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New species of *Neophyllobius* and *Tycherobius* (Acari, Camerobiidae) from Turkey

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Abstract: Two new species of *Neophyllobius* (Acari, Camerobiidae) viz. *N. populus* sp. n., *N. karabagiensis* sp. n., and a new species of *Tycherobius* (Acari, Camerobiidae), *Tycherobius dazkiriensis* sp. n., are described from Turkey and illustrated based on females and a protonymph. A key to the known species of *Tycherobius* is presented.

Key words: Acari, Camerobiidae, *Neophyllobius*, *Tycherobius*, new species, Turkey.

Introduction

The Camerobiidae (Acari, Camerobiidae) is the second largest family in the Raphignathoidea superfamily. Its members are predators, preying on phytophagous mites, unarmored and first instar nymphs of armoured scale insects (Meyer, 1962; Richards, 1962; Gerson, 1971, 1972, 1973; Gerson & Smiley, 1990; Gerson et al., 1990; Du Toit et al., 1998; Bolland & Mehrnejad, 2001; Khanjani & Ueckermann, 2002). Six genera are known (Bolland, 1986, 1991; Du Toit et al., 1998), of which three and 20 species, were hitherto known from Turkey (Koç & Ayyildiz, 1996, 1998; Koç, 1999, 2001, 2005; Bolland & Koç, 2001; Koç & Madanlar, 2002; Ayyildiz & Doğan, 2003; Doğan & Ayyildiz, 2003; Akyol & Koç, 2006a, b).

Three new species, viz. *N. populus*, *N. karabagiensis* and *T. dazkiriensis*, are described from Turkey in this paper. Setal nomenclature follows Kethley (1990) and measurements are given in micrometers (μm) and range is given in parentheses. The type materials and all other specimens are deposited in the Zoological Museum of Celal Bayar University (Manisa, Turkey) (CBZM).

Camerobiidae Southcott, 1957

Type genus: *Camerobia* Southcott, 1957.
This family can be defined within the Raphignathoidea superfamily by having very long (stilted) legs, weak ventrally directed palpi and looped peritremes.

Neophyllobius Berlese, 1886

Type species: *Neophyllobius elegans* Berlese, 1886.
Dorsum with fourteen or fifteen setae, two pairs of eyes, genital and anal shields fused, setal formula of tibiae 9-8-8-7, all tarsi with claws, and their empodia with tenent hairs.

Neophyllobius populus sp. n. (Fig. 1)

Description. Female. Dimensions of holotype (range for paratypes in parentheses): body length (including gnathosoma) 374 (369–385), width 260 (260–265).

Gnathosoma. Length 62. Subcapitulum with one pair of smooth medioventral setae, 18 long. Pedipalp setation: trochanter 0, femur 2, genu 1, tibia 3+1 sword-like seta, tarsus 2+2 eupathidia.

Dorsum. Almost ovoid; dorsum with irregular striations; areas around bases of most dorsal setae appear free from striations. Fifteen pairs of finely serrated dorsal setae on tubercles. Two pairs of eyes located between *sci* and *sce*. Setae d_1 the longest. Lengths of setae: *vi* 62 (62–68), *ve* 52 (52–55), *sci* 52 (52), *sce* 55 (52–55), c_1 62 (52–62), c_2 70 (70–81), d_1 120 (117–125), d_2 52 (52), e_1 104 (96–104), e_2 57 (57–65), f_1 81 (78–86), f_2 34 (31–34), h_1 34 (26–36), h_2 29 (26–31), *pdx* 49 (47–49).

Venter. Ventral surface striated; coxisternal shield absent; ventral setae simple, *1a* 18, setting on coxa I, *3a* 27, placed on membrane between coxae III, *4a* 18, anterolaterad of aggenital shield; setae *3a* and *4a* each located on a small platelet; genital and anal shields fused with two pairs of genital setae $g_1 = g_2 = 17$ and three pairs of pseudanal setae $ps_1 = ps_2 = ps_3 = 10$. Coxal setae with denticles.

Legs. Length of legs (from base of femur to tip of tarsal claw): leg I 442 (437–442), leg II 390 (364–395), leg III 416 (411–426), leg IV 452 (447–458). Setal formula of leg segments (solenidia in parentheses) as follows: coxae 3-1-2-2, trochantera 1-1-1-1, femora 4-3-2-2, genua 1(+k)-1(+k)-1-1, tibiae 9(+φ)-8(+φ)-8-7,

