

A NEW SPECIES OF PHYTOSEIIDAE (ACARI: MESOSTIGMATA) FROM THE ALPINE CAUCASUS, RUSSIA

Vladimir A. Khaustov^{1*}, Ismail Döker^{1,2}, Omid Joharchi¹ and Alexander A. Khaustov¹

¹X-BIO Institute, Tyumen State University, Tyumen, Russia

²Acarology Laboratory, Department of Plant Protection, Agricultural Faculty, Cukurova University, Adana, Turkey

*corresponding author; e-mail: v.a.khaustov@utmn.ru

ABSTRACT: *Typhlodromips pseudomontanus* sp. n. (Acari: Phytoseiidae) is described and illustrated based on material collected from low-ground herbaceous plants in the Alpine Caucasus, Krasnodar Territory, Russia.

KEY WORDS: Typhlodromipsini, fauna, predatory mites, new species.

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INTRODUCTION

The genus *Typhlodromips* De Leon, 1965 is a large genus in the tribe Typhlodromipsini Chant et McMurtry, 2005, with 105 described species (Demite *et al.* 2021) generally distributed in South, Central and North America (including Mexico), Africa, Australia, China, India and Japan (Chant and McMurtry 2005).

According to Chant and McMurtry (2005), the genus *Typhlodromips* is defined by the combination of the following distinctive characters: female dorsal setal pattern 10A:9B (except *T. extrasetus* Moraes *et al.* 2001 with *J1* seta); dorsal setae *Z4* and *Z5* often stout and serrated; ratio of setae *s4*:*Z1* < 3.1: 1.0; seta *z2* shorter than distance between its base and that of seta *z4*; seta *z4* usually shorter than distance between its base and that of seta *s4*; setae *z6* absent. The genus is further divided into five species groups based on the presence/absence of dorsal seta *J1* and the shape of the spermathecal calyx (Chant and McMurtry 2005).

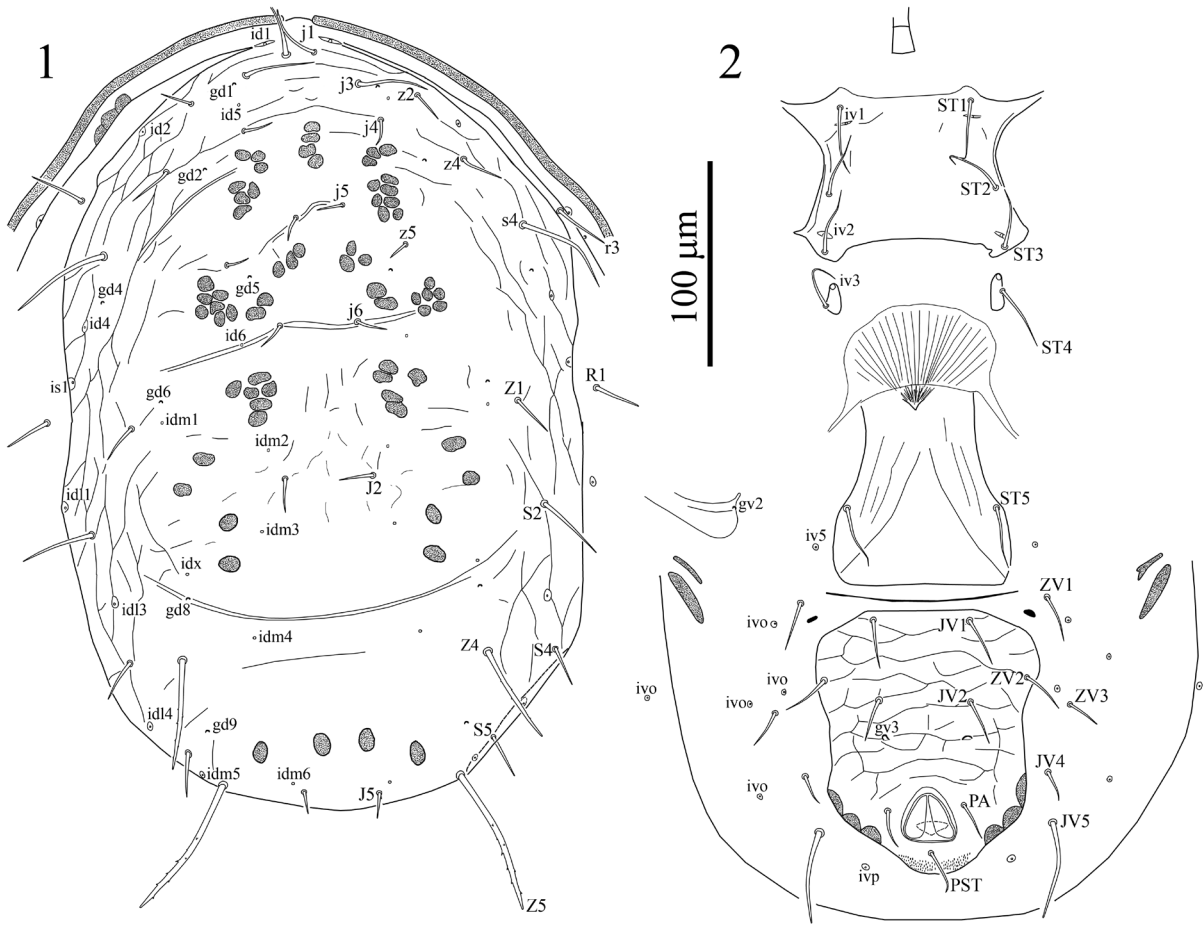
Until now, the Krasnodar Territory fauna of phytoseiid mites includes 19 species belonging to ten genera (Beglyarov, 1958, 1962, 1981; Wainstein, 1962, 1972, 1977; Sapozhnikova, 1966; Beglyarov and Malov, 1977; Kuznetsov, 1984; Meshkov, 1990; Kolodochka, 2006; Demite *et al.* 2021). In this study, a new species, *Typhlodromips pseudomontanus* sp. n., is described and illustrated based on material collected from the Alpine Caucasus, Krasnodar Territory, Russia.

