

On the taxonomic status of the water mite *Hydryphantes hellichi* Thon, 1899 (Acari, Hydrachnidia, Hydryphantidae)

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Abstract

The redescription of larva, deutonymph, female and male of the water mite *Hydryphantes hellichi* Thon, 1899 are given. The proposal of Lundblad (1962), to synonymize *H. hellichi* with *H. ruber* (Geer, 1778) is rejected.

Key words: water mite, Hydryphantidae, *Hydryphantes hellichi*, morphology, larva, deutonymph, female, male.

Introduction

The water mite *Hydryphantes hellichi* Thon, 1899, for a long time was treated as a separate species (Thon 1899, Piersig 1897-1900; K.H. Viets 1936, 1956; Sokolow 1940; K.O. Viets 1987, etc). However Lundblad (1962) proposed synonymization with *H. ruber* (Geer, 1778), followed by Di Sabatino *et al.* (2010). Data on the morphology of adults *H. hellichi* are present in many works (Thon 1899, Piersig 1897-1900; K.H. Viets 1936; Sokolow 1940; etc). Biesiadka & Cichocka (1990) gave a description of the morphology of the larva *H. hellichi*. The larva described by Wainstein (1980) under the name of *H. planus* as showed by Tuzovskij (2014) is the larva of *H. hellichi*. The deutonymph of *H. hellichi* was described by Piersig (1901) and Sokolow (1931, 1940). The descriptions of the larva and deutonymph are incomplete and insufficiently illustrated, complicating the identification of this species.

The aim of the paper is to study the morphology larva, deutonymph and adults of *H. hellichi* and discuss of the taxonomic status of this species.

Material and Methods

Specimens were collected by the author in temporary reservoirs of the European part of Russia. To obtain larvae, water mites were maintained in laboratory (room temperature, natural day-night conditions). Eggs and larvae obtained from females kept individually in glass or transparent plastic vessels of 10–15 mm diameter, and a height of 15 mm.

Idiosomal setae are named according to Tuzovskij (1987): *Fch* – frontales chelicerae, *Fp* – frontales pedipalporum, *Vi* – verticales internae, *Ve* – verticales externae, *Oi* – occipitales internae, *Oe* – occipitales externae, *Hi* – humerales internae, *He* – humerales externae, *Hv* – humerales ventralia, *Sci* – scapulares internae, *Sce* – 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: P-1-5, pedipalp segments (trochanter, femur, genu, tibia and tarsus); I-Leg-1-6, first leg, segments 1-6 (trochanter, basifemur, telofemur, genu, tibia and tarsus) i.e. III-Leg-3 = genu of third leg; C1 – coxal seta located medially on coxa I, C2 – coxal seta located posterolaterally on coxa I, C4 – coxal seta located anteromedially on coxa III; *e* - eupathidium, *s* – solenidion, *ac* – acanthoid seta; I-Leg-6: *de* – distance between the anterior end of segment and eupathidium, *ds* – distance between the anterior end of segment and solenidion; L – length; W – width; D – diameter; n – number of specimens measured; all measurements are given in micrometers (μm).

