Tritosternum 88 (80–93) long, with two barbed laciniae; venter of idiosoma with nine pairs of opisthogastric setae. Sternal shield smooth, posterior margin concave and with two pairs of setae of similar lengths [*St1* 31 (27–35), *St2* 31 (28–32) and two pairs of lyrifissures (*iv1–2*); setae *St3* 30 (30–31) and *St4* 30 (27–35) set on small metasternal shields, each with one small lyrifissure. Genital shield 117 (110–130) long, 75 (70–80) wide at level of base and with a pair of setae, *St5* 30 (27–35) long. Two pairs of elongate metapodal shields, primary shield almost twice as long as secondary shield [31 (30–34), 15 (13–17)]. Ventrianal shield reticulated, 114 (110–130) long and 75 (70–80) at level of setae *ZV2*, four pairs of pre–anal setae *JV1* 22 (20–25), *ZV2* 23 (20–26), *JV2* 23 (20–25), *JV3* 23 (20–27) long and without preanal pore; para–

anal setae *PA* 18 (15–20) and postanal seta *PST* 19 (17–20) long. Opisthogasteric cuticle bearing four pairs of setae on cuticle *ZV1* 24 (20–27), *ZV3* 23 (20–27), *JV4* 22 (20–25) and *JV5* 57 (55–60) long, all smooth; four pairs of lyrifissures and a pair of platelets and a slender transverse platelet between genital and ventrianal shields (Fig. 2).

Spermatheca (Fig. 8): Calyx fundibular, 15 (11–21) long and 11 (9–15) wide at junction with vesicle.

Peritreme (Figs. 1 & 7): Stippled, extending to level of setae *z3*, 101 (90–115) long.

Legs (Figs. 5–6): Length of legs (including pretarsus) as follows: Leg I 300 (280–320), leg II 252 (230–270), leg III 255 (240–267) and leg IV 333 (310–360). Basitarsus IV with a knobbed macroseta (St) 47 (42–50) (Fig. 6). Genua I-IV with 10-7-7-7 setae (Figs. 5–6).

Specimens examined: Faculty of Agriculture (Hamedan): (34° 48' N, 48° 29' E, 1810 m a.s.l.), 25 x 2008 and 10 xi 2009, 2 (♀♀), aerial part of Cypress tree, *Cupressus sempervirens* L. (Cupressaceae), infested by *Cenopalpus pulcher* (Canestrini & Fanzago, 1876) (Tenuipalpidae) and 10 xi &14 x 2009, 3 (♀♀), aerial part of Plane tree, *Platanus orientalis* L. (Platanaceae) and 24 ix 2009, 1 (♀), aerial part of apple, *Malus domestica* Moller (Rosaceae), infested by *Bryobia rubrioculus* (Scheuten) (Tetranychidae); Heydareh village, vicinity of Hamedan (34° 48' N, 48° 28' E, 1830 m a.s.l.), 09 ix 2009, 1 (♀), aerial part of apple; Ghorveh Dar Jazin region of Razan vicinity of Hamedan province (35° 21' N, 49° 06' E, 1810 m a.s.l.), 20–23 x 2009, 2 (♀♀), aerial part of grape Shahani cultivar, *Vitis vinifera* L. (Vitaceae); 6 (♀♀), aerial part of grape Askari cultivar; 1 (♀), aerial part of grape Fakhri cultivar; 3 (♀♀), aerial part of grape Ghaznei cultivar; 23 x 2009, 1 (♀), aerial part of apple; Malham Abad village from Asad Abad vicinity (34° 49' N, 48° 08' E, 1822 m a.s.l.), 19 iii 2011, 3 (♀♀), aerial part of plum, *Prunus cerasifera* Ehrh. (Rosaceae), infested by scale, *Tecaspis asiatica* Balachowsky (Diaspididae).

Sanandaj vicinity in Kurdistan province (35° 05' N, 46° 55' E, 1322 m a.s.l.), 09 x 2009, 2 (♀♀), aerial part of apple, 1 (♀), aerial part of sour cherry, *Prunus cerasus* L. (Rosaceae), 1 (♀), aerial part of eggplant, *Solanum melongena* L. (Solanaceae), 1 (♀), aerial part of Peach tree, *Prunus persica* (L.) Batsch (Rosaceae); 14 xi 2009, 3 (♀♀), aerial part of apple; Chenu region from Sanandaj vicinity (35° 08' N, 46° 57' E, 1328 m a.s.l.), 18 x 2009, 1 (♀), aerial part of Sweet cherry tree, *Prunus avium* L. (Rosaceae); 09 xi 2009, 2 (♀♀), aerial part of apple.

Remarks

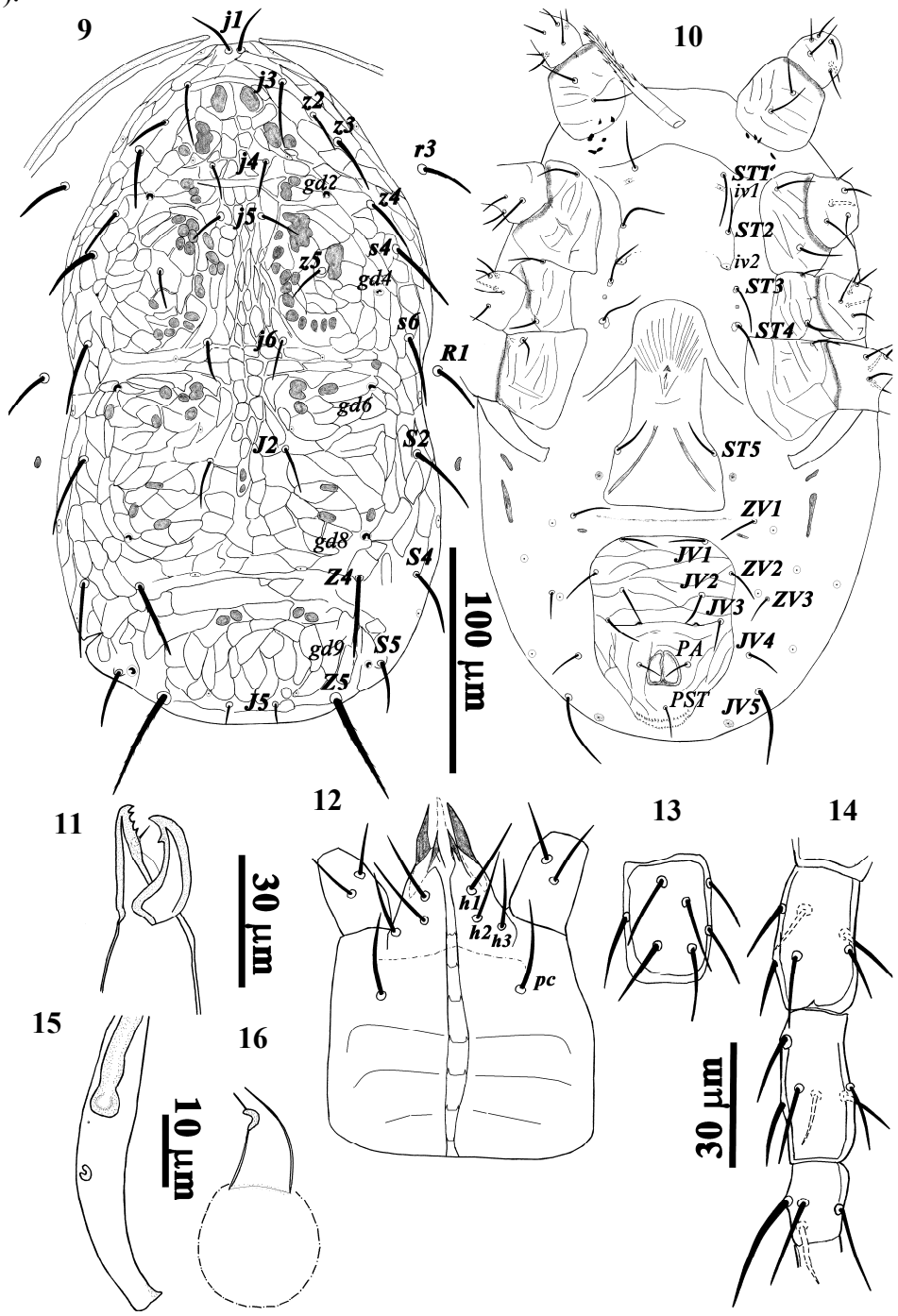
Dorsal idiosoma characteristics of the Iranian specimens are similar to those in the redescription of Denmark and Welbourn (2002). The measurements of the specimens herein collected are very similar to those of the original description of Wainstein and Arutunjan (1967) from Armenia except for leg measurements: leg I 235, leg II 195, leg III 195 and leg IV 270. Furthermore the specimens herein described differ from specimens collected by Daneshvar and Denmark (1982) as follows: apex of peritreme extending to between level of setae *z3–z4*; fixed digit with two teeth.

