



The Tenuipalpidae of Turkey, with a key to species (Acari: Trombidiformes)

SULTAN ÇOBANOĞLU^{1,5}, EDWARD ALBERT UECKERMANN^{2,3} & HAYRİYE DİDEM SAĞLAM⁴

¹University of Ankara, Agricultural Faculty, Plant Protection Department, 06110, Dışkapı. Ankara/Turkey.

E-mail: coban.sultan@gmail.com

²School of Biological Sciences/Zoology, North-West University, Potchefstroom Campus 2520, South Africa

³ARC-Plant Protection Research Institute, Private Bag X134, Queenswood, Pretoria, 0121 South Africa.

E-mail: UeckermannE@arc.agric.za

⁴University of Ahi Evran, Agricultural Faculty, Plant Protection Department, 40200 Kırşehir/Turkey. E-mail: saglamhds@gmail.com

⁵Corresponding author

Abstract

A new Turkish species of Tenuipalpidae, *Aegyptobia juniperi* sp. nov., is described and seven previously recorded species are redescribed: *Aegyptobia beglarovi* Livshitz & Mitrofanov 1967, *Brevipalpus rotai* Castagnoli & Pegazzano, 1979, *Cenopalpus bagdasariani* (Livshitz & Mitrofanov, 1970), *Cenopalpus bakeri* Düzgüneş, 1967, *Phytoptipalpus salicicola* (Al-Gboory, 1987), *Tenuipalpus granati* Sayed, 1946 and *Tenuipalpus punicae* Pritchard & Baker, 1958. A key to the 28 species of Tenuipalpidae from Turkey is provided. *Cenopalpus bagdasariani*, *B. rotai* and *A. beglarovi* are new records for Turkey.

Key words: flat mites, false spider mites, key, new species, new records, taxonomy

Introduction

Members of the family Tenuipalpidae are plant feeding mites and some are of agricultural importance. For example, species of the genus *Brevipalpus* are vectors of pathogens like citrus leprosis virus (Rodrigues *et al.* 2012). The family is world-wide in distribution with more than 1,100 species belonging to 36 genera (Mesa *et al.* 2009; Beard *et al.* 2014). The family Tenuipalpidae has not received much attention in Turkey in recent years. Düzgüneş (1963, 1965, 1967a,b) reported 12 tenuipalps from Turkey: *Pseudoleptus zelihae* Pritchard & Baker, 1958, *Cenopalpus pulcher* (Canestrini & Fanzago, 1876), *C. lineola* (Canestrini & Fanzago, 1876), *Brevipalpus californicus* (Banks, 1904), *B. lewisi* McGregor, 1949, *B. olearius* Sayed, 1950, *B. obovatus* Donnadieu, 1875, *B. phoenicis* (Geijskes, 1939), *Tenuipalpus granati* Sayed, 1946, *T. punicae* Pritchard & Baker, 1958 (misidentified as *T. granati* by Düzgüneş (1965) and described two species, *Cenopalpus bakeri* and *C. pritchardi*. Since the work by Düzgüneş, *Raoiellana allium* Baker & Tuttle, 1972 was indirectly recorded from Turkey via a quarantine interception in New York, USA from *Allium pulchellum* G. Don (Liliaceae) bulbs imported from Turkey in 1964. More recently the following species were recorded from Turkey: *Aegyptobia aletes* Pritchard & Baker, 1958; *Aegyptobia cupressus* Baker & Tuttle, 1972; *Aegyptobia mccormicki* (Baker & Pritchard, 1953); *Aegyptobia tragardhi* Sayed, 1950; *Brevipalpus obovoides* DeLeon, 1961; *Cenopalpus lanceolatsetae* (Attiah, 1956), *Phytoptipalpus salicicola* (Al Gboory, 1987); *Pentamerismus erythreus* (Ewing, 1917); *Pentamerismus oregonensis* McGregor, 1949 and *Pentamerismus taxi* (Haller, 1877) (Uysal *et al.* 2001; Akyazı & Ecevit 2003; Sağlam & Çobanoğlu 2010; Yeşilayer & Çobanoğlu 2011). *Cenopalpus lineola* (Canestrini & Fanzago, 1876) and *Cenopalpus spinosus* (Donnadieu, 1875) were re-collected from coniferous plants in Turkey and *Brevipalpus lewisi* McGregor 1949 from Aegean vineyards (Bayram & Çobanoğlu 2007; Göven *et al.* 2009). The presence of *Tenuipalpus punicae* Pritchard & Baker, 1958 was recently confirmed from pomegranate orchards at Adana (Döker *et al.* 2013).

Herein, eight species, including one new species, *Aegyptobia juniperi* **sp. nov.**, were collected during surveys carried out in 2005 to 2006, and are variously redescribed and described, based on all available life stages. *Cenopalpus bagdasariani* (Livshitz & Mitrofanov, 1970), *Aegyptobia beglarovi* Livshitz & Mitrofanov, 1967 and *Brevipalpus rotai* Castagnoli & Pegazzano, 1979 are new records for the tenuipalpid fauna of Turkey.

The authors wish to dedicate this publication to Prof. Dr. Düzgüneş in memory of her contribution to the Tenuipalpidae of Turkey.

Material and methods

The tenuipalpids of this study were collected from all over Turkey but mainly in Ankara, Antalya, İzmir, Balıkesir, Manisa, Yalova, Erzincan and Kocaeli (Table 1).

TABLE 1. Localities where Tenuipalpidae were sampled in Turkey.

Location	North	East	Elevation
Abdi İpekçi Parkı / Ankara	39° 55' 41.23"	32° 51' 24.29"	859.8 m
Antalya	36° 53' 2.90"	30° 42' 20.27"	35.1 m
Balıkesir	39° 38' 33.31"	27° 53' 20.14"	143.5 m
Çavuşköy, Menemen / İzmir	38° 38' 16.75"	27° 1' 29.91"	7.7 m
Elvankent / Ankara	39° 56' 49.37"	32° 36' 39.47"	814.9 m
Eryaman / Ankara	39° 58' 50.02"	32° 37' 1.10"	808.7 m
Erzincan	39° 45' 0.00"	39° 30' 0.00"	1205.0 m
Kalecik / Ankara	40° 5' 50.00"	33° 24' 30.00"	741.6 m
Kocaeli	40° 51' 11.77"	29° 52' 53.47"	464.8 m
Kurtuluş Parkı / Ankara	39° 55' 37.94"	32° 51' 50.94"	869.00 m
Mamak / Ankara	39° 54' 44.66"	33° 3' 23.01"	1159.2 m
Menemen / İzmir	38° 36' 25.92"	27° 4' 2.68"	13.2 m
Nasuh Akar Parkı / Ankara	39° 57' 33.90"	32° 53' 3.88"	889.9 m
Salihli / Manisa	38° 29' 13.84"	28° 7' 56.39"	98.9 m
Subayevleri / Ankara	39° 58' 20.06"	32° 52' 8.73"	902.1 m
Termal / Yalova	40° 36' 19.00"	29° 10' 28.00"	142.6 m
Vedat Dalokay Parkı / Ankara	39° 57' 45.04"	32° 44' 1.82"	858.4 m
Ziraat Fakültesi / Ankara	39° 57' 21.79"	32° 51' 38.28"	865.8 m

Notations of the dorsal setae follow Grandjean (1939) and Lindquist (1985) and all measurements are in micrometers (μm). Body length was taken between setae *v2* and *h1* and the width between *sc2-sc2* (Saito *et al.* 1999). The first measurement is that of the holotype in case of new species and redescrptions (if examined) followed by the range in brackets. Measurements were done by means of an Olympus soft imaging system. Width of body was measured at the level of C-row setae, and in the case of the genus *Tenuipalpus* also across F-row setae. Length of the gnathosoma was taken from the tip of eupathidium on the palp tarsus to base of gnathosoma, ventrally. Lengths of legs were measured from the tip of the empodium to the posterior margin of the trochanter.

Some specimens examined were from the collection of Prof. Dr. Z. Düzgüneş (kept in the collection of the University of Ankara). Specimens of *Aegyptobia cupressus* Baker and Tuttle, 1972 and *Brevipalpus oleae* Baker, 1949 were borrowed from the Smithsonian, Beltsville, USA. If not otherwise specified, the specimens were collected by S. Çobanoğlu and H.D. Sağlam. The holotype and some of the paratypes will be deposited in the Collection University of Ankara, Plant Protection and the rest of the paratypes in the Arachnida Collection of ARC-Plant Protection Research Institute, Queenswood, Pretoria, South Africa.

Genus *Aegyptobia* Sayed 1950

Type-species: *Pentamerismus macswaini* Pritchard & Baker 1952:8.

Diagnosis. As defined by Seeman & Beard (2011).

Aegyptobia juniperi sp. nov. Ueckermann, Çobanoğlu & Sağlam

(Figs 1–23)

Diagnosis. *Adult female, nymphs:* opisthosoma with 13 pairs of coarsely barbed, lanceolate setae slightly expanding distally (*f2* present); prodorsum striate-reticulate, ornamentation can be vague centrally, dorsal opisthosoma striate-reticulate; anterior margin of prodorsal shield with short notched rounded projection medially; venter with transverse striae between *1a* to *3a* and posterior to *4a*, cuticle between setae *3a–4a* smooth; ventral plate weakly developed, smooth; setae *ps3* shortest and *ps1* longest; seta *l'* present on femur I–II; seta *d* present on femur III; seta *l'* present on genu I–III; seta *tc''* present on tarsi I–IV; femur I–III *d*, genu I–II *d* slender and serrate; trochanter III *l'* serrate, femur II *l'* short and smooth; palp 0, 1, 0, 2, 2(1); setae *ps1–3*, *gl–2*, *ag* slightly serrate. Tarsal claws unciniate. *Adult female:* spermatheca short, terminating in a small oblong vesicle. *Deutonymph:* *l''*, *d* present on genu I–III; *l'* absent on femora I–II.

Description. Female—Dimensions. Length of body excluding gnathosoma (between *v2* and *h1*) 224 (212–232); width 105 (97–107), length of gnathosoma 68 (65–73). Leg lengths: I 84 (83–88); II 81 (75–82); III 72 (65–72); IV 74 (66–76). Setal lengths: *v2* 21 (18–22); *sc1* 20 (17–23); *sc2* 21 (18–23); *c1* 22 (20–22); *c2* 21 (15–21); *c3* 17 (16–19); *d1* 13 (13–18); *d2* 17 (13–17); *d3* 18 (14–20); *e1* 15 (13–17); *e2* 18 (13–20); *e3* 15 (15–21); *f2* 16 (15–19); *f3* 18 (15–21); *h1* 18 (17–21); *h2* 19 (19–23).

Dorsum (Figs 1, 2). Anterior margin of prodorsum with short notched rounded projection medially. Dorsum mainly striated, prodorsum with smooth patch dorsocentrally; opisthosoma rugose medially, with diagonal striations laterally; dorsal body setae lanceolate and serrate, subequal in length. Band of transverse striae between prodorsum and opisthosoma.

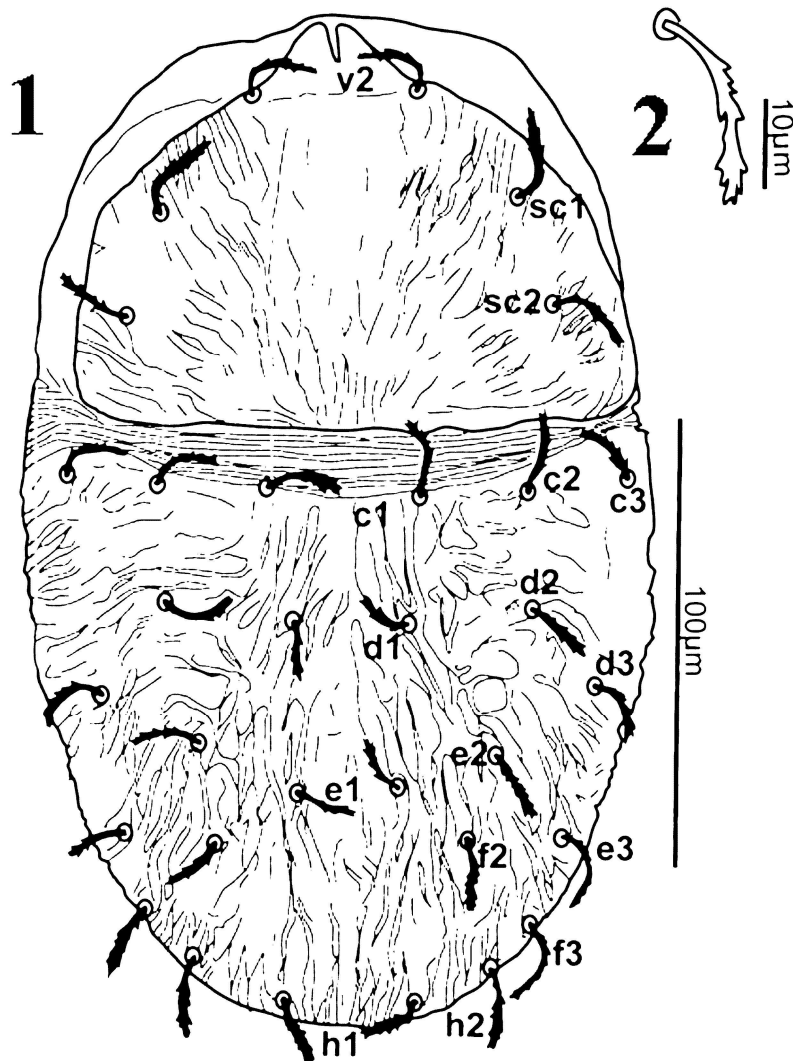
Venter (Figs 3, 4). Venter with transverse striae between setae *1a–3a* and posterior to setae *4a*; cuticle between setae *3a–4a* smooth; pregenital and genital region smooth with longitudinal striae laterally; anal shields striate. Pregenital area with weakly developed ventral plate. Both setae *3a* and *4a* long and whip like. One pair of aggenital and two pairs of genital setae, slightly serrate and subequal in length. Genital setae transversely aligned along posterior margin of genital shield. Three pairs of serrate anal setae with *ps3* shortest and *ps1* longest. Spermatheca a slender tube terminating into oblong vesicle (Fig. 4).

Gnathosoma (Fig. 5). Infracapitulum nearly reaching anterior margin of tibia I. Palp five-segmented. Tarsus with two eupathidia (*ul'* and *ul''*) and solenidion (ω), tibia with two setae (*d*, *l''*), genu and trochanter without setae and femur with one seta (*d*).

Legs (Figs 6–8). Counts of setae and solenidia (included in counts) on podomeres of legs I–IV: coxae 2-2-1-1, trochanters 1-1-2-1, femora 4-4-2-1, genua 3-3-1-0, tibiae 4-4-3-3, tarsi 9(ω)-9(ω)-5-5. Leg chaetotaxy as follows: coxa I *1b*, *1c*; cx II *2b*, *2c*; cx III *3b*; cx IV *4b*; trochanters I, II, IV *v'*; tr III *l'*, *v'*; femora I–II *d*, *v'*, *bv''*, *l'*; fe III *d*, *ev'*; fe IV *ev'*; genua I–II *l'*, *d*, *l''*; ge III *l'*; ge IV nude; tibiae I–II *d*, *l'*, *v'*, *v''*; ti III–IV *d*, *v'*, *v''*; tarsus I–II *u'*, *u''*, *p'*, *p''*, *tc'*, *tc''*, *ft'*, *ft''*, ω ; ta III–IV *u'*, *u''*, *tc'*, *tc''*, *ft'*. Dorsal setae on femora and genua I–II slender and serrate. Tarsal claws unciniate, empodium pad-like.

Male. Unknown.

Deutonymph (Figs 9–13). Dimensions. Length of body excluding gnathosoma 182–218; width 81–92, length of gnathosoma 51–59. Legs: I 64–76; II 59–64; III 50–60; IV 54–62. Setae: *v2* 17–21; *sc1* 17–22; *sc2* 16–19; *c1* 14–16; *c2* 13–15; *c3* 13–17; *d1* 10–12; *d2* 13–15; *d3* 14–17; *e1* 10–13; *e2* 11–14; *e3* 11–17; *f2* 12–15; *f3* 10–18; *h1* 11–13; *h2* 14–20. Prodorsum with weak longitudinal striae; dorsal opisthosoma with broadly separated transverse lines, and weakly developed pygidial shield capturing setae *e1*, *f1–2* and *h1–2*, with few longitudinal striae. Anterior margin of prodorsum smoothly rounded, without notched projection. Setae similar to that of female. Venter completely striate with setae *1a*, *3a*, *4a*, *ag*, *gl*, *ps1–3*. Gnathosoma similar to that of female. Legs as in female except, femora I–II with three setae (*d*, *v'*, *bv''*) present; *l'* absent in all specimens (usually appears in deutonymph, but here it is delayed to adults) and trochanter IV nude (*v'* absent); coxal setae *2c* and *4b* added (Figs 11, 13).

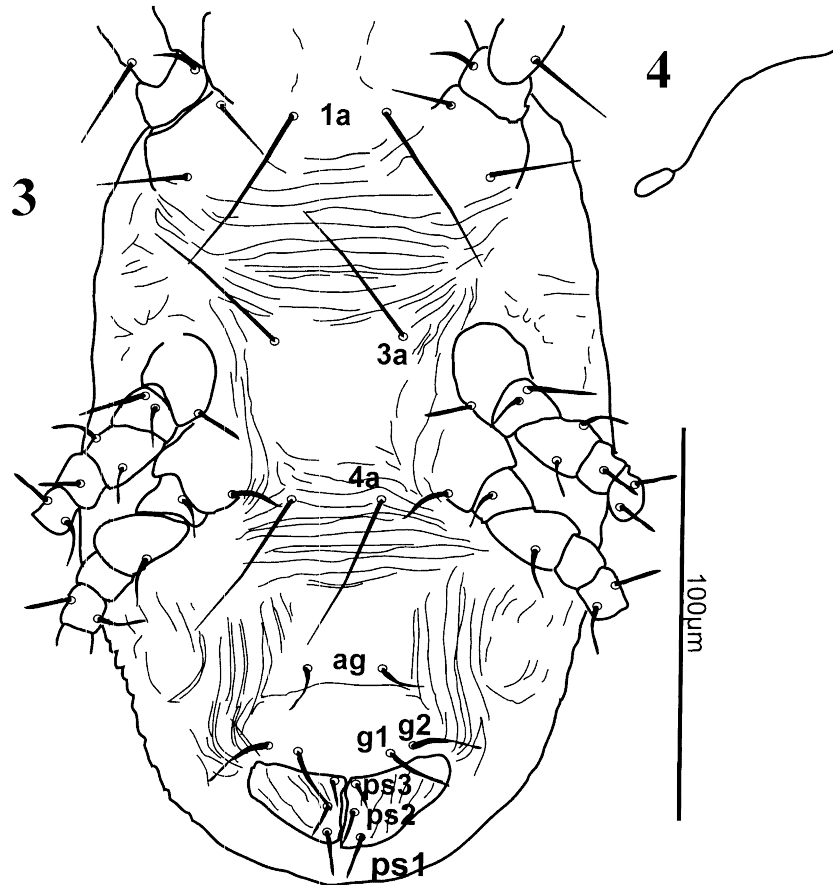


FIGURES 1–2. *Aegyptobia juniperi* sp. nov. Female. 1. Dorsal view. 2. Dorsal seta *c1*.

Protonymph (Figs 14–18). Dimensions. Length of body excluding gnathosoma 168–176; width 74–79, length of gnathosoma 44–45. Legs: I 60–61; II 54–58; III 54–55; IV 51–52. Setae: *v2* 17–18; *sc1* 13–17; *sc2* 11–13; *c1* 11–15; *c2* 10–13; *c3* 12–13; *d1* 10–11; *d2* 11–13; *d3* 10–13; *e1* 9–10; *e2* 11–12; *e3* 12–15; *f2* 11–12; *f3* 10–17; *h1* 9; *h2* 11–13. Dorsum similar to that of deutonymph except pygidial shield not formed. Venter similar to deutonymph except with weaker striae; setae *1a*, *3a*, *ag*, *ps1–3* present, setae *4a* absent. Leg chaetotaxy as in female and deutonymph, except: trochanter I–II nude (*v'* absent), trochanter III with only *l'* present (*v'* absent); genua I–III with only *l'* present (*d*, *l''* absent); tarsus IV with *ft'*, *u'*, *u''* present (*te'*, *te''* absent); coxal setae *1c* added. Gnathosoma similar to that of female (Figs 16, 18).

Larva (Figs 19–22). Dimensions. Length of body excluding gnathosoma 139; width 71, length of gnathosoma 24. Legs: I 53; II 49; III 49; IV absent. Setae: *ve* 13; *sci* 10; *sce* 14; *c1* 12; *c2* 10; *c3* 12; *d1* 10; *d2* 11; *d3* 10; *e1* 11; *e2* 13; *e3* 18; *f2* 13; *f3* 22; *h1* 13; *h2* 22. Dorsum similar to that of deutonymph and protonymph. Ventral cuticle with similar pattern to deutonymph; with setae *1a*, *3a*, *ps1–3*. Leg chaetotaxy of legs I–III: trochanters I–III nude; *fe* I–III, *ge* I–III, *ti* I–III as in protonymph; tarsi I–III as in protonymph except setae *te'* and *te''* absent; only coxal setae *1b* present (Figs 21–22).

