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New records and complementary description of two Phytoseiidae (Acari: Mesostigmata) species from Türkiye

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Original research

ABSTRACT

A preliminary survey was conducted in Kaz Dağları, also known as Mount Ida, one of the regions considered a biodiversity rich region due to its wide range of floral diversity at the westernmost point of Türkiye. As a result, we found two species of phytoseiids associated with unknown eriophyoid mite species on two different endemic plants in Kaz Dağları. *Neoseiulus vasoides* (Karg) and *Typhlodromus* (*Typhlodromus*) *ernesti* Ragusa & Swirski were collected from *Sideritis trojana* Bornm. (Lamiaceae) and *Abies nordmanniana* subsp. *equi-trojani* (Asch. & Sint. ex Boiss.) Coode & Cullen (Pinaceae) at high elevations of 1726 meters and 1350 meters, respectively. The new species records are complementarily described and illustrated based on Turkish specimens, including detailed descriptions of leg chaetotaxy. Important diagnostic characters of the new species records are provided to further improve diagnosis and to avoid any confusion regarding the species status of the Turkish specimens.

Keywords systematics; predatory mites; Kaz Dağları; new records; morphology; leg chaetotaxy

Introduction

Species of the family Phytoseiidae (Acari: Mesostigmata) are crucial for their potential as predators of phytophagous mites and various small soft-bodied insects, including thrips and whiteflies (McMurtry *et al.* 2013). In Türkiye, recent faunistic studies focusing on native phytoseiid species have reported about 140 species belonging to 24 genera (Kasap and Çobanoğlu 2009; Döker *et al.* 2015, 2019, 2020, 2023, 2024; Akyazı *et al.* 2016; Çobanoglu *et al.* 2018; Baş *et al.* 2022).

Kaz Dağları, also known as Mount Ida, is a region rich in biodiversity located in western Türkiye. Renowned for its mythological significance since ancient times, this mountain is one of the highest points in Western Anatolia (Uysal *et al.* 2011). Kaz Dağları is home to a remarkable variety of endemic plant species and diverse ecosystems, making it an important area for both floral and faunal diversity (Uysal 2010). However, there have been no studies on phytoseiid mites in Kaz Dağları. Therefore, a preliminary sampling was conducted to identify the species present on two endemic plants in the region.

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Material and methods

Phytoseiid mites were collected from *Abies nordmanniana* subsp. *equi-trojani* (Pinaceae) and *Sideritis trojana* (Lamiaceae), both located within the boundaries of Kaz Dağları (Mt. Ida) in the Çanakkale and Balıkesir provinces. All collected plant materials were labeled, wrapped in paper, placed in polyethylene bags, and transferred to the Acarology and Systematics Laboratory at Çanakkale Onsekiz Mart University (ÇOMÜ) Faculty of Agriculture in an ice box. The plant samples were examined under a stereo microscope (Olympus SZ51), and the phytoseiid mites present on them were collected using a No. 00 brush and transferred into 70% alcohol. The collected mites were cleared in 60% lactic acid at 50 °C for two days on a hotplate before being mounted on microscope slides. The permanent slides were prepared using Hoyer's medium. The slides were examined with an Olympus® CX-41 microscope, and illustrations were prepared using a Camera Lucida. Final adjustments were made using Adobe Photoshop (version CS6). The taxonomic classification follows that of Chant and McMurtry (2007). Nomenclature for dorsal setae is based on Lindquist and Evans (1965), as adapted by Rowell *et al.* (1978); ventral setae nomenclature follows Chant and Yoshida-Shaul (1991). Idiosomal dorsal and ventral setal patterns are based on Chant and Yoshida-Shaul (1989, 1992), while the symbols for leg macrosetae are adapted from Athias-Henriot (1957). Nomenclature for idiosomal solenostomes follows Athias-Henriot (1971, 1975), and ventral pores follow Athias-Henriot (1971). The leg chaetotaxy follows Evans (1963). The length of the dorsal shield was measured along the midline from the anterior to the posterior margins. The length of the chelicera digits was measured from the basal margin to the apical margin. The length of the calyx of the spermatheca was measured from the atrium to the apical end of the calyx. The length of the legs was measured from the base of the coxa to the apex of the tarsus (excluding the ambulacrum).

