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RESEARCH ARTICLE

Contributions to the knowledge of the water mite fauna (Acariformes, Hydrachnidia) of Türkiye with descriptions of two new species

Yunus ESEN[1,3], **Vladimir PEŠIĆ** [2]

[1]*Solhan Vocational School of Health Services, Bingöl University, Bingöl, Türkiye*
[2]*Department of Biology, Faculty of Sciences, University of Montenegro, Cetinjski put b.b., 81000 Podgorica, Montenegro*
[3]Corresponding author: yesen@bingol.edu.tr

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ABSTRACT: In this study, water mites have been collected from running waters and springs in Elazığ province (Eastern Türkiye). Totally, twenty species are identified. The families, Hydrovolziidae and Feltriidae are newly recorded from Elazığ province. *Atractides* (*Atractides*) *ermani* sp. nov. and *A.* (*Atractides*) *elazigensis* sp. nov. are described as new to science. Additionally, the recent list of known number of species of water mite in Türkiye by provinces is given based on published data with an overall assessment.

Keywords: Acari, *Atractides*, diversity, Elazığ, species number
Zoobank: https://zoobank.org/43C6F2B5-F663-4E2C-9C61-22FDF5227933

INTRODUCTION

Türkiye is very rich in terms of biodiversity, but the knowledge on the water mite fauna of Türkiye is still lacking. To date, 25 families, 62 genera and 336 species of water mites are known from Türkiye (Erman et al., 2010, 2019; Esen, 2021). Research on water mites has been continuing rapidly based on materials collected from different provinces in Türkiye for the last twenty years.

The first list of the water mite fauna of Elazığ province was given by Erman and Özkan (2000) with 51 species in 15 families. Later on, studies on water mite fauna of Elazığ province continued by Pešić et al. (2006), Pešić and Erman (2006), Erman et al. (2006, 2008), Esen and Erman (2018). Including the present study, the total number of the water mites' taxa recorded from Elazığ reaches to 76 species in 17 families.

During a survey on the freshwater fauna of Türkiye, several species of the mite were collected from Elazığ province, including two undescribed species. The aim of this work is to contribute to the water mite diversity of Türkiye, to describe two new species and give the recent list of the numbers of species according to the provinces.

MATERIALS AND METHODS

The water mites were collected by hand netting, sorted on the spot from the living material, conserved in Koenike's fluid and dissected as described elsewhere (e.g., Gerecke et al., 2007). The holotype and paratypes of the new species are deposited in the research collection of the Department of Biology, Bingöl University, Bingöl, Türkiye. The composition of the material is given as: (males/females/deutonymphs). All measurements and scale bars in the figures are given in micrometres. For a detailed description and discussion of the characteristics of the genus *Atractides* and a detailed methodological introduction, see Gerecke (2003) and Davids et al. (2005).

The following abbreviations are used: a.s.l. = above sea level, Ac-1 = first acetabulum, Cx-I = first coxae, dL = dorsal length, H = height, HA = height on the level of ventral seta of I-L-5, HB = height on the level of ventrodistal edge of I-L-5, L = length, %L = relative length, I-L-6 = Leg 1, sixth segment (tarsus), mL = medial length, P-1 = palp, first segment, S-1 = large proximal ventral seta at I-L-5, S-2 = large distal ventral seta at I-L-5, Vgl = ventroglandulare, V = ventrale, W = width.

RESULTS

Family: HYDROVOLZIIDAE Thor, 1905

Genus: *Hydrovolzia* Thor, 1905

Hydrovolzia cancellata Walter, 1906

Material examined: Elazığ province, Arıcak district, Akdağlar mountain, low order streams, 38°37'56"N 40°08'00"E 2145 m a.s.l., 05.07.2018, (1/3/0).

Records from Türkiye: Afyon, Muş and Rize provinces (Erman et al., 2010).

Family: HYDRYPHANTIDAE Piersig, 1896

Genus: *Thyopsis* Piersig, 1899

Thyopsis cancellata (Protz, 1896)

Material examined: Elazığ province, Sivrice district, Sürek village, spring, 38°27'05" N, 39°21'49" E, 1290 m a.s.l., 13.07.2013, (1/0/0).

Records from Türkiye: Erzurum (Erman et al., 2010) and Malatya (Esen and Erman, 2012).

Genus: *Panisus* Koenike, 1896

Panisus torrenticolus Piersig, 1898

Materials examined: Elazığ province, Arıcak district, Akdağlar Mountain, low order streams, 38°37'56" N, 40°08'00" E, 2145 m a.s.l., 05.07.2018, (0/1/1).

Records from Türkiye: Afyon, Erzurum (Erman et al., 2010), Antalya (Boyacı et al., 2012) and Isparta (Durucan and Boyacı, 2020).

Genus: *Protzia* Piersig, 1896

Protzia rotunda Walter, 1908

Materials examined: Elazığ province, Sivrice district, Sürek village, spring, 38°27'05" N, 39°21'49" E, 1290 m a.s.l., 13.07.2013, (2/3/0).

Records from Türkiye: Afyon (Erman et al., 2010), Malatya (Esen and Erman, 2012) and Bingöl (Esen and Erman, 2013).

Family: SPERCHONTIDAE Thor, 1900

Genus: *Sperchon* Kramer, 1877

Sperchon (*Hispidosperchon*) *beckeri* Bader and Sepasgozarian, 1984

Materials examined: Elazığ province, Arıcak district, Akdağlar Mountain, low order streams, 38°37'56" N, 40°08'00" E, 2145 m a.s.l., 05.07.2018, (3/8/1).

