

Two new species records of *Proprioiseiopsis* Muma (Acari: Mesostigmata: Phytoseiidae) from Germany

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Abstract

Proprioiseiopsis mauiensis (Prasad, 1968) and *P. sharovi* (Wainstein, 1975) are new species records for German mite fauna. They are re-described and illustrated.

Keywords Germany | Phytoseiidae | *Proprioiseiopsis* | re-description

1. Introduction

Species of the family Phytoseiidae are important predaceous mites feeding on phytophagous mites and small insects (Gerson et al. 2003, McMurtry 1984). According to the phytoseiid digital database of Demite et al. (2018), about 70 species of phytoseiid mites are recorded from Germany. Among them, 6 species belong to the genus *Proprioiseiopsis*, which are namely *P. gallus* Karg, 1989; *P. messor* (Wainstein, 1960); *P. okanagensis* (Chant, 1957); *P. sororculus* (Wainstein, 1960), *P. umidus* Karg, 1989 and *P. vulgaris* (Schuh, 1960).

Proprioiseiopsis vulgaris (Schuh, 1960) was collected in Germany by Irmgard Schuh and described by her as *Typhlodromus vulgaris* in her unpublished doctoral thesis in 1958. Karg (1960) cited this species as '*Typhlodromus vulgaris* Schuh, 1958', referring to that thesis by providing a short diagnosis of the female, drawing of spermatheca and also a short description of the hitherto unknown male with drawing of chelicera. According to the International Code of Zoological Nomenclature (Article 50.1), since the original description of that species is not published correctly, the

name is not available and should be considered as nomen nudum. According to the preamble of the International Code of Zoological Nomenclature 'The objects of the Code are to promote stability and universality in the scientific names of animals ...'. The used name of this species therefore should be '*Proprioiseiopsis vulgaris* (Schuh, 1960)', because a short description of the species is published correctly in Karg's paper (1960) with reference to the authorship of Schuh (see also De Moraes et al. 2004, Catalogue of life, GBIF). Karg did not mention this species in his three later papers (1971, 1989 & 1993).

Chant & McMurtry (2005) provided some distinguishing characters for *Proprioiseiopsis* to separate it from the closely related genera as 'seta J_2 absent, seta j_5 present, setae S_2 , S_4 , S_5 and dorsocentral setae short/medium length, genital and ventrianal shields usually somewhat broader; idiosoma usually tan or brown in colour; leg I usually without macrosetae; leg II and III usually with macrosetae; leg IV with 3 strong macrosetae'. They have recognized two species groups based on having macroseta on genu I and 3 species subgroups based on the form of spermatheca.

Despite the previous extensive studies on mite fauna of Germany, in one of our samplings, we have found two species of *Proprioiseiopsis* new for the fauna of Germany. This paper aims to re-describe these two species according to the collected specimens.

2. Material and Methods

Mites were extracted during 3 to 4 days from the field-collected weed samples using Berlese funnel. Phytoseiid specimens were cleared in a mixture of Nesbitt and lactophenol solutions 1:1, and mounted in modified Hoyer's medium as described by Faraji & Bakker (2008). Drawings were made with the aid of a camera lucida (drawing tube) attached to an Olympus phase contrast microscope. The notations used for dorsal and ventral setations follow those of Lindquist & Evans (1965) as adapted by Rowell et al. (1978) and Chant & Yoshida-Shaul (1991), respectively. The notation for gland pores (solenostomes) or lyrifissures (poroids) is according to Athias-Henriot (1975). All measurements are given in micrometers (μm). The mean of the measurements is given first followed by the range in parentheses. The classification systems follow those of Chant & McMurtry (2007). The voucher specimens of mites are deposited in the Acari collection of MITOX Consultants/Eurofins, Amsterdam Science Park.

3. Results

Proprioiseiopsis mauiensis (Prasad, 1968)

Amblyseius mauiensis: Prasad 1968

Proprioiseiopsis musaevi: Abbasova 1970

Amblyseius (Amblyseius) mauiensis:

Wainstein 1979

Amblyseius (Amblyseiulus) mauiensis:

Kolodochka 1981

Proprioiseiopsis (Amblyseiulus) mauiensis:

Karg 1989

synonymy according to Wainstein (1979)

(Fig. 1A–E & 3A–C)

Female – Five specimens measured.

Idiosomal setal pattern: 10A:8E/JV–3:ZV.