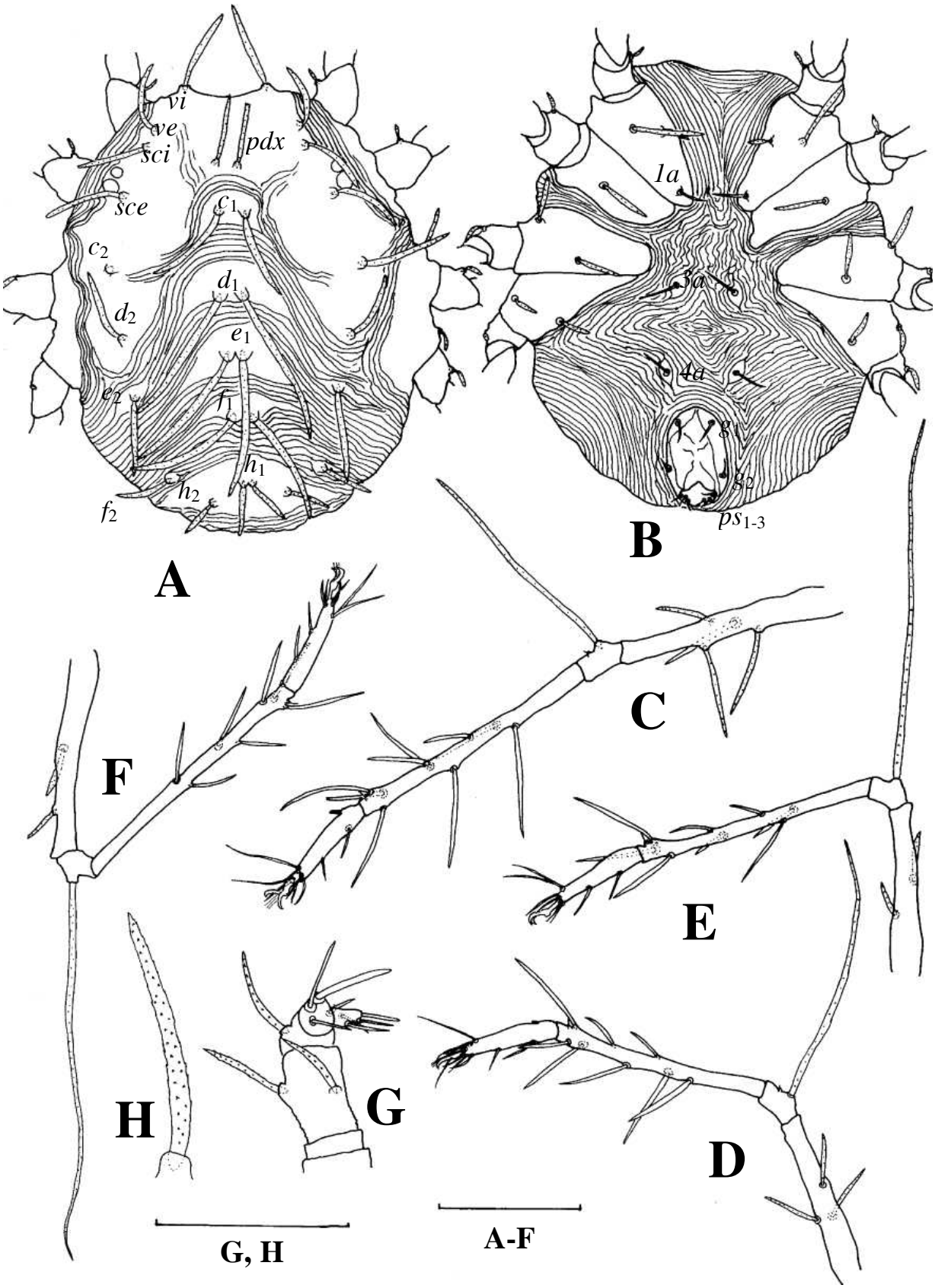

Fig. 1. *Neophyllobius populus* sp. n., female: A – dorsal view; B – ventral view; C – leg I; D – leg II; E – leg III; F – leg IV; G – palpus; H – seta c_1. Scales 100 μm (A–F), 150 μm (G–H).

tarsi 10(ω)-10(ω)-8-8. Tarsi I–IV with two midventral setae. Genua I and II with solenidia *k*.

Male. Unknown.

Material examined. Holotype (female): Turkey, Afyonkarahisar, Sultandağı district, between Eber Lake and Akşehir Lake, Taşköprü place (38°36′ N, 31°17′ E), 950 m a.s.l., litter under *Populus* sp., 19.V.2005; **paratypes:** Sultandağı district, between Eber Lake and Akşehir Lake, Taşköprü place (38°36′ N, 31°17′ E), 950 m a.s.l., from litter under *Cerasus vulgaris*, 16.I.2006, 1 ♀; Özdilek, Zafer memorial (38°47′ N, 30°28′ E), 1040 m a.s.l., from litter under *Pinus brutia*, 18.I.2006, 1 ♀; Bolvadin district, B. Karabağ town, Kayadanağil place (38°45′ N, 31°17′ E), 1100 m a.s.l., from litter under *Verbascum* sp., 19.III.2006, 1 ♀; all leg. M. Akyol.