This species was commonly found in the regions considered.

Typhlodromus (*Anthoseius*) *kerkirae* Swirski & Ragusa, 1976

Female (Figs. 9–16) (n= 3): Idiosoma oval, length of body (excluding palp) 370 (350–390), (including palp) 539 (528–550); all idiosomal and leg setae smooth except *Z4* and *Z5*; idiosomal setal pattern: 12A:8A/JV: ZV.

Dorsum (Fig. 9): Dorsal shield reticulated, 308 (305–310) long, 176(173–179) wide at level of setae *s4*, with 18 pairs of smooth setae except *Z4* and *Z5* and five pairs of gland pores (*gd2*, *gd4*, *gd6*, *gd8*, *gd9*) (Fig. 9). Length of dorsal setae as follows: *j1* 22 (20–24), *j3* 28 (27–28), *j4* 16, *j5* 17 (16–17), *j6* 20 (19–21), *J2* 22, *J5* 8 (7–9), *z2* 20 (18–22), *z3* 27 (26–27), *z4* 24 (22–26), *z5* 18(17–18), *Z4* 35 (34–35), *Z5* 51 (47–55), *s4* 31 (30–31), *s6* 31, *S2* 34 (32–36), *S4* 29 (27–31), *S5* 23 (22–24), *r3* 25 (23–27), *R1* 24 (22–25).



Figures 9–16. *Typhlodromus* (*Anthoseius*) *kerkirae* (female). 9. Dorsal view of idiosoma; 10. Ventral view of idiosoma; 11. Chelicera; 12. Hypostome; 13. Genu II; 14. Genu–basitarsus IV; 15. Peritreme; 16. Spermatheca.

Gnathosoma (Figs. 11–12): Three pairs of smooth hypostomal setae, *h1* 20, *h2* 20 and *h3* 20 long and palp coxa with a pair of smooth setae, *pc* 23 (22–23). Hypostomal groove with seven rows of denticles, each with two denticles, corniculi distally pointed (Fig. 12); tectum convex 35(34–35) wide; fixed digit of chelicera 29 (28–30) long, with three teeth plus pilus dentilis, 6 long, movable digit 26 (25–27) long and with one tooth (Fig. 11).

Venter (Fig. 10): Tritosternum 79 (76–82) long, with two barbed laciniae, venter of idiosoma with nine pairs of opisthogastric setae. Sternal shield smooth and with two pairs of setae of similar lengths [*St1* 27 (26–28), *St2* 25] and two pairs of lyrifissures (*iv1–2*); setae *St3* 26 and *St4* 27 (25–28) set on small metasternal shields and one small lyrifissure between them. Genital shield 113 (110–115) long, 64 (61–66) wide at level of base and with a pair of setae, *St5* 25 long.

Two pairs of elongate metapodal shields, primary shield almost twice as long as secondary shield [27 (26–27), 12 (11–12)]. Ventrianal shield reticulated, 106 (102–110) long and 80 at level of setae *ZV2*, four pairs of pre–anal setae *JV1* 19 (18–20), *ZV2* 21 (19–22), *JV2* 20, *JV3* 21 (19–22) long and with a pair of preanal pores; para–anal setae *PA* 14 (13–14) and postanal seta *PST* 18 (17–18) long. Opisthogasteric cuticle bearing four pairs of setae on cuticle *ZV1* 20 (18–22), *ZV3* 14 (13–14), *JV4* 19 (17–20) and *JV5* 41 (39–42) long, all smooth; five pairs of lyrifissures and a pair of platelets and one slender transverse platelets between genital and ventrianal shields (Fig. 10).

Spermatheca (Fig. 16). Calyx bell–shaped, 9 (8–10) long and 8 wide at junction with vesicle, atrium C form.

Peritreme (Figs. 9 & 15): Stippled, extending to level of seta *j1*, 184 (183–185) long.

Legs (Figs. 13–14): Length of legs (including pretarsus) as follows: leg I 282 (275–288), leg II 230 (223–238), leg III 222 (218–225) and leg IV 292 (283–300). Basitarsus IV with pointed macrosetae (St) 29 (27-31); Genua I-IV with 10-7-7-7 setae.

Specimens examined: Heyran region in Ardabil province (38° 26' N, 48° 35' E, 1474 m a.s.l.), 28 ix 2008, 3 (♀♀), aerial part of Lady Fern bushes, *Athyrium filix-femina* (L.) & Roth (Dryopteridaceae).

