

Re-descriptions of *Amblyseius decolor* (Westerboer) and *Proprioseiopsis sororculus* (Wainstein) (Acari: Phytoseiidae) based on the specimens collected in Turkey and France

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ABSTRACT

Re-descriptions of *Amblyseius decolor* (Westerboer, 1962) and *Proprioseiopsis sororculus* (Wainstein, 1960) (Acari: Phytoseiidae) based on specimens collected in Turkey and France are provided. Both of these mite species represent new distribution records for Turkey. Some new morphological data related to these two species collected in Turkey and France, as well as an identification key for Amblyseiini species of Turkey, are also given. These species are re-described, measured and illustrated. *Amblyseius lutezhicus* Wainstein is considered as a junior synonym of *A. decolor*.

Keywords *Amblyseius decolor*, France, Mesostigmata, predatory mite, *Proprioseiopsis sororculus*, Turkey

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Introduction

More than 2798 species of the family Phytoseiidae have been described and among them 2521 are known valid (Demite *et al.* 2018). Some members of the family Phytoseiidae are considered among the most important agents in pest biological control. These beneficial arthropods have been used successfully against the injurious mites and small insects like thrips and whiteflies (Gerson *et al.* 2003; Zhang 2003; Faraji *et al.* 2011, McMurtry *et al.* 2013). Considerable studies have been made in Turkey to record the species of Phytoseiidae and so far 97 phytoseiid species belonging to 19 genera have been recorded (Düzungün 1963, Moraes *et al.* 1986, 2004, Faraji *et al.* 2011, Döker *et al.* 2016, 2017; Demite *et al.* 2018). During a survey between 2014 and 2016 on determining the mites inhabiting garlic plants and those associated with garlic bulbs in storage, we have found two phytoseiid species new for the fauna of Turkey. The aim of this paper is to re-describe these two new species records and compare them morphologically with the species collected in France. We also present a key for the species in tribe Amblyseiini recorded from Turkey.

Received 9 April 2018
Accepted 7 July 2018
Published 14 September 2018

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Academic editor
Serge-Kreiter

DOI
[10.24349/acarologia/20184272](https://doi.org/10.24349/acarologia/20184272)

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Materials and methods

The mite samples were collected from garlic bulbs in storages or garlic plants in garlic fields of Kastamonu region, which is located North-eastern part of Turkey. The predatory mites were extracted using Berlese funnel set-up, cleared in a mixture of lactophenol: Nesbitt 1:1

How to cite this article Çobanoğlu S. *et al.* (2018), Re-descriptions of *Amblyseius decolor* (Westerboer) and *Proprioseiopsis sororculus* (Wainstein) (Acari: Phytoseiidae) based on the specimens collected in Turkey and France. *Acarologica* 58(4): 825-836; DOI 10.24349/acarologia/20184272

and mounted in the Hoyer's medium on microscope slides. The notations used for dorsal and ventral setations follow those of Lindquist and Evans (1965) as adapted by Rowell *et al.* (1978) and Chant and 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 voucher specimens of species re-described here are deposited in the mite collection of the Department of Plant Protection (University of Ankara, Turkey) and MITOX consultants/Eurofins (Amsterdam, Netherlands).

Results

***Amblyseius decolor* (Westerboer, 1962)**

Typhlodromus decolor Westerboer, in Hirschmann, 1962: 25.

Typhlodromus (Typhlodromus) decolor — Westerboer & Bernhard, 1963: 654.

Typhlodromips decolor — Moraes *et al.*, 1986: 139, 2004: 211.

Amblyseius (Typhlodromips) decolor — Karg, 1991.

Amblyseius decolor — Chant & McMurtry, 2007: 78; Prasad, 2012: 393; Demite *et al.*, 2018.

Amblyseius lutezhicus Wainstein, 1972: 1408. (new synonymy).

Female — Turkish strain of *Amblyseius decolor* (n=1) (Figure 1)

Idiosomal setal pattern: 10A:9B/JV-3:ZV.

Dorsal idiosoma (Figure 1A) — Dorsal shield 340 long and 200 wide at j_6 level, mostly smooth with some striae laterally; with 19 pairs of dorsal setae (r_3 and R_1 included), dorsal setae smooth, except for Z_4 and Z_5 , slightly serrate; lengths j_1 28, j_3 48, j_4 5, j_5 5, j_6 5, J_2 13, J_5 8, z_2 10, z_4 38, z_5 5, Z_1 8, Z_4 90, Z_5 98, s_4 78, S_2 25, S_4 18, S_5 13; setae r_3 15 and R_1 18 on lateral integument; dorsal shield with 6 pairs of large solenostomes (gd_1 , gd_2 , gd_4 , gd_6 , gd_8 and gd_9), and 10 pairs of poroids.

Peritreme — Extending beyond the insertions of setae j_1 (Figure 1A).