MATERIALS AND METHODS

Low-herbaceous plants were collected during a survey conducted in the aforementioned region. The mites were collected directly from plant

leaves with the aid of a stereomicroscope “Discovery V8” and placed in vials filled with 96% ethanol. Specimens were cleared in lactic acid solution and mounted in Hoyer’s medium. The taxonomic system follows that of Chant and McMurtry (2007). Setal nomenclature for the dorsal idiosoma follows that of Lindquist and Evans (1965) as adapted by Rowell *et al.* (1978) and Chant and Yoshida-Shaul (1991). For designations of dorsal solenostomes (gland pores), we used Athias-Henriot (1975) as proposed by Papadoulis *et al.* (2009), and for the ventral surface of the idiosoma, we applied Johnston and Moraza (1991). The terminology of the morphological structures of the spermatodactyl follows that of Beard (2001). The chaetotaxy of the palp tibia and tarsus and of the distal part of tarsus I follows that of Jackson (1974) with minor modification by Khaustov (2020). Chaetotaxy of other parts of legs and palps follows that of Evans (1963a, 1963b). Measurements are given in micrometers (µm) and are presented as the mean followed by the range in parentheses.

Morphological observations, illustrations and measurements were made using a compound microscope Axio Imager A2 (Carl Zeiss, Germany), equipped with differential interference contrast (DIC) and phase contrast optical systems. Pictures were taken with an Axiocam 506 color (Carl Zeiss, Germany). The holotype, one female paratype and allotype male are deposited at the mite collection of the Tyumen State University Museum of Zoology, Tyumen, Russia (TSUMZ). One female paratype is deposited in the Acarology Laboratory, Department of Plant Protection, Cukurova University, Adana, Turkey (ALCU).



Figs. 1–2. *Typhlodromips pseudomontanus* sp.n., female. 1—dorsal idiosoma; 2—ventral idiosoma.

SYSTEMATICS

Family **Phytoseiidae Berlese, 1916**
 Genus ***Typhlodromips* De Leon, 1965**
Typhlodromips pseudomontanus sp.n.

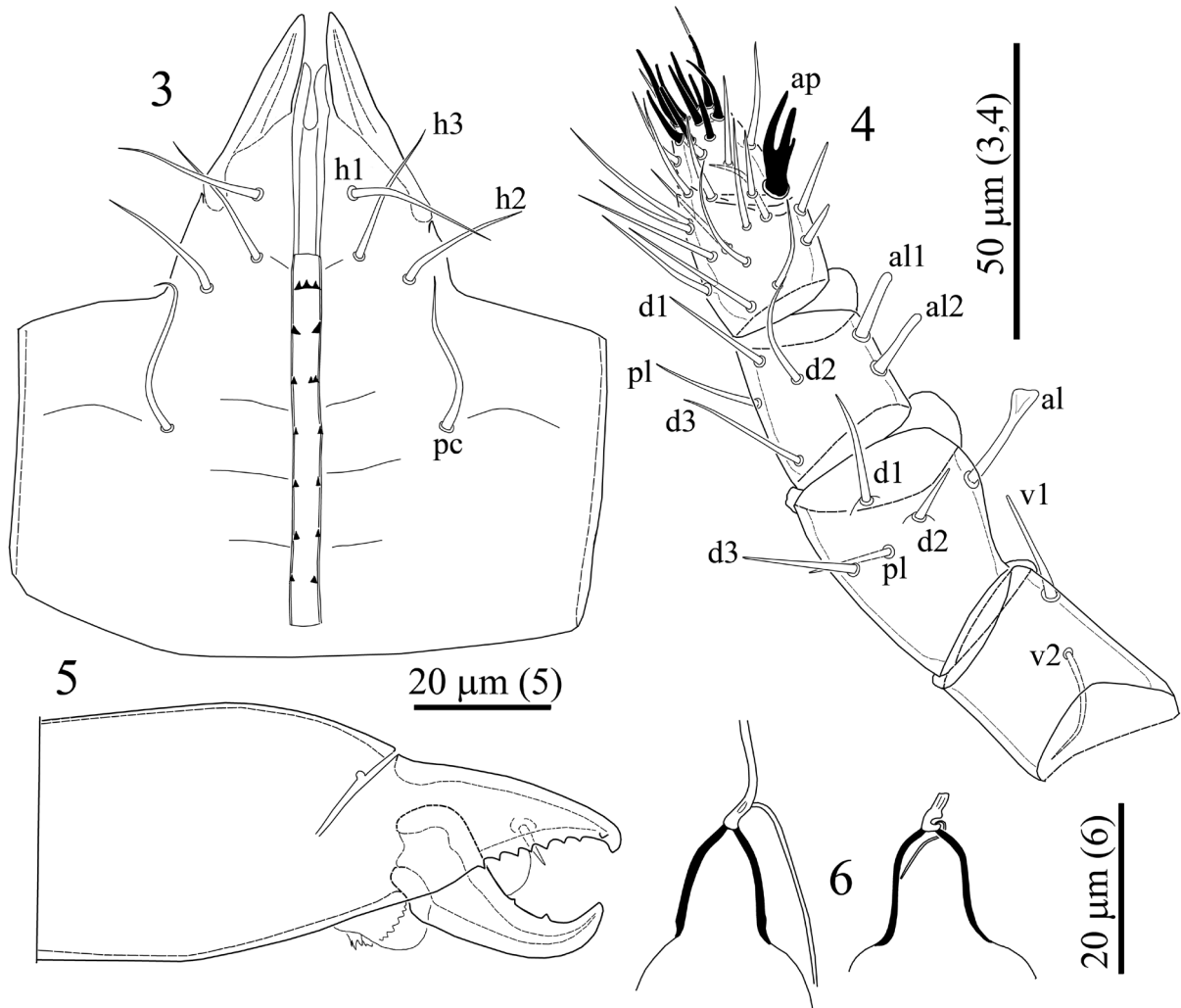
(Figs. 1–22)