Remarks

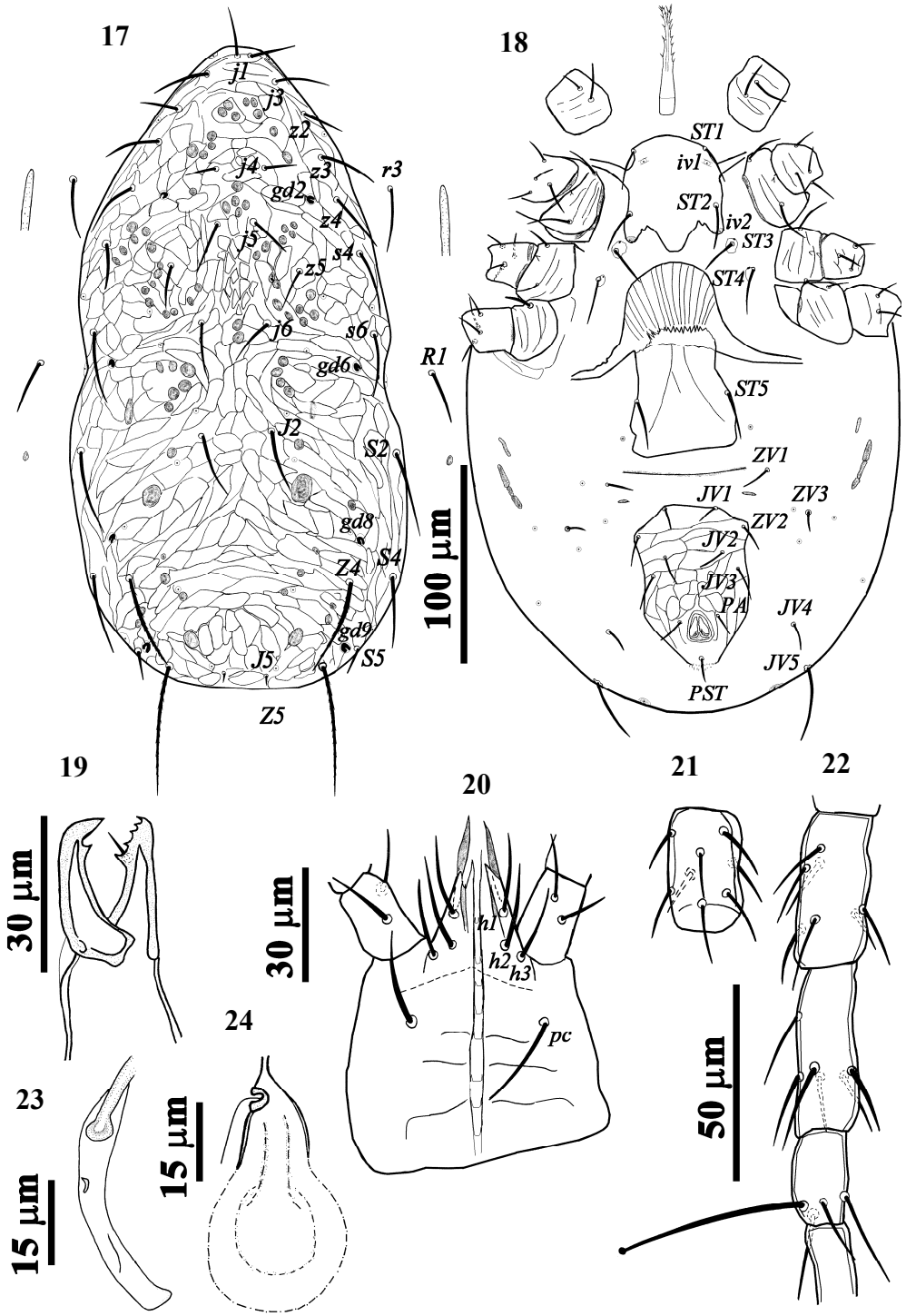
The collected specimens are similar to those considered in the original description of Swirski and Ragusa (1976) from Greece even if some differences are observed: sclerotized V–shaped plate not visible posteriorly to the sternal shield on the presently observed specimens, ratio of L/W of ventrianal shield 1.375 vs. 1.17–1.24, a pair of platelet near seta *ZV1* vs. two pairs.

Furthermore, this redescription is also very similar to the redescription of Papadoulis *et al.* (2009) but it differs by: absence of slender transverse platelet between genital and ventrianal shields, presence of a pair of platelets near seta *ZV1* but absent on Greek specimens, fixed digit with three instead of four teeth.

This species was rarely observed in the present study.

***Typhlodromus* (*Anthoseius*) *khosrovensis* Arutunjan, 1971**

Female (Figs. 17–24) (n= 17) (10 specimens measured). Idiosoma oval, length of body (excluding palp) 405 (395–415), (including palp) 603 (580–625), idiosomal setal pattern: 12A:8A/JV: ZV.



Figures 17–24. *Typhlodromus* (*Anthoseius*) *khosrovensis* (female). 17. Dorsal view of idiosoma; 18. Ventral view of idiosoma; 19. Chelicera; 20. Hypostome; 21. Genu II; 22. Genu–basitarsus IV; 23. Peritreme; 24. Spermatheca.

Dorsum (Fig. 17): Dorsal shield reticulated, 325 (320–330) long, 172 (164–180) wide at level of seta *s4*, with 18 pairs of smooth setae (except *Z4–5* serrated) and 12 pairs of lyrifissures and four pairs of gland pores (*gd2*, *gd6*, *gd8*, *gd9*). Length of dorsal setae as follows: *j1* 21 (20–21), *j3* 32 (31–32), *j4* 20 (18–21), *j5* 21 (20–22), *j6* 26 (24–27), *J2* 28 (27–29), *J5* 4 (4), *z2* 23 (23), *z3* 30 (29–30), *z4* 30 (28–31), *z5* 20 (20), *Z4* 46

(45–47), *Z5* 60, *s4* 35 (33–36), *s6* 37 (36–37), *S2* 39 (38–40), *S4* 35 (34–35), *S5* 14, *r3* 28 (27–28), *R1* 27 (26–28).

Gnathosoma (Figs. 19–20): Three pairs of smooth hypostomal setae, *h1* 21(20–21), *h2* 21 (20–21) and *h3* 21 (19–23) long and palp coxa with a pair of smooth setae, *pc* 27 (25–27). Hypostomal groove with eight rows of denticles, each with two denticles, corniculi distally pointed (Fig.20); tectum convex 30 wide; fixed digit of chelicera 28 (27–28) long, with four teeth plus pilus dentilis 6 (5–6) long, movable digit 26 (25–26) long and with one tooth (Fig. 19).

Venter (Fig. 18): Tritosternum 84 (83–87) long, with two barbed laciniae; venter of idiosoma with nine pairs of opisthogastric setae. Sternal shield smooth, posterior margin with a median lobe and with two pairs of setae of similar lengths [*St1* 31 (29–33), *St2* 31 (30–31)] and two pairs of lyrifissures (*gv1–2*); setae *St3* 30 (29–30) and *St4* 29 (28–32 set on small metasternal shields, each with one small lyrifissure. Genital shield 122 (118–126) long, 62 (59–65) wide at level of base and with a pair of setae, *St5* 30 (27–33) long.

Two pairs of elongate metapodal shields, primary shield almost twice as long as secondary shield [33 (30–35), 21 (17–22)]. Ventrianal shield reticulated, 111 (109–113) long and 77 at level of setae *ZV2*, four pairs of pre–anal setae *JV1* 23 (22–23), *ZV2* 19 (18–20), *JV2* 18 (16–20), *JV3* 24 (22–25) long and without preanal pore; para–anal setae *PA* 16 (15–17) and postanal seta *PST* 17 (16–17) long. Opisthogasteric cuticle bearing four pairs of setae on cuticle *ZV1* 22 (21–23), *ZV3* 19 (18–20), *JV4* 20 (19–20) and *JV5* 46 (44–48) long, all smooth; six pairs of lyrifissures and a pair of platelets and one slender transverse platelet between genital and ventrianal shields (Fig. 18).

