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# Complementary description of *Typhlodromus (Anthoseius) drori* Grinberg & Amitai (Acari: Mesostigmata: Phytoseiidae), a new record for Russia with its new synonyms

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## Original research

### ABSTRACT

*Typhlodromus (Anthoseius) drori* Grinberg & Amitai is redescribed based on female and male specimens collected from *Tamarix* sp. in Republic of Dagestan, Russia. In addition, *T. (A.) tamaricis* (Kolodochka), *T. (A.) beskaravainyi* (Kuznetsov) are proposed as junior synonyms of *T. (A.) drori*, while *T. (A.) eremitidis* (Chaudhri, Akbar & Rasool) is considered a potential junior synonym.

**Keywords** predatory mites; Typhlodrominae; morphology; biodiversity; taxonomy; *Tamarix*

**Zoobank** <http://zoobank.org/1A8EC08F-1704-460D-AB81-CDFFA80E281F>

## Introduction

Predatory mites belonging to the family Phytoseiidae (Acari: Mesostigmata) are recognized as significant biological control agents against a range of phytophagous pests, including mites (primarily from the families Tetranychidae, Tenuipalpidae, Tarsonemidae, and Eriophyidae) and other small soft-bodied insects such as thrips and whiteflies (McMurtry *et al.* 2013). Mites from the subgenus *Typhlodromus (Anthoseius)* De Leon are distributed globally, predominantly inhabiting vascular plants. This subgenus is differentiated from its sister subgenus, *Typhlodromus (Typhlodromus)* Scheuten, by the presence of dorsal idiosomal setae *S5*. Mites of the subgenus *Typhlodromus (Anthoseius)* De Leon comprise the largest number of species in the subfamily Typhlodrominae, with approximately 400 described species, including synonyms (Demite *et al.* 2024). However, because most of species were originally described briefly and lack many important characters used in modern phytoseiid taxonomy, it is assumed that many synonyms exist (Döker *et al.* 2024a, b; Jose *et al.* 2024). The fauna of the subgenus *Anthoseius* in Russia currently includes about 23 species (Demite *et al.* 2024; Döker *et al.* 2021; Khaustov *et al.* 2021, 2022). The fauna of phytoseiid mites in the Republic of Dagestan is practically unknown, except for a single species, *Amblyseius meridionalis* Berlese (Makarova & Ermilov 2022).

In this study, we report *Typhlodromus (Anthoseius) drori* Amitai & Grinberg for the first time in Russia. A complementary description based on female and male specimens, collected from the Republic of Dagestan, Russia, is provided. In addition, *T. (A.) tamaricis* (Kolodochka) and *T. (A.) beskaravainyi* (Kuznetsov) are proposed as junior synonyms of *T. (A.) drori*, while *T. (A.) eremitidis* (Chaudhri, Akbar & Rasool) is considered a potential junior synonym.

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## Material and methods

The mites were extracted from the leaves and branches of various plants using Berlese-Tullgren funnels and collected in 2 ml tubes filled with 96% ethanol using a camel hairbrush (size 000). Subsequently, some of the mite specimens were treated with 80% lactic acid for clearing and then fixed in Hoyer's medium for further morphological analysis (Walter & Krantz 2009). The classification of Phytoseiidae mites follows Chant & McMurtry (2007). Dorsal setal nomenclature follows that of Lindquist & Evans (1965) and adapted by Rowell *et al.* (1978) for adult phytoseiids. The ventral idiosomal nomenclature follows that of Chant & Yoshida-Shaul (1991). The nomenclature of setae on leg segments is based on Evans (1963). The terminology for the dorsal solenostomes (gland pores) and poroids follows that of Athias-Henriot (1975). Measurements are presented in micrometers ( $\mu\text{m}$ ) and are given in square brackets for the female holotype of *T. (A.) beskaravainyi* (Kuznetsov) with mean values and ranges in parentheses indicating variability for newly collected specimens. Morphological observations, illustrations, and measurements were conducted using the Axio Imager A2 compound microscope (Carl Zeiss, Germany), which is equipped with differential interference contrast and phase contrast optical systems. Digital images were captured using the AxioCam 506 colour (Carl Zeiss, Germany). Line drawings of mites were prepared in Adobe Photoshop CS2 using a Wacom Cintiq 16 (DTK1660K0B) interactive display and Wacom Pro Pen 2. The length of the dorsal shield was measured along the midline at the level of setae *j1* and *J5*. The length of peritreme in female measured from basal margin of stigma to apex of peritreme. All examined specimens deposited in the mite collection of the Zoology Museum of Tyumen State University, Russia.

