ON THE SYSTEMATICS OF THE PIONA NODATA AND THE P. COCCINOIDES COMPLEXES IN RUSSIA (ACARI: HYDRACHNIDIA, PIONIDAE) WITH THE DESCRIPTION OF A NEW SPECIES

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ABSTRACT: This study presents a detailed taxonomic review of water mites of the *Piona nodata* and the *P. coccinoides* complexes (Pionidae, *Piona*), found in Russia. The review includes illustrations, descriptions and redescriptions of 11 *Piona* species found in Russia: *Piona accepta* sp. n.; *P. ambigua* (Piersig, 1894); *P. annulata* (Thor, 1901); *P. caucasica* Tuzovskij, 2019; *P. coccinoides* (Thor, 1897); *P. inflata* Sokolow, 1927; *P. laminata* (Thor, 1901); *P. magadanensis* Tuzovskij, 2013; *P. neococcinoides* Tuzovskij, 2019; *P. nodata* (Müller, 1776); and *P. nodatella* Tuzovskij, 2015.

KEY WORDS: Water mite, Pionidae, Piona, morphology, new species, male, female, larva, identification key, Russia.

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INTRODUCTION

Lundblad (1962) studied the following species of the Piona nodata complex in western Europe: P. nodata (Müller, 1776), P. ambigua (Piersig, 1894), P. annulata (Thor, 1901) and P. laminata (Thor, 1901). The species of the P. nodata complex are distinguishable in females only (Smit et al. 2015, Gerecke et al. 2016). In addition, the males of the *P. nodata* complex are very similar to the males of P. coccinoides (Thor, 1897) (Gerecke et al. 2016). In Russia, the P. nodata complex includes the following species: P. accepta sp.n.; P. caucasica Tuzovskij, 2019; P. inflata Sokolow, 1927; P. magadanensis Tuzovskij, 2013; P. nodatella Tuzovskij, 2015. The P. coccinoides complex in Russia includes two species: P. coccinoides (Thor, 1897) and P. neococcinoides Tuzovskij, 2019. The descriptions of the adults of the above species are incomplete and insufficiently illustrated, complicating their identification.

The aim of this paper is to examine the morphology and the (re)descriptions of the males and females of various species belonging to the genus *Piona*, collected in Russia, with the goal of creating an identification key.

MATERIALS AND METHODS

The material was collected by the author in the European and Asian parts of Russia. To obtain larvae, water mites were maintained in laboratory (room temperature, natural day-night) conditions. 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—humeralis 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 (Figs. 1 and 2).

In addition, the following abbreviations are used: P-1–5, pedipalp segments (trochanter, femur, genu, tibia and tarsus); I-Leg-1–5, first leg, segments 1–5 (trochanter, femur, genu, tibia and tarsus), e.g., I-Leg-4—genu of first leg; C1—coxal seta 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; D—diameter; n=number of specimens measured. All measurements are given in micrometers (μ m).

SYSTEMATICS

Family Pionidae Thor, 1900 Genus *Piona* Koch, 1842

Piona accepta sp.n.

(Figs. 1–27)

Type material. Holotype: female, slide 8644, Europe, Russia, Yaroslavl Region, Nekouz District, sedge bog near the settlement of Borok, 6 May 2002, Leg. P. V. Tuzovsky. Paratypes: 13 females, 11 males and 32 larvae from same locality as ho-



Figs. 1–2. Piona accepta sp.n., larva: 1-dorsal view; 2-ventral view. Scale bar: 1 and 2=50 µm.

lotype, May–June 2015, 2017. Larvae were reared from four females; the duration of the embryonic period was 10–15 days.

Diagnosis. Larva. Dorsal shield convex and elongate, setae C2 shorter than C3; excretory pore plate wider than it is long with convex anterior margin; P-4 with three setae, III-Leg-2 with one, III-Leg-4 with four heavy setae; dorsal shield and all coxal plates porous and with reticulation. Adults: dorsum with 2 elongate narrow plates; setae *Fch* long, thick; pedipalp relatively short and compact; P-3 with 3 setae, lateral setae longest, these shorter than dorsal margin of segment, genital field with 9–17 pairs of subequal acetabula.

Male: posterior coxal groups separated but touching distally, 11–15 pairs of acetabula, ejaculatory complex proximal chamber large, with a curving narrow projection, forming 1.5 coils, I/II-Leg-6 distally slightly thickened, I-Leg-5 with three to four swimming setae. **Female:** P-4 slenderer than in male, both setal tubercles small and distinctly separated, genital field with two bowed plates bearing 9–17 pairs of subequal acetabula, in anterior part narrow (1 acetabulum in width), posteriorly with 2–4 acetabula in width, medial margin strongly concave. Legs thin and slender, I/II-Leg-6 not thickened, I-Leg-5 with three swimming setae.

Description. Larva. Idiosoma flat, dorsal plate convex and elongate (L/W ratio 1.3-1.4), covering almost the whole dorsum (Fig. 1), bearing four pairs of setae (Fch, Fp, Vi, Oi) with convex lateral margins, its anterior margin straight or slightly convex, posterior margin rounded; setae Fch slightly shorter than Vi, trichobothria Fp and Oi relatively short and equal in length. Setae Oe, Hi, He, Sci, Sce, Li, Le and Si situated in soft membrane, Oe longest, Si shortest, Hi shorter than He, Sce longer than Sci, and Li longer than Le. Coxal plates (Fig. 2) moderately large and elongate, first plates with short apodemes directed laterally, plates II and III with single rudimentary apodeme near middle of their medial margin on each side. Setae C1 and C2 subequal in length; C4 relatively thick, just short of reaching the posterior margin of coxal plates III and shorter than C3. Setae Ci very long, thickened, located on small tubercles. Setae Pi and Pe subequal in length.

Excretory pore plate (Figs. 3 and 4) wider than it is long (L/W ratio 0.55-0.60) with convex anterior margin and a minute median projection; Piona nodata and P. coccinoides complexes in Russia



Figs. 3–7. *Piona accepta* sp.n., larva: 3–4—excretory pore plate; 5—capitulum, ventral view; 6—chelicera, dorsal view; 7—pedipalp, lateral view. Scale bars: 3–6=50 μm; 7=20 μm.



Figs. 8–12. *Piona accepta* sp.n., larva: 8—Leg I; 9—Leg II; 10—Leg III; 11—claws of leg I; 12—claws of leg III. Scale bars: 8–10=50 µm; 11 and 12=20 µm.

bases of setae *Ai* and *Ae* located near posterior margin of the plate, *Ae* slightly longer than *Ai*. Capitulum (Fig. 5) with wide base and relatively narrow rostrum, anterior hypostomal setae longer than posterior ones. Surface of capitular base porose. Basal segments of chelicerae (Fig. 6) fused to each other medially, expanded proximally and tapering distally, with concave anterior margin. Pedipalps short and stocky (Fig. 7): P-1 short and without seta; P-2 large with slightly convex dorsal



Figs. 13–16. *Piona accepta* sp.n., male: 13—dorsal platelets; 14—seta *Fch*; 15—idiosoma, ventral view; 16—pedipalp, lateral view. Scale bars: 13, 15=100 μm; 14, 16=50 μm.

margin, with a single dorsodistal seta; P-3 shorter than P-2, with very long, thick lateroproximal seta and relatively short dorsodistal one; P-4 short, with three thin setae and large dorsodistal claw; P-5 small, with single rather long solenidion, three unequal long and four relatively short unequal simple setae.

Legs 5-segmented, shape and arrangement of setae on legs segments as shown in Figs. 8-10. Total number of leg setae, excluding eupathidia, as follows (specialized setae indicated in parentheses): I-Leg-1-5: 1, 7, 5(s), 11(2s), 14(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), 11(ac). Number of thickened distal setae from trochanter to tarsus: I-Leg: 0, 1, 1, 1, 0; II-Leg: 0, 1, 2, 3, 0; III-Leg: 0, 1, 2, 4, 0. I-Leg-1 with relatively short seta, II/III-Leg-1 each with long seta. Solenidion or solenidia on I/II-Leg-3/4 located dorsodistally, solenidion on III-Leg-3/4 and II-Leg-5 located a little dorsodistally to middle of these segments; I/II-Leg-4 with subequal solenidia. Acanthoid seta comparatively short and setose, located distally on tarsi of all legs. Empodial claw

a little longer and thicker than lateral claws on tarsi of all legs (Figs. 11 and 12).

Measurements, n=10. Dorsal plate L 260–275, W 190–205; setae Fch L 48–51, setae Vi L 63–67, setae Fp and Oi L 28-33; setae L Oe 90-96; setae Hi and Sci L 54-60, setae He and Sce L 75-87, setae Li L 60-65, setae Le and Se L 70-85; setae *Si* L 35–40; setae *Ci* L 115–130, setae *Pi* L 48–52, *Pe* L 41–48; setae *Ai* L 28–32; setae *Ae* L 35–38; setae C1 L 55-65, setae C2 L 60-75, setae C3 L 95-115, setae C4 L 80-90; medial edge of coxa I L 75–80, medial edges of coxae II+III L 115–120; urstigma D 16–19; excretory pore plate L 19–22, W 35-40; cheliceral segments: base L 67-80, chela L 16-19; pedipalpal segments (P-1-5) L: 6-9, 32-35, 25-30, 9-10, 6-7; leg segments L: I-Leg-1-5: 32-40, 28-35, 40-42, 504-56, 67-72; II-Leg-1-5: 32-42, 35-39, 38-42, 57-65, 83-90; III-Leg-1-5: 41-45, 38-45, 41-45, 57-65, 85-93.

