

WATER MITES OF THE GENUS *FORELIA* HALLER, 1882 (ACARI, HYDRACHNIDIA, PIONIDAE) IN RUSSIA

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ABSTRACT: This study presents a detailed taxonomic review of water mites of the genus *Forelia* Haller, 1882 (Pionidae, Foreliinae) found in Russia. The review includes illustrations, descriptions and redescriptions of eight *Forelia* species found in this country: *F. brevipes* (Neuman, 1880), *F. diaphana* (Croneberg, 1899), *F. liliacea* (Müller, 1776), *F. markovensis* sp.n., *F. mutata* (Piersig, 1901), *F. mutatella* sp.n., *F. spatulifera* (Marucci, 1907) and *F. variegator* (Koch, 1837).

KEY WORDS: Water mites, Pionidae, Foreliinae, *Forelia*, morphology, new species, identification key, Russia.

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INTRODUCTION

The following four species of the genus *Forelia* were recorded in the former USSR: *F. brevipes* (Neuman, 1880), *F. diaphana* (Croneberg, 1899), *F. liliacea* (Müller, 1776) and *F. variegator* (Koch, 1837) (Sokolow 1940). Larvae of the genus *Forelia* are abdominal parasites of chironomid Diptera (Kouwets and Davids 1984, Smit and Oliver 1986). The existing descriptions of adults of the named species (Piersig 1897–1900, Soar and Williamson 1927, Viets 1936, Sokolow 1940, Lundblad 1962, Szalay 1974, Gerecke *et al.* 2016) are incomplete and insufficiently illustrated, complicating the identification of this species.

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

MATERIAL AND METHODS

The specimens were collected in standing and running waters in the European and Asian parts of Russia. Most specimens were not dissected to preserve the natural shape of their bodies. For several females and males, gnathosoma and legs were mounted in a position that allowed the examination of the chelicerae, pedipalps and legs in a lateral view. All specimens were mounted in Hoyer's medium.

Idiosomal setae and slit organs are named according to Tuzovsky (1987): *Fch*—frontalis chelicerae, *Fp*—frontalis pedipalporum, *Vi*—verticalis interna, *Ve*—verticalis externa, *Oi*—occipitalis interna, *Oe*—occipitalis externa, *Hi*—humeralis interna, *He*—humeralis externa, *Hv*—humeralis ventralis, *Sci*—scapularis interna, *Sce*—scapularis externa, *Li*—lumbalis interna, *Le*—lumbalis exter-

