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Redescription of three species of phytoseiid mites (Acari, Mesostigmata) from Poland

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ABSTRACT — Three species of phytoseiid mites of the genera *Amblyseius* and *Typhlodromus* (Parasitiformes, Phytoseiidae) are found for the first time in fauna of Poland. More detailed redescriptions, drawings, measurements, and diagnosis of the species, *A. krantzi* (Chant, 1959), *A. rademacheri* (Dosse, 1958) and *T. pritchardi* Arutunjan, 1971 as well as the data of mite locations in Poland are given.

KEYWORDS — *Amblyseius*; *Typhlodromus*; new records; National Parks; Poland

INTRODUCTION

Phytoseiid mites are well known as effective predators of small microarthropods, particularly phytophagous pests on various plants in terraneous plant associations. Occasionally, the plant-inhabiting phytoseiid mites can be found in other habitats such as moss, herbal rhizosphere, soil, and so on (Kolodochka, 2006). During the present study on mites inhabiting soil and litter in the Polish National Parks, some phytoseiid species new for Polish fauna were found. These species, namely *Amblyseius krantzi* (Chant, 1959), *A. rademacheri* (Dosse, 1958), and *Typhlodromus pritchardi* Arutunjan, 1971 were not included earlier in the Checklist of Animals of Poland (Razowski, 1997).

The aim of this paper is to record three phytoseiid species for Poland and to provide more detailed descriptions.

MATERIALS AND METHODS

Specimens of phytoseiid mites (Parasitiformes, Phytoseiidae) were extracted using a Berlese funnel from samples of soil, litter and moss collected in three Polish National Parks in 2010–2013. The mites were kept in 70 % alcohol, and then mounted on microscope slides in Hoyer's medium for examining under Zeiss Axioscop 2 and MBI-3 (LOMO) microscopes. A phase contrast attachment KF-1 (LOMO) and a camera Lucida apparatus were used for the drawings. The nomenclature of dorsal and ventral setae follows that of Chant and McMurtry (2007), dorsal solenostomes Athias-Henriot (1975), spermathecal structures Wainstein (1973) and Kolodochka (1990). The apical tooth is not included in the number of teeth of the cheliceral digits. Measurements are presented in micrometers (μm).

Specimens of mites are deposited in the Insti-

tute of Zoology, National Academy of Sciences of Ukraine (IZNASU), Kiev.

For the most recent distribution records of these species see the website of "Phytoseiidae Database" (Demite *et al.*, 2015).

***Amblyseius krantzi* (Chant, 1959)
(Figure 1)**

Typhlodromus (Amblyseius) berlesei Chant, 1957: 292-293, Fig. 10;

Typhlodromus (Amblyseius) krantzi Chant, 1959: 83, Figs. 158, 159;

Amblyseius (Amblyseius) krantzi (Chant), Muma, 1961: 287.

Amblyseius krantzi (Chant), Chant, Hansell, 1971: 708, 734, Figs. 16-21.

Amblyseius krantzi (Chant), Begljarov, 1981: I: 31, 39, Fig. 39.

Amblyseius (Typhlodromips) frutexis Karg, 1991: 19, new syn.

Amblyseius frutexis Karg, 1993: 186, Fig. 145 b-d, new syn.

For more see Demite *et al.*, 2015

Material examined — One female, from soil and litter, no MF 29, data 21.07.2011, Ojców National Park (50°12'N, 19°49'E), coll. D.J. Gwiazdowicz.

Description. Female. Dorsal shield (Fig. 1A) oval, without constrictions at level of R1, weakly or moderately sclerotized, smooth, with muscle marks (the largest are drown), 6 pairs of small solenostomes (*gd1*, *gd4*, *gd5*, *gd6*, *gd8*, *gd9*), and 17 pairs of setae acute and contrasting in length. Setae *s4*, *Z4*, *Z5* much longer than others, *j1* and *j3* medium; the rest very short. Dorsal setae smooth except *Z5* weakly serrated. Seta *j3* longer than distance from own base to base of seta *z2*. Sternal shield with 2 pairs of solenostomes and 3 pairs of setae (*St1-St3*); *St4* placed on separate metasternal platelets (Fig. 1B). Genital shield with one pair of seta (*Ge*). Ventrianal shield elongate with salient frontal margin, vase-shaped in form, smooth, narrower than genital shield. Three pairs of preanal setae *JV1*, *JV2*, *ZV2*, one pair of para-anal setae (*Pa*) and unpaired post-anal (*Pst*) on ventrianal shield (Fig. 1B). Anal pores large, crescent shaped, transversely aligned and closely associated with setae *JV2* (Fig. 1C).

