New records of the water mite genus *Atractides* Koch, 1837 from Iran (Acari: Hydrachnidia: Hygrobatidae)

VLADIMIR PEŠIĆ¹*, HARRY SMIT² & ALIREZA SABOORI³

¹Department of Biology, University of Montenegro, Cetinjski put b.b., 81000 Podgorica, Montenegro.
²Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, the Netherlands.
³Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran.
*Corresponding author. E-mail: vladopesic@gmail.com

Received 1 July 2021 | Accepted by V. Pešić: 7 July 2021 | Published online 8 July 2021.

Abstract
In the present study three water mite species of the genus *Atractides* Koch, 1837 are reported from Iran. *Atractides yazdensis* sp. nov., is described as new for science; the hitherto unknown females of *A. elburzensis* Pešić, Smit & Saboori, 2014 and *A. bakhtiari* Pešić, Asadi & Saboori, 2016 are described.

Key words: Acari, new species, taxonomy, running waters, Iran.

Introduction
The water mite genus *Atractides* Koch, 1837 has been found in all biogeographical regions except Antarctica and Australasia (Gerecke 2003). The name *Atractides* was firstly proposed in 1837 by the German arachnologist Carl Ludwig Koch, with *A. spinipes* Koch, 1837 as typus generis (Radford 1950). In the Palaearctic, the genus comprises of three subgenera, i.e., *Atractides* s. s., *Tympanomegapus* Thor, 1923, and *Polymegapus* K. Viets, 1926. More than 180 years of taxonomic studies has led to the identification of 172 species from the Palaearctic region (Pešić and Smit 2021a, b).

In Iran, the genus *Atractides* includes 30 species (Schwoerbel and Sepasgozarian1976, Pešić and Asadi 2002, Pešić and Saboori 2007, Pešić and Vafaei 2009, Asadi et al. 2010, Pešić et al. 2004a,b, 2005a,b, 2006, 2007, 2008, 2009, 2011, 2012, 2014, 2016, 2019). Most of these species belong to *Atractides* s.s., while two species belong to *Polymegapus* K. Viets, 1926 (i.e., *A. cf. polyergus* (K. Viets, 1922) and *A. persicus* Pešić & Asadi, 2010) and two species belong to *Tympanomegapus* Thor, 1923 (i.e., *A. acutirostris* (Motaş & C. Angelier, 1927) and *A. omanensis* Smit & Pešić, 2010).

In this paper, one new species of the genus *Atractides* is described from Iran. Moreover, the hitherto unknown females of two species (*A. elburzensis* and *A. bakhtiari*) are described.
Material and Methods

Water mites were collected by hand netting, sorted live in the field, and immediately preserved in Koenike’s fluid and/or 96% ethanol. Some specimens were dissected, and slide mounted in Faure’s medium. Morphological nomenclature follows Gerecke et al. (2016). The holotype and paratype of the new species are deposited in Naturalis Biodiversity Center in Leiden (RMNH). In the section ‘Material examined’ collecting site abbreviations derive from the geographical database Pešić.

All measurements are in µm. The following abbreviations are used: Ac-1 = first acetabulum; asl = above sea level; Cx-I = first coxae; dL = dorsal length; Dgl-3 = dorsoglandularia 3; H = height; I-L-4-6 = fourth-sixth segments of first leg; L = length; IL = lateral length; mL = medial length; P-1-P-5 = palp segment 1-5; pregen = pregenital sclerite; RMNH = Naturalis Biodiversity Center, Leiden; S-1 = seta 1 on I-leg-5; Vgl-1 = ventroglandularia 1; W = width.

Systematics

Family Hygrobatidae Koch

Genus Atractides Koch, 1837

Subgenus Atractides s.s.

Atractides (Atractides) elburzensis Pešić, Smit & Saboori, 2014

Fig. 1

Material examined — Iran, IR81 Mazandaran Province, Tilikenar (ca. 25 km from Chalus), Warabon, stream in forest, 17.06.2005, leg. Pešić & Saboori, 1 ♂, 14 ♀ (1 ♂, 1 ♀, dissected and slide mounted - RMNH).