Diagnosis. Dorsal setal pattern 10A:9B; dorsal shield with patches of reticulations in anterolateral and posterolateral regions, with seven pairs of solenostomes. Dorsal setae smooth and setiform except *Z4* and *Z5*, which serrated and stout. Peritreme extending to level of setae *j1*. Sternal shield smooth with three pairs of setae, genital shield striated. Ventrianal shield reticulated with three pairs of setae and one pair of crescentic solenostomes. Calyx of spermatheca bell-shaped, flaring distally; atrium nodular, attached to calyx without neck. Fixed and movable digits of chelicera with eight and two teeth, respectively. Genu II with eight setae. Macrosetae present on Leg III and IV. Posterior margin of male sternogenital shield straight, ventrianal shield with three pairs of pre-anal setae. Male spermatophoral process wand-like, with slightly developed heel, toe digit-like.

Female (n=3) (Figs. 1–15, 19–22).

Dorsum (Figs. 1, 19). Dorsal setal pattern 10A:9B (*r3* and *R1* off shield). Dorsal shield much longer than wide, sclerotized, with reticulations in anterolateral and posterolateral regions, with waist at level of seta *R1*. Bearing seven pairs of solenostomes (*gd1*, *gd2*, *gd4*, *gd5*, *gd6*, *gd8* and *gd9*) and sixteen pairs of poroids (sensillae) (*idl1*, *id2*, *id4*, *id5*, *id6*, *idm1*, *idm2*, *idm3*, *idm4*, *idm5*, *idm6*, *idx*, *is1*, *idl1*, *idl3*, *idl4*). Muscle-marks (sigillae) visible mostly on podosoma, length of dorsal shield 388 (379–399), width (distance at level of *s4*) 234 (225–245), width (distance at level of *S4*) 232 (229–235). Dorsal setae smooth, except *Z4* and *Z5*, which serrated and somewhat stout. Measurements of dorsal setae as follows: *j1* 29 (27–30), *j3* 35, *j4* 14 (13–15), *j5* 14 (12–15), *j6* 17 (14–19), *J2* 18 (16–20), *J5* 12 (11–13), *z2* 17 (15–18), *z4* 23 (22–24), *z5* 12 (10–13), *Z1* 22 (20–27), *Z4* 54 (53–55), *Z5* 78 (76–83), *s4* 50, *S2* 30 (28–35), *S4* 22 (20–25), *S5* 22 (20–25), *r3* 26 (23–28) and *R1* 21 (18–23).

Peritreme. Long, and extending to level of setae *j1*.