Two pairs of light oval muscle maculae along both margins of caudal part of ventrianal shield. Setae *ZV1*, *JV4* and *JV5* on the integument surrounding the ventrianal shield. Seta *ZV3* absent. All ventral setae thin, acute, and smooth. Chelicerae normal in relation to body size. Fixed digit with 8 denticles (6 large and 2 small), movable digit with 3 (Fig. 1D). Metapodal plates elongate, anterior platelets smaller and narrower than posterior plates (Fig. 1E). Funnel (*infundibulum*) of spermatheca cup-shaped connected to large atrium by a short cervix (Fig. 1F). Peritremes long, extending beyond bases of setae *j1* (Fig. 1A). Posterior part of peritremal shield as on Fig. 1G. Leg IV with three pointed and smooth macrosetae: longest on basitarsus and genu, and shorter on tibia (Fig. 1H). Genu and tibia of leg III, genu II, and genu I each with one short macroseta. Genu II with 8 setae (1 - 2, 2 / 1, 1 - 1).

Measurements — length of dorsal shield, *Lds* 380; width of dorsal shield at R1 level, *Wds* 250; length of ventrianal shield, *Lvas* 118; max width of ventrianal shield, *Wvas* 72; distance between anal pores, *Lian* 32; length of tarsus of leg IV, *Ltar IV* 134.

Setae — *j1* 27, *j3* 43, *j4* 6, *j5* 5, *j6* 6, *J2* 7, *J5* 7, *s4* 70, *z2* 8, *z4* 7, *z5* 5, *S2* 9, *S4*, *S5* 6, *Z1* 8, *Z4* 94, *Z5* 117, *r3* 16, *R1* 9, *JV5* 39; macrosetae on leg IV, *MCh IV*: *ge* 69, *ti* 51, *tar* 72; *MCh III*: *ge* 37, *ti* 30; *MCh II*: *ge* 36; *MCh I*: *ge* 37.

Males were absent in investigated material.

Notes — The absence of ventral setae *ZV3* in *A. krantzi* is a unique feature which clearly separate it from the other closely related species. *Amblyseius krantzi* resembles *A. rademacheri* (Dosse, 1958) and *A. andersoni* (Chant, 1957) by having dorsal setae *s4*, *Z4*, *Z5* distinctly longer than others, *j1* and *j3* medium, the rest of dorsal setae very short; and large anal pores.

Amblyseius krantzi differs from the former in having the dorsal shield smooth (in *A. rademacheri* dorsal shield reticulate), by presence of 6 pairs of solenostomes (*gd2* absent) instead of 7 as in *A. rademacheri*, by ventrianal shield narrower than genital shield, by large anal pores closely associated with setae *JV2* and transversely aligned with them (in *A. rademacheri* scutiform ventrianal shield