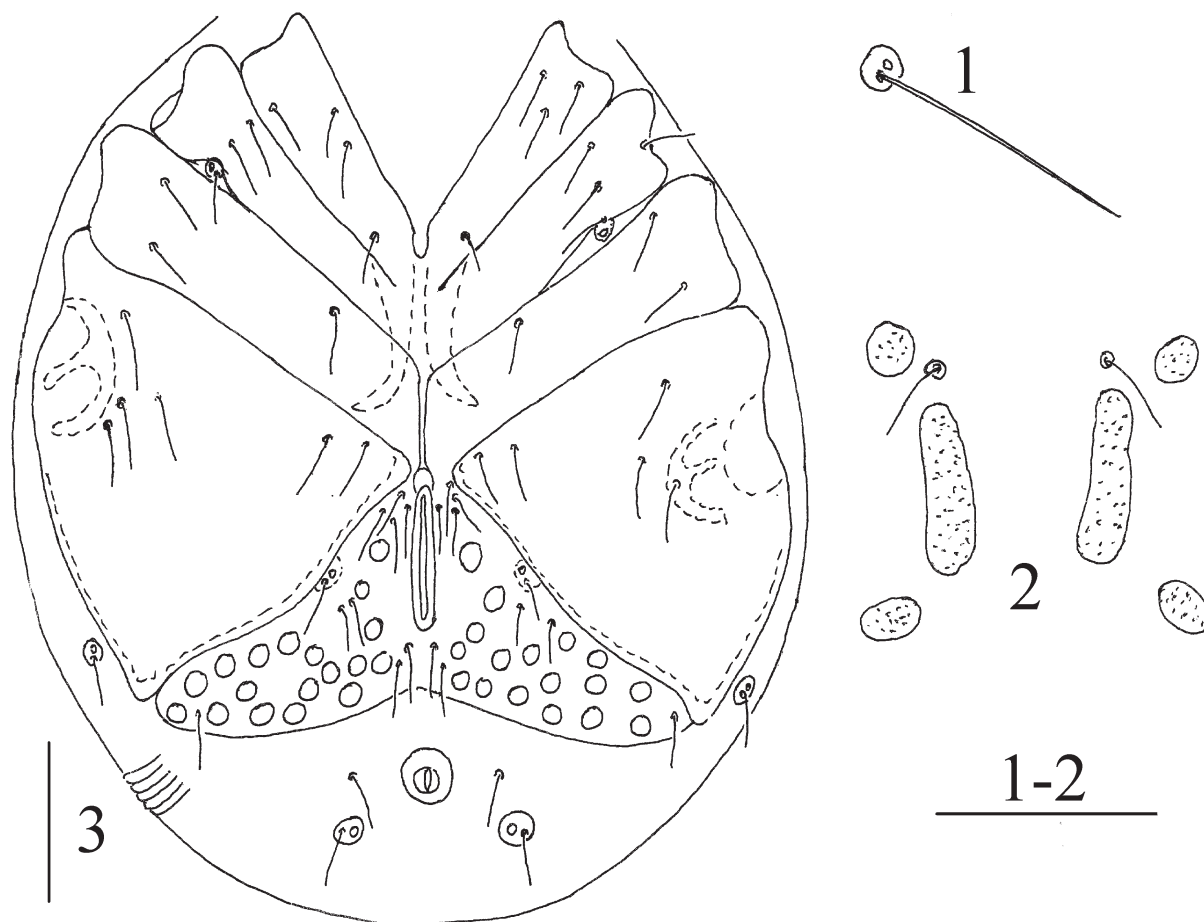
na, *Si*—sacralis interna, *Se*—sacralis externa, *Ci*—caudalis interna, *Pi*—praeanalisis interna, *Pe*—praeanalisis externa (Figs. 23–24, 48–49).

In addition, 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-4—genu of third leg; n—number of specimens measured. The lengths of the appendage segments were measured along their dorsal side. All measurements are given in micrometers (µm). The adults were identified using the original description and a revision of Lundblad (1962) and Gerecke *et al.* (2016).

SYSTEMATICS

Family **Pionidae** Thor, 1900
Subfamily **Foreliinae** Thor, 1923
Genus ***Forelia*** Haller, 1882

Diagnosis (refined after Cook 1974 and Gerecke *et al.* 2016). Integument smooth or lineated or with reticulation. Dorsum of males mostly membranous, bearing two to three pairs of small platelets that may be fused into a single anteromedial plate, or nearly covered by a single large sclerotized shield; dorsum of females mostly membranous, bearing one to three pairs of small dorsal platelets. Coxal plates in two to four groups, in males often fused medially. Venter of males with the coxal groups surrounded, except posteriorly, by membranous integument or fused with a sclerotized ventral shield. Posterior apodeme of anterior coxal groups vary from short to moderately long. Medial margin of coxal plates IV generally reduced to medial angles. Genital field with five or (usually) more acetabula, in males along its anterior edge fused to Cx-4, in females genital



Figs. 1–3. *Forelia brevipes* (Neuman, 1880), male: 1—seta *Fch*; 2—dorsal platelets, 3—idiosoma, ventral view. Scale bars: 1–2 and 3=100 μ m.

field free. Excretory pore sclerotized. Posteromedial margin of gnathosoma with a short to moderately long anchoral process. Palp may show sexual dimorphism, P-4 with peg-like distomedial seta, ventral setae often on small tubercles, P-5 in male of certain species more or less expanded proximally. Legs with swimming setae. Legs exhibiting sexual dimorphism in males, IV-Leg-5 simple, but IV-Leg-6 with a dorsal concavity flanked by two or more peg-like setae; occasionally IV-Leg-4 and/or III-Leg-6 also modified for spermatophore transfer; III-Leg-6 always different in proportions from I/II-Leg-6 in male.