Ventral idiosoma (Figure 1B) — Sternal shield mostly smooth with some slight striae anterior and laterally and with faint lines medially, 65 long and 75 wide at level of setae ST_2 , with two pairs of poroids (iv_1 and iv_2) and three pairs of setae, ST_1 20, ST_2 28, ST_3 25; distances between ST_1 – ST_3 60 and ST_2 – ST_2 66; metasternal setae ST_4 23 and a pair of poroids (iv_3) on small platelets; genital shield smooth at middle and with a few striae laterally, width 70 at widest point, ST_5 (18) distances between ST_5 – ST_5 71; two pairs of metapodal shields, primary 25 and accessory 13 long; ventrianal shield subpentagonal, with some striae between JV_1 and paranals; length 118, width at level of setae ZV_2 95 and width at level of paranal setae 92; with three pairs of preanal setae (JV_1 18, JV_2 23, ZV_2 18); four pairs of setae surrounding ventrianal shield on integument (JV_4 13, JV_5 50, ZV_1 13, ZV_3 13); ventrianal shield with a pair of non-aligned small round pores posteriad to JV_2 , and muscle marks posterolaterally, distance between these pores 38 and the distance between insertions of JV_2 – JV_2 48.

Spermatheca — Calyx very long 60 snake-shaped, atrium incorporated in the calyx whose walls are thickened at the anterior tip, calyx gets A-shaped one-fourths of its length towards vesicle, minor duct not visible (Figure 1C).

Chelicera — Fixed digit 28 long with 6 small teeth and *pilus dentilis*; movable digit 25 long with two widely separated teeth (Figure 1D).

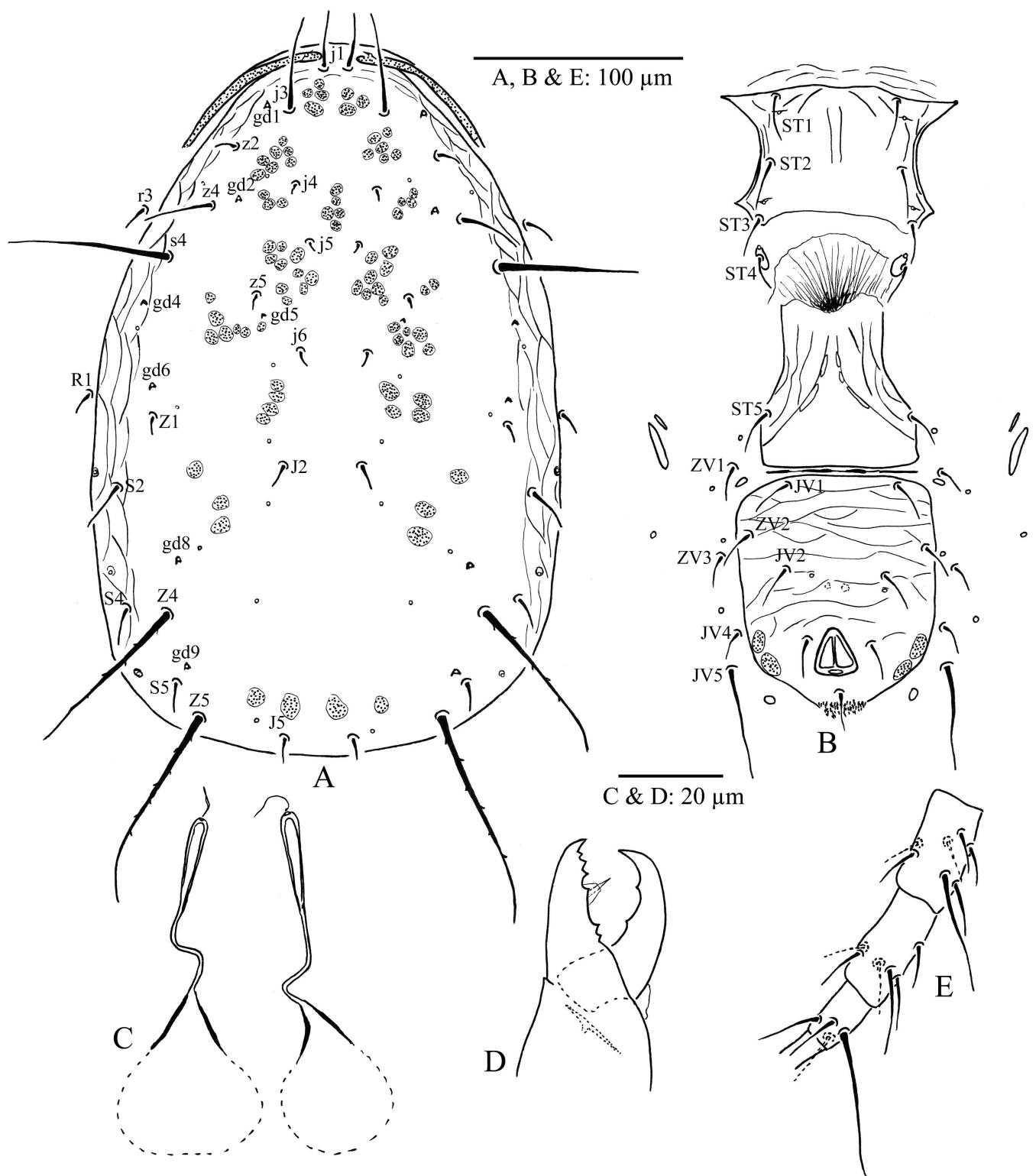


Figure 1 *Amblyseius decolor* (Westerboer)-Turkey, female: A – Dorsal view; B – Ventral view; C – Spermathecae; D – Chelicera; E – Genu, tibia and basitarsus IV.