Dorsal idiosoma (Fig. 1A) – Dorsal shield 397 (385–405) long and 283 (280–285) wide at j_6 level, reticulated at opisthosoma and lateral parts of podosoma, reticulation at the central part of hysterosoma with wavy lines (Fig. 3A); with 18 pairs of dorsal setae (r_3 and R_1 included); dorsal shield setae smooth, except for Z_4 and Z_5 , slightly serrated;

lengths: j_1 24, j_3 40 (38–42), j_4 9 (8–10), j_5 8 (8–9), j_6 9 (10–12), J_5 11 (11–12), z_2 24 (21–25), z_4 17 (16–18), z_5 8 (7–8), Z_1 19 (19–20), Z_4 92 (90–95), Z_5 87 (83–93), s_4 73 (73–74), S_2 23 (22–24), S_4 23 (22–25), S_5 25 (23–26); setae r_3 28 (27–28) and R_1 21 (20–24) on lateral integument; Z_4 , Z_5 and s_4 are the longest, dorsal setae smooth, except for Z_4 and Z_5 slightly serrate; dorsal shield with 6 pairs of solenostomes (gd_1 , gd_2 , gd_4 , gd_6 , gd_8 , gd_9) and 10 pairs small poroids. Setae z_2 longer than z_4 .

Peritreme – Extending almost beyond of setae j_1 (Fig. 1A).

Ventral idiosoma (Fig. 1B) – Sternal shield wider than long, posterior margin slightly concave, smooth at the central area with some lateral striae, 66 (65–67) long, 90 (88–93) wide at level of setae ST_2 , three pairs of setae and two pairs of pores (iv_1 and iv_2), ST_1 37, ST_2 35, ST_3 33; distances between ST_1 – ST_3 70 (68–73) and ST_2 – ST_3 75 (75–76); metasternal setae ST_4 35 and a pair of pores (iv_3) on small platelets; genital shield smooth width at widest point 111 (105–115), ST_5 36 (34–38); distances between ST_5 – ST_5 97 (95–100); two pairs of metapodal shields, primary 31 (30–33) long and accessory 13–14 long; ventrianal shield shield-shaped (Fig. 3C), reticulated all over with slightly darker colour at the edges, length 127 (125–130), width at level of setae ZV_2 , 143 (140–148), and width at level of paranal setae 100 (98–102); with three pairs of preanal setae (JV_1 33–36, JV_2 38, ZV_2 33); four pairs of setae surrounding ventrianal shield on integument (JV_4 25–26, JV_5 61 (57–63), ZV_1 30, ZV_3 20–21), three pairs of pores and four pairs of small platelets surrounding ventrianal shield. Ventrianal shield with a pair of small round pores wide apart, posteriad to JV_2 , distance between these pores 57 (53–59).

Spermatheca – Calyx saccular 19 (18–19) long, 7 in diameter at the middle part of the calyx; atrium inserted at base of the calyx (Figs 1D & 3B).

Chelicera – Fixed digit 28 long with 4 teeth and a pilus dentilis; movable digit 30 long with 1 tooth (Fig. 1E).

Legs – Leg IV (Fig. 1C) with three pointed macrosetae, SgeIV 52 (50–53), StiIV 43 (41–45), StIV 85 (80–88); legs I, II and III with no recognizable macrosetae; length of legs from the base of coxae to the tip of claws: leg I 462 (450–470), leg II 351 (340–360), leg III 352 (350–355), leg IV 449 (445–455); chaetotatic formulae of genua and tibiae I–II–III–IV with 10(2-2/1, 2/1-2) – 8(2-2/1, 2/0-1) – 7(1-2/1, 2/0-1) – 7(1-2/0, 2/1-1) and 10(2-2/1, 2/1-2) – 7(1-1/1, 2/1-1) – 7(1-1/1, 2/1-1) – 6(1-1/0, 2/1-1) setae respectively.

Distribution – Azerbaijan (Abbasova 1970); Germany (this study); Hawaii (Prasad 1968 and Tenorio et al. 1985); Russia (Wainstein 1979); Ukraine (Kolodochka 1981).

Specimen examined – Seventeen females, 27 June 2017, unidentified weeds of a grassland, Mössingen, Baden-Württemberg, Germany (48.389939° N, 9.006464° E), collector: Pierre Mack.