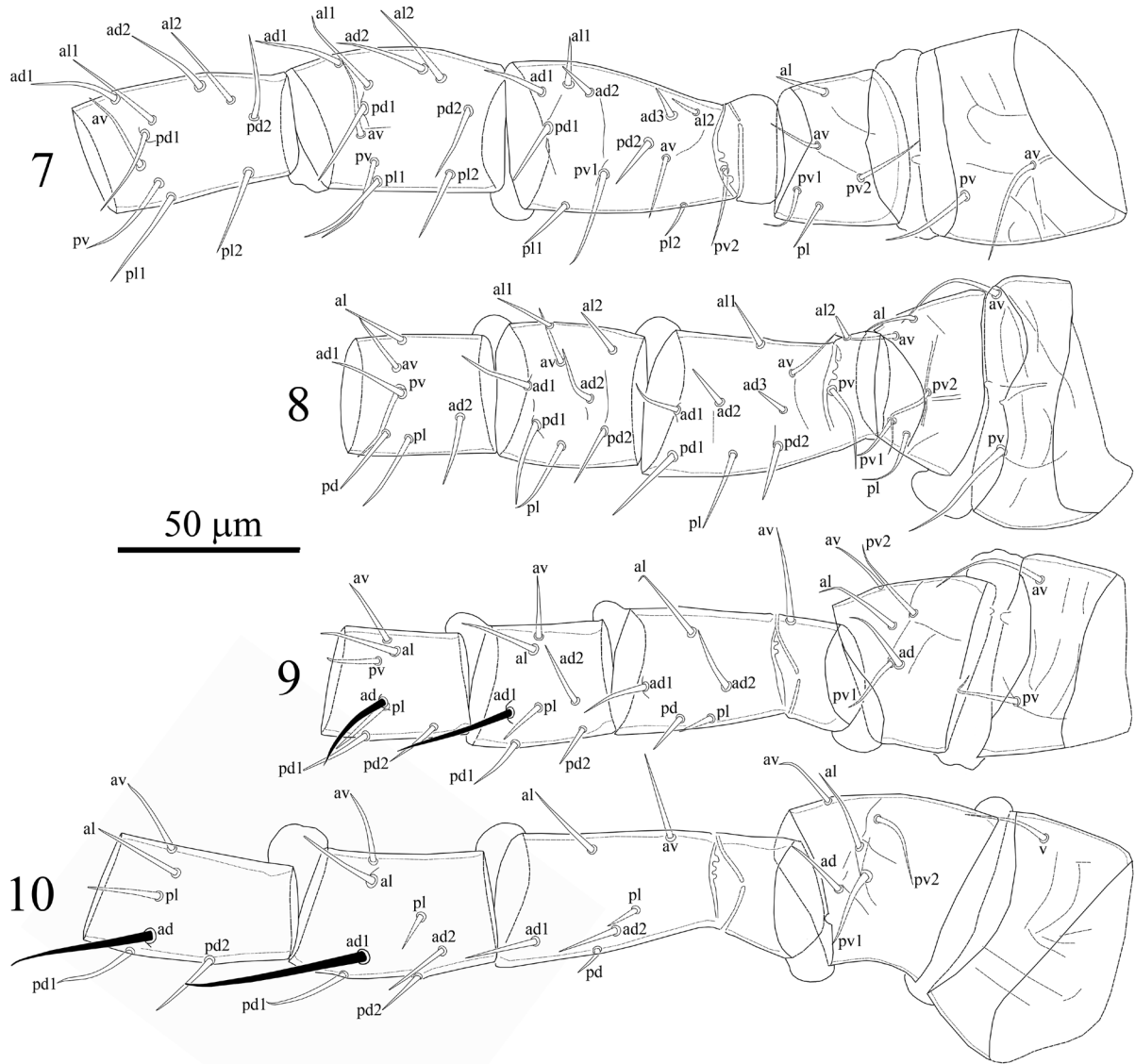


Figs. 3–6. *Typhlodromips pseudomontanus* sp.n., female. 3—subcapitulum; 4—dorsal view of left palp; 5—chelicera; 6—spermathecae.

Venter (Fig. 2). Ventral setal pattern 14: *JV*-3:*ZV*. Sternal shield smooth, lightly sclerotized; with three pairs of setae (*ST1*, *ST2* and *ST3*) and two pairs of pores (*iv1* and *iv2*); length (*ST1*–*ST3*) 74 (71–78), width (distance between setae *ST2*) 80 (78–81); metasternal setae *ST4* and one pair of pores (*iv3*) on metasternal shields. Genital shield striated, narrower than ventrianal shield, width at level of genital setae (*ST5*) 77 (75–80). Ventrianal shield pentagonal, reticulated, with distinct waist at level of setae *JV2*. Three pairs of pre-anal setae (*JV1*, *JV2* and *ZV2*); and one pair of crescentic solenostomes (*gv3*) almost in line with setae *JV2*, distance between pre-anal pores 39 (37–40). One pair of para-anal (*PA*) and single post-anal setae (*PST*). Length of ventrianal shield 138 (128–147), width at level of setae *ZV2* 109 (106–113). Setae *ZV1*, *ZV3*, *JV4* and *JV5* and five pairs of poroids on integument surrounding ventrianal shield. Setae

JV5 smooth, much longer than other ventral setae, 44 (42–45) in length.

Gnathosoma (Figs. 3–5, 20). Hypostomal groove with seven transverse rows of denticles, each row with two or three teeth; subcapitular setae *h1* 25 (24–25), *h2* 21 (20–22) *h3* 25 (24–26), palpal setae (*pc*) 27. Chaetotaxy of palps: trochanter with two setae *v1*, *v2*; femur with five setae, thickened and apically spatulate antero-lateral *al*, three dorsal (*d1*, *d2*, *d3*) and one postero-lateral (*pl*); genu with six setae, antero-lateral setae (*al1* and *al2*) thickened, three dorsal setae (*d1*, *d2*, *d3*) and one postero-lateral (*pl*); tibia with 14 setae, one antero-lateral (*al*), eight dorsal *d1*–*d8*, two setae *di-1* and *di-2* arise from the dorsal surface at the distal end, two ventral (*v1*, *v2*) and one postero-lateral (*pl*); tarsus with 15 setae (six simple *d1*, *d2*, *d3*, *v1*, *v2*, *v3*; nine stout setae with rounded tips *di-1* to *di-9*) and three-tined apotele (Fig. 4).