Legs — Leg IV (Figure 1E) with three macrosetae, all pointed apically, $SgeIV$ 60, $StiIV$ 40, $StIV$ 75; distance from base of macrosetae to slit like organ 58, 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.

Specimen examined — 1♀, 14 August 2015, stored garlic bulbs, Taşköprü-Kastamonu (41°31'00.94"N 34°11'46.74"E) collected by Cihan Cılbürcioğlu.

Female — French strain of *Amblyseius decolor* (n=5) (Figure 2 & 4A)

Due to the similarities in features with the Turkish specimen, only the measurements are provided.

Dorsal idiosoma (Figure 2A) — Dorsal shield 332 (330–340) long and 210 (200–220) wide at j_6 level; setal lengths: j_1 23 (18–28), j_3 34 (33–38), j_4 4 (3–5), j_5 4 (3–5), j_6 4 (3–5), J_2 7 (5–8), J_5 10 (9–10), z_2 8 (8–10), z_4 19 (13–25), z_5 3, Z_1 9 (8–10), Z_4 68 (63–70), Z_5 73 (68–80), s_4 64 (60–68), S_2 18 (15–20), S_4 12 (10–15), S_5 11 (8–13); setae r_3 13 (10–15) and R_1 11 (8–15) on lateral integument.

Ventral idiosoma (Figure 2B) — Sternal shield 59 (58–63) long and 73 (68–75) wide at level of setae ST_2 ; ST_1 33 (33–35), ST_2 25 (23–28), ST_3 26 (23–28); distances between ST_1 - ST_3 58–63 and ST_2 - ST_2 66–70; ST_4 29 (23–39); genital shield width at widest point 72 (68–75) and ST_5 25 (20–28); distances between ST_5 - ST_5 69–75; primary metapodal shields 23 (18–25) and accessory 19 (18–20) long; ventrianal shield length 109 (103–115), width at level of setae ZV_2 , 94 (93–105), and 94 (93–98) width at level of paranal setae; setae JV_1 17 (15–20), JV_2 21 (20–23), ZV_2 16 (13–18), JV_4 10 (8–10), JV_5 46 (43–50), ZV_1 17 (15–20), ZV_3 11 (8–13); distance between preanal pores 29 (25–38) and JV_2 - JV_2 45 (40–51).

Spermatheca — Calyx very long 51 (48–58) (Figure 2C & 4A).

Chelicera — Fixed digit 32 (28–38) and movable digit 27 (25–30) long with two widely separated teeth (Figure 2D).

Legs — Leg IV (Figure 2E) $SgeIV$ 54 (48–60), $StiIV$ 40 (33–48), $StIV$ 61 (60–65); distance from base of macrosetae to slit like organ 58 (53–60).

Specimens examined — 2♀♀, 21 August 2003; 3♀♀ 17 October 2003 Buzet, Lot-et-Garonne, Southwest France (44°15'53.6"N 0°17'57.5"E), ground weeds (apple orchard), Mitox, collected by F. Bakker.

Distribution — Armenia (Wainstein, 1977); France (Tixier *et al.*, 2000); Moldova (Kolodochka, 1980), Portugal (Espinha *et al.*, 1998); Spain (Hirschmann, 1962; Escudero & Ferragut, 1998); Turkey (this study) and Ukraine (Wainstein, 1972).

Remarks — This is the first report of *A. decolor* from Turkey. Most of the morphological features of the specimen found in Turkey are similar to those collected in France as well as in the original descriptions of *A. decolor* and *A. lutezhicus*. One of the noticeable differences is the length of z_4 and its ratio to the distance between insertions of z_4 and s_4 . Seta z_4 reaching the insertion of s_4 in the Turkish specimen while for the French specimens and specimen re-described by Ferragut *et al.* (2010) that is half and for the specimens collected in Ukraine (Wainstein, 1972) is almost one-thirds. The Turkish specimen has longer some dorsal shield setae as mentioned in Table 1. This observation shows to some extends variability in setal lengths in this species. The shape of spermatheca in *A. decolor* is very unique and