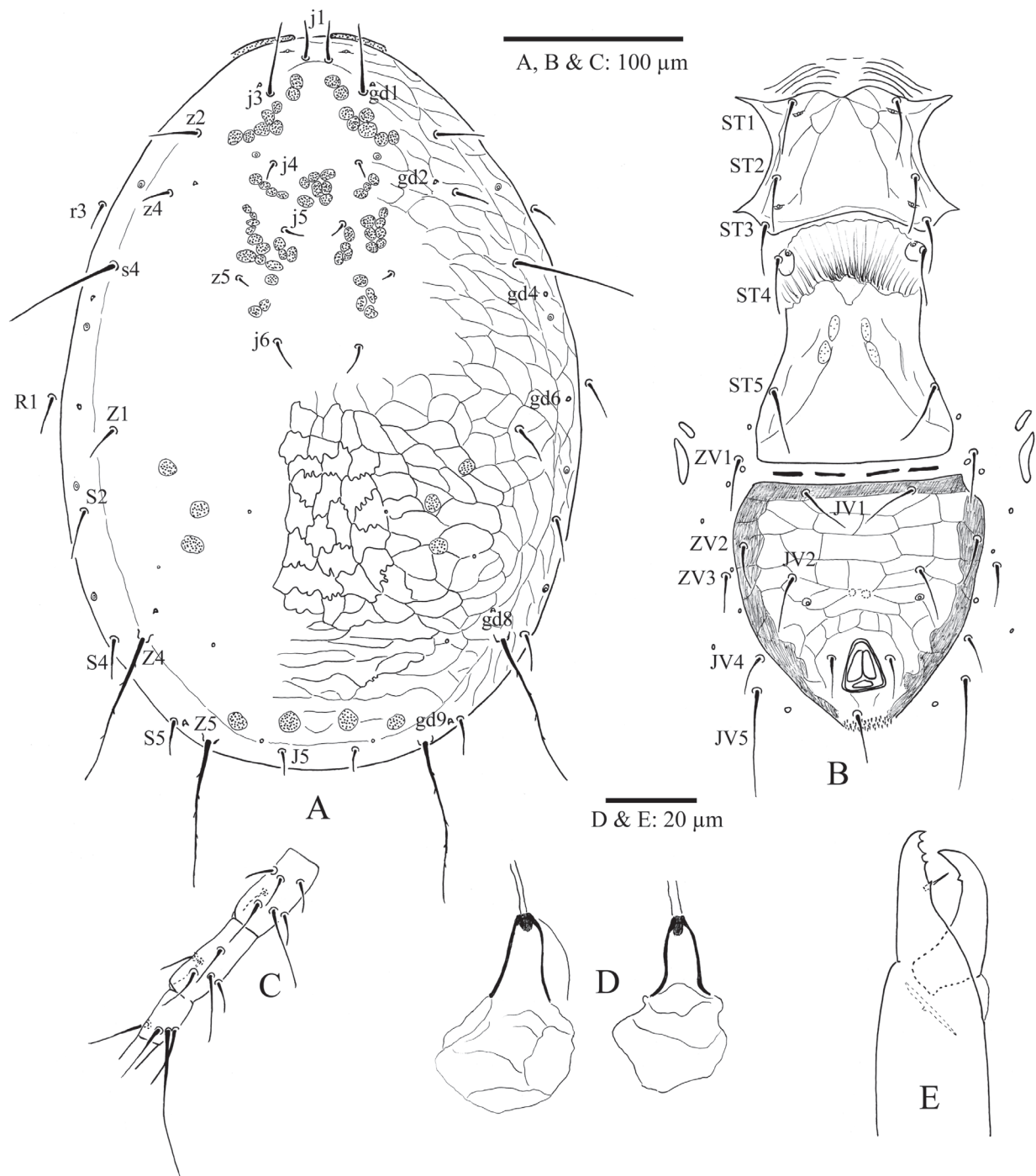


Figure 1. *Proprioseiopsis mauiensis* (Prasad, 1968) (Female): (A) Idiosoma, dorsal view, (B) Idiosoma, ventral view, (C) Leg IV, (D) Spermathecae, (E) Chelicera.

