Larval morphology of the water mite *Hygrobates fluviatilis* (Ström, 1768) (Acari, Hydrachnidia, Hygrobatidae)

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Data on the morphology of the larval water mite *Hygrobates fluviatilis* (Ström, 1768) are given in the papers of Ullrich (1976), Wainstein (1980), Martin (2000) and Müller (2015). Martin (2016) has presented a detailed redescription of a larva of this species. However, Pešić et al. (2017) yield six well supported species by using together molecular and morphological evidence in order to resolve of diversity in the *Hygrobates fluviatilis* species complex: *Hygrobates fluviatilis*, *H. arenarius* Smit & Pešić, 2017, *H. corsicus* Pešić & Smit, 2017, *H. marezaensis* Pešić & Dabert, 2017, *H. persicus* Pešić & Asadi, 2017 and *H. turcicus* Pešić & Dabert, 2017. The larva described by Martin (2016) under the name *H. fluviatilis* turned out to be the larva of *H. arenarius* (Pešić et al. 2017). Unfortunately, Wainstein (1980) and Müller (2015) have not characterized female morphology whose larvae have been reared which complicates the identification of the species. The aim of this paper is to study the morphology of larva *H. fluviatilis* in detail and identify differences to the larva of the related *H. arenarius*. The females of *Hygrobates fluviatilis* were identified with the key of Pešić et al. (2017).

Idiosomal setae are named according to Tuzovskij (1987): Fch – frontales chelicerarum, Fp – frontales pedipalporum, Vi – verticales internae, Ve – verticales externae, Oi – occipitales internae, Oe – occipitales externae, Hi – humerales internae, He – humerales externae, Sc1 – scapulares internae, Sc2 – scapulares externae, Li – lumbales internae, Le – lumbales externae, Si – sacrales internae, Se – sacrales externae, Ci – caudales internae, Pi – praeanales internae, Pe – praeanales externae, Ai – anales internae, Ae – anales externae.

Furthermore, the following abbreviations are used: P1–5, pedipalp segments (trochanter, femur, genu, tibia and tarsus); I–Leg1–5, first leg, segments 1–5 (trochanter, femur, genu, tibia and tarsus) i.e. III–Leg3 = genu of third leg; C1 – coxal setae located posteromedially on coxa I, C2 – coxal setae located posterolaterally on coxae I, C3 – coxal setae located posterolaterally on coxae II, C4 – coxal setae located anteriorly on coxae III, L – length; W – width; n = number of specimens measured; all measurements are given in μm.

Systematics

Family *Hygrobatidae* Koch, 1837

Genus *Hygrobates* Koch, 1837
Hygrobates fluviatilis (Ström, 1768)  
(Figs 1-11)

Material examined. Adult mites are collected by the author in streams of Samara and Yaroslavl Provinces, both located in the European part of Russia. Larvae of Hygrobates fluviatilis were reared by the author from six females: 2 females and 9 larvae from Samara Province, National natural Park “Samara Luka”, Kuibyshev reservoir near village Kol'tsovo; 4 females and 32 larvae from Yaroslavl Province, Nekouz District, Ild stream near village Mar’ino. To obtain larvae, water mites were maintained in the laboratory (room temperature, natural day-night conditions). Each mature female was placed in a separate glass cylinder (10-15 mm in diameter and 15 mm in height). The duration of the embryonic period was 9-12 days.

Diagnosis. Larva. Dosal plate elongate (L/W ratio 1.55-1.70) with slightly convex lateral margin, tmas on coxae III present, II-Leg-5 solenidion located proximally, setae Pi and Pe equal in length, number of thickened distal setae from trochanter to tarsus on legs segments: I: 1-1-1-0-0, II: 0-2-2-1-0, III: 0-2-4-2-0.