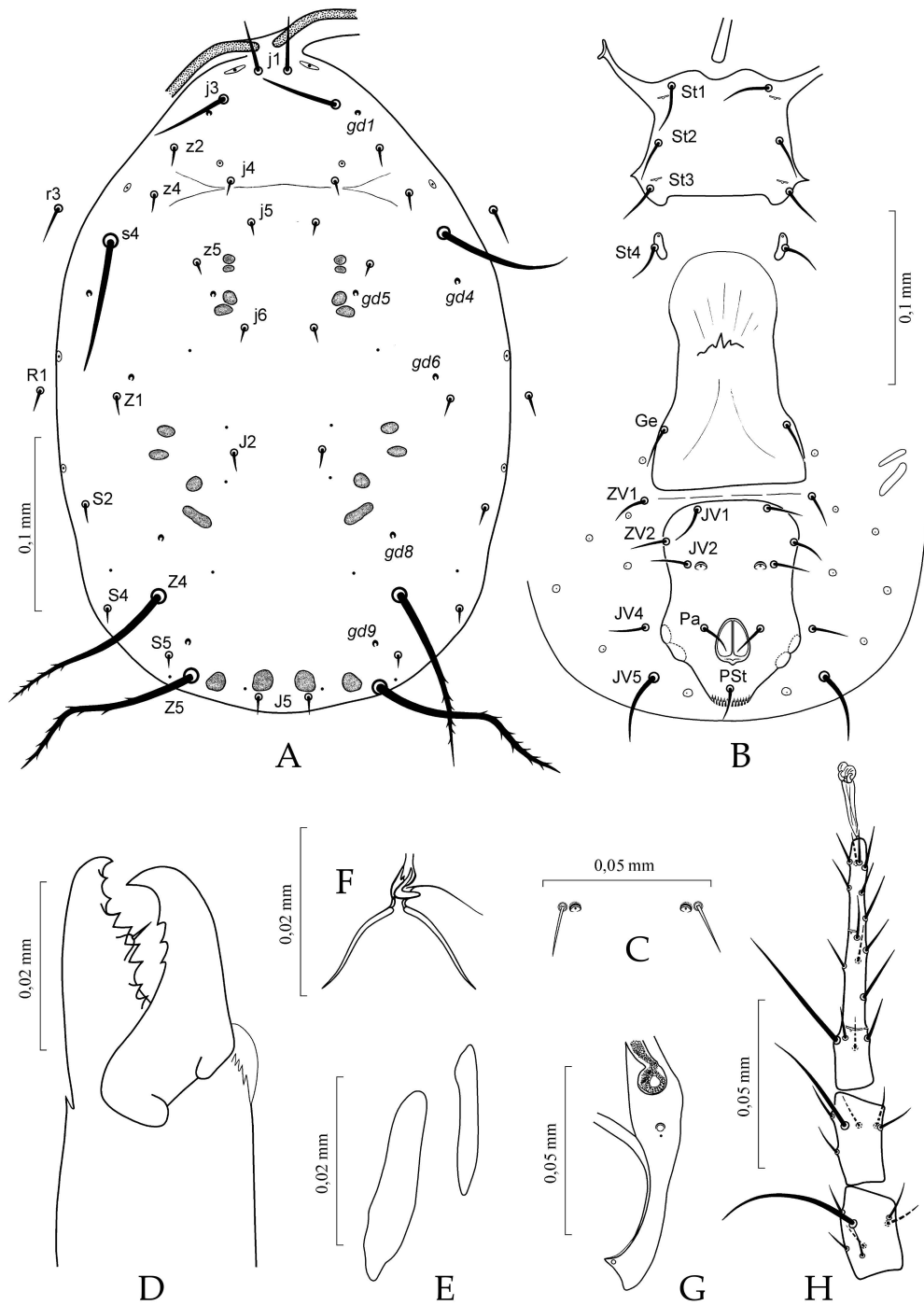


FIGURE 1: *Amblyseius krantzi* (Chant, 1959). Female: A – dorsal shield; B – fragment of ventral body surface; C – setae JV2 and anal pores; D – chelicera; E – metapodal plates; F – spermatheca; G – caudal part of peritremal shield; H – fragment of leg IV (bottom-up: tibia, genu, tarsus).

broader than genital shield, and anal pores inclined and not closely associated and slightly posterior to level of setae JV2 bases), by atrium of spermatheca with short neck (in *A. rademacheri* atrium sedentary) and by presence of 3 teeth on movable cheliceral digit (instead of 2 as in *A. rademacheri*).

Amblyseius krantzi distinctly differs from *A. andersoni* by dorsal shield without constrictions at level setae R1, by large oval anal pores associated with setae JV2 instead of in *A. andersoni* dorsal shield with constrictions, and fissured anal pores not associated with preanal setae.

This rare species is known from trees, shrubs, and herbs in Alaska; Canada - British Columbia, Ontario; Kazakhstan; Russia - Moscow Province, Yaroslavl province; USA - Washington (Demite *et al.*, 2015); Ukraine (Kolodochka, 2006).

***Amblyseius rademacheri* Dosse, 1958
(Figure 2)**

Amblyseius rademacheri Dosse, 1958: 44, figs. 1-5
For full extensive bibliography of this widespread species see Demite *et al.*, 2015.

Material examined — One female, from litter, no AG 59/1, data 23.07.2013, Wielkopolska National Park (52°14'48"N, 16°50'42"E), coll. D.J. Gwiazdowicz.