Remarks. Seta *l'* on femora I–II usually first appears in the deutonymph (Seeman & Beard 2011; Beard *et al.* 2014) but in this species it is delayed to the adult which is unique for the genus. However, this seta is also sometimes absent, such as in *Aegyptobia tragardhi*, *A. nummulus* Chaudhri, 1972 and *A. pomaderrisae* Collyer, 1969 (Seeman & Beard 2011; Khanjani *et al.* 2012a).



FIGURES 3–4. *Aegyptobia juniperi* sp. nov. Female. 3. Ventral view. 4. Spermatheca.

We compared our new species with all the species listed in Mesa *et al.* (2009) with special attention to those collected from Cupressaceae. It resembles *A. iranensis* Khanjani *et al.*, 2008 in most respects. However, a close examination revealed that it differs from the latter in the ornamentation of the dorsal shields and form of the dorsal setae. The ornamentation of the prodorsal shield in *A. juniperi* has many broken lines, including some in the medial portion of the shield, whereas in *A. iranensis* these lines are complete and do not extend into the medial portion of the prodorsal shield; similarly, the opisthosomal shield is irregularly rugose in *A. juniperi*, but in *A. iranensis* this shield is reticulate. Also, the dorsal setae of *A. iranensis* are slender and finely serrated, opposed to coarsely serrated and slightly expanded distally in *A. juniperi* (personal communication with Prof M. Khanjani). Furthermore, the rostrum of the new species reaches to the base of tarsus I compared with to tibia I in *A. iranensis* (Khanjani *et al.* 2008); and setae *ft'* on tarsus I and *d* on tibia I of *A. iranensis* are depicted as serrated but in *A. juniperi* they are smooth.

This species also closely resembles *A. cupressus*. However, it differs to material borrowed from the Smithsonian (USNM), Beltsville, Washington D.C., USA in that the opisthosoma of *A. juniperi* is irregularly rugose, as opposed to striate in *A. cupressus*; the shape of the spermatheca is a long slender tube terminating in an oblong vesicle in the new species, instead of a short tube terminating in a round bulb (Fig. 23) as found in *A. cupressus*; and *A. cupressus* has a swirl pattern on the cuticle between setae *c1* and *c2* that is absent in *A. juniperi* (Baker & Tuttle 1972).

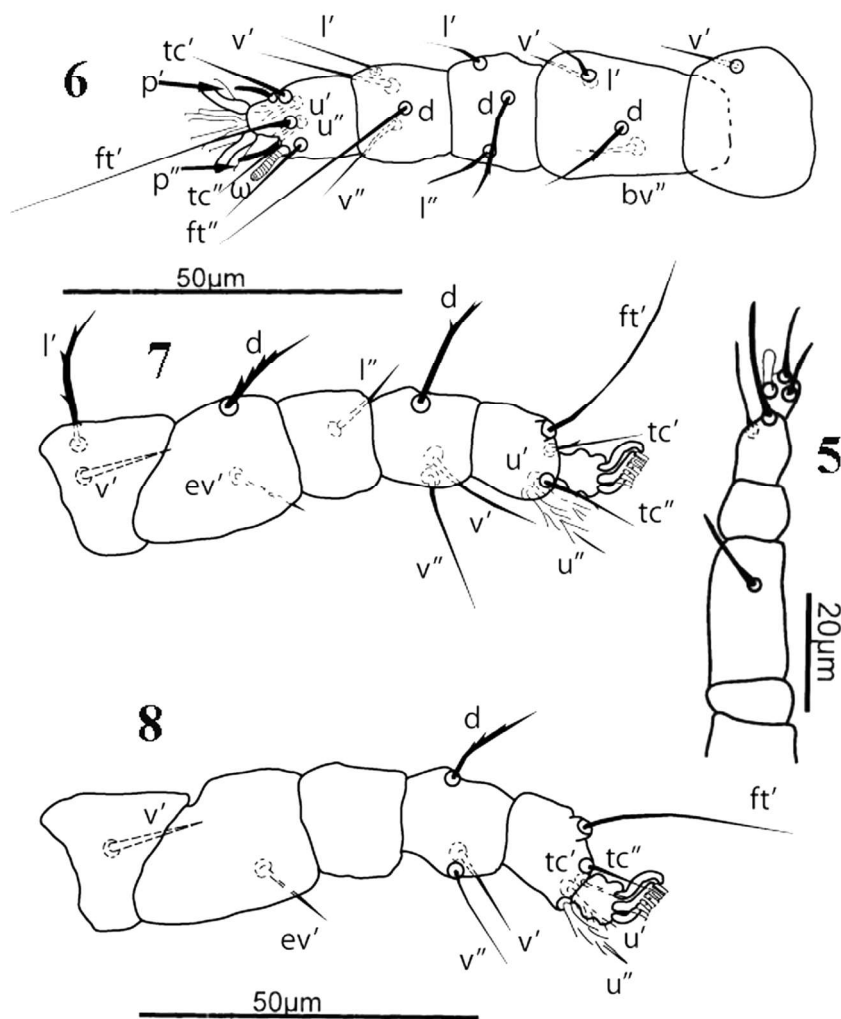
Distribution. Ankara, Turkey.

Type material. Turkey—Holotype female, 7 paratype females, 1 paratype deutonymph, 1 paratype protonymph and 1 paratype larva, from *Juniperus horizontalis* (Moench) (Cupressaceae), Subayevleri/Ankara, 13 July 2006; 1 paratype deutonymph, 2 paratype protonymphs and one paratype larva from *Thuja orientalis* L. (Cupressaceae), Nasuh Akar Parkı/Ankara 23 June 2006; 2 paratype females and 3 paratype deutonymphs from

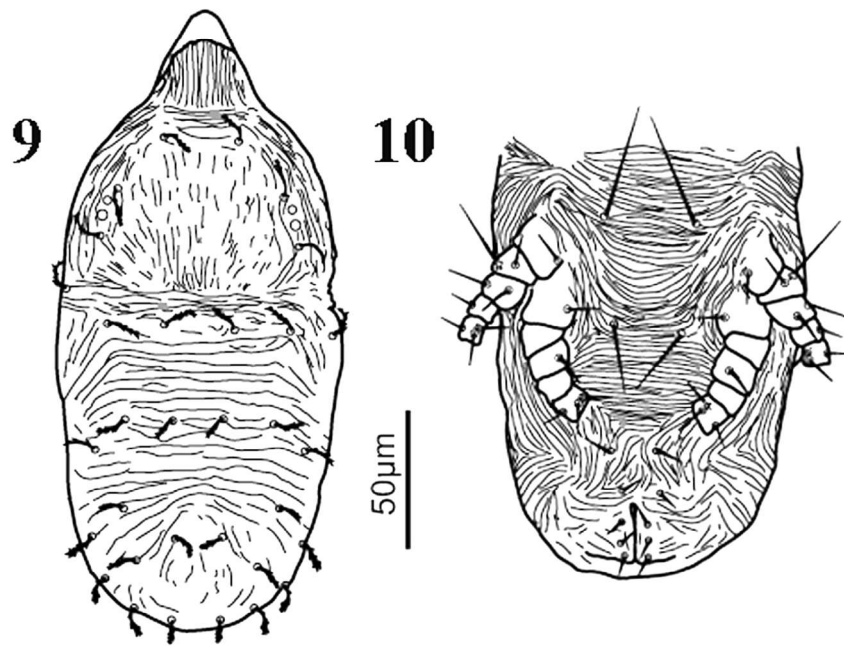
T. orientalis, Subayevleri/Ankara, 14 July 2006; 6 paratype females from *J. horizontalis*, Kalecik/Ankara, 03 August 2006; 6 paratype females and 1 paratype protonymph from *Juniperus virginiana* L. cv *skyrocket* (Cupressaceae), Elvankent/Ankara, 29 August 2006; 2 paratype females from *J. horizontalis*, Elvankent/Ankara, 29 August 2006; 2 paratype females, 2 paratype deutonymphs and one paratype protonymph from *Juniperus media* Van Melle (Cupressaceae), Elvankent/Ankara, 29 August 2006; 14 paratype females from *Thuja horizontalis*, Elvankent/Ankara, 29 August 2006; 4 paratype females from *J. horizontalis*, Eryaman/Ankara, 31 August 2006; 4 paratype females from *J. horizontalis*, Kurtuluş/Ankara, 08 September 2006; 2 paratype females from *J. horizontalis*, Abdi İpekçi Parkı/Ankara, 08 September 2006.

Type deposition. Holotype female and paratype females, deutonymphs, protonymphs and larvae are kept at University of Ankara, Plant Protection Department, except for 2 paratype females and 3 deutonymphs (Slide numbers: 195/2, 195/3, 195/4, 363/6 and 225/1) deposited at the ARC-Plant Protection Research Institute, Queenswood, Pretoria, South Africa.

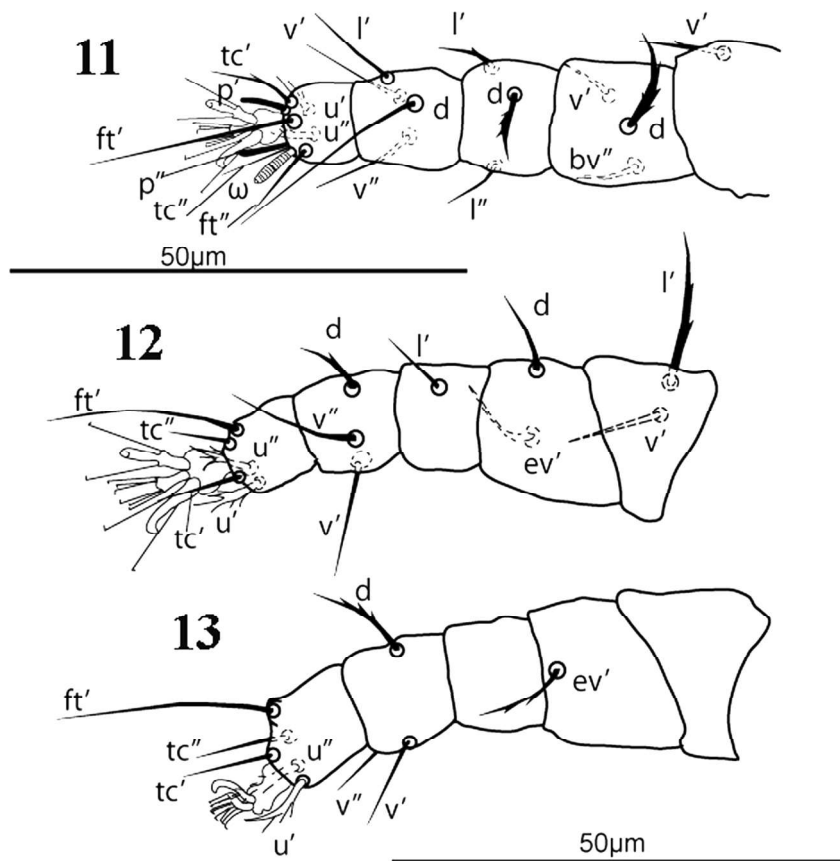
Etymology. The species is named for one of its host genera *Juniperus*.



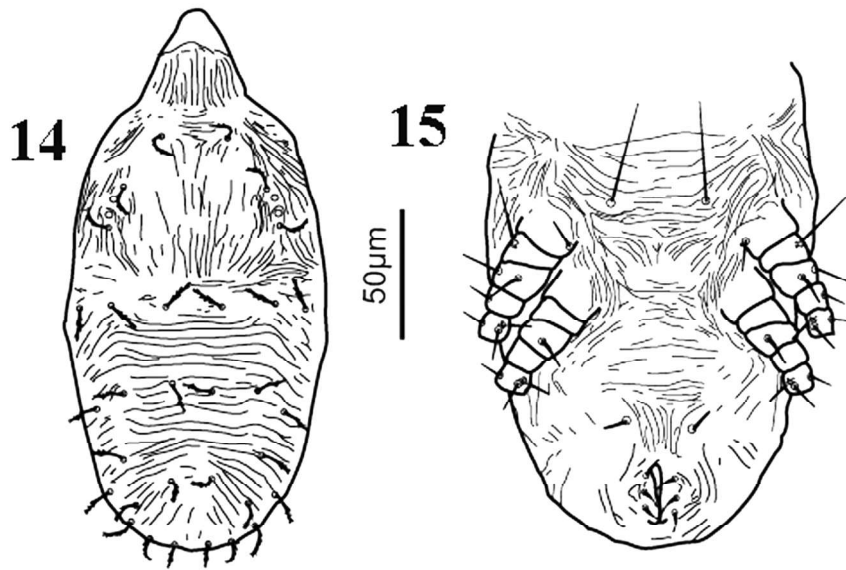
FIGURES 5–8. *Aegyptobia juniperi* sp. nov. Female. 5. Palp. 6. Leg I, left. 7. Leg III, right. 8. Leg IV, right.



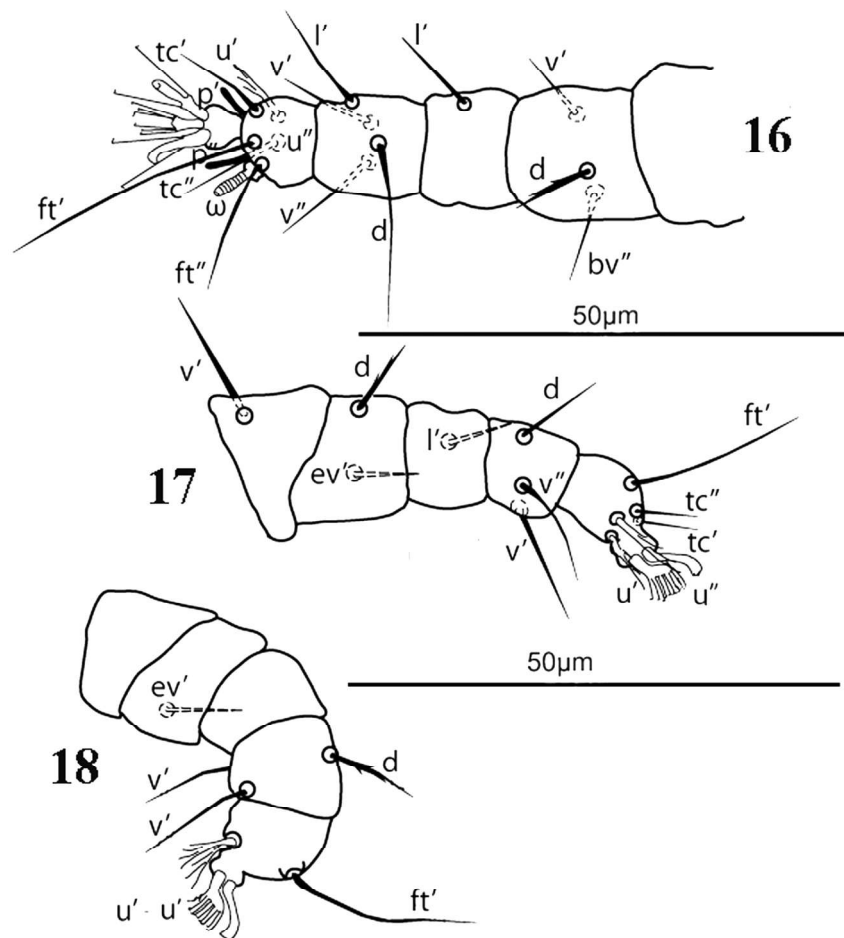
FIGURES 9–10. *Aegyptobia juniperi* sp. nov. Deutonymph. 9. Dorsal view. 10. Ventral view.



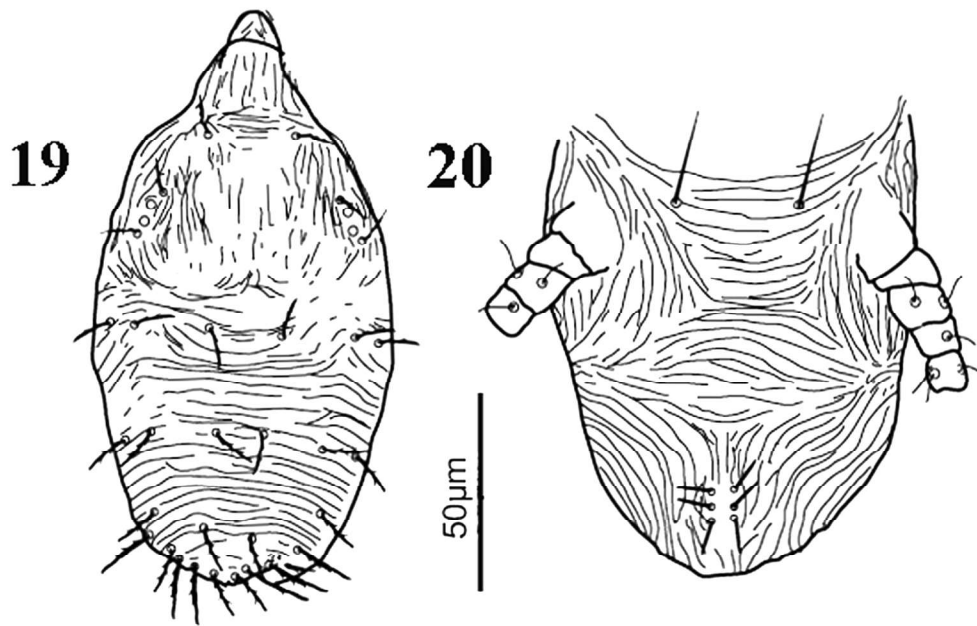
FIGURES 11–13. *Aegyptobia juniperi* sp. nov. Deutonymph. 11 Leg I, left. 12. Leg III, left. 13. Leg IV, left.



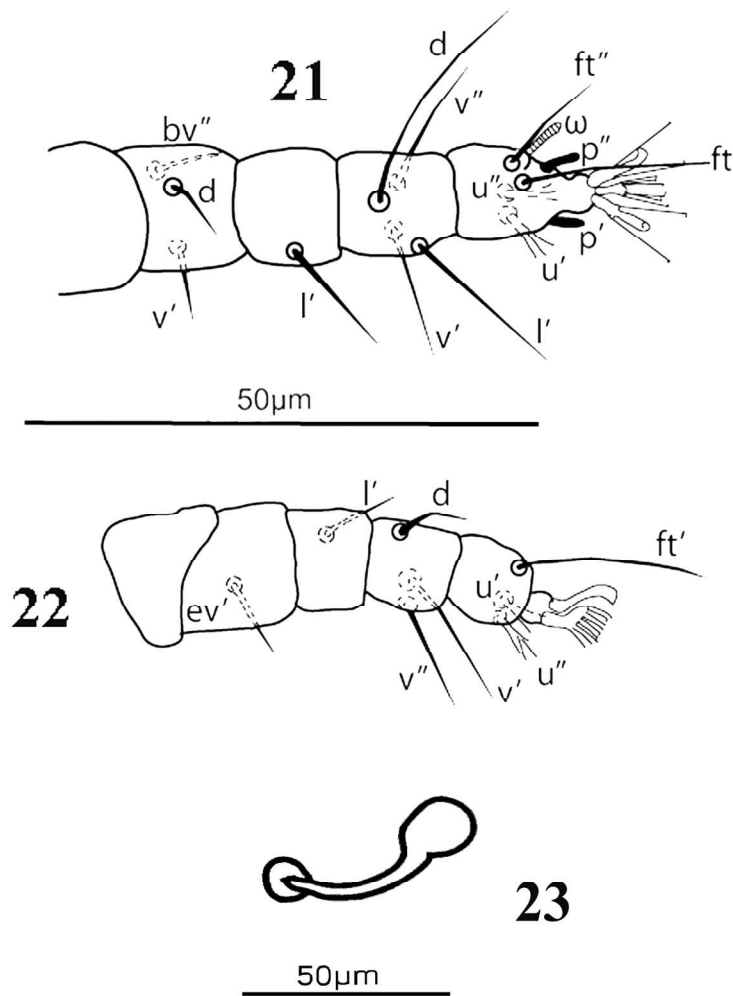
FIGURES 14–15. *Aegyptobia juniperi* sp. nov. Protonymph. 14. Dorsal view. 15. Ventral view.



FIGURES 16–18. *Aegyptobia juniperi* sp. nov. Protonymph. 16. Leg I, left. 17. Leg III, right. 18. Leg IV, right.



FIGURES 19–20. *Aegyptobia juniperi* sp. nov. Larva. 19. Dorsal view. 20. Ventral view.



FIGURES 21–23. 21–22. *Aegyptobia juniperi* sp. nov. Larva. 21. Leg I, left. 22. Leg III, right. 23. *Aegyptobia cupressus* Baker & Tuttle. Female, spermatheca.