## Results

### *Typhlodromus (Anthoseius) drori* Grinberg & Amitai

(Figures 1–5)

*Typhlodromus drori* Grinberg & Amitai, 1970: 7.

*Anthoseius beskaravainyi* Kuznetsov, 1984: 385. **New synonym.**

*Anthoseius (Amblydromellus) tamaricis* Kolodochka, 1982: 11. **New synonym.**

*Amblydromella eremitidis* Chaudhri, Akbar & Rasool, 1974: 212. **Suspected junior synonym.**

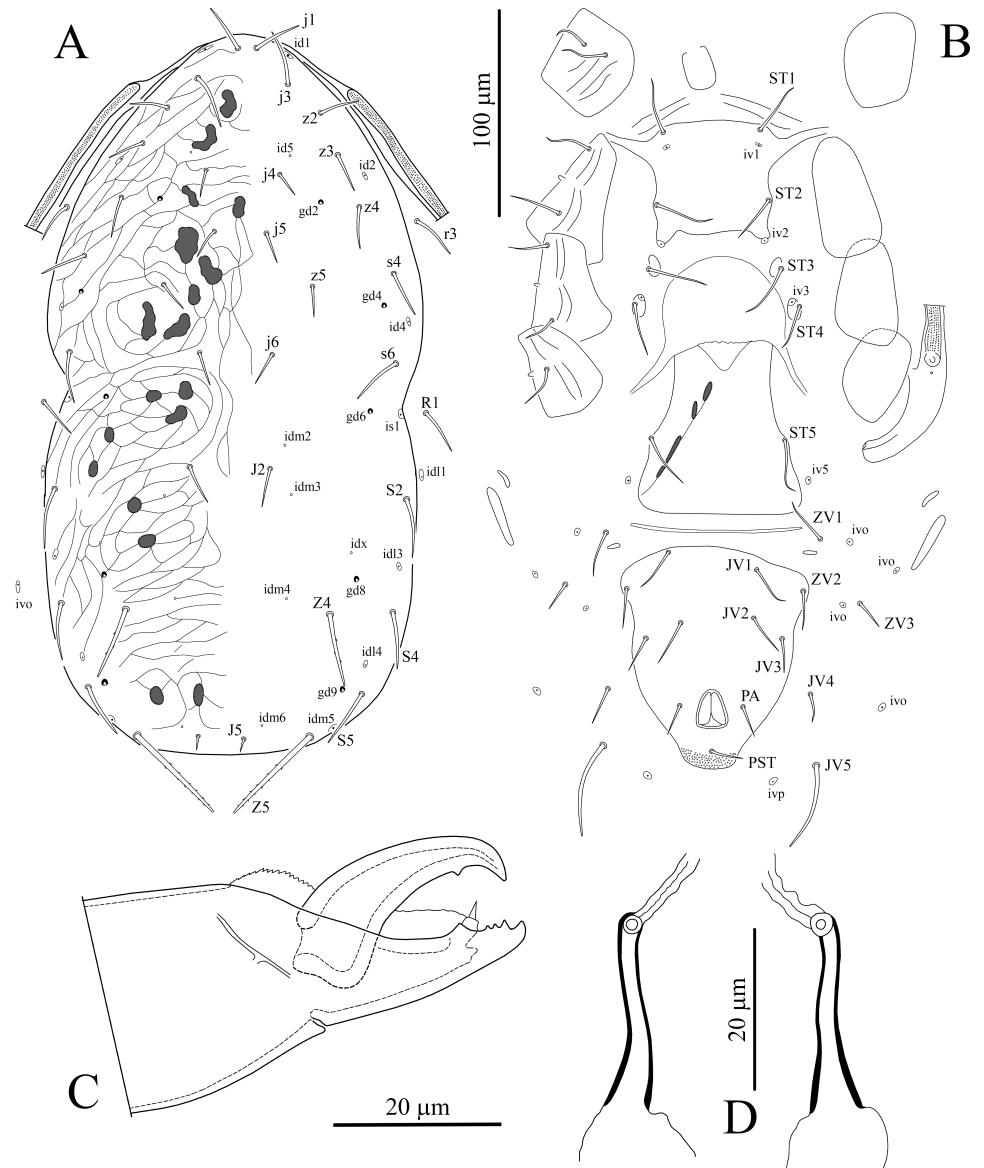
### Material examined

Fourteen females, two males on *Tamarix* sp. near river Shura-ozen, Kumtorkalinsky district, Dagestan Republic, Russia, 43°00' N 47°14' E, 11 May 2024, coll. Khaustov A.A.; holotype female of *T. (A.) beskaravainyi* (Kuznetsov), on fruit and herbaceous plants, slide number 203/1, Leningradsky district, Kulab Region, Tajikistan, 12 Aug. 1976, coll. Kuznetsov N.N.