Figs. 7–10. *Typhlodromips pseudomontanus* sp.n., female. 7—left leg I, except tarsi, dorsal aspect; 8—leg II; 9—leg III; 10—leg IV.

Chelicera (Figs. 5, 20). Fixed digit 32 (30–35) long with eight prominent teeth and pilus dentilis; movable digit 34 (33–35) long with two teeth.

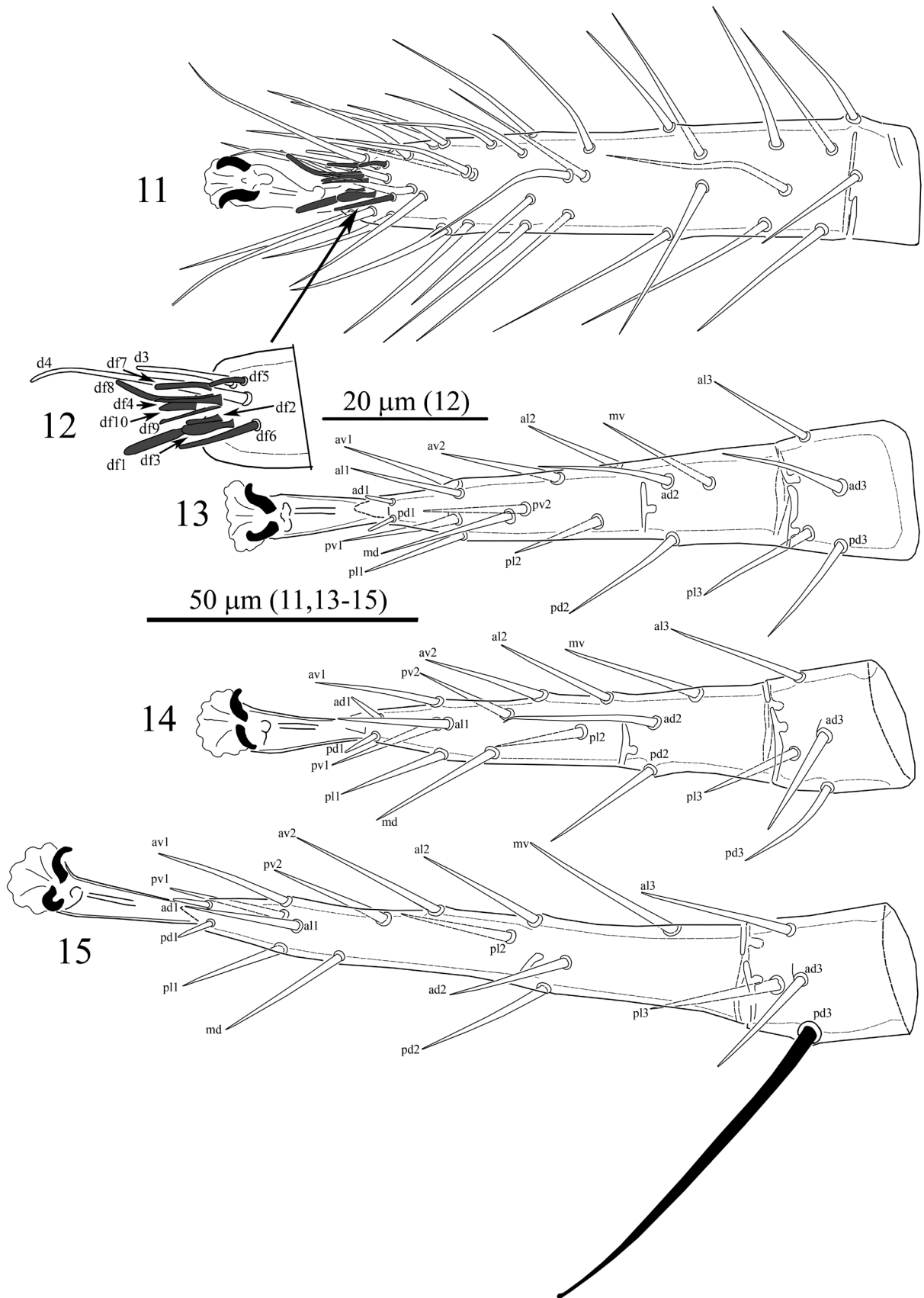
Spermatheca (Fig. 6). Atrium nodular attached to the calyx without neck. Calyx bell-shaped, flaring distally, 16 (14–18) in length; major duct long; minor duct visible.