Results

Neoseiulus vasoides (Karg)

Amblyseius (*Neoseiulus*) *vasoides* Karg, 1989: 117.
(Figures 1, 2)

Complementary description

Female (n=1)

Dorsal idiosoma — (Figure 1a). Dorsal setal pattern 10A: 9B (*r3* and *R1* off shield). Dorsal shield sclerotized, reticulated, with a slight waist at level of seta *R1*, with six pairs of solenostomes (*gd1*, *gd2*, *gd5*, *gd6*, *gd8*, and *gd9*), and 16 pairs of visible poroids (sensillae) (*id1*, *id2*, *id4*, *id5*, *id6*, *idm1*, *idm2*, *idm3*, *idm4*, *idm5*, *idm6*, *idx*, *is1*, *idl1*, *idl3*, and *idl4*). Muscle-marks (sigilla) visible mostly on podosoma, length of dorsal shield 310, width at level of *s4* 150, width at level of *S2* 158. All dorsal setae smooth, except *Z4* and *Z5* slightly serrated, and *J5* with one barb. Measurements of dorsal setae as follows: *j1* 16, *j3* 18, *j4* 11, *j5* 12, *j6* 12, *J2* 13, *J5* 9, *z2* 16, *z4* 17, *z5* 10, *Z1* 17, *Z4* 38, *Z5* 55, *s4* 20, *S2* 28, *S4* 28, *S5* 26, *r3* 16, and *R1* 17. Peritremes extends to level of setae *j1*. Poroid *id3* visible on peritrematal shield.

Ventral idiosoma — (Figure 1b). Ventral setal pattern 14: *JV*-3: *ZV*. Sternal shield smooth with three pairs of setae (*ST1-ST3*) and two pair of poroids (*iv1*, *iv2*); length (distance between *ST1-ST3*) 62, width distance between setae *ST2* 60; setae *ST4* and poroids *iv3* on metasternal platelets. Posterior margin of sternal shield straight. Genital shield smooth, with one pair of setae *ST5*; width at level of *ST5* 60; one pair of para-genital poroids *iv5* on soft cuticle. Ventrianal shield pentagonal, mostly reticulated; with three pairs of pre-anal setae (*JV1*, *JV2*, and *ZV2*), one pair of para-anal setae *PA*, unpaired post-anal seta *PST*, without preanal solenostomes, (remnants of *gv3* solenostomes slightly visible but they are not real openings). Length of ventrianal shield (distance between anterior to posterior margins along midline) 105,