Etymology. The new species is named after the host plant, genus *Populus*, from whose litter the holotype was collected.

Differential diagnosis. This species is close to *N. mangiferus* Zaher et Gomaa, 1979 and to *N. theobromae* Bolland, 1991 in that tarsi I–IV bear two midventral setae, femur IV two setae, setae d_1 pass the bases of f_1. However, *N. populus* differs from *N. mangiferus* and *N. theobromae* in that all genual setae are whip-like. *N. populus* also differs from *N. mangiferus* in that $c_1 < f_1$ ($c_1 > f_1$ in *N. mangiferus*), the dorsal setae are not broad with a dark impression (dorsal setae broad with dark impression in *N. mangiferus*). *N. populus* differs from *N. theobromae* in that $pdx < c_1$ ($pdx = c_1$ in *N. theobromae*), the female dorsum is larger (length of body 374, width 260, versus length 230, width 185 in *N. theobromae*).

Neophyllobius karabagiensis sp. n. (Fig. 2)

Description. Male. Dimensions of holotype (range for paratypes in parentheses): body length (including gnathosoma) 270 (260–281), width 198 (177–203).

Gnathosoma. Length 47 (47–52). Subcapitulum with one pair of setae, 10 long. Pedipalp setation: trochanter 0, femur 2, genu 1, tibia 3+1 sword-like seta, tarsus 2+2 eupathidae.

Dorsum. Almost ovoid; dorsum with irregular striations and the areas around bases of most dorsal setae appear free from striations. Two pairs of eyes between *sci* and *sce*; fifteen pairs of dorsal setae placed on tubercles, *pdx* present, dorsal body setae with denticles, h_1 reduced in length, setae c_2 the longest. Lengths of setae: *vi* 55 (49–55), *ve* 42 (39–42), *sci* 44 (39–44), *sce* 49 (39–49), c_1 39 (36–42), c_2 55 (44–57), d_1 42 (39–42), d_2 44 (39–44), e_1 31 (31), e_2 39 (34–39), f_1 26 (26), f_2 39 (31–39), h_1 8 (8), h_2 23 (21–23).

Venter. Ventral surface striated; coxisternal shield absent; ventral setae simple, *1a* 18, setting on coxa I, *3a* 26, set on membrane between coxae III, *4a* 18, placed on membrane posterior to coxae IV, setae *3a* and *4a* each located on small platelets; coxal setae with denticles; anal shields with four pairs of setae.

Legs. Length of legs (from base of femur to tip of tarsal claw): leg I 507 (468–507), leg II 416 (390–416), leg III 468 (426–468), leg IV 514 (468–514). Setal formula of leg segments (solenidia in parentheses) as follows: coxae 3-1-2-2, trochantera 1-1-1-1, femora 4-3-2-2, genua 1-1-1-1, tibiae 9(φ)-8(φ)-8(φ)-7(φ), tarsi 10(ω♂)-10(ω♂)-8(ω♂)-8(ω♂). The distal of the two solenidia on the distal end of tibia I, is thrice the length of the other; tarsi I–IV with two midventral setae and one solenidion; genu I with a relatively short lanceolate seta about a fifth the length of the tibia, setae on genua II, III and IV relatively long, whip-like and spinose, the setae on genu II longer than half the length of the tibia, genu III and IV setae reach past the tarsal solenidia and the setae on genu I are relatively short; other genual setae whip-like.

Female. Unknown.

Material examined. Holotype (male): Turkey, Afyonkarahisar; Bolvadin district, B. Karabağ town, Çayderesi place (38°46′ N, 31°14′ E), 1200 m a.s.l., 26.VII.2005, from litter under *Euphorbia* sp.; **paratypes:** Bolvadin district, B. Karabağ town, Emirdağlari, Çukurburun place (38°49′ N, 31°16′ E), 1300 m a.s.l., 24.VII.2005, from litter under *Astragalus* sp., 1 ♂; Dinar district, Saribelen hill, Akçaköy village (38°08′ N, 30°14′ E), 22.VIII.2005, from litter under *Astragalus* sp., 1 ♂; Sandıkli district, Yeniköy (38°29′ N, 30°01′ E), 1050 m a.s.l., 15.X.2005, from litter under *Astragalus* sp., 1 ♂; all leg. M. Akyol.

Etymology. The species is named after the type locality, B. Karabag, Afyonkarahisar, Turkey.

Differential diagnosis. This species is close to the male of *N. sycomorus* Zaher et Gomaa, 1979 in that tarsi I–IV with two midventral setae and one solenidion; femur IV with two setae; two solenidia on the distal end of the tibiae I; one solenidion on the distal end of tibiae II–IV. *Neophyllobius karabagiensis* differs from the male of *N. sycomorus* in that genu I bears relatively short lanceolate setae, shorter than a fifth of the length of tibia I (these setae less than a third the length of tibia I in *N. sycomorus*); the setae on genu II longer than half the length of tibia II (shorter than a third of the length of tibia II in *N. sycomorus*); of the two solenidia on the distal end of tibia I, the most distal is about three times the length of the other solenidion (this solenidion is only twice as long as the length of the other solenidion in *N. sycomorus*), coxae I–IV without polygonal dimples (coxa I–IV with polygonal dimples in *N. sycomorus*).