Legs (Figs. 7–15, 21, 22). Length of legs (base of coxae to base of claws): leg I 388 (383–390); leg II 316 (303–330); leg III 322 (314–326); leg IV 420 (413–425). Chaetotaxy 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 2/1 1/1 1. Leg III: coxa 0 0/1 0/1 0, trochanter 1 1/1 0/2 0, femur 1 2/1 1/0

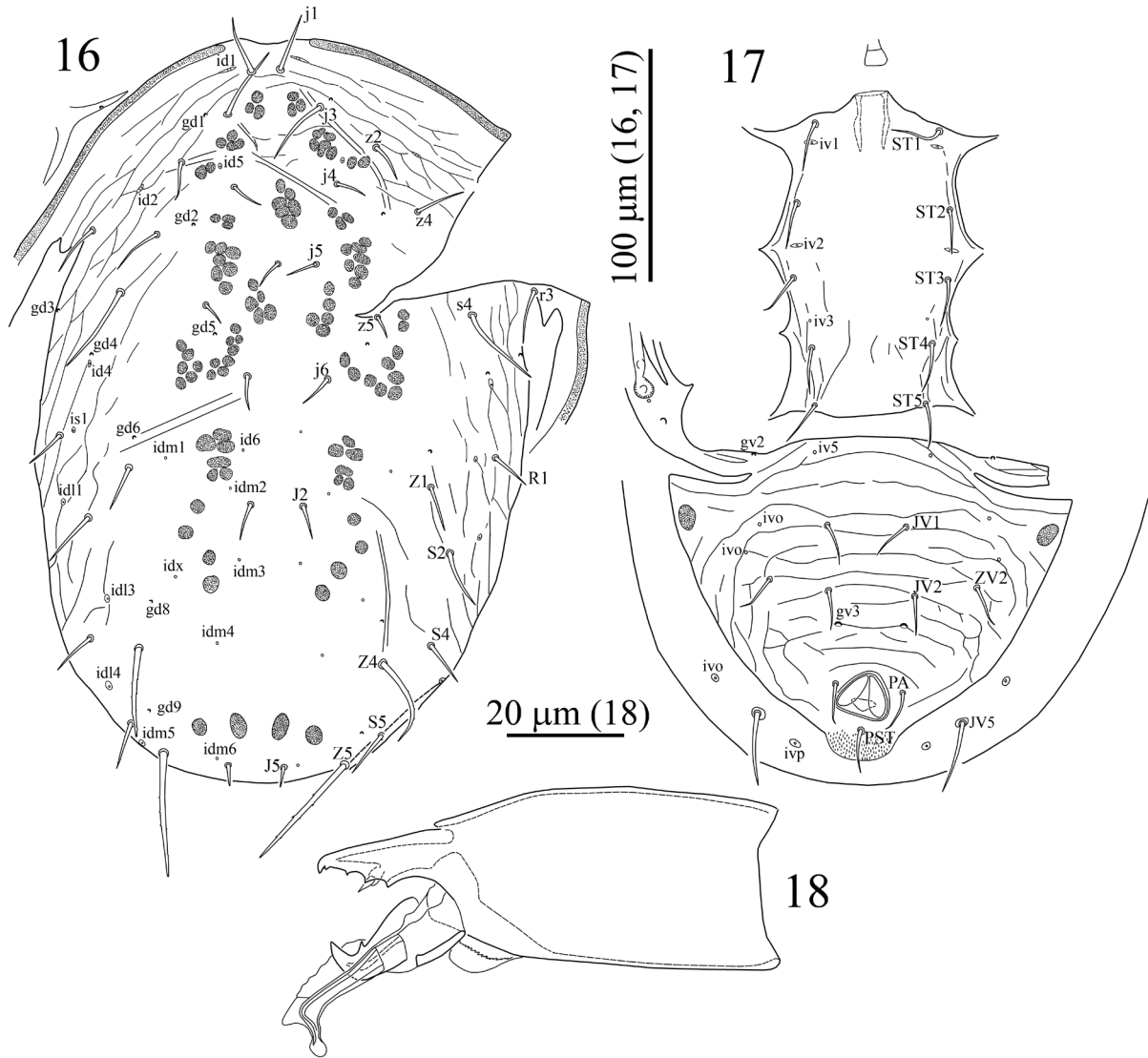
1, genu 1 2/1 2/0 1, tibia 1 1/1 2/1 1. Leg IV: coxa 0 0/1 0/0 0, trochanter 1 1/1 0/2 0, femur 1 2/1 1/0 1, genu 1 2/0 2/1 1, tibia 1 1/0 2/1 1. Chaetotaxy of tarsi II–IV typical for Phytoseiidae and bears 18 setae 3 3/2 3/2 3 + *mv*, *md*. Tarsus I with 36 setae, excluding apical sensorial setal cluster. The latter includes 10 short setae of different shape. Measurements of macrosetae as follows: *SgeIII* 28 (27–30), *StiIII* 22 (22–23), *SgeIV* 50 (49–50), *StiIV* 39 (38–40), *StIV* 70 (68–73).

Male (n=1) (Figs. 16–18). Similar to female.

Dorsum (Fig. 16). Dorsal setal pattern 10A:9B (*r3* and *R1* on shield), reticulated laterally. Bearing eight pairs of solenostomes (*gd1*, *gd2*, *gd3*, *gd4*, *gd5*, *gd6*, *gd8* and *gd9*). Sixteen pairs of poroids (sensillae) visible on the shield. Muscle-marks



Figs. 11–15. *Typhlodromips pseudomontanus* sp. n., female. 11—left tarsus I (dorsal aspect); 12—apical sensorial setal cluster area of tarsus I (dorsal aspect); 13—tarsus II; 14—tarsus III; 15—tarsus IV.