Spermatheca (Fig. 24): Calyx bell-shaped, 10 (9–10) long and 8 wide at junction with vesicle, atrium C form.

Peritreme (Figs. 17 & 23): Stippled, extending to level of seta *z4*, 66 (64–68) long.

Legs (Figs. 21–22). Length of legs (including pretarsus) as follows: leg I 302 (300–303), leg II 253 (250–255), leg III 253 (149–257) and leg IV 330 (320–340). Basitarsus IV with knobbed macroseta (St) 51 (50–52). Genua I-IV with 10-8-7-7 setae (Figs. 21–22).

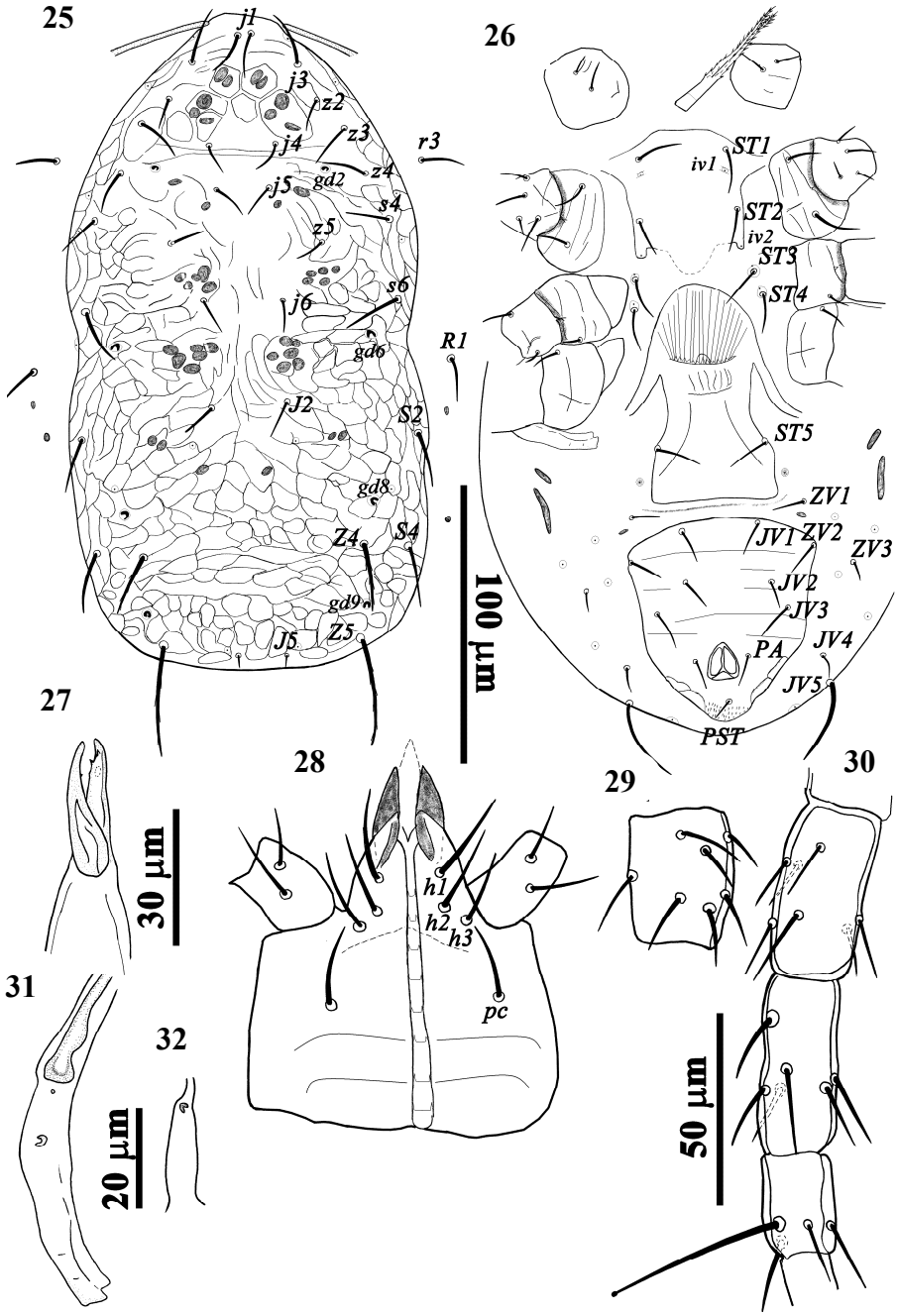
Specimens examined: Faculty of Agriculture (Hamedan) (34° 48' N, 48° 29' E, 1810 m a.s.l.) [08 x 2008, 1 (♀), aerial part of Plane tree, *Platanus orientalis* L. (Platanaceae); 28 x 2008, 1 (♀), aerial part of apple, *Malus domestica* Moller (Rosaceae) and 01 viii 2010, 12 (♀♀), aerial part of plum, *Prunus cerasifera* Ehrh. (Rosaceae) infested by Brown mite, *Bryobia rubrioculus* (Scheuten) (Tetranychidae)]; Heydareh village of Hamedan vicinity (34° 48' N, 48° 28' E, 1830 m a.s.l.), 06 xi 2009, 2 (♀♀), aerial part of apple tree, *Malus domestica* Moller (Rosaceae) infested by TSSM and 1 (♀), aerial part of peach tree.

Remarks

The presently observed specimens are similar to those considered in the original description of Arutunjan (1971) but it differs by: apex of peritreme reaching level of *z4* vs. *s4* on the Armenian specimens. This redescription is very similar to the redescription of Ueckermann *et al.* (2009) (specimens of Iran) but differs by: dorsal seta *Z4* reaching level base of *Z5* vs. not reaching; ventrianal shield reticulated vs. ventrianal shield with several transverse lines.

***Typhlodromus* (*Typhlodromus*) *phialatus* Athias-Henriot, 1960**

Female (Figs. 25–32) (n= 2): Idiosoma oval, length of body (excluding palp) 398 (385–410), (including palp) 590 (570–610), idiosomal setal pattern: 12A:7A/JV: ZV.



Figures 25–32. *Typhlodromus* (*Typhlodromus*) *phialatus* (female). 25. Dorsal view of idiosoma; 26. Ventral view of idiosoma; 27. Chelicera; 28. Hypostome; 29. Genu II; 30. Genu–basitarsus IV. 31. Peritreme; 32. Spermatheca.

Dorsum (Fig. 25): Dorsal shield reticulated, 338 (335–340) long, 186 (179–193) wide at level of setae *s4*, with 17 pairs of smooth setae (except *Z4–5* serrated) and seven pairs of lyrifissures and four pairs of gland pores (*gd2*, *gd6*, *gd8*, *gd9*). Length of dorsal setae as follows: *j1* 25 (24–25), *j3* 32 (31–32), *j4* 17 (16–18), *j5* 20, *j6* 20 (19–20), *J2* 21

(20–21), *J5* 7, *z2* 19, *z3* 26 (25–27), *z4* 24 (23–25), *z5* 19, *Z4* 38, *Z5* 60, *s4* 26, *s6* 31 (30–31) *S2* 33 (32–33), *S4* 36 (35–36), *r3* 24 (22–25), *R1* 23 (22–24).