Tycherobius Bolland, 1986

Type species: *Neophyllobius lombardinii* Summers et Schlinger, 1955.

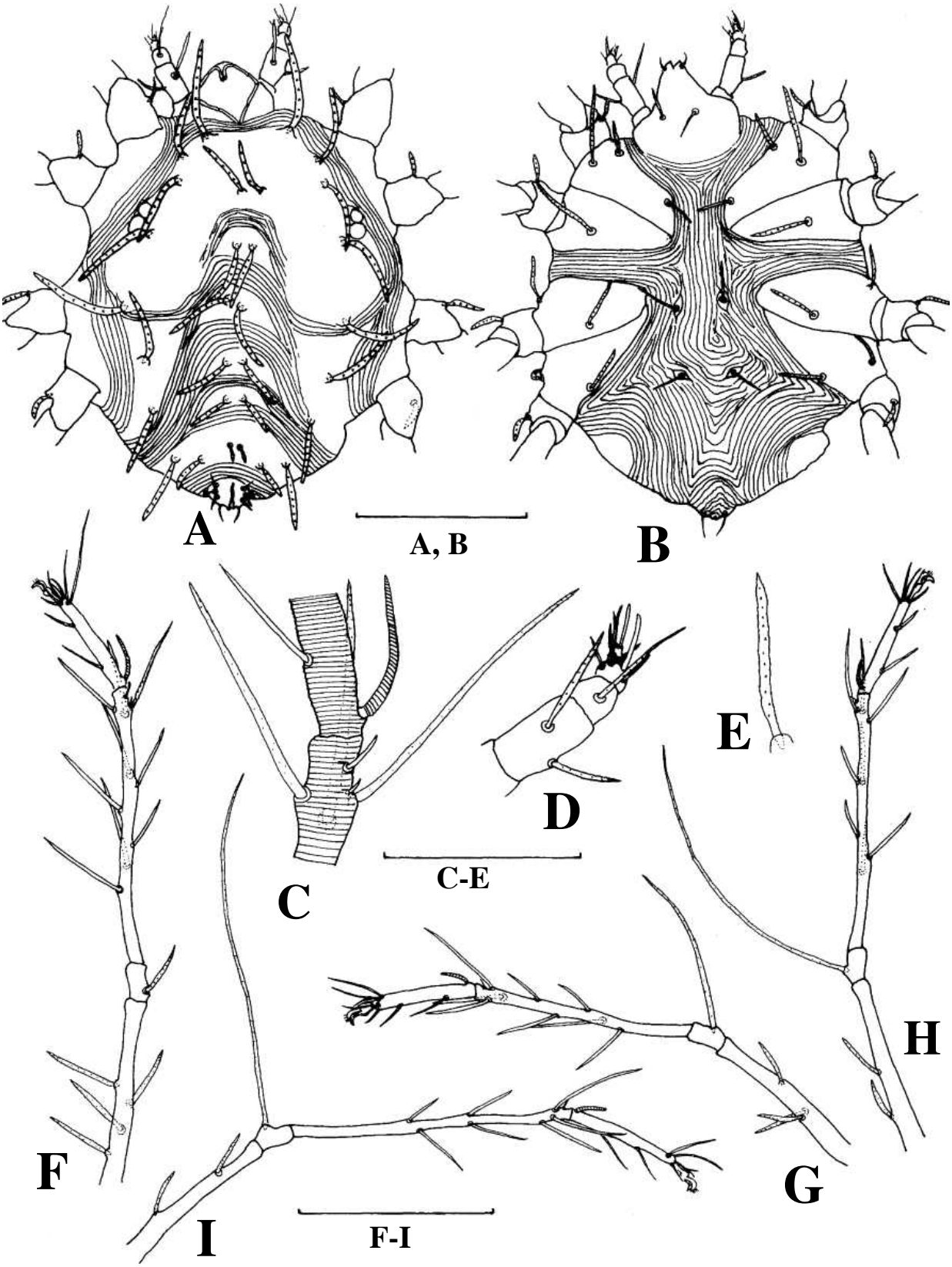

Fig. 2. *Neophyllobius karabagiensis* sp. n., male: A – dorsal view; B – ventral view; C – distal of tibia I; D – palpus; E – seta c_1; F – leg I; G – leg II; H – leg III; I – leg IV. Scales 100 μm (A, B), 40 μm (C–E), 150 μm (F–I).