Records from Türkiye: Elazığ (Esen, 2021).

Sperchon (*Hispidosperchon*) *clupeifer* Piersig, 1896

Material examined: Elazığ province, Arıcak district, Akdağlar Mountain, low order streams, 38°37'56" N, 40°08'00" E, 2145 m a.s.l., 05.07.2018, (0/1/0).

Records from Türkiye: Kayseri, Rize, Afyon, Erzurum, Malatya, Bingöl (Erman et al., 2010), Antalya (Boyacı et al., 2012), Erzincan (Esen et al., 2013), Siirt (Esen and Erman, 2015), Adıyaman (Beyaz et al., 2016) and Isparta (Durucan and Boyacı, 2020).

Genus: *Sperchonopsis* Piersig, 1896

Sperchonopsis verrucosa (Protz, 1896)

Materials examined: Elazığ province, Arıcak district, Akdağlar Mountain, low order streams, 38°37'56" N, 40°08'00" E, 2145 m a.s.l., 05.07.2018, (0/2/0).

Records from Türkiye: Afyon**,** Erzurum, Muş, Rize (Erman et al., 2010), Malatya (Esen and Erman, 2012), Antalya (Boyacı et al., 2012), Erzincan (Esen et al., 2013), Bingöl (Esen and Erman, 2013), Siirt (Esen and Erman, 2015), Burdur (Gülle et al., 2017) and Isparta (Durucan and Boyacı, 2020).

Family: ANISITSIELLIDAE Koenike, 1910

Genus: *Nilotonia* Thor, 1905

Nilotonia (*Manotonia*) *tegulata* (Viets, 1951)

Material examined: Elazığ Province, Sivrice district, Sürek village, spring, 38°27'05" N, 39°21'49" E, 1290 m a.s.l., 13.07.2013, (0/1/0).

Records from Türkiye: Isparta (Boyacı and Özkan, 2008; Durucan and Boyacı, 2020), Antalya (Boyacı et al., 2012), Erzincan (Esen et al., 2013) and Bingöl (Esen and Erman, 2013).

Family: LEBERTIIDAE Thor, 1900

Genus: *Lebertia* Neuman, 1880

Lebertia (*Lebertia*) *glabra* Thor, 1897

Materials examined: Elazığ province, Arıcak district, Akdağlar mountain, low order streams, 38°37'56" N, 40°08'00" E, 2145 m a.s.l., 05.07.2018, (11/13/0); Sivrice district, Sürek village, spring, 38°27'05" N, 39°21'49" E, 1290 m a.s.l., 13.07.2013, (0/1/0).

Records from Türkiye: Niğde (Smit, 1995), Malatya (Esen and Erman, 2012), Antalya (Boyacı et al., 2012), Erzincan (Esen et al., 2013), Siirt (Esen and Erman, 2015), Burdur (Gülle et al., 2017) and Isparta (Durucan and Boyacı, 2020).

Lebertia (*Lebertia*) *fimbriata* Thor, 1899

Materials examined: Elazığ province, Arıcak district, Akdağlar Mountain, low order streams, 38°37'56" N, 40°08'00" E, 2145 m a.s.l., 05.07.2018, (1/1/0).

Records from Türkiye: Bingöl (Esen and Erman, 2013), Erzincan (Esen et al., 2013), Çanakkale (Gülle et al., 2014), Adıyaman (Beyaz et al., 2016) and Isparta (Durucan and Boyacı, 2020).

Lebertia (*Mixolebertia*) *sefvei* Walter, 1911

Material examined: Elazığ province, Arıcak district, Akdağlar Mountain, low order streams, 38°37'56" N, 40°08'00" E, 2145 m a.s.l., 05.07.2018, (0/1/0).

Records from Türkiye: Malatya (Esen and Erman, 2012).

Family: TORRENTICOLIDAE Piersig, 1902

Genus *Torrenticola* Piersig, 1896

Torrenticola (*Torrenticola*) *barsica* (Szalay, 1933)

Materials examined: Elazığ province, Arıcak district, Akdağlar Mountain, low order streams, 38°37'56" N, 40°08'00" E, 2145 m a.s.l., 05.07.2018, (5/12/2).

Records from Türkiye: Rize, Artvin (Erman et al., 2010), Malatya (Esen and Erman, 2012), Bingöl (Esen and Erman, 2013), Erzincan (Esen et al., 2013), Çanakkale (Gülle et al., 2014), Siirt (Esen and Erman, 2015), Adıyaman (Beyaz et al., 2016), Isparta (Durucan and Boyacı, 2020).

Remarks: Recently Pešić et al. (2023) using molecular DNA barcoding techniques showed that *T. barsica* like specimens from southeastern Türkiye belongs to *T. baueri*

Bader and Sepasgozarian, 1987. The latter authors suggested the former records of *T. barsica* from Türkiye likely should be assigned to *T. baueri*.

Torrenticola (*Torrenticola*) *brevirostris* (Halbert, 1911)

Materials examined: Elazığ province, Arıcak district, Akdağlar Mountain, low order streams, 38°37'56" N, 40°08'00" E, 2145 m a.s.l., 05.07.2018, (7/13/1).