Both sexes. Color red to dark brown. Idiosoma oval, integument soft and smooth. Dorsum with two relatively long narrow platelets (Fig. 13). All dorsal setae thin and approximately equal in length,



Figs. 17–22. *Piona accepta* sp.n., male: 17—ejaculatory complex; 18—I-Leg-5–6; 19—III-Leg-5–6; 20—IV-Leg-4–6; 21—claw of leg I; 22—claws of leg III. Scale bars: 17–20=100 μm; 21 and 22=50 μm.

but setae *Fch* (Fig. 14) longer and thicker than other idiosomal setae associated with glandularia and trichobothria. Excretory pore surrounded by narrow sclerotizing ring (occasionally in immature specimens only anterior and posterior sclerites present) and situated anteriorly to flanking setae (*Pi* and *Ci*). Capitulum with short anchoral process, P-2 ventral margin straight or slightly convex, P-3 with three short subequal setae, P-4 with sexual dimorphism. I-Leg-4/5 with three swimming setae.

Male. Anterior coxal groups separated, with short apodemes (Fig. 15). Sclerites bearing glandularia and setae *Hv* not fused with posterior margin of coxal plates II. Coxal plates III separated, interspace between sclerotized. Coxal plates IV separated but touching distally. Suture line between third and fourth coxal plates incomplete, obliterated medially. Genital field fused to posterior coxal plates and extending a little beyond postero-lateral projections of Cx-IV. Gonopore trapezoidal in shape, with small median incision anteromedially, genital pit deep, 11–15 acetabula and 4–5 thin setae on each side. Pedipalp (Fig. 16) compact: P-1 short, with single short dorsodistal seta; P-2 large, with straight or slightly convex ventral margin and

five short subequal dorsal setae; P-3 with three unequal setae, lateral seta located near middle of segment; P-4 with two distinct setal tubercles, lying behind each other, ventrodistal peg-like seta short and directed anteroventrally.

Ejaculatory complex with moderately long proximal and distal arms, proximal chamber large, with a curving narrow proximal projection, forming 1.5 coils (Fig. 17). I/II-Leg-5/6 slightly thickened distally (Fig. 18); III-Leg-5 longer than III-Leg-6 and club-shaped (Fig. 19); IV-Leg-4 thick, with a deep concavity bearing numerous unequal thick setae, IV-Leg-5 narrowed in anterior two third and expanded distally, IV-Leg-6 thin, with three to four thick, long setae (Fig. 20). Number of swimming setae as follows: three (occasionally four) on I-Leg-4/5; five to six on II-Leg-4, four to seven on II-Leg-4; two to three on III-Leg-4; three to five on III-Leg-5; three on IV-Leg-4, and six to nine on IV-Leg-5. Claws of tarsi I and II relatively large, with two subequal in length clawlets, internal clawlet thicker than external one; claw blade with equally convex ventral margin (Fig. 21). Claws of legs III (Fig. 22) asymmetrical: large claw with thick, long straight dorsal clawlet and a relatively



Figs. 23–27. *Piona accepta* sp.n., female: 23—ventral view; 24—pedipalp; 25-27—genital plate. Scale bars: 23=200 μm; 24=100 μm; 25–27=50–μm.

short, thin ventral clawlet; small claw with relatively thin internal clawlets and comparatively thick external clawlet.

Measurements (n=10). Idiosoma L 750–850; dorsal plates L 75–90, W 17–19; seta *Fch* 60–70; cheliceral segments L: base 180–200, chela 55–60; pedipalp segments (P-1–5) L: 42–50, 125–150, 65–75, 115–125, 50–55; leg segments L: I-Leg-1–6: 75–85, 110–120, 130–140, 185–195, 185–215, 225–240; II-Leg-1–6: 75–85, 110–120, 150–160, 210–220, 205–225, 225–250; III-Leg-1–6: 85–115, 110–125, 125–140, 235–250, 270–280, 200–215; IV-Leg-1–6: 135–150, 115–140, 125–135, 200– 225, 235–265, 205–230.

Female. Dorsum similar that of the male. All coxal groups (Fig. 23) separated and cover about half of the ventral surface in mature specimens. Medial margin of coxal plate IV 2.0–3.0 times longer than medial margin of coxal plate III. Posterior margins of coxal plates IV form right or obtuse angles, apodemes moderately developed. Pedipalp (Fig. 24) similar as in the male, but P-4 slenderer than in male, both setal tubercles small and distinctly separated. Genital field with two bowed

plates bearing 9–17 pairs of subequal acetabula, in anterior part narrow (1 acetabulum in width), posteriorly with 2–4 acetabula in width, medial margin strongly concave (Figs. 25–27). Legs thin and slender, I/II-Leg-6 not thickened. Number of swimming setae as follows: three on I-Leg-4/5, four to six on II-Leg-4/5, five to six on III-Leg-4/5; five on IV-Leg-4, six to eight on IV-Leg-5.

Measurements (n=10). Idiosoma L 900–1,150; dorsal plates L 75–85, W 9–12; seta *Fch* 65–80; cheliceral segments L: base 220–225, chela 60–65; pedipalp segments (P-1–5) L: 48–51, 144–150, 78–85, 140–150, 60–63; leg segments L: I-Leg-1–6: 80–90, 110–125, 135–150, 200–215, 210–225, 250–265; II-Leg-1–6: 80–90, 120–130, 165–175, 225–240, 235–265, 265–290; III-Leg-1–6: 85–100, 125–140, 160–175, 235–250, 260–275, 275–290; IV-Leg-1–6: 135–150, 130–145, 175–190, 250– 265, 250–275, 230–240.

Differential diagnosis. *Piona accepta* sp.n. is similar to *P. magadanensis* Tuzovskij, 2013 but differs in the following characters (character states of adults *P. magadanensis* are indicated in parentheses): **male**: genital opening trapezoidal, wider than it is long, Fig. 15 (equilateral triangle, Fig. 89), genital plates with 11–15 pairs of subequal acetabula (with 23 pairs of acetabula, 2 pairs of which much larger than others), I/II-Leg-6 slightly thickened distally, Fig. 18 (strongly thickened distally, Fig. 92), EC proximal chamber with proximal projection forming 1.5 coils, Fig. 17 (with single incomplete coils, Fig. 90); **female:** genital plates with 9–17 subequal acetabula each, Fig. 23, 25–27 (with 14–25 acetabula each, two pairs of which much larger than others, Fig. 85), basal segment of chelicera large, L 220 (relatively small, L 175-180).

Etymology. The species epithet "*accepta*" (Latin "*acceptus*") designates "pleasant, lovely".

Deutonymph. Unknown.

Habitat. Small temporary standing forest waters, adults during springtime.

Distribution. Europe, Russia: Yaroslavl Region.

Piona ambigua (Piersig, 1894)

1894 *Curvipes ambiguus* Piersig, Zool. Anz. 17: 372

1926 *Piona nodatoides* Sokolow, Rev. Russe Entomol., Leningrad, 20: 171–173

(Figs. 28–33)

I was not able to examine any specimens of *P. ambigua*. The diagnosis of this species is based on reference data (Sokolow 1940, Lundblad 1962, Gerecke *et al.* 2016). Unfortunately, the species description was not presented adequately.

Both sexes. Color yellow grey to red. Idiosoma anteriorly truncate, dorsum with two long, slender platelets (often barely visible). Pedipalp stocky: P-2 ventral margin convex, P-3 ventral margin twice shorter than dorsal margin of segment, P-4 ventral margin straight or slightly convex, setal tubercles lying behind each other, P-5 distal part strongly narrowed (Figs. 28, 32).

Male: Idiosoma length/width 550–650/450– 550. Cx-IV medially fused in their posterior third; genital plates fused to Cx-IV posterior margin, each with 11–15 acetabula, genital pit deep (Fig. 29). Ejaculatory complex with subequal in length proximal and distal arms, proximal chamber large, with a curving narrow proximal projection, forming two coils (Fig. 30). Excretory pore between the associated glandularia. Pedipalp segments (P-1–5) L: 36, 112, 51, 103, 54. I/II-Leg-6 distally distinctly thickened, with large claws, III-Leg-6 shortened and club-shaped, with claws bent at obtuse angles as in *P. nodata*. IV-Leg-5 distally thickened. **Female:** Idiosoma length/width 850–1,000/650– 750. Genital plates crescent-shaped, strongly sclerotized, about 2–3 acetabula in width, with 11–14 pairs of acetabula; 2 small platelets with some setae between genital plates and Cx-4 (Fig. 31). Pedipalp segments (P-1–5) L: 38, 125, 57, 116, 54. Distal leg segments not thickened. I-Leg-5 with three (Fig. 33), IV-Leg-5 with eight swimming setae.

Larva. Unknown.

Deutonymph. See Lundblad (1962). **Habitat.** Lakes.

Distribution. Rare; in Europe known only from northern Sweden and Russia (Sokolow 1940, Lundblad 1962, Gerecke *et al.* 2016).