Description. Female — Integument striated, muscle insertions unsclerotized. Glandularia enlarged (Dgl-3 38 µm); secondary sclerotization generally less extended than in males (see Pešić et al. 2014), but clearly visible in the irregular margins of the glandularia, coxae and genital sclerites. Mediocaudal margin Cx-I convex, apodemes of Cx-II in an obtuse angle. Acetabula in an obtuse triangle, pregen large (Fig. 1A). Excretory pore smooth; Vgl-1 not fused to Vgl-2 (but in older specimens apparently fused). Palps: more slender than in males (see Pešić et al. 2014), ventral margin P-2 straight, with slightly curved distal margin, ventral margin P-3 straight or slightly concave, P-4 with a small denticle near ventral setae, P-4 sword seta halfway between ventral setae (Fig. 1B). Legs: I-L-5 with dorsal and ventral margins subparallel basally and centrally, but slightly diverging near the distal edge, S-1 and -2 slender and close to each other; I-L-6 relatively long and weakly curved, narrowed in the centre of the segment (Fig. 1C).

Measurements. Female — Idiosoma L 675, W 531; maximum diameter Dgl-3, 38. Coxal shield L 316; Cx-III W 386; Cx-I+II mL 106, Cx-I+II IL 216. Genital field L/W 141/147, genital plates L 92-99, pregenital sclerite W 100, gonopore L 106, L Ac-1-3: 29, 30, 33. Eggs (n = 2) maximum diameter 141-144.

Gnathosoma — palp total L 332; dL/H, dL/H ratio: P-1, 26/25, 1.03; P-2, 66/41, 1.6; P-3, 89/37, 2.4 1.9; P-4, 118/27, 4.2; P-5, 33/11, 3.0; length ratio P-2/P-4, 0.59. Gnathosoma vL 115.

Legs — I-L-5 dL 157, vL 130, dL/vL ratio 1.21, maximum H 31, dL/maximum H 5.1, S-1 L 48, L/W ratio 7.7, S-2 L 48, L/W ratio 6.8, distance S-1-2, 4.0, dL ratio S-1/2 1.0; I-L-6 dL 119, central H 23, dL/central H ratio 5.17; L I-L-5/6 ratio 1.32.

Remarks — The species was described by Pešić et al. (2014) on the basis of a single male collected in a mountain stream in Kheirud Kenar forest in Mazandaran Province. Therefore, this is the first description of the female.

Distribution — Iran (Pešić et al. 2014; this study).
Figure 1. *Atractides elburzensis* Pešić, Smit & Saboori, 2014, ♀, Tilikenar, Iran. A – idiosoma, ventral view; B – palp, lateral view; C – I-L-5 and -6. Scale bars = 100 µm.
**Atractides (Atractides) bakhtiari** Pešić, Asadi & Saboori, 2016

Figs. 2-3

Material examined — Iran, IR75 North Khorasan Province, Darrood stream in Darrood city (ca. 59º08´E, 36º10´N), ca. 2200 m asl., 10.06.2005. leg. Pešić & Saboori, 2 ♂, 4 ♀ (1 ♂, 1 ♀, dissected and slide mounted - RMNH).

**Description. Female** — Integument lineated, muscle insertions unsclerotized. Glandularia diameter 23 µm. Mediocaudal margin Cx-I indented, apodemes of Cx-II strong, in an acute angle with the median line (Fig. 3A). Acetabula in a weakly curved line (Fig. 3C). Excretory pore smooth; Vgl-1 not fused to Vgl-2. Palp: P-2 with a slightly convex ventrodistal margin; P-3 ventral margin concave; P-4 slender than in male, ventral margin slightly protruding near proximoventral seta, sword seta between ventral setae (Fig. 3B). I-L-5: S-1-2 separated, with obtuse tips, S-1 slender, S-2 shorter and proximally enlarged; I-L-6 maximum H in basal part, distally equally narrowed (Fig. 3D).