Records from Türkiye: Rize, Afyon, Erzurum (Erman et al., 2010), Malatya (Esen and Erman, 2012), Antalya (Boyacı et al., 2012), Bingöl (Esen and Erman, 2013), Erzincan (Esen et al., 2013), Siirt (Esen and Erman, 2015), Adıyaman (Beyaz et al., 2016), Isparta (Durucan and Boyacı, 2020).

Family: HYGROBATIDAE Koch

Genus: *Atractides* Koch

Subgenus *Atractides* Koch

***Atractides* (*Atractides*) *ermani* sp. nov.**

https://zoobank.org/6E34FF3B-DB83-4486-9E1A-284643349C33

Type material: Holotype: male, dissected and slide mounted in Hoyer's fluid; Elazığ province (Türkiye), Alacakaya district, Halkalı village, spring and low order streams, 38°32'44" N, 39°56'22" E, 1507 m a.s.l., 12.07.2020, leg. Esen. Paratype, same data as holotype, ibid., 23.08.2020 (1/0/0).

Diagnosis (*male*): Integument finely striated, muscle attachment unsclerotized. Coxal field: posterior margin Cx-1+2 slightly protruding. Genital field wider than long, L/W ratio 0.68-0.69, with acetabula in triangular arrangement, genital plate posterior margin indented. Excretory pore sclerotized; Vgl-1 not fused to Vgl-2. P-2 with strongly developed ventrodistal protrusion with a few pointed dents, P-4 sword seta halfway between ventral setae; I-L slightly modified, I-L-5 with S-1 and S-2 rod-shaped, with blunt tips, close together. I-L-6 short and stout, weakly curved.

Description: *Male* (measurements of paratype given in parentheses): Length of idiosoma 410 (393), width 352 (344). Dorsally integument is finely striated. Muscle attachments, unsclerotized. Dgl-3 length 30 (29). Coxal field (Fig. 1A); posterior margin Cx-1+2 medially slightly protruding, with large protruding apodemes, coxal field length 312 (297), Cx-3 width 310 (305), Cx-1+2 width 258 (255), Cx-1+2 medial suture line 112 (110) in length; distance from lateralmost tips of Cx-2 to the medioposterior edge of Cx-1+2 216 (210). Measurements of mouthparts: chelicera 207 (200) in length, claw 57 (55) in length; palp total length 270 (265), dorsal length of single segments; P-1 31 (30), P-2 65 (65), P-3 64 (62), P-4 80 (78), P-5 30 (30); relative length (% total length) of single segments: P-1 11.5 (11.3), P-2 24.1 (24.5), P-3 23.7 (23.4), P-4 29.6 (29.4), P-5 11.1 (11.3); ratio length P-2/P-4 is 0.81 (0.83), P-3 39 (38), P-4 32 (31) in height; palp (Figs 1B, 2A): P-2 ventrodistally strongly protruding, with 2-3 pointed dents, P-3 straight, P-4 strongly thickened, well developed denticle near each ventral hair insertion, divided by ventral setae in sectors 2:1:1, sword seta halfway between ventral hairs. Genital field: L/W 95 (90) / 139 (130), Ac-1-3 length 40 (34), 38 (35), 34 (28).

I-L (Figs 1C, 2B): little modified, I-L-5 slightly enlarged distally, S-1 and S-2 very close to each other, short, blunt and similar in shape; I-L-6 short, thickened and weakly curved; I-L-5 dL 127 (125), HA 30 (29), HB 40 (40), vL 101 (100); S-1 41 (40), S-2 37 (35) in length; I-L-6 112 (108) in length, central H 36 (35); ratio dL I-L-5/I-L-6 1.13 (1.16).

Female and immature stages: Unknown.

Remarks: Due to the strongly projected ventrodistal protrusion on P-2 and similar morphology of I-L (I-L-5 with short, equally rod-shaped sword setae and the stout, slightly modified I-L-6), the male of new species resembles *Atractides dentipalpis* (Walter, 1935) and *A. turcicus* Aşçı, 2009.

Atractides dentipalpis was originally described from Algeria on the basis of a female specimen (Walter, 1935). Later, Boyacı (2007) reported *A. dentipalpis* from Isparta, Türkiye on the basis of both female and male sexes, and presented the first description of the male. Compared with the female specimens from Isparta, assigned by Boyacı (2007) to *A. dentipalpis*, the female holotype from Algeria clearly differs in less projected ventrodistal projection on P-2, comparatively more stouter palpal segments, and the presence of an unpaired sclerite between Cx-IV and genital field (see Gerecke 2003). It is likely that specimens reported and illustrated by Boyacı (2007) are not conspecific with *A. dentipalpis*, a species that is currently known with certainty only from Algeria. The shape of palp and I-L in specimens described by Boyacı (2007) show general conformity with the male specimens from Elazığ, which are described here as a new species. The difference was found in a male genital plate being wider than long, and with indented posterior margin in the new species (*vs.* genital plate longer than wider, with nearly straight posterior margin in male specimen from Isparta (see Boyacı, 2007). A more detailed comparison of males is made in table 1. Further sampling was needed to test variability to determine whether these populations in Isparta and Elazığ were conspecific.