Piona annulata (Thor, 1900)

1900 *Curvipes annulatus* Thor, Nyt. Mag. Naturv. 38: 369

(Figs. 34–44)

Both sexes. Color red. Integument soft and striated. Sclerites bearing setae Hv free. Dorsum with 2 elongate narrow plates (Fig. 34); setae *Fch* long, thick (Fig. 35); P-3 with 3 short unequal setae, lateral setae slightly longer than the other 2 setae, 11–19 pairs subequal genital acetabula, I-Leg-5 with 2 swimming setae.

Male: Coxal plates IV medial margins separated, interspace between them sclerotized (Fig. 36). Suture line between third and fourth coxal plate incomplete, obliterated medially. Acetabular plates fused to coxal plates IV posterior margin and extending laterally beyond the posterior projections of these plates. Gonopore trapezoidal in shape with small incision anteriorly, genital pit deep, 11-14 pairs of genital acetabula on each side. Setae Pe free. Excretory pore surrounded by narrow sclerotized ring and situated anteriorly to setae Pi and Ci. Capitulum with short anchoral process and two pairs of subequal ventral setae. Ejaculatory complex (Fig. 37), with subequal proximal and distal arms, proximal chamber large, with a curving narrow proximal projection, forming single coil.

Pedipalp (Fig. 38) stout: P-1 short, with single short dorsodistal setae; P-2 ventral margin straight to slightly convex; all P-3 setae shorter than dorsal margin of segment, lateral seta slightly longer than the other two setae and situated a little proximally to the middle of segment; P-4 with two distinct setal tubercles, lying behind each other, ventrodistal peg-like seta short and located on small tubercle.



Figs. 28–33. *Piona ambigua* (Piersig, 1894): 28, 32—pedipalp; 29, 31—genital field; 30—ejaculatory complex; 33—I-Leg-5/6; 28–30—male, 31–33—female; 28, 30, 32 and 33 after Lundblad (1962); 29 and 31 after Gerecke *et al.* (2016).

I/II-Leg-5/6 strongly thickened distally (Fig. 39); III-Leg-5 long, expanded distally, III-Leg-6 relatively short and club-shaped (Fig. 40). Number of swimming setae as follows: one to two on I-Leg-4, two on I-Leg-5 and II-Leg-4, three on II-Leg-5 and IV-Leg-4, five to six on III-Leg-5, seven to nine on IV-Leg-5. Claws of tarsi I and II relatively large, with two subequal clawlets (Fig. 41). Claws of legs III asymmetrical (Fig. 42), large claw with long, thick straight dorsal clawlet and relatively short, thin slightly curved ventral clawlet; small claw with two thick pointed subequal clawlets.

Measurements (n=5). Idiosoma L 620–750; dorsal platelets L 65–90, W 6–8; seta Fch 42–55;



Figs. 34–42. *Piona annulata* (Thor, 1900), male: 34—dorsal platelets; 35—seta *Fch*; 36—idiosoma, ventral view; 37—ejaculatory complex; 38—pedipalp, lateral view; 39—I-Leg-4–6; 40—III-Leg-4-6; 41—claws of leg I; 42—claw of leg III. Scale bars: 34, 36, 39 and 40=100 μ m; 35, 37 and 38, 41=50 μ m; 42=20 μ m.



Figs. 43–45. *Piona annulata* (Thor, 1900), female: 43—idiosoma, ventral view; 44—pedipalp, lateral view; 45—I-Leg-4–6. Scale bars: $43=200 \ \mu m$; $44=50 \ \mu m$; $45=100 \ \mu m$.

genital field W 365–385; cheliceral segments L: base 150–165, chela 48–55; pedipalpal segments (P-1–5) L: 30–48, 108–140, 70–78, 108–110, 45–54; Leg segments L: I-Leg-1–6: 50–72, 78–100, 95–108, 125–150, 140–155, 160–175; II-Leg-1–6: 55–78, 85–100, 100–115, 135–160, 155–180, 150–185; III-Leg-1–6: 60–78, 85–105, 95–115,168–180, 204–230, 145–156; I-Leg-1–6: 108–115, 90–95, 95–105, 165–175, 175–186, 160–168.

Female. Dorsum similar as in male. All coxal groups separated and cover about half of the ventral surface in mature specimens (Fig. 43). Anterior coxal plates with short apodemes. Medial margin of coxal plate IV 1.5–2.0 times longer than medial margin of coxal plate III. Posterior margins of coxal plates IV forming obtuse angles, apodemes slightly developed. Genital opening and acetabular plates approximately equal in length. Acetabular plates bowed, narrow, with 9-15 pairs subequal acetabula in a single row; in addition, medially to acetabular plates 1 or 2 acetabula lying free in soft integument. Each acetabular plate with single anterior and two posterior genital setae; in addition, two (occasionally three) genital setae situated on small platelet between acetabular plate and anterior genital sclerite on each side.

Pedipalp (Fig. 44) similar as in male, but P-4 slenderer than in male, both setal tubercles small and distinctly separated. Legs thin and slender. Number of swimming setae as follows: one on I-Leg-4, two (occasionally three) on I-Leg-5 (Fig. 45), one to three on II-Leg-4, three on II-Leg-5, four on III-Leg-4, five to six on III-Leg-5, three to four on IV-Leg-4, and seven to nine on IV-Leg-5.

Measurements (n=5). Idiosoma L 620–750; dorsal platelets L 65–90, W 6–8; seta Fch 42–55; genital field W 365–385; cheliceral segments L: base 150–165, chela 48–55; pedipalpal segments (P-1–5) L: 30–48, 108–140, 70–78, 108–110, 45–54; Leg segments L: I-Leg-1–6: 50–72, 78–100, 95–108, 125–150, 140–155, 160–175; II-Leg-1–6: 55–78, 85–100, 100–115, 135–160, 155–180, 150–185; III-Leg-1–6: 60–78, 85–105, 95–115,168–180, 204–230, 145–156; I-Leg-1–6: 108–115, 90–95, 95–105, 165–175, 175–186, 160–168.

Deutonymph. See Lundblad (1927), Tuzovskij (1990).

Larva. See Wainstein (1980).

Habitat. Small temporary standing water bodies, adults found April through June (Lundblad 1962, 1968; Tuzovsky 2016).

Distribution. Central and Northern Europe; Russia: Upper Volga (Tuzovskij 1979; Tuzovsky 2016).

Piona caucasica Tuzovskij, 2019

2019 *Piona caucasica* Tuzovskij, Acarina, 27(1): 85–87

(Figs. 46–51)

Material examined. Holotype: female, slide 1596, Europe, Russia, North Caucasus, Krasnodar Territory, Seversky District, small pond near the settlement of Ubinskaya, 20 May 1976.

Diagnosis. Female. Dorsum with 2 small elongate platelets; setae *Fch* short, thick; P-2 ventral margin convex with 5 dorsal setae, P-3 with 3 unequal setae, these much shorter than dorsal margin of segment, P-4 slender, with 2 closely located small ventral setal tubercles; genital field with 2 bowed plates, 16–17 acetabula, 6–7 anteromedially and 3–4 posteromedial genital setae, I-Leg-5 with 6–7 short swimming setae, IV-Leg-5 with 7 long swimming setae.

Description. Idiosoma oval, integument soft and finely striated. Dorsum with small elongate platelets, ratio L/W 3.0 (Fig. 46). All dorsal setae thin and approximately equal in length, but setae Fch (Fig. 47) shorter and thicker than others idiosomal setae. All coxal groups separated and cover about half of the ventral surface (Fig. 48). Anterior coxal plates with short apodemes. Sclerites, bearing setae Hv, free and located between anterior and posterior coxal groups on each side. Medial margin of coxal plate IV two times longer than medial margin of coxal plate III. Posterior margin of coxal plates IV forming obtuse angles, apodemes moderately developed. Gonopore and acetabular plates approximately equal in length (Fig. 49). Genital field with 2 bowed plates bearing 16-17 pairs of acetabula. Each genital plate one acetabula in width, embracing three acetabula, which are located in the soft integument or touching the medial acetabular plate margin. All genital setae located on the plates, six to seven setae located anteromedially, and four setae-posteromedially.

Pedipalp compact (Fig. 50): P-1 with single dorsodistal seta; P-2 ventral margin slightly convex with five dorsal setae; all P-3 setae shorter than dorsal margin of segment, these subequal and located in posterior half of segment; P-4 ventral setal tubercles small and slightly separated, ventrodistal peg-like seta short; P-5 with proximal solenidion, five thin setae and four thick distal spines.

Legs thin and slender. I-Leg-4 with three to four, I-Leg-5 with six to seven short swimming setae (Fig. 51). Legs II–IV with long swimming setae, their number as follows: seven to eight on



Figs. 46–51. *Piona caucasica* Tuzovskij, 2019, female: 46—dorsal platelets; 47—seta *Fch*, 48—coxal plates, 49—genital field; 50—pedipalp, 51—I-Leg-5/6. Scale bars: 46 and 48=200 µm; 47 and 50=50 µm; 49 and 51=100 µm.

