

ON THE SYSTEMATICS OF THE WATER MITE *PIONA RECURVA* LUNDBLAD, 1920 (ACARI: HYDRACHNIDIA, PIONIDAE)

P.V. Tuzovskij

[Тузовский П.В. К систематике водяного клеща *Piona recurva* Lundblad, 1920 (Acari: Hydrachnidia, Pionidae)]
Institute for Biology of Inland Waters of the Russian Academy of Sciences, Borok, Nekouz District, Yaroslavl Province, 152742, Russia. E-mail: tuz@ibiw.yaroslavl.ru

Институт биологии внутренних вод РАН, Борок, Некоузский район, Ярославская область, 152742, Россия. E-mail: tuz@ibiw.yaroslavl.ru

Key words: water mite, Pionidae, *Piona recurva*, acarology, taxonomy, morphology, larva, deutonymph, Russia

Ключевые слова: водяной клещ, *Piona recurva*, акарология, таксономия, морфология, личинка, дейтонимфа, Россия

Summary: The first illustrated description of the larva and deutonymph, and the redescription of female and male of the water mite *Piona recurva* Lundblad, 1920 are given.

Резюме: Представлены первое иллюстрированное описание личинки и дейтонимфы и переописание самки и самца водяного клеща *Piona recurva* Lundblad, 1920.

INTRODUCTION

The water mite *Piona recurva* Lundblad, 1920 has been known only from male and female. Lundblad [1920] originally described this species as a form of the water mite *Piona coccinea* (Koch, 1836), K.H. Viets [1956] considered it as a subspecies (*P. coccinea recurva*), and K.O. Viets [1987] as a full species (*P. recurva*). Known descriptions of the adult mites [Lundblad, 1920; Sokolow, 1940] are short and insufficiently illustrated. The purpose of this paper is to describe the larva and deutonymph, and to redescribe the adults of the water mite *Piona recurva*.

MATERIALS AND METHODS

Specimens were collected by the author in the Volga River basin. The material (adults and deutonymph) was sampled with a common hand net with 250 µm mesh size. Specimens were not fixed in Koenike liquid, but slides were made from the fresh material. All mites were mounted in Hoyer's medium. To obtain larvae, water mites were maintained in laboratory conditions. Eggs and larvae obtained from females were kept individually in glass or transparent plastic vessels of 10–15 mm in diameter, and a height of 15 mm.

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, *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–1–5 (for larvae), first leg, segments 1–5 (trochanter, femur, genu, tibia and tarsus); I–Leg–1–6 (for deutonymph and adult), first leg, segments 1–6 (trochanter, basifemur, telofemur, genu, tibia and tarsus) i.e. III–Leg–1 = trochanter of third leg; C1 – coxal setae located posteromedially on coxa I, C2 – coxal seta located posterolaterally on coxa I, C3 – coxal seta located posterolaterally on coxa II, C4 – coxal seta located anteriorly on coxa III, s – solenidion, ac – acanthoid seta; L – length; W – width, n = number of specimens measured; all measurements are given in µm. IBIW – the Institute for Biology of Inland Waters of the Russian Academies of Sciences (Borok, Yaroslavl Province, Russia).

Family Pionidae Thor, 1900

Genus *Piona* Koch, 1842

Piona recurva Lundblad, 1920

(Figs 1–31)

Material examined. 13 females, 6 males, 3 deutonymphs, and 49 larvae reared in laboratory (IBIW): Russia, Yaroslavl Province, Nekouz District, Rybinsk Reservoir near settlement Borok, July–August 2002, 2014, P.V. Tuzovskij.