Figs. 16–18. *Typhlodromips pseudomontanus* sp. n., male. 16—dorsal idiosoma; 17—ventral idiosoma; 18—chelicera.

(sigillae) visible mostly on podosoma, length of dorsal shield 319, width (distance at level of *s4*) 201, width (distance at level of *S2*) 172. Dorsal setae smooth and setiform except *Z4* and *Z5*, which serrated and stout. Measurements of dorsal setae as follows: *j1* 25, *j3* 31, *j4* 13, *j5* 13, *j6* 15, *J2* 15, *J5* 8, *z2* 16, *z4* 21, *z5* 10, *Z1* 19, *Z4* 38, *Z5* 54, *s4* 39, *S2* 25, *S4* 20, *S5* 20, *r3* 24 and *R1* 19.

Peritreme. Long, extending to level of setae *j1*.

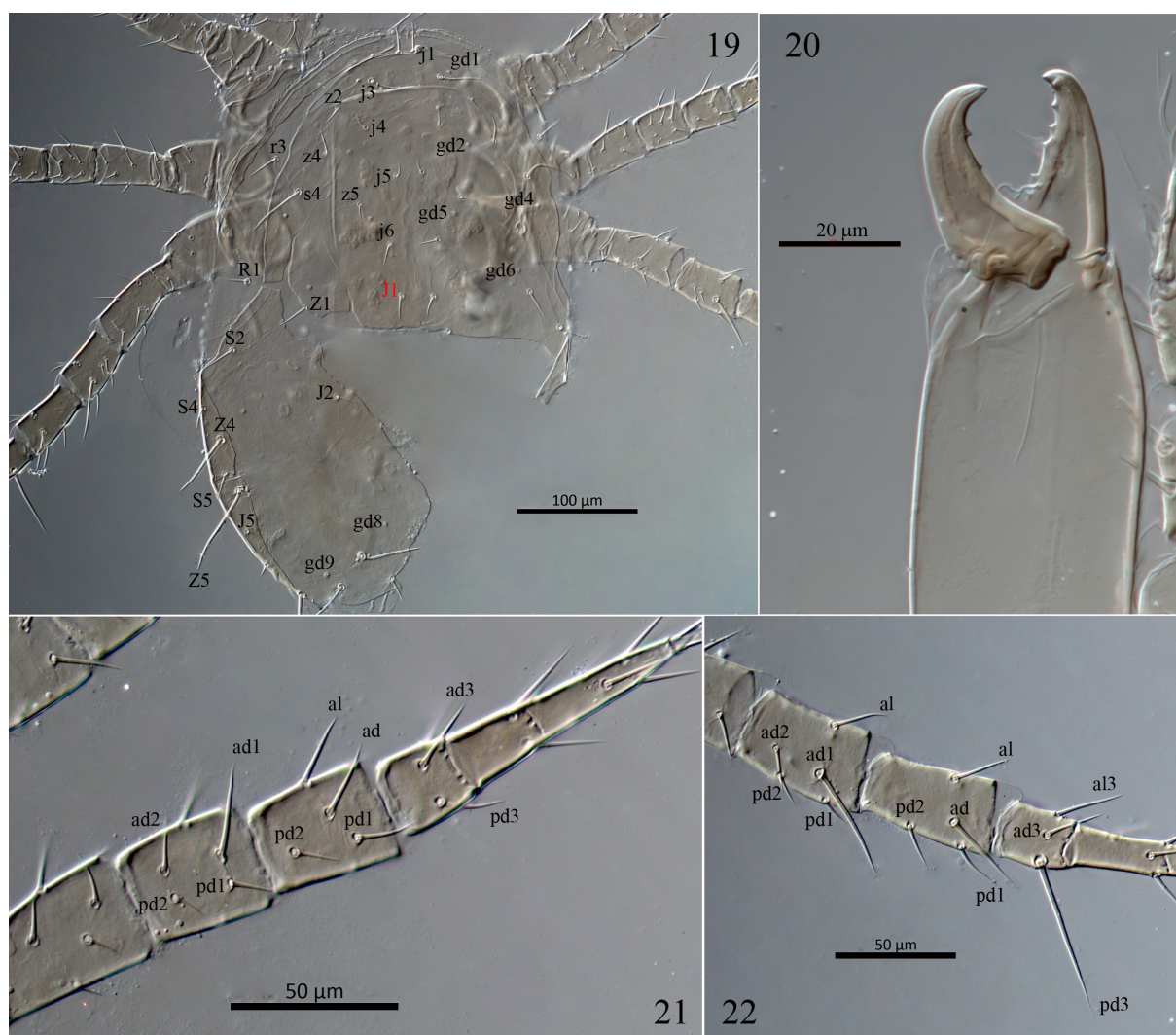
Venter (Fig. 17). Ventral setal pattern 14: *JV*-3,4:*ZV*-1,3. Sternogenital shield striated posteriorly, lightly sclerotized, posterior margin straight, bearing five pairs of setae (*ST1*, *ST2*, *ST3*, *ST4* and *ST5*) and three pairs of pores (*iv1*, *iv2* and *iv3*); length (*ST1*–*ST5*) 116, width (distance between setae *ST2*) 68. Ventrianal shield triangular, reticulated. Three pairs of pre-anal setae (*JV1*, *JV2* and

ZV2), and one pair of small crescentic solenostomes (*gv3*) posteromedian to setae *JV2*. One pair of para-anal (*PA*) and one post-anal setae (*PST*). Length of ventrianal shield 139, width at anterolateral corners 173. Setae *JV5* smooth, much longer than other ventral setae, 30 in length.