II-Leg-4, 9–10 on II-Leg-5, seven to nine on III-Leg-4, eight to nine on III-Leg-5, five on IV-Leg-4, seven on IV-Leg-5. Claws with long, thin external clawlets and relatively short, thick internal clawlets, lamella with convex ventral margin. Measurements (n=1). Idiosoma L 910; dorsal plates L 55; setae *Fch* L 27; acetabular plates: L 140; cheliceral segments L: base 210, chela 72; pedipalp segments (P-1–5) L: 36, 155, 80, 145, 42; leg segments L: I-Leg-1–6: 75,130, 160, 210, 240,

235; II-Leg-1–6: 90, 135, 185, 255, 260, 250; III-Leg-1–6: 90, 135, 185, 255, 275, 250; IV-Leg-1–6: 155, 150, 210, 275, 305, 250.

Male. Unknown.

Deutonymph. Unknown.

Larva. Unknown.

Habitat. Standing waters.

Distribution. Europe, Russia: North Caucasus (Tuzovsky 2019a).

Piona inflata Sokolow, 1927

1927 *Piona nodata* var. *inflata* Sokolow Trav. Stat. biol. Caucase Nord, II(1): 67–68

(Figs. 52-68)

Material examined. 8 males, 11 females, Russia, Yaroslavl Region, Nekouz District, temporary standing waters, April–June 2016–2017.

Both sexes: Color red to dark brown. Idiosoma oval, integument soft and finely striated. Dorsum with two small narrow, elongate platelets (Fig. 52). All dorsal setae thin and approximately equal in length, but setae *Fch* (Fig. 53) longer and thicker than other idiosomal setae. Glandularia and setae Hv free. P-3 comparatively short, with three unequal setae, lateral seta longest but shorter than dorsal margin of segment. Excretory pore surrounded by narrow sclerotized ring (occasionally in immature specimens only anterior and posterior sclerites present).

Male. Anterior coxal groups with short apodemes, posterior coxal groups' medial margins clearly separated (Fig. 54). Suture line between third and fourth coxal plates incomplete, obliterated medially. Genital field fused to posterior coxal plates and slightly extending beyond posterolateral projections of Cx-IV. Gonopore trapezoidal in shape and with small median incision anteromedially, genital pit deep, 9–18 acetabula and 4–5 thin setae on each side. Ejaculatory complex (Fig. 55) with long proximal and comparatively short distal arms, proximal chamber large, with a curving narrow proximal projection, forming 1.5 coils. Chelicera (Fig. 56) with large basal segment and short crescent chela. Pedipalp (Fig. 57) compact: P-1 short, with single short dorsodistal seta; P-2 large, with straight or slightly convex ventral margin and five short subequal dorsal setae; P-3 with three unequal setae, all these setae shorter than dorsal margin of segment; P-4 with two distinct setal tubercles, lying behind each other, ventrodistal peg-like seta short and located on small tubercle.

I/II-Leg-5/6 strong thickened distally (Fig. 58); III-Leg 5 longer than III-Leg-6 and club-shaped (Fig. 59); IV-Leg-4 thick, with a deep concavity bearing numerous unequal thick setae, IV-Leg-5 narrowed in anterior two thirds and expanded distally, IV-Leg-6 thin straight, with three to four thick, long setae. Number of swimming setae as follows: three on I-Leg-4, three to four on I-Leg-5; three to five on II-Leg-4, four on II-Leg-5; four to five on III-Leg-5; three on IV-Leg-4, and six to eight on IV-Leg-5. Claws of tarsi I and II relatively large, with two subequal clawlets, claw blade with equally convex ventral margin (Fig. 60). Claws of legs III (Fig. 61) asymmetrical: large claw with thick, long straight dorsal clawlet and a relatively short, thin, slightly curved ventral clawlet; small claw with relatively long internal clawlets and comparatively short external clawlet.

Measurements (n=8). Idiosoma L 750–815; dorsal plates L 100–115, W 12–15; setae *Fch* 60–65; cheliceral segments L: base 185–200, chela 50–65; pedipalp segments (P-1–5) L: 43–50, 135–150, 75–80, 110–125, 55–62; leg segments L: I-Leg-1–6: 75–90, 85–100, 110–125, 160–170, 165–180, 185–190; II-Leg-1–6: 75–90, 100–115, 125–140, 185–200, 180–190, 185–200; III-Leg- 1–6: 85–95, 100–115, 125–140, 225–240, 260–270, 185–200; IV-Leg-1–6: 135–150, 110–125, 110–125, 185–200, 200–215, 200–215.

Female. All coxal groups separated and covering about half of the ventral surface in matures species, anterior coxal plates with short apodemes (Fig. 62). Medial margin of coxal plate IV twice longer than medial margin of coxal plate III. Posterior margin of coxal plates IV forming right or obtuse angles, apodemes moderately developed. Gonopore and acetabular plates approximately equal in length. Acetabular plates with concave medial margin, 9-16 pairs of acetabula, in anterior part narrow, usually 1 acetabulum in width (Figs. 62, 64 and 65), occasionally two acetabula in width (Figs. 66 and 67); posteriorly broader, with three to four acetabula in width. All acetabula and genital setae located on plates. Acetabular plates with three to six anterior and two to three posterior genital setae. Pedipalp compact (Fig. 63): P-3 with three short unequal setae, base of lateral seta located near middle of segment; P-4 slenderer than in male, both ventral setal tubercles distinct and slightly separated. Legs thin and slender. Number of swimming setae as follows: four to six on I-Leg-4/5(Fig. 68), six to ten on II-Leg-4/5, seven to eight



Figs. 52–61. *Piona inflata* Sokolow, 1927, male: 52—dorsal platelets; 53—seta *Fch*; 54—idiosoma, ventral view; 55—ejaculatory complex; 56—chelicera; 57—pedipalp, lateral view; 58—I-Leg-4–6; 59—III-Leg-5–6; 60—claw of leg I; 61—claws of leg III. Scale bars: 52, 56, 58 and 59=100 μm; 53, 55, 57, 60 and 61=50 μm; 54=200 μm.

on III-Leg-4; seven to nine on legs III-Leg-5; six to ten on IV-Leg-4/5.

Measurements (n=10). Idiosoma L 1,000– 1,500; dorsal plates L 75–115, W 11–15; setae *Fch* L 60–75; acetabular plates: L 185–200, W 120–130; cheliceral segments L: base 195–205, chela 76–65; pedipalp segments (P-1–5) L: 60–90, 135–150, 60–75, 125–150, 55–75; leg segments L: I-Leg-1–6: 70–80, 110–140, 150–175, 210–240, 225–265, 260–275; II-Leg-1–6: 75–90, 125–150, 160–190, 250–275, 260–300, 280–305; III-Leg-1–6: 85–100, 135–165, 160–200, 260–300, 285–315, 275–300;



Figs. 62–68. *Piona inflata* Sokolow, 1927, female: 62—idiosoma, ventral view; 63—pedipalp, lateral view; 64–67—acetabular plate; 68—I-Leg-4-6. Scale bars: 62=200 µm; 63=50 µm; 64–68=100 µm.

IV-Leg-1–6: 135–160, 150–175, 185–215, 260– 310, 275–340, 250–275.
Larva. See Wainstein (1980).
Deutonymph. See Tuzovskij (1990).
Habitat. Standing waters.
Distribution. Europe, Russia (Sokolow 1927).

Piona laminata (Thor, 1901)

1901 *Curvipes laminatus* Thor, Nyt. Mag. Naturv. 38: 371

(Figs. 69-82)

Material examined. 7 females, 6 males in total. Asia, Russia, Magadan Region, Tenkinsky District, village of Sibik-Tyellakh, small lake, 1



Figs. 69–78. *Piona laminata* (Thor, 1901), male: 69—dorsal platelets; 70—seta *Fch*; 71—idiosoma, ventral view; 72—ejaculatory complex; 73—chelicera; 74—pedipalp, lateral view; I-Leg-4–6; 76—III-Leg-4–6; 77—claw of leg I; 78—claw of leg-III. Scale bars: 69, 70, 73, 74, 75 and 76=100 µm; 71=200 µm; 72, 77 and 78=50 µm.



Figs. 79–82. *Piona laminata* (Thor, 1901), female: 79—idiosoma, ventral view; 80—genital field; 81—pedipalp, lateral view; 82—I-Leg-5/6. Scale bars: 79, 80=200 µm; 81=50 µm; 82=100 µm.

male and 1 female, 21 June 1979; 1 female, 8 July 1979; 1 female, 19 July 1979; 1 female, 20 June 1987. Also, Chukotka, Anadyr District, small lake near the settlement of Markovo, 5 males and 3 females, 11 June 1981, Leg. P.V. Tuzovsky.

Both sexes. Color red to dark brown. Idiosoma oval, integument soft and finely striated. Dorsum with two small narrow elongate platelets (Fig. 69). All dorsal setae thin and approximately equal in length, but setae *Fch* (Fig. 70) longer and thicker than other idiosomal setae. Glandularia and setae Hv free. P-3 with three unequal short setae, lateral seta equal or slightly shorter than dorsal margin of segment. Excretory pore surrounded by narrow sclerotized ring (occasionally in immature specimens only anterior and posterior sclerites present).