***Forelia brevipes* (Neuman, 1880)**

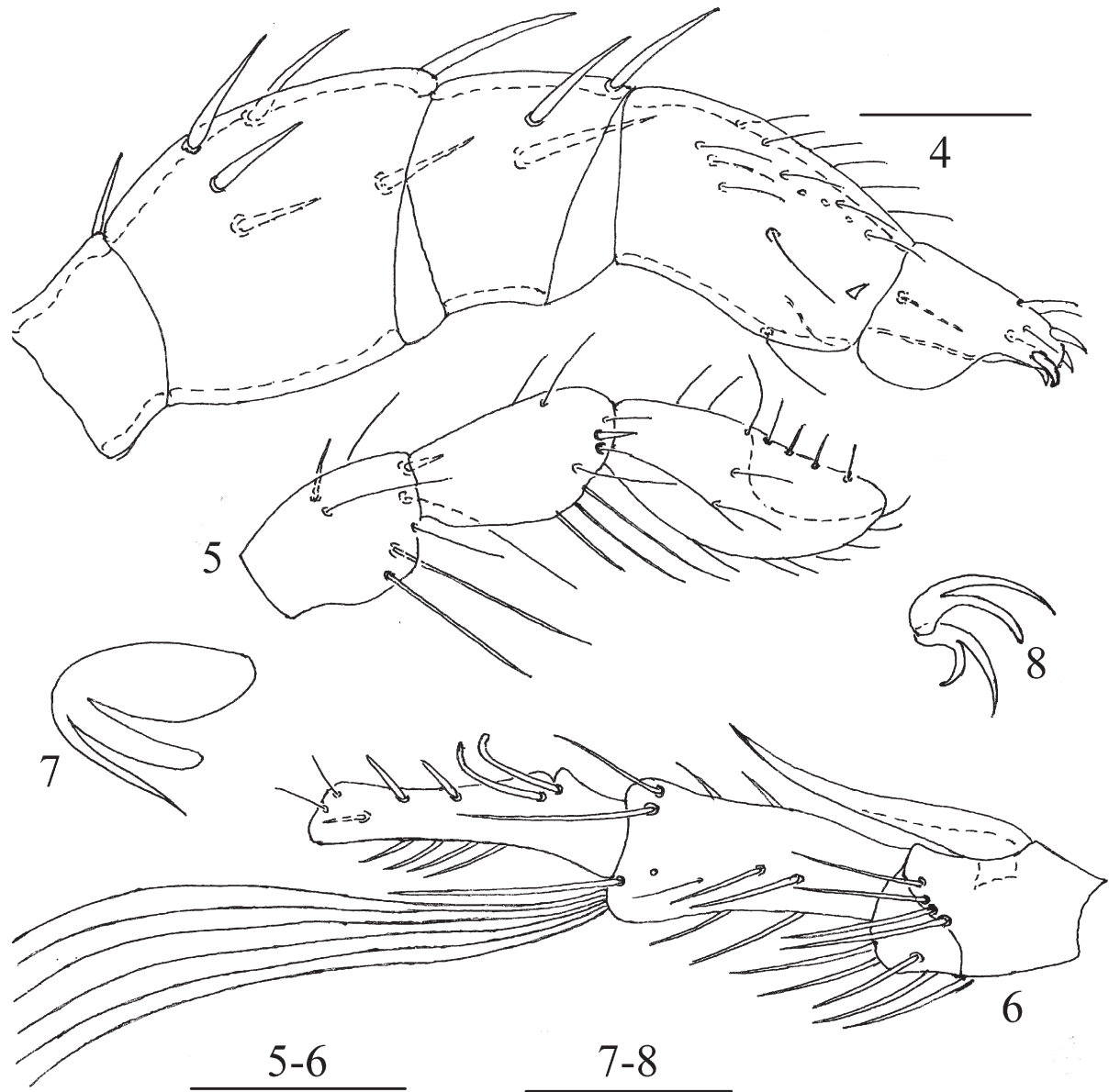
Figs. 1–10

Material examined: 3 males, 2 females, Russia, Yaroslavl Region, Nekouz District, pond in the park of the Borok settlement, April–July 1975; 1 female, Rybinsk Reservoir near the Borok settlement, 19 July 2001, leg P.V. Tuzovsky.