Gnathosoma (Fig. 27–28): Three pairs of smooth hypostomal setae, *h1* 23(21–25), *h2* 25 (23–27) and *h3* 24 (23–25) long and palp coxa with a pair of smooth setae, *pc* 25 (24–26). Hypostomal groove with eight rows of denticles, each with two denticles, corniculi distally pointed (Fig. 28); tectum convex 30 wide; fixed digit of chelicera 31 (30–31) long and with three teeth, movable digit 27 (26–28) long and with one tooth (Fig. 27).

Venter (Fig. 26): Tritosternum 88 (85–91) long, with two barbed laciniae; venter of idiosoma with nine pairs of opisthogastric setae. Sternal shield smooth, with two pairs of setae of similar lengths [*St1* 30 (29–31) – *St2* 28 (27–28)] and two pairs of lyrifissures (*iv1–2*); setae *St3* 29 (28–29) and *St4* 26 (25–26) set on small metasternal shields, each with one small lyrifissure. Genital shield 114 (106–122) long, 65 wide at level of base and with a pair of setae, *St5* 26 (25–26) long. Two pairs of elongate metapodal shields, primary shield almost twice as long as secondary shield [28 (26–29), 13 (12–13)]. Ventrianal shield lightly reticulated, 113 (108–118) long and 109 (100–117) at level of setae *ZV2*, four pairs of pre–anal setae *JV1* 21 (20–21), *ZV2* 21 (20–21), *JV2* 21 (20–21), *JV3* 22 (21–23) long and without preanal pore; para–anal setae *PA* 17 (15–18) and postanal seta *PST* 16 (15–16) long. Opisthogasteric cuticle bearing four pairs of setae on cuticle *ZV1* 23 (20–26), *ZV3* 12, *JV4* 19 (18–19) and *JV5* 50 (49–50) long, all smooth; five pairs of lyrifissures and a pair of platelets and one slender transverse platelet between genital and ventrianal shields (Fig. 26).

Spermatheca (Fig. 32): Calyx long and fundibular, 21 (20–21) long and 9 (8–10) wide at junction with vesicle, atrium C form.

Peritreme (Figs. 25 & 31). Stippled, extending to level of seta *j1*, 195 (190–200) long.

Legs (Figs. 29–30): Length of legs (including pretarsus) as follows: leg I 308 (305–310), leg II 258 (255–260), leg III 255 (251–260) and leg IV 340 (325–355). Basitarsus IV with a knobbed macrosetae (St) 47 (46–48), Genua I-IV with 10-7-7-7 setae (Figs. 29–30).

Specimens examined: Heyran region of Ardabil province (38° 26' N, 48° 35' E, 1475 m a.s.l.), 28 ix 2008, 3 (♀♀), areal part of Cypress tree, *Cupressus sempervirens* L. (Cupressaceae).

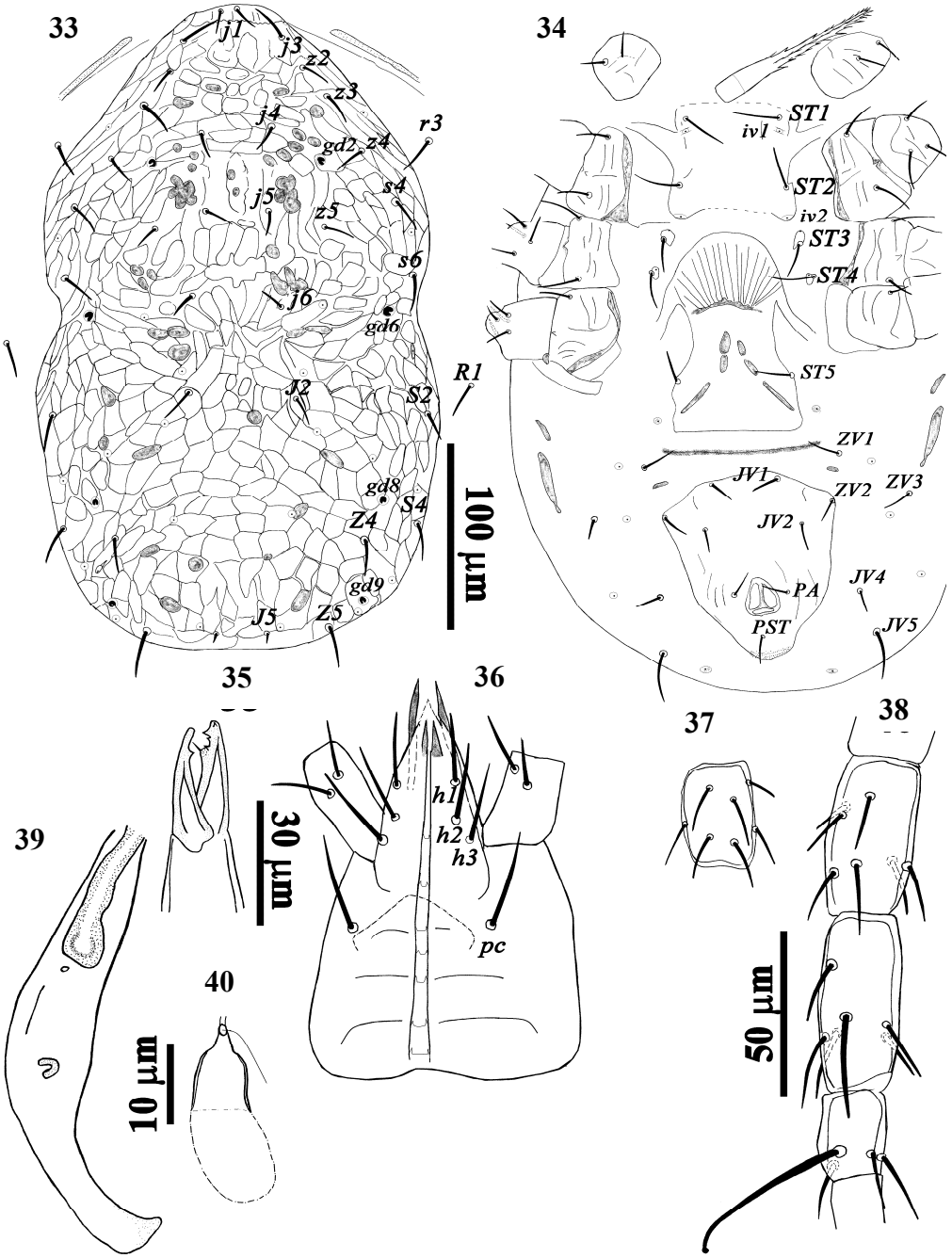
Remarks

The measurements of Iranian specimens are similar to those considered in the original description by Athias-Henriot (1960) except *S4* 42 and *STIV* 42. Also, the specimens herein considered are similar to those re–described by Chant and Yoshida–Shaul (1987) except *Z5* 54, *JV5* 55, *STIV* 38 and also fixed digit of chelicera with 2 teeth. Furthermore some measurements of the Iranian presently considered specimens differ from the original description recorded by Tixier *et al.* (2010) as follow: *j3* 27, *j5* 15, *Z5* 54, *s4* 30, *STIV* 38, *JV5* 55 and also fixed digit with 2 teeth. Finally, the redescription is similar to redescription by Denmark (1992) but it differs from by: *j3* 22, *j4* 12, *j4* 13, *z2* 15, *z5* 14, *Z5* 54, *STIV* 33.