### Diagnosis

**Female** — Idiosoma setal pattern 12A:8A/JV: ZV (*r3* and *R1* off shield). Dorsal shield well reticulated, with five pairs of solenostomes (*gd2*, *gd4*, *gd6*, *gd8*, *gd9*); all dorsal setae smooth, except *Z4* and *Z5* slightly serrated. Peritremes extending to level between setae *j3*–*z2*. All ventral shields smooth; ventrianal shield pentagonal with four pairs of preanal setae and without preanal pores. Calyx of spermatheca narrow and tubular with nodular atrium incorporated to basal part of calyx. Fixed digit of chelicera with four teeth, movable digit with one tooth. Leg IV with three macrosetae *SgeIV* and *StIV* modified into club-shape and *StiIV* blunt-shaped. Trochanter I with six setae and genu II with seven setae.

**Male** — Idiosoma setal pattern 12A:8A/JV – 4: ZV – 1, 3 (*r3* and *R1* on shield). Dorsal shield well reticulated, with five pairs of solenostomes (*gd2*, *gd4*, *gd6*, *gd8*, *gd9*). Peritremes extending to level between setae *z2*–*z3*. Peritremal shield with a pair of enlarged solenostome *gd3*. Dorsal setae as in female. Ventrianal shield triangular, slightly reticulated, with four pairs



**Figure 1** *Typhlodromus (Anthoseius) drori* Grinberg & Amitai, 1970, female. A – Dorsal idiosoma, B – Ventral idiosoma, C – Chelicera, D – Spermathecae.

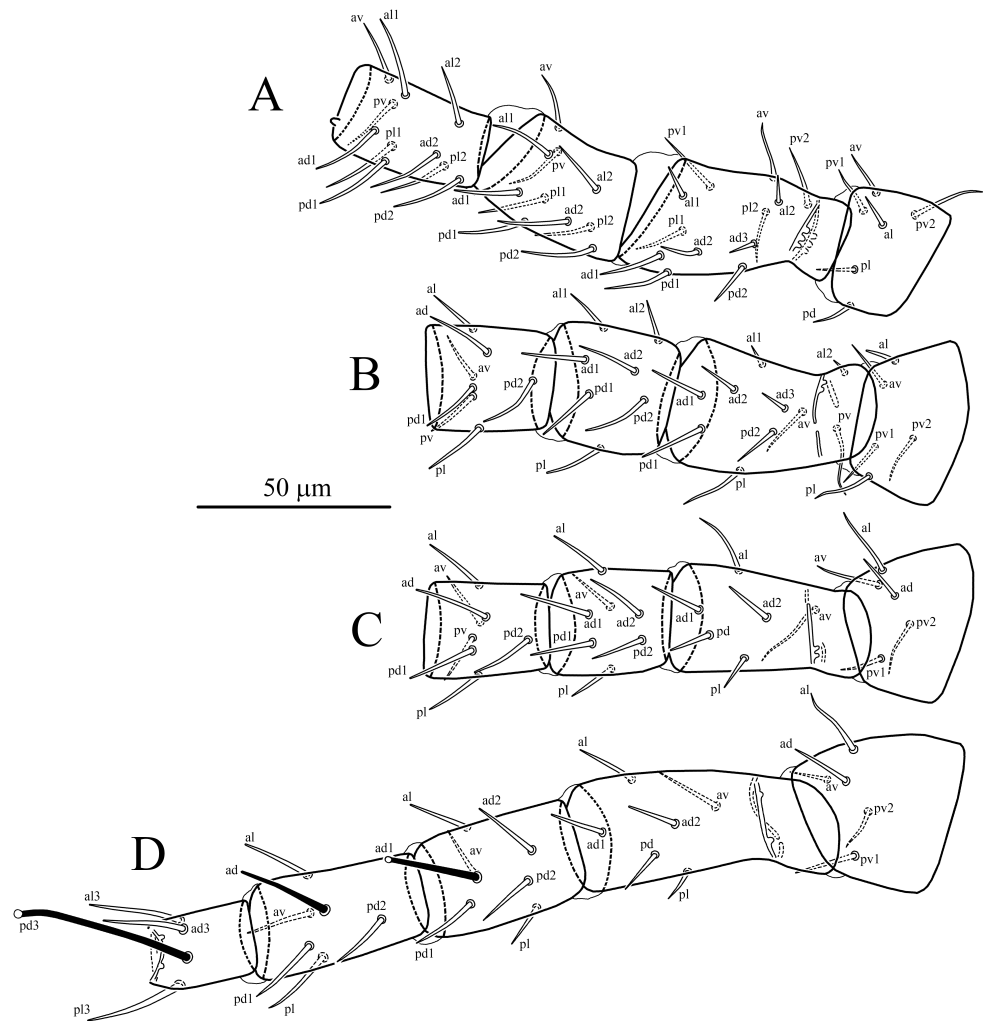
of preanal setae and without preanal pores. Fixed digit of chelicera with three apical teeth and movable digit unidentate. Spermatodactyl L-shaped, large and expanded apically. Leg chaetotaxy, number and shape of macrosetae as in female.