Both sexes. Integument lineated; all idiosomal setae thin and approximately equal in length, but setae *Fch* (Fig. 1) longest and thickest; dorsum with three pairs of platelets, second pair elongated (Fig. 2); 12–24 pairs of genital acetabula; sclerite bearing glandularium and seta *Hv* fused with posterior margin of coxal plate II on each side; P-3 with three unequal setae, these shorter than dorsal margin of segment; I-Leg-6 with convex ventral margin, number of swimming setae as follows: three to four on II-Leg-5, six to seven on III/IV-Leg-4.

Male. All coxal groups fused medially and forming ventral shield with genital field (Fig. 3). Apodeme beneath the posteromedial edge of coxal plate I moderately long, not extending posteriorly to beneath the medial edge of coxal plate III. Genital field triangular with slightly concave posterior margin, bearing 12–20 acetabula and 8–11 thin setae on each side.

Pedipalp (Fig. 4) compact: P-1 short, with single short dorsodistal seta; P-2 large, with slightly convex ventral margin and five short unequal



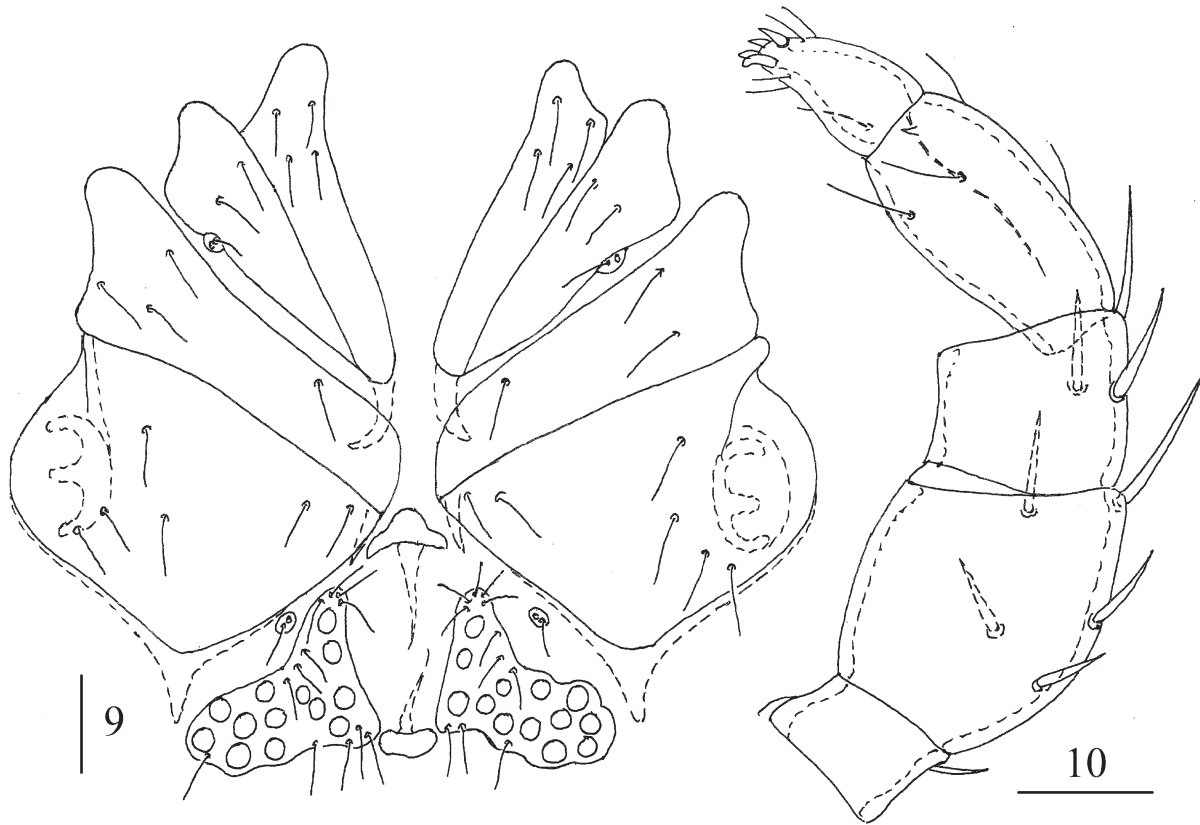
Figs. 4-8. *Forelia brevipes* (Neuman, 1880), male: 4—pedipalp; 5—I-Leg-4-6; 6—IV-Leg-4-6; 7—claw of leg I; 8—claw of Leg III. Scale bars: 4 and 7-8=50 µm, 5-6=100 µm.