***Aegyptobia beglarovi* Livshitz & Mitrofanov 1967**

(Figs 24–31)

Aegyptobia beglarovi Livshitz & Mitrofanov, 1967: 40; Khanjani *et al.* 2012a: 35.

Aegyptobia kharazii Mesa & Moraes in Mesa *et al.* 2009: 15; Khanjani *et al.* 2012a: 35.

Aegyptobia meyerae Khosrowshahi & Arbabi, 1997: 10 (preocc.).

Female. Diagnosis. Dorsum (Fig. 24) with elongate reticulations medially and rugose cuticle laterally. Anterior margin of prodorsal shield with short notched triangular projection. Dorsal body setae spatulate and serrate.

Venter (Fig. 25) with transverse striae between setae *1a–3a*; cuticle between setae *3a–4a* smooth; ventral plate indicated by smooth cuticle with longitudinal striae laterally; genital plate smooth; anal plates with some striae. Dorsal setae on femora I–III and genua I–II narrowly lanceolate and serrate. Palp (Fig. 27) five-segmented; palp tarsus with one eupathidium and two setae; palp tibia with two setae; palp genu and trochanter without setae; palp femur with one serrate seta. Tarsal claws unciniate, empodium pad-like. Spermatheca a small, slender tube terminating into small bulb, difficult to detect (Fig. 26).

Deutonymph (Figs 28–31). Dimensions. Length of body excluding gnathosoma 223–224; width 76–98, length of gnathosoma 54–66. Legs: I 72–84; II 68–69; III 62–66; IV 64–65. Setae: *v2* 16–18; *sc1* 15–16; *sc2* 15–16; *c1* 14–15; *c2* 14–15; *c3* 16–17; *d1* 12–13; *d2* 14–15; *d3* 12–15; *e1* 11; *e2* 12–14; *e3* 13–15; *f2* 12–14; *f3* 13–14; *h1* 11–12; *h2* 13–15.

Dorsum (Fig. 28). Dorsal body setae similar to that of female; dorsal cuticle covered with striae; weak broken longitudinal striae on prodorsum; transverse striae between C-row and E-row; with weak longitudinal striae on weakly developed pygidial shield. Venter completely covered with striae; with setae *1a*, *3a*, *4a*, *ag*, *g1*, *ps1–3* present, posterior setae slightly serrate. Gnathosoma also similar to that of female. The leg chaetotaxy only differs from that of the female in that trochanter IV is without setae (*v*' absent) (Figs 29–31).

Remarks. Khanjani *et al.* (2012a) re-described this species and the Iranian specimens correspond with our Turkish specimens in all respects except for small variations in the dimensions. This is the first report of this species from Turkey.

Material examined. 2 females and 1 deutonymph from *Juniperus horizontalis* Moench (Cupressaceae), Kurtuluş/Ankara, 23 July 2005; 1 female from *J. horizontalis*, Kurtuluş/Ankara, 08 September 2006; 4 females and 1 deutonymph from *J. horizontalis*, Kurtuluş/Ankara, 07 July 2006.

Distribution. Western Palearctic (Khanjani *et al.* 2013 a).

Genus *Phytoptipalpus* Trägårdh 1904

Type species: *Phytoptipalpus paradoxus* Trägårdh 1904: 10.

Diagnosis. As defined by Meyer (Smith) & Van Dis 1993 and updated by Khanjani *et al.* 2012a.

***Phytoptipalpus salicicola* (Al-Gboory 1987)**

(Figs 32–44)

Aegyptobia salicicola Al-Gboory 1987: 106; Khanjani *et al.* 2012a: 50.

Aegyptobia daneshvari Parsi & Khosrowshahi 1990: 38; Al-Gboory 1987: 106; Khanjani *et al.* 2012a: 50.

Diagnosis. As defined by Meyer (Smith) & Van Dis 1993 and updated by Khanjani *et al.* 2012a.

Female, male, deutonymph. Described by Khanjani *et al.* (2012a).

Protonymph (Figs 37–40). Dimensions. Length of body excluding gnathosoma 177–191; width 96–102, length of gnathosoma 37–43. Legs: I 57–63; II 55–58; III 53–60; IV 43–45. Setae: *v2* 22–23; *sc1* 20–21; *sc2* 27–28; *c1* 22–26; *c2* 21–23; *c3* 19–20; *d1* 19–22; *d2* 21–24; *d3* 22–23; *e1* 22–26; *e2* 20–23; *e3* 20–28; *f2* 24–26; *f3* 33; *h1* 14–18; *h2* 24–30. Dorsum with reticulations on prodorsum weak or replaced by punctations. Venter with *1a*, *3a*, *ag*, *ps1–2*. Leg chaetotaxy as in female and deutonymph, except: trochanters I–II and IV nude, tr III with seta *l*'; tarsus IV with setae *tc'* and *tc''* absent. Gnathosoma similar to that of female.

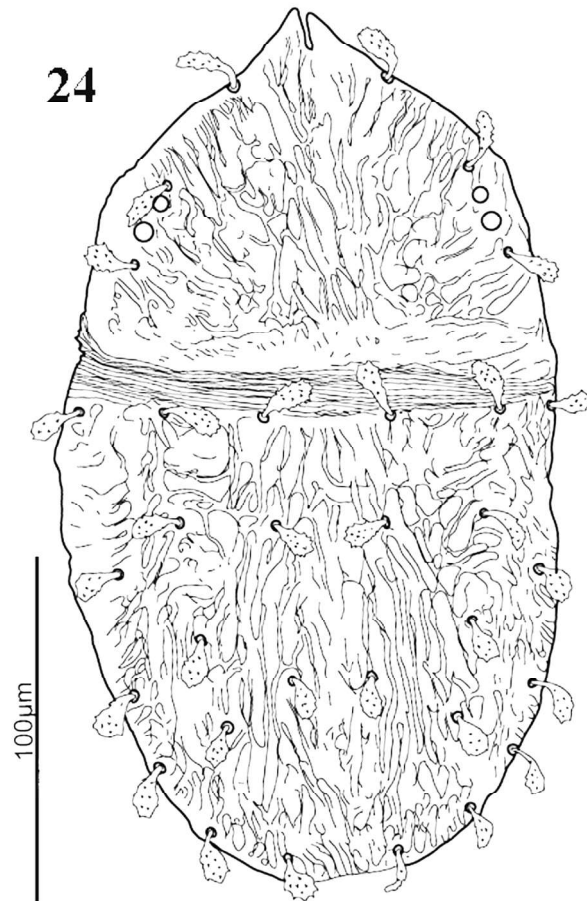
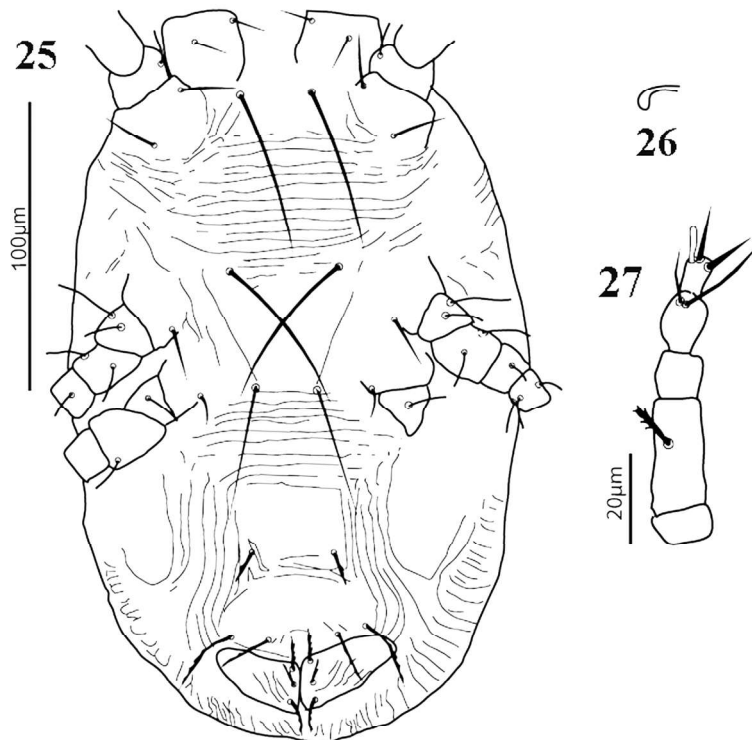


FIGURE 24. *Aegyptobia beglarovi* Livshitz & Mitrofanov. Female, dorsal view.



FIGURES 25–27. *Aegyptobia beglarovi* Livshitz & Mitrofanov. Female. 25. Ventral view. 26. Spermatheca, 27. Palp.

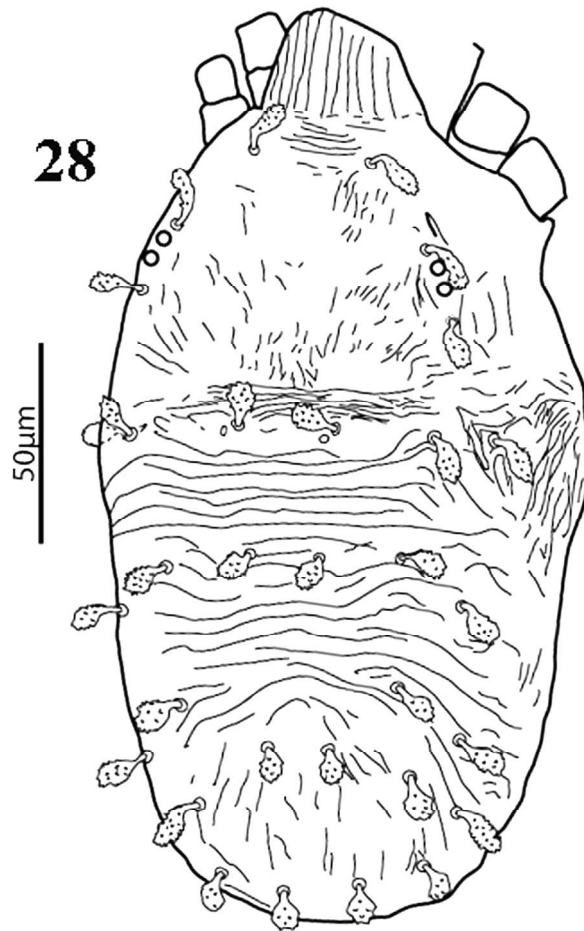
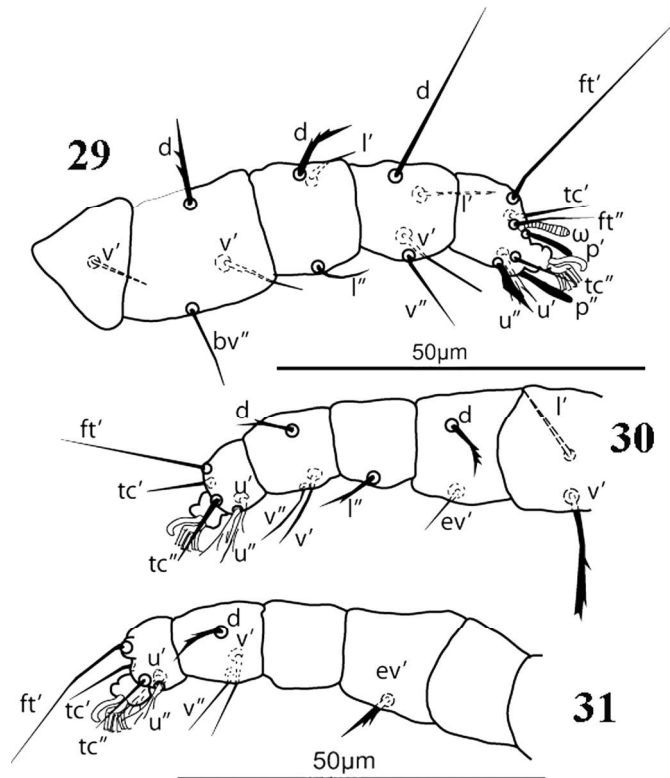
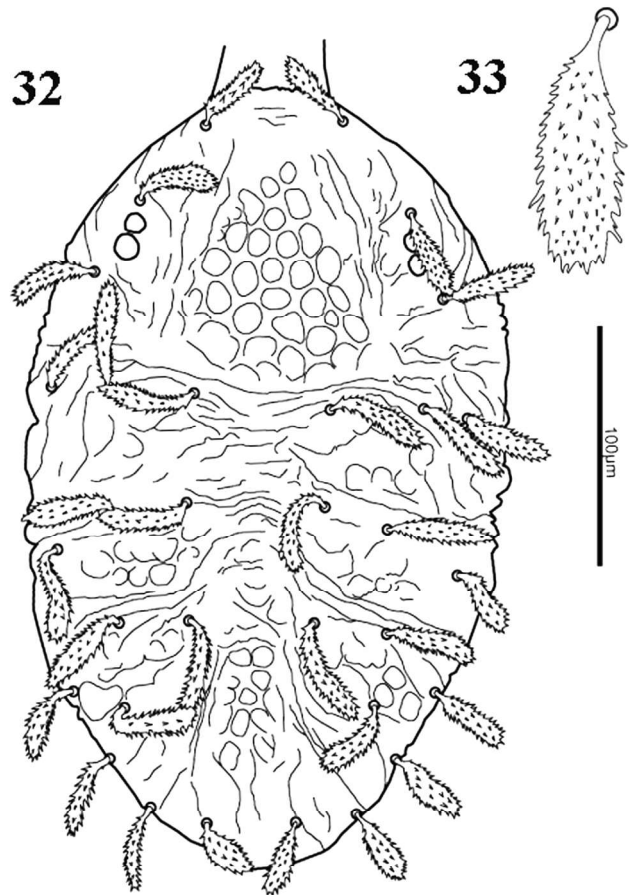


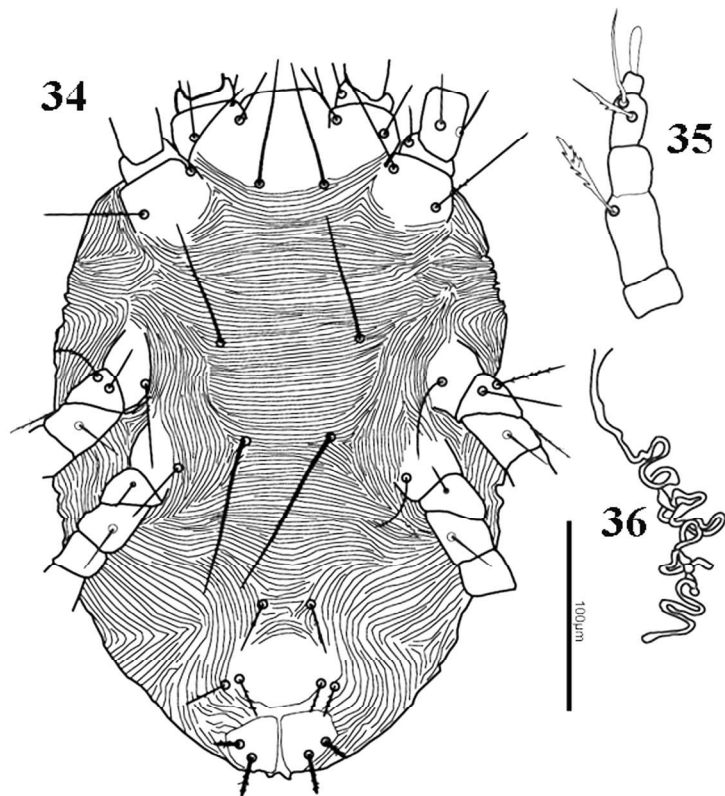
FIGURE 28. *Aegyptobia beglarovi* Livshitz & Mitrofanov. Deutonymph, dorsal view.



FIGURES 29–31. *Aegyptobia beglarovi* Livshitz & Mitrofanov. Deutonymph. 29. Leg I, right. 30. Leg III, left. 31. Leg IV, left.



FIGURES 32–33. *Phytoptipalpus salicicola* (Al-Gboory). Female. 32. Dorsal view. 33. Dorsal seta *sc1*.



FIGURES 34–36. *Phytoptipalpus salicicola* (Al-Gboory). Female. 34 Ventral view. 35 Palp. 36. Spermatheca.

37

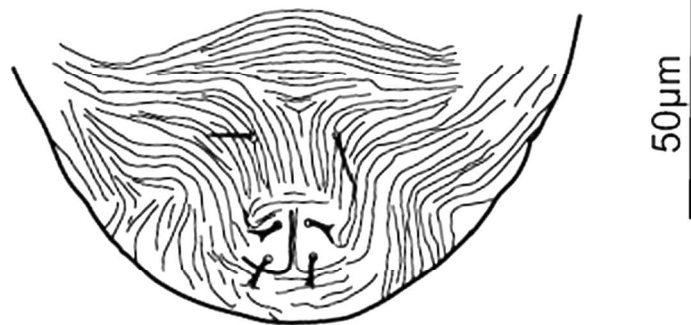
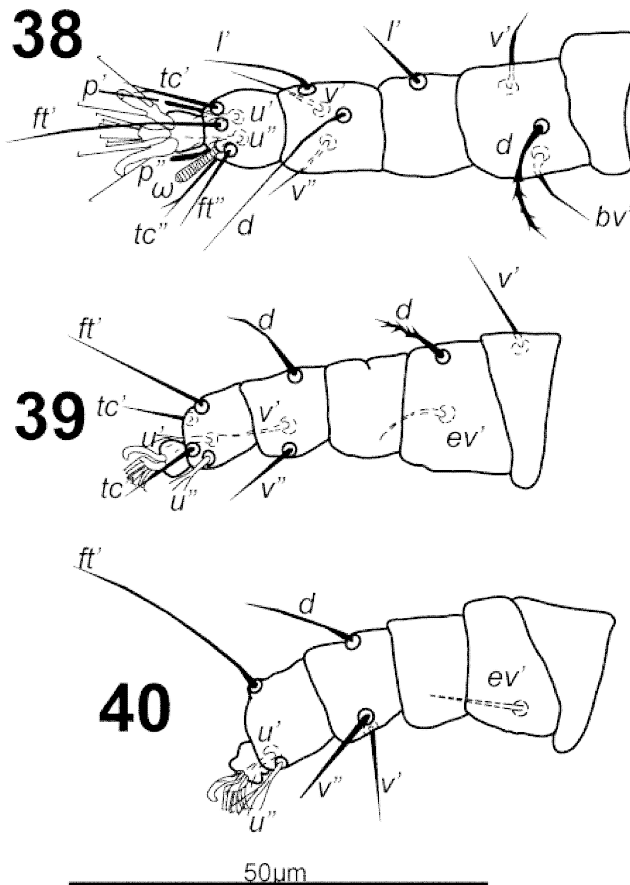


FIGURE 37. *Phytoptipalpus salicicola* (Al-Gboory). Protonymph, posterior venter.



FIGURES 38–40. *Phytoptipalpus salicicola* (Al-Gboory). Protonymph. 38. Leg I, left. 39. Leg III, right. 40. Leg IV, right.

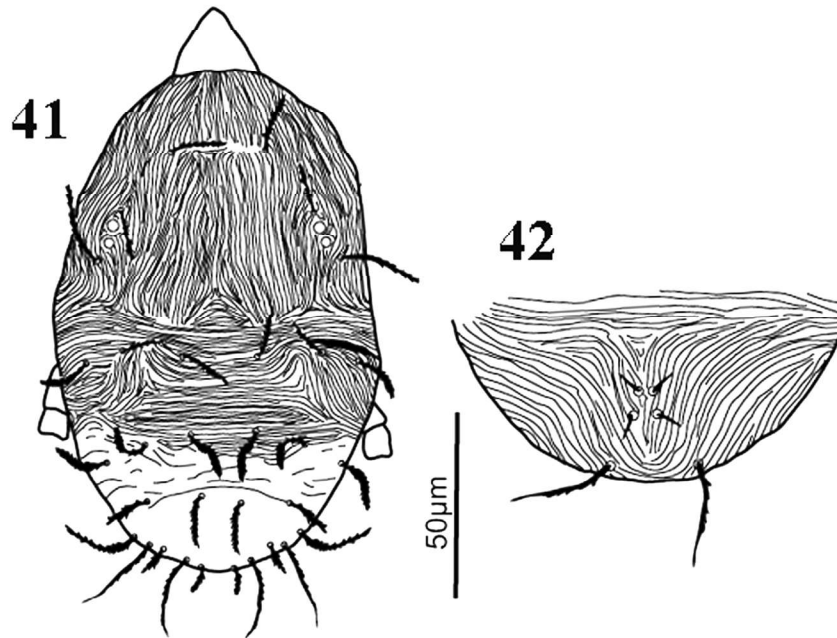
Larva (Figs 41–44). Dimensions. Length of body excluding gnathosoma 154; width 91, length of gnathosoma 40. Legs: I 60; II 56; III 53; IV absent. Setae: *v2* 21; *sc1* 17; *sc2* 25; *c1* 20; *c2* 20; *c3* 17; *d1* 18; *d2* 16; *d3* 22; *e1* 21; *e2* 16; *e3* 22; *f2* 11; *f3* 29; *h1* 9; *h2* 26. Dorsum striate. Dorsal body setae narrowly lanceolate, setae *e3*, *f3* and *h2* long and slender. Venter striated and with one pair of *1a* and *3a* setae and two pairs of anal setae. Leg chaetotaxy differs from that of protonymph as follows: trochanter III nude (*l'* absent), tarsi with setae *tc'* and *tc''* absent.