Female. Dorsum with fourteen-fifteen pairs of setae; palpal tarsi each with one or two eupathidia and one solenidion. Leg trochanters each bearing one seta; femora 3-4, 3-4, 1-3, 1-2; genua 1+k, 1+k, 1, 1; tibiae with 9+1φ, 8+1φ, 7+1φ, 7+1φ; tarsi 8-10+1ω, 8-10+1ω, 7, 7; tarsi I and II each with 2 medio-ventral setae and tarsi III and IV each with 1 medio-ventral seta.

Key to the known species of *Tycherobius***

1 Idiosoma with five pairs of dorsomedian setae 2
– Idiosoma with more than five pairs of dorsomedian setae 8
2 Femora I and III with 4 and 3 setae, respectively . 3
– Femora I and III with 3 and 2 setae, respectively; Italy . . . . . ***T. superbus*** (Canestrini, 1889)
3 Tarsus I with 9+1ω 4
– Tarsus I with 10+1ω 5
4 Tarsus II with 9+1ω; peritremes complex, each with more than 2 branches; c_1 : d_1 : e_1 : f_1 = 4.0–5.9 : 1.6–2.4 : 1.0 : 1.0; Hawaii . . . . . ***T. hawaiiensis*** Bolland et Swift, 2000
– Tarsus II with 8+1ω; peritremes simple, each with 2 branches; c_1 : d_1 : e_1 : f_1 = 3.9 : 4.1 : 1.0 : 1.0; Turkey . . . . . ***T. bollandi*** Ayyildiz et Doğan, 2003
5 Length of setae c_1 less than twice that of d_1 6
– Length of setae c_1 more than four times that of d_1; Turkey . . . . . ***T. quercus*** Bolland et Koç, 2001
6 Dorsal most seta on femur III small, not reaching distal rim of femur; e_1 and f_1 subequal; f_1 2.0–2.8 twice the length of f_2 7
– Dorsal most seta on femur III long, extending beyond distal rim of femur; e_1 more than twice of the length f_1; f_1 less than 1.2× length of f_2; USA . . . . . ***T. lombardinii*** (Summers et Schlinger, 1955)
7 Palptarsus with 2+1 eupathidium +1ω; *vi* : *ve* = 1.5; f_1 : f_2 = 2.8; Poland, Turkey, Ukraine . . . . . ***T. polonicus*** Bolland, 1986
– Palptarsus with 1+1 eupathidium +1ω; *vi*: *ve*= 2.3; f_1: f_2= 2.0; Israel, Turkey . . . . . ***T. stramenticola*** Bolland, 1986
8 Idiosoma with six pairs of dorsomedian setae 10
– Idiosoma with an unpaired and five pairs of dorsomedian setae 9
9 Setae c_1, d_1 and e_1 minute, peg-like; palptarsus with 1 seta; USA . . . . ***T. virginiensis*** (McGregor, 1950)
– Setae c_1, d_1 and e_1 prominently long, palptarsus with 2 seta; Australia . . . ***T. acicula*** Fan et Walter, 2006
10 Femur II with 3 setae 11
– Femur II with 4 setae; Pakistan . . . . . ***T. rhytis*** (Chaudhri, Akbar et Rasool, 1974)
11 Femora III and IV with 3 and 2 setae, respectively 12
– Femora III and IV each with 1 seta; Turkey . . . . . ***T. dazkiriensis*** sp. n.
12 Dorsal idiosomal setae distally expanded, clavate or palmate 13
– Dorsal idiosomal setae not distally expanded, lanceolate 14
13 Dorsal idiosomal setae slender, d_1, e_1 and f_1 obviously longer than others; c_1 : d_1 : e_1 : f_1 = 1.0 : 1.4 : 1.4 : 1.3; New Zealand . . . . . ***T. aotearoa*** Fan et Zhang, 2005
– Dorsal idiosomal setae broadly clavate, subequal; c_1 : d_1 : e_1 : f_1 = 1.0 : 1.1 : 1.2 : 1.2; Australia . . . . . ***T. stipula*** Fan et Walter, 2006
14 Palptarsus with 2+2 eupathidae +1ω 15
– Palptarsus with 2+1 eupathidae +1ω 16
15 Peritremes with two loops; setae c_1 and d_1 long, overtake bases of e_1 and f_1 respectively; genu I and II without solenidion *k*; tarsi I and II with 10+1ω, 10+1ω; Brazil . . . . . ***T. edaphon*** Flechtmann, 2001
– Peritremes with three loops; setae c_1 and d_1 short, do not overtake bases of e_1 and f_1 respectively; genu I and II with solenidion *k*; tarsi I and II with 10+1ω, 8+1ω; Turkey . . . . . ***T. turcicus*** Ayyildiz et Doğan, 2003
16 Peritremes with one loop; tibia I with 9+1φ; tarsi I and II with 10+1ω, 8+1ω; idiosomal setae lanceolate, almost subequal in length; c_1 : c_2 = 0.8, d_1 : d_2 = 1.4, e_1 : e_2 = 1.3, f_1 : f_2 = 1.3, c_1 : d_1 : e_1 : f_1= 1.0 : 1.2 : 1.4 : 1.3; Australia . . . . . ***T. australis*** Fan et Walter, 2006
– Peritremes with two loops; tibia I with 9+2φ; tarsi I and II with 9+1ω, 8+1ω; idiosomal setae lanceolate, c_1 much longer than others; c_1 : c_2 = 3.1, d_1 : d_2 = 0.9, e_1 : e_2 = 1.3, c_1 : d_1 : e_1 : f_1 = 5.4 : 1.4 : 1.4 : 1.0; Australia . . . . ***T. elongata*** Fan et Walter, 2006