**Measurements. Male** — Idiosoma L 525 W 413; maximum diameter Dgl-3, 23. Coxal shield L 322; Cx-III W 353; Cx-I+II mL 91, Cx-I+II lL 197. Genital field L/W 98/102 ratio 0.97, L Ac-1-3: 31-34, 34-36, 24-25. Ejaculatory complex L 125.

**Figure 2.** Atractides bakhtairi Pešić, Asadi & Saboori, 2016, ♂, Darrood, Iran. A – genital field; B – palp, medial view; C – I-L-5 and -6. Scale bar = 100 µm.
Figure 3. Atractides bakhtiar Pešić, Asadi & Saboori, 2016, ♂, Darrood, Iran. A – coxal field, partial view; B – palp, medial view; C – genital field; D – I-L-5 and -6. Scale bars = 100 µm.
NEW RECORDS OF WATER MITE GENUS ATRACTIDES FROM IRAN

Gnathosoma — palp total L 275; dL/H, dL/H ratio: P-1, 31/25, 1.25; P-2, 64/53, 1.21; P-3, 59/42, 1.41; P-4, 88/38, 2.3; P-5, 33/14, 2.3; length ratio P-2/P-4 0.73. Chelicera total L 192.

Legs — I-L-5 dL 170, vl 109, dL/vL ratio 1.56, maximum H 47, dL/maximum H 3.6, S-1 L 83, L/W ratio 8.3, S-2 L 66, L/W ratio 5.3, distance S-1-2, 22, dL ratio S-1/2 1.26; I-L-6 dL 134, central H 23, dL/central H ratio 5.9; L I-L-5/6 ratio 1.27.

Female — Idiosoma L 734, W 550; maximum diameter Dgl-3, 23. Coxal shield L 381; Cx-III W 453; Cx-I+II mL 98, Cx-I+II IL 234. Genital field L/W 154/166, genital plates L 120, pregenital sclerite W 75, gonopore L 136, L Ac-1-3: 41-44, 35-38, 31.

Gnathosoma — palp total L 362; dL/H, dL/H ratio: P-1, 38/33, 1.14; P-2, 81/56, 1.46; P-3, 91/44, 2.1; P-4, 113/30, 3.8; P-5, 39/14, 2.8; length ratio P-2/P-4 0.72. Chelicera total L 238.

Legs — I-L-5 dL 238, vL 147, dL/vL ratio 1.6, maximum H 60, dL/maximum H 3.95, S-1 L 105, L/W ratio 9.6, S-2 L 78, L/W ratio 4.9, distance S-1-2, 31, dL ratio S-1/2 1.34; I-L-6 dL 163, central H 21, dL/central H ratio 7.7; L I-L-5/6 ratio 1.45.

Remarks — The species was described by Pešić et al. (2016) on the basis of a single male collected in a small stream in Chahar Mahal and Bakhtiari Province. The latter specimen was originally assigned by Pešić et al. (2004a) to A. fluviatilis, a species which in both sexes differs in the shape of the genital field and arrangement of Ac (A. fluviatilis: Ac nearly equal or Ac-3 larger, male genital plate anterior margin straight or slightly concave). This is the first description of the female.

The new record of A. bakhtiari from the northern Khorasan province is about 1000 kilometers away from the locus typicus of the latter species (Fig. 4), and therefore additional studies relying on molecular analysis are recommended.

Distribution — Iran (Pešić et al. 2016; this study).

Figure 4. Distribution of the three studied Atractides species in Iran.
**Atractides (Atractides) yazdensis** sp. nov.

https://zoobank.org/urn:lsid:zoobank.org:act:753AFA49-8804-442B-8E2F-430F342750E7

Fig. 5

**Synonymy.** *Atractides gibberpalpis* Pešić et al. 2004b nec Piersig, 1898.

Type material — Holotype ♂, dissected and slide mounted (RMNH), Iran: IR39 Yazd Province, Deh Bala, 60 km SW from Yazd, 05.08.2003, leg. Pešić & Saboori. Paratypes: 1 ♂, dissected and slide mounted (RMNH), same data as the holotype, leg. Pešić & Saboori.