Male. Anterior coxal groups separated, with short apodemes (Fig. 71). Coxal plates III separated, interspace between them sclerotized. Coxal plates IV touching but not fused medially. Suture line between third and fourth coxal plates incomplete, obliterated medially. Genital field fused to posterior coxal plates and a little extended beyond

posterolateral projections of Cx-IV. Gonopore trapezoidal in shape and with small median incision anteromedially, genital pit deep, with 9-22 acetabula and 4-5 thin setae on each side. Ejaculatory complex with long proximal and relatively short distal arms, proximal chamber large, with a curving narrow proximal projection, forming three coils (Fig. 72). Chelicera (Fig. 73) with large basal segment and short crescent chela. Pedipalp (Fig. 74) compact: P-1 short, with single short dorsodistal seta; P-2 large, with slightly convex ventral margin and five short subequal dorsal setae; P-3 with three unequal setae, lateral seta equal or slightly shorter than dorsal margin of segment; P-4 with two distinct setal tubercles, lying behind each other, ventrodistal peg-like seta short.

I/II-Leg-5/6 hardly thickened distally (Fig. 75); III-Leg-5 longer than III-Leg-6 and thickened distally, III-Leg-6 club-shaped (Fig. 76); IV-Leg-4 thick, with a deep concavity bearing numerous unequal thick setae, IV-Leg-5 narrowed in anterior two-thirds and expanded distally, IV-Leg-6 thin straight, with three to four thick setae. Number of swimming setae as follows: five to six (occasionally three or four) on I-Leg-4/5, five to seven on II-Leg-4/5, five to six on III-Leg-5; three on IV-Leg-4, and eight to twelve on IV-Leg-5. Claws of tarsi I and II relatively large, with two unequal clawlets, lamella moderately developed (Fig. 77). Claws of legs III asymmetrical (Fig. 78): large claw with thick, long straight dorsal clawlet and a relatively short, thin, slightly curved ventral clawlet; small claw with long internal clawlet and comparatively short, thick external one.

Measurements (n=6). Idiosoma L 500–850; dorsal plates L 70–80, W 12–15; setae *Fch* L 85–90; cheliceral segments L: base 185–240, chela 55–75; pedipalp segments (P-1–5) L: 35–40, 125–150, 60–90, 110–125, 50–65; leg segments L: I-Leg-1–6: 75–90, 110–125, 135–190, 185–250, 200–240, 235–275; II-Leg-1–6: 75–90, 110–140, 150–175, 210–275, 210–290, 235–300; III-Leg- 1–6: 75–90, 110–150, 125–175, 225–290, 275–315, 185–215; IV-Leg-1–6: 125–150, 125–165, 110–150, 210– 250, 235–275, 225–265.

Female. Dorsal platelets are less developed than in male and sometimes hardly visible. All coxal groups separated and cover about half of the ventral surface in matures species, anterior coxal plates with short apodemes (Fig. 79). Medial margin of coxal plate IV twice as long as medial margin of coxal plate III. Posterior margin of coxal plate IV forming right or obtuse angle, apodeme slightly developed. Gonopore and acetabular plates approximately equal in length. Acetabular plates with concave medial margin, 8-15 pairs of acetabula, narrow in anterior part (1 acetabulum in width), posteriorly with 2-4 acetabula in width (Fig. 80). Acetabular plates with three to six anterior and three to four posterior genital setae. All genital setae and acetabula located on acetabular plates.

P-2 with slightly convex ventral margin, P-3 with three unequal setae, base of lateral seta located slightly proximally to middle of segment; P-4 slenderer than in male, both ventral setal tubercles distinct and slightly separated (Fig. 81).

Legs thin and slender. I/II- Leg-6 not thickened (Fig. 82). Number of swimming setae as follows: 5–7 on I-Leg-4, 6–8 on I-Leg-5, 6-11 on II-Leg-4, 8–10 on II-Leg-5, 8–12 on III-Leg-4; 10–13 on III-Leg-5, 6–9 on IV-Leg-4, and 8–11 on IV-Leg-5.

Measurements (n=10). Idiosoma L 1,000– 1,500; dorsal plates L 100–125, W 11–13; seta *Fch* 85–115; acetabular plate L 200–250, W 75–90; cheliceral segments L: base 225–240, chela 75–80; pedipalp segments (P-1–5) L: 40–50, 135–165, 75–90, 135–165, 60–70; leg segments L: I-Leg-1–6: 85–100, 150–175, 185–240, 275–315, 275–315, 300–340; II-Leg-1–6: 100–125, 160–190, 210–250, 310–350, 310–340, 285–350; III-Leg-1–6: 110–125, 175–190, 210–250, 285–350, 285–350, 285–340; IV-Leg-1–6: 160–175, 185–200, 225–250, 310–350, 310–325, 290–340.

Larva. See Tuzovsky (2019a).

Deutonymph. See Tuzovsky (2019a). **Habitat**. Standing waters.

Distribution. Palaearctic (Gerecke *et al.* 2016); Russia: Magadan Region (Tuzovsky 2019a).

Piona magadanensis Tuzovskij, 2013

2013 Piona magadanensis Tuzovskij, Zootaxa 3664(3): 321–327

(Figs. 83–95)

Material examined. Holotype: male, slide 2430, Asia, Russia, Magadan Region, Ola District, small forest pond near the Ola settlement, depth of 0.3–0.5 m, 2 June 1979, Leg. P. V. Tuzovsky. Paratypes: 2 females, Magadan City, small pond near the Gertner Bay, depth of 0.3–0.5 m, 7 August 1978, Leg. P. V. Tuzovsky.

Both sexes. Idiosoma oval, integument soft and finely striated. Dorsum with two small elongate platelets (Fig. 83). All dorsal setae thin and approximately equal in length, but setae *Fch* (Fig. 84) thicker than other idiosomal setae. Glandularia and setae Hv free. P-2 ventral margin straight, P-3 with three short subequal setae, all these setae much shorter than dorsal margin of segment. Excretory pore surrounded by narrow sclerotized ring.

Female. All coxal groups separated and covering about half of the ventral surface in mature species, anterior coxal plates with short apodemes (Fig. 85). Medial margin of coxal plate IV 2.5-3 times longer than medial margin of coxal plate III. Posterior margin of coxal plate IV forms obtuse angle, apodeme slightly developed. Gonopore and acetabular plates approximately equal in length. Acetabular plates sickle-shaped, well indented on medial margin, 14-25 pairs of acetabula, 2 pairs of which much larger than others; all acetabula and genital setae located on the plates, 3 setae located anteromedially, and 3 setae located posteromedially on each side. Anterior large acetabulum located in anteromedial corner of acetabular plate, second large acetabulum located near the middle of the medial margin of the plate.



Figs. 83–88. *Piona magadanensis* Tuzovskij, 2013, female: 83—dorsal platelets; 84—seta *Fch*; 85—idiosoma, ventral view; 86—pedipalp, lateral view; 87—I-Leg-5/6; 88—claw of leg II. Scale bars: 83, 85 and 87=100 µm; 84, 86 and 88=50 µm.



Figs. 89–95. *Piona magadanensis* Tuzovskij, 2013, male: 89—idiosoma, ventral view; 90—ejaculatory complex; 91—pedipalp, lateral view; 92—I-Leg-5/6; 93—III-Leg-5/6; 94—claw of leg I; 95—claws of leg III. Scale bars: 89, 90, 92 and 93=100 μm; 91=50 μm; 94 and 95=20 μm.

Pedipalp rather slender (Fig. 86): P-2 with straight ventral margin, P-3 with three short subequal setae, base of lateral seta located near middle of segment; P-4 stocky, shorter than P-2, ventral setae located on small subequal tubercles, which are well separated, distoventral peg-like seta short; P-5 with proximal solenidion, five thin setae, and four thick distal spine.

Legs thin and slender. I/II-Leg-5/6 not thickened (Fig. 87). Number of swimming setae as follows: one or two on I-Leg-4, two on I-Leg-5, three or four on II-Leg-4/5, four to five on III-Leg-4, five on III-Leg-5 and IV-Leg-4; seven or eight on IV-Leg-5. Claws with long external and short internal clawlets, lamella with convex ventral margins (Fig. 88).

Measurements (n=2). Idiosoma L 1,100–1,150; dorsal plates L 84–87, W 15–18; seta *Fch* 65–70; acetabular plate L 175–185, W 150–185; cheliceral segments L: base 175–180, chela 57–60; pedipalp segments (P-1–5) L: 40–42, 138–150, 75–85, 125–140, 57–60; leg segments L: I-Leg-1–6: 78–85, 95–102, 120–138, 165–175, 170–185, 165–170; II-Leg-1–6: 75–85, 100–105, 130–140, 180–195, 190–200, 210–225; III-Leg-1–6: 90–96, 100–115, 130–140, 195–210, 220–235, 210–225; IV-Leg-1–6: 120–125, 120–125, 160–175, 230–245, 230–240, ?.

Male. Dorsum and setae Fch similar to those of the female. Anterior coxal groups well separated, coxal plates IV touching but not fused to each other (Fig. 89). Genital field fused to posterior margin of coxal plates IV. Genital field extending laterally slightly beyond posterior corner of the fourth coxal plates, with a large, deep genital pit; 23 genital acetabula on each side, two pairs of which much larger than others. Genital opening triangular, with small anteromedian incision. Setae Pe free or fused with coxal plate IV. Ejaculatory complex with subequal in length proximal and distal arms, proximal chamber large, with a curving narrow proximal projection, forming single incomplete coil (Fig. 90). Pedipalp short and stout (Fig. 91): P-2 with straight ventral margin, P-3 with three short subequal setae, base of lateral seta located a little anteriorly to the middle of segment; P-4 with two distinct setal tubercles, lying behind each other, distoventral peg-like seta short; P-5 with proximal solenidion, five thin setae and four thick distal spines.