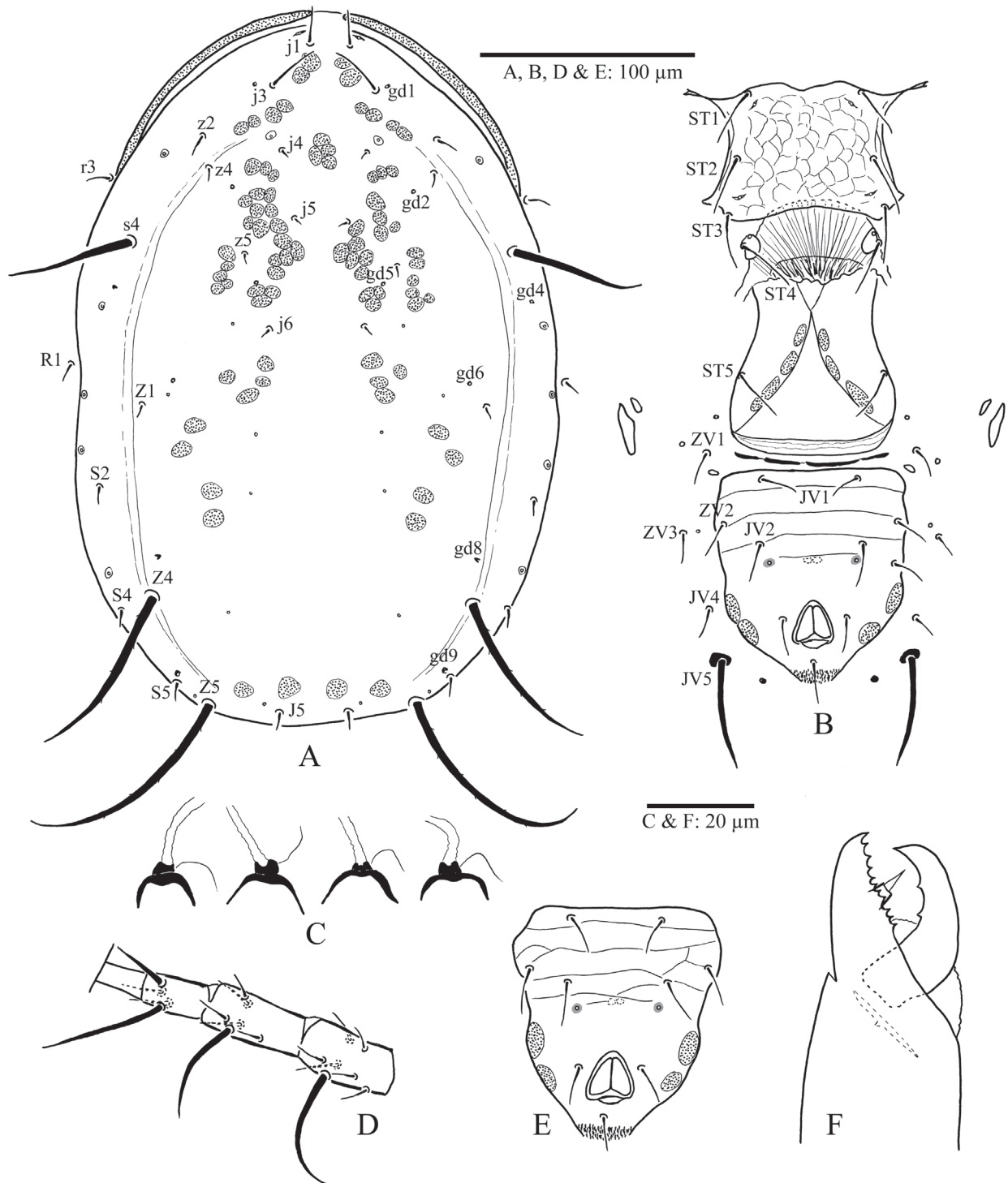


Figure 2. *Proprioseiopsis sharovi* (Wainstein, 1975) (Female): (A) Idiosoma, dorsal view, (B) Idiosoma, ventral view, (C) Spermathecae, (D) Leg IV, (E) Ventrian shield, (F) Chelicera.

Remarks – Prasad (1968) found *P. mauiensis* in Hawaii and described it based on four female specimens. The female holotype is deposited the B. P. Bishop Museum, Honolulu. One paratype female was in the collection of Dr. Frank Haramoto (pers. comm. of Dr. Vikram Prasad with FF). Prasad's measurements for that species fit well within the range of dimensions of the specimens collected in Germany. His drawing of the dorsal shield, however, does not show the wavy lines of the reticulation at the central part of hysterosoma, which could be considered as a unique feature of this species.

***Proprioseiopsis sharovi* (Wainstein, 1975)**

Amblyseius (Amblyseius) sharovi:

Wainstein 1975

Amblyseiulus sharovi: Juvara-Bals 1988

Proprioseiopsis (Patinoseius) sharovi:

Karg 1989

(Fig. 2A–F & 3D–E)

FEMALE – 5 specimens measured.