Female. Idiosoma oval, integument soft and striated. Dorsum with two small elongated platelets, ratio L/W 2.1–2.6 (Fig. 1). The number and position of idiosomal setae typical for the genus *Piona*. All dorsal setae thin and approximately equal in length, but setae *Fch* (Fig. 2) thicker and shorter than other idiosomal setae associated with glandularia (Fig. 3) and trichobothria (Fig. 4). Coxae of legs (Fig. 5) cover about half ventral surface in mature specimens. Anterior coxal plates with short apodemes. Sclerites bearing setae *Hv* free and located between anterior

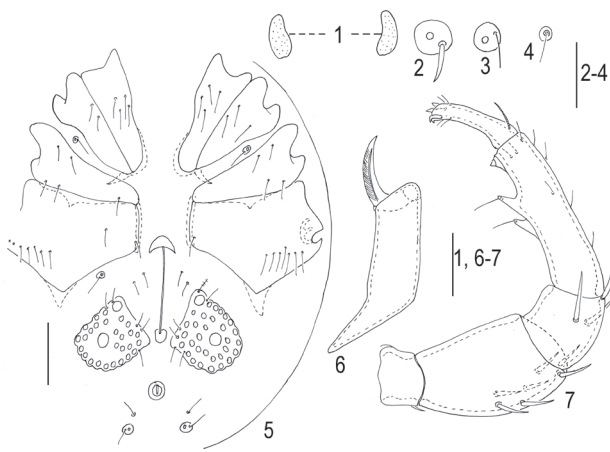


Fig. 1-7. *Piona recurva* Lundblad, 1920, female: **1** – dorsal plates; **2** – seta *Fch*; **3** – seta with glandularia; **4** – trichobothria *Oi*; **5** – coxal plates and genital field; **6** – chelicera, **7** – pedipalp, lateral view. Scale bars: **1, 6-7** = 100 μm ; **2-4** = 50 μm ; **5** = 200 μm

and posterior coxal groups. Suture line between coxal plates III and IV complete. Medial margin of coxal plate IV 2.0–2.6 times longer than medial margin of coxal plate III. Posterior margins of coxal plate IV forming right or acute angle, apodeme slightly developed. Acetabular plates shorter than genital opening, with straight or slightly concave medial margin, 22–40 pairs of genital acetabula, two pairs of which larger than others, all acetabula located on the plates; one to two setae located anteromedially and two to four setae located posteromedially on each plate; in addition, two (rarely three) pairs of genital setae are located in integument between acetabular plates and pregenital sclerite. Excretory pore surrounded by narrow sclerotized ring and placed anterior to setae *Pi*.

Chelicera (Fig. 6) with large basal segment and short crescent stylet. Surface of basal segments punctuated.

Pedipalp slender (Fig. 7): P-1 short, with single short dorsodistal seta; P-2 large, with straight ventral margin and bearing six to eight dorsal setae; P-3 with three short subequal setae, base of lateral seta located distally middle of segment; P-4 slender, both ventral setae located on small conical unequal tubercles which are well separated, distoventral spine short and directed ventrally; P-5 with proximal solenidion, five thin setae and four thick distal spines.

Legs 6-segmented slender; I-Leg-4 with one swimming seta, I-Leg-5 with three to five short swimming setae (Fig. 8); Legs II-IV with long swimming setae, their number as following: four to five on II-Leg-4, 7–10 on II-Leg-5, six to eight on III-Leg-4, 9–13 on III-Leg-5, five to eight on IV-Leg-4, 7–13 on IV-Leg-5; IV-Leg-6 with four to six thick setae (Fig. 9). Claws with long external and short internal clawlets, lamella with convex ventral margin (Fig. 10).

Measurements (n=5). Idiosoma L 1080–1690; acetabular plates L 160–190, W 175–200; cheliceral

segments: base L 325–350, stylet L 120–130; pedipalp segments (P-1-5) L: 60–65, 230–265, 105–125, 240–270, 125–140; leg segments L: I-Leg-1-6: 90–110, 150–180, 165–180, 245–290, 275–300; II-Leg-1-6: 100–115, 155–175, 180–210, 285–325, 345–405, 285–340; III-Leg-1-6: 120–135, 165–190, 185–210, 300–330, 370–420, 290–355; IV-Leg-1-6: 170–215, 165–210, 240–275, 350–420, 395–450, 285–340.

Male. Dorsum, chelicerae and pedipalp similar to those of the female. Coxal plates in three groups, anterior coxal groups free with short apodemes, posterior coxal groups fused to each medially (Fig. 11). Genital field fused with fourth coxal plates, not extending laterally beyond posterior corner of fourth coxal plates; 20 to 30 genital acetabula on each side, two pairs of which larger than others; genital opening trifoliate, with deep pit and small anteromedian incision. Ejaculatory complex (Fig. 12) with long proximal and short distal arms; proximal chamber large, with a curving, narrow proximal projection, forming three coils. Excretory pore surrounded by narrow sclerotized ring.