Description. Female. Dorsal shield (Fig. 2A) elongate, widened caudally, without constrictions at level of R1, moderately sclerotized, reticulate, with 7 pairs of small solenostomes (*gd1*, *gd2*, *gd4*, *gd5*, *gd6*, *gd8*, *gd9*) and 17 pairs of setae. Dorsal setae acute, short and smooth with the exception of setae s4, Z4, Z5 much longer than others as well as setae Z4 and Z5 thick and roughly serrated. Seta j3 slightly shorter than distance between own base and base of seta z2. Seta z2 subequal in length to z4 (z2 1 to 2 μ m longer). Setae S2 and S4 equal, and longer than S5. Seta Z5 more than 10 times longer than S5. All ventral setae thin, smooth, and pointed except JV5 serrated (Fig. 2B). Sternal shield with 2 pairs of solenostomes and 3 pairs of setae (St1-St3); St4 placed on separate metasternal platelets. Ventrianal shield broader than genital shield, scutiform with anterior and lateral margins slightly concave,

lightly reticulated, with three pairs of preanal setae JV1, JV2 and ZV2. Anal pores distinct, inclined, disposed between setae JV2 and slightly behind their level. Four pairs of ventral setae (ZV1, ZV3, JV4 and JV5) on integument surrounding ventrianal shield. Long peritremes extend forward beyond bases of setae j1 (Fig. 2A). Chelicerae (Fig. 2C) normal in relation to body sizes. Fixed digit with 9 denticles, movable digit with 2. Posterior metapodal plates semi-oval, anterior platelets smaller and oblong (Fig. 2D). Funnel of spermatheca cup-shaped with large sedentary atrium, neck absent (Fig. 2E). Posterior part of peritremal shield as on Fig. 2F. Three elongate pointed macrosetae on leg IV (Fig. 2G), longest on basitarsus. Genu of legs I-III each with one short macroseta. Genu II with 8 short setae (1 - 2, 2 / 1, 1 - 1).

Measurements — Lds 385, Wds 235, Lvas 120, Wvas 105, Lian 32, Ltar IV 123.

Setae — j1 23, j3 34, j4, j5 7, j6 9; J2 9, J5 9; s4 61; z2 16, z4 14, z5 8; Z1 11; Z4 82, Z5 98; S2 12, S4 12, S5 8; r3 19; R1 8; JV5 45; MCh IV: ge 64, ti 45, tar 81; MCh III: ge 34, ti 27; MCh II: ge 27; MCh I: ge 32.

Males were absent in investigated material.

Notes — Features which distinguish *A. rademacheri* from *A. krantzi* were given in notes for *A. krantzi*. Females of *A. rademacheri* may be differentiated from similar *A. andersoni* by dorsal shield distinctly reticulated, presence of 2 teeth on moveable digit of chelicerae, and dorsal setae Z4 and Z5 roughly serrate and thick, as against in *A. andersoni* dorsal shield smooth, moveable digit of chelicerae with 3 teeth, and dorsal setae Z4 and Z5 slightly serrate and thin.

Amblyseius rademacheri inhabits mainly herbaceous plants, and also may be found on trees and shrubs. This species is widespread in many countries - Armenia, Austria, Azerbaijan, China - Jiangxi, Czech Republic, Denmark, Georgia, Germany, Hungary, Iran, Italy, Japan, Latvia, Moldova, Netherlands, Russia - Moscow Province, Primorsky Territory; Yaroslavl Province; Slovakia, Slovenia, South Korea, Spain, Switzerland, Ukraine (Demite *et al.*, 2015).