**Diagnosis** (Female unknown) — P-2 and P-3 ventrally each with a distinct protrusion; P-4 sword seta slightly proximal to posteroventral hair; genital plate anterior margin straight or slightly concave; Ac smaller, Ac-3 L < 40, Ac-3 subtriangular, not drop-shaped; seta S-1 not pointed, apically truncated.

**Description. Male** — Integument striated, muscle insertions unsclerotized; mediocaudal margin Cx-I slightly concave, apodemes of Cx-II in an acute angle with the median line. Genital plate anterior margin straight or slightly concave, posterior margin indented, Ac in an obtuse triangle, subtriangular in shape (Figs. 5D-E). Excretory pore smooth; Vgl-1 not fused to Vgl-2. P-2 and P-3 ventrally each with a distinct ventral extension, P-4 stocky, ventral setae not exceeding the length of the segment, P-4 sword seta slightly proximal to posteroventral hair (Fig. 5B). I-L-5 setae S-1 and S-2 separated, S-1 curved, with concave adaxial margin, apically truncated and with a fine distomedial extension, S-2 proximally enlarged; I-L-6 long and slender, curved, proximally slightly thickened, with parallel dorsal and ventral margins from the centre to the claw pit (Fig. 5C).

**Measurements. Male** (holotype; in parentheses some measurements of the paratype) — Idiosoma L 572 (580); maximum diameter Dgl-3, 25. Coxal shield L 322; Cx-III W 369; Cx-I+II mL 109, Cx-I+II IL 234. Genital field L/W 104 (111)/111 (120), ratio 0.93 (0.92), L Ac-1-3: 33-34 (36), 31-33 (32), 36-39 (39). Ejaculatory complex L (123).

Gnathosoma — palp total L 326 (330); dL/H, dL/H ratio: P-1, 34/31, 1.07 (28/30, 0.95); P-2, 74/65, 1.15 (81/70, 1.17); P-3, 77/50, 1.53 (83/58, 1.43); P-4, 106/39, 2.7 (105/47, 2.2); P-5, 35/14, 2.5 (33/14, 2.3); length ratio P-2/P-4 0.7 (0.77). Gnathosoma L 133; ccelicera total L 236 (242).

Legs — I-L-5 dL 195 (215), vl. 138 (143), dL/vL ratio 1.4 (1.5), maximum H 68 (73), dL/maximum H 2.9 (2.9), S-1 L 97 (105), L/W ratio 9.1 (9.6), S-2 L 81 (91), L/W ratio 6.1 (6.4), distance S-1-2, 16 (16), dL ratio S-1/2 1.19 (1.16); I-L-6 dL 136 (147), central H 22 (23), dL/central H ratio 6.2 (6.3); L I-L-5/6 ratio 1.44 (1.46).

Female — Unknown.

**Etymology.** The new species is named after the province where the type locality is located.

**Discussion** — The new species from South Iran closely resembles *Atractides gibberpalpis* Piersig, 1898, a rhiotribiontic species from the Palaearctic. The specimens from Yazd province (central Iran), here assigned to the new species, were originally assigned by Pešić et al. (2004b) to *A. gibberpalpis*. Re-examination of this material reveals a diagnostic differences in the shape of genital field and S-1 (*A. gibberpalpis*: Ac larger, Ac-3 elongated, drop-shaped, anterior margin more or less indented; S-1 distally narrowed with bluntly pointed tip, see Gerecke 2003).