I/II-Leg-5/6 thickened distally (Fig. 92); III-Leg-5 long and expanded distally, III-Leg-6 short and club-shaped (Fig. 93). Claws of tarsi I and II with rather long, thin clawlets, external clawlet slightly longer than internal one (Fig. 94). Claws of legs III asymmetric (Fig. 95); large claw with thick, long dorsal clawlet and relatively thin internal one; small claw with thick pointed dorsal clawlet and thin ventral one. Number of swimming setae as follows: 1 on I-Leg-4, 2 on I-Leg-5, 7 on II-Leg-4, 8–10 on II-Leg-5, III-Leg-4 and IV-Leg-4; 11–13 on III-Leg-5 and IV-Leg-5.

Measurements (n=1). Idiosoma L 660; dorsal plates L 66, W 16; seta *Fch* 60; acetabular plate W 348; cheliceral segments L: base 160, chela 48; pedipalp segments (P-1–5) L: 42, 125, 69, 102, 54; leg segments L: I-Leg-1-6: 65, 85, 108, 138,145, 168; II-Leg-1-6: 72, 90, 108, 145, 155, 175; III-Leg-1–6: 78, 90, 105, 175, 215, 160; IV-Leg-1–6: 85, 90, 95, 170, 180, 170.

Larva. Unknown.

Deutonymph. See Tuzovskij (2013).

Habitat. Standing waters.

Distribution. Asia (Russia, Magadan Region), Tuzovskij (2013).

Piona nodata (Müller, 1776)

1776 *Hydrachna nodata* Müller, Zoologiae Danicae Prodromus: 191 *1928 Piona nodata* var. *lacerata* Sokolow, Zool. Jbch., 54: 481–482

(Figs. 96-108)

Material examined. Russia: 33 females, 16 males in total. Including 12 females, 7 males, Yaro-slavl Region, Nekouz District, temporary waters near the Borok settlement and the village of Pogorelka, May–June 2015, 2017. Also 6 males, 16 females, Samara Region, Stavropolsky District, "Samarskaya Luka" National Park, small ponds near the Koltsovo village, May–June 1992–1993. Also 3 males, 5 females, Magadan Region, Anadyr District, small lake near the Markovo settlement, June–July 1981.

Both sexes. Color red to dark brown. Idiosoma oval, integument soft and striated. Dorsum with two relatively long narrow platelets (Fig. 96), often barely visible. All dorsal setae thin and approximately equal in length, but setae *Fch* (Fig. 97) much longer and thicker than other idiosomal setae associated with glandularia and trichobothria. Pedipalp (Fig. 99) relatively short and compact: P-2 ventral margin slightly convex with five subequal dorsal setae; P-3 with three unequal setae, lateral seta equal or longer than dorsal margin of segment; P-4 with two subequal distinct ventral setal tu-



Figs. 96–104. *Piona nodata* (Müller, 1776), male: 96—dorsal platelets; 97—seta Fch; 98—idiosoma, ventral view; 99—pedipalp, lateral view; 100—ejaculatory complex; 101—I-Leg-5/6; 102—III-Leg-5/6; 103—claw of leg I; 104—claws of leg III. Scale bars: 96 and 98=200 μm; 97, 99, 103 and 104=50 μm; 100, 101 and 102=100 μm.



Figs. 105–108. *Piona nodata* (Müller, 1776), female: 105—coxal plates; 106–108—genital field. Scale bars: 105=200 μm; 106–108=100 μm.

bercles, lying behind each other, ventrodistal peglike seta relatively large.

Male. Sclerites bearing setae Hv, fused with posterior of coxal plates II, but suture line present on each side (Fig. 98). Coxal plates III separated, interspace between them sclerotized. Coxal plates IV fused to each medially but suture line present. Acetabular plates fused to posterior margins of coxal plates IV and slightly extending laterally beyond posterior projections of these plates. Gonopore oval to hexagonal in shape, with small median incision anteriorly, genital pit deep, 8-21 subequal genital acetabula on each side, occasionally 1-3 pairs of acetabula larger than other acetabula. Ejaculatory complex (Fig. 100) with long proximal arms and comparatively short distal arms; proximal chamber large, with a curving narrow proximal projection forming three coils.

I/II-Leg-6 (Fig. 101) distally slightly thickened; III-Leg-4 swimming setae reduced, III-Leg-5 long distally slightly expanded, III-Leg-6 comparatively short and club-shaped (Fig. 102); IV-Leg-4 thick, with a deep concavity bearing numerous unequal spine-like setae, IV-Leg-5 slightly expanded distally, IV-Leg-6 straight thin, with three to five thick setae. Number of swimming setae as follows: 4–5 on I-Leg-4, 4–7 on I-Leg-5; 5–8 on II-Leg-4–5; 4–7 on III-Leg-5; 2–3 on IV-Leg-4, 7–12 on IV-Leg-5. Claws of tarsi I and II comparatively large, with two long clawlets (Fig. 103). Claws of legs III asymmetrical (Fig. 104); large claw with thick, long straight dorsal clawlet and a thin curved ventral clawlet; small claw with a subequal clawlets.

Measurements (n=10). Idiosoma L 700–940; dorsal plates L 85–115, W 10–15; seta *Fch* 85–100; cheliceral segments L: base 185–215, chela 62–75; pedipalp segments (P-1–5) L: 37–50, 110–140, 65–75, 110–140, 50–62; leg segments L: I-Leg-1–6: 75–115, 110–125, 150–190, 185–250, 200– 250, 235–290; II-Leg-1–6: 75–115, 110–150, 150–200, 225–275, 210–275, 235–300; III-Leg-1–6: 85–115, 110–165, 130–170, 235–300, 275–325, 175–225; IV-Leg-1–6: 125–150, 125– 150, 110–150, 190–240, 225–290, 210–275.

Female. All coxal groups (Fig. 105) separated and covering about half of the ventral surface in mature specimens. Medial margin of coxal plate IV 2.0–2.5 times longer than medial margin of coxal plate III. Posterior margins of coxal plates IV forming right or obtuse angles, apodemes moderately developed. Genital field with two bowed plates bearing 6-14 acetabula, usually in a single row, embracing 1 or 2 other acetabula, located in the soft integument or fused to the medial acetabular plate margin (Fig. 106). Each acetabular plate with three to five anterior and two to three posterior genital setae. Acetabula and genital setae usually located on acetabular plates but occasionally one to three anterior acetabula and genital setae situated on soft integument (Figs. 107 and 108). Legs thin and slender, I/II-Leg-6 not thickened. Number of swimming setae as follows: 5-6 on I-Leg-4, 6-10 on I-Leg-5; 8-11 on II-Leg-4/5; 9-10 on III-Leg-4; 10-12 on III-Leg-5; 7-9 on IV-Leg-4/5.

Measurements (n=10). Idiosoma L 800–1,350; dorsal plates L 75–100, W 8–15; seta *Fch* 100–115; cheliceral segments L: base 200–260, chela 62–75; pedipalp segments (P-1–5) L: 37–50, 125–150, 62–90, 110–137, 50–75; leg segments L: I-Leg-1–6: 85–100, 125–150, 175–215, 250–290, 250– 325, 275–340; II-Leg-1–6: 90–100, 135–165, 200–240, 260–340, 275–340, 285–350; III-Leg-1–6: 90–115, 135–175, 185–240, 275–340, 285–350, 285–350; IV-Leg-1–6: 150–190, 160– 190, 210–250, 285–340, 285–375, 275–325.

Larva. See Sparing (1959), Tuzovsky (2017a). All previously investigated larvae of *P. nodata* from Russia have developed to the nymphal stages in the absence of parasitism (Tuzovsky 2017a).

Deutonymph. See Tuzovskij (1990).

Habitat. Temporary and permanent standing waters.

Distribution. Holarctic (Viets 1956; Lundblad 1968).

Piona nodatella Tuzovskij, 2015

2015 *Piona nodatella* Tuzovskij, Acarina, 23(2): 156–160

(Figs. 109-120)

Material examined. Holotype: male, slide 3174, Europe, Yaroslavl Region, Nekouz District, sedgesphagnum bog near the Borok settlement, 1 July 1974. Paratypes: 1 female, same locality and date as holotype, 1 female, 3 July 1974, and 2 females, 7 July 1974, same locality as holotype, Leg. P.V. Tuzovsky.

Both sexes. Color red to dark brown. Dorsum with two elongate narrow plates; setae *Fch* long, thin; sclerites bearing setae *Hv*, fused with posterior of coxal plates II; P-2 ventral margin slightly

convex with four or five subequal dorsal setae; P-3 with two long unequal setae, lateral seta situated near the middle of segment; P-4 setal tubercles moderately developed and separated; P-5 short and strong, expanded proximally; two to three acetabula larger than others acetabula on each side. I-Leg-5 with four to five swimming setae. Excretory pore surrounded by narrow sclerotizing ring and situated anteriorly to setae *Pi* and *Ci*.

Male. Color red to dark brown. Idiosoma oval, integument soft and striated. Dorsum with two elongate narrow plates, ratio L/W 6.0 (Fig. 109). All dorsal setae thin and approximately equal in length, but setae *Fch* (Fig. 110) much longer than other Idiosomal setae. Posterior coxal groups touching, but not fused medially, interspace between them sclerotized (Fig. 111). Acetabular plates fused to coxal plates IV posterior margins and extending laterally beyond posterior projections of these plates. Gonopore trapezoidal in shape with small median incision anteriorly, genital pit deep, 13–14 subequal genital acetabula on each side, two to three pairs larger than others.