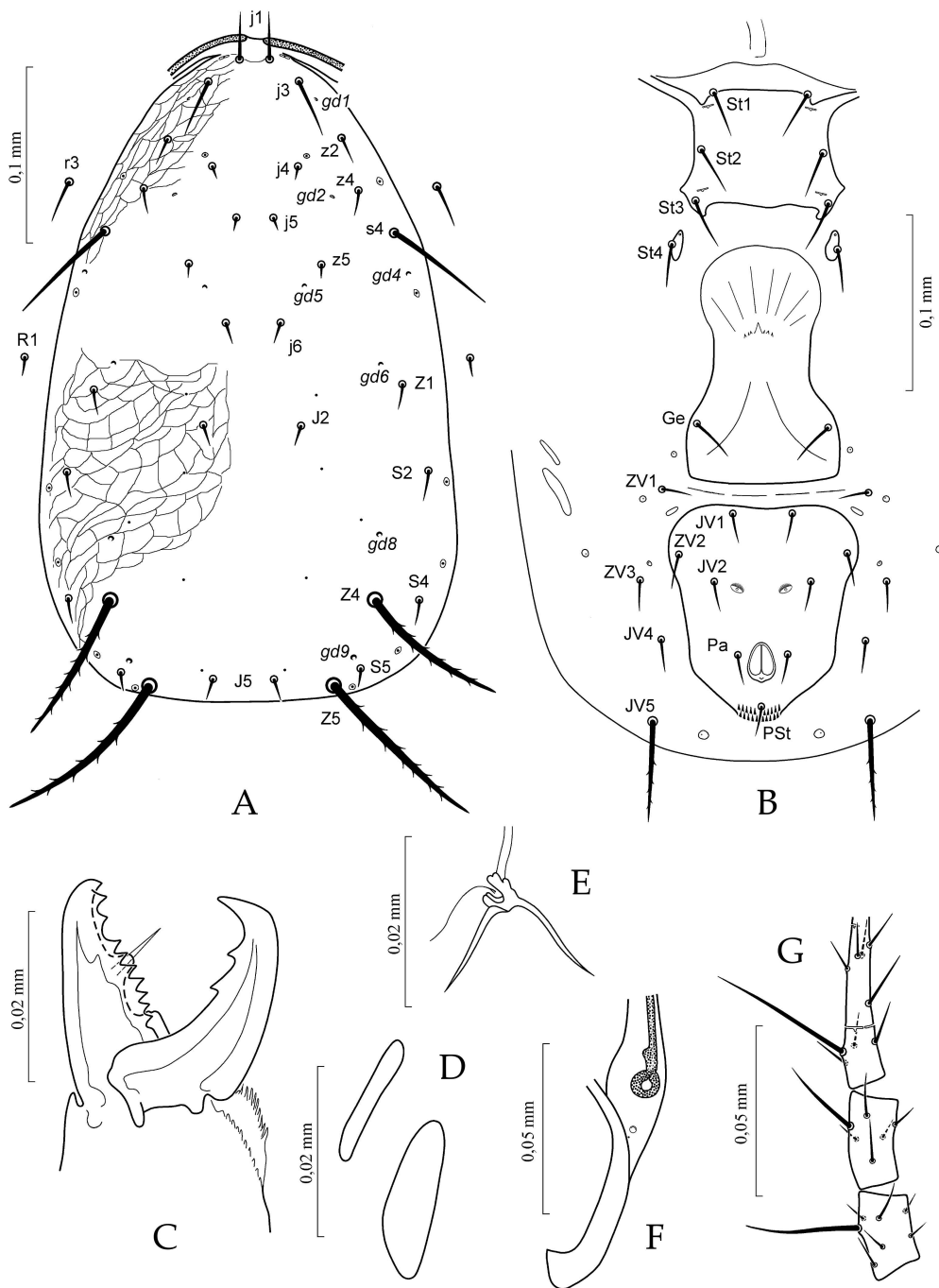


FIGURE 2: *Amblyseius rademacheri* (Dosse, 1958). Female: A – dorsal shield; B – fragment of ventral body surface; C – chelicera; D – metapodal plates; E – spermatheca; F – caudal part of peritremal shield; G – fragment of leg IV (bottom-up: tibia, genu, fragment of tarsus).

***Typhlodromus pritchardi* Arutunjan, 1971
(Figure 3)**

Typhlodromus pritchardi Arutunjan, 1971: 305-306, fig. 1.

Typhlodromus pritchardi, Denmark, 1992: 23-24, fig. 94-98.

Typhlodromus (Typhlodromus) pritchardi Papadoulis *et al.*, 2009: 143, fig. 83.

Typhlodromus pritchardi Faraji *et al.*, 2012: 21: 15-19, figs. 6-10.

Material examined — One female, from moss, no BPN 528, data 16.08.2010; one female, litter, no BPN 560, data 17.08.2010, Bialowieza National Park (52°42'N, 23°52'E), coll. D.J. Gwiazdowicz.

Description. Female. Dorsal shield (Fig. 3A) oval with constrictions at level of R1, weakly sclerotized, reticulated, with 4 pairs of distinct solenostomes (*gd2*, *gd6*, *gd8*, *gd9*) and 17 pairs of short, acute, thin, smooth, and medium-sized setae. Setae Z5 longer than others. Seta *j3* longer than distance to seta *z2* which also longer than distance to seta *z3*.