* This key is modified from Fan & Walter (2006).

***Tycherobius dazkiriensis* sp. n.**

Description. Female (Fig. 3)**.** Dimensions of holotype (range for paratypes in parentheses): body length (including gnathosoma) 343 (328–369), width 229 (213–244).

Gnathosoma. Length 57. Subcapitulum with one pair of smooth setae medioventrally, 26 long. Peritreme with two loops. Number of setae and solenidia on palpi (from trochanter to tarsi): 0-2-1-3+1 swordlike seta -2+1 eupathidia.

Dorsum. Almost ovoid; with irregular striations; areas around bases of dorsal setae without striae; 15 pairs of finely serrated dorsal setae, set on tubercles, six dorsomedian pairs, a pair of *pdx* present; two pairs of eyes located between *sci* and *sce*; setae $c_1$the longest. Lengths of setae: *vi* 99 (99–104), *ve* 57 (57–62), *sci* 104 (99–17), *sce* 62 (62–65), c_1 276 (276), c_2 127 (117–130), d_1 234 (211–234), d_2 125 (120–130), e_1 169 (161–182), e_2 104 (99–107), f_1 117 (109–130), f_2 55 (55–65), h_1 52 (52), h_2 47 (44–52), *pdx* 60 (60–65). All dorsal setae are strongly serrated.

Venter. Ventral surface striated; coxisternal shield absent; ventral setae simple, *1a* 34, set on coxae I, *3a*