Atractides turcicus was described by Aşçı (2009) on the basis of a male and female collected in a stream at the Rize Province in the eastern Black Sea coast of Türkiye. The holotype of this species may be missing, is it not found at Zoology Museum of Atatürk University (Erzurum, Türkiye). According to the original description, Aşçı (2009) stated that presence of pointed sword setae on I-L-5, makes *A. turcicus* most similar to *A. subterraneaus*, which can easily be separated by the characteristic shape of genital field, and palp without distinct protrusion on P-2 (Gerecke, 2003). Based on the original description, *A. turcicus* differs from the new species (in parentheses) in the setae S-1 and -2 with pointed tips (sword setae rod-

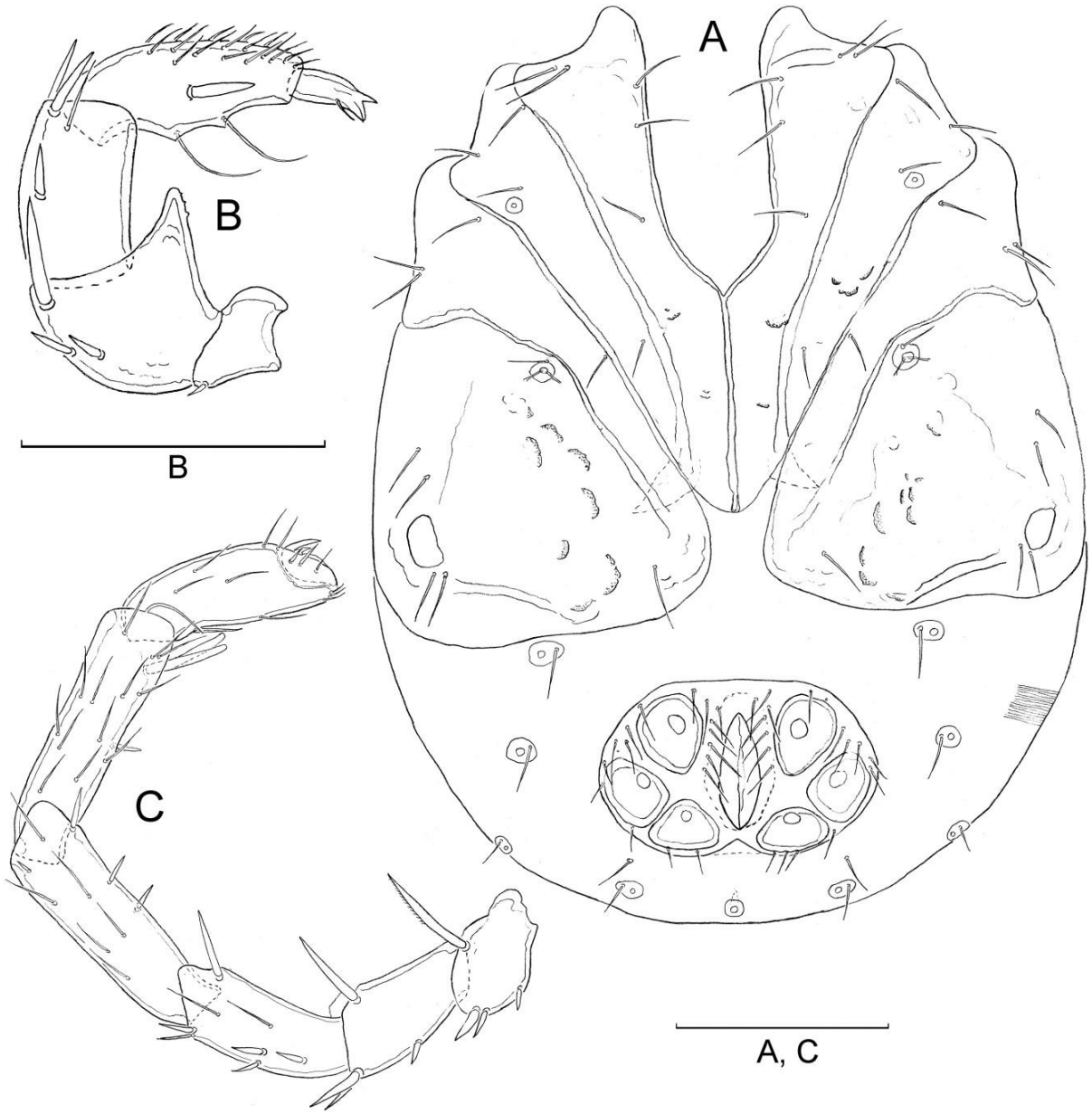

Figure 1. *Atractides* (*Atractides*) *ermani* sp. nov. (male). **A.** Idiosoma, ventrally, **B.** Palp, medial view, **C.** I-L (Scale bars=100).

Figure 2. *Atractides* (*Atractides*) *ermani* sp. nov. male. **A.** Gnathosoma, **B.** I-L-5-6 (Scale bars = 100).

Table 1. Comparison of males of *Atractides dentipalpis* and *A. ermani.*

Body part	*A. dentipalpis*	*A. ermani*
Idiosoma L / W	590 / 400	393-410 / 344-352
Chelicerae L	200	200-207
Coxal field L	287	297-312
Cx-1+2 W	250	255-258
Cx-1+2 mL	115	110-112
Cx-3 W	315	305-310
Palp segments dL and total L	25-63-62-77-22 = 249	30(31)-65(65)-64(62)-78(80)-30(30) = 265(270)
Genital field L / W	125 / 108	90-95 / 130-139
I-L-5-6 dL	102-96	(125-127)-(108-112)

shaped, with blunt tips), P-2 ventrodistal projection covered by a fine denticles (P-2 extension with 2-3 pointed dents) and a comparatively less wider genital plate (see Aşçı, 2009).