Pedipalp (Fig. 112) compact: P-1 with single short dorsodistal seta, P-2 with four subequal setae, P-3 with two long unequal setae, lateral seta located near middle of segment; P-4 setal tubercles moderate in size and a little separated, ventrodistal peg-like seta relatively large; P-5 short (L/H ratio 1.33), strongly expanded proximally.

Ejaculatory complex (Fig. 113) with long proximal arms and short distal arms; proximal chamber large, with a curving narrow proximal projection forming three coils.

I/II-Leg-6 (Fig. 114) identical thickness along entire length; III-Leg-5 long, expanded distally, III-Leg-6 comparatively short and club-shaped (Fig. 115); IV-Leg-4 thick, with a deep concavity bearing numerous unequal spine-like setae, IV-Leg-5 narrowed posterior to middle of segment and expanded distally, IV-Leg-6 thin, straight, with four to five thick setae. Number of swimming setae as follows: four on I-Leg-4/5, five on II-Leg-4/5; two on III-Leg-4; five to six on III-Leg-5; two to three on IV-Leg-4, six to seven on IV-Leg-5. Claws of tarsi I and II relatively large, with two long clawlets (Fig. 116). Claws of legs III asymmetrical (Fig. 117), large claw with thick, long straight dorsal clawlet and a relatively thin, slightly curved ventral clawlet; small claw with subequal clawlets.

Measurements (n=1). Idiosoma L 660; dorsal plates L 55, W 9; seta *Fch* 110; genital field W 310; cheliceral segments L: base 155, chela 50; pedipalp



Figs. 109–117. *Piona nodatella* Tuzovskij, 2015, male: 109—dorsal platelets; 110—seta Fch; 111—idiosoma, ventral view; 112—pedipalp, lateral view; 113—ejaculatory complex; 114—I-Leg-4–6; 115—III-Leg-5/6; 116—claw of leg I; 117—claws of leg III. Scale bars: 109,110, 111, 114 and 115=100 µm; 112, 113, 116 and 117=50 µm.



Figs. 118–120. *Piona nodatella* Tuzovskij, 2015, female: 118—idiosoma, ventral view; 119—pedipalp, lateral view; 120—I-Leg-4–6. Scale bars: 118=200 μm; 119=50 μm; 120=100 μm.

segments (P-1–5) L: 38, 108, 54, 90, 36; leg segments L: I-Leg-1–6: 55, 90, 130, 170, 175, 210; II-Leg-1–6: 60, 108, 130, 185, 190, 220; III-Leg-1–6: 65, 108, 115, 200, 240, 170; IV-Leg-1–6: 115, 96, 95, 180, 205, 200.

Female. All coxal groups (Fig. 118) separated and covering about half of the ventral surface in mature specimens. Anterior coxal plates with short apodemes. Medial margin of coxal plate IV 1.5-2.0 times longer than medial margin of coxal plate III. Posterior margins of coxal plates IV forming right or obtuse angles, apodemes slightly developed. Gonopore and acetabular plates approximately equal in length. All acetabula and genital setae located on acetabular plates. Acetabular plates bowed, with 9-13 pairs of unequal acetabula (2-3 pairs of acetabula larger than others), narrow in anterior part (one acetabula in width), posteriorly broader (with two to three acetabula in width), medial margin concave; each plate with four to six anterior and two to four posterior genital setae. P-4 a little slenderer than in the male, setal tubercles distinctly separated (Fig. 119).

Legs thin and slender, I/II-Leg-6 not thickened (Fig. 120). Number of swimming setae as follows: four to five on I-Leg-4/5, four to seven on II-Leg-4,

seven to eight on II-Leg-5, five to six on III-Leg-4, seven to nine on III-Leg-5, three to four on IV-Leg-4, and five to seven on IV-Leg-6.

Measurements (n=4). Idiosoma L 735–1,050; dorsal plates L 60–70, W 7–9; seta *Fch* 100–110; cheliceral segments L: base 168–180, chela 48–60; pedipalp segments (P-1–5) L: 36–42, 108–115, 54–65, 95–108, 36–39; leg segments L: I-Leg-1–6: 70–85, 100–115, 150–165, 190–215, 205–230, 225–240; II-Leg-1–6: 78–90, 105–125, 150–170, 210–240, 225–260, 240–270; III-Leg-1–6: 78–105, 120–140, 145–170, 220–240, 225–270, 240–270; IV-Leg-1–6: 120–135, 120–140, 150–175, 225– 245, 240–255, 220–255.

Larva. See Tuzovskij (2017b). Deutonymph. Unknown. Habitat. Temporary, standing waters.

Habitat. Temporary, standing waters.

Distribution. Europe (Russia, Yaroslavl Region), Tuzovsky (2015).

Piona coccinoides (Thor, 1897)

1897 *Curvipes coccinoides* Thor, Arch. Math. Naturv. 20: 31

(Figs. 121–132)



Figs. 121–129. *Piona coccinoides* (Thor, 1897), male: 121—dorsal platelets; 122—seta *Fch*; 123—idiosoma, ventral view; 124—pedipalp, lateral view; 125—ejaculatory complex; 126—I-Leg-4–6; 127—III-Leg-5/6; 128—claw of leg I; 129—claws of leg III. Scale bars: 122, 124, 128 and 129=50 μ m; 121, 123, 125, 126 and 127=100 μ m.

Material examined. 16 males, 17 females, Asia, Russia, Magadan Region, Anadyr District, small lakes and sedge bogs near the Markovo settlement, May–August 1979, 1982; 3 females, Kamchatka Territory, Ust-Kamchatsky District, Dyakonovskoe Lake, near the "Raduga" Biological Station, July 1983, Leg. P.V. Tuzovsky.

Both sexes. Color red. Integument soft and striated. Dorsum with two elongate narrow plates; setae *Fch* short, thick; all genital acetabula small and subequal in size. P-2 ventral margin straight, P-3 with three short subequal setae, these much shorter than dorsal margin of segment, lateral seta located near middle of segment, P-4 with sexual dimorphism. Excretory pore surrounded by narrow

sclerotizing ring and situated anteriorly to setae *Pi* and *Ci*, I-Leg-6 with three to four swimming setae.

Male. Dorsum with two elongate narrow plates (Fig. 121); setae *Fch* (Fig. 122) short, thick. Sclerites bearing setae Hv, fused with posterior of coxal plates II; but suture line between them present (Fig. 123). Posterior coxal groups close touching, but not fused medially, interspace between them sclerotized. Acetabular plates fused to coxal plates IV posterior margins and extending laterally beyond posterior projections of these plates. Gonopore trapezoidal in shape with small median incision anteriorly, genital pit deep, 13–25 subequal genital acetabula on each side. Pedipalp (Fig. 124) stocky: P-3 with three short subequal



Figs. 130–132. *Piona coccinoides* (Thor, 1897), female: 130—idiosoma, ventral view; 131—pedipalp, lateral view; 132—I-Leg-4–6. Scale bars: 130=200 µm; 131 and 132=100 µm.

setae, these much shorter than dorsal margin of segment, lateral seta located near middle of segment; P-4 with two subequal distinct ventral setal tubercles, lying behind each other, ventrodistal peg-like seta moderately in size; P-5 short and not strong expanded proximally. Ejaculatory complex (Fig. 125) with subequal in length proximal distal arms; proximal chamber large, with a curving narrow proximal projection forming 2.5 coils. I/ II-Leg-6 moderately thickened distally (Fig. 126); III-Leg-5 a little longer than III-Leg-6, the latter shortened and spindle-shaped, enlarged (Fig. 127). Claws of tarsi I and II relatively large, with two long subequal pointed clawlets (Fig. 128). Claws of legs III asymmetrical (Fig. 129); large claw with thick, long straight dorsal clawlet and a relatively thin curved ventral clawlet; small claw with subequal clawlets. IV-Leg-4 thick, with a deep concavity bearing numerous unequal spinelike setae, IV-Leg-5 expanded distally, IV-Leg-6 thin straight, with four to five thick setae. Number of swimming setae as follows: two to three on I-Leg-4, three to four I-Leg-5, four to five on II-Leg-4, four to six on II-Leg-5, two to three on III/ IV-Leg-4; four to five on III-Leg-5, eight to nine on IV-Leg-5.

Measurements (n=10). Idiosoma L 680–950; dorsal plates L 85–90, W 10–12; seta *Fch* 30–38; acetabular plate W 335–365; cheliceral segments L: base 200–215, chela 65–75; pedipalp segments (P-1–5) L: 35–50, 130–155, 75–90, 110–135, 50–55; leg segments L: I-Leg-1–6: 60–75, 85–100, 110– 120, 150–170, 160–175, 185–215, II-Leg-1–6: 70–75, 85–100, 115–130, 165–190, 180–200, 205–215; III-Leg-1–6: 85–100, 100–120, 110–125, 205–225, 225–250, 185–200; IV-Leg-1–6: 110–150, 110–120, 110–125, 185–205, 205–225, 200–225.