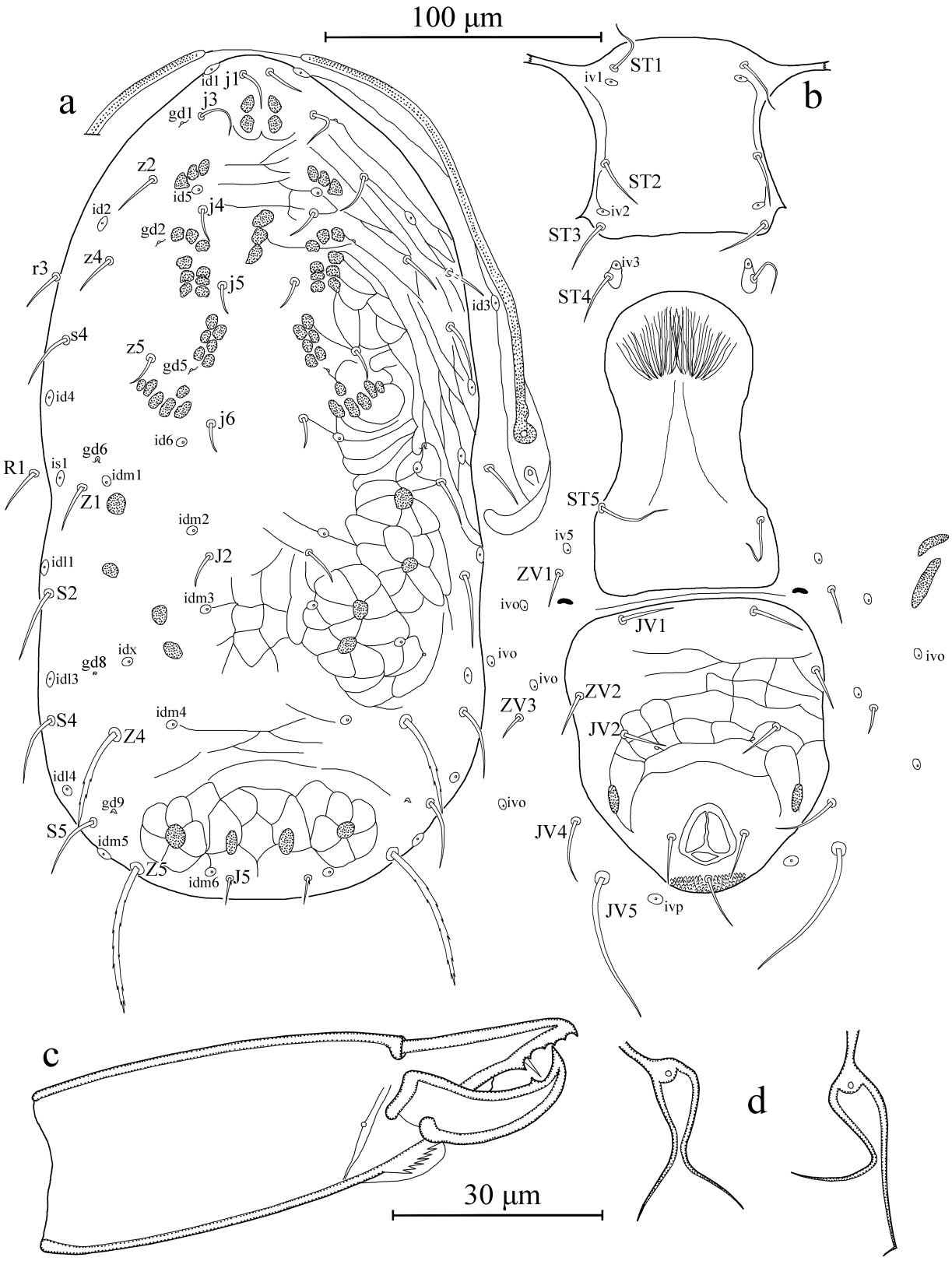

Figure 1 . *Neoseiulus vasoides* (Karg, 1989) female. a – Dorsal idiosoma; b – Ventral idiosoma; c – Chelicera; d – Spermathecae.

width at level of *ZV2* 91. Four pairs of caudoventral setae (*ZV1*, *ZV3*, *JV4*, and *JV5*) and five pairs of poroids (four pairs of *ivo*, and *ivp*) on soft cuticle surrounding ventrianal shield. Setae *JV5* smooth, 55 in length.

Chelicera — (Figure 1c). Fixed digit 26 long, with five teeth and pilus dentilis; movable digit 27 long, with one tooth.

Spermatheca — (Figure 1d). Calyx of spermatheca bendable vase-shaped; swollen basally, then narrowing and flaring distally, 24 long, atrium nodular incorporated within the base of calyx; major duct long; minor duct not visible.

Legs — (Figures 2a–d). Length of legs: I 310, II 243, III 225, and IV 290. Chaetotaxy of legs as follows: Leg I: coxa 0 0/1 0/1 0, trochanter 1 0/1 0/2 1, femur 2 3/1 2/2 2, genu 2 2/1 2/1 2, tibia 2 2/1 2/1 2. Leg II: coxa 0 0/1 0/1 0, trochanter 1 0/1 0/2 1, femur 2 3/1 2/1 1, genu 2 2/1 2/0 1, tibia 1 1/1 2/1 1. Leg III: coxa 0 0/1 0/1 0, trochanter 1 1/1 0/2 0, femur 1 2/1 1/0 1, genu 1 2/1 2/0 1, tibia 1 1/1 2/1 1. Leg IV: coxa 0 0/1 0/0 0, trochanter 1 1/1 0/2 0, femur 1 2/1 1/0 1, genu 1 2/1 2/0 1, tibia 1 1/1 2/0 1. Leg IV with two macrosetae, *SgeIV* (*ad1*) 26, and *StIV* (*pd3*) 43 in length. Other legs without macrosetae.

Material examined

One female specimen from *Sideritis trojana* Bornm (Lamiaceae) in association with unknown eriophyid mites, in Kaz Dağları, 39°42′00″ N, 26°49′48″ E, 1726 meters above sea level, in Edremit County, Balıkesir Province, August 2, 2024, İ. Yaşar, Ş. Kök and İ. Kasap collectors.

Remarks

Neoseiulus vasoides was first described by Karg (1989) based on a holotype female collected from humus in the Kemnitz Valley, near Karl-Marx-Stadt (now Chemnitz), Germany. Until now, the species was known only from its original description, with no further records from other countries. Therefore, this study presents the first discovery of *N. vasoides* outside Germany and reports its presence in Türkiye for the first time.

Karg's original description, which relied on basic drawings and a few setal measurements, is quite limited and lacks several important diagnostic characters currently used to differentiate phytoseiid species. Specifically, it does not include the lengths of some dorsal setae, the number of dorsal solenostomes, or leg chaetotaxy. However, the available morphological characteristics and measurements of the current specimen are almost identical with those of the holotype.