*Atractides yunusi* Pešić & Smit, 2021, a species recently described species from Kyrgyzstan (Pešić and Smit 2021a) resembles the new species in Ac arrangement and in a I-L with enlarged penultimate segment bearing a truncated sword seta S-1 but differs in shape of the genital field (anterior margin slightly convex, Ac-3 more roundish and smaller in size) and P-4 sword seta nearer to distoventral seta (Pešić and Smit 2021a).

**Distribution** — Iran; known from a high-order stream.
Figure 5. Atractides yazdensis sp. nov., ♂, Deh Bala, Iran (A-D holotype, E paratype). A – coxal field, partial view; B – palp, medial view; C – 1-L-5 and -6; D-E – genital field. Scale bars = 100 µm.
References

Asadi, M., Pešić, V. & Etemadi, I. (2010) A revised survey of water mites (Acari: Hydrachnidia) from Iran: new synonyms and descriptions of three new species. Zootaxa, 2628, 43–55. https://doi.org/10.11646/zootaxa.2628.1.3

Gerecke, R. (2003) Water mites of the genus Atractides Koch, 1837 (Acari: Parasitengona: Hygrobatidae) in the western Palaearctic region: A revision. Zoological Journal of the Linnean Society, 138(2-3), 141–378. https://doi.org/10.1046/j.1096-3642.06-0.00051.x

Gerecke, R., Gledhill, T., Pešić, V. & Smit, H. (2016) Chelicerata: Acari III. In: Gerecke R, ed. Süßwasserfauna von Mitteleuropa, Bd. 7/2-3. Springer-Verlag Berlin, Heidelberg, pp. 1–429. https://doi.org/10.1007/978-3-8274-2689-5

Koch, C.L. (1837) Deutschlands Crustaceen, Myriapoden und Arachniden, Heft 11. In: Herrich-Schäffer GAW, ed. Deutschlands Insekten (continuation of Panzer, Faunae Insectorum Germaniae Initia [= Panzer, 146]). Regensburg: Fr. Pustet, 16.

Pešić, V. & Asadi, M (2002) Two new water mite species from Iran of the water mite families Torrenticolidae and Hygrobatidae (Acari: Hydrachnidia). Zootaxa, 127, 1–7. https://doi.org/10.11646/zootaxa.127.1.1

Pešić, V. & Saboori, A. (2007) A checklist of the water mites (Acari: Hydrachnidia) of Iran. Zootaxa, 1473, 45–68. https://doi.org/10.11646/zootaxa.1473.1.3

Pešić, V. & Vafaei, R. (2009) New records of water mites (Acari: Hydrachnidia) from Iran, with the first descriptions of the male of Nilotonia persica Pesic & Saboori, 2006 and Atractides mirkopesici Pesic, 2004. Systematic and Applied Acarology, 14, 153–160. https://doi.org/10.11158/saa.14.2.7

Pešić, V. & Smit, H. (2011) A new species of Atractides Koch, 1837 (Acari, Hydrachnidia, Hygrobatidae) from Ethiopia, with a discussion on the biodiversity of the genus Atractides in the Afrotropical region. ZooKeys, 86, 1–10. https://doi.org/10.3897/zookeys.86.972

Pešić, V. & Smit, H. (2021a) Water mites of the genus Atractides Koch, 1837 from Kyrgyzstan (Acari: Hydrachnidia: Hygrobatidae) with the description of six new species. Acarologia, 61(2), 332−355. https://doi.org/10.24349/acarologia/20214434

Pešić, V. & Smit, H. (2021b) A new species of the genus Atractides Koch, 1837 from Turkey (Acari: Hydrachnidia: Hygrobatidae). Ecologica Montenegrina, 44, 44–50. http://dx.doi.org/10.37828/em.2021.43.6

Pešić, V., Saboori, A., Asadi, M. & Vafaei, R. (2004a) Studies on water mites of the family Hygrobatidae (Acari,Hydrachnidia) from Iran, I. The water mite genus Atractides Koch, with the description of five new species. Zootaxa, 495, 1–40. https://doi.org/10.11646/zootaxa.495.1.1