Remarks. This species was originally described from *Salix alba* (Salicaceae) in Iraq by Al Gboory (1987). The female, male and deutonymph of this species were re-described in detail by Khanjani *et al.* (2012a); however, details of the spermatheca, protonymph and larva were not included and are provided here. The Turkish specimens

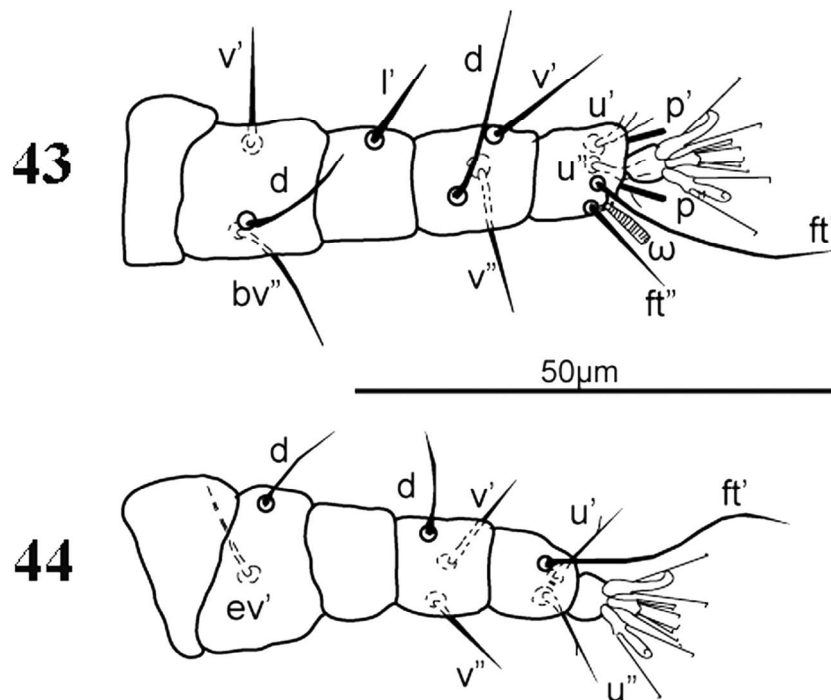
closely match the description provided by Khanjani *et al.* (2012a), in all respects. This species was reported on *S. alba* in Iraq and Iran, and from *Populus alba* L. and *P. tremula* L. (Salicaceae) in Ankara, Turkey (Sağlam & Çobanoğlu 2007, 2010).

Material examined. 7 females, 5 males, 6 deutonymphs and 1 larva, from *Populus tremula* (Salicaceae), Kurtuluş Parkı/Ankara, 8 September 2006; 1 female, 1 male, 3 deutonymphs and 1 protonymph, from *P. tremula* (Salicaceae), Eryaman/Ankara, 31 August 2006; 3 females, 2 males and 3 deutonymphs, from *P. alba* (Salicaceae), Eryaman/Ankara, 31 August 2006.

Distribution. Western Palearctic (Khanjani *et al.* 2013a).



FIGURES 41–42. *Phytoptipalpus salicicola* (Al-Gboory). Larva. 41. Dorsal view. 42. Posterior venter.



FIGURES 43–44. *Phytoptipalpus salicicola* (Al-Gboory). Larva. 43. Leg I, right. 44. Leg III, right.

Genus *Brevipalpus* Donnadieu 1875

Type species: *Brevipalpus obovatus* Donnadieu 1875: 116.

Diagnosis. As defined by Beard *et al.* (2015).

Brevipalpus rotai (Castagnoli & Pegazzano 1979)

(Figs 45–51)

Hystripalpus rotai Castagnoli & Pegazzano 1979: 285.

Diagnosis. Dorsal opisthosomal setae *f2* present. Dorsum rugose-reticulate medially and mostly smooth with well separated granules laterally. Dorsal body setae short, narrowly lanceolate and serrate. Venter smooth medially from setae *1b* to ventral shield with reticulations and granules laterally. Setae *3a* much shorter than *4a*. Cuticle laterad and posterolaterad *4a* with reticulation. Dorsal setae on femora I–III and genua I–II lanceolate and serrate. Trochanters I–IV with 1-1-1-0 setae. Spermatheca a long slender, coiling tube terminating in large, prominent hairy bulb.

Female. Dimensions. Length of body excluding gnathosoma 246; width 156, length of gnathosoma 83. Legs: I 130; II 130; III 116; IV 121. Setae: *v2* 6; *sc1* 16; *sc2* 11; *c1* 6; *c3* 9; *d1* 8; *d3* 10; *e19*; *e3* 9; *f2* 9; *f3* 10; *h18*; *h28*. Body oval.

Dorsum (Fig. 45). Anterior projection of prodorsum with deep notches forming four lobes. Dorsum rugose-reticulate medially and striate-granular laterally, with short transverse folds at *e1-e1*; dorsal body setae short, serrate and subequal in length.

Venter (Figs 46–48). Venter smooth medially from setae *1a* to ventral shield, with reticulations and granules laterally. Setae *4a* much longer than *3a*. Ventral, genital and anal shields mostly smooth, with some weak transverse striations; setae *ag*, *g1-2*, *ps1-2* smooth; setae *g2* inserted slightly anterior to *g1*. Spermatheca a long, slender, coiling tube terminating into large, prominent hairy bulb (Fig. 47).

Gnathosoma (Fig. 48). Tip of gnathosoma reaching anterior margin of genu I. Palp four-segmented; tarsus with one solenidion and two eupathidia; tibia with two setae; femur-genu with one; trochanter without setae.

Legs (Figs 49–51)—Counts of setae and solenidia (included in counts) on podomeres of legs I–IV: coxae 2-2-1-1, trochanters 1-1-1-0, femora 4-4-2-1, genua 3-3-1-1, tibiae 5-5-3-3, tarsi 9(ω)-9(ω)-5-5. Leg chaetotaxy as follows: trochanters I, II, III *v'*, IV nude; femora I–II *d*, *v'*, *bv''*, *l'*; femur III *d*, *ev'*; femur IV *ev'*; genua I–II *l'*, *d*, *l''*; III–IV *l'*; tibiae I–II *d*, *l'*, *l''*, *v'*, *v''*; III–IV *d*, *v'*, *v''*; tarsus I–II *u'*, *u''*, *p'*, *p''* *tc'*, *tc''*, *ft'*, *ft''*, ω ; III–IV *u'*, *u''*, *tc'*, *tc''*, *ft'*.

Remarks. Mesa *et al.* (2009) suspected that the three species *B. dosis* Chaudhri *et al.* (1974), *B. olearius* Sayed 1950 and *B. olivicola* Castagnoli & Pegazzano 1979 were all junior synonyms of *B. oleae* Baker 1949. However, Castagnoli & Pegazzano (1979) considered *B. olearius*, *B. olivicola* and *B. oleae*, and their new species, *B. rotai*, to all be separate true species based on the shape and/or position of the dorsal setae of the deutonymphs, and did not consider *B. dosis*. The adults of these four species are morphologically close in having similar dorsal ornamentation, shape and length of infracapitulum, anterior prodorsal projection, body setae and shape of spermatheca, except for minor variations. Castagnoli & Pegazzano (1979) also divided these four species into two groups based on the setal numbers on the trochanters—*B. olivicola* and *B. oleae* make one group with two setae on trochanter III (*l'*, *v'* present) and one seta on trochanter IV (*v'* present); and *B. olearius* and *B. rotai* represent the second group with one seta on trochanter III (*v'* absent; *l'* present) and trochanter IV without setae. We examined a female *B. oleae* specimen borrowed from the Smithsonian (USNM), and confirm that the trochanter formula is 1-1-2-1. Our Turkish specimen belongs to the *B. olearius* and *B. rotai* group, with the trochanter formula 1-1-1-0. Unfortunately we have only one female specimen and our decision to consider this specimen to be *B. rotai* as opposed to *B. olearius*, is based solely on the fact that the base of the anterior prodorsal projection is not smooth as it is in *B. olearius*. Confirmation of this will depend on the examination of more specimens of each of these species, especially immatures. This is a first report of this species for Turkey.

Material examined. 1 female from *Olea europae* L. (Oleaceae), Balıkesir, Turkey, 03 December 1999, Turkey, 03 December 1999 (Collector; S. Çobanoğlu. Deposited at University of Ankara).

Distribution. Crimea, Egypt, Greek, Italy, Morocco, Pakistan, Portugal, Russia, South Africa, Tunisia and USA (Meyer 1979; Hatzinikolis 1986b; Mesa *et al.* 2009).

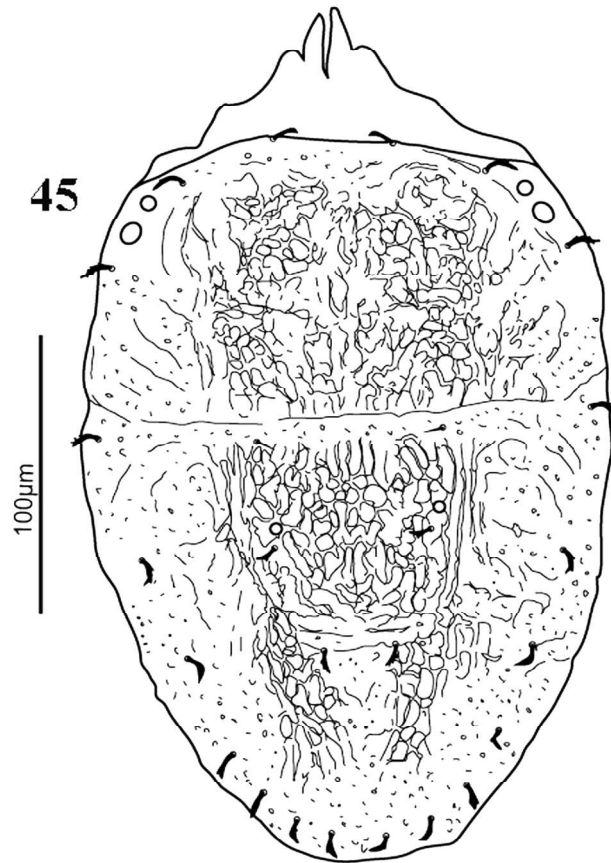
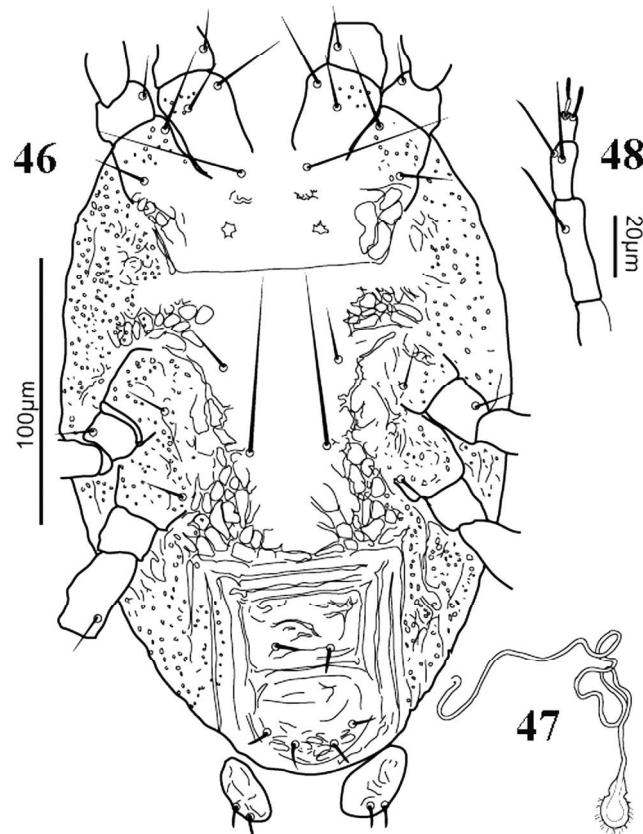
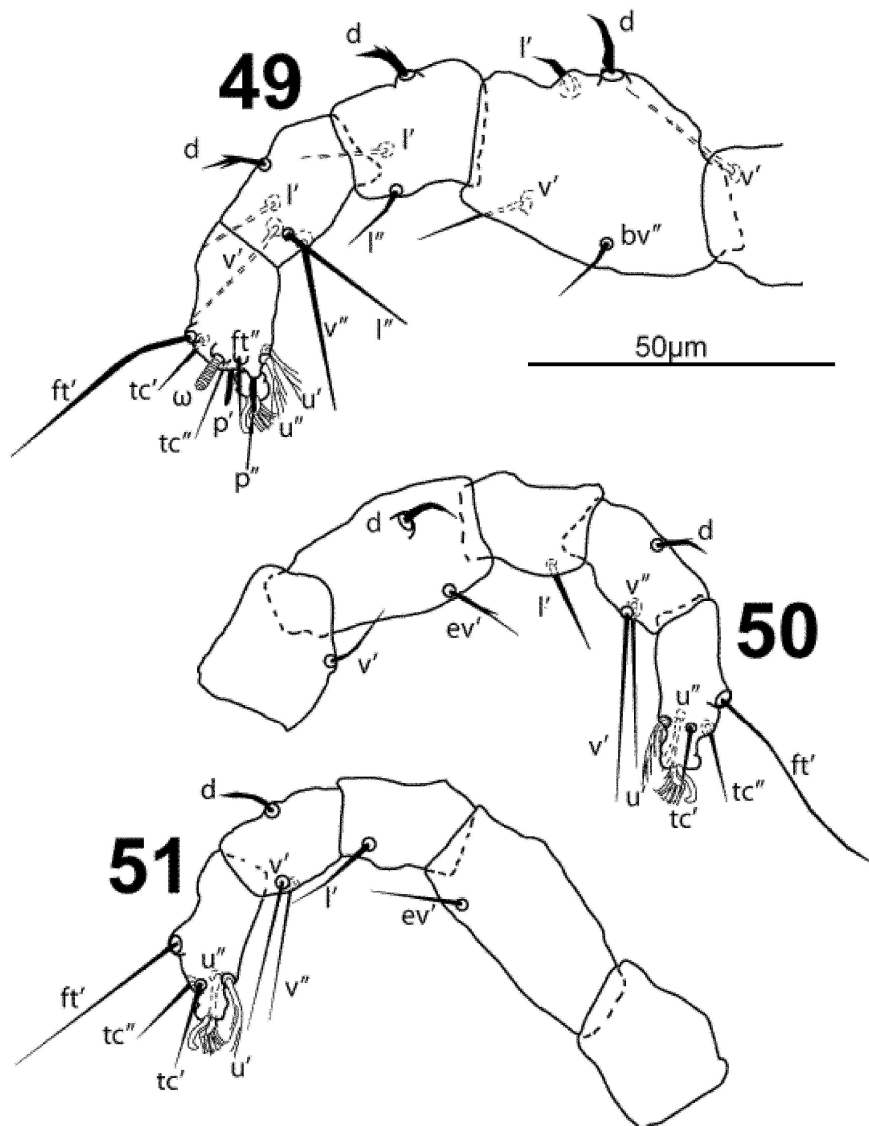


FIGURE 45. *Brevipalpus rotai* (Castagnoli & Pegazzano). Female, dorsum.



FIGURES 46–48. *Brevipalpus rotai* (Castagnoli & Pegazzano). Female. 46. Venter view. 47. Spermatheca. 48. Palp.



FIGURES 49–51. *Brevipalpus rotai* (Castagnoli & Pegazzano). Female. 49. Leg I, left. 50. Leg III, left. 51. Leg IV, left.

Genus *Cenopalpus* Pritchard & Baker, 1958

Type species: *Brevipalpus spinosus* (Donnadieu 1875).

Diagnosis. As defined by Khanjani *et al.*, 2012b.

Cenopalpus bakeri Düzgüneş 1967 (Figs 52–70)

Cenopalpus bakeri Düzgüneş 1967b: 91.

Brevipalpus bakeriana Ghai & Shenhmar 1984: 127.

Diagnosis. Dorsum entirely reticulate. Dorsal opisthosomal setae *f2* present. Prodorsal setae *v2*, *sc1* long, lanceolate and slightly serrate. Dorsal opisthosomal setae *c3*, *d1*, *e1*, *h1*, *h2* short, smooth; setae *c1*, *c2*, *d3*, *e3*, *f2*, *f3* lanceolate-serrate. Ventral cuticle between setae *1b–4a* smooth; cuticle between setae *4a* and ventral shield reticulate. Ventral, genital and anal shields reticulate. Dorsal setae on femora I–II and genua I–II strongly serrate. Spermatheca a long, slender tube, distal end not visible.

Female. Dimensions. Length of body excluding gnathosoma 239–260; width 130–141, length of gnathosoma 56–73. Legs: I 132–141; II 119–131; III 111–124; IV 122–132. Setae: *v2* 22–24; *sc1* 21–24; *sc2* 14–17; *c1* 9–19; *c2* 12–13; *c3* 13–19; *d1* 12–15; *d3* 14–19; *e1* 10–17; *e3* 14–17; *f2* 12–18; *f3* 11–15; *h1* 9–12; *h2* 5–9.

Dorsum (Figs 52–55). Dorsum entirely reticulate. Prodorsal setae *v2*, *sc1* long and slightly serrate, dorsocentral setae on opisthosoma slender and smooth and lateral setae and *c2* lanceolate and slightly serrate. Notch of anterior projection of prodorsal shield deep, reaching setae *v2*, forming two broad triangular lobes.

Venter (Figs 56–57). Ventral cuticle between setae *1b–4a* smooth; cuticle between *4a* and ventral shield reticulate. Setae *3a* much shorter than long *4a*. Ventral, genital and anal shields reticulate. Setae *ag*, *g1–2*, *ps1–2* all smooth; setae *g2* inserted slightly anterior to *g1*. Spermatheca a long tube, distal end not visible (Fig. 57).

Gnathosoma (Fig. 58). Tip of gnathosoma reaching middle to anterior margin of femur I. Palp four-segmented; palp tarsus with one solenidion and two eupathidia; tibia with two setae; femorogenu with one seta; trochanter without setae.

Legs (Figs 59–61). Counts of setae and solenidia (included in counts) on podomeres of legs I–IV: coxae 2-2-1-1, trochanters 1-1-2-1, femora 4-4-2-1, genua 3-3-1-0, tibiae 5-5-3-3, tarsi 9(ω)-9(ω)-5-5. Leg chaetotaxy as follows: trochanters I, II, IV *v'*; tr III *v'*, *l'*; femora I–II *d*, *v'*, *bv''*, *l'*; fe III *d*, *ev'*; fe IV *ev'*; genua I–II *l'*, *d*, *l''*; ge III *l''* IV nude; tibiae I–II *l'*; ti III–IV *d*, *v'*, *v''*; tarsus I–II *u'*, *u''*, *p'*, *p''* *tc'*, *tc''*, *ft'*, *ft''*, ω ; ta III–IV *u'*, *u''*, *tc'*, *tc''*, *ft'*. Dorsal setae on genua I–II and femora I–II strongly serrate. Solenidion on tarsi I and II long and slender. Setae *ft'* on tarsi I–IV long.

Deutonymph (Figs 62–65). Dimensions: Length of body excluding gnathosoma 245–249; width 120–125, length of gnathosoma 32–42; Legs: I 96–109; II 83–91; III 75–76; IV 75–91. Setae: *v2* 31–39; *sc1* 38–41; *sc2* 39–45; *c1* 4–5; *c2* 5–6; *c3* 41–45; *d1* 3–6; *d3* 44–50; *e1* 3–5; *e3* 40–50; *f2* 44–49; *f3* 38–43; *h1* 3–4; *h2* 3–4. Dorsum striated; setae *sc1*, *sc2*, *c3*, *d3*, *e3*, *f2* and *f3* long, lanceolate and serrate, setae *c1*, *c2*, *d1*, *e1*, *h1*, *h2* minute and smooth. Venter completely covered with striae, with one pair of setae *1a*, *3a* and *4a*, one pair of aggenital, one pair of genital and two pairs of pseudanal setae all slightly serrate. Gnathosoma similar to that of female. Leg chaetotaxy only differs from that of female in that trochanter IV is without setae. Dorsal setae *d* on femora I–II much longer, and thicker than those of female.