Legs 6-segmented; III-Leg-5 much longer than III-Leg-6 (Fig. 13), last expanded distally; IV-Leg-4 (Fig. 14) thick and has a deep concavity bearing numerous unequal spine-like setae, IV-Leg-6 with 5–8 thick setae. I-Leg-4 with one to three, I-Leg-5 with four to seven short swimming setae; legs II-IV with long swimming setae, their number as following: 9–13 on II-Leg-4 and II-Leg-5, 13–15 on III-Leg-5, six to eight on IV-Leg-4; 10–14 on IV-Leg-5. Claws of tarsi I-II and IV similar to female; claws of legs III asymmetric (Fig. 15); large claw with short lamella and three unequal clawlets, very long central hook-shaped, short pointed dorsal et and relatively long ventral with rounded tip; small claw with two pointed clawlets, external clawlet shorter than internal one, last well curved distally.

Measurements (n=5). Idiosoma L 980–1100; dor-

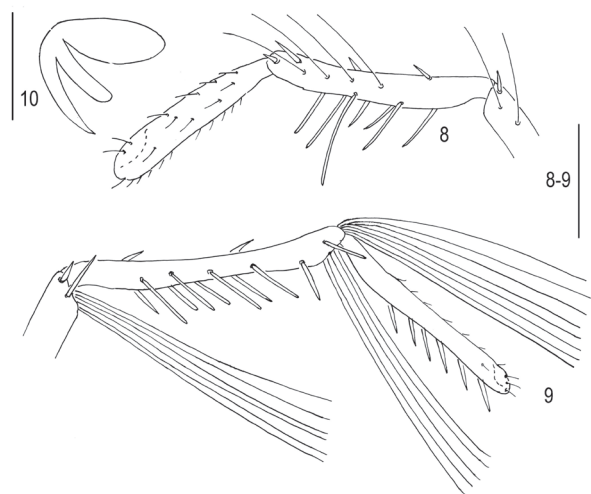


Fig. 8-10. *Piona recurva* Lundblad, 1920, female: **8** – I-Leg-5-6; **9** – IV-Leg-5-6; **10** – claw of leg II. Scale bars: **8-9** = 200 μm ; **10** = 50 μm

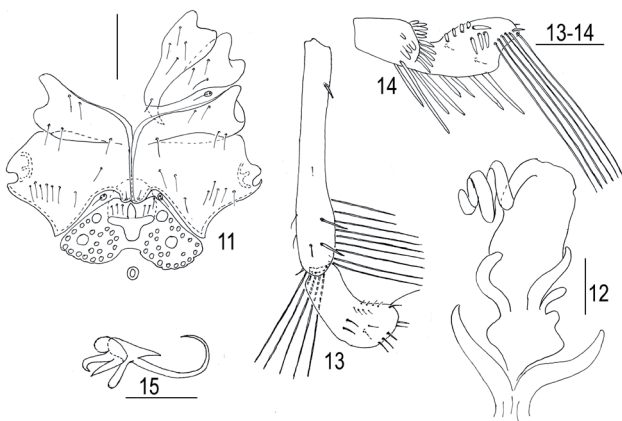


Fig. 11-15. *Piona recurva* Lundblad, 1920, male: **11** – coxal plates and genital field; **12** – III-Leg-5-6; **13** – IV-Leg-4; **14** – ejaculatory complex; **15** – claws of leg III. Scale bars: **11** = 200 μ m; **13-14** = 100 μ m; **12, 15** = 50 μ m

sal platelets L 50-60, W 18-20; acetabular plates L 160-175, W 370-390; cheliceral segments: base L 220-225, stylet L 105-110; pedipalp segments (P-1-5) L: 50-55, 215-230, 105-120, 230-240, 115-120; leg segments L: I-Leg-1-6: 65-90, 140-170, 160-180, 230-260, 300-320, 255-285; II-Leg-1-6: 95-105, 150-170, 170-200, 270-290, 330-360, 260-300; III-Leg-1-6: 75-95, 140-150, 140-150, 225-245, 280-360, 120-140; IV-Leg-1-6: 165-180, 150-170, 125-145, 260-295, 345-370, 275-315.