Distance between bases of setae *z2* and *z3* twice shorter than distance between bases of setae *z3* and *z4*. All ventral setae smooth, pointed, and slender. Sternal shield with 2 pairs of solenostomes and 2 pairs of setae (St1-St2). Setae St3 and St4 placed on separate metasternal platelets (Fig. 3B). Ventrianal shield scutiform with 4 pairs of preanal setae JV1, JV2, ZV2, JV3 (Fig. 3B). Anal pores very small, round, and transversely aligned with setae JV3. Setae ZV1, ZV3, ZV4 and JV5 on the integument surrounding the ventrianal shield (Fig. 3B). Short peritremes reach only bases of setae *r3* (Fig. 3A, C). Chelicerae normal in relation to body size. Fixed digit with 4 denticles: 3 small in terminal position and one large tooth near *pilus dentilis*; movable digit with 2 teeth (Fig. 3D). Metapodal plates elongate, anterior plate smaller (Fig. 3E). Spermatheca with elongate bottle-shaped funnel; with c-shaped atrium (Fig. 3F). Peritremes short, reach only level setae *r3* (Fig. 3C). Posterior part of peritremal shield as on Fig. 3C. Three pointed macrosetae on leg IV: on basitarsus elongate, and on tibia and genu short (Fig. 3G). No macrosetae on other legs. Genu II with 7 setae (0 - 2, 2 / 1, 1 - 1).

Measurements — Lds 360, Wds 185, Lvas 130, Wvas 110, Lian 38; length of peritreme, Lper 90; Ltar IV 122. Setae: *j1* 27, *j3* 33, *j4* 20, *j5* 20, *j6* 23; J2 27, J5 9; *s4* 24, *s6* 30; S2 37, S4 36; *z2* 19, *z3* 31, *z4* 29, *z5* 22; Z4 39, Z5 53; *r3* 23; R1 35; JV5 50; MCh IV: *ge* 29, *ti* 31, *tar* 50.

Males were absent in investigated material.

Notes — *Typhlodromus pritchardi* was first described from strawberry (*Fragaria* sp.), 800 m a.s.l., Ijevan District, Armenia. Chant and Yoshida-Shaul (1987) gave *T. pritchardi* the status of *species inquirenda* in a world review of the "pyri species" group in the genus *Typhlodromus* Scheuten. These authors were unable to examine the holotype and proposed *T. andrei* Karg, 1982 as a possible synonym of the *T. pritchardi* because of its close resemblance. Revising the genus *Typhlodromus*, Denmark (1992) redescribed *T. pritchardi* adequately but established 4 teeth on fixed digit of chelicera whereas Arutunjan (1971) specified 3 teeth. Also he didn't support Chant's and Yoshida-Shaul's opinion (1987) about close resemblance of *T. pritchardi* and *T. andrei* Karg when noted: "The spermathecae are distinct in the two species ...".

Faraji *et al.* (2012) compared descriptions of these two species, found some differences, and identified the Iranian specimen as *T. pritchardi*.

After Denmark's revision, *T. pritchardi* was re-described twice. But neither of these descriptions corresponds to that of Arutunjan (1971) in details. Re-description of *T. pritchardi* by Faraji *et al.* (2012) includes the following difference: "dorsal setae smooth, except for Z5, slightly serrate". On the contrary, seta Z5 smooth in original description and in the Polish specimens.

Posterior dorsal setae (Z4, Z5, S2, and S4) in figure of *T. pritchardi* in Papadoulis *et al.* (2009) are shown shorter, and atrium of spermatheca sedentary (neck absent), but setae Z5 smooth, fixed digit of chelicera with 3 teeth, and leg IV with three macrosetae as in original description.