Chelicera (Fig. 18). Fixed digit 24 long with four teeth and pilus dentilis; movable digit 26 long with one tooth. Spermatophoral process wand-like, with slightly developed heel, toe digit-like.

Legs. Length of legs (base of coxae to base of claws): leg I 317; leg II 265; leg III 271; leg IV 351. Chaetotaxy same as in female. Measurements of macrosetae as follows: *SgeIII* 20, *SgeIV* 32, *StiIV* 26, *StIV* 60.

Type material. Holotype female and two paratype females collected from low-ground herba-



Figs. 19–22. DIC micrographs of *Typhlodromips pseudomontanus* sp.n., female. 19—dorsal idiosoma of paratype with archaic seta *J1*; 20—chelicera; 21—dorsal view of genu, tibia and tarsus of right leg III; 22—dorsal view of genu, tibia and basitarsus of right leg IV.

ceous plants at Krasnaya Polyana, Krasnodar Territory, Russia (43°38' N, 40°15' E, 1,995 m a.s.l.) on September 3, 2020.

Etymology. The name of the new species is derived from a closely related species, *Typhlodromips montanus*.

Differential diagnosis. Due to the absence of dorsal setae *J1*, and having a bell-shaped calyx of spermatheca, *Typhlodromips pseudomontanus* sp.n. belongs to the *ariri* species group of Chant and McMurtry (2005). The new species was compared with all known species in this subgroup. It is closely related to *T. montanus* (Wainstein), a species known from Russia, and recently included in this species group (Khaustov *et al.* 2020) based on the prominent dorsal *s4*, *Z4* and *Z5*; bell-shaped calyx of spermatheca flaring distally; pentagonal

and reticulated ventrianal shield with a pair of crescentic *gv3* solenostomes; and genu II with eight setae. *Typhlodromips pseudomontanus* sp.n. can be distinguished from *T. montanus* by having two teeth on movable digit of chelicera, as opposed to one in *T. montanus*. The importance of movable digit dentition was recently confirmed based on an Internal Transcribed Spacer (ITS) marker to separate species in a different genus *Kampimodromus*, which also belongs to the subfamily Amblyseiinae (Döker *et al.* 2018). We collected and examined more than 50 specimens of *T. montanus* (Wainstein) from Russia without variations of cheliceral dentition (Khaustov *et al.* 2020). In addition, measurements of setae *Z4*, *Z5* and *JV5* are 54 (53–55), 78 (76–83) and 44 (42–45) in the new species, and 72 (67–77), 99 (92–105) and 55 (52–57) in *T. monta-*

nus, respectively (Khaustov *et al.* 2020). Furthermore, the posterior margin of the male sternogenital shield is straight in the new species and concave in *T. montanus*.

Typhlodromips pseudomontanus sp.n. was also compared with all known species in the *cucumeris* species group, tribe Neoseiulini Chant and McMurtry, 2003, in particular, *cucumeris* species subgroup based on the shape of calyx of spermatheca. The reason being, according to Chant and McMurtry 2003, the *cucumeris* species subgroup is evolving toward an increased number of teeth on the fixed digit of the chelicera and the development of a short macroseta on genu III, and sometimes on genu II as well. The new species is closely related to *Neoseiulus crataegi* (Jorgensen and Chant, 1960) and *N. tobon* (Chant and Hansell, 1971), based on the shape of the calyx of spermatheca and the prominent dorsal setae *s4*, *Z4* and *Z5*. However, *Typhlodromips pseudomontanus* sp.n. can be separated from these species by having two teeth on the movable digit of the chelicerae. Moreover, the new species can be distinguished from *N. crataegi* by the length of setae *z2* 27–30, *s4* 39 and *JV5* 62, whereas in the new species these setae are 17 (15–18), 50 and 44 (42–45), respectively. In addition, *Typhlodromips pseudomontanus* sp.n. is distinguished from *Neoseiulus tobon* by having longer dorsal seta *Z5* (78 (76–83) vs. 60).

Remarks. It is interesting to note that dorsal setae *J1* are present in one of the three examined females of the new species (Fig. 19). More likely, the presence of *J1* seta is a rare symmetrical abnormality. However, due to the limited number of specimens, we cannot be sure of such a statement. The presence of setae *J1* is used to separate genera in the tribe Typhlodromipsini, as well as species groups in the genus *Typhlodromips* (Chant and McMurtry, 2005). Just one exception, *T. extrasetus* Moraes *et al.* 2001, has a female idiosomal pattern 10A:10B with additional dorsal seta *J1*. Whether the presence or absence of setae *J1* can be used to separate genera within the tribe should be confirmed by collecting more specimens and using molecular analysis.

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