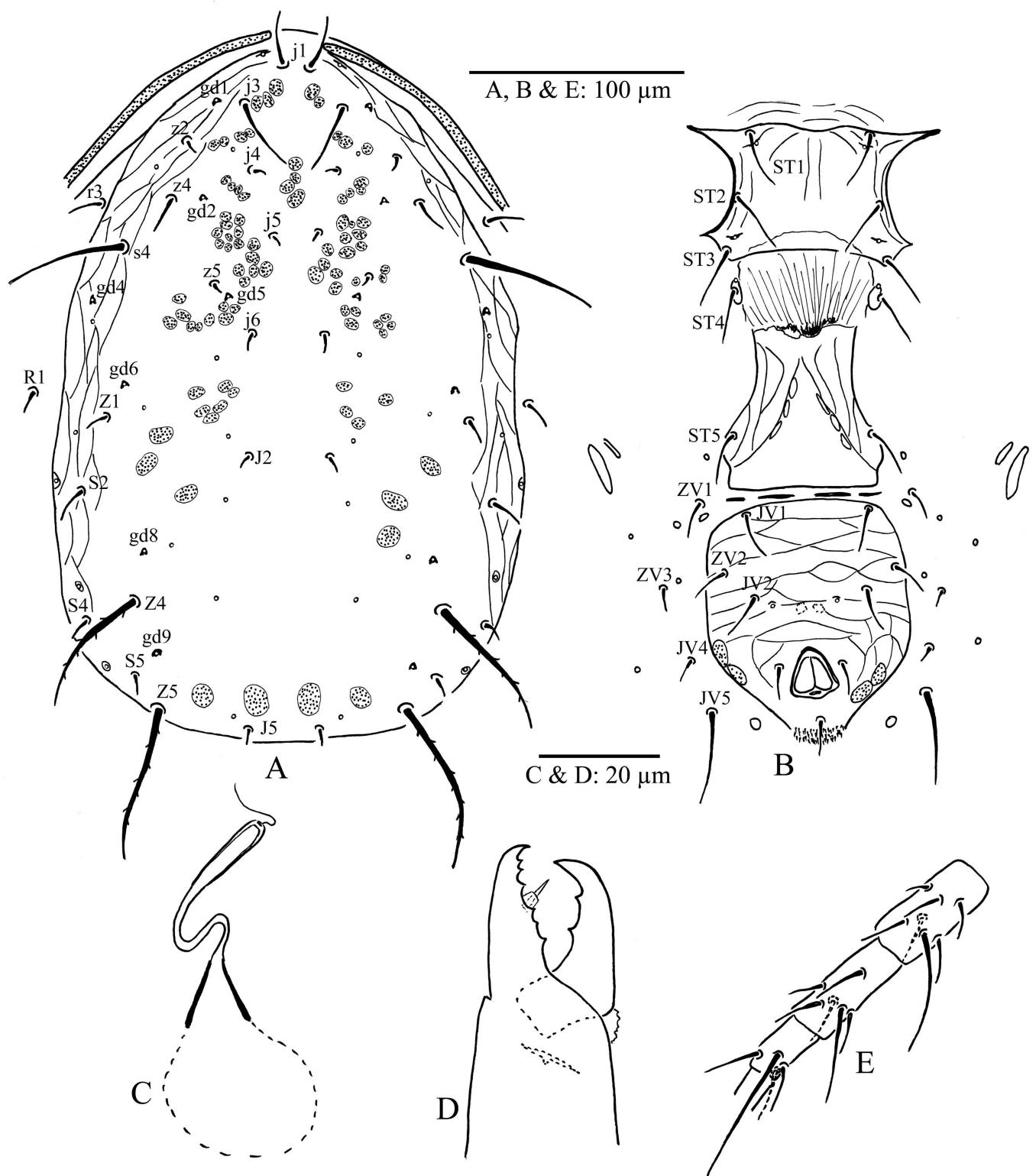


Figure 2 *Amblyseius decolor* (Westerboer)-France female: A – Dorsal view; B – Ventral view; C – Spermathecae; D – Chelicera; E – Genu, tibia and basitarsus IV.

Table 1 Comparisons of some dorsal shield setal lengths of female *Amblyseius decolor* collected in three locations with *A. lutezhicus* and *Transeius macrospermaticus*

	<i>j</i> ₃	<i>J</i> ₂	<i>z</i> ₄	<i>Z</i> ₄	<i>Z</i> ₅	<i>s</i> ₄	<i>S</i> ₂	<i>S</i> ₄
<i>Amblyseius decolor</i> (Turkey)*	48	13	38	90	98	78	25	18
<i>Amblyseius decolor</i> (France)*	34	7	19	68	73	64	18	12
<i>Amblyseius decolor</i> (Spain)**	38-41	9	18	71-80	76-92	62-72	18-21	10-12
<i>Amblyseius lutezhicus</i> (Ukraine)***	38	9	18	81	94	72	20	13
<i>Transeius macrospermaticus</i>	47	11	36	86	97	81	40	18

*This paper; **Re-description by Ferragut *et al.* (2010); ***Original description

does share it with two other closely related species, which are assigned in another genus (*Transeius*). *Transeius infundibulatus* (Athias-Henriot, 1961) and *T. macrospermaticus* Papadoulis, Emmanouel & Kapaxidi, 2009 described from Spain and Greece, respectively show a close affinity with *A. decolor* in many respects. Ignoring slightly longer *S*2 seta, the specimen of *A. decolor* collected in Turkey resembles *T. macrospermaticus* in all respects and the minor differences fall within intraspecific variation. It is astonishing enough to find that these two species suspected being conspecific classified in two different genera: *Amblyseius* and *Transeius*. In another study, Tsolakis *et al.* (2012) have shown that *Transeius montdorensis* (Schicha) is closely related to *Amblyseius andersoni* (Chant) and *A. swirskii* Athias-Henriot. Therefore, there would be a question about the integrity of the genus *Amblyseius* and the validity of the genus *Transeius*. A molecular study on *A. decolor*, *T. macrospermaticus* and *T. infundibulatus* or more collection of specimens from Europe might reveal these species conspecific. If these species turn to be conspecific then *T. infundibulatus* would be the valid name.