Based on the morphology of its spermatheca, which is characterized by a bendable, vase-shaped calyx that is swollen at the base, then narrows, and finally flares distally, this species shows similarities to several other species within the genus. Specifically, it shows affinity to *N. agrafioticus* Papadoulis, Emmanouel & Kapaxidi, 2009, *N. karandinosi* Papadoulis, Emmanouel & Kapaxidi, 2009, *N. plantagenis* (Kolodochka, 1981), *N. pseudotauricus* Papadoulis, Emmanouel & Kapaxidi, 2009, *N. tauricus* (Livshitz & Kuznetsov, 1972) and *N. tervus* Meshkov, 1994. These species have seven pairs of dorsal solenostomes, except for *N. agrafioticus*, which bears six pairs. *Neoseiulus vasoides* also has six pairs of dorsal solenostomes but with a different combination, *gd4* is absent, and *gd5* is present in *N. vasoides*, however, an opposite situation appears for *N. agrafioticus*, where *gd4* is present and *gd5* is absent.

Typhlodromus (*Typhlodromus*) *ernesti* Ragusa & Swirski

Typhlodromus (*Typhlodromus*) *ernesti* Ragusa & Swirski, 1978: 211.
(Figures 3, 4, 5)

Complementary description

Female (n=4)

Dorsal idiosoma — (Figure 3a). Dorsal setal pattern 12A: 7A (*r3* and *R1* off shield). Dorsal shield sclerotized, reticulated, with a slight waist at level of seta *R1*, with four pairs of