Female. All coxal groups (Fig. 130) separated and covering about half of the ventral surface in mature specimens. Anterior coxal plates with short apodemes. Medial margin of coxal plate IV 1.5–2.0 times longer than medial margin of coxal plate III. Posterior margins of coxal plates IV forming obtuse angles, apodemes slightly developed. Gonopore much longer than acetabular plates. Acetabular plates rounded, medial margin straight or concave, 11–25 pairs of small acetabula; each plate with three to four anterior and two to three posterior genital setae. All acetabula and genital setae located on acetabular plates. P-4 a little slenderer than in the male, setal tubercles distinctly separated (Fig. 131). Legs thin and slender, I/II-Leg-6 not thickened (Fig. 132). Number of swimming setae as follows: two to three on I-Leg-4, three to four on I-Leg-5, three to five on II-Leg-4, four to five on II-Leg-5, four to six on III-Leg-4, seven to nine on III-Leg-5, four to six on IV-Leg-4, and six to eight on IV-Leg-6.

Measurements (n=10). Idiosoma L 685–1,350; dorsal plates L 65–75, W 10–13; seta *Fch* 30–38; cheliceral segments L: base 215–250, chela 70–75; pedipalp segments (P-1-5) L: 35–50, 150–175, 85–100, 150–165, 55–65; leg segments L: I-Leg-1–6: 75–85, 100–115, 125–150, 180–215, 185–225, 210–250; II-Leg-1–6: 75–85, 100–125, 150–165, 200–250, 210–275, 235–275; III-Leg-1–6: 85–90, 110–140, 135–175, 225–275, 235–290, 230–275; IV-Leg-1–6: 135–150, 125–150, 160–195, 235– 300, 250–315, 210–290.

Larva. See Thor (1925).

Deutonymph. Tuzovskij (1990). **Habitat**. Standing waters.

Habitat. Standing waters

Distribution. Holarctic (Sokolow 1940; Lundblad 1968; Gerecke *et al.* 2016).

Piona neococcinoides Tuzovskij, 2019

2019 *Piona neococcinoides* Tuzovskij, Acarina, 27(1): 89–92

(Figs. 133-140)

Material examined. Holotype: male, slide 4446, Asia, Russia, Magadan Region, Chaun District, small sedge bog on the right bank of the Pucheveem River, 18 km upstream from the river mouth, 11 July 1982, Leg. P.V. Tuzovsky.

Description. Color red. Idiosoma oval, integument soft and finely striated. Dorsum with two small elongate narrow platelets (Fig. 133). Setae Fch (Fig. 134) shorter and thicker than other idiosomal setae. Anterior coxal groups separated with short apodemes (Fig. 135). Sclerites bearing setae and glandularia Hv free. Posterior coxal group separated anteriorly and touching posteriorly. Acetabular plates fused to coxal plates IV posterior margin and slightly extending laterally beyond posterior projections of these plates. Gonopore wider than it is long, with small median incision anteriorly, genital pit deep, 17-18 subequal genital acetabula on each side. Excretory pore surrounded by narrow sclerotized ring and situated anteriorly to setae Pi and Ci. Ejaculatory complex with proximal arms larger than distal arms, proximal chamber large, with a curving narrow proximal projection, forming three coils.

Chelicera with large basal segment and short crescent chela. Pedipalp (Fig. 136) stocky: P-1 short, with single short dorsodistal seta; P-2 ventral margin slightly convex, with five short subequal dorsal setae; P-3 short, with three short unequal setae, these setae shorter than dorsal margin of segment; P-4 shorter than P-2, with ventral protrusion bearing two distinct setal tubercles, lying close to each other distally to middle of segment, distal peg-like seta directed ventrally; P-5 with proximal solenidion, four thin setae and four very short, thick distal spines.

Legs comparatively short: I/II-Leg-6 strongly thickened distally (Fig. 137); III-Leg-4/5 slightly expanded distally, III-Leg-6 comparatively short and club-shaped (Fig. 138); IV-Leg-4 thick, with a deep concavity bearing numerous unequal spine-like setae, IV-Leg-5 narrowed in anterior half and expanded distally, IV-Leg-6 thin, straight, with one short and four long thick setae. Number of swimming setae as follows: two on I-Leg-4, three on I-Leg-5, three on II-Leg-4 and IV-Leg-4, three to four on II-Leg-5; four on III-Leg-5, five to six on IV-Leg-5. Claws of tarsi I and II relatively large, with two subequal pointed clawlets (Fig. 139). Claws of legs III asymmetrical (Fig. 140); large claw with thick, long straight dorsal clawlet and a relatively short, thin, slightly curved ventral clawlet. Small claw with two thick pointed subequal clawlets.

Measurements (n=1). Idiosoma L 660; seta *Fch* L 25–35; genital field W 325; cheliceral segments L: base 185, chela 62; pedipalp segments (P-1–5) L: 37, 125, 70, 112, 50; leg segments L: I-Leg-1–6: 70, 85, 95, 125, 125, 150; II-Leg-1–6: 75, 85, 95, 125, 135, 170; III-Leg-1–6: 75, 125, 112, 180, 200, 162; IV-Leg-1–6: 120, 95, 100, 180, 170, 155.

Female. Unknown.
Deutonymph. Unknown.
Larva. Unknown.
Habitat. Small temporary standing waters.
Distribution. Asia (Russia: Magadan Region).

Key to species of the *Piona nodata* and *P. coccinoides* complexes in Russia



Figs. 133–140. *Piona neococcinoides* Tuzovskij, 2019, male: 133—dorsal platelets; 134—seta *Fch*; 135—idiosoma, ventral view; 136—pedipalp, lateral view; 137—I-Leg-4–6; 138—III-Leg-4–6; 139—claw of leg I; 140—claws of leg III. Scale bars: 133, 135, 137 and 138=100 μ m; 134, 136, 139 and 140=50 μ m.

- Distal part of P-5 not strongly narrowed dis-4. P-3 with two setae, Fig. 119.....P. nodatella Tuzovskij, 2015 5. Each acetabular plate with one acetabulum in - Each acetabular plate posteriorly broader, with 6. I-Leg-5 with two to three swimming setae (Fig. 45), two to three genital setae situated on small platelets between the acetabular plates and anterior genital sclerite (Fig. 43)... P. annulata (Thor, 1900) - I-Leg-5 with five to ten swimming setae, all genital setae located on acetabular plates7 7. P-3 longest seta, longer or equal than dorsal margin of segment, P-4 with two distinct ventral tubercles (Fig. 99) P. nodata (Müller, 1776) - P-3 all setae much shorter than dorsal margin of segment, P-4 with small ventral tubercles (Fig. 50) P. caucasica Tuzovskij, 2019 8. I-Leg-5 with two to three swimming setae9 - I-Leg-5 with four to eight swimming setae ... 10 9. Acetabular plates with 14-25 acetabula each, two pairs of which much larger than others (Fig. 86), basal segment of chelicera small, L 175-180P. magadanensis Tuzovskij, 2013 - Acetabular plates with 9-17 subequal acetabula each (Fig. 24), basal segment of chelicera comparatively large, L 220-225.....P. accepta sp.n. 10. P-3 lateral setae much shorter than dorsal margin of segment and located near middle of segment (Fig. 63).....P. inflata Sokolow, 1927 - P-3 lateral setae equal of dorsal margin of segment and located proximally to middle of segment (Fig. 81)..... P. laminata (Thor, 1901) 11. Distal part of P-5 strongly narrowed, Fig. 28P. ambigua (Piersig, 1894) - Distal part of P-5 not strongly narrowed......12 12. P-3 with two setae, Fig. 112.....P. nodatella Tuzovskij, 2015 13. I/II-Leg-5/6 strongly thickened distally 14 - I/II-Leg-5/6 not strongly thickened distally... 17 14. Setae Fch short (25-35 µm, Fig. 134), P-4 shorter than P-2 (Fig. 136), EC proximal chamber with a proximal projection, forming three coils.... P. neococcinoides Tuzovskij, 2019 — Setae *Fch* long (\geq 40), P-4 longer or equal P-2, EC proximal chamber with a proximal projection, 15. I-Leg-5 with three to four swimming setae (Fig. 58)P. inflata Sokolow, 1927 - I-Leg-5 with two swimming setae16 16. Acetabular plates with 23 acetabula each, two pairs of which much larger than others (Fig. 89)..P. magadanensis Tuzovskij, 2013 - Acetabular plates with 11-19 subequal acetabula each (Fig. 36) P. annulata (Thor, 1900) 17. I-Leg-5 with five to nine swimming setae, seta - I-Leg-5 with three to four swimming setae, seta Fch comparatively short (<70)19 18. P-3 lateral setae longer than dorsal margin of segment (Fig. 99), I/II-Legs claws with subequal pointed clawlets (Fig. 101)P. nodata (Müller, 1776) - P-3 lateral setae shorter than dorsal margin of segment (Fig. 74), I/II-Legs claws with long pointed external and comparatively short obtuse internal one (Fig. 77).... P. laminata (Thor, 1901) 19. EC proximal chamber with a proximal projection, forming 1.5 coils (Fig. 17), seta Fch relatively long (60-70, Fig. 14)P. accepta sp.n. - EC proximal chamber with a proximal projection, forming 2.5 coils (Fig. 125), seta Fch relatively short (30–40, Fig. 122)P. coccinoides (Thor, 1897)

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