***Proprioseiopsis sororculus* (Wainstein, 1960)**

For other names and synonyms see Demite *et al.*, 2018.

Female – Turkish strain of *Proprioseiopsis sororculus* (n=3) (Figure 3)

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

Dorsal idiosoma (Figure 3A) — Dorsal shield smooth 407 (360–430) long, 264 (250–270) wide at *j*6 level, with 18 pairs of dorsal setae (*r*3 and *R*1 included); dorsal shield setae smooth, except for *Z*5, slightly serrated; lengths *j*1 26 (25–28), *j*3 40 (38–42), *j*4 5, *j*5 4 (3–5), *j*6 4 (3–5), *J*5 7 (5–8), *z*2 17 (15–18), *z*4 11 (10–12), *z*5 4 (3–5), *Z*1 7 (5–10), *Z*4 82 (78–85), *Z*5 100 (95–105), *s*4 67 (66–68), *S*2 9 (8–10), *S*4 8, *S*5 7 (5–8); setae *r*3 18 (16–20) and *R*1 13 (12–15) on lateral integument; *Z*4 and *Z*5 are the longest, dorsal shield with 7 pairs of solenostomes (*gd*1, *gd*2, *gd*4, *gd*5, *gd*6, *gd*8, *gd*9), *gd*9 larger than the others and 15 pairs small poroids. Setae *z*2 slightly longer than *z*4.

Peritreme — Extending beyond the insertions of setae *j*1 (Figure 3A).

Ventral idiosoma (Figure 3B) — Sternal shield wider than long, large, smooth, 63 (60–65) long, 81 (78–83) wide at level of setae *ST*2, with a lateral stria, three pairs of setae and two pairs of pores (*iv*1 and *iv*2), *ST*1 28, *ST*2 29 (25–35), *ST*3 22 (20–23); distances between *ST*1–*ST*3 64 (63–66) and *ST*2–*ST*2 72 (71–73); metasternal setae *ST*4 23 (18–30) and a pair of pores (*iv*3) on small platelets; genital shield smooth width at widest point 87 (80–90), *ST*5 32 (30–33); distances between *ST*5–*ST*5 80 (79–81) two pairs of metapodal shields, primary 25 (23–28)