Typhlodromus (*Typhlodromus*) *leptodactylus* Wainstein, 1961

Female (Figs. 33–40) (n= 1): Idiosoma oval, length of body (excluding palp) 390, (including palp) 670, idiosomal setal pattern: 12A:7A/JV–3: ZV.

Dorsum (Fig. 33): Dorsal shield reticulated, 345 long, 193 wide at level of setae *s4*, with 17 pairs of smooth setae and 12 pairs of lyrifissures and four pairs of gland pores (*gd2*, *gd6*, *gd8*, *gd9*). Length of dorsal setae as follows: *j1* 15, *j3* 19, *j4* 14, *j5* 15, *j6* 14, *J2* 14, *J5* 5, *z2* 19, *z3* 17, *z4* 16, *z5* 15, *Z4* 19, *Z5* 25, *s4* 18, *s6* 19, *S2* 20, *S4* 20, *r3* 20, *R1* 18.



Figures 33–40. *Typhlodromus* (*Typhlodromus*) *leptodactylus* (female). 33. Dorsal view of idiosoma; 34. Ventral view of idiosoma; 35. Chelicera; 36. Hypostome; 37. Genu II; 38. Genu–basitarsus IV; 39. Peritreme; 40. Spermatheca.

Gnathosoma (Figs. 35–36): Three pairs of smooth hypostomal setae, *h1* 23, *h2* 22 and *h3* 22 long and palp coxa with a pair of smooth setae, *pc* 23. Hypostomal groove with seven rows of denticles, each with two denticles, corniculi distally pointed (Fig.

36); tectum convex 25 wide; fixed digit of chelicera 34 long, with three teeth plus pilus dentilis 4 long, movable digit 30 long and with one tooth (Fig. 35).

Venter (Fig. 34): Tritosternum 103 long, with two barbed laciniae, venter of idiosoma with eight pairs of opisthogastric setae. Sternal shield smooth and with two pairs of setae of similar lengths [*St1* 25, *St2* 23] and two pairs of lyrifissures (*iv1–2*); setae *St3* 25 and *St4* 23 set on small metasternal shields, each with one small pore and lyrifissures respectively.

Genital shield 120 long, 70 wide at level of base and with a pair of setae, *St5* 21 long. Two pairs of elongate metapodal shields, primary shield twice as long as secondary shield [33, 15]. Ventrianal shield smooth with irregular lines, 103 long and 92 at level of setae *ZV2*, three pairs of pre–anal setae *JV1* 15, *ZV2* 12, *JV2* 15 long and without preanal pore; para–anal setae *PA* 17 and postanal seta *PST* 16 long. Opisthogasteric cuticle bearing four pairs of setae on cuticle *ZV1* 19, *ZV3* 13, *JV4* 12 and *JV5* 28 long, all smooth; four pairs of lyrifissures and a pair of platelet and one slender transverse platelet between genital and ventrianal shields (Fig. 34).

Spermatheca (Fig. 40): Calyx bell-shape, 15 long and 11 wide at junction with vesicle.

Peritreme (Figs. 33 & 39): Stippled, extending to level of seta *j3*, 150 long.

Legs (Figs. 37–38). Length of legs (including pretarsus) as follows: leg I 317, leg II 269, leg III 268 and leg IV 351. Tibia and basitarsus IV with pointed and knobbed macrosetae (Ti) 32 (St) 51 long, respectively; Genua I-IV with 10-7-7-7 setae (Figs. 37–38).

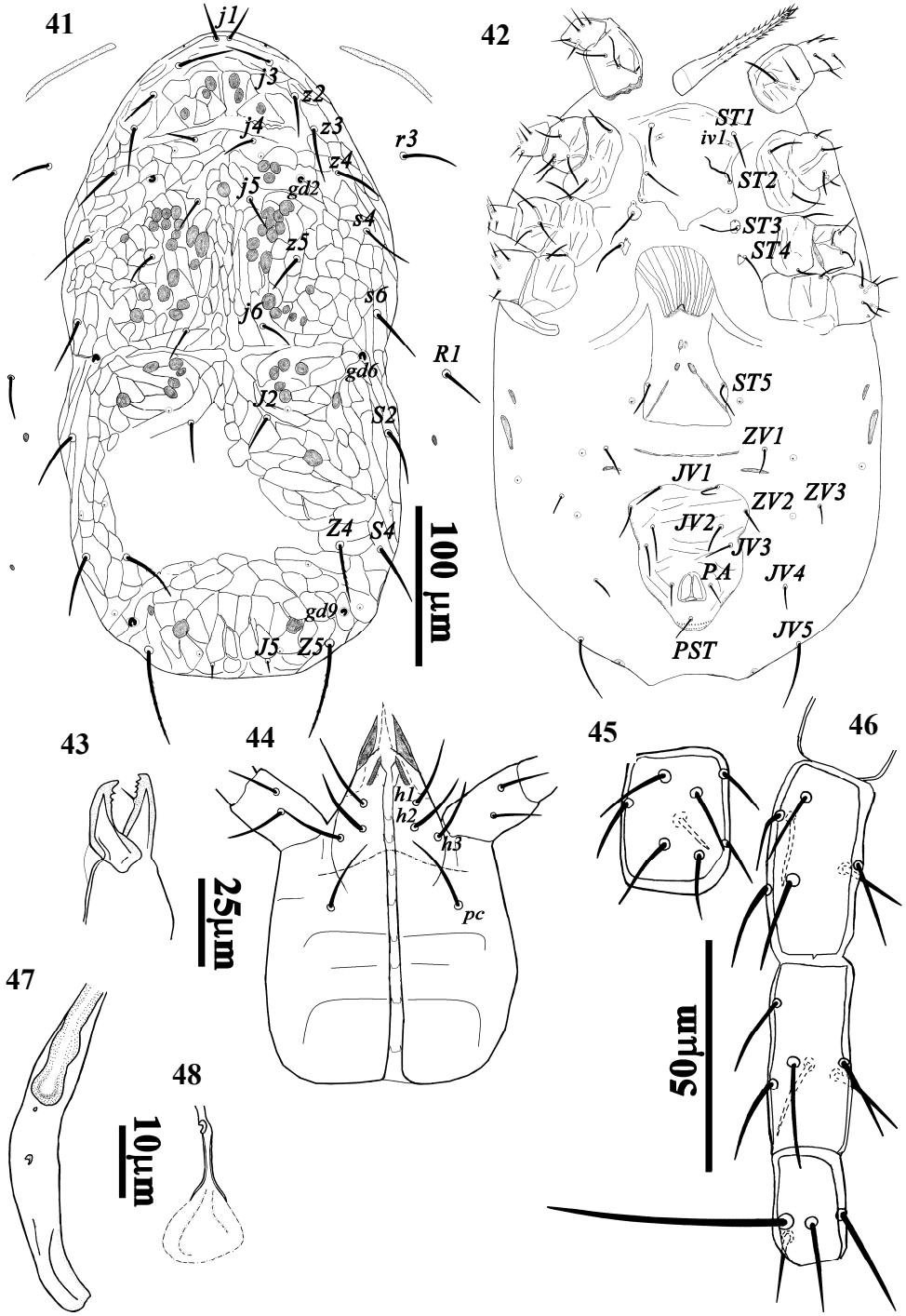
Specimens examined: Heyran region of Ardabil province (38° 26' N, 48° 35' E, 1475 m a.s.l.), 02 i 2008, 1 (♀), areal part of Cypress tree, *Cupressus sempervirens* L. (Cupressaceae).