Etymology: The species is named in honour of Professor Orhan Erman (Fırat University, Elazığ, Türkiye) in appreciation of his studies on the Turkish water mites.

Biology: *Atractides ermani* sp. nov. is a crenobiontic species, which inhabits springs.

***Atractides* (*Atractides*) *elazigensis* sp. nov.**

https://zoobank.org/12FF196B-5D6B-4325-B91E-6F3C77E3F41F

Type series: Holotype: male, dissected and slide mounted in Hoyer's fluid; Elazığ province (Türkiye), Alacakaya district, Halkalı village, spring and low order streams, 38°32'44" N, 39°56'22" E, 1507 m a.s.l., 12.07.2020, leg. Y. Esen. Paratypes: same data as holotype (1/1/0); ibid., 23.08.2020 (1/1/0).

Diagnosis: Integument lineated; muscle insertions unsclerotized. Genital field with acetabula in an obtuse triangle. Excretory pore smooth; Vgl-3 not fused to Cx-IV; Vgl-1 not fused to Vgl-2. Palp with weak sexual dimorphism, ventral margin of P-2 distally protruding, without projection; I-L-5/6 larger (L I-L-5/6 ♂ >170/ >130, ♀ > 300/200); S-1/2 longer (S-1/2 > 100/80 in ♂, > 130/100 in ♀), S-1 long, with truncate tip, S-2 shortened, enlarged; I-L-6 slender and long, I-L-5/6 >1.3. Male: P-4 sword seta nearer to distoventral seta, S-1-2 separation 20-25. Female: P-4 sword seta between ventral setae, S-1-2 separation 28-31.

Description. Male (measurements of paratype given in parentheses) Length of idiosoma 430 (413), width 365 (375). Dgl-3 length 20 (21). Coxal field (Fig. 3A); coxal field length 317 (308), Cx-3 width 337 (314), Cx-1+2 width 288 (285), Cx-1+2 medial suture line 127 (118) in length. Measurements of mouthparts: chelicera 200 (160) in length, claw 60 (53), palp (Figs 3B, C) total length 331 (323), dorsal length of single segments P-1 37 (35), P-2 75 (74), P-3 74 (72), P-4 110 (107), P-5 35 (35), P-3 49 (47) in height, P-4 38 (36) in height; relative total length (% total length) of single segments: P-1 1.1, P-2 22.7 (22.9), P-3 22.4 (22.3), P-4 33.2 (33.1), P-5 1.1; ratio length P-2/P-4 is 0.68 (0.69). Genital field (Fig. 3A), L/W 110/131 (98/132), Ac-1-3 length 39 (38), 45 (32), 52 (33). I-L (Fig. 3D), I-L-5 dL 190 (180), vL 125 (119), HA 47 (44), HB 55 (50), I-L-6 length 145 (138), central H 21 (20), ratio length I-L-5/I-L-6 1.31 (1.30), S-1 length 106 (100), S-2 length 85 (80), distance between sword seta of I-L-5 25 (20).

Female (n=2) Length of idiosoma 780 (770), width 672 (680). Dgl-3 length 24 (22). Coxal field (Fig. 4A); coxal field length 430 (380), Cx-3 width 563 (498), Cx-1+2 width 460 (342), Cx-1+2 medial suture line 160 (125) in length. Measurements of mouthparts: chelicera 302 (260) in length, claw 90 (73), palp (Fig. 4C) total length 509 (394), dorsal length of single segments P-1 47 (40), P-2 111 (91), P-3 141 (102), P-4 160 (120), P-5 50 (41), P-3 58 (50) in height, P-4 32 (30) in height; relative total length (% total length) of single segments: P-1 0.9 (1.1), P-2 21.8 (23.1), P-3 27.7 (25.9), P-4 31.4 (30.5), P-5 1.0; ratio length P-2/P-4 is 0.69 (0.76). Genital field (Fig. 3D), L/W 190/202 (187/203), Ac-1-3 length 67 (45), 87 (47), 88 (66). Vgl-1 not fused to Vgl-2 (Fig. 4B).

I-L (Fig. 4E), I-L-5 dL 330 (303), vL 247 (230), HA 75 (71), HB 88 (81), I-L-6 length 222 (206), central H 24 (22), ratio length I-L-5/I-L-6 1.49 (1.47), S-1 length 142 (135), S-2 length 115 (102), distance between sword setae of I-L-5 31 (28).

Immature stages: Unknown.

Remarks. The new species resembles *Atractides panniculatus* (K. Viets, 1925) and *A. rivalis* Lundblad, 1956. The latter two species share the following characters with the new species: a lineated integument, a similar shape of the palp (male P-2 ventrodistal margin convexly protruding, without projection), and the distal position of the sword seta on P-4 in male. From the latter two above mentioned species, the new species differ in acetabula arranged in an obtuse triangle rather than in a triangular position as in *A. panniculatus* and *A. rivalis*. *Atractides panniculatus* differs in the male in a larger I-L-5/6 (L >200/>150, a stouter P-3 (L/H <1.6) and Vgl-3 fused to Cx-IV and a S-1-2 separation wider in the both sexes (> 30 in ♂, >35 in ♀).