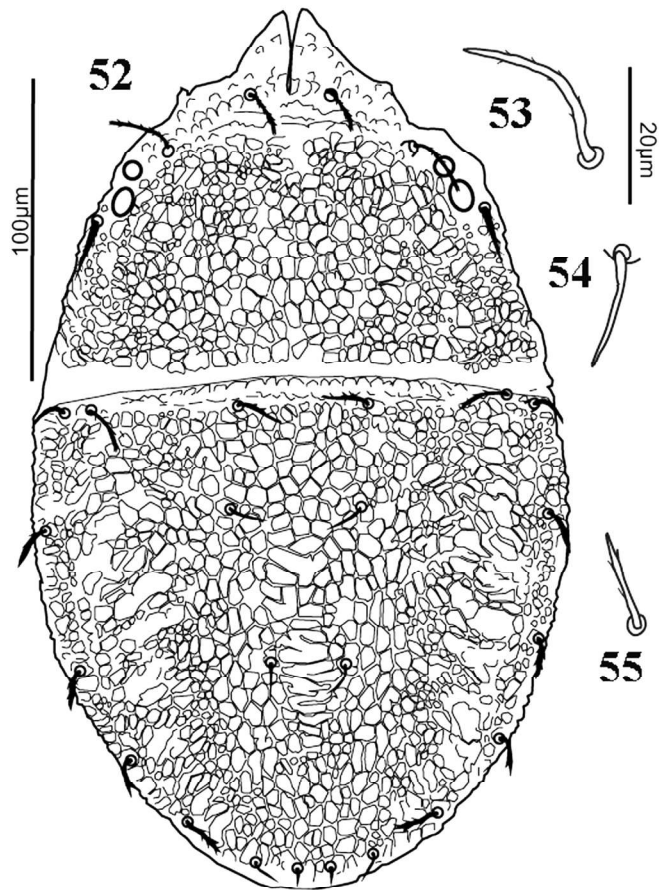
Protonymph (Figs 66–68). Dimensions: Length of body excluding gnathosoma 186; width 111, length of gnathosoma 30; legs: I 74; II 67; III 61; IV 95. Setae: *v2* 28; *sc1* 33; *sc2* 32; *c1* 3; *c2* 3; *c3* 37; *d1* 3; *d3* 38; *e1* 3; *e3* 35; *f2* 43; *f3* 30; *h1* 2; *h2* 3. Dorsum similar to that of deutonymph. Leg chaetotaxy differs from deutonymph as follows: tarsus IV without setae *tc'*, *tc''*; trochanters I–II and IV without setae; trochanter III with only *l'*; genu I with only seta *l'*. Gnathosoma similar to that of female.

Larva (Figs 69–70). Dimensions: Length of body excluding gnathosoma 141; width 88, length of gnathosoma 25; legs: I 64; II 61; III 59; IV absent. Setae: *v2* 21; *sc1* 26; *sc2* 30; *c1* 4; *c2* 4; *c3* 28; *d1* 4; *d3* 35; *e1* 3; *e3* 30; *f2* 36; *f3* 24; *h1* 4; *h2* 3. Dorsum similar to that of protonymph; venter striate. Counts of setae and solenidia of podomeres of legs I–III: coxae 2-0-0; trochanters 0-0-0; femora 3-3-2; genua 1-1-1, tibiae 5-5-3; tarsi 7(ω)-7(ω)-3. Femora I–II with *l'* absent (*d*, *v'*, *bv''* present), genua I–III each with only seta *l'*.

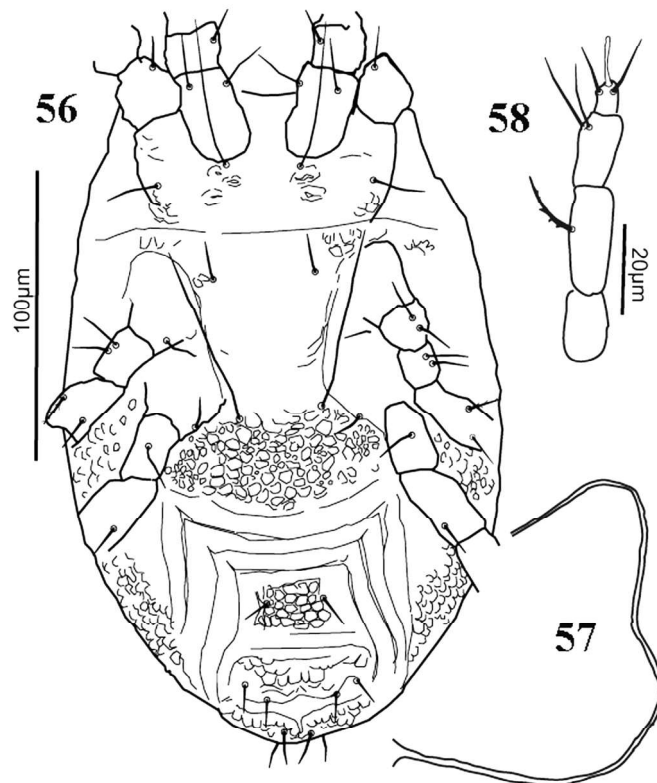
Remarks. Düzgüneş (1967) described this species from Turkey, but it has since been reported from Iran (Kamali *et al.* 2001; Khanjani *et al.* 2012a, b).

Material examined. All material collected in Turkey—2 females from *Rubus fruticosus* L. (Rosaceae), Kocaeli, 11 September 1974; 24 females and 2 deutonymphs from *Crataegus* sp. (Rosaceae), Dışkapı/Ankara, 13 September 1966; 22 females from *R. fruticosus*, Kocaeli, 13 April 1967; 3 females, 4 deutonymphs, 1 protonymph and 1 larva from *Malus comminus* L. (Rosaceae), Erzincan, 26 June 1965 (Zeliha Düzgüneş's Collection).

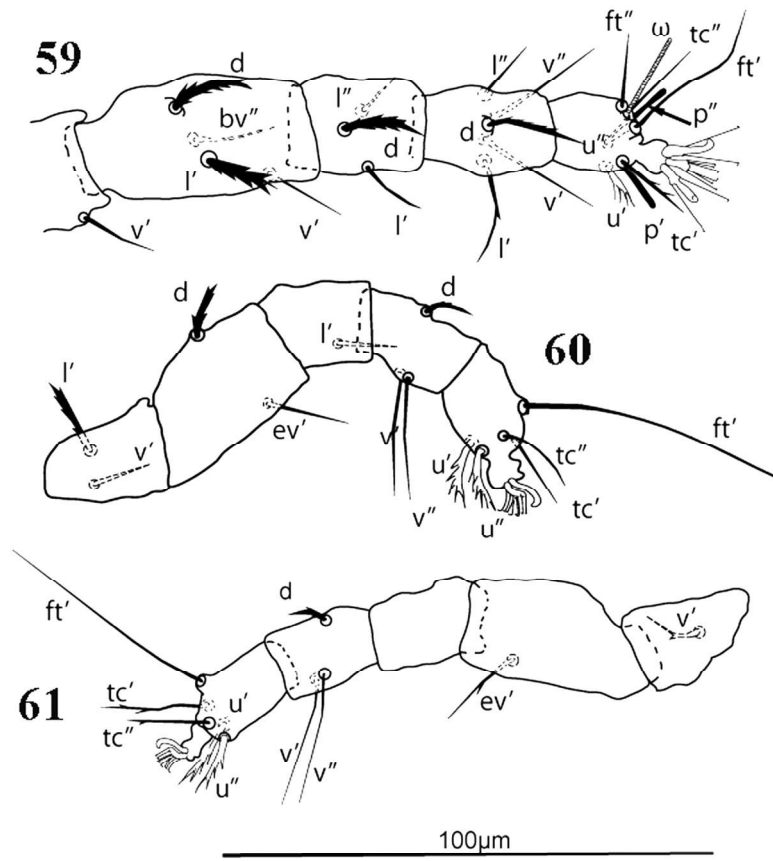
Distribution. Western Palearctic (Khanjani *et al.* 2013a).



FIGURES 52–55. *Cenopalpus bakeri* Düzgüneş. Female. 52. Dorsum. Dorsal setae: 53. v2. 54. cl. 55. f2.



FIGURES 56–58. *Cenopalpus bakeri* Düzgüneş. Female. 56. Venter view. 57. Spermatheca. 58. Palp.



FIGURES 59–61. *Cenopalpus bakeri* Düzgüneş. Female. 59. Leg I, left. 60. Leg III, right. 61. Leg IV, left.

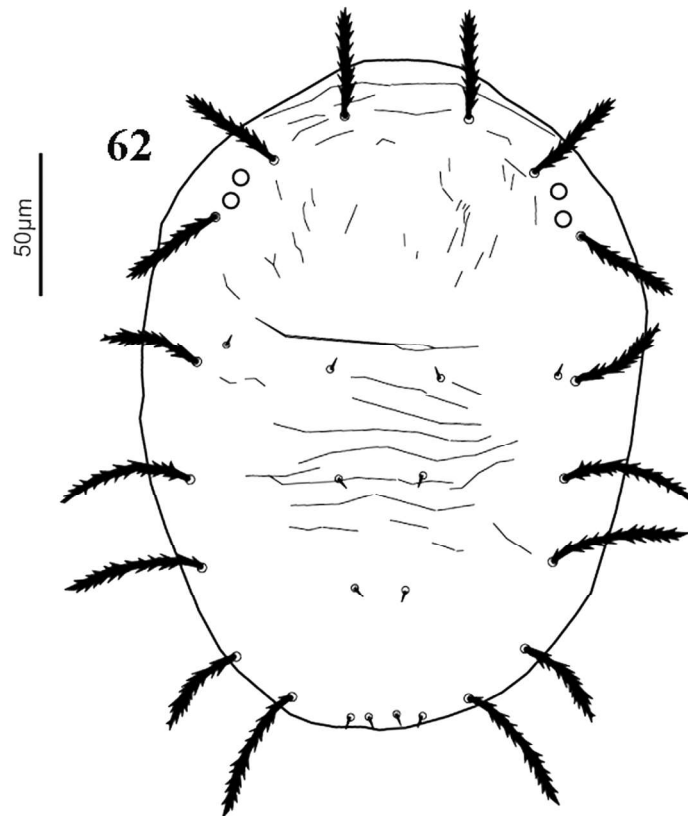
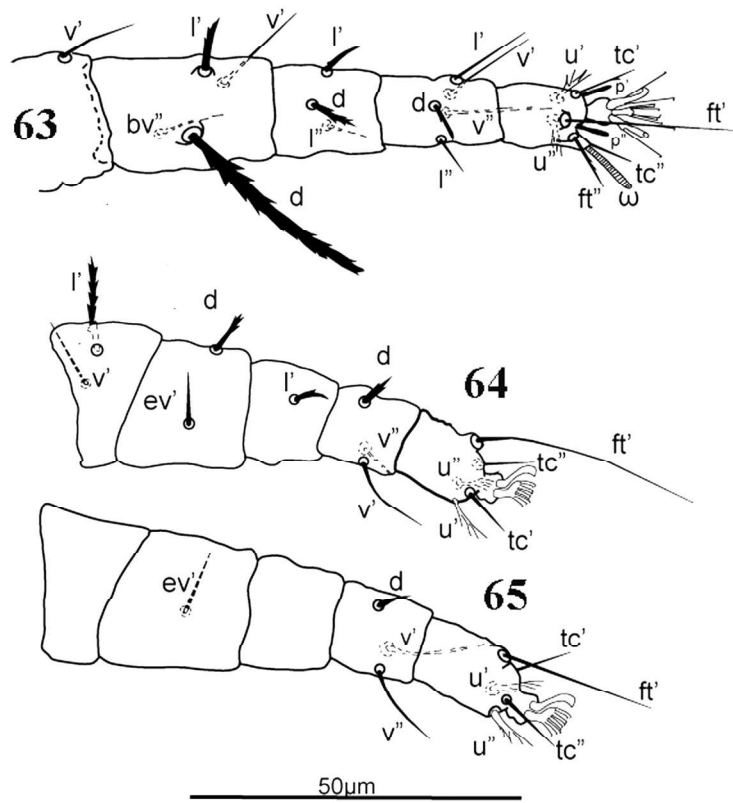
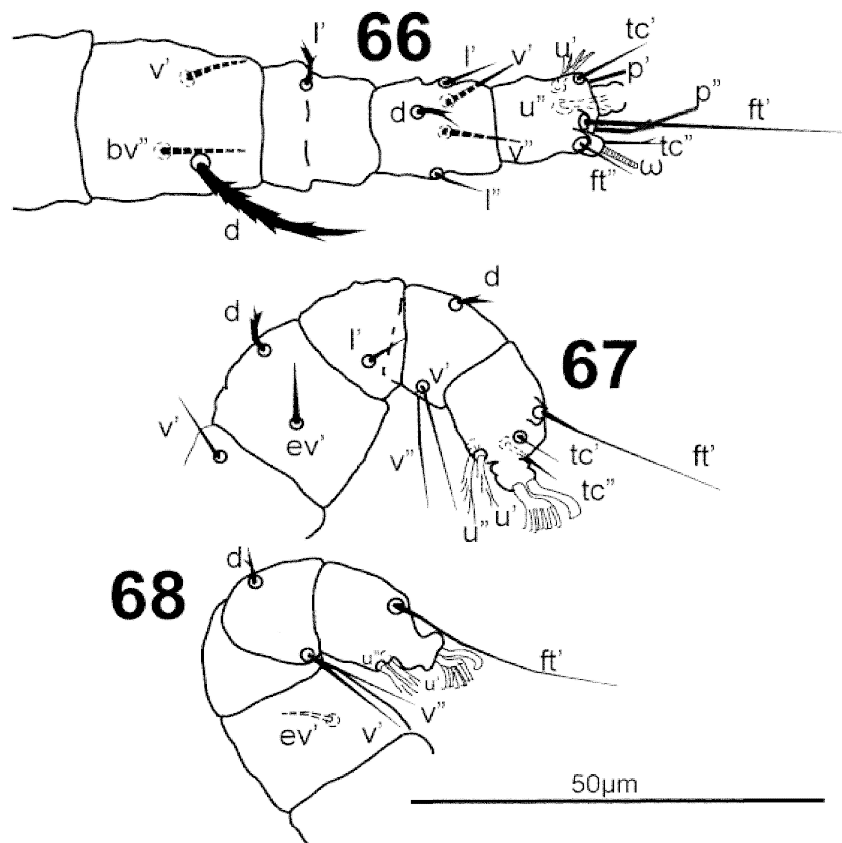


FIGURE 62. *Cenopalpus bakeri* Düzgüneş. Deutonymph, dorsum.

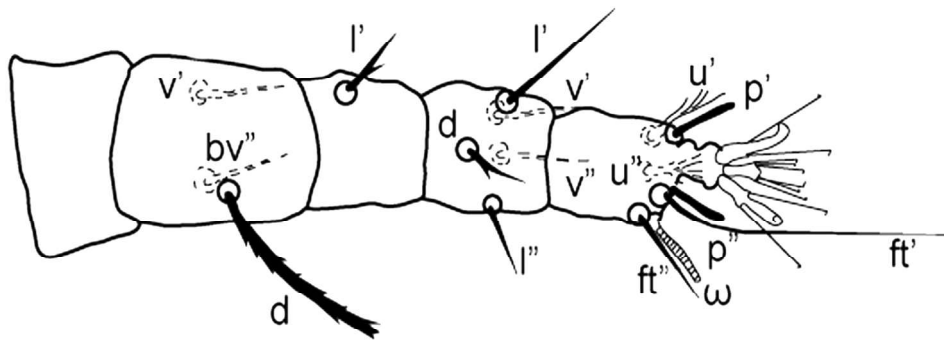


FIGURES 63–65. *Cenopalpus bakeri* Düzgüneş. Deutonymph. 63. Leg I, right. 64. Leg III, right. 65. Leg IV, right.

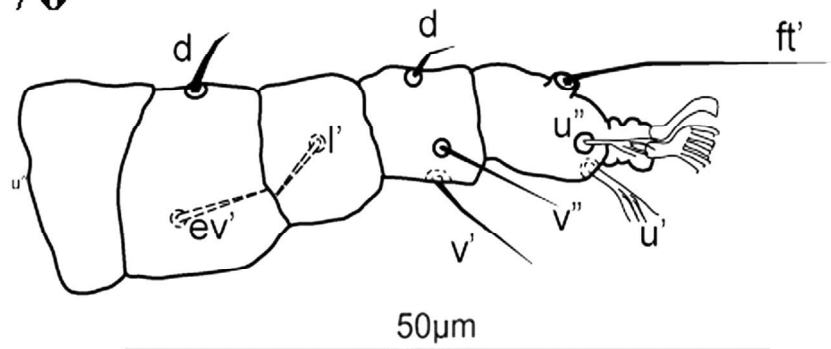


FIGURES 66–68. *Cenopalpus bakeri* Düzgüneş. Protonymph. 66. Leg I, right. 67. Leg III, left. 68. Leg IV, right.

69



70



FIGURES 69–70. *Cenopalpus bakeri* Düzgüneş. Larva. 69 Leg I, right. 70. Leg III, right.

***Cenopalpus bagdasariani* (Livshitz & Mitrofanov 1970)**

(Figs 71–81)

Brevipalpus bagdasariani Livshitz & Mitrofanov 1970: 789.

Diagnosis. Prodorsum and opisthosoma with dorsocentral and lateral rugose ridges, separated by reticulations. Dorsal body setae broadly lanceolate and strongly serrate. Venter smooth with patch of reticulations laterad *4a*. Ventral and genital shields with few striae and reticulations, anal shield more strongly reticulate. Dorsal setae on femora I–II broadly lanceolate and strongly serrate, and on genua I–II narrowly lanceolate and serrate. Spermatheca a long slender tube, terminating in round bulb.

Female. Dimensions: Length of body excluding gnathosoma 274–289; width 132–146, length of gnathosoma 85; Legs: I 135; II 125; III 118; IV 133; setae: *v2* 36; *sc1* 37; *sc2* 31; *c1* 26; *c2* 23; *c3* 31; *d1* 15; *d3* 19; *e1* 13; *e3* 18; *f2* 20; *f3* 19; *h1* 18; *h2* 11.

Dorsum (Fig. 71). Both prodorsum and opisthosoma with dorsocentral and lateral rugose ridges, separated by reticulations. Dorsal body setae broadly lanceolate and strongly serrate. Prodorsal projection deeply notched (notch not reaching setae *v2*), forming two broad triangular lobes, with small lateral lobes.

Venter (Figs 72–73). Venter smooth with reticulated patches lateral to setae *4a*; ventral and genital shields with few striae and reticulations, but anal shields strongly reticulate. Setae *4a* much longer than *3a*. Aggenital setae smooth; genital (*g1–2*) and pseudanal setae (*ps1–2*) weakly serrate; setae *g2* inserted slightly anterior to *g1*. Spermatheca a long slender tube terminating in small round bulb.

Gnathosoma (Fig. 74). Infracapitulum reaching middle to anterior margin of genu I. Palp four-segmented; palp tarsus with two eupathidia and a seta, tibia with two setae, femorogenu with one seta and trochanter without setae.

71

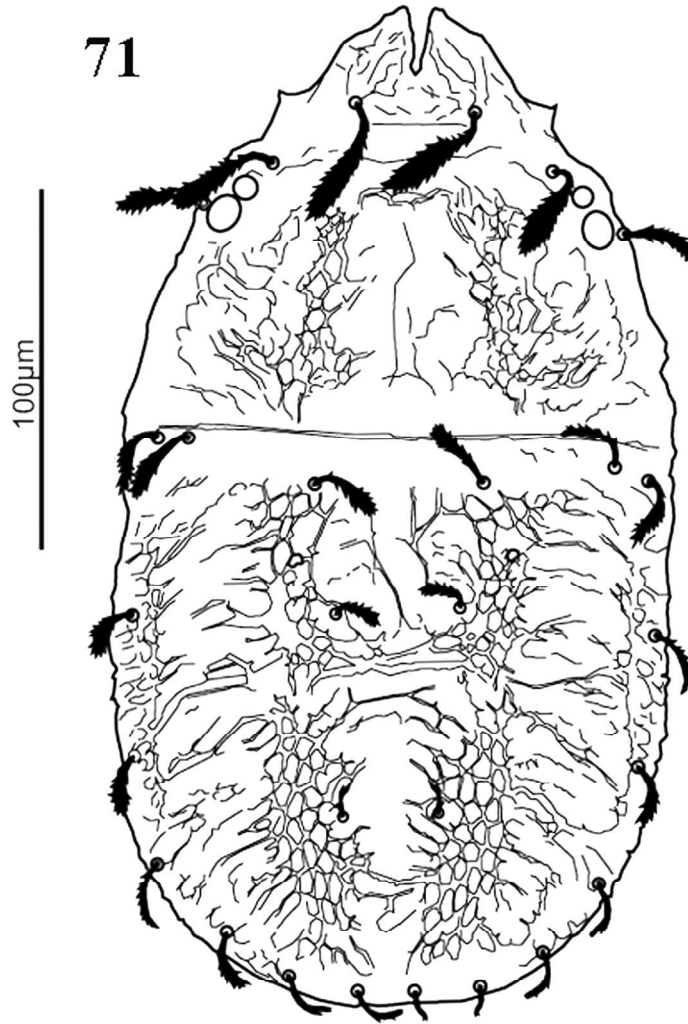


FIGURE 71. *Cenopalpus bagdasariani* (Livshitz & Mitrofanov). Female, dorsal view.