Remarks

Some measurements of the specimen herein re-described are longer than those of type species by Chant and Yoshida–Shaul (1987) as follows: *j1* 9, *z2* 11, *z3* 12 and *r3* 13. Furthermore, the apex of peritreme extends to level of *j3* in the Iranian specimen but between levels of *j3* and *z2* in the Georgian specimens; a slender, transverse platelet was observed between genital and ventrianal shields in Iranian specimen vs. four separated transverse platelets in the Georgian specimens. Furthermore, the measurement of the Iranian specimen herein reported differ from those of the original description recorded by Tixier *et al.* (2010) as follows: *r3* 13. This redescription also differs from the redescription of Papadoulis *et al.* (2009) by the presence of two pairs of lyrifissures on opisthogasteric cuticle. Furthermore the redescription is similar to redescription by Denmark (1992) but it differs in measurements of *j5* 9, *r3* 11, *R1* 11 and chelicerae dentition (fixed digit with one tooth). Finally the herein collected specimen differs from redescription provided in Livshitz and Kuznetsov (1972) as follows: *j3* 12–15, St IV 38; fixed digit of chelicera with 5 teeth.

Typhlodromus (*Typhlodromus*) *tubifer* Wainstein, 1961

Female (Figs. 41–48) (n= 1). Idiosoma oval, length of body (excluding palp) 430, (including palp) 600 and 295 wide, idiosomal setal pattern: 12A:7A/JV:ZV, fixed digit with two teeth.



Figures 41–48. *Typhlodromus* (*Typhlodromus*) *tubifer* (female). 41. Dorsal view of idiosoma; 42. Ventral view of idiosoma; 43. Chelicera; 44. Hypostome; 45. Genu II; 46. Genu–basitarsus IV; 47. Peritreme; 48. Spermatheca.

Dorsum (Fig. 41). Dorsal shield reticulated, 321 long, 184 wide at level of setae *s4*, with 17 pairs of smooth setae (except *Z4–Z5* serrated) and eight pairs of lyrifissures and three pairs of gland pores (*gd2*, *gd6*, *gd9*). Length of dorsal setae as follows: *j1* 21, *j3* 30, *j4* 16, *j5* 16, *j6* 18, *J2* 18, *J5* 6, *z2* 20, *z3* 28; *z4* 25, *z5* 17, *Z4* 30, *Z5* 50, *s4* 26, *s6* 28, *S2* 29, *S4* 31, *r3* 23, *R1* 22.

Gnathosoma (Figs. 43–44). Three pairs of smooth hypostomal setae, *h1* 25, *h2* 24 and *h3* 23 long and palp coxa with a pair of smooth setae, *pc* 24. Hypostomal groove with eight rows of denticles, each with two denticles, corniculi distally pointed (Fig. 44); tectum convex 38 wide; fixed digit of chelicera 29 long, with three teeth plus pilus dentilis 8 long, movable digit 26 long and with two teeth (Fig. 43).

Venter (Fig. 42). Tritosternum 85 long, with two barbed laciniae, venter of idiosoma with nine pairs of opisthogastric setae. Sternal shield smooth, posterior margin with median lobe and with two pairs of setae of similar lengths [*St1* 27 – *St2* 25] and two pairs of lyrifissures (*iv1–2*); setae *St3* 25 and *St4* 26 set on small metasternal shields, each with one small pore and lyrifissures respectively. Genital shield 120 long, 67 wide at level of base and with a pair of setae, *St5* 25 long. Two pairs of elongate metapodal shields, primary shield almost twice as long as secondary shield [27, 13]. Ventrianal shield with several transvers lines, 102 long and 86 at level of setae *ZV2*, four pairs of preanal setae *JV1* 20, *JV2* 22, *JV3* 21 and *ZV2* 22 long and without preanal pore; para–anal setae *PA* 16 and postanal seta *PST* 18 long. Opisthogasteric cuticle bearing five pairs of setae on cuticle *ZV1* 21, *ZV3* 15, *JV4* 18 and *JV5* 45 long, all smooth; four pairs of lyrifissures and a pair of platelets and four slender transverse platelets between genital and ventrianal shields (Fig. 42).

Spermatheca (Fig. 48): Calyx tubular, 16 long and 8 wide at junction with vesicle.

Peritreme (Figs. 41 & 47): Stippled, extending to level of seta *j3*, 153 long.

Legs (Figs. 45–46). Length of legs (including pretarsus) as follows: leg I 300, leg II 235, leg III 220 and leg IV 320. Basitarsus IV with pointed macrosetae (St) 50, genua I-IV with 10-8-7-7 setae (Figs. 45–46).

Specimens examined: Fandoghlou forest of Ardabil province (38° 23' N, 48° 32' E, 1360 m a.s.l.), 20 v 2009, 1 (♀), areal part of Hazelnut tree, *Corylus avellanae* L. (Corylaceae).

Remarks

The herein considered specimen differs from the redescription of type species by Chant and Yoshida–Shaul (1987) as follows: width of ventrianal shield at level of seta *ZV2* 72; length of calyx 21; St IV 30; fixed digit with two denticules. Also, the measurements of this redescription differ from those of other Iranian specimens as follows: *J5* 9, length of calyx 10 (Rahmani *et al.* 2010). The redescription is similar to redescription by Denmark (1992) but it differs in: concave posterior margin of sternal shield and absence of median lobe; fixed digit with two teeth.

Discussion

The redescriptions and illustrations of these species are presented, based on specimens collected in this study; these redescriptions show minor differences between the presently considered Iranian specimens and the original descriptions and other re-descriptions. It seems that *Typhlodromus* (*Anthoseius*) *bagdasarjani* is very common in the regions considered. As it is reported from crops, it may play an important role in the control of various small phytophagous arthropod pests especially tetranychid mites in western Iran.