Atractides rivalis can be separated by the male genital field much wider than long (L/W ratio 0.77, data taken from Gerecke 2003) and sword setae on I-L-5 shorter in the both sexes (L S-1/2 ♂: < 100/80, ♀: < 115/90). The both, *A. panniculatus* and *A. rivalis* have been reported from Türkiye by Pešić and Erman (2006), but with a

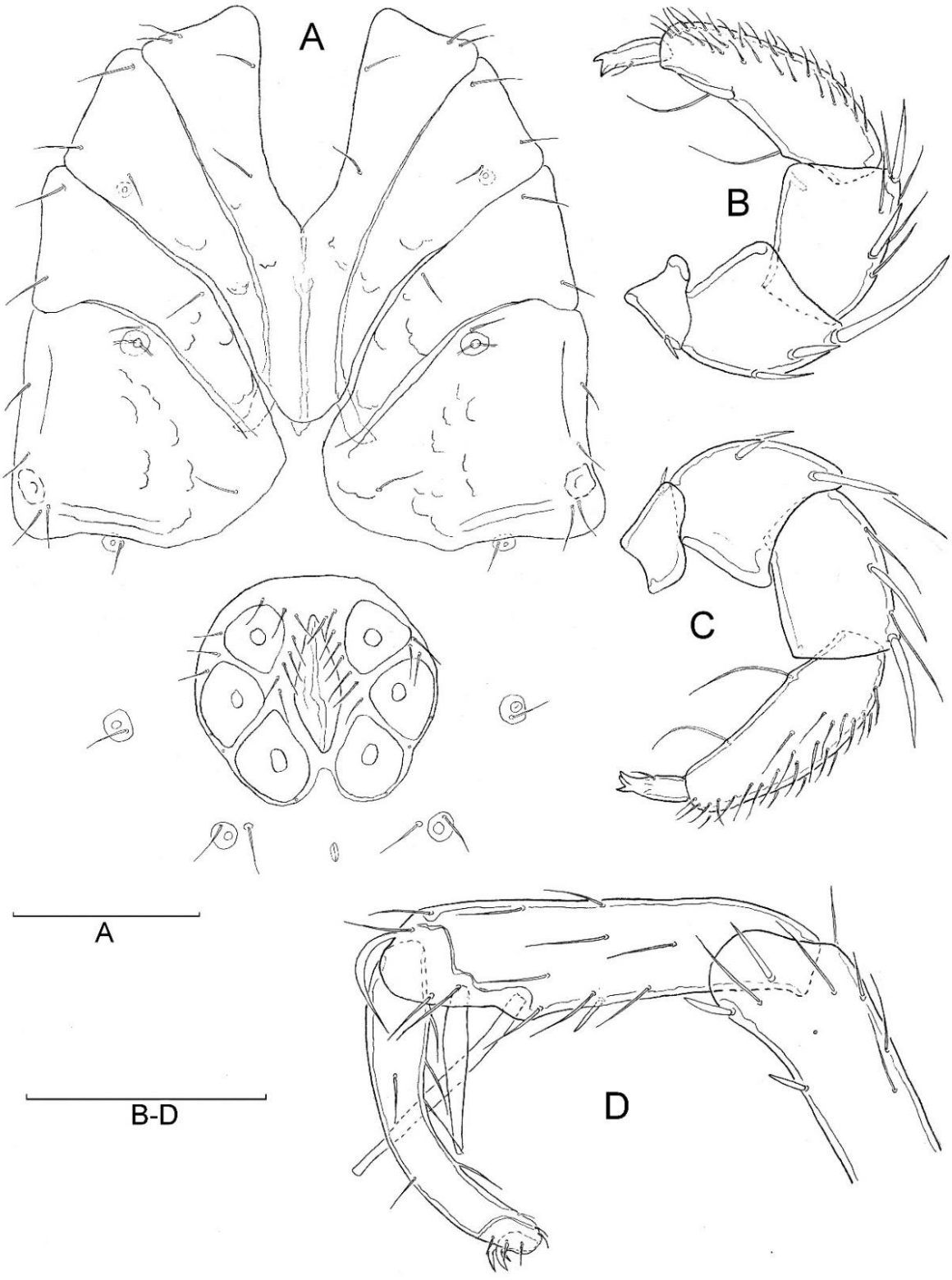

Figure 3. *Atractides* (*Atractides*) *elazigensis* sp. nov. male. **A.** Coxal and genital field, **B.** Palp, medial view, **C.** Palp, lateral view, **D.** I-L-5/6 (Scale bars = 100).

statement that future investigations on these species likely prove that this taxon represents a species complex. Concerning general morphology and measurement range the males of *Atractides elazigensis* sp. nov. shows general agreement with the male specimens assigned by Pešić and Erman (2006) to *A. panniculatus*. However, the specimens assigned by Pešić and Erman (2006) to *A. panniculatus* differs in male by P-4 ventral setae inserted far apart dividing ventral margin of the segment in sectors 2:3:1 and seta S-1 with oblique, not truncate tip. Additional sampling and possible applying a molecular method are needed to clarify relationship of these populations.

Atractides (Atractides) graecus K.Viets, 1950

Materials examined: Elazığ Province, Sivrice district, Sürek village, spring, 38°27'05" N, 39°21'49" E, 1290 m a.s.l., 13.07.2013, (2/5/0).