Legs (Figs 75–77). Counts of setae and solenidia (included in counts) on podomeres of legs I–IV: coxae 2-2-1-1, trochanters 1-1-2-1, femora 4-4-2-1, genua 3-3-1-0, tibiae 5-5-3-3, tarsi 9(ω)-9(ω)-5-5. Leg chaetotaxy as follows: trochanters I, II, IV v' ; tr III v' , l' ; femora I–II d , v' , bv'' , l' ; fe III d , ev' ; fe IV ev' ; genua I–II l' , d , l'' ; ge III l' ; ge IV nude; tibiae I–II d , l' , l'' v' , v'' ; ti III–IV d , v' , v'' ; tarsus I–II u' , u'' , p' , p'' tc' , tc'' , ft' , ft'' , ω ; ta III–IV u' , u'' , tc' , tc'' , ft' .

Dorsal setae on femora I–II broadly lanceolate and strongly serrate, and on genua I–II narrowly lanceolate and serrate.

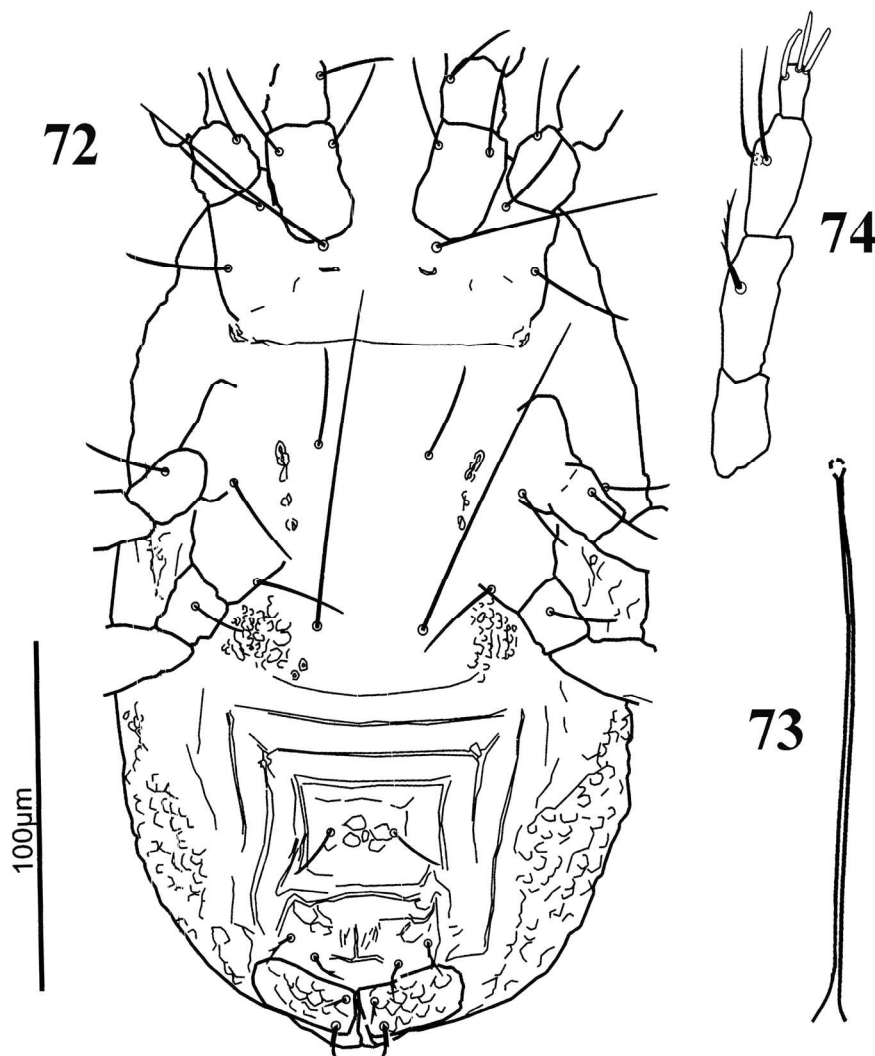
Male. Dimensions: Length of body excluding gnathosoma 215; width 108, length of gnathosoma 62; Legs: I 128; II 122; III 110; IV 116; setae: $v2$ 33; $sc1$ 35; $sc2$ 36; $c1$ 28; $c2$ 25; $c3$ 31; $d1$ 21; $d3$ 40; $e1$ 16; $e3$ 39; $f2$ 36; $f3$ 37; $h1$ 12; $h2$ 27. Body tapered posteriorly with transverse striae between d and e setae. Prodorsum and dorsal body setae similar to that of female, though some longer. Aedeagus long, gradually tapering towards anal opening. Leg chaetotaxy similar to that of female, solenidia on tarsi I and II similar to that of female. Coxae III–IV also flanked by longitudinal slits.

Deutonymph (Figs 78–81). Dimensions: Length of body excluding gnathosoma 249–250; width 132–142, length of gnathosoma 60–68; Legs: I 102–105; II 98–99; III 85–89; IV 85–94; setae: $v2$ 31–33; $sc1$ 30–34; $sc2$ 30–31; $c1$ 38–39; $c2$ 26–29; $c3$ 36; $d1$ 33; $d3$ 36–38; $e1$ 10–14; $e3$ 32–35; $f2$ 30–34; $f3$ 35–36; $h1$ 30–32; $h2$ 7–9. Dorsum similar to that of female, except most setae longer, especially posterior setae, setae $h2$ five times longer than $h1$. Venter completely covered with mainly transverse striae, one pair of setae $1a$, $3a$ and $4a$, one pair of aggenital, one pair of genital and two pairs of pseudanal setae, most slightly serrate. Gnathosoma similar to that of female. Leg chaetotaxy only differs from female in that trochanter IV is without setae.

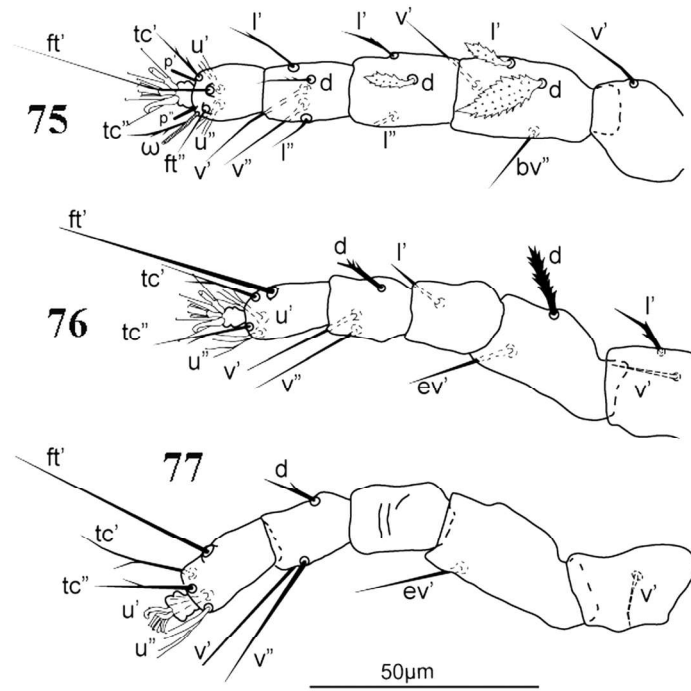
Remarks. Our Turkish specimens resemble *C. bagdasariani* in all respects, except for having an ornamented ventral shield, depicted as smooth in the original description (Livshitz & Mitrofanov 1970). Meyer (Smith) (1979) referred to the dorsal ornamentation as “irregular” and Livshitz & Mitrofanov (1970) described it as “folds form a reticular design consisting of multiangled cells and prodorsal shield smooth dorsocentrally”. The Turkish specimens fit these descriptions. These specimens also resemble those of *C. pennatisetis* Wainstein 1958 and even share the same genus of host plant (*Populus*, Salicaceae); however, the latter has large polygonal cells mediolaterally on the prodorsum and anteromedially on the opisthosoma (Wainstein 1960; Mitrofanov & Strunkova 1979). The mediolateral prodorsal cells are smaller in *C. bagdasariani* and the opisthosoma is smooth anteromedially. The deutonymphs collected with the female Turkish specimens also resemble those of *C. pennatisetis*; however, *C. bagdasariani* deutonymphs differ from those of *C. pennatisetis* in that the dorsal setae are broadly lanceolate in *C. bagdasariani* instead of narrowly lanceolate in *C. pennatisetis*, and setae *c1* are clearly shorter than the distance *c1-d1* as opposed to as long as or slightly longer than this distance in *C. pennatisetis*. A spermatheca is described here for the first time and may confirm this identification in future.

Material examined. 2 females, 4 males and 2 deutonymphs from *Populus nigra* L. (Salicaceae), Mamak/Ankara, Turkey, 27 September 2006, 1 female from *P. tremula*, Vedat Dalokay Parkı/Ankara, Turkey, 01 September 2005, (Collector; H.D. Sağlam. Deposited at University of Ankara).

Distribution. Kazakhstan of the former USSR (Mitrofanov & Strunkova 1979).



FIGURES 72–74. *Cenopalpus bagdasariani* (Livshitz & Mitrofanov). Female. 72. Ventral view. 73. Spermatheca. 74. Palp.



FIGURES 75–77. *Cenopalpus bagdasariani* (Livshitz & Mitrofanov). Female. 75. Leg I, right. 76. Leg III, right. 77. Leg IV, right.

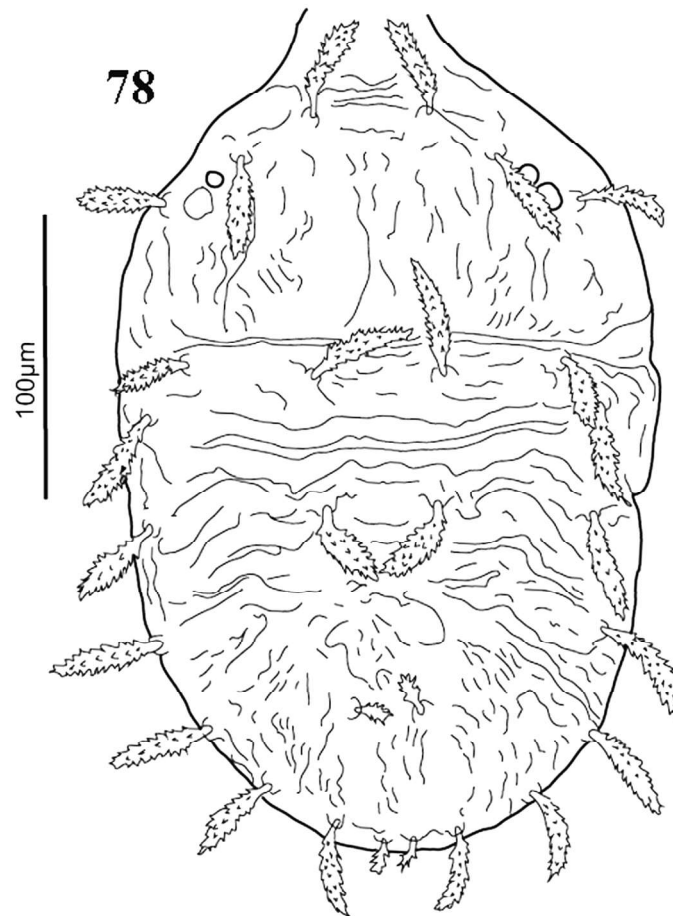
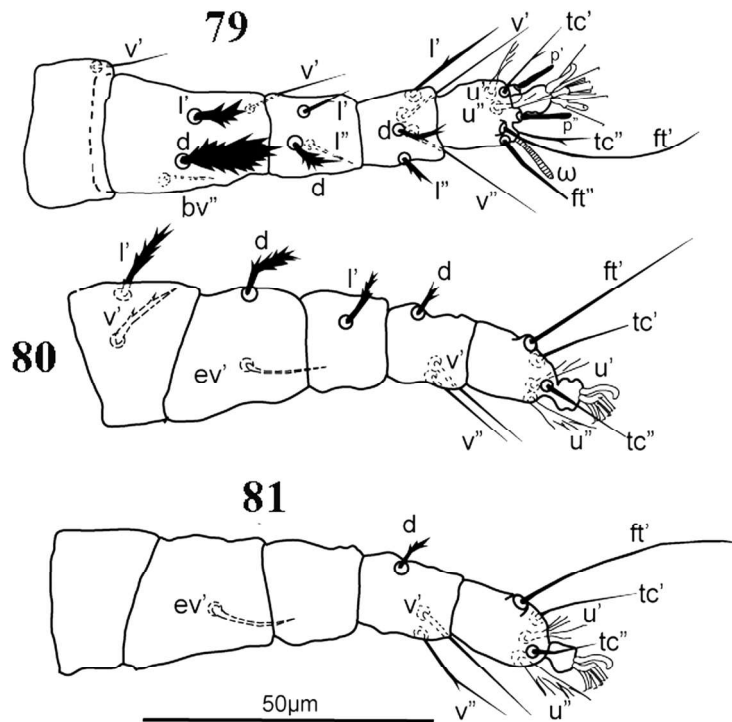


FIGURE 78. *Cenopalpus bagdasariani* (Livshitz & Mitrofanov). Deutonymph, dorsal view.



FIGURES 79–81. *Cenopalpus bagdasariani* (Livshitz & Mitrofanov). Deutonymph. 79. Leg I, right. 80. Leg III, right. 81. Leg IV, right.

Genus *Tenuipalpus* Donnadieu 1875

Type species: *Tenuipalpus palmatus* Donnadieu 1875.

Diagnosis. As defined by Khanjani *et al.* (2013b).

Tenuipalpus granati Sayed 1946

(Figs 82–88)

Tenuipalpus granati Sayed 1946: 100; Wainstein 1960: 247; Livshitz & Mitrofanov 1967: 31; Meyer (Smith) 1979: 70.

Tenuipalpus orchidarum Sayed 1942: 96. Misidentification.

Diagnosis. Dorsum with irregular striae but almost smooth in the Turkish specimens, longitudinal laterally on opisthosoma, venter with mainly transverse striae. Dorsal opisthosomal setae *c1*, *f2* present; setae *d1* and *e1* absent. Venter with two pairs of *4a* setae. Spermatheca is a long, slender tube, terminating in small bulb.

Female. Dimensions: Length of body excluding gnathosoma 240–254; width 139–141, infracapitulum covered by anterior prodorsal projection; Legs: I 119–122; II 105–109; III 100–107; IV 105–108; setae: *v2* 6–7; *sc1* 8–11; *sc2* 30–35; *c1* 8–13; *c3* 10–18; *d3* 8–10; *e3* 11–19; *f2* 17–26; *f3* 15–24; *h1* 122–147; *h2* 14–19. Body oval.

Dorsum (Fig. 82). Anterior prodorsal projection deeply notched medially forming pair of pointed lobes medially. Prodorsum with an angulate anterolateral margin, just anterior to setae *sc2*; opisthosoma gradually narrowing posteriorly, with two large lateral pores. Prodorsum and opisthosoma with scattered longitudinal to diagonal striae. Dorsal body setae slender, lanceolate, and weakly serrate.

Venter (Figs 83–84). Venter striate. Metapodosoma with one pair of *3a* and two pairs of flagellate *4a*. Striation pattern of ventral and genital shields mostly transverse, with some longitudinal striae laterad in genital region. Pair of aggenital setae slightly longer than two pairs of genital setae, reaching to or slightly passing bases of genital setae; two pairs of pseudanal setae. Ventral setae smooth. Genital setae transversely aligned. Spermatheca a long, slender tube; terminating in a small bulb.

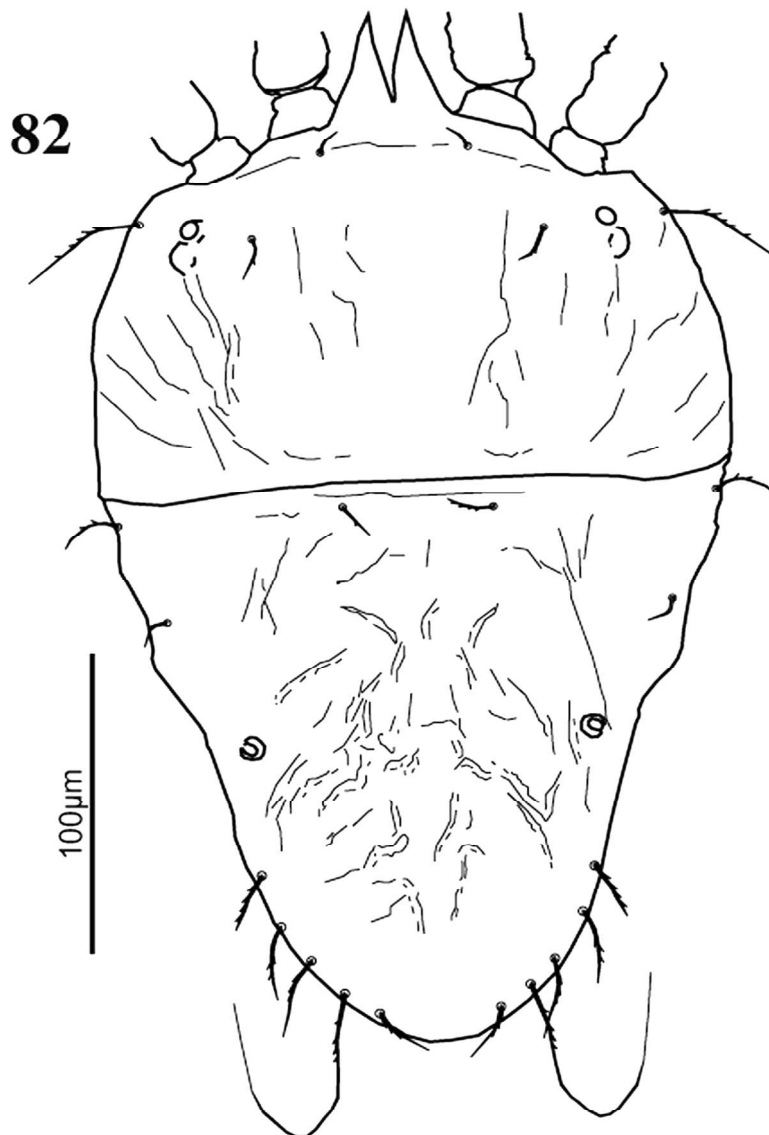


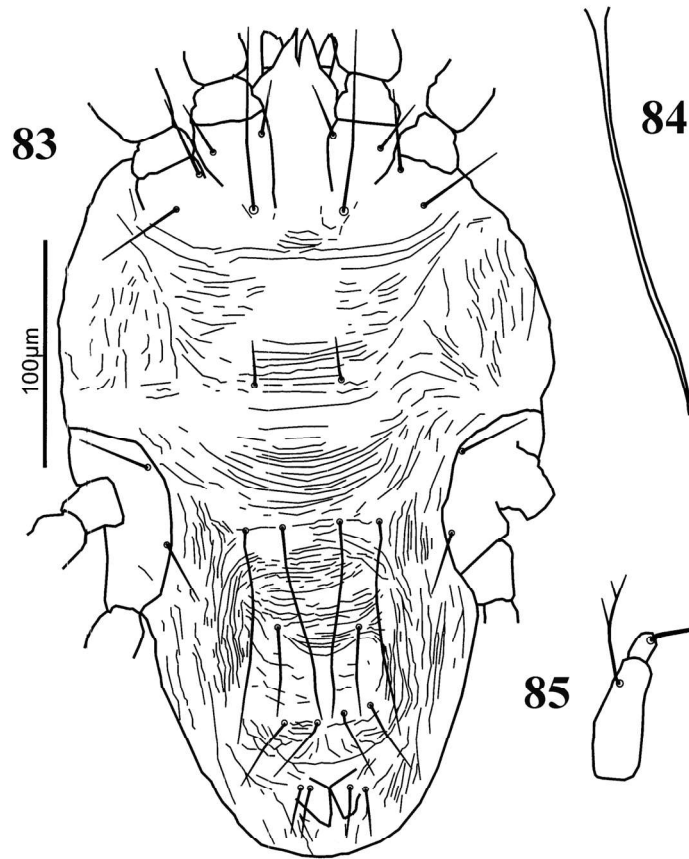
FIGURE 82. *Temipalpus granati* Sayed. Female, dorsal view.

Gnathosoma (Fig. 85). Infracapitulum covered by anterior projection, reaching to middle of femur I. Palp three-segmented, tarsus with a eupathidium, seta on tibia with at least two serrations; distal segment almost half length of second segment.