Key to female of Iranian *Typhlodromus* species (Modified from Faraji *et al.* 2007; 2012)

1. Setae *S5* present ……...subgenus *Anthoseius* De Leon……...……..…..2

- Setae *S5* absent …… …….subgenus *Typhlodromus* Scheuten…..……...19
2. Ventrianal shield with three pairs of preanal setae……... 3
- Ventrianal shield with four pairs of preanal setae…….. 5
3. Ventrianal shield with a pair of pores……4
- Ventrianal shield without pore. … . .. .*T.* (*A.*) *rodriguezi* (Denmark & Daneshvar)
4. Setae *JV1* off the ventrianal shield (5 setae on integument surrounding ventrianal shield) ..... *T.* (*A.*) *intercalaris* Livshitz & Kuznetsov
- Setae *JV1* on the ventrianal shield (4 setae on integument surrounding ventrianal shield)……..……....……*T.* (*A.*) *haiastanius* (Arutunjan)
5. Peritreme reaching seta *j1* or level between *j1-j3* ……..……..…….6
- Peritreme not reaching seta beyond *z2* 15
6. Dorsal shield heavily sclerotized…….. *T.* (*A.*) *bakeri* (Garman)
- Dorsal shield not heavily sclerotized……..……..……...…..7
7. Sternal shield with three setae (*St1-3*)...…….…… *T.* (*A.*) *vulgaris* Ehara
- Sternal shield with two setae (*St1-2*)……..…….8
8. Ventrianal shield with a pair of pores ……..……9
- Ventrianal shield without pore…..……..……*T.* (*A.*) *tamaricis* (Kolodochka)
9. Calyx of the spermatheca tubular……..……..……10
- Calyx of the spermatheca bell-shaped……...……..……..13
10. Calyx of the spermatheca narrow…….……*T.* (*A.*) *caudiglans* Schuster
- Calyx of the spermatheca not narrow……...…….……11
11. Seta *S4* 51 µm in average, *Z4* of 55 µm in average…… (*A.*) *dalfardicus* (Daneshvar)
- Setae *S4* and *Z4* much smaller (30–40 µm)……...……....12
12. Seven setae on the Ge II……...…..……...*T.* (*A.*) *persianus* McMurtry
- Eight setae on the Ge II..……*T.* (*A.*) *rhenanus* (Oudemans)
13. Primary metapodal shield elongate and sausage shape…….……14
- Primary metapodal shield axe shape……..…….. *T.* (*A.*) *georgicus* Wainstein
14. Dorsal shield with 5 pairs of solenostomes (*gd2*, *gd4*, *gd6*, *gd8*, *gd9*)…… …… ……...……..……..*T.* (*A.*) *kerkirae* Swirski and Ragusa
- Dorsal shield with 3 pairs of solenostomes (*gd2*, *gd6*, *gd9*)……. ……*T.* (*A.*) *kazachstanicus* Wainstein
15. Dorsal shield with 5 pairs of solenostomes (*gd2*, *gd4*, *gd6*, *gd8*, *gd9*); peritreme reaching level between *j3–z2*……..... *T.* (*A.*) *bagdasarjani* Wainstein and Arutunjan
- Dorsal shield with less than 5 pairs of solenostomes; peritreme reaching level of *z2*..16
16. Dorsal shield with 4 pairs of solenostomes (*gd2*, *gd6*, *gd8*, *gd9*)……..……...*T.* (*A.*) *khosrovensis* Arutunjan
- Dorsal shield with 3 pairs of solenostomes (*gd2*, *gd6*, *gd9*) …….....17
17. Ventrianal shield with a pair of pores…… ……...……..*T.* (*A.*) *neyshabouris* (Denmark and Daneshvar)
- Ventrianal shield without pore …….……..…. 18
18. Macroseta on basitarsus of leg IV with pointed tip (setiform), peritreme reaching seta levelbetween *z4-s4*, posterior margin of sternal shield with a central lobe.……...……. (*A.*) *torbatejamae* (Denmark and Daneshvar)
- Macroseta on basitarsus of leg IV with knobbed tip, peritreme reaching seta level between *z4-s4*, posterior margin of sternal shield with a small central lobe…….*T.* (*A.*) *iranensis* (Denmark and Daneshvar)
19. Ventrianal shield with three pairs of preanal setae ….. (*T.*) *leptodactylus* Wainstein
- Ventrianal shield with four pairs of preanal setae..... 20

20. Dorsal shield with three pairs of solenostomes (*gd2*, *gd6*, *gd9*)……
……..……*T.* (*T.*) *tubifer* Wainstein
- Dorsal shield with four pairs of solenostomes (*gd2*, *gd6*, *gd8*, *gd9*……..... 21
21. Ventrianal shield with preanal pores ..... *T.* (*T.*) *pritchardi* Arutunjan
- Ventrianal shield without preanal pore……..... 22
22. Peritreme short extending to level of *z4* and *z3*; peritreme not stippled, with central core; *Z5* smooth..... *T.* (*T.*) *klimenkoi* Kolodochka
- Peritreme longer extending anteriorly to level between *z2* and *j3*; peritreme stippled; *Z5* serrated ……..... 23
23. Setae *Z5* length between 65-87 μm, *Z4* length between 44–64 μm…….…….
……..…….…… *T.* (*T.*) *athiasae* Porath and Swirski
- Seate *Z5* length less than 66 μm, *Z4* length less than 46 μm…….……...…24
24. *STIV* length of 53 μm in average, no tooth on the fixed digit……
……..……*T.* (*T.*) *laurae* Arutunjan
- *STIV* length less than 40 μm in average, at least two teeth on the fixed digit…....….25
25. Spermatheca with a neck, four teeth on the fixed digit..… (*T.*) *cotoneastri* Wainstein
- Spermatheca without neck, two teeth on the fixed digit.....
…….....*T.* (*T.*) *phialatus* Athias-Henriot

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بازتوصیف شش گونه از جنس *Typhlodromus* (Acari: Phytoseiidae: Typhlodrominae) یافت شده از برخی از مناطق غرب و شمال غرب ایران

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چکیده

جمع‌آوری گونه‌های جنس *Typhlodromus* Scheuten در برخی از مناطق غرب و شمال غرب ایران در طی سال‌های ۲۰۰۸-۲۰۱۱ صورت گرفت. مقاله حاضر بازتوصیف شش گونه متعلق به دو زیرجنس *Typhlodromus* (*Anthoseius*) De Leon و *Typhlodromus* (*Typhlodromus*) Scheuten (هر کدام با سه گونه، به ترتیب): *T.* (*A.*) *bagdasarjani* Wainstein & Arutunjan، *T.* (*A.*) *kerkirae* Swirski & Ragusa ، *T.* (*A.*) *khosrovensis* Arutunjan ، *T.* (*T.*) *phialatus* Athias–Henriot ، *T.* (*T.*) *leptodactylus* Wainstein و *T.* (*T.*) *tubifer* Wainstein ارایه می‌شود. همچنین در این مقاله کلید شناسایی گونه‌های جنس *Typhlodromus* ایران تهیه شده است.

واژگان کلیدی: کنه‌های شکارگر، *Anthoseius* ، *Typhlodromus* ، گزارش جدید، ایران.

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