Idiosomal setal pattern: 10A:8E/JV–3:ZV.

Dorsal idiosoma (Fig. 2A) – Dorsal shield 352 (345–355) long and 227 (215–230) wide at j_6 level, smooth (a pair of bands are recognizable extending between z_4 and Z_5 setae); dorsal setae smooth, except for Z_4 and Z_5 , lightly serrate; lengths: j_1 21 (20–21), j_3 29 (29–30), j_4 6, j_5 5 (4–5), j_6 7, J_5 9 (8–9), z_2 12 (12–13), z_4 10 (9–11), z_5 6 (6–7), Z_1 9, Z_4 85 (82–88), Z_5 115 (113–119), s_4 67 (66–70), S_2 10 (9–10), S_4 11 (10–11), S_5 11 (10–11); setae r_3 14 (13–14) and R_1 10 (9–10) on lateral integument; Z_4 , Z_5 and s_4 are the longest and thicker, dorsal setae smooth, except for Z_4 and Z_5 slightly serrate; dorsal shield with 7 pairs of solenostomes (gd_1 , gd_2 , gd_4 , gd_5 , gd_6 , gd_8 , gd_9) and 14 pairs small poroids. Setae z_2 longer than z_4 .

Peritreme – Extending anterior to setae j_1 (Fig. 2A).

Ventral idiosoma (Fig. 2B) – Sternal shield lightly reticulate, with a few lateral striae, posterior margin slightly concave, 63 (62–65) long and 79 (78–80) wide at level of setae ST_2 ; ST_1 31 (30–31), ST_2 , ST_3 , ST_4 & ST_5 28–30, ST_4 on metasternal shields; distances between ST_1 – ST_3 59 (58–59) and ST_2 – ST_2 66 (66–67); genital shield smooth (posterior part with an extended strip), width 80 (78–84) at widest point, distances between ST_3 – ST_5 72 (70–74); 2 pairs of metapodal shields, primary 21 (20–22) and accessory 10 (10–11) long; ventrianal shield pentagonal (Fig. 3E), slightly striated on anterior half, up to preanal pores, length 108 (105–113), width at ZV_2 95 (85–98) and width at level of paranal setae 70 (69–73); with 3 pairs of preanal setae JV_1 19 (18–19), JV_2 20, ZV_2 18 (17–18), one specimen with 3 + 4 preanal setae (Fig. 2B), the rest of specimens normal (Fig. 2E); 4 pairs

of setae surrounding ventrianal shield on integument, JV_4 14 (13–15), JV_5 56 (50–58), ZV_1 20 (19–20), ZV_3 13 (12–14); ventrianal shield with a pair of small round pores posteromesad to JV_2 , distance between these pores 39 (34–41) slightly shorter than distance between JV_2 – JV_2 50 (48–51) insertions.

Spermatheca – Calyx cup-shaped 7 (6–8) long, 11 in diameter at its distal part; atrium u-shaped inserted at base of the calyx. (Figs 2C & 3D).

Chelicera – Fixed digit 29 (29–30) long with 10 teeth and a pilus dentilis; movable digit 30–31 long with 2 teeth (Fig. 2D).

Legs – Leg IV (Fig. 2D) with three pointed macrosetae, SgeIV 64 (63–68), StiIV 46 (45–48), StIV 60 (60–61); legs II and III with one macroseta each, SgeIII 31 (30–33), SgeII 28 (25–29); length of legs from the base of coxae to the tip of claws: leg I 375 (370–380), leg II 288 (285–290), leg III 292 (290–295), leg IV 375 (370–380); chaetotatic formulae of genua and tibiae I–II–III–IV with 10(2-2/1, 2/1-2) – 8(2-2/1, 2/0-1) – 7(1-2/1, 2/0-1) – 7(1-2/1, 2/0-1) and 10(2-2/1, 2/1-2) – 7(1-1/1, 2/1-1) – 7(1-1/1, 2/1-1) – 6(1-1/1, 2/0-1) setae respectively.

Distribution – Germany (this study); Greece (Papadoulis et al. 2009); Norway (Denmark & Edland 2002); Russia (Wainstein 1975).

Specimens examined – Nine females, 27 June 2017, unidentified weeds of a grassland, Mössingen, Baden-Württemberg, Germany (48.389939° N, 9.006464° E), collector: Pierre Mack.