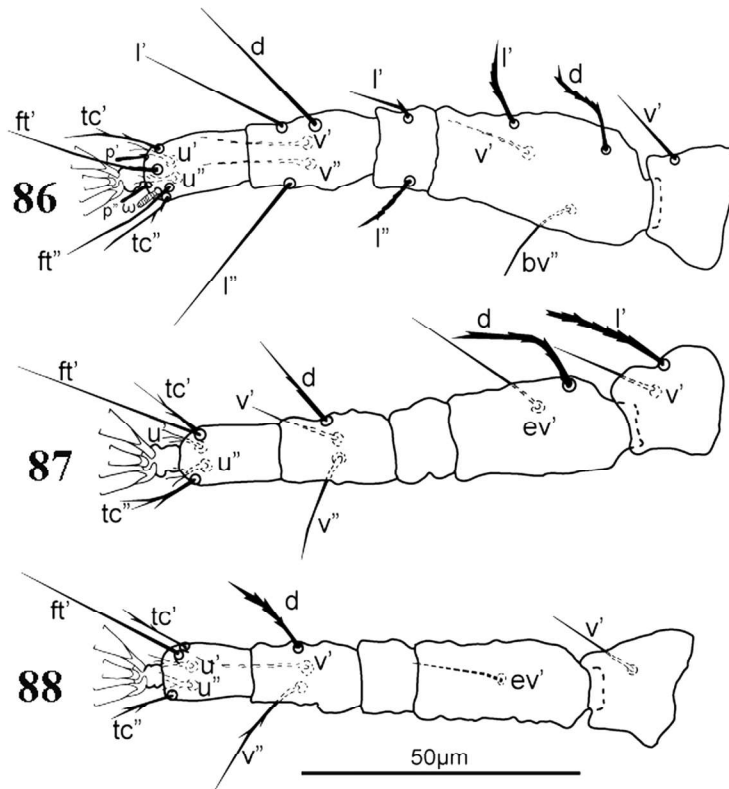
Legs (Figs 86–88). Setae and solenidia (included in counts) on segments of legs I–IV: coxae 2-2-1-1, trochanters 1-1-2-1, femora 4-4-2-1, genua 2-2-0-0, tibiae 5-5-3-3, and tarsi 9(ω)-9(ω)-5-5. Leg chaetotaxy as follows: trochanters I, II, IV v' ; tr III l' , v' ; femora I-II d , v , bv'' , l' ; fe III d , ev' ; fe IV ev' ; genua I-II l' , l'' ; ge III-IV nude; tibiae I-II d , l' , l'' , v' , v'' ; ti III-IV d , v' , v'' ; tarsus I-II u' , u'' , p' , p'' , tc' , tc'' , ft' , ft'' , ω ; ta III-IV u' , u'' , tc' , tc'' , ft' . Dorsal setae on femora I–III lanceolate and serrate, absent on genua I–II.

Material examined. 1 female from *Vitis vinifera* L. (Vitaceae), Salihli/Manisa, 10 September 1997, S. Çobanoğlu; 2 females from *Vitis vinifera*, Menemen Çavuşköy/Izmir, 04–05 September 1997, (Collector; S. Çobanoğlu. Deposited at University of Ankara).

Distribution. Azerbaijan, Cyprus, Egypt, Georgia, Greece, India, Iran, Kazakhstan, Ukraine (Sayed 1946; Pritchard & Baker 1958; Wainstein 1960; Dosse 1971; Sadana & Gupta 1984; Hatzinikolis 1986a; Khanjani *et al.* 2013 b).



FIGURES 83–85. *Tenuipalpus granati* Sayed. Female. 83. Ventral view. 84 Spermatheca. 85. Palp.



FIGURES 86–88. *Tenuipalpus granati* Sayed. Female. 86. Leg I, left. 87. Leg III, left. 88. Leg IV, left.

***Tenuipalpus punicae* Pritchard & Baker 1958**

(Figs 89–98)

Tenuipalpus punicae Pritchard & Baker 1958: 240; Wainstein 1960: 245; Livschitz & Mitrofanov 1967: 32; Khosrowshahi & Arbabi 1997: 38.

Tenuipalpus granati Sayed 1946; Düzgüneş 1965: 144. Misidentification.

Diagnosis. Dorsum medially and laterally reticulate; prodorsum with oblique striae and folds laterally; opisthosoma with longitudinal striae laterally. Dorsal opisthosomal setae *c1*, *d1*, *e1*, *f2* present. Prodorsal setae *v2*, *sc1* minute and *sc2* longer, lanceolate and serrate; opisthosoma with dorsocentral setae *c1*, *d1*, *e1* short and slightly serrate; lateral setae longer, weakly lanceolate and serrate; setae *h1* flagelliform. Venter mostly smooth with weak striae laterally and posteriorly. Spermathecal duct narrows to form proximal constriction, prior to forming a membranous bulge and narrows again into a slender tube terminating into a small bulb distally. Seta *tc*'' absent on tarsi I–II, present on tarsi III–IV.

Female. Dimensions: Length of body including gnathosoma 277–313; width (broadest part) 174–192, width (narrowest part) 106–132; infracapitulum covered by anterior prodorsal projection; Legs: I 98–119; II 95–108; III 84–96; IV 89–103; setae: *v2* 6–9; *sc1* 6–8; *sc2* 22–25; *c1* 5–9; *c3* 9–11; *d1* 7–9; *d3* 6–9; *e1* 7–9; *e3* 11–14; *f2* 13–17; *f2* 12–15; *h1* 135–161; *h2* 10–16.

Dorsum (Fig. 89). Anterior prodorsal projection deeply notched medially forming pointed lobes. Prodorsum with an angulate anterolateral margin, near insertion of setae *sc2*. Opisthosoma gradually narrowing posteriorly, with two large lateral pores. Both prodorsum and opisthosoma medially reticulate and laterally with longitudinal to oblique striae. Setae *v2* and *sc1* minute; setae *sc2* longer, lanceolate and serrate; opisthosoma with dorsocentral setae *c1*, *d1*, *e1* short and slightly serrate; lateral setae longer, lanceolate and serrate; setae *h1* flagelliform.

Venter (Figs 90–91). Venter mostly smooth with weak striae laterally and in genital region; setae *3a* short, setae *4a*, *ag* elongate. Striation pattern of pregenital and genital shields transverse. Setae *ag* longer than setae *g1*–*2*, extending beyond bases of *g1*–*2*, almost to setae *ps1*–*2*; setae *g2* inserted slightly anterior to *g1*, ventral setae smooth. Spermatheca narrows to a proximal constriction prior to forming a membranous bulge, and narrows again into a long slender tube terminating in a small bulb.

Gnathosoma (Fig. 92). Infracapitulum covered by anterior prodorsal projection, extending to proximal third of femur I. Palp three-segmented; palp tarsus with two eupathidia, one short and one longer; seta on tibia with serrations; distal segment about one third length of second segment.

Legs (Figs 93–95). Setae and solenidia (included in counts) on segments of legs I–IV: coxae 2-2-1-1, trochanters 1-1-2-1, femora 4-4-2-1, genua 2-2-0-0, tibiae 5-5-3-3, and tarsi 8(ω)-8(ω)-5-5. Leg chaetotaxy as follows: trochanters I, II, IV *v*'; tr III *l*', *v*'; femora I–II *d*', *bv*'', *l*'; fe III *d*', *ev*'; fe IV *ev*'; genua I–II *l*', *l*'; ge III–IV nude; tibiae I–II *d*', *l*', *l*'', *v*', *v*''; ti III–IV *d*', *v*', *v*''; tarsus I–II *u*', *u*'', *p*', *p*'', *tc*', *ft*', *ft*'', *ω*; ta III–IV *u*', *u*'', *tc*', *tc*'', *ft*'. Dorsal setae on femora I–III lanceolate and serrate and on genua I–II absent. Coxal setae *1b*, *2b* and *4b* distinctly longer than other coxal setae.

Deutonymph (Figs 96–98) **Legs.** Differs from female in that trochanter IV is without setae and tarsi IV without setae *tc*', *tc*''. The deutonymph matches the description of Pritchard & Baker (1958).

Remarks. Düzgüneş (1965) refers to specimens she identified as *T. granati*; however, as these specimens bear three pairs of dorsocentral setae (*c1*, *d1*, *e1*) we feel that they are actually *T. punicae*, because *T. granati* has just one pair of dorsocentral setae (*c1*). The rest of the dorsum in her description also strongly resembles that of *T. punicae* (distinctly reticulate, as opposed to mostly smooth in *T. granati*), including the description of the deutonymph as described by Pritchard & Baker (1958).

Material examined. Six females and two deutonymphs from *Punica granatum* L. (Lythraceae), Antalya, Turkey, 26 July 2000, (Collector; S. Çobanoğlu. Deposited at University of Ankara).

Distribution. Azerbaijan, Georgia, Greece, India, Iran, Iraq, Israel, Jordan, Kazakhstan, Spain, Turkey, Ukraine (Sayed 1946; Pritchard & Baker 1958; Wainstein 1960; Düzgüneş 1965; Dosse 1971; Sadana & Gupta 1984; Hatzinikolis 1986a; Khanjani *et al.* 2013b).

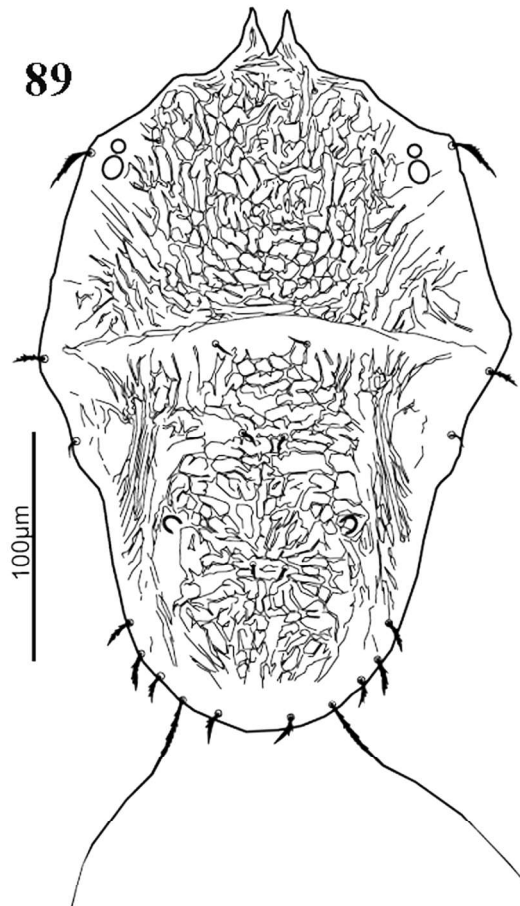
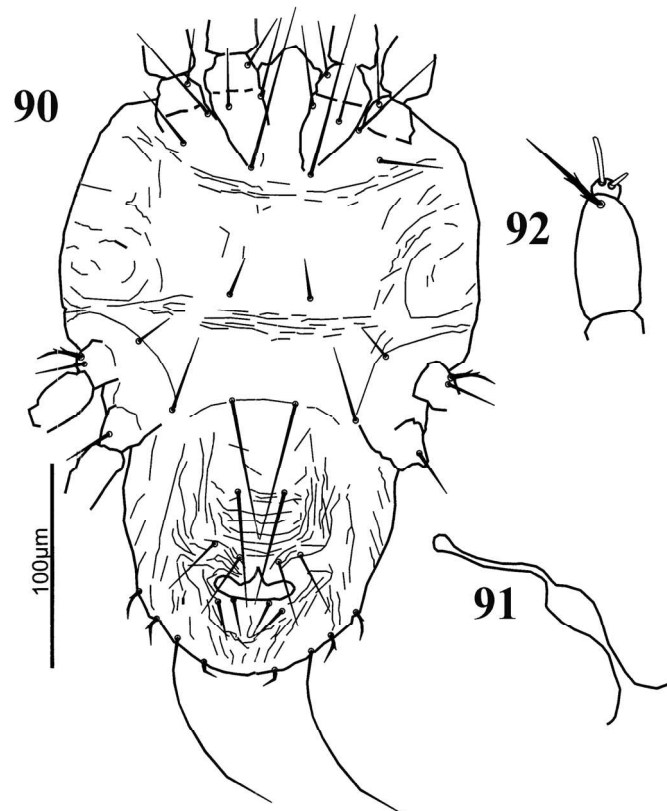
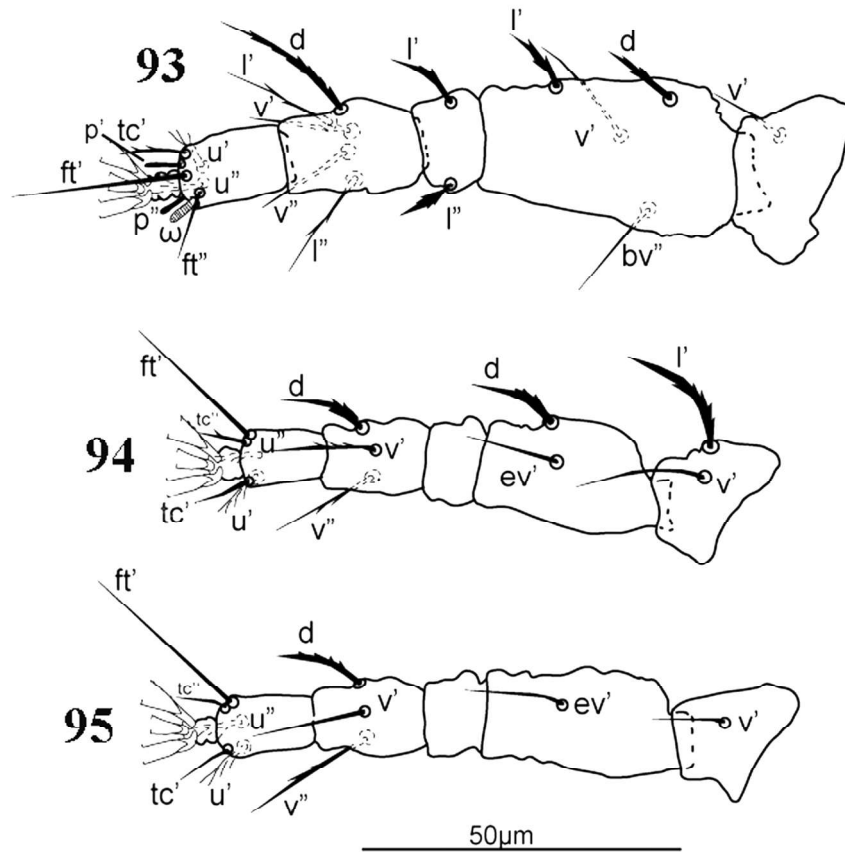


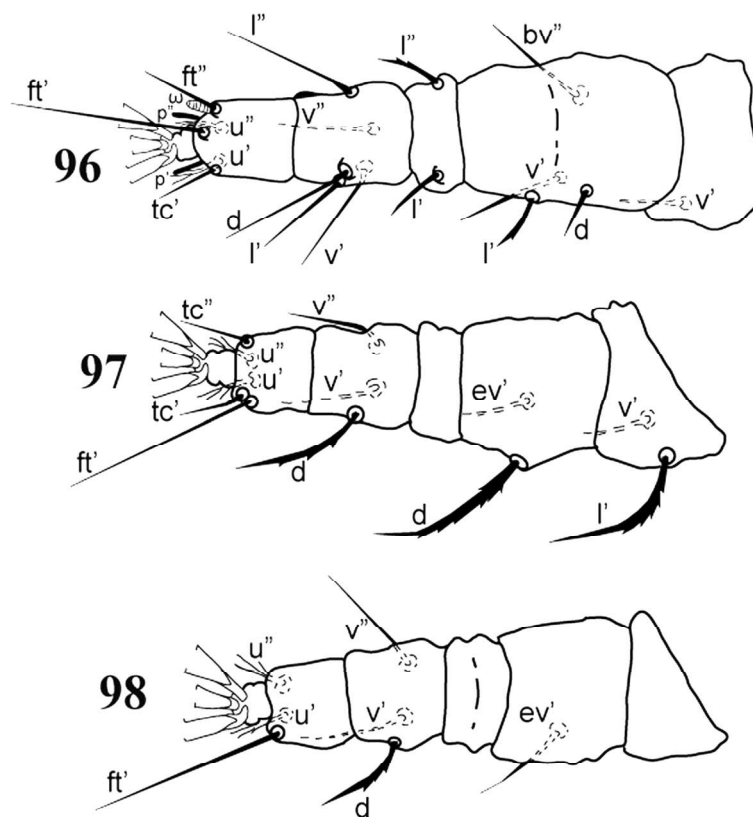
FIGURE 89. *Tenuipalpus punicae* Pritchard & Baker. Female, dorsal view.



FIGURES 90–92. *Tenuipalpus punicae* Pritchard & Baker. Female. 90. Ventral view. 91. Spermatheca. 92 Palp.



FIGURES 93–95. *Tenuipalpus puniceae* Pritchard & Baker. Female. 93. Leg I, left. 94. Leg III, left. 95. Leg IV, left.



FIGURES 96–98. *Tenuipalpus puniceae* Pritchard & Baker. Deutonymph. 96. Leg I, right. 97. Leg III, right. 98. Leg IV, right.

Key to the Tenuipalpidae of Turkey (based on adult females)

1. Dorsal opisthosoma with any of setae *c2*, *d2*, *e2* present (Fig. 1) 2
- Dorsal opisthosoma with all setae *c2*, *d2*, *e2* absent (Fig. 45) 20
2. Four pairs of legs present (n.b. some spp. of *Phytoptipalpus* have three pairs of legs); eyes present; dorsal opisthosomal setae *f2* present or absent 3
- Three pairs of legs present; eyes absent; dorsal opisthosomal setae *f2* absent *Raoiellana allium* Baker & Tuttle 1972
3. Dorsal opisthosoma with two or more pairs of setae *c2*, *d2*, *e2*, *f2* present; ventral and genital shields not developed to weakly developed; ventral shield not framed by distinct striae (Fig. 3); palp 4–5-segmented 10
- Dorsal opisthosoma with setae *c2* present and setae *d2*, *e2* absent (Fig. 52); setae *f2* present or absent; ventral and genital shields distinct and separate; ventral shield framed by distinct striae (Fig. 46); palp 4-segmented . . . *Cenopalpus* Pritchard & Baker 4
4. Dorsum mainly covered with reticulations; palp tibia with 2 setae 5
- Dorsum striate; palp tibia with one seta *C. lineola* (Canestrini & Fanzago 1876)
5. Prodorsum with reticulations irregular, smooth to rugose centrally, prodorsal setae broadly lanceolate (Fig. 71)
- *C. bagdasariani* (Livshitz & Mitrofanov 1970)
- Prodorsum with reticulations regular; prodorsal setae slender to narrowly lanceolate or broadly lanceolate to spatulate. 6
6. Prodorsal setae narrowly lanceolate to slender. 7
- Prodorsal setae broadly lanceolate to spatulate. 9
7. Dorsal opisthosomal cuticle with distinct series of short transverse bands between setae *d1-e1*; prodorsum with small irregular elements in reticulation; ventral cuticle between setae *4a* and ventral plate covered in small irregular reticulations; deutonymph with dorsal opisthosomal setae *c2* long (one of the longest dorsal setae). *C. spinosus* (Donnadieu 1875)
- Dorsal opisthosoma cuticle without distinct series of short transverse bands between setae *d1-e1*; prodorsum with large regular elements in reticulation; ventral cuticle between setae *4a* and ventral plate with large regular reticulation, strongest laterally becoming weak to absent centrally (i.e. smooth centrally); deutonymph with dorsal opisthosomal setae *c2* minute (Fig. 62). . . 8
8. Deutonymph with dorsal opisthosomal setae *f2* long *C. bakeri* Düzgüneş 1967
- Deutonymph with dorsal opisthosomal setae *f2* minute *C. pulcher* (Canestrini & Fanzago 1876)
9. Setae *v2* shorter than *v2-v2*; setae *d1* and *e1* narrowly lanceolate; deutonymph with dorsal opisthosomal setae *h2* as long as other lateral setae, and setae *e1* minute. *C. lanceolatisetae* Attiah 1956
- Setae *v2* as long as or longer than *v2-v2*; setae *d1* and *e1* broadly lanceolate; deutonymph with dorsal opisthosomal setae *h2* minute, and seta *e1* short. *C. pritchardi* Düzgüneş 1967
10. Anterior margin of prodorsum with a forked medial projection, the prongs of the projection with acute apices; ventral and genital shields not developed; setae *ps1-3* inserted in a triangular pattern; palp 4-segmented with second segment nude and palp tarsus with single seta and solenidion *Pseudoleptus zelihae* Pritchard & Baker 1958
- Anterior margin of prodorsum without acutely pointed forked projection, may have short notched anterior projection; ventral and genital shields weakly developed or not; palp 5-segmented, with variable setation 11
11. Opisthosoma with 12–13 pairs of dorsal setae (setae *f2* commonly absent); setae *e2* and *f2* (when present) inserted along the lateral margin aligned with setae *c3*, *d3*, *e3*, *f3*, *h1*, *h2* *Pentamerismus* McGregor . . . 12
- Opisthosoma with 12–13 pairs of dorsal setae (setae *f2* rarely absent); setae *e2* and *f2* (when present) inserted in a sublateral position, aligned with setae *c2*, *d2*. 14
12. Dorsal opisthosoma with setae *f2* absent; setae *c3*, *d3*, *e2*, *e3*, *f3*, *h1*, *h2* in lateral position; length of setae *v2* subequal to or longer than *sc1*; prodorsal and lateral opisthosomal setae variable in shape, from short slender to narrowly lanceolate. 13
- Dorsal opisthosoma with setae *f2* present in lateral position aligned with setae *c3*, *d3*, *e2*, *d3*, *f3*, *h1*, *h2*; prodorsum with setae *v2* subequal to *sc1*; prodorsal and lateral opisthosomal setae broadly leaf-like, other opisthosomal setae minute and slender. *P. erythreus* (Ewing 1917)
13. Opisthosoma with all dorsal setae short and slender. *P. taxi* (Haller 1877)
- Opisthosoma with dorsolateral setae narrowly lanceolate, central setae minute *P. oregonensis* McGregor 1949
14. Two pairs of pseudanal setae (*ps1-2*) (Fig. 34); prodorsum with patch of reticulation medially (Fig. 32); dorsal setae broadly lanceolate and serrate *Phytoptipalpus salicicola* (Al Gboory 1987)
- Three pairs of pseudanal setae (*ps1-3*) (Fig. 3); prodorsum sculpture variable; dorsal setae variable in shape . . . *Aegyptobia* Sayed 15
15. Prodorsum striate; dorsal setae linear-lanceolate or broadly lanceolate 16
- Prodorsum rugose-reticulate; dorsal setae club-shaped, serrate (Fig. 24). *A. beglarovi* Livshitz & Mitrofanov 1967
16. Anterior margin of prodorsum with notched projection; dorsal setae lanceolate to broadly lanceolate, serrate 17
- Anterior margin of prodorsum rounded without projection or notch; setae in dorsal opisthosomal setal row C and D slender or lanceolate, other posterior opisthosomal setae broadly lanceolate, serrate. *A. tragardhi* Sayed 1950
17. Anterior margin of prodorsum with projection deeply notched 18
- Anterior margin of prodorsum with projection shallowly notched; all dorsal setae lanceolate, serrate, with most lateral setae broadly lanceolate *A. mccormicki* (Baker & Pritchard 1953)
18. Dorsal body setae narrowly lanceolate, serrate. 19
- Dorsal body setae broadly lanceolate, serrate. *A. aletes* (Pritchard & Baker 1952)
19. Palp tarsus with two eupathidia and a tactile seta; spermatheca a short tube ending in a round bulb (Fig. 5)
- *A. cupressus* Baker & Tuttle 1972
- Palp tarsus with one eupathidium and two tactile setae; spermatheca a long, thin tube ending in an elongate oval bulb (Fig. 4)