Systematics

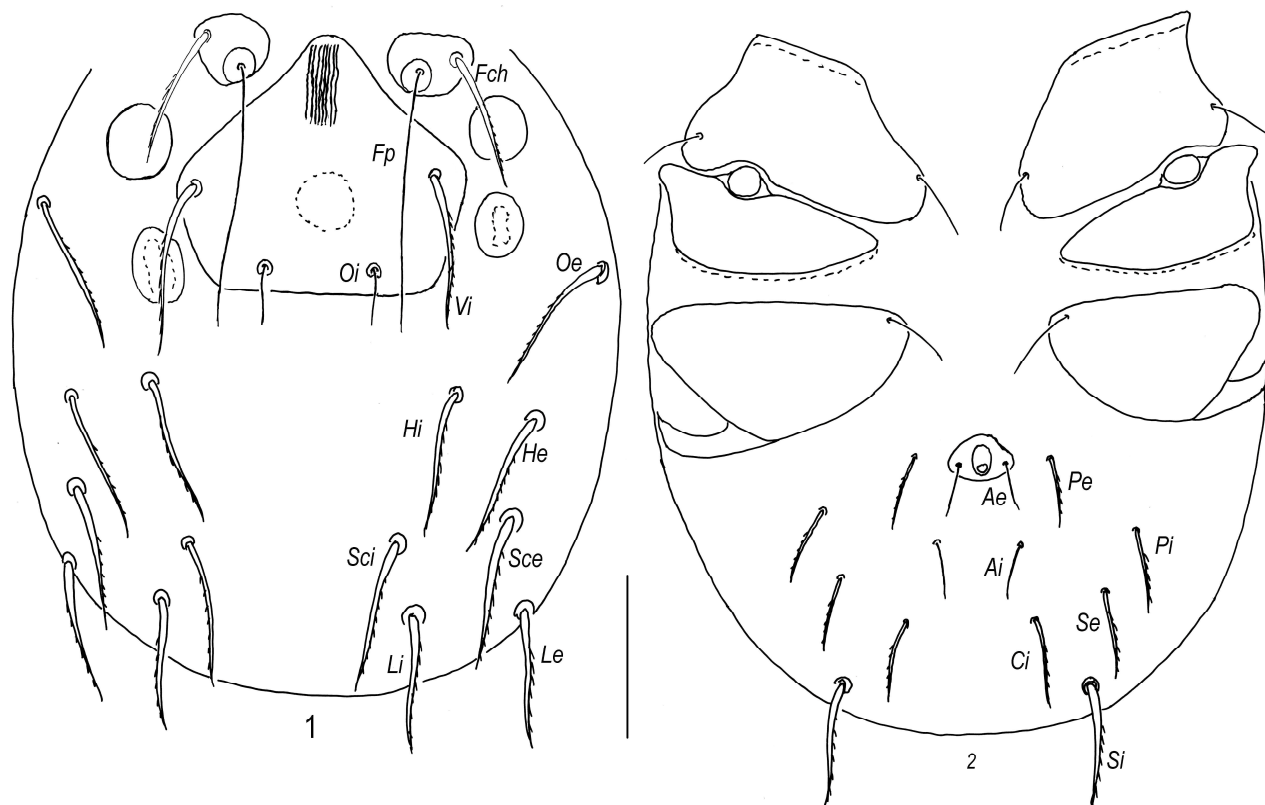
Family Hydryphantidae Piersig, 1896

Genus *Hydryphantes* Koch, 1841

Hydryphantes hellichi Thon, 1899

(Figs 1-29)

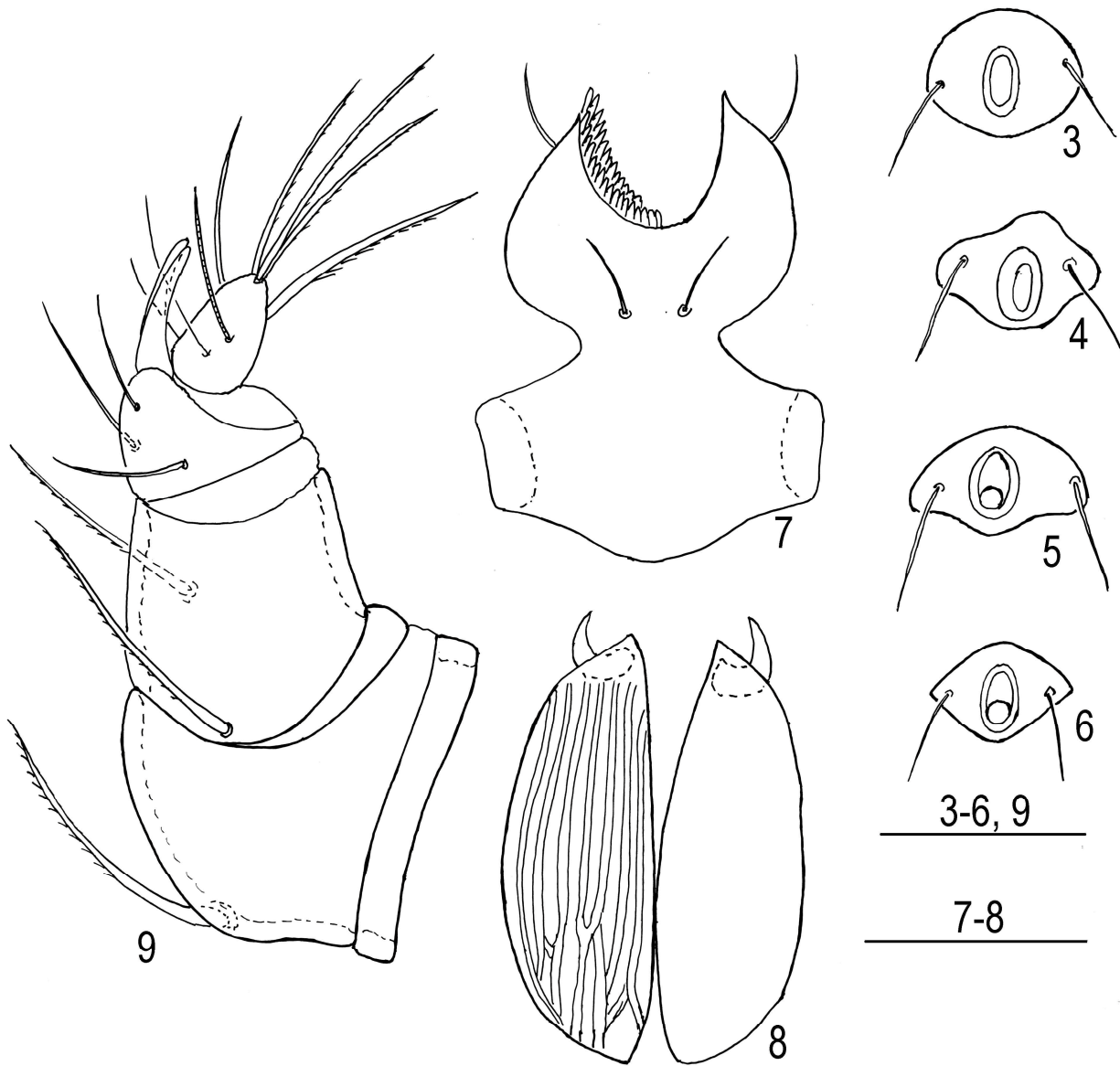
Material examined. 8 males, 7 females and 4 deutonymphs, Russia, Yaroslavl Province, Nekouz District, April-July 2000-2002, 2004, sedge bogs near village Postyltsevo, leg. P.V. Tuzovskij. Larvae (n = 60) were reared from four females in laboratory conditions, one female 28 May 2000, one female 4 July 2001, and two females 27 May 2002. The duration of the embryonic period was 12-15 days.



Figures 1-2. *Hydryphantes hellichi* Thon, 1899, larva: 1- dorsal view, 2- ventral view. Scale bar: 50 μm .