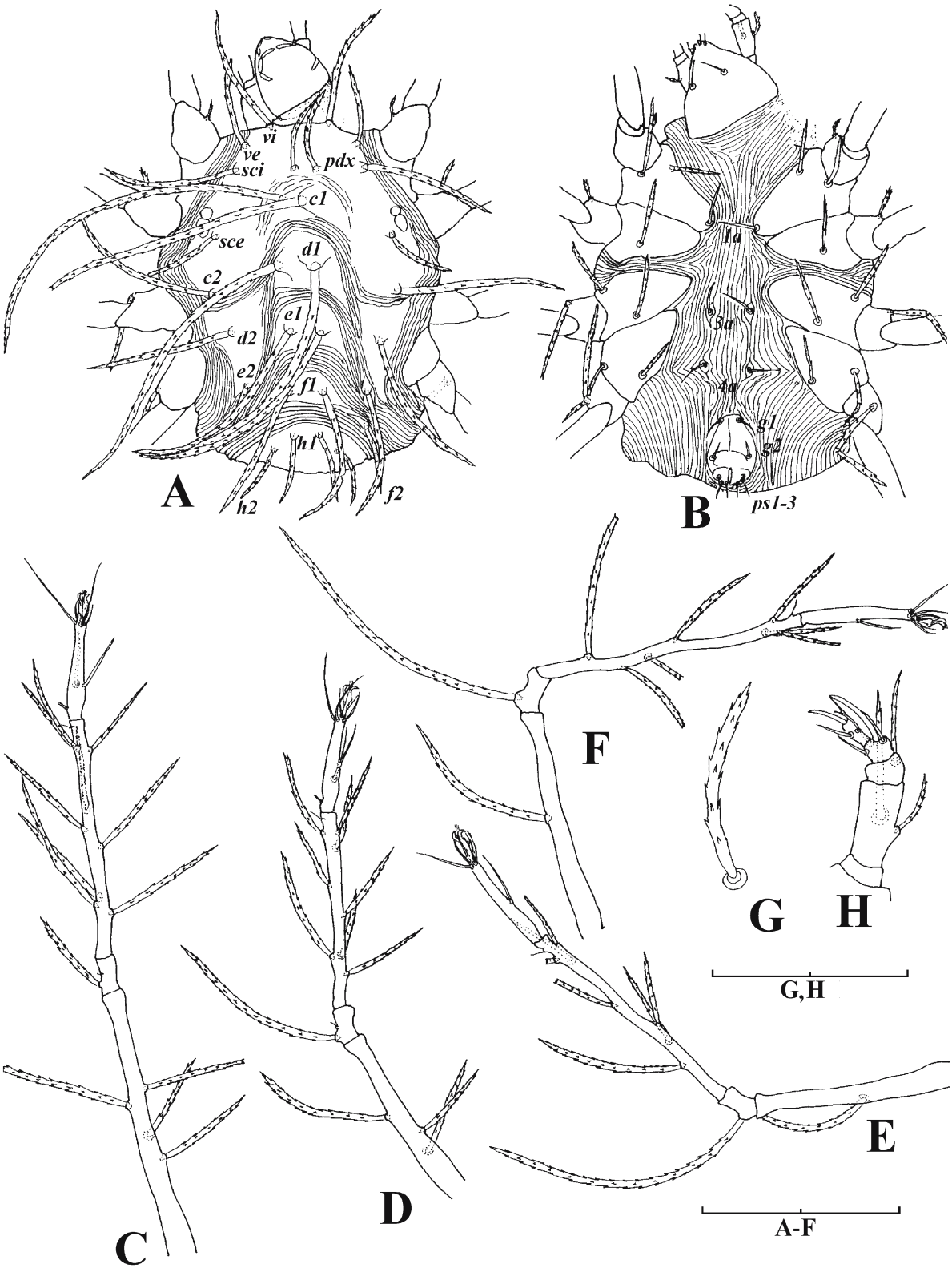

Fig. 3. *T. dazkiriensis* sp. n., female: A – dorsal view; B – ventral view; C – leg I; D – leg II; E – leg III; F – leg IV;G – setae *pdx*; H – palpus. Scales 150 μm (A–F), 60 μm (G, H).

34, set on membrane between coxae III, *4a* 26, anterolaterad of anogenital shield, setae *3a* and *4a* each located on a small platelets; setae *1a*, *3a* and *4a* simple, but coxal setae with denticles; genital and anal shields fused with two pairs of genital setae $g_1 = g_2 = 16$ and three pairs of pseudanal setae $ps_1 = ps_2 = ps_3 = 13$.