Usually, some of morphological differences (especially metric data) may occur as a result of variability of specimens collected from different geographical distributions. But other distinctions may

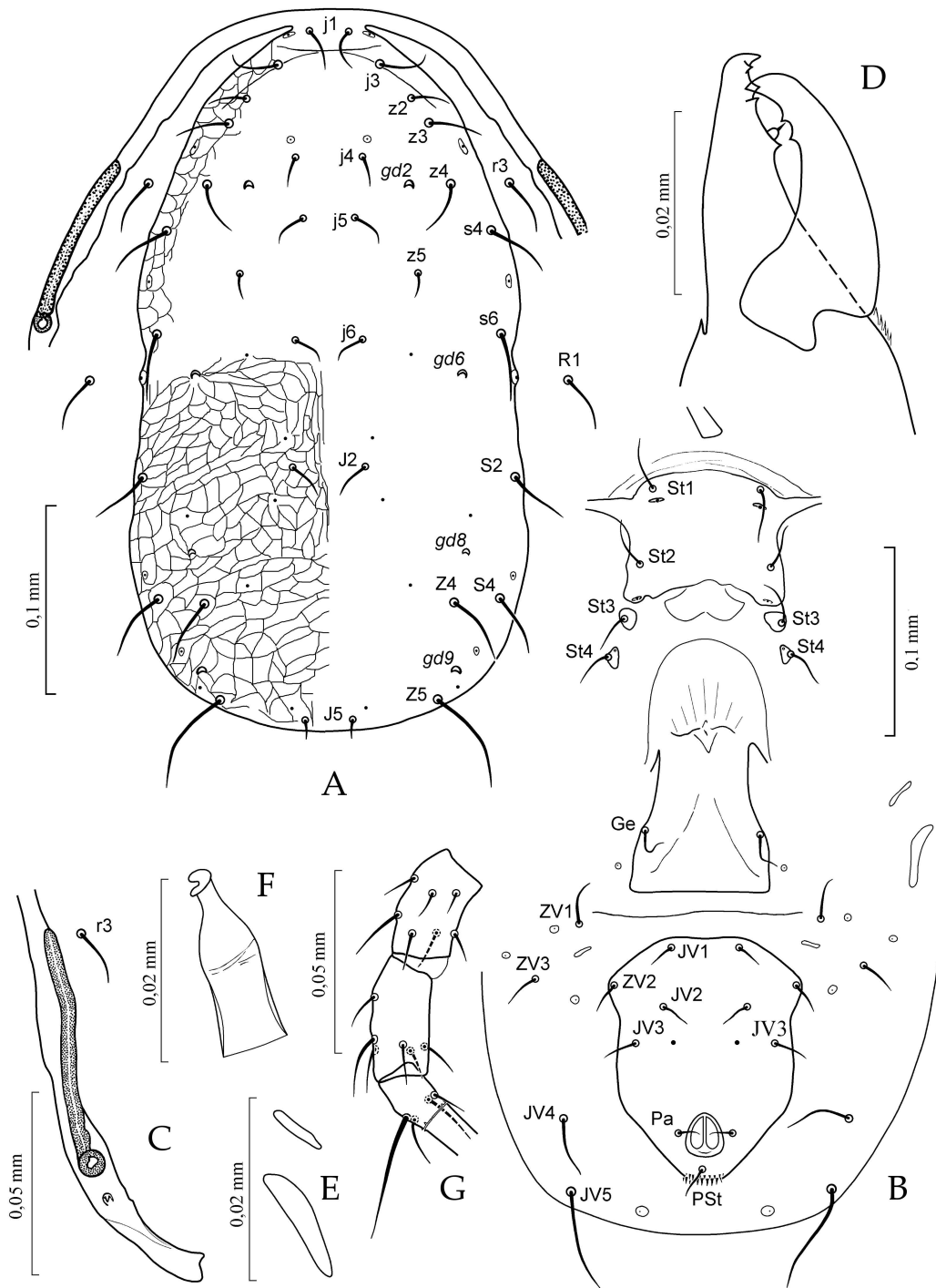


FIGURE 3: *Typhlodromus pritchardi* (Arutunjan, 1971). Female: A – dorsal shield; B – fragment of ventral body surface; C – peritreme and seta r3; D – chelicera; E – metapodal plates; F – spermatheca; G – fragment of leg IV (top-down: tibia, genu, fragment of tarsus).


indicate deeper dissimilarity and testify of an interspecies distance. Thus, additional revision of discussed specimens would be useful to reach a final conclusion.

Typhlodromus pritchardi is a rare and not numerous species. As a rule, it inhabits coniferous plants but from time to time solitary specimens were found on herbs and mosses in Armenia, Iran, Greece, Russia (Moscow Province, Yaroslavl Province), and Ukraine (Demite *et al.*, 2015).

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