**Complementary description**

**Female (n = 5 + holotype female of *T. (A.) beskaravainyi*)**

(Figures 1–4)

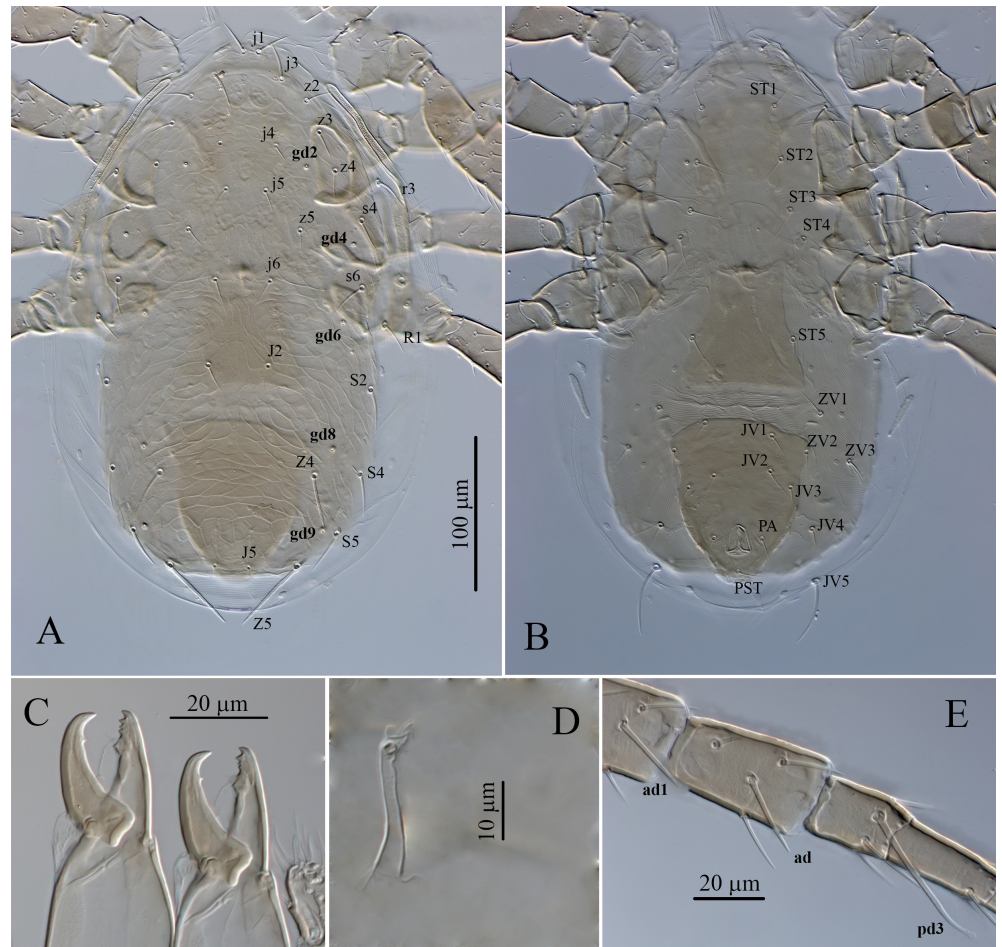
**Dorsal idiosoma** — (Figures 1A, 3A). Dorsal setal pattern 12A:8A (setae *r3* and *R1* off shield). Dorsal shield oval elongated, well reticulated, with constriction at level of *R1*, with five pairs of solenostomes (*gd2*, *gd4*, *gd6*, *gd8*, *gd9*) and 14 visible poroids (*idl1*, *id2*, *id4*, *id5*, *idm2*, *idm2*, *idm3*, *idm4*, *idm5*, *idm6*, *is1*, *idx*, *idl3*, *idl4*); poroid *idl1* situated on soft