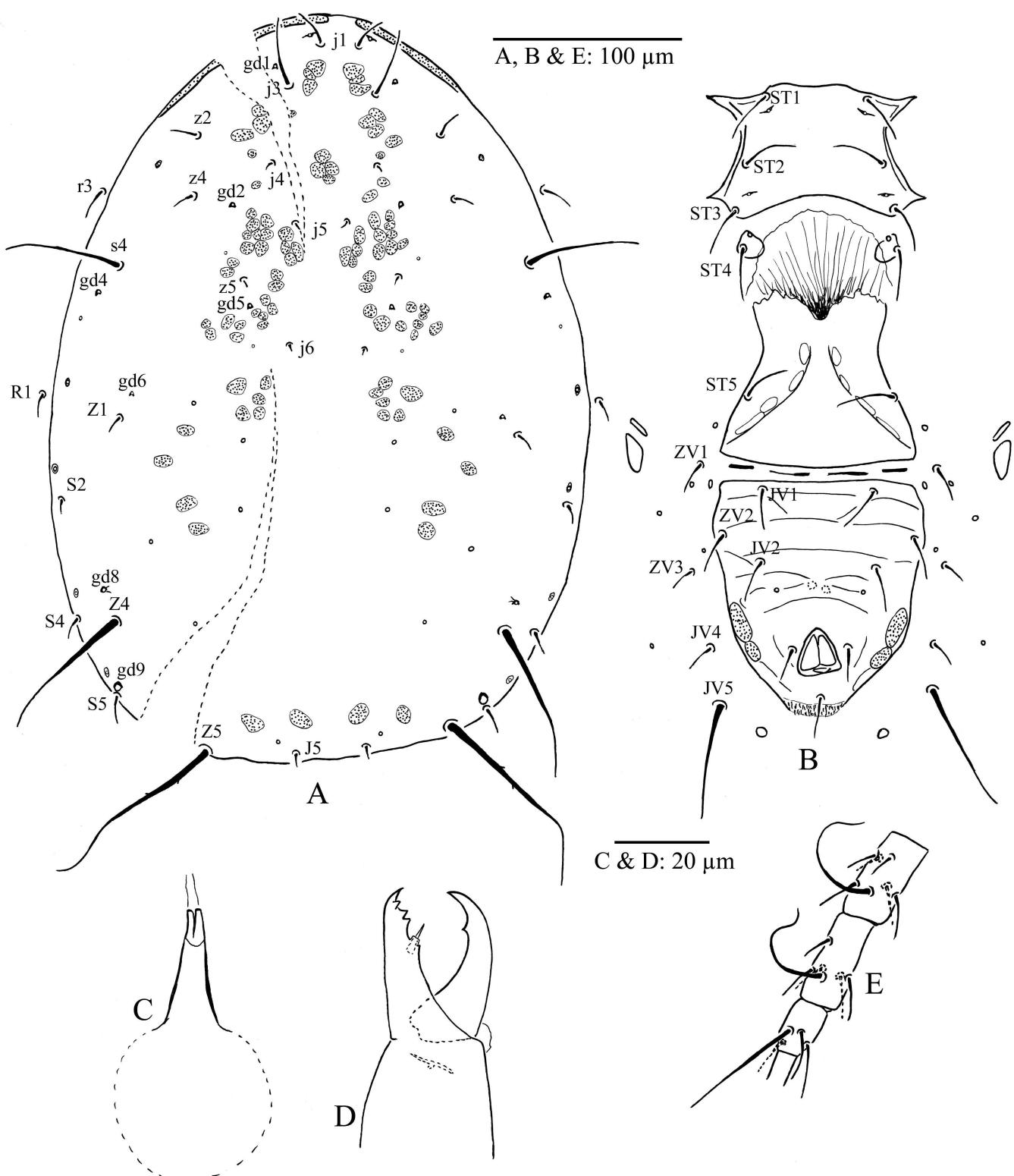


Figure 3 *Proprioseiopsis sororculus* (Wainstein)-Turkey, female: A – Dorsal view; B – Ventral view; C – Spermathecae; D – Chelicera; E – Genu, tibia and basitarsus IV.

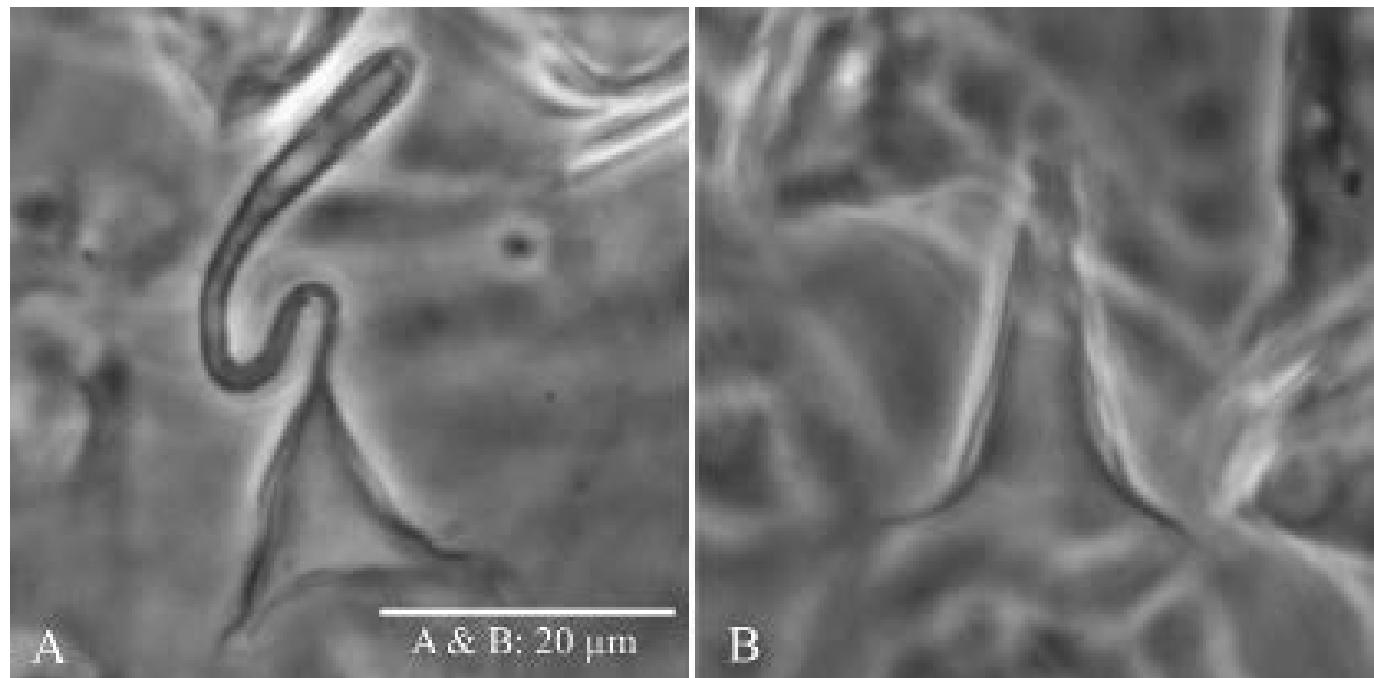


Figure 4 Spermatheca of females of A – *Amblyseius decolor* (Westerboer); B – *Proprioseiopsis sororculus* (Wainstein).

long and accessory 13 (13–15) long; ventrianal shield subpentagonal, slightly striated all over the shield between *JV1* and paranals, with crosswise lines between preanal pores, length 119 (113–128), width at level of setae *ZV2*, 115 (113–118), and width at level of paranal setae 94 (93–98); with three pairs of preanal setae (*JV1* 23, *JV2* 22 (18–25), *ZV2* 21 (18–23)); four pairs of setae surrounding ventrianal shield on integument (*JV4* 16 (15–18), *JV5* 67 (65–69), *ZV1* 19 (18–20), *ZV3* 12 (10–15)), three pairs of pores and two pairs of small platelets posteriad to *ZV1*. Ventrianal shield with a pair of small round pores wide apart, posteriad to *JV2*, distance between these pores 51 (48–58) and muscle marks posterolaterally.