Deutonymph. Similar to female, differing mainly in smaller size, external structure of genital field and number of setae on appendages. Dorsum with two small dorsal platelets (Fig. 16). Setae *Fch* short, thick (Fig. 17). Coxal plates in four groups (Fig. 18), suture line between coxal plates III and IV complete, posterior apodemes on coxal plates IV short. Gonopore is absent, acetabular plates closed by medial ends, with two subequal acetabula and three thin, short setae; genital sclerite much larger than pregenital sclerite.

Pedipalp stout (Fig. 19): P-1 short, without seta; P-2 large, with concave ventral margin and bearing

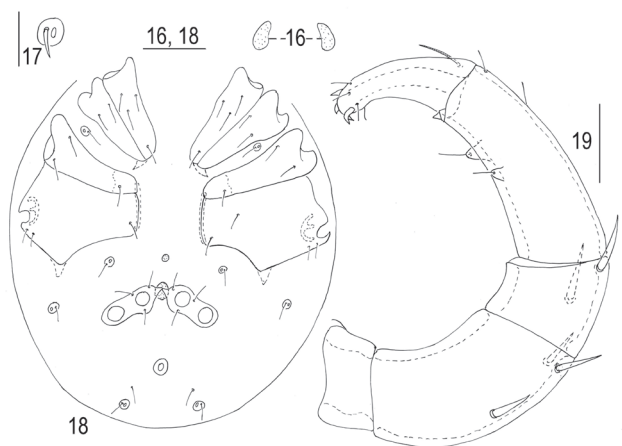


Fig. 16-19. *Piona recurva* Lundblad, 1920, deutonymph: **16** – dorsal platelets; **17** – seta *Fch*; **18** – idiosoma, ventral view; **19** – pedipalp. Scale bars: **16, 18** = 100 μ m; **17, 19** = 50 μ m

three subequal dorsal setae; P-3 with two short unequal setae, base of lateral seta located near to middle of segment; P-4 with slightly concave ventral margin, ventral setae located on small unequal tubercles which well separated, distoventral spine short, pointed; P-5 with concave ventral margin, proximal solenidium, four short thin setae and four thick distal spines.

Legs slender, I-Leg-4 without swimming setae, I-Leg-5 with two short swimming setae. Legs II-IV with long swimming setae, their number as following: one to two on II-Leg-4, four to five on II-Leg-5 and III-Leg-5, five to six on IV-Leg-5.

Measurements (n=3). Idiosoma L 680-875; acetabular plates L 95-100, W 55-60; cheliceral segments: base L 130-140, stylet L 39-42; pedipalp segments (P-1-5) L: 26-35, 108-105, 60-63, 108-120,

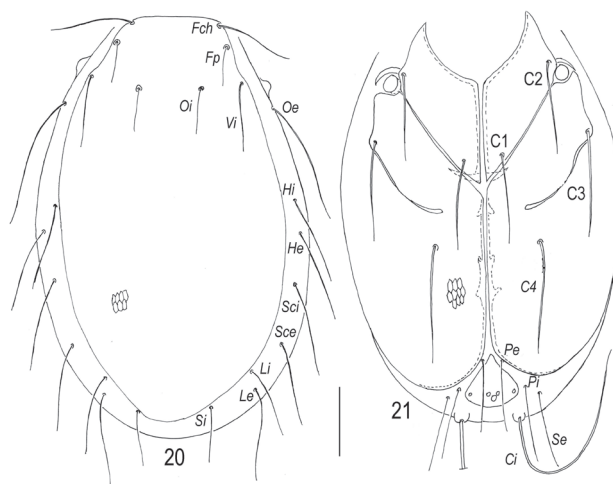


Fig. 20-21. *Piona recurva* Lundblad, 1920, larva: **20** – dorsal view; **21** – ventral view. Scale bar: 50 μ m

72-78; leg segments L: I-Leg-1-6: 40-50, 75-95, 75-90, 108-120, 150-160, 135-150; II-Leg-1-6: 45-52, 75-90, 85-90, 130-145, 180-190, 140-155; III-Leg-1-6: 50-60, 80-90, 90-97, 135-145, 190-210, 160-175; IV-Leg-1-6: 90-95, 95-105, 115-125, 165-180, 210-225, 160-170.