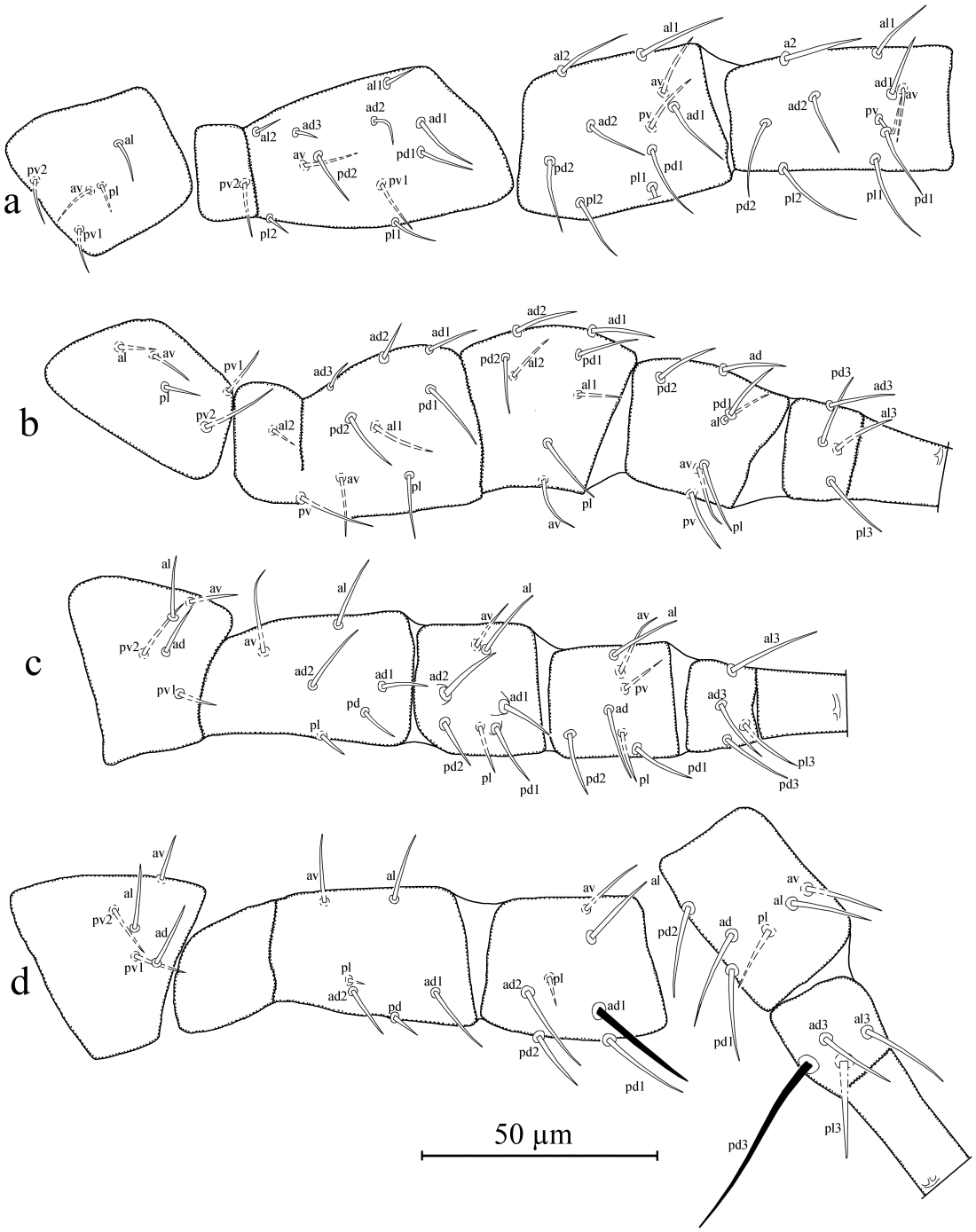

Figure 2 . *Neoseiulus vasoides* (Karg, 1989), female right legs. a – Leg I (trochanter-tibia); b – leg II (trochanter-basitarsus); c – Leg III (trochanter-basitarsus); d – Leg IV (trochanter-basitarsus). Macrosetae drawn in solid black for clarity.

solenostomes (*gd2*, *gd6*, *gd8*, and *gd9*), and 14 pairs of visible poroids (sensillae) (*id1*, *id2*, *id4*, *id5*, *id6*, *idm2*, *idm3*, *idm4*, *idm5*, *idm6*, *idx*, *is1*, *idl3*, and *idl4*). Poroid *idl1* flanking shield and situated on soft cuticle. Muscle-marks (sigilla) visible mostly on podosoma, length of dorsal shield 341 (330–360), width at level of *s4* 171 (165–178), width at level of *S2* 182 (175–188). All dorsal setae smooth, except *Z4* and *Z5* slightly serrated, and *J5* with one barb. Measurements of dorsal setae as follows: *j1* 23 (20–25), *j3* 30, *j4* 17 (15–18), *j5* 18, *j6* 20