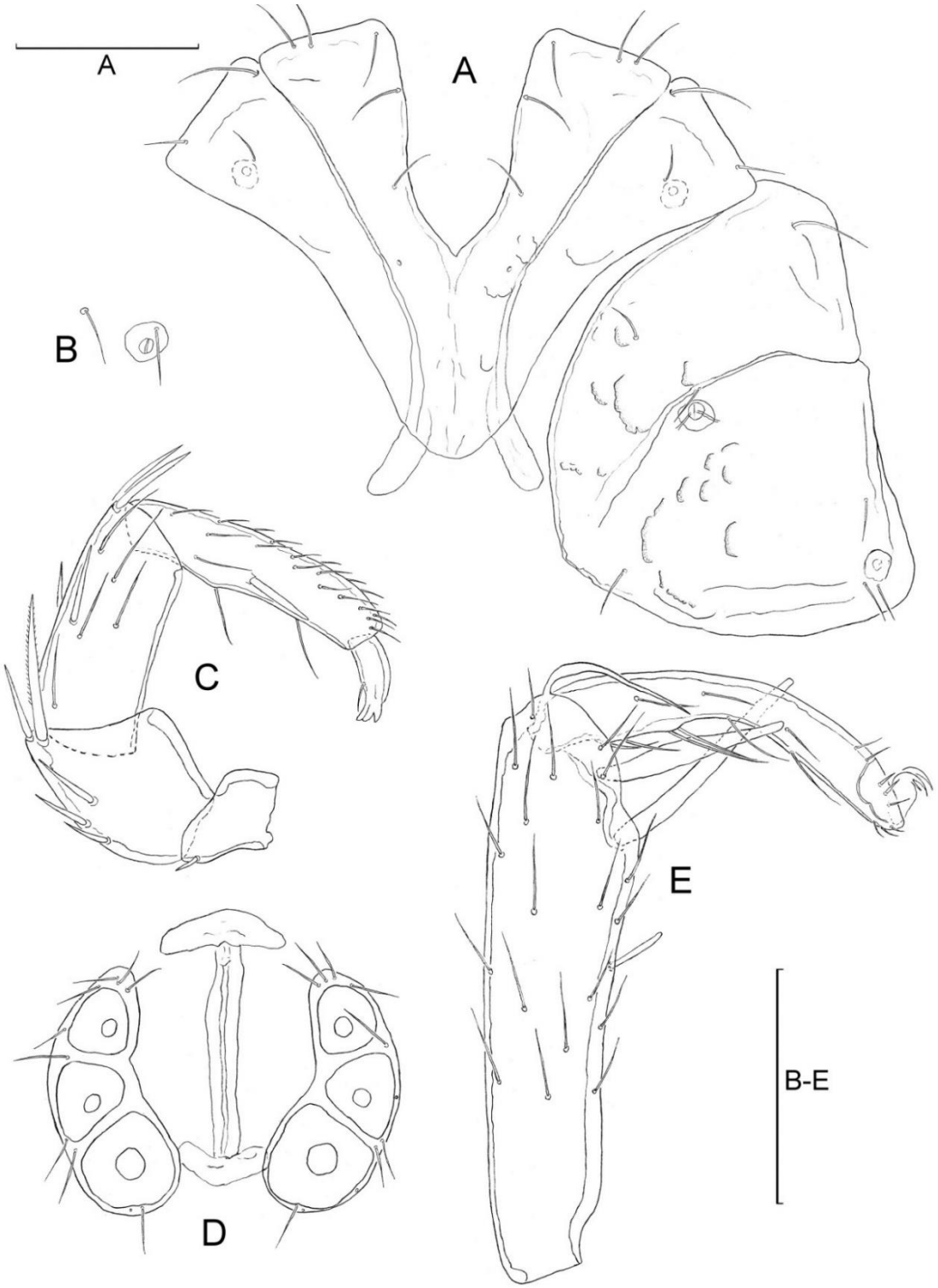

Figure 4. *Atractides* (*Atractides*) *elazigensis* sp. nov. female. **A.** Coxal field, **B.** Vgl-1 and Vgl-2, **C.** Palp, medial view, **D.** Genital field, **E.** I-L-5/6 (Scale bars = 100).

Records from Türkiye: Bingöl (Esen and Erman, 2013), Erzincan (Esen et al., 2013), Siirt (Esen and Erman, 2015), Adıyaman (Beyaz et al., 2016) and Burdur (Gülle et al., 2017).

Atractides (*Atractides*) *panniculatus* (Viets, 1925)

Materials examined: Elazığ province, Arıcak district, Akdağlar mountain, low order streams, 38°37'56" N, 40°08'00" E, 2145 m a.s.l., 05.07.2018, (1/2/0).

Records from Türkiye: Van, Elazığ, Malatya, Afyon, Erzurum (Erman et al., 2010; Esen and Erman, 2012), Bingöl (Esen and Erman, 2013), Erzincan (Esen et al., 2013), Siirt (Esen and Erman, 2015) and Adıyaman (Beyaz et al., 2016).

Family: FELTRIIDAE K. Viets, 1926

Genus *Feltria* Koenike, 1892

Feltria (*Feltria*) *minuta* Koenike, 1892

Materials examined: Elazığ province, Arıcak district, Akdağlar mountain, low order streams, 38°37'56" N, 40°08'00" E, 2145 m a.s.l., 05.07.2018, (1/3/0).

Records from Türkiye: Erzurum (Erman et al., 2010) and Antalya (Boyacı et al., 2012).