**Figure 2** *Typhlodromus (Anthoseius) drori* Grinberg & Amitai, 1970, female, left legs. A – Leg I (coxa and tarsus omitted), B – Leg II (coxa and tarsus omitted), C – Leg III (coxa and tarsus omitted), D – Leg IV (coxa and telotarsus omitted).

cuticle. Muscle-marks (sigillae) visible mostly on podosoma, length of dorsal shield [362] 353 (349–359), width at level of *s4* [170] 174 (172–177), width at level *S2* [–] 176 (172–180). Dorsal setae smooth, except *Z4* and *Z5* slightly serrated. Measurements of dorsal setae: *j1* [24] 23 (21–24); *j3* [28] 26 (23–28); *j4* [14] 14 (13–14); *j5* [15] 14 (14–15); *j6* [17] 16 (15–17); *J2* [20] 18 (17–20); *J5* [6] 7 (6–8); *z2* [20] 19 (17–20); *z3* [20] 19 (17–20); *z4* [20] 21 (20–21); *z5* [15] 14 (13–15); *Z4* [36] 33 (31–36); *Z5* [54] 49 (47–52); *s4* [24] 22 (20–24); *s6* [28] 25 (23–26); *S2* [30] 28 (26–29); *S4* [28] 27 (25–28); *S5* [28] 27 (23–32); *r3* [23] 21 (20–23); *R1* [25] 21 (19–23). Peritreme [142] 146 (145–148) in length, extending to level between setae *j3*–*z2*. Peritremal shield with small rounded solenostome *gd3* and poroid *id3*.

**Ventral idiosoma** — (Figures 1B, 3B, 4A). Ventral setal pattern 15: *JV*: *ZV*. Sternal shield smooth, poorly sclerotized, [not measurable] 57 (54–59) in length (distance between *ST1*–*iv2*) and [not measurable] 58 (54–60), width (distance between bases of setae *ST2*); with two pairs of setae (*ST1*, *ST2*) and two pairs of poroids (*iv1*, *iv2*); setae *ST3* situated on small poorly sclerotized shield; metasternal setae *ST4* and poroids *iv3* situated on metasternal shields. Genital shield smooth, width at level of setae *ST5* [68] 66 (62–68), poroids *iv5* on soft cuticle. One long slender platelet (genital sigilla) between genital and ventrianal shield. Ventral



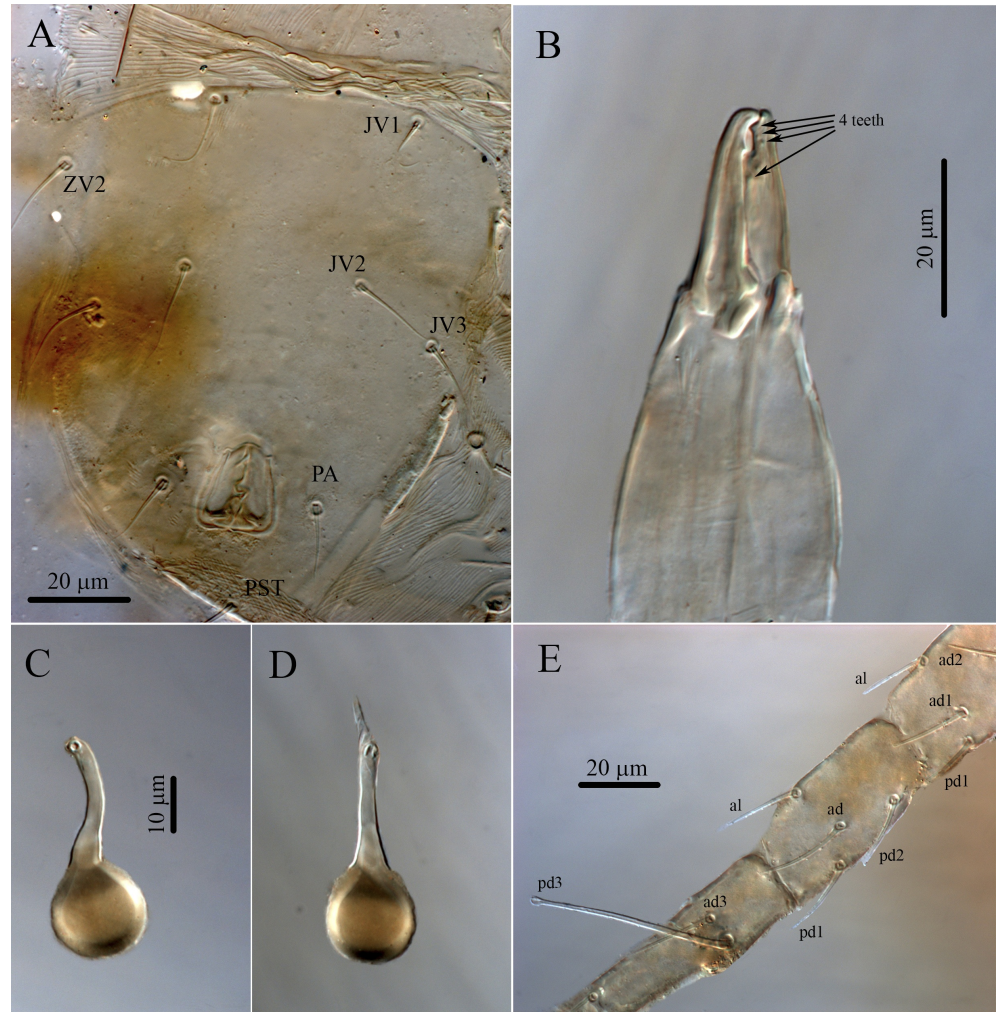
**Figure 3** DIC micrographs of *Typhlodromus (Anthoseius) drori* Grinberg & Amitai, 1970, female. A – Dorsal idiosoma, B – Ventral idiosoma, C – Chelicerae, D – Spermatheca, E – Genu, tibia and basitarsus of leg IV (dorsal view).