Larva. Idiosoma flat, dorsal plate in unengorged larvae covering almost the whole dorsum (Fig. 20), with slightly convex lateral margins, its anterior margin straight or slightly convex, posterior margin rounded, with short and punctuate scale-like patterns; setae *Fch* longer than *Vi*, trichobothria *Fp* and *Oi* relatively short and subequal. Setae *Oe*, *Hi*, *He*, *Sci*, *Sce*, *Li*, *Le* and *Si* situated in soft membrane, *Oe* longest, *Si* shortest; *Hi*, *He*, *Sci*, *Sce* and *Le* moderate in length.

Coxal plates (Fig. 21) moderately large and elongate, first plates with short pointed apodemes directed laterally, plates II-III with a rudimentary apodeme on each side. Setae C1 relatively short, reaching or slightly extending beyond bases of C4; the latter setae slightly longer than C2 and C3, but not reaching to posterior margin of coxal plates III. Setae *Ci* very

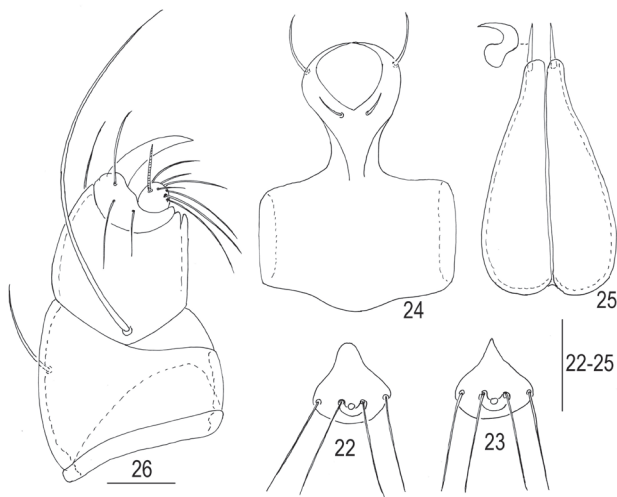


Fig. 22-26. *Piona recurva* Lundblad, 1920, larva: 22-23 – excretory pore plate; 24 – capitulum; 25 – chelicerae, dorsal view; 26 – pedipalp, lateral view. Scale bars: 22-25 = 50 μ m, 26 = 50 μ m

long thickened, located on small tubercles. Setae *Se*, *Pe* and *Pi* moderate in length. Excretory pore plate (Figs 22-23) triangular (L/W ratio 1.0-1.05) with convex posterior margin; setae *Ai* and *Ae* subequal and forming true transverse row; bases of *Ai* close to each other, located anteriorly to excretory pore; distance between setae *Ae*-*Ae* almost three times longer than distance between *Ai*-*Ai*.

Capitulum (Fig. 24) with wide base and relatively narrow rostrum, anterior hypostomal setae longer than posterior ones. Basal segments of chelicerae (Fig. 25) fused to each other medially, longer than wide, expanded proximally and tapering distally; cheliceral stylets small, crescent-shaped.

Pedipalps short and stocky (Fig. 26): P-1 short and without seta; P-2 large, with slightly convex dorsal margin and single dorsal seta near middle of segment; P-3 with very long, thick lateroproximal seta and relatively short dorsodistal one; P-4 with three unequal setae and large dorsodistal claw; P-5 small, with short solenidion, three long and four short unequal simple setae.