Larva. Idiosoma flat. Dorsal plate elongate (L/W ratio 1.55–1.70), in unengorged larvae covering almost the whole dorsum, with slightly convex lateral margin, simple setae long and thick, but setae Fch much shorter than Vi, trichobothria Fp, Oi short, thin and equal in length (Fig. 1). Seven pairs of setae (Oe, Hi, He, Sci, Sce, Li, Si) situated in the soft membrane laterally of the dorsal plate; Hi longest, Li shortest, Hi, He and Sci nearly subequal in length and longer than other posterior setae situated in the membrane. Surface of dorsal plate with elongate cell-shaped reticulation.

Figures 1–2. Hygrobates fluviatilis, larva: 1- dorsal view, 2- ventral view. Scale bar: 50 μm.
Both pairs of coxal setae (C1 and C2) short, thin and equal in length; lateral setae (C3) slightly shorter than medial setae (C4) (Fig. 2). Transverse muscle attachment scar on coxa III present anteriorly to setae Pe. Urstigma relatively large and oval. Excretory pore plate large and broad (L/W ratio 0.32–0.40), slightly convex or nearly straight anteriorly, with muscle attachment scars anteriorly; excretory pore located posterior to bases of setae Ae. Anal setae (Ai, Ae) reduced and represent in form of alveoli only, distance between setae Ai–Ai shorter than distance between setae Ae–Ae. Setae Pi and Pe short, thin and equal in length. Setae Ci very long, inserted on long projections. Surface of coxal plates with elongate cell-shaped reticulation.

Capitulum (Fig. 3) elongate, with relatively wide base and narrow rostrum, anterior hypostomal setae much longer than posterior ones.

Basal segments of chelicerae fused to each other medially (Fig. 4), with straight or slightly convex lateral margins. Chela relatively small and crescent-shaped, with two small subapical teeth (Fig. 5).

Pedipalps stout (Fig. 6): P–1 very short, without setae; P–2 relatively large, with one single short dorsodistal seta; P–3 with a very long, thick lateroproximal seta and a short dorsodistal seta; P–4 with long lateral and short dorsodistal seta and a massive dorsodistal claw; P–5 small, with one rather long solenidion and six unequal simple setae, one of them very short.

Legs five-segmented. Shape and arrangement of setae, excluding eupathidia, as shown in Figs 7-9. Number of thickened setae from trochanter to tarsus: I–Leg: 1-1-1-0-0; II–Leg: 0-2-2-1-0; III–Leg: 0-2-4-2-0. Solenidion on I/II-Leg-3 and both solenidia on I/II-Leg-4 located distally, distal solenidion on II-Leg-3 much longer than both solenidia on II-Leg-4; solenidion on I-Leg-5 located distally, and solenidion on II-Leg-5 located proximally. Claws of legs I and II (Fig. 10) smaller than claws of leg III (Fig. 11).

Measurements (n=10). Dorsal plate L 260–275, W 160–170; setae Fch L 48-58; setae Vi L 125-145; setae Fp and Oi L 24-26; setae Hi, Sci L 83-95; setae Oe L 75–87; setae He L 80-85; setae Sce L 48-58; setae Li L 44-48, setae Le L 55-61; setae Si L 64-67; setae Se L 39-48, setae Ci L 175–195, setae Pi and Pe L 35-39, setae C1 and C2 L 48-55, setae C3 L 67-74, setae C4 L 96-125; medial margins of coxae I–III L 160-
Figures 7–11. Hygrobates fluviatilis, larva: 7 - leg I, 8 - leg II, 9 - leg III, 10 - claws of leg I, 11 - claws of leg III. Scale bars: 7-9 = 50 μm, 10-11 = 20 μm.

Remarks. The larva of Hygrobates fluviatilis is similar to larva of H. arenarius. The larvae of H. arenarius are characterized by the following features (see Martin 2016, in parentheses: characters of H. fluviatilis): the excretory pore located posterior to setae Ae, Fig. 2 (excretory pore centrally located between setae Ae), the surface of dorsal plate and coxal plates with well elongate cell-shaped reticulations, Figs 1-2, respectively (surface of dorsal plate and coxal plates with not elongate cell-shaped reticulations), II-Leg-5 solendion located proximally, Fig. 8 (II-Leg-5 solendion located distally).
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