Family: ATURIDAE Thor, 1900

Genus: *Kongsbergia* Thor, 1899

Kongsbergia (*Kongsbergia*) *materna* Thor, 1899

Materials examined: Elazığ province, Arıcak district, Akdağlar mountain, low order streams, 38°37'56" N, 40°08'00" E, 2145 m a.s.l., 05.07.2018, (1/1/0).

Records from Türkiye: Afyon, Erzurum (Erman et al., 2010), Antalya (Boyacı et al., 2012), Erzincan (Esen et al., 2013) and Isparta (Durucan and Boyacı, 2020).

Family: ARRENURIDAE Thor, 1900

Genus: *Arrenurus* Dugès, 1834

Arrenurus (*Truncaturus*) *fontinalis* Viets, 1920

Materials examined: Elazığ Province, Sivrice district, Sürek village, spring, 38°27'05" N, 39°21'49" E, 1290 m a.s.l., 13.07.2013, (1/1/0).

Records from Türkiye: Erzurum (Erman et al., 2010), Malatya (Esen and Erman, 2012), Antalya (Boyacı et al., 2012), Bingöl (Esen and Erman, 2013), Erzincan (Esen et al., 2013), Burdur (Gülle et al., 2017) and Isparta (Durucan and Boyacı, 2020).

DISCUSSION

Studies on water mites from Türkiye have been increased over the last two decades. Erman et al. (2010, 2019) listed 236 (in 23 families, 52 genera) and 335 (in 25 families, 62 genera) water mite species, respectively. Nevertheless, most of the provinces of Türkiye are not studied extensively. So, only 18 of 81 provinces were studied on water mites within the scope of a project or postgraduate thesis (Fig. 5). Bingöl (142 species), Isparta (119), Erzurum (102), Burdur (81), Afyon (80), Elazığ (76) and Erzincan (77) provinces are richest in number of species based on recent published data (Table 2). Some provinces were studied within a postgraduate thesis (e.g. Kars, Ardahan, Rize, Artvin, Van, Konya provinces) but the findings were not published. Twenty three provinces shown in yellow colour in the map (Fig. 5) were not studied comprehensively and there are only a few records of water mite species. It is clear that studies on water mite fauna of Türkiye are largely incomplete (Erman et al., 2010, 2019).

In this study, twenty water mites were identified, including two new species; *Atractides* (*Atractides*) *ermani* sp. nov. and *A.* (*Atractides*) *elazigensis* sp. nov. *Hydrovolzia cancellata, Panisus torrenticolus, Protzia rotunda, S.* (*Hispidosperchon*) *clupeifer, Sperchonopsis verrucosa, Nilotonia* (*Manotonia*) *tegulata, Lebertia* (*Lebertia*) *glabra, L.* (*Lebertia*) *fimbriata, L.* (*Mixolebertia*) *sefvei, Torrenticola* (*Torrenticola*) *barsica, T.* (*Torrenticola*) *brevirostris, Atractides* (*Atractides*) *graecus, Feltria* (*Feltria*) *minuta, Kongsbergia* (*Kongsbergia*) *materna* and *Arrenurus* (*Truncaturus*) *fontinalis* are new record for Elazığ province. Hydrovolziidae and Feltriidae are firstly recorded from Elazığ province. With the records of this study, the number of known water mite species of Elazığ Province reaches to 76 species.

Figure 5. Map of provinces of Türkiye studies on water mites within the scope of a project or postgraduate thesis and limited individual works.

Table 2. The number of water mite species recorded from the Turkish provinces in alphabetical order.

Province	Numbers of species	Province	Numbers of species	Province	Numbers of species
Adana	2	Elazığ	76	Mardin	-
Adıyaman	2	Erzincan	77	Mersin	7
Afyon	76	Erzurum	102	Muğla	-
Ağrı	4	Eskişehir	14	Muş	18
Aksaray	1	Gaziantep	-	Nevşehir	1
Amasya	-	Giresun	-	Niğde	2
Ankara	-	Gümüşhane	-	Ordu	-
Antalya	69	Hakkâri	8	Osmaniye	-
Ardahan	1	Hatay	-	Rize	38
Artvin	14	Iğdır	-	Sakarya (Adapazarı)	-
Aydın	-	Isparta	119	Samsun	-
Balıkesir	-	İstanbul	-	Şanlıurfa	-
Bartın	-	İzmir	3	Siirt	65
Batman	-	Kahramanmaraş	19	Sinop	2
Bayburt	4	Karabük	-	Sivas	-
Bilecik	-	Karaman	1	Şırnak	-
Bingöl	142	Kars	3	Tekirdağ	-
Bitlis	10	Kastamonu	-	Tokat	6
Bolu	-	Kayseri	50	Trabzon	2
Burdur	81	Kilis	-	Tunceli	-
Bursa	-	Kırıkkale	-	Uşak	-
Çanakkale	11	Kırklareli	-	Van	19
Çankırı	-	Kırşehir	-	Yalova	-
Çorum	-	Kocaeli (İzmit)	-	Yozgat	2
Denizli	2	Konya	20	Zonguldak	1
Diyarbakır	1	Kütahya	-		
Düzce	2	Malatya	62		
Edirne	-	Manisa	-		

Authors' contributions

Yunus Esen: Fieldwork, collection of samples, microscopic examinations (measurements, drawing), methodology, investigation. **Vladimir Pešić:** Identification of mites, writing-editing, methodology, investigation.

Statement of ethics approval

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Conflict of interest

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