Legs 5-segmented, shape and arrangement of setae on legs segments as shown in Figs 27-29. Total number of leg setae, excluding eupathidia, as follows (specialized setae indicated in parentheses): I-Leg-1-5: 1, 7, 5 (s), 11 (2s), 13 (s, ac); II-Leg-1-5: 1, 7, 5 (s), 11 (2s), 13 (s, ac); III-Leg-1-5: 1, 6, 5 (s), 10 (s), 12 (ac). Number of thickened distal setae from trochanter to tarsus: I-Leg: 0, 1, 0, 1, 0; II-Leg: 0, 1, 2, 2, 0; III-Leg: 0, 2, 3, 4, 0. I-Leg-1 with relatively short seta, II-Leg-1 and III-Leg-1 each with long seta. Solenidion on I-Leg-3 and II-Leg-3 longer than solenidion on III-Leg-3; I-Leg-4 and II-Leg-4 with unequal dorsodistal solenidia; III-Leg-3 and III-Leg-4 with subequal solenidia. Acanthoid seta comparatively long and setose, located distally on tarsus of all

legs. Lateral claws and empodial claw nearly equal in length, but lateral claws less heavy than empodial claw; empodial claw I-II well curved (Fig. 30), empodial claw III slightly curved (Fig. 31).

Measurements, n=10. Dorsal plate L 305-325, W 165-175; setae *Fch* and *Vi* L 39-43, setae *Fp* and *Oi* L 28-32; setae *L Oe* 95-105; setae *Hi*, *He*, *Sci*, *Sc*, *Li* L 50-60, setae *Le* L 55-65, setae *Si* L 32-35; setae *Se* L 60-65, setae *Ci* L 155-165, setae *Pi* and *Pe* L 50-60, setae *Ai* and *Ae* L 45-48; setae C1 L 55-60, setae C2 L 65-73, setae C3 L 90-96, setae C4 L 95-100; medial edge of coxa I L 85-87, medial edges of coxae II-III L 128-130; excretory pore plate L 32-42, W 32-40; cheliceral segments: base L 67-70, stylet L 22-24; pedipalpal segments (P-1-5) L: 6-9, 41-45, 32-41, 12-14, 9-10; legs segments L: I-Leg-1-5: 32-35, 48-52, 54-58, 67-74, 75-80; II-Leg-1-5: 44-46, 48-51, 55-58, 80-84, 95-100; III-Leg-1-5: 47-49, 48-52, 55-60, 80-85, 105-115.

Habitat. Lakes, reservoirs, canals, slow running waters, ponds.

Distribution. Europe: Sweden, Denmark, Germany, Ireland, Holland [Lundblad, 1968], Russia: Karelia [Sokolow, 1940] and Upper Volga [Tuzovskij, 1996].

Remarks. Biesiadka [1977] synonymized *Piona coccinea* var. *recurva*, *P. coccinea* f. *imminuta* and other forms or subspecies of the group "coccinea"

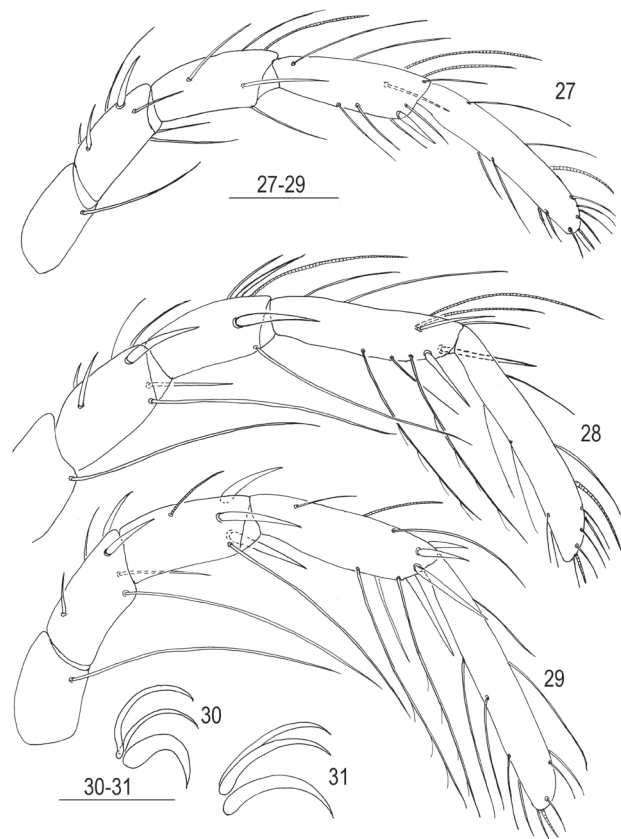


Fig. 27-31. *Piona recurva* Lundblad, 1920, larva: 27 – leg I; 28 – leg II; 29 – leg III; 30 – claws of leg I; 31 – claws of leg III. Scale bars: 27-29 = 50 μ m, 30-31 = 20 μ m