opisthosoma with two pairs of metapodal platelets, primary [28] 32 (31–34) and accessory [13] 10 (7–12). Ventrianal shield pentagonal, smooth, with four pairs of pre-anal setae (*JV1*, *JV2*, *JV3*, *ZV2*), one pair of para-anal setae *PA*, unpaired post-anal seta *PST*, preanal solenostomes *gv3* absent. Length of ventrianal shield [111] 109 (106–113), width at the level of setae *ZV2* [91] 91 (89–94). Setae *ZV1*, *ZV3*, *JV4*, *JV5* and five pairs of poroids on soft cuticle surrounding ventrianal shield. Setae *JV5* smooth and much longer than other ventral setae, [43] 39 (34–42) in length.

**Chelicera** — (Figures 1C, 3C, 4B). Fixed digit [not measurable] 28 (27–29) long, with five teeth, three of them apical and one situated near base of pilus dentilis; movable digit [not measurable] 28 (27–28) long with one tooth.

**Spermatheca** — (Figures 1D, 3D, 4C–D). Calyx tubular [24] 24 (22–24) long, with large nodular atrium incorporated to basal part of calyx. Major duct wide, minor duct not visible.

**Legs** — (Figures 2, 3E, 4E). Length of legs (distance between bases of coxae to bases of pretarsi): leg I [255] 276 (269–285); leg II [230] 243 (234–248); leg III [221] 251 (240–258); leg IV [325] 321 (318–325). Chaetotaxy as follows: Leg I: coxa 0/0/1/0/0, trochanter 1/0/1/1/2, femur 2/3/1/2/2/2, genu 2/2/1/2/1/2, tibia 2/2/1/2/1/2; Leg II: coxa 0/0/1/0/0, 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 0/0/1/0/0, trochanter 1/1/1/0/2/0, genu 1/2/1/2/0/1; tibia 1/1/1/2/1/1; Leg IV: coxa 0/0/1/0/0, 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. Chaetotaxy of tarsi II–IV



**Figure 4** DIC micrographs of *Typhlodromus (Anthoseius) beskaravainyi* (Kuznetsov, 1984), holotype female, a junior synonymy of *T. (A.) drori* Grinberg & Amitai. A – Ventrianal shield, B – Chelicera, C, D – Spermathecae, E – Genu, tibia and basitarsus of leg IV (dorsal view).