Remarks – Wainstein (1975) described the species based on only two females. The specimens of *P. sharovi* collected in Germany show all the features as provided by Wainstein (1975) except the relative lengths of two dorsal shield setae of z_2 and z_4 . He mentioned z_2 (12) slightly shorter than z_4 (13) while in the specimens collected in Germany z_2 12 (12–13) slightly longer than z_4 10 (9–11). Also, the German specimens show slightly shorter macrosetae of leg IV than those provided by Wainstein (1975).

4. Discussion

Re-descriptions of species with poor quality figures and short descriptions are very important. Some species are described based on a single specimen or only the measurements of the holotype, or the average of measurements are provided which does not show the intraspecific variation for important features. Moreover, re-describing species from different geographical locations provide an extended overview for the intraspecific variation.

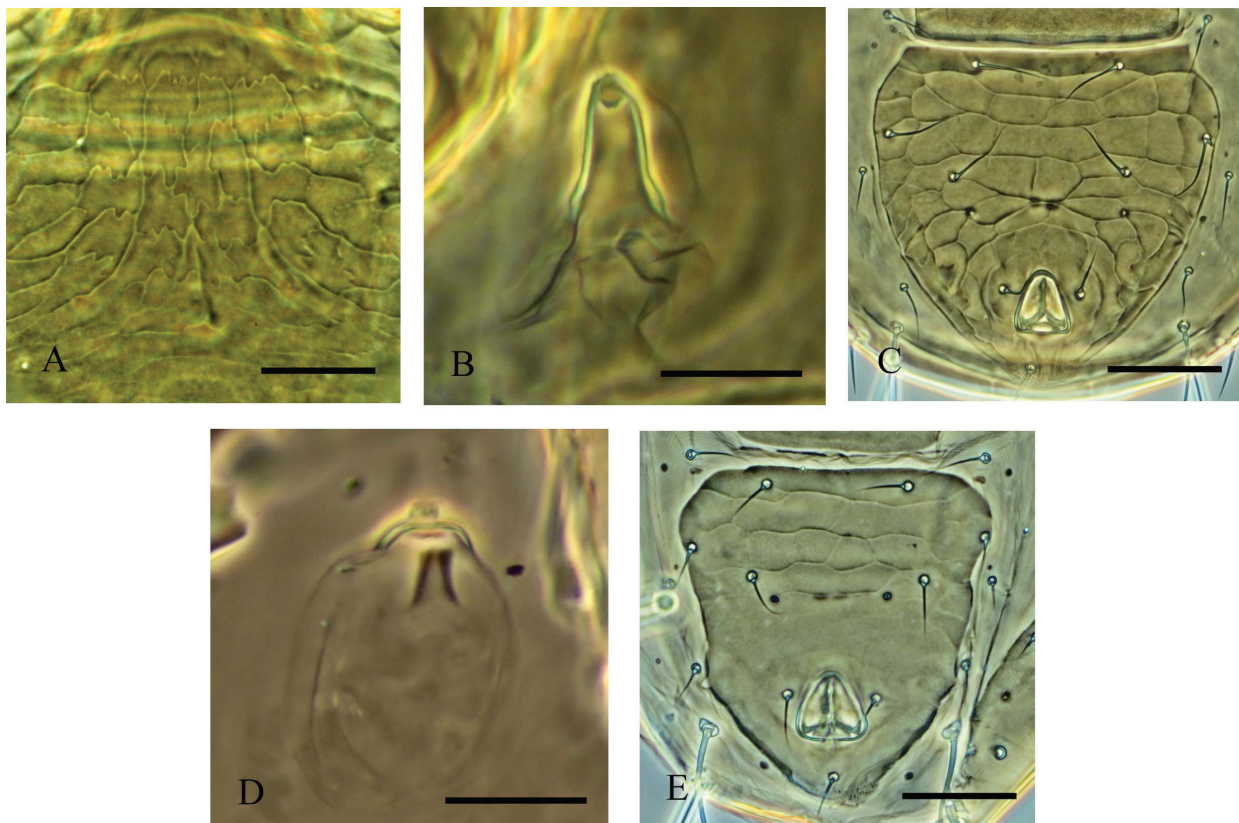


Figure 3. *Proprioseiopsis maiiensis* (Prasad, 1968) (Female): (A) Pattern of dorsal shield reticulation at central part of hysterosoma, (B) Spermatheca, (C) Ventrianal shield. *Proprioseiopsis sharovi* (Wainstein, 1975) (Female): (D) Spermatheca, (E) Ventrianal shield. Scale bars for A, C & E = 40 μ m and for B & D = 20 μ m.

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