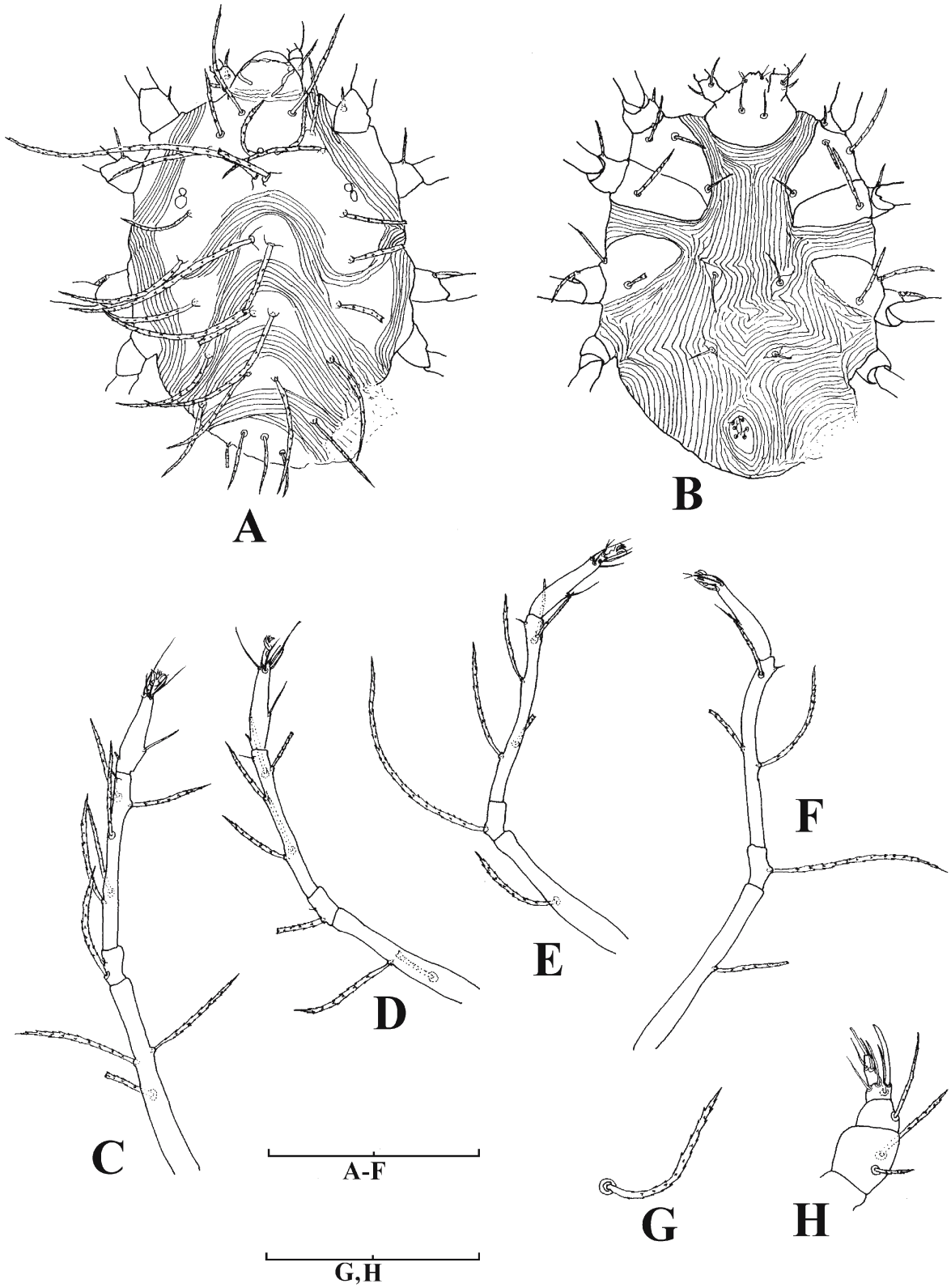

Fig. 4. *T. dazkiriensis* sp. n., protonymph: A – dorsal view; B – ventral view; C – leg I; D – leg II; E – leg III; F – leg IV; G – setae *pdx*; H – palpus. Scales 150 μm (A–F), 60 μm (G, H).

Legs. Length of legs (from base of femur to tip of tarsal claw) (range in parenthesis): leg I 530 (525–546), leg II 421 (416–437), leg III 489 (478–494), leg IV 546 (536–551). Setal formula of leg segments (solenidia in parentheses) as follows: coxae 3-1-2-2, trochanters 1-1-1-1, femora 4-3-1-1, genua 1(+k)-1(+k)-1-1, tibiae

9(+φ)-8(+φ)-7(+φ)-7(+φ), tarsi 10(ω)-10(ω)-7-7. All tibiae with a distal solenidion. Tarsi I and II each with a subbasical solenidion and two variously spaced setae. Tarsi III and IV with only one medial seta. Genua I and II with solenidia *k*.

Male. Unknown.

Protonymph (Fig. 4). Length of body (including gnathosoma): 296, width 208.

Gnathosoma. Length 52. Subcapitulum with one pair of smooth setae medioventrally. Number of setae and solenidia on palpi (trochanter to tarsi): 0-2-1-3+1 swordlike seta -2+1 eupathidia.

Dorsum. Almost ovoid, with irregular striation, areas around bases of dorsal setae without striae; 15 pairs of finely serrated dorsal setae, set on tubercles, six dorsomedian pairs including *pdx* present; two pairs of eyes located between *sci* and *sce*; setae c_1 the longest. Dimensions of dorsal setae as follows: *vi* 78, *ve* 57, *sci* 78, *sce* 52, c_1 182, c_2 104, d_1 161, d_2 96, e_1 120, e_2 78, f_1 83, f_2 55, h_1 42, h_2 29, *pdx* 44. All dorsal setae serrated.

Venter. Ventral surface striated; coxisternal shield absent; ventral setae simple, *1a* 21, set on coxa I, *3a* 26, set on membrane between coxae III, *4a* 16, anterolaterad of anogenital shield, setae *3a* and *4a* each located on a small platelet; setae *1a*, *3a* and *4a* simple, but coxal setae with denticles; aggenital setae, genital shields and setae absent; anal shields with three pairs of setae.

Legs. Length of legs (from base of femur to tip of tarsal claw): leg I 378, leg II 317, leg III 364, leg IV 390. Setal formula of leg segments (solenidia in parentheses) as follows: coxae 3-1-2-0, trochanters 1-1-1-0, femora 3-2-1-1, genua 1(+k)-1(+k)-1-1, tibiae 5(+φ)-5(+φ)-5(+φ)-3(+φ), tarsi 9(ω)-8(ω)-7-5.

Material examined. Holotype (female): Turkey, Afyonkarahisar, Dazkiri district, near Lake Acigöl (37°53′ N, 29°47′ E), 900 m a.s.l., 17.XII.2005, from litter under *Pinus sylvestris*; **paratypes:** same site as holotype, 8 ♀♀, one protonymph; swamp of the Acigöl, 18.III.2006, from litter under reeds *Phragmites australis,* 2 ♀♀; all leg. M. Akyol.

Etymology. The species is named after the type locality, Dazkiri, Afyonkarahisar, Turkey.

Differential diagnosis. This species is close to *Tycherobius rhytis* (Chaudhri, Akbar et Rasool, 1974), *T. edaphon* Flechtmann, 2001 and *T. turcicus* Ayyildiz et Doğan, 2003, *T. australis* Fan et Walter, 2006, *T. elongata* Fan et Walter, 2006 in that the dorsum has six pairs of dorsomedian setae and dorsal lanceolate idiosomal setae. However, *T. dazkiriensis* differs from them in that femora III and IV only with one seta and all dorsal idiosomal setae are very long.

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