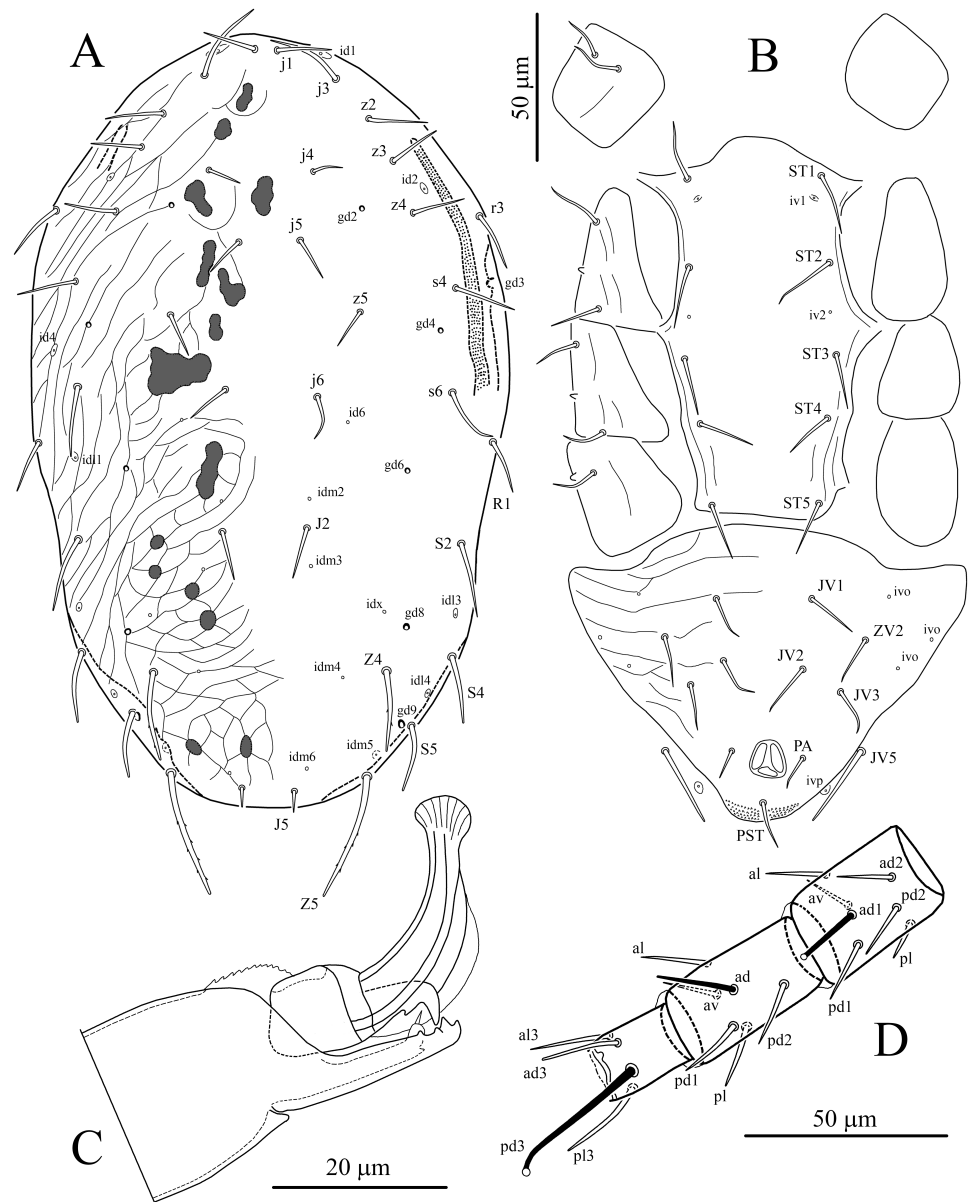
is typical for Phytoseiidae with 18 setae 3 3/2 3/2 3 +mv, md. Leg IV with three macrosetae, club-shaped *SgeIV* [20] 23 (22–25) and *StiIV* [50] 49 (47–52), blunt-shaped *StiIV* [21] 23 (22–24). Other segments of legs without macrosetae.

**Male (n = 2)**

(Figure 5).

**Dorsal idiosoma** — (Figure 5A). Dorsal setal pattern 12A:8A (setae *r3* and *R1* on shield). Dorsal shield oval, reticulated, length of dorsal shield 257–267, width at level of *s4* 136–168, width at level of *S2* 132–144. Dorsal shield with five pairs of solenostomes (*gd2*, *gd4*, *gd6*, *gd8* and *gd9*) and 13 visible pairs of poroids. Muscle-marks (sigillae) visible mostly on podosoma. Dorsal setae smooth, except *Z4* and *Z5* slightly serrated. Measurements of dorsal setae: *j1* 17–18, *j3* 25–28, *j4* 12–13, *j5* 13–15, *j6* 15–16, *J2* 16–18, *J5* 7–8, *z2* 17–18, *z3* 15–18, *z4* 16–18, *z5* 13–15, *Z4* 26–30, *Z5* 37–45, *s4* 19–20, *s6* 21–25, *S2* 23–25, *S4* 23, *S5* 22–23, *r3* 20–21 and *R1* 17–19. *Peritreme* extending to level between setae *z2*–*z3*. *Peritremal shield* with a pair of enlarged solenostome *gd3*.