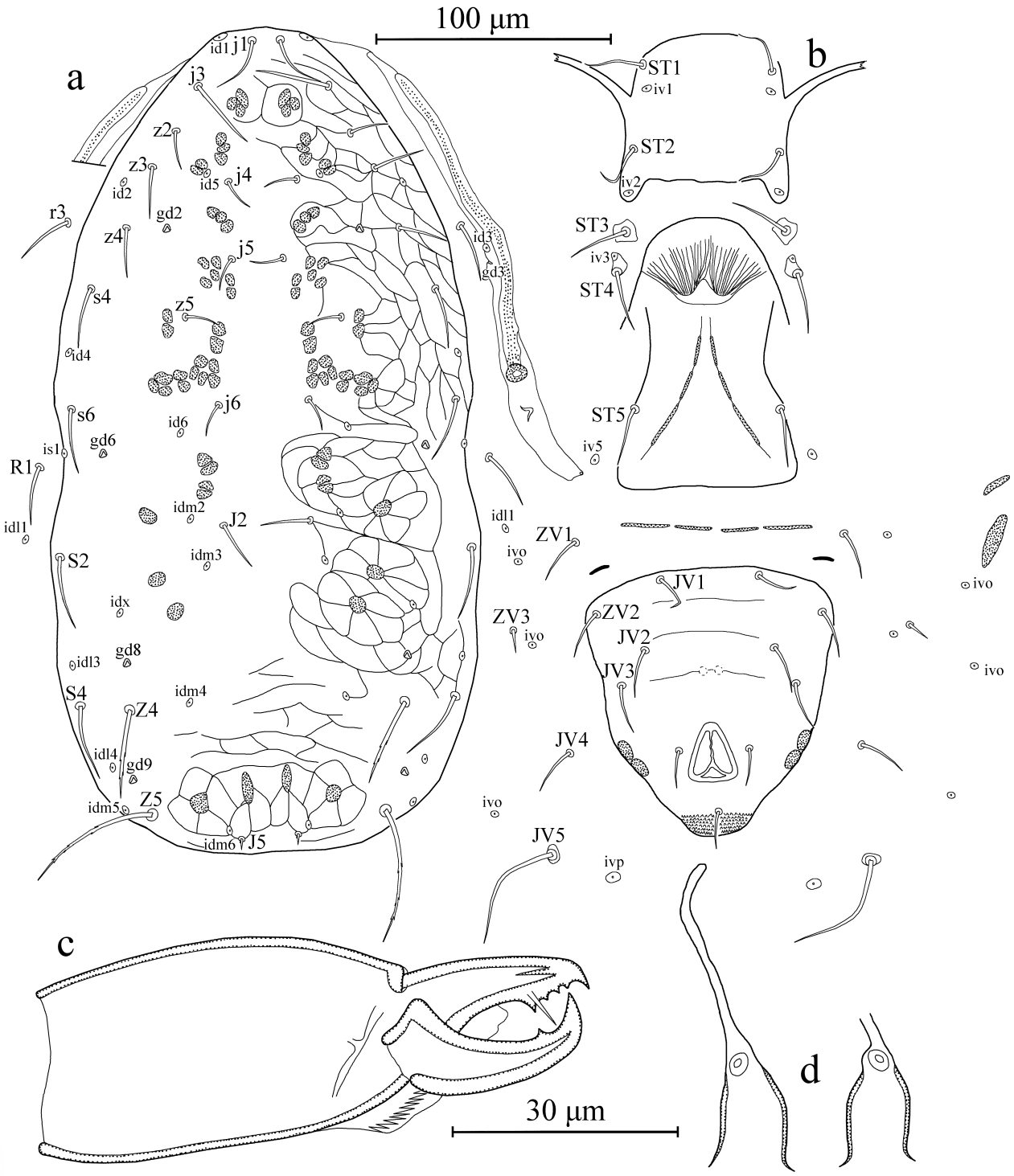

Figure 3 . *Typhlodromus* (*Typhlodromus*) *ernesti* Ragusa & Swirski 1978: female. a – Dorsal idiosoma; b – Ventral idiosoma; c – Chelicera; d – Spermathecae.

(18–22), *J2* 21 (20–23), *J5* 5, *z2* 19 (18–20), *z3* 23 (23–24), *z4* 23 (22–23), *z5* 16 (15–17), *Z4* 36 (33–40), *Z5* 56 (55–58), *s4* 25, *s6* 28 (28–29), *S2* 31 (30–33), *S4* 30, *r3* 24 (23–25), and *R1* 24 (23–25). Peritremes extends to level of setae *j3*. Solenostomes *gd3* and poroid *id3* visible

on peritrematal shield.

Ventral idiosoma — (Figure 3b). Ventral setal pattern 15: *JV*: *ZV*. Sternal shield smooth with two pairs of setae (*ST1*, *ST2*) and two pair of poroids (*iv1*, *iv2*); length (distance between *ST1-iv2*) 54 (53–55), width distance between setae *ST2* 61 (59–63); setae *ST3* on separate platelets, setae *ST4* and poroids *iv3* on metasternal platelets. Posterior margin of sternal shield with wavy lines. Genital shield smooth, with one pair of setae *ST5*; width at level of *ST5* 62 (59–65); one pair of para-genital poroids *iv5* on soft cuticle. Ventrianal shield pentagonal, striated anteriorly; with four pairs of pre-anal setae (*JV1*, *JV2*, *JV3*, and *ZV2*), one pair of para-anal setae *PA*, unpaired post-anal seta *PST*, without preanal solenostomes. Length of ventrianal shield (distance between anterior to posterior margins along midline) 110 (103–113), width at level of *ZV2* 99 (93–103). Four pairs of caudoventral setae (*ZV1*, *ZV3*, *JV4*, and *JV5*) and six pairs of poroids (five pairs of *ivo*, and *ivp*) on soft cuticle surrounding ventrianal shield. Setae *JV5* smooth, 49 (48–50) in length.

Chelicera — (Figure 3c). Fixed digit 26 (25–27) long, with four teeth and pilus dentilis; movable digit 26 (25–27) long, with one tooth.

Spermatheca — (Figure 3d). Calyx bell-shaped, 14 (12–15) long, atrium large nodular incorporated within calyx. Major duct broad and minor duct not visible.

Legs — (Figures 4a–e). Length of legs: I 295 (290–300), II 240 (225–250), III 233 (220–240), and IV 323 (315–330). Chaetotaxy of legs as follows: Leg I: coxa 0 0/1 0/1 0, trochanter 1 0/1 1/2 1, femur 2 3/1 2/2 2, genu 2 2/1 2/1 2, tibia 2 2/1 2/1 2. Leg II: coxa 0 0/1 0/1 0, trochanter 1 0/1 0/2 1, femur 2 3/1 2/1 1, genu 2 2/0 2/0 1, tibia 1 1/1 2/1 1. Leg III: coxa 0 0/1 0/1 0, trochanter 1 1/1 0/2 0, femur 1 2/1 1/0 1, genu 1 2/1 2/0 1, tibia 1 1/1 2/1 1. Leg IV: coxa 0 0/1 0/0 0, trochanter 1 1/1 0/2 0, femur 1 2/1 1/0 1, genu 1 2/1 2/0 1, tibia 1 1/1 2/0 1. Leg IV with three blunt macrosetae, *SgeIV* (*ad1*) 25, *StiIV* (*ad*) 29 (28–30), and *StIV* (*pd3*) 44 (40–48) in length. Other legs without macroseta.