Pešić, V., Saboori, A., Asadi, M. & Vafaei, R. (2004b) New records of water mites (Acari, Hydrachnidia) from Iran, with the description of one new species. Zoology in the Middle East, 32, 97–110. https://doi.org/10.1080/09397140.2004.10638051

Pešić, V. Saboori, A., Asadi, M. & Vafaei, R. (2005a) Water mites (Acari: Hydrachnidia) from interstitial waters of Iran, with the description of one new species. Zootaxa, 1030, 49–60. https://doi.org/10.11646/zootaxa.1030.1.2

Pešić, V., Saboori, A. & Asadi, M. (2005b) The first hyporheobiontic species of the genus Atractides Koch (Acari, Hydrachnidia) from interstitial water in Iran. Fragmenta Faunistica, 48, 97-100. https://doi.org/10.3161/00159301ff2005.48.1.097

Pešić, V., Saboori, A., Asadi, M. & Jaleian, M. (2006) New records of water mites (Acari: Hydrachnidia) from Khorasan Province (Iran), with the description of one new species. Systematic and Applied Acarology, 11 (1), 73–82. https://doi.org/10.11158/saa.11.1.10

Pešić, V., Dinipour, A., Vafaei, R. & Saboori, A. (2007) The water mite (Acari: Hydrachnidia) fauna of running waters of Guilan Province (Northern Iran). Systematic & Applied Acarology, 12 (3-4), 213–222. https://doi.org/10.11158/saa.12.3.6

Pešić, V., Arman, P., Vafaei, R. & Saboori, A. (2008) The water mite (Acari: Hydrachnidia) fauna of running waters of Kermanshah Province (Western Iran). Systematic & Applied Acarology, 13, 137–144. https://doi.org/10.11158/saa.13.2.7
Pešić, V., Jabaleh, I., Saboori, A., Askarianzadeh, A. & Asadi, M. (2009) Three new water mite species (Acari: Hydrachnidia) from Golestan Province (NE Iran). *Zootaxa*, 2173, 55–65. https://doi.org/10.11646/zootaxa.2173.1.6

Pešić, V., Smit, H., Asadi, M. & Etemadi, I. (2011) New records of water mites (Acari: Hydrachnidia) from southern Iran, with description of one new genus and three new species. *Zootaxa*, 2783, 21–34. https://doi.org/10.11646/zootaxa.2783.1.2

Pešić, V., Smit, H. & Saboori, A. (2012) Water mites delineating the Oriental and Palaearctic regions - the unique fauna of southern Iran, with descriptions of one new genus, one new subgenus and 14 new species (Acari: Hydrachnidia). *Zootaxa*, 3330, 1–67. https://doi.org/10.11646/zootaxa.3330.1.1

Pešić, V., Smit, H. & Saboori, A. (2014) Checklist of the water mites (Acari, Hydrachnidia) of Iran: Second supplement and description of one new species. *Eologica Montenegrina*, 1(1), 30-48. https://doi.org/10.37828/em.2014.1.6

Pešić, V., Saboori, A. & Asadi, M. (2016) New species of the genus *Atractides* Koch, 1837 (Acari: Hydrachnidia: Hygrobatidae) from Iran. *Systematic & Applied Acarology*, 21(9), 1250-1266. https://doi.org/10.11158/saa.21.9.8

Pešić, V., Asadi, A., Etemadi, I. & Smit, H. (2019) New records of water mites (Acari: Hydrachnidia) from the Khuzestan Province (South Iran) with description of three new species. *Zootaxa*, 4559 (3), 550–558. https://doi.org/10.11646/zootaxa.4559.3.5

Radford, D. (1950) Systematic check list of mite genera and type species. *Union internationale des sciences biologiques*, 1, 1–232.

Schwoerbel, J. & Sepasgozarian, H. (1976) Wassermilben (Acari, Prostigmata, Hydrachnellae) aus dem Iran. 1. Mitteilung. *Acta Ecologica Iranica*, 1, 9–18.