Spermatheca — Calyx conical, saccular, flared distally 23 (18–25) long and 12 (10–13) width, atrium large, nodular (Figure 3C & 4B).

Chelicera — Fixed digit 36 (35–38) long with four small teeth and *pilus dentilis*; movable digit 32 (30–33) long with one tooth (Figure 3D).

Legs — Leg IV (Figure 3E) with three macrosetae, all pointed apically, *SgeIV* 67 (63–70), *StiIV* 56 (53–58), *StiIV* 67 (63–70) long; distance from base of macrosetae to slit like organ 51 (48–58); 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.

Specimens examined — 3♀, 28 April 2016 Taşköprü-Kastamonu (41°34'53.64"N 34°16'29.93"E) ground weeds (*Cirsium arvense* (L.) Scop., (Asteraceae) (Garlic growing areas), collected by Cihan Cılbaşıoğlu.

Female — French strain of *Proprioseiopsis sororculus* (n=4)

Due to the similarities in features with Turkish strain, only the measurements are provided.

Dorsal idiosoma — Dorsal shield 388 (370–400) long, 221 (200–230) wide at *j6* level, setal lengths *j1* 32 (25–38), *j3* 41 (35–48), *j4* 5, *j5* 5, *j6* 5, *J5* 9 (8–10), *z2* 24 (20–25), *z4* 12 (10–13), *z5* 5, *Z1* 6 (5–10), *Z4* 81 (75–88), *Z5* 96 (85–110), *s4* 61 (55–70), *S2* 8 (8–10), *S4* 9 (8–10), *S5* 8 (8–10), *r3* 17 (13–23) and *R1* 13 (8–18) on lateral integument.

Ventral idiosoma — Sternal shield 65 (55–73) long, 83 (78–90) wide at level of setae *ST2*; *ST1* 29 (25–35), *ST2* 28 (25–30), *ST3* 26 (23–28), *ST4* 24 (23–30); distances between *ST1*—*ST3* 62–64 and *ST2*—*ST2* 73–74; genital shield 84 (78–95) width at widest point, *ST5* 29 (28–30); distances between *ST5*—*ST5* 80–88; primary metapodal shields 26 (23–30) long and accessory 13 long; ventrianal shield 117 (113–128) long, width at level of setae *ZV2* 115 (110–120), and width at level of paranal setae 107 (100–110); *JV1* 19 (15–23), *JV2* 20 (18–23), *ZV2* 19 (18–23); *JV4* 13 (10–18), *JV5* 57 (55–60), *ZV1* 19 (18–20), *ZV3* 11 (8–15); distance between preanal pores 47 (43–51).

Spermatheca — Calyx 19 (18–28) long and 11 (10–13) wide.

Chelicera — Fixed digit 34 (33–35) and movable digit 32 (30–33) long.

Legs — *SgeIV* 58 (50–65), *StiIV* 47 (40–53), *StIV* 61 (58–63) long; distance from base of macrosetae to slit like organ 55 (53–58).

Specimens examined — 4♀♀, 21 August 2003; 3♀♀ 17 October 2003 Buzet, Lot-et-Garonne, Southwest France (44°15'53.6"N 0°17'57.5"E), ground weeds (apple orchard), Mitox, collected by F. Bakker.

Distribution — Hungary (Ripka *et al.*, 2005); Moldova (Kolodochka 1980); Russia (Wainstein, 1960; Meshkov, 1999); Serbia: (Kropczynska & Petanović, 1987); Spain (Escudero & Ferragut, 1998); Turkey (this study) and Ukraine (Kolodochka, 1981).

Remarks — This is the first report of *P. sororculus* from Turkey. All the measurement and morphological features are similar for the Turkish and French specimens.

Key to the Turkish species of Phytoseiidae tribe Amblyseiini Muma

1. Sternal shield broader, L/W ratio usually less than 1.0:1.0; female ventrianal shield usually broader, L/W ratio less than 1.0:1.1; all shields more strongly sclerotized; seta *J2* present/absent; genital shield usually narrower than ventrianal shield, ratio width of genital shield to width of ventrianal shield usually 1.0:1.1–3.9; sternal and genital shields smooth or reticulate; peritremal shield ranging from narrow to extremely broad, ectal strip often present; legs II–IV with/without macrosetae; setae *z2* and/or *z4* often longer; setae *j5*, *J2*, *S2*, *S4* and/or *Z1* present/absent
..... subtribe Proprioseiopsina Chant & McMurtry, 2004: *Proprioseiopsis* Muma, 1961 ...2
- Sternal shield narrower, L/W ratio usually ca. 1.0:1.0; female ventrianal shield usually longer than wide, L/W ratio usually greater than 1.0:1.1; all shields lightly sclerotized; seta *J2* present or, if absent, ventrianal shield narrow, L/W ratio > 1.5:1.0; genital shield approximately as wide as ventrianal shield, ratio width genital shield to width ventrianal shield usually approximately 1.0:1.0; sternal shield usually smooth, at most lightly reticulate; genital shield smooth; ventrianal shield usually smooth or at most lightly striate; peritremal shield narrow, ectal strip rarely present; legs II and III usually and leg I often with macrosetae; leg IV usually with three strong macrosetae; setae *z2* and *z4* usually short/minute; setae *j5*, *S2* and *S4* present, setae *J2*, *S5* and *Z1* present/absent subtribe Amblyseiina Muma, 1961 ...5
2. Distance between preanal pores about 1/3 of distance between *JV2* setae; sternal shield strongly reticulated *P. ovatus* (Garman)