Male (n=1)

(Figure 5)

Dorsal idiosoma — Dorsal setal pattern 12A:7A (setae *r3* and *R1* on shield). Dorsal shield sclerotized, reticulated with five pairs of solenostomes (*gd2*, *gd3*, *gd6*, *gd8*, and *gd9*), and 15 pairs of visible poroids (sensillae) (*id1*, *id2*, *id4*, *id5*, *id6*, *idm2*, *idm3*, *idm4*, *idm5*, *idm6*, *idx*, *is1*, *idl1*, *idl3*, and *idl4*). Muscle-marks (sigillae) visible mostly on podosoma, length of dorsal shield 268, width at level of *s4* 158, width at level of *S2* 148. Morphology of dorsal setae as in female. Measurements of dorsal setae as follows: *j1* 18, *j3* 24, *j4* broken, *j5* 14, *j6* 15, *J2* 16, *J5* 5, *z2* 13, *z3* 19, *z4* 17, *z5* 15, *Z4* 30, *Z5* 46, *s4* 23, *s6* 26, *S2* 25, *S4* 21, *r3* 20 and *R1* 17. Peritreme extends to level of seta *z2*.

Ventral idiosoma — (Figure 5a). Ventral setal pattern 12: *JV–4*: *ZV–1*, *3*. Sternogenital shield smooth, with five pairs of setae (*ST1–ST5*) and three pairs of poroids (*iv1*, *iv2*, *iv3*); distance between bases of setae *ST1–ST5* 105, distance between bases of setae *ST3* 57. Ventrianal shield triangular, transversally striated anteriorly; with four pairs of pre-anal setae (*JV1*, *JV2, JV3*, and *ZV2*), a pair of para-anal seta (*PA*) and post-anal seta (*PST*), without preanal solenostomes. Length of ventrianal shield 100, width at level of anterolateral corners 140. Seta *JV5* and two pairs of poroids *ivo* and *ivp* on soft cuticle surrounding ventrianal shield. Setae *JV5* smooth, 25 long.

Chelicera — (Figure 5b). Fixed digit 20 long, with three teeth and pilus dentilis; movable digit 20 long with one tooth. Spermatodactyl foot almost straight, toe slightly bulbous, 25 long from basal attachment to tip of toe (including foot and toe).

Legs — Length of legs: Length of legs (excluding pretarsus): I 260, II 215, III 210, and 285. Chaetotaxy as female. Leg IV with three blunt macrosetae, *SgeIV* (*ad1*) 20, *StiIV* (*ad*) 25, and *StIV* (*pd3*) 38 in length. Other legs without macrosetae.

Material examined

Four females and one male specimens from *Abies nordmanniana* (Stev.) subsp. *equi-trojani* (Pinaceae), in association with unknown eriophyid mites, in Kaz Dağları, 39°45′57″ N,