- *A. juniperi* **sp. nov.** Ueckermann, Çobanoğlu & Sağlam
20. Setae *h2* long and flagellate, at least 4x longer than other dorsal setae (Fig. 82); dorsal opisthosoma with setae *c3, d3, e3, f3, h1, h2* present; setae *c1, d1, e1, f2* present or absent; idiosoma often narrowed behind leg IV (Fig. 82); palp 1–3-segmented ...*Tenuipalpus* Donnadieu 21
- Setae *h2* not long and flagellate, but similar in length to other dorsal setae; dorsal opisthosoma with setae *c1, c3, d1, d3, e1, e3, f3, h1, h2* present (except *d1, e1* absent in *B. recki*); setae *f2* present or absent; idiosoma does not obviously narrow behind leg IV (Fig. 45); palp 4-segmented *Brevipalpus* Donnadieu...22
21. Venter with two pairs of setae *4a* (Fig. 83); dorsal opisthosoma with *c1* present and *d1, e1* absent (Fig. 82); dorsum nearly smooth. *T. granati* Sayed 1946
- Venter with one pair of setae *4a* (Fig. 90); dorsal opisthosoma with *c1, d1, e1* present (Fig. 89); dorsum reticulate *T. punicae* Pritchard & Baker 1958
22. Dorsal opisthosomal setae *f2* absent; dorsal opisthosoma with setae *c3, d3, e3, f3, h2* and *h1* present laterally 23
- Dorsal opisthosomal setae *f2* present; dorsal opisthosoma with setae *c3, d3, e3, f2, f3, h2, h1* present laterally 25
23. Tarsus II with a single solenidion distally 24
- Tarsus II with two solenidia distally *B. phoenicis* sensu lato (Geijskes 1939)
24. Palp tarsus with one solenidion and two setae distally; deutonymph with setae *sc1, sc2, f3, h1, h2* setae largest, lanceolate and serrate; setae *c3, d3, e3* short; setae *c1, d1, e1* minute *B. obovatus* Donnadieu 1875
- Palp tarsus with one solenidion and one seta distally; deutonymph with setae *sc2, c3, f3, h1* and *h2* largest and serrate; setae *v2, c1, d1, e1, e3* minute *B. obovoides* DeLeon 1961
25. Tarsus II with a single solenidion distally 26
- Tarsus II with two solenidia distally *B. californicus* (Banks 1904)
26. Tip of infracapitulum elongate, extending to anterior margin of genu I; deutonymph with dorsal setae *sc2, c3, f3, h1*, or setae *sc1, sc2, c3, d3* and *f3* the longest and broadly lanceolate 27
- Infracapitulum not elongate, not extending beyond distal end of femur I; nymph with dorsal setae *sc2, c3, f2, f3, h1* and *h2* longest and broadly lanceolate, other dorsal opisthosomal setae short *B. lewisi* McGregor 1949
27. Trochanter III with one seta, trochanter IV without setae; deutonymph with setae *sc1, sc2, c3, d3* and *f3* longest, broadly lanceolate and serrate; setae *v2, c1, d1, e1, e3, f2, h1, h2* much shorter and serrate *B. rotai* Castagnoli & Pegazzano 1979
- Trochanter III with two setae, trochanter IV with one seta; deutonymph with setae *sc2, c3, d3, e3, f3* and *h1* longest, broadly lanceolate and serrate; setae *v2, sc1, c1, d1, e1, f2, h2* much shorter and serrate *B. olearius* Sayed 1950

Acknowledgements

The authors wish to thank the Plant Protection Department of the University of Ankara for making this study possible and supporting as a project “Project No:20060711006 HPD” and “The European Union Research Executive Agency (ERA), FP7 IRSES (Grant No: 269133- Detanmite Project)—Belgium”, for supporting part of this work as a project. Thanks and appreciation is also due to Drs. Ron Ochoa of the USDA, Beltsville Washington, USA for the loan of specimens, Alex Khaustov of Tyumen, Russia, Prof. Dr. Mohammad Khanjani, Iran for supplying information and Dr Jenny Beard of the Queensland Museum, Brisbane, Australia for her much appreciated and constructive criticism.

This work is also based on research supported in part by the National Research Foundation of South Africa. Any opinion, findings and conclusions or recommendations expressed in the material are those of the authors and therefore the NRF does not accept any liability in regard there to.

References

- Akyazi, F. & Ecevit, O. (2003) Ordu, Samsun ve Giresin illeri fındık bahçelerinde görülen akar türlerinin belirlenmesi. *Ondokuz Mayıs Üniversitesi Ziraat Fakültesi Dergisi*, 18 (3), 39–45.
- Al-Gboory, I. (1987) *Taxonomic studies of false spider mites (Acari: Tenuipalpidae) in central Iraq. 1987*. Tese (Doctor in Agronomy), Institut für angewandte Zoologie der Rheinischen Friedrich-Wilhelms, Universität Bonn, Bonn, 205 pp.
- Attiah, H.H. (1956) The genus *Brevipalpus* in Egypt (Acarina: Tenuipalpidae). *Bulletin de la Société Entomologique d’Egypte*, 40, 433–477.
- Baker, E.W. (1949) The genus *Brevipalpus* (Acarina: Pseudoleptidae). *The American Midland Naturalist*, 42 (2), 350–402. <http://dx.doi.org/10.2307/2422013>
- Baker, E.W. & Pritchard, A.E. (1953) A key to mites of the genus *Pentamerismus*, with descriptions of three new species (Acarina: Phytoseptidae). *The Wasmann Journal of Biology*, 11 (3), 353–366.
- Baker, E.W. & Tuttle, D.M. (1972) New species and further notes on the Tetranychoida mostly from Southwestern United States (Acarina: Tetranychidae and Tenuipalpidae). *Smithsonian Contributions to Zoology*, 116, 1–36. <http://dx.doi.org/10.5479/si.00810282.116>

- Banks, N. (1904) Four new species of injurious mites. *Journal of the New York Entomological Society*, 12, 53–56.
- Bayram, Ş. & Çobanoğlu, S. (2007) Mite fauna (Acari: Prostigmata, Mesostigmata, Astigmata) of coniferous plants in Turkey. *Türkiye Entomoloji Dergisi*, 31 (4), 279–290
- Beard, J.J., Seeman, O.D. & Bauchan, G.R. (2014) Tenuipalpidae (Acari: Trombidiformes) from Casuarinaceae (Fagales). *Zootaxa*, 3778 (1), 1–157.
<http://dx.doi.org/10.11646/zootaxa.3778.1.1>
- Beard, J.J., Ochoa, R., Braswell, W.E. & Bauchan, G.R. (2015) *Brevipalpus phoenicis* (Geijskes) species complex – a closer look. *Zootaxa*, 3944 (1), 1–67.
<http://dx.doi.org/10.11646/zootaxa.3944.1.1>
- Canestrini, G. & Fanzago, F. (1876) Nuovi acari Italiani. *Atti Accademia Cientifico Veneto, Trentino, Istriana, Pádua, Italy*, 5, 130–142
- Castagnoli, M. & Pegazzano, F. (1979) Rassegna degli acari Tenuipalpidi dell'olivo con descrizione di *Hystripalpus rotai* sp.nov. *Redia*, 62, 281–297.
- Chaudhri, W.M. (1972) Five new species of mites of the genus *Aegyptobia* from Pakistan (Acarina: Tenuipalpidae). *Pakistan Journal of Scientific Research*, 24 (1/2), 18–24.
- Chaudhri, W.M., Akbar, S. & Rasool, A. (1974) Taxonomic studies of the mites belonging to the families *Tenuipalpidae*, *Tetranychidae*, *Tuckerellidae*, *Caligonellidae*, *Stigmaeidae* and *Phytoseiidae*. University of Agriculture, Lyallpur, Pakistan. Project No. A17-Ent-26, 1–250.
- Collyer, E. (1969) A new species of *Aegyptobia* (Acarina: Tenuipalpidae) from New Zealand. *New Zealand Journal of Science*, 12 (4), 815–816.
- DeLeon, D. (1961) New false spider mites with notes on some previously described species (Acarina: Tenuipalpidae). *Florida Entomologist*, 44 (4), 167–179.
- Donnadieu, A.L. (1875) Recherches pour servir a l'histoire des Tétranyques. Thèses. Faculté des Sciences de Lyon Francia, 1–131.
- Dosse, Von G. (1971) Die Familie Tenuipalpidae in Iran (Acari). *Pflanzenkrankheiten und Pflanzenschutz*, 78 (10), 577–585.
- Döker, I., Kazak, C. & Karut, K. (2013) A new pomegranate pest for Turkey; Pomegranate false spidermite, *Tenuipalpus punicae* Pritchard and Baker (Acari: Tenuipalpidae) *Türkiye Entomoloji Bülteni*, 3 (2), 113–117.
- Düzgüneş, Z. (1963) Türkiye'de yeni bulunan akarlar. *Bitki Koruma Bülteni*, 3 (4), 237–246.
- Düzgüneş, Z. (1965) Türkiye'de bitkilere zarar veren Tenuipalpidae Sayed familyası türleri üzerinde incelemeler. *Ankara Üniversitesi Ziraat Fakültesi Yıllığı*, 15 (3), 120–148.
- Düzgüneş, Z. (1967a) The biological characteristics of some species of the family Tenuipalpidae in Turkey. In: *Proceedings of the 2nd International Congress of Acarology, Sutton Bonington (England), 19th–25th July 1967*. Akad. Kiadó, Budapest, pp. 169–171. fig. 1–2. [1969]
- Düzgüneş, Z. (1967b) Two new species of the genus *Cenopalpus* (Acarina:Tenuipalpidae). *University of Ankara Year Book of the Faculty of Agriculture 1966, 1967*, 90–98.
- Ewing, H.E. (1917) New Acarina. Part II. Descriptions of New Species and Varieties from Iowa, Missouri, Illinois, Indiana, and Ohio. *Bulletin of the American Museum of Natural History*, 37 (2), 149–172.
- Geijskes, D.C. (1939) Contributions to the knowledge of European spinning mites with particular reference to the Netherlands species. *Arten. Mededelingen van de Landbouwhogeschool Wageningen*, 42, 1–68.
- Ghai, S. & Shenmar, M. (1984) A review of the world fauna of Tenuipalpidae (Acarina: Tetranychoida). *Orientalis Insects*, 18, 99–172.
<http://dx.doi.org/10.1080/00305316.1984.10432200>
- Grandjean, F. (1939) Les segments post-larvaires de l'hystérosoma chez les Oribates (Acariens). *Bulletin de la Société Zoologique de France*, 64, 273–284.
- Göven, M.A., Çobanoğlu, S. & Güven, B. (2009) Predatory mite fauna in Aegean vineyards. *Bitki Koruma Bülteni*, 49 (1), 1–10.
- Haller, G. (1877) Mitteilungen. *Schweizerische Z. für Forstwesen*, 2, 85–89.
- Hatzinikolis, E.N. (1986a) The genus *Tenuipalpus* (Acari: Tenuipalpidae) in Greece. *Entomologia Hellenica*, 4, 19–22.
- Hatzinikolis, E.N. (1986b) Tenuipalpid mites (Acari: Tenuipalpidae) of *Olea europaea* a key to *Brevipalpus* from the genus *Olea*. *Entomologia Hellenica*, 4, 23–27
- Kamali, K., Ostovan, H. & Atamehr, A. (2001) *A catalogue of mites and Tick (Acari) of Iran*. Islamic Azad University Scientific Publication Center, Tehran, 192 pp.
- Khanjani, M., Gotoh, T. & Barimani Varandi, H. (2008) A new species of the genus *Aegyptobia* Sayed (Acari: Prostigmata, Tenuipalpidae) from Iran. *Systematic & Applied Acarology*, 13, 65–69.
<http://dx.doi.org/10.11158/saa.13.1.7>
- Khanjani, M., Khanjani, M. & Seeman, O.D. (2012a) The false spider mites of the genera *Aegyptobia* Sayed and *Phytoptipalpus* Trägårdh (Acari: Tenuipalpidae) from Iran. *Zootaxa*, 3295, 30–58.
- Khanjani, M., Khanjani, M., Saboori, A. & Seeman, O.D. (2012b) The false spider mites of the genus *Cenopalpus* Pritchard & Baker (Acari: Tenuipalpidae) from Iran. *Zootaxa*, 3433, 1–59.
- Khanjani, M., Farzan, S., Asadi, M. & Khanjani, M. (2013a) Checklist of the flat mites (Acari: Trombidiformes: Tenuipalpidae) of Iran. *Persian Journal of Acarology*, 2 (2), 235–251.

- Khanjani, M., Khanjani, M. & Seeman, O.D. (2013b) The flat mites of the genus *Tenuipalpus* Donnadieu (Acari: Tenuipalpidae) from Iran, *International Journal of Acarology*, 39 (2), 97–129.
- Khosrowshahi, M. & Arbabi, M. (1997) *The Tenuipalpidae (Acari) of Iran with introduction of new species for the world fauna and Iran*. Ministry of Agricultural Research, Education and Extension Organization. Plant Pests and Diseases Research Institute, 19 pp. (English text) & 59 pp. (Iranian text).
- Lindquist, E.E. (1985) External anatomy. In: Helle, W. & Sabelis, M.W. (Eds.), *Spider mites: their Biology Natural Enemies and Control. Vol. 1A*. Elsevier Science Publishers B.V., Amsterdam, pp. 3–28.
- Livshitz, I.Z. & Mitrofanov, V.I. (1967) Materials to the knowledge of the fauna of False spider Mites (Acariformes: Tenuipalpidae). *Proceedings of the Nikitsky Botanical Gardens*, 39, 1–72.
- Livshitz, I.Z. & Mitrofanov, V.I. (1970) New species of mites (Tenuipalpidae: Acariformes). *Zoologicheskyy Zhurnal*, 49, 787–789.
- McGregor, E.A. (1949) Nearctic mites of the family Pseudoleptidae. *Memoir of the Southern California Academy of Sciences*, 3, 1–45.
- Mesa, N.C., Ochoa, R., Welbourn, W.C., Evans, G.A. & de Moraes, G.J. (2009) A catalog of the Tenuipalpidae (Acari) of the World with a key to genera. *Zootaxa*, 2098, 1–185.
- Meyer, M.K.P. (Smith) (1979) The Tenuipalpidae (Acari) of Africa with keys to the world genera. *Entomology Memoir Department of Agricultural Technical Services Republic of South Africa*, 50, 1–135.
- Meyer, M.K.P. (Smith) & Van Dis, J.C.S. (1993) Notes on some species of the related genera *Aegyptobia* Sayed, *Phytoptipalpus* Trägårdh and *Pentamerismus* McGregor, with descriptions of eight new species (Acari: Tenuipalpidae). *Genus*, 4 (4), 309–357.
- Mitrofanov, V.I. & Strunkova, Z.I. (1979) A key to false spider mites. *Operdelitl Kleshchei-ploskotelok, USSR*, 148, 1–148.
- Parsi, B. & Khosrowshahi, M. (1990) A new species of false spider mite (Acari: Tenuipalpidae) from Iran. *Applied Entomology and Phytopathology*, 57 (1–2), 37–40.
- Pritchard, A.E. & Baker, E.W. (1952) The false spider mites of California (Acarina: Phytoptipalpidae). *University of California Publications in Entomology*, 9 (1), 1–94.
- Pritchard, A.E. & Baker, E.W. (1958) The false spider mites (Acarina: Tenuipalpidae). *University of California Publications in Entomology*, 14 (3), 175–274.
- Rodrigues, J.C.V., Childers, C.C., Grafton-Cardwell, E.E.A.E. & Morse, J. (2012) Part I -Citrus leprosis viruses and their known *Brevipalpus* mite vector. *Citrograph*, 26–30.
- Sadana, G.L. & Gupta, B.K. (1984) New species of the genus *Tenuipalpus* Donnadieu (Tenuipalpidae: Acarina) from India. *Entomon*, 9 (2), 141–147.
- Sağlam, H.D. & Çobanoğlu, S. (2007) Studies on the determination and host plants of Tenuipalpidae (Acarina: Prostigmata) species in Ankara, Turkey. *4th African Acarology Symposium*, October 22–26, Hammamet, Tunisia. [unknown pagination]
- Sağlam H.D. & Çobanoğlu, S. (2010) Determination of Tenuipalpidae (Acari: Prostigmata) species in parks and ornamental plants of Ankara, Turkey. *Turkish Journal of Entomology*, 34 (1), 37–52.
- Saito, Y., Kotaro, M. & Chittenden, A.R. (1999) Body characters reflecting the body size of spider mites in flattened specimens (Acari, Tetranychidae). *Applied Entomology and Zoology*, 34 (3), 383–386.
- Sayed, M.T. (1942) Contribution of the knowledge of the Acarina of Egypt II. The genus *Tenuipalpus* Donnadieu. *Bulletin de la Société d' Fouad 1^{er} Entomologique*, 26, 93–113.
- Sayed, M.T. (1946) Description of *Tenuipalpus granati* nov. spec. and *Brevipalpus pyri* nov. spec. (Acarina: Trichadenidae). *Bulletin de la Société d' Fouad 1^{er} Entomologique*, 30, 99–104.
- Sayed, M.T. (1950) Description of a new genus and two new species of the family Tenuipalpidae Sayed (Acarina). *Proceedings of 8th International Congress of Entomology*, 1018–1021.
- Seeman, O.D. & Beard, J.J. (2011) A new species of *Aegyptobia* (Acari: Tenuipalpidae) from Myrtaceae in Australia. *Systematic & Applied Acarology*, 16, 73–89.
<http://dx.doi.org/10.11158/saa.16.1.10>
- Trägårdh, I. (1904) *Acariden aus Ägypten und dem Sudan*. K.W. Appelbergs boktryckeri, Stockholm, 124 pp.
- Uysal, C., Çobanoğlu, S. & Ökten, M.E. (2001) Determination of Tetranychidae (Acarina: Prostigmata) species harmful in the park areas of Ankara. *Turkish Journal of Entomology*, 25 (2), 147–160.
- Wainstein, B.A. (1958) A contribution to the knowledge of the fauna and the taxonomy of spider mites (Acariformes, Tetranychidae). *Revue d'Entomologie de l'URSS*, 37, 455–459.
- Wainstein, B.A. (1960) Tetranychoid mites of Kazakhstan (with revision of the family). *Kazakhstan Akademia Sel'skokhoziaistvikh nauk. Trudy Nauchno-Issledovatel'skogo Instituta Rastenii*, 5, 1–276.
- Yeşilayer, A. & Çobanoğlu, S. (2011) Determination of Tenuipalpidae (Acari: Prostigmata) species in parks and ornamental plants of Istanbul, Turkey. *Bitki Koruma Bülteni*, 51 (4), 315–330.