— Distance between preanal pores more than half distance between JV2 setae; sternal shield not reticulated	3
3. Seta <i>z4</i> longer than <i>z2</i> ; <i>S2</i> longer than <i>Z1</i> <i>P. okanagensis</i> (Chant)	
— Seta <i>z4</i> shorter than <i>z2</i> ; <i>S2</i> and <i>Z1</i> short and subequal.....	4
4. Seta <i>Z5</i> longer than the distance between their insertions; setae <i>j1</i> and <i>z2</i> subequal	
..... <i>P. messor</i> (Wainstein)	
— Seta <i>Z5</i> shorter than the distance between their insertions; seta <i>z2</i> shorter than <i>j1</i>	
..... <i>P. sororculus</i> (Wainstein)	
5. Spermatheca with atrium bifurcate/vacuolate at juncture with major duct; male spermatophoral process T-shaped, with both heel and toe elongate, approximately equal	
..... <i>Graminaseius</i> Chant & McMurtry, 2004: <i>G. graminis</i> (Chant)	
— Spermatheca with atrium not bifurcate/vacuolate at juncture with major duct; male spermatophoral process not T-shaped, heel and toe not both elongate, not approximately equal	
..... 6	
6. Ratio seta <i>s4</i> : <i>S2</i> >3.0:1.0	7
— Ratio seta <i>s4</i> : <i>S2</i> <2.7:1.0	17
7. Chelicera unusually large, robust with fixed digit longer than movable digit	
..... <i>Chelaseius</i> Muma & Denmark 1968: <i>C. valliculosus</i> Kolodochka	
— Chelicera of normal size, fixed digit not much longer than movable digit	
..... <i>Amblyseius</i> Berlese, 1914 ...8	
8. Ventrianal shield vase-shaped	
..... <i>A. largoensis</i> (Muma)	
— Ventrianal shield not vase-shaped	9
9. Spermatheca with calyx annulated, flared distally	
..... <i>A. obtusus</i> (Koch)	
— Spermatheca with calyx not annulated	10
10. Ventrianal shield with large elliptical (crescent-shaped) preanal solenostomes	11
— Ventrianal shield with small round preanal solenostomes	14
11. Dorsal shield strongly reticulated	
..... <i>A. bryophilus</i> Karg	
— Dorsal shield smooth	12
12. Calyx of spermatheca about four times longer than width	
..... <i>A. adjaricus</i> Wainstein & Vartapetov	
— Calyx of spermatheca with about equal width and length	13
13. Seta <i>Z5</i> 102–116 µm long; atrium of spermatheca relatively longer; <i>StIV</i> at most reaching the insertion of <i>StIV</i>	
..... <i>A. swirskii</i> Athias-Henriot	
— Seta <i>Z5</i> longer than 150 µm; atrium of spermatheca short and c-shaped; <i>StIV</i> passing well behind the insertion of <i>StIV</i>	
..... <i>A. andersoni</i> (Chant)	
14. <i>z4</i> short, less than 1/5 of its insertion to seta <i>s4</i>	15
— <i>z4</i> longer, at least half the distance to seta <i>s4</i>	16
15. <i>Z5</i> much longer than the distance between its insertions	
..... <i>A. meridionalis</i> Berlese	
— <i>Z5</i> shorter or equal the distance between its insertions	
..... <i>A. kadzhajai</i> Gomelauri	

16. Spermatheca very long, calyx snake-shaped	<i>A. decolor</i> (Westerboer)
— Spermatheca not long, calyx saccular.....	<i>A. armeniacus</i> Arutunjan & Ohandjanian
17. Seta S5 absent	<i>Amblyseiella</i> Muma, 1955: <i>A. setosa</i> Muma
— Seta S5 present <i>Transeius</i> Chant & McMurtry, 2004.....	18
18. Ventrianal shield without preanal solenostomes; seta Z5 shorter than distance between its bases	<i>T. herbarius</i> (Wainstein)
— Ventrianal shield with preanal solenostomes; seta Z5 longer than distance between its bases	19
19. Calyx of spermatheca elongate about 25 µm	<i>T. begljarovi</i> (Abbasova)
— Calyx of spermatheca short about 8 µm long	<i>T. wainsteini</i> (Gomelauri)

Acknowledgments

The authors wish to thank Funding for this study through grants by the Turkish Council of Research (TUBITAK TOVAG grant no.: 114O416). We are grateful to Esra DAŞTAN for help in preparing the slides.

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