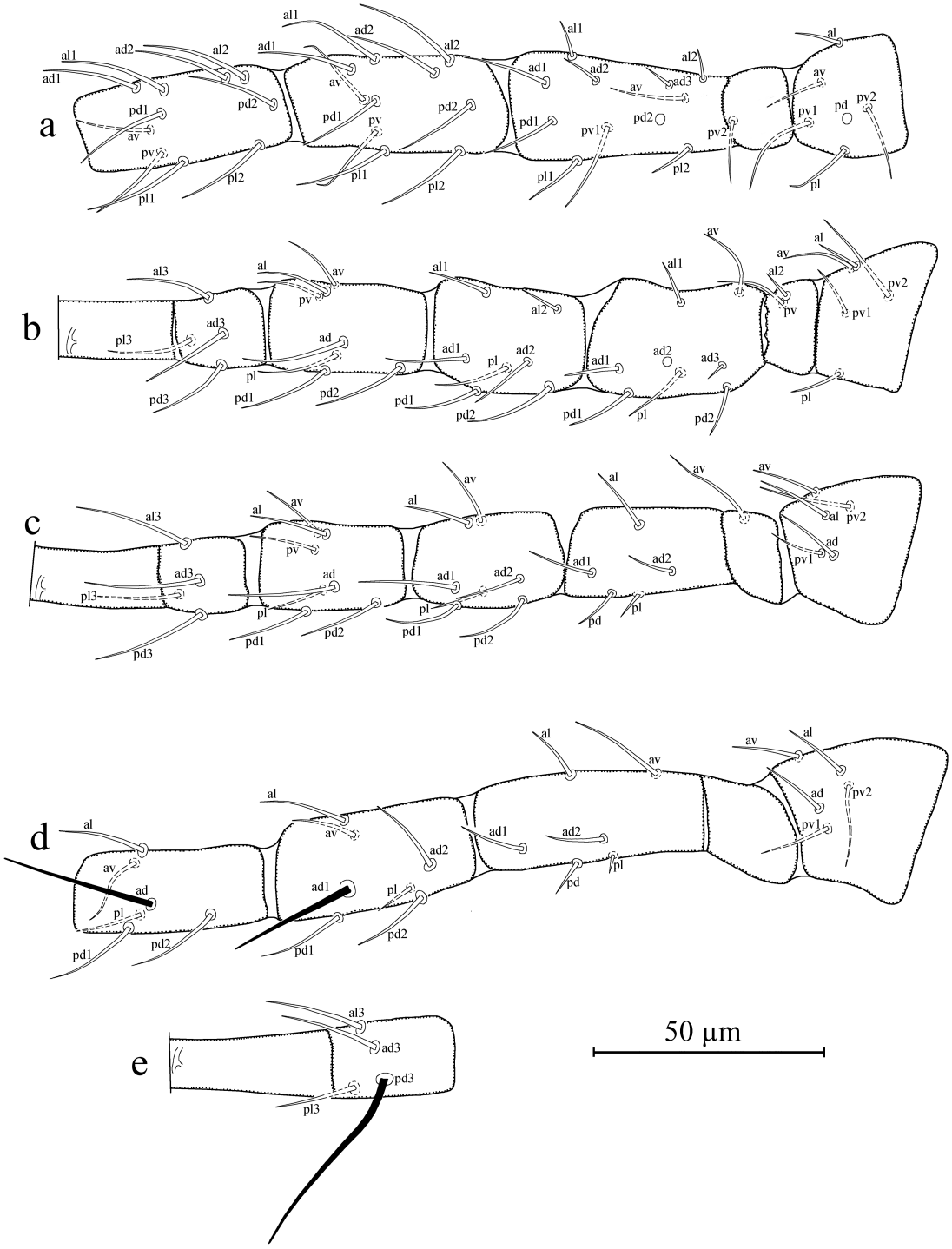

Figure 4 . *Typhlodromus* (*Typhlodromus*) *ernesti* Ragusa & Swirski 1978, female left legs. a – Leg I (trochanter-tibia); b – leg II (trochanter-basitarsus); c – Leg III (trochanter-basitarsus); d – Leg IV (trochanter-tibia); e – Leg IV (basitarsus). Macrosetae drawn in solid black for clarity.

26°58′31″ E, 1.350 meters above sea level, in Bayramiç county, Çanakkale Province, 25 July 2024, İ. Yaşar, Ş. Kök and İ. Kasap collectors.

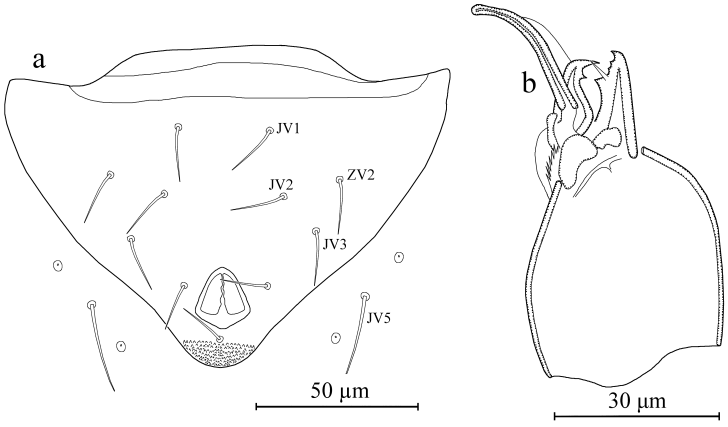

Figure 5 . *Typhlodromus* (*Typhlodromus*) *ernesti* Ragusa & Swirski 1978: male. a – Ventrianal shield; b – Chelicera.

Remarks

Typhlodromus (*Typhlodromus*) *ernesti* was first described by Ragusa and Swirski (1978) based on the holotype and four paratype specimens collected from *Taxus baccata* L. (Taxaceae) in Monte Amiata, Tuscany, Italy. This is the first report of *T.* (*T.*) *ernesti* in Türkiye. Morphological characteristics and measurements of the current specimens are almost identical with those of provided in its original description and a subsequent redescription (Chant and Yoshida-Shaul 1987).

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