Diagnosis. Larva: dorsal plate wider than long, distance between bases of trichobothria *Oi* larger than their length; all dorsal hysterosomal setae subequal; excretory pore plate wider than long; basal segment of chelicera with wide strips; I-Leg-4 solenidion and eupathidium equal in length, I-Leg-6 *de* = *ds*; II-Leg-4 solenidion longer than eupathidium; **adults:** frontal plate elongate (L/W ratio 1.17-1.35), with rather long

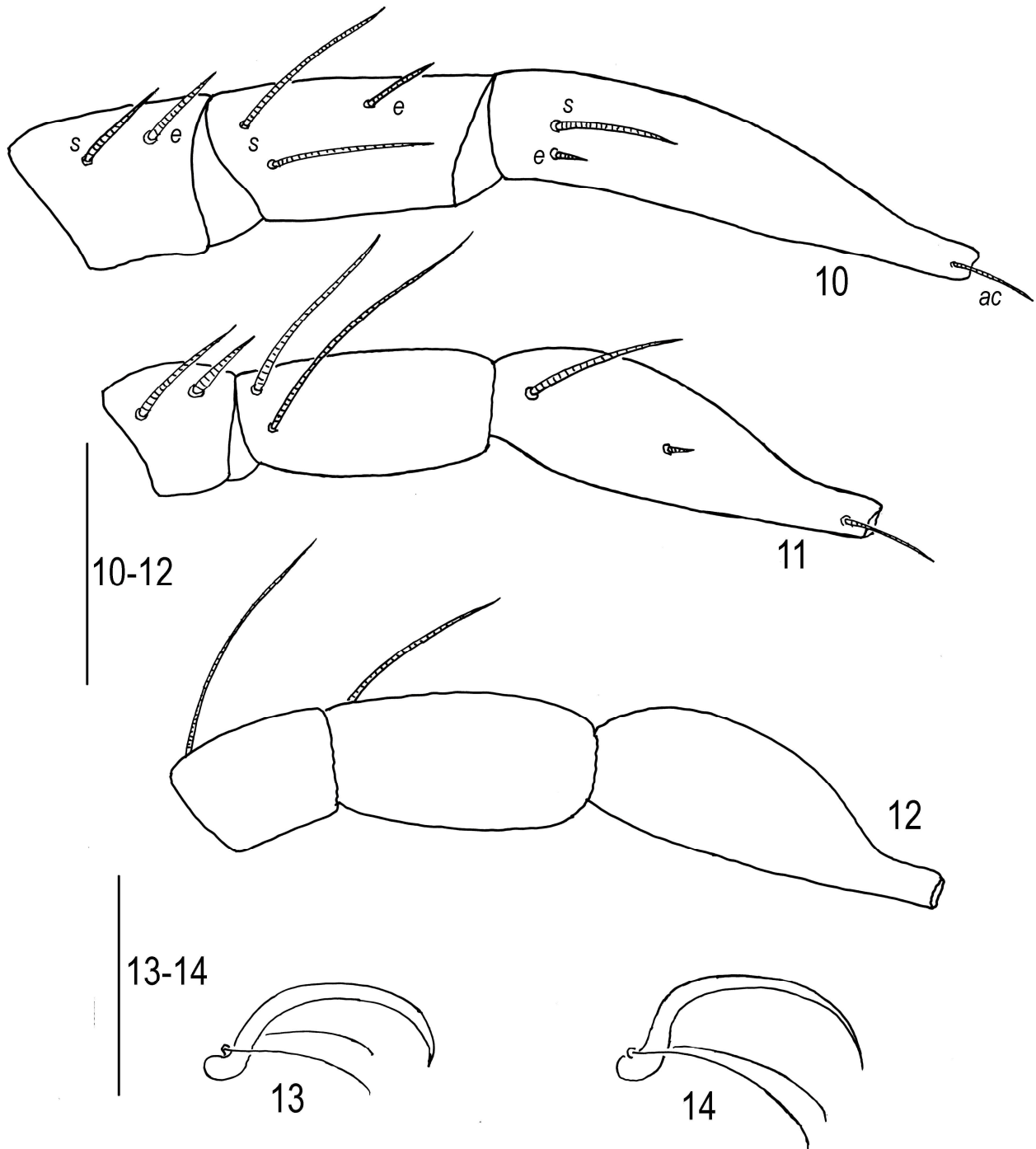
posterior projections, median eye situated at level of anterior setae of plate; capitulum long (base of capitulum/rostrum L ratio 2.0-2.7); P-3 with 7–10 setae; **deutonymph**: frontal plate elongate, capitulum with long rostrum; P-3 with four to six long, thin setae, genital field with two pairs subequal acetabula and six to eight pairs of thin setae.



Figures 3–9. *Hydryphantes hellich* Thon, 1899, larva: 3–6 – excretory pore plate, 7– capitulum, 8 – chelicerae, dorsal view, 9 – pedipalp. Scale bars: 3–6, 9 = 50 µm, 7–8 = 100 µm.

Redescription

Larva. Color red. Idiosoma oval, all setae not associated with glandularia (figures 1–2). Proterosoma with two pairs of trichobothria (*Fp*, *Oi*) and three pairs of simple setae: *Fch*, *Vi*, *Oe*. Anterior pair of dorsal platelets triangular or oval, trichobothria *Fp* long and well extending to posterior margin of dorsal plate. Posterior plate wider than long (L/W ratio 0.75–0.90), pentagonal, narrows anteriorly and widens posteriorly; median eye slightly developed (rarely absent) and situated slightly posterior to setae *Vi*; *Fch* shorter *Vi*; *Oi* short, distance between *Oi*–*Oi* larger than their length. Hysterosomal setae *Hi*, *He*, *Sci*, *Sce*, *Li*, *Le* and *Si* subequal, their bases situated on very small sclerites. All coxal plates separated on each side. Coxal plates II triangular, coxal plates I and III more or less trapezoidal and broadly rounded medially, all coxal setae short and subequal. Urstigma oval and wider than long. Setae *Se*, *Ci*, *Pi* and *Pe* subequal and slightly longer than both pairs of anal setae (*Ai*, *Ae*).



Figures 10–14. *Hydryphantes hellichi* Thon, 1899, larva: 10 - I-Leg-4–6; 11 - II-Leg-4–6; 12 - III-Leg-4–6; 13 - claws of leg I; 14 - claws of leg III. Simple setae on I–III-Leg-4–6 are not shown.

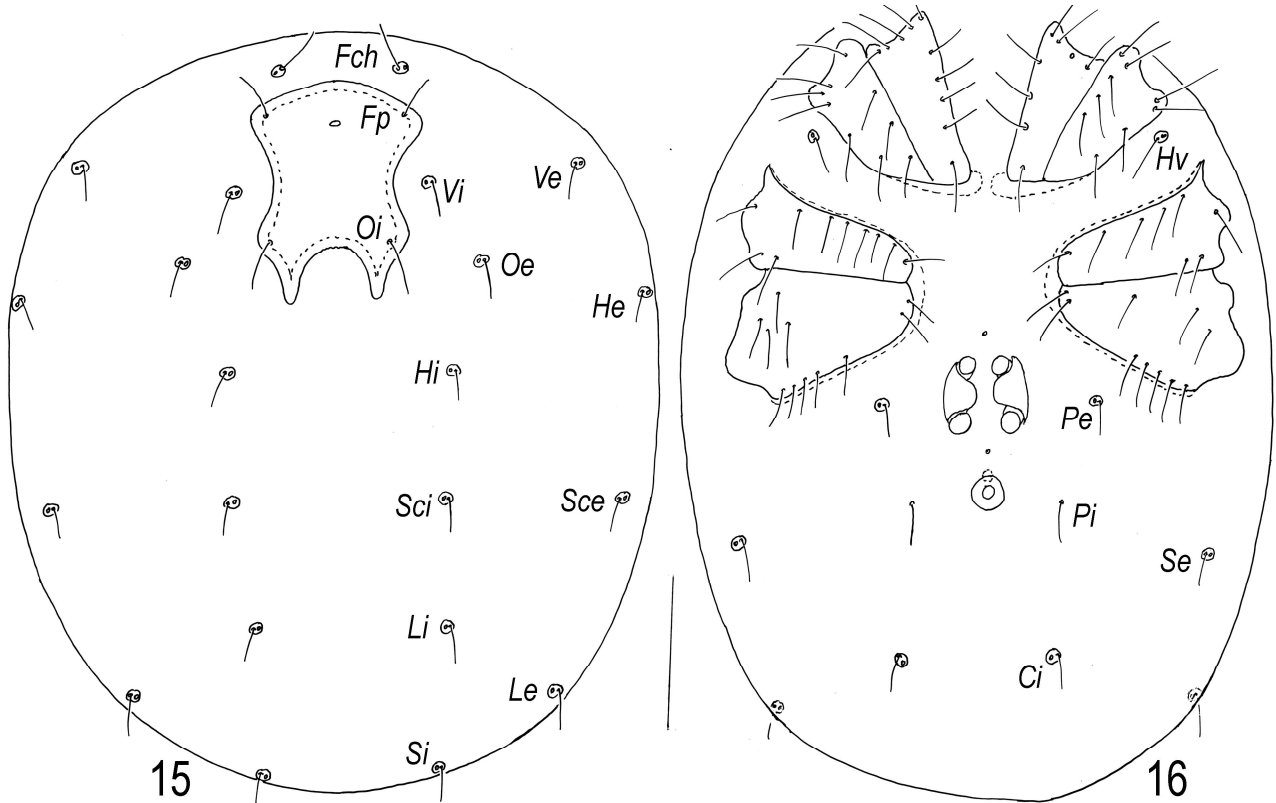
Excretory pore plate small, wider than long (L/W ratio 0.57–0.64), its shape variable (figures 3–6). Capitulum (figure 7) with short, wide base, ventral setae slightly shorter than dorsal ones. The mouth opening surrounded by numerous papillae. Basal part of capitulum without distinct reticulations. Basal segment of chelicera with wide strips, cheliceral stylet heavy and without apical teeth (figure 8).

Pedipalps moderately long (figure 9): P–1 short, without setae; P–2 large with convex dorsal margin and single dorsal seta proximally to middle of segment; P–3 with two unequal setae (long, thick proximal and relatively short, thin distal); P–4 with three unequal setae and large dorsodistal bifurcate claw; P–5 small with moderately long solenidion, five long, thick and two relatively short, thin unequal setae.

Leg 6-segmented. Leg II distinctly shorter than anterior and posterior ones. Number of leg setae (specialized setae indicated in parenthesis): I-Leg-1-6 – 1, 2, 5, 6(s, e), 13 (2s, e), 22 (s, e, ac); II-Leg-1-6 – 1, 2, 5, 6 (s, e), 12 (2s), 22 (s, e, ac); III-Leg-1-6 – 1, 2, 5, 5 (s, e), 11 (s), 20. Shape and arrangement of specialized setae on terminal legs segments as shown in figures 10–12. All simple setae heavy and usually with long serrations. I-Leg-4 solenidion and eupathidium equal in length, I-Leg-5 with subequal long proximal solenidia and short distal eupathidium, I-Leg-6 de = ds; II-Leg-4 solenidion longer than eupathidium, II-Leg-5 with unequal proximal solenidia, II-Leg-6 solenidion is proximal and eupathidium is submedial; III-Leg-4 proximal solenidion longer than III-Leg-5 solenidion.

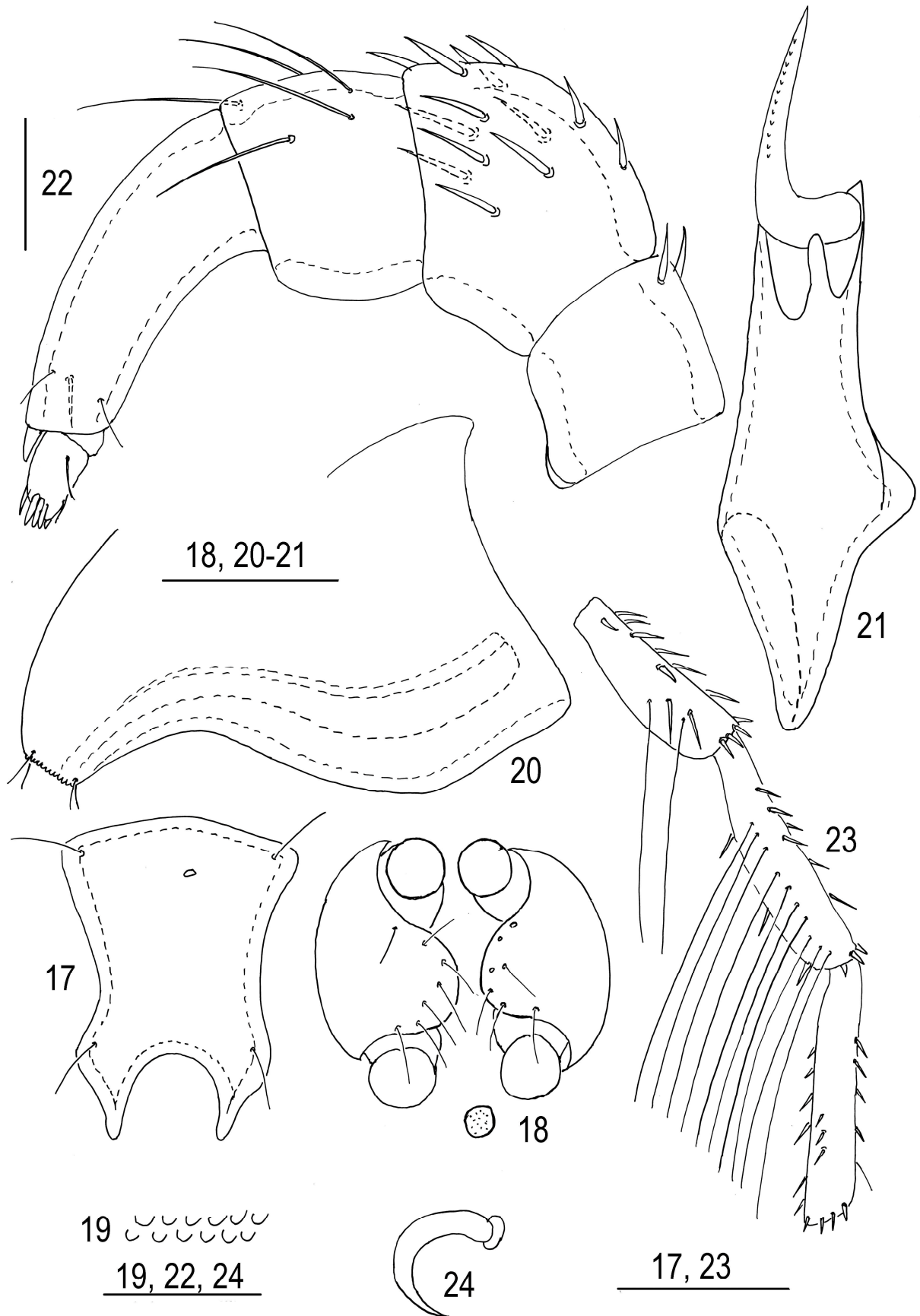
Empodium large and crescent on all tarsi, ambulacra I (figure 13) shorter than ambulacra II and III (figure 14).

Measurements, n=10. Dorsal plate L 41–48, W 51–58; setae *Fch* L 25–32, setae *Fp* L 44–52, setae *Vi* L 32–38, setae *Oi* L 10–13, setae *Oe*, *Hi*, *He*, *Sci*, *Sce*, *Li*, *Le* and *Si* L 28–32; setae *Ci*, *Se*, *Pi*, *Pe* 16–19; setae *Ai* and *Ae* 13–15; distance between setae *Vi*–*Vi* 40–45, distance between setae *Oi*–*Oi* 15–23; excretory pore plate L 9–11, W 12–16; urstigma L 5–7, W 8–12; basal segments of chelicerae L 85–99, cheliceral stylet L 21–26; strips on basal segment of chelicera W 2.5–4.0, distance between strips on basal segment of chelicera 2.5–5.0; pedipalpal segments (P–1–5) L: 6–8, 26–32, 17–26, 13–19, 9–13; legs segments L: I-Leg-1–6: 21–26, 16–19, 13–16, 22–29, 27–35, 53–64; II-Leg-1–6: 22–25, 12–19, 10–14, 16–18, 26–32, 41–48; III-Leg-1–6: 24–30, 12–16, 9–14, 17–23, 27–33, 41–48; de1= 6-8, ds1-6-8; de2= 20-24, ds2= 6-10.

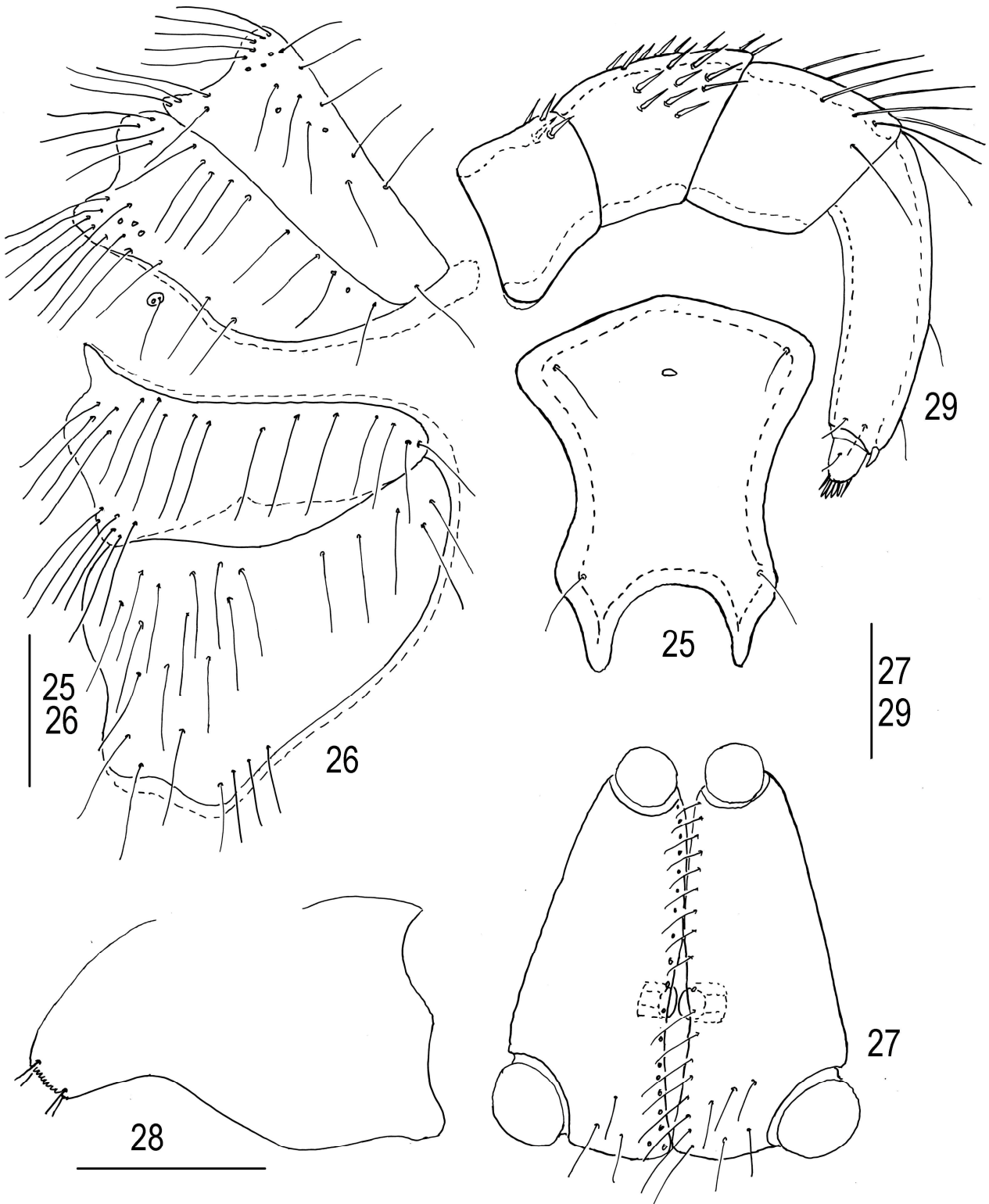


Figures 15–16. *Hydryphantes hellichithon* Thon, 1899, deutonymph: 16 – dorsal view, 17 – ventral view. Scale bar: 50 μ m.

Deutonymph. Color red. Idiosoma oval and some what flattened dorsoventrally. Trichobothria *Fp*, *Oi* and setae *Pi* not associated with glandularia, other idiosomal setae associated with glandularia (figures 15-16). Frontal plate (figure 17) elongate (L/W ratio 1.18–1.30), anterior margin obtuse-angled or slightly convex, posterior margin concave, posterior projections rather long, their length equal to 1/3-1/4 length of basal portion of plate; frontal eye situated posterior trichobothria *Fp*. Coxal plates in four groups, all coxal plates with a few fine setae each. Coxal plates I+II with small subcutaneous posteromedial extension on each side. Genital field (figure 18) with two pairs of acetabula and six to eight pairs of thin setae; anterior and posterior pairs of acetabula subequal. Excretory pore surrounded by sclerotized ring. Integument with short papillae distally rounded (figure 19).



Figures 17–24. *Hydryphantes hellichi* Thon, 1899, deutonymph: 17 – frontal plate; 18 – genital field; 19 – fragment of integument; 20 – capitulum; 21 – chelicera; 22 – pedipalp; 23 - II-Leg-4-5; 24 – claw. Scale bars: 17, 23 = 200 μm , 18, 20-21 = 100 μm , 19, 22, 24 = 50 μm .



Figures 25–29. *Hydryphantes hellichi* Thon, 1899, adults: 25 - frontal plate; 26 - coxal plates; 27 - genital field; 28 - capitulum; 29 - pedipalp. Scale bars: 25–26, 28 = 200 μ m, 27, 29 = 100 μ m.

Capitulum (figure 20) with long rostrum (base of capitulum/rostrum L ratio 2.2-3.0) and convex basal part. Chelicera (figures 21) rather slender, basal segment with large dorsal hump near middle, cheliceral stylet moderately long. Pedipalp compact (figures 22): P-1 with one to two setae, P-2 with 10-13 short, thick setae, P-3 with four to six long, thin setae; P-4 slightly tapering distally, with three distal setae and short, thick dorsodistal spine.

II-Leg-4-5 (figures 23) and III/IV-Leg-3-5 with long swimming setae. Number of swimming setae: II-Leg-4-5, 0-2, 9-14; III-Leg-3-5, 2-3, 6-9, 9-14; IV-Leg-3-5, 3-4, 9-13, 10-14. All legs with simple hook-like claws (figure 24).

Measurements (n=4). Idiosoma L 1000-1250; coxal plates I+II L 175-190, W 200-210; Coxal plates III+IV L 250-285, W 210-240; genital plate L 78-100, W 42-66; anterior genital acetabula D 30-33, posterior genital acetabula D 35-38; capitulum L 215-240; chelicera L 210-240, cheliceral stylet L 95-115; pedipalpal segments (P-1-5) L: 50-57, 100-135, 55-72, 130-150, 24-30; leg segments L: I-Leg-1-6: 75-90, 85-115, 85-115, 135-165, 160-200, 185-215; II-Leg-1-6: 75-90, 85-115, 115-140, 185-225, 215-275, 250-290; III-Leg-1-6: 75-90, 85-115, 100-145, 185-250, 225-290, 250-295; IV-Leg-1-6: 150-165, 125-165, 160-215, 210-340, 260-340, 250-300.

Adults. Males and females are similar to deutonymph, but differ in structure of external genital organs, large sizes, number of idiosomal glandularia (setae *Pi* associated with glandularia) and by more numerous setae on all segments of appendages. Males and females do not exhibit external sexual dimorphism, but mature females larger than males.

Frontal shield (figure 25) elongate (L/W ratio 1.17-1.35), anterior margin convex, lateral margins concave, posterior projections rather long. Median eye small and situated almost at level of anterior setae. All coxal plates with numerous setae (figures 26).

Genital field (figure 27) with three pairs of acetabula and of thin setae; anterior pair of acetabula large than second pair but slightly smaller than posterior pairs of acetabula.

Acetabular plate elongate (L/W ratio 2.0-2.5), with 20-30 pairs medial setae.

Capitulum (figures 28) with long rostrum (base of capitulum/rostrum L ratio 2.0-2.7) and convex basal part. Pedipalp compact (Fig. 29): P-1 with 3-4 dorsodistal setae; P-2 with 13-18 setae; P-3 with 7-10 setae; P-4 slender with four thin setae and short, thick dorsodistal spine.

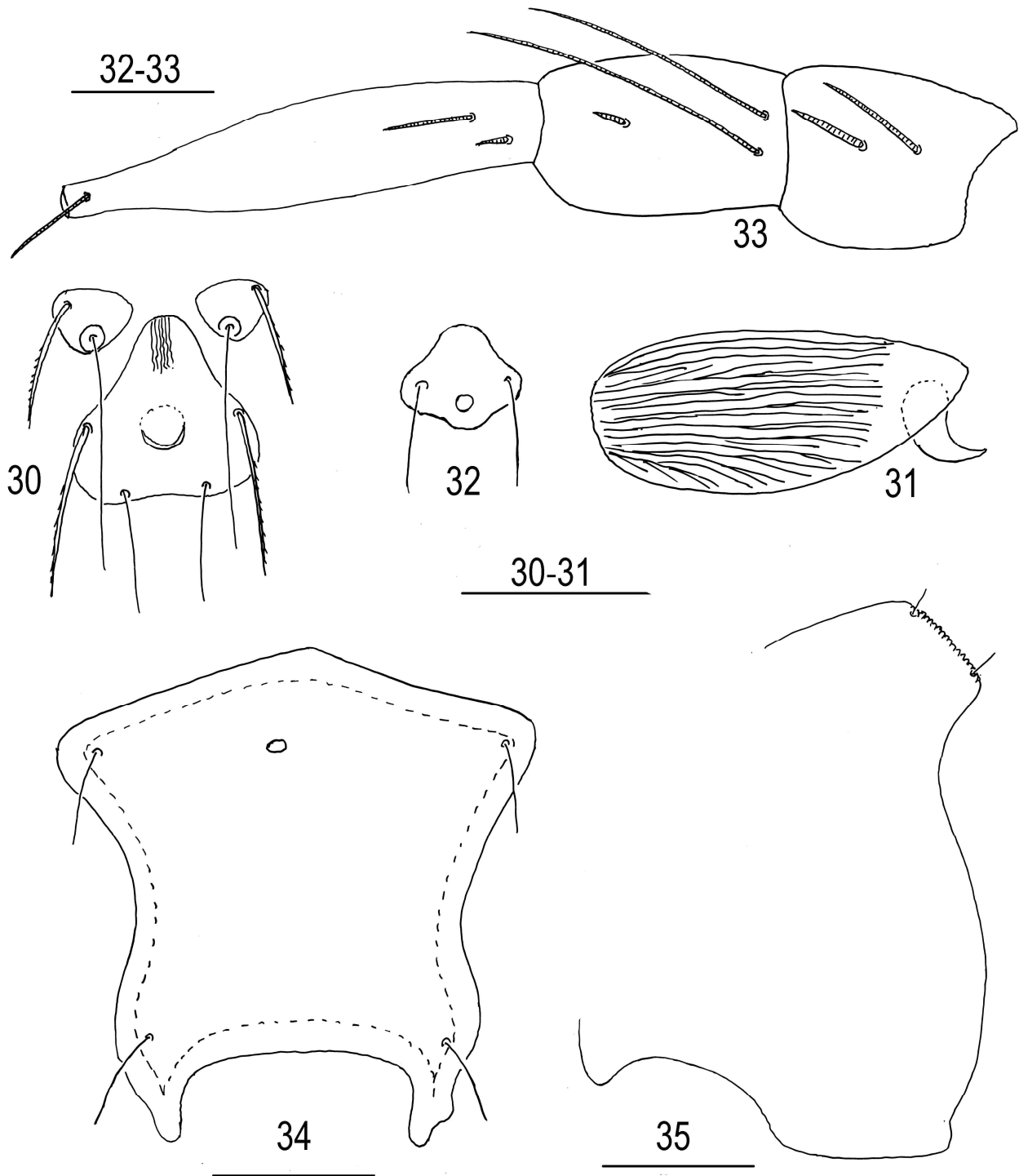
Number of swimming setae: II-Leg-4-5, 3-6, 16-20; III-Leg-3-5, 0-4, 13-20, 17-28; IV-Leg-3-5, 3-8, 20-27, 20-26.

Measurements, female (n=7). Idiosoma L 1600-2070; dorsal plate L 535-570, W 410-465; genital flaps L 275-315, W 135-150; genital acetabula (ac.1-ac. 3) D 50-60, 35-40, 60-75; capitulum L 400-460, rostrum L 110-125, chelicera total L 525-590, cheliceral stylet L 175-200; pedipalpal segments (P-1-5) L: 90-100, 175-190, 110-125, 235-255, 37-50; legs segments L: I-Leg-1-6: 110-150, 150-165, 175-215, 260-300, 310-350, 310-365; II-Leg-1-6: 125-150, 150-180, 210-250, 360-425, 410-475, 410-475; III-Leg-1-6: 125-140, 160-190, 225-265, 375-450, 425-500, 425-475; IV-Leg-1-6: 235-265, 250-265, 350-400, 500-590, 500-565, 435-500.

Measurements, male (n=8). Idiosoma L 1400-1570; dorsal plate L 500-560, W 400-420; genital flaps L 260-315, W 120-130; genital acetabula (ac.1-ac.3) D 37-43, 30-35, 50-63; capitulum L 360-400, rostrum L 100-125; chelicera: basal segment L 350-365, cheliceral stylet L 135-165; pedipalpal segments (P-1-5) L: 80-90, 160-175, 110-120, 210-230, 30-38; legs segments L: I-Leg-1-6: 100-125, 125-140, 160-190, 260-290, 325-350, 375-400; II-Leg-1-6: 100-125, 135-140, 210-240, 350-400, 435-465, 475-500; III-Leg-1-6: 125-140, 150-190, 225-250, 360-400, 435-465, 485-515; IV-Leg-1-6: 210-240, 225-250, 325-375, 485-550, 475-525, 485-500

Remarks. The water mite *Hydryphantes hellichi* is similar to *H. ruber* (Geer, 1778). However, clear differences can be found in the morphology of the larva, deutonymph and adults of *H. hellichi* compared with the latter species. *Hydryphantes hellichi* differs from *H. ruber* by the following characters (character states of the larva, deutonymph and adults are given in parenthesis): **larva:** the distance between bases of trichobothria *Oi* larger than their length, Fig. 1 (smaller than their length, Fig. 30), the basal segments of chelicerae with wide strips, Fig. 8 (with narrow strips, Fig. 31), excretory pore plate wider than long, figures 3-6 (as long as wide, Fig. 32), I-Leg-4 solenidion and eupathidium equal in length, Fig. 10 (solenidion longer than eupathidium, Fig. 33), I-Leg-6 $de=ds$ (I-Leg-6 $de < ds$); **deutonymph and adults:** the frontal plate elongate with rather long posterior projections, Figs. 15, 17, 25 (subquadrate, with short posterior projections, Fig. 34), the capitulum with long rostrum, Figs. 20, 28 (with relatively short rostrum, Fig. 35).

Thus, the morphology of all active stages of *H. hellichi* clearly differs from that of *H. ruber*, and *H. hellichi* should be treated as a separate species.



Figures 30–35. *Hydryphantes ruber* (Geer, 1788): 30 – dorsal platelets; 31 – chelicera, dorsal view; 32– excretory pore plate; 33 – I-Leg-4–6, simple setae are not shown; 34 – frontal plate; 35 – capitulum, lateral view; 30–33 – larva, 34–35 – female. Scale bars: 30–31 = 50 μm , 32–33 = 20 μm , 34 = 200 μm , 35 = 100 μm .

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