dorsal setae; P-3 with three unequal setae shorter than dorsal margin of segment; P-4 a little shorter than P-2 without setal tubercles, ventrodistal peg-like seta short and pointed; P-5 broadened, spoon-shaped, ventral margin in lateral view S-shaped.

I-Leg-6 with convex ventral margin (Fig. 5). IV-Leg-4 with a large pointed, slightly S-shaped sword-like seta, its base near the middle of the segment (Fig. 6); IV-Leg-6 with two longer curved setae and one to three short club-shaped setae. Claws of tarsi I-II relatively large, external clawlets thin pointed, internal clawlets thick with rounded tip (Fig. 7). Claws of IV-Leg-6 asymmetrical (Fig. 8): large claw with subequal in length claw-

lets, but internal clawlet thicker than external one; small claw with relatively long external clawlet and comparatively short internal clawlet.

Measurements (n=3). Idiosoma L 390-560; coxal plates III+IV L 300-305, W 210-240; setae *Fch* L 90-100; cheliceral segments L: base 105-100, chela 42-45; pedipalp segments (P-1-5) L: 36-42, 100-108, 48-54, 90-96, 55-60; leg segments L: I-Leg-1-6: 50-60, 60-65, 65-72, 80-85, 90-95, 124-135; II-Leg-1-6: 65-70, 65-72, 70-90, 90-95, 120-130, 135-145; III-Leg-1-6: 65-75, 65-80, 75-85, 95-100, 140-150, 120-125; IV-Leg-1-6: 120-125, 75-80, 70-80, 80-90, 125-130, 145-155.



Figs. 9–10. *Forelia brevipes* (Neuman, 1880), female: 9—ventral view; 10—pedipalp. Scale bars: 9=100 µm, 10=50 µm.

Female. All coxal groups separated and covering about half of the ventral surface in mature specimens, anterior coxal groups with moderately long apodemes (Fig. 9). Coxal plates IV wider than long. Acetabular plates triangular with 14–24 pairs of acetabula, medial and anterior margins slightly concave. Gonopore longer than acetabular plates, pregenital sclerite larger than posterior one. All acetabula and genital setae located on plates. Acetabular plates with three to six anterior ones, and two to three posterior genital setae. Pedipalp (Fig. 10) is similar to male but P-5 not as broadened. Posterior pair of legs and III-Leg-6 claws not modified.

Measurements (n=3). Idiosoma L 650–850; coxal plates III+IV L 290–305, W 240–260; setae *Fch* L 110–120; acetabular plates: L 100–110, W 115–125; cheliceral segments L: base 120–135, chela 48–54; pedipalp segments (P-1–5) L: 35–42, 100–110, 60–66, 90–95, 54–60; leg segments L: I-Leg-1–6: 65–72, 65–72, 75–85, 90–95, 95–105, 125–140; II-Leg-1–6: 70–80, 80–95, 85–90, 100–110, 125–135, 135–150; III-Leg-1–6: 70–85, 85–90, 95–105, 125–135, 185–200, 155–165; IV-Leg-1–6: 135–145, 95–105, 130–140, 180–190, 200–205, 180–190.

Larva. See (Tuzovsky 2019).

Deutonymph. See (Tuzovsky 1990).

Habitat. Lakes, canals and ditches, but also reported from many other habitat types, including streams (Sokolow 1940, Lundblad 1968, Gerecke *et al.* 2016).

Distribution. Palaearctic. Widespread in Europe (Sokolow 1940, Lundblad 1968, Gerecke *et al.* 2016).