with *P. coccinea* (Koch, 1836) without taking in consideration their larval morphology. Davids & Kouwets [1987] described the larva and consider *P. coccinea* f. *imminuta* as a separate species (*P. imminuta*), and synonymized with this species the following sub-specific taxa: *recurva*, *gracilipalpis* and *confertipora*, again without taking in consideration their larval morphology. Nonetheless, having reared the larvae, I could establish differences between the larvae of *P. recurva* and *P. imminuta*.

The larva of *P. recurva* differs from that of *P. imminuta* (Piersig, 1897) by the following characters (character states of larva *P. imminuta* follow Davids & Kouwets [1987] and are indicated in parenthesis): the excretory pore plate as long as wide, Figs 22-23 (wider than long), II-Leg 4 with 11 setae, Fig. 28 (with 10 setae), II-Leg-4/5 with two heavy distal setae each (with single heavy distal seta each), the basal segments of chelicerae (Fig. 25) and the excretory pore plate without a reticulation (with a reticulation), the lateral claws and empodial claw in all legs subequal in length, Figs 30-31 (the lateral caws longer than the empodial claw).

Adult mites of these species well differ by a structure of the first legs; I-Leg-4/5 in *P. recurva* with the swimming setae, Fig. 8; while in *P. imminuta* I-Leg-4/5 without a swimming setae (H. Smit, pers. comm.).

Thus, *P. recurva* should be treated as a separate species.

ACKNOWLEDGEMENTS

The author is grateful to Dr. Harry Smit (The

Netherlands) for the information on morphology of terminal segments of the first legs in adults of the water mite *Piona imminuta*.

REFERENCES

- Biesiadka E., 1977. Sur la position systématique de *Piona coccinea* (Koch, 1836) et *Piona stjördalensis* (Thor, 1897) // Bulletin de l'Académie polonaise des sciences: Série des sciences biologiques. Cl. II. Vol. 24, No 12. P. 735-740.
- Lundblad O., 1920. Süßwasseracarinen aus Dänemark // Mém. Acad. Sci. lettr. Dänemark, Copenhague. Sect. sci. (s.8), Bd. 6 (2). S. 133-258.
- Lundblad O., 1968. Die Hydracarinen Schwedens. III // Arkiv för Zoologi, 21(1). S. 1-633.
- Sokolow I.I., 1940. Hydracarina – vodyanye kleshchi. Chast' I. Hydrachnellae. Fauna SSSR (novaya seriya No 20. Paukoobraznye, 5(2) [Hydracarina – the aquatic mites. Part I. Hydrachnellae. Fauna of the USSR. (nouv. ser., No 20), Arachnides, 5(2)]. Publisher: Nauka, Moscow-Leningrad, P. 1-511 (in Russian).
- Tuzovskij P.V., 1987. Morfologiya i postembrional'noye razvitie vodyanykh kleshchey [Morphology and Postembryonic Development in Water Mites]. Publisher: Nauka, Moscow. 172 p. (in Russian).
- Tuzovskij P.V., 1996. Vodyanye kleshchi Verkhney Volgi [Water mites of the Upper Volga] // Publisher: The Institute of Ecology of the Volga Basin, Tolyatti. 82 p. (in Russian).
- Viets K.H., 1956. Die Milben des Süßwassers und des Meeres. Hydrachnellae et Halacaridae (Acari). Zweiter und dritter Teil: Katalog und Nomenklator. Jena: G. Fischer. S. 1-870.
- Viets, K.O., 1987. Die Milben des Süßwassers (Hydrachnellae und Halacaridae [part.], Acari). 2. Katalog. Sonderbände des Naturwissenschaftlichen Vereins in Hamburg, 8. S. 1-1012.