**Ventral idiosoma** — (Figure 5B). Ventral setal pattern 12:JV-4:ZV-1,3. *Sternogenital shield* smooth with a few lateral striae, with five pairs of setae (*ST1*–*ST5*) and two visible



**Figure 5** *Typhlodromus (Anthoseius) drori* Grinberg & Amitai, 1970, male. A – Dorsal idiosoma, B – Ventral idiosoma, C – Chelicera, D – Genu, tibia and basitarsus of leg IV.

pairs of poroids (*iv1*, *iv2*); length (distance between bases of setae *ST1–ST5*) 112–113, width (distance between bases of setae *ST2*) 49. Ventrianal shield triangular, striated anterolaterally; with four pairs of pre-anal setae (*JV1*, *JV2*, *JV3*, and *ZV2*), a pair of para-anal seta (*PA*) and post-anal seta (*PST*), pre-anal solenostomes *gv3* absent. Length of ventrianal shield (from anterior to posterior margins) 96–102, width at level of anterolateral corners 138–142. Seta *JV5* and a pair of poroids *ivp* on soft cuticle surrounding ventrianal shield. Setae *JV5* smooth, much longer than other ventral setae, 25–29 long.

**Chelicera** — (Figure 5C). Fixed digit of chelicera 23 long, with three sub-apical teeth and short pilus dentilis; movable digit 22 long with one tooth. Spermatodactyl L-shaped, large with toe expanded apically.

**Legs** — (Figure 5D). Length of legs (base of coxae to base of pretarsus): leg I 228–234; leg



II 202–204; leg III 209–211; leg IV 265–273. Chaetotaxy formulae of the segments as in adult female. Leg IV with three macrosetae, club-shaped *SgeIV* 17 and *StiIV* 38–44, blunt-shaped *StiIV* 18–20.

## World distribution

Israel, Greece, Iran, Saudi Arabia, Turkey, Turkmenistan, Tajikistan, Russia (this study).

## Remarks

*Typhlodromus (Anthoseius) drori* Grinberg & Amitai was initially described based on 34 female and 10 male specimens collected from *Tamarix* sp. in Ein Fesha, Southern District, Israel. Later, it was reported again from the same country (Swirski & Amitai 1985; Swirski *et al.* 1998). The specimens examined in our study closely match the original description, except that setae *S5* are smooth in our specimens, whereas it was described as slightly serrated in the original description. However, Swirski *et al.* (1998) studied the holotype female and reported only setae *Z4* and *Z5* as being serrated.

Furthermore, upon examining the original descriptions of all known species from the subgenus *Typhlodromus (Anthoseius)*, it was determined that *T. (A.) tamaricis* (Kolodochka, 1982), *T. (A.) eremitidis* (Chaudhri, Akbar & Rasool, 1974), and *T. (A.) beskaravainyi* (Kuznetsov, 1984) are morphologically very similar to *T. (A.) drori*.

The original description and redescrptions of *T. (A.) tamaricis*, are consistent with the original description of *T. (A.) drori*, except length of setae *j3* (15), *S4* (15) and *S5* (15), which are almost two times shorter than in the original description of *T. (A.) drori* *j3* 27–33, *S4* 27–33, *S5* 30–42. However, in the original illustration of dorsal idiosoma (Figure 3.1, page 12 in Kolodochka 1982) of *T. (A.) tamaricis*, seta *j3* is longer than *j1* (23), and setae *S4* and *S5* are almost equal in length to seta *S2* (28). Therefore, it is possible that there was an oversight in measurements of setae *j3*, *S4* and *S5*. In addition, morphometric and morphological characters of original description of *T. (A.) drori* and the specimens examined in the current study well fit with the redescrptions of *T. (A.) tamaricis* by Stathakis *et al.* (2016), Fayaz *et al.* (2012) and Kasap and Çobanoğlu (2009).

The original description of *T. (A.) beskaravainyi* closely resembles *T. (A.) drori*, except for differences in the number of teeth on the movable digit (two in *T. (A.) beskaravainyi* vs. one in *T. (A.) drori* and the reticulated ventrianal shield of the female. However, our examination of the holotype female of *T. (A.) beskaravainyi* reveals that the aforementioned morphological characters were likely described incorrectly in the original description and are, in fact, identical to those described in the original description of *T. (A.) drori* and the specimens examined in the current study.

Original description of *T. (A.) eremitidis*, described from Pakistan, is also totally consistent with *T. (A.) drori* based on idiosomal setal measurements. However, it differs in having a smooth dorsal shield and a club-shaped macroseta on the tibia of leg IV. These differences, along with the impossibility of examining the type material, prevent us to confidently asserting *T. (A.) eremitidis* is a junior synonym of *T. (A.) drori*. Therefore, in this study, we propose to considering *T. (A.) eremitidis* only as a potential junior synonym until a detailed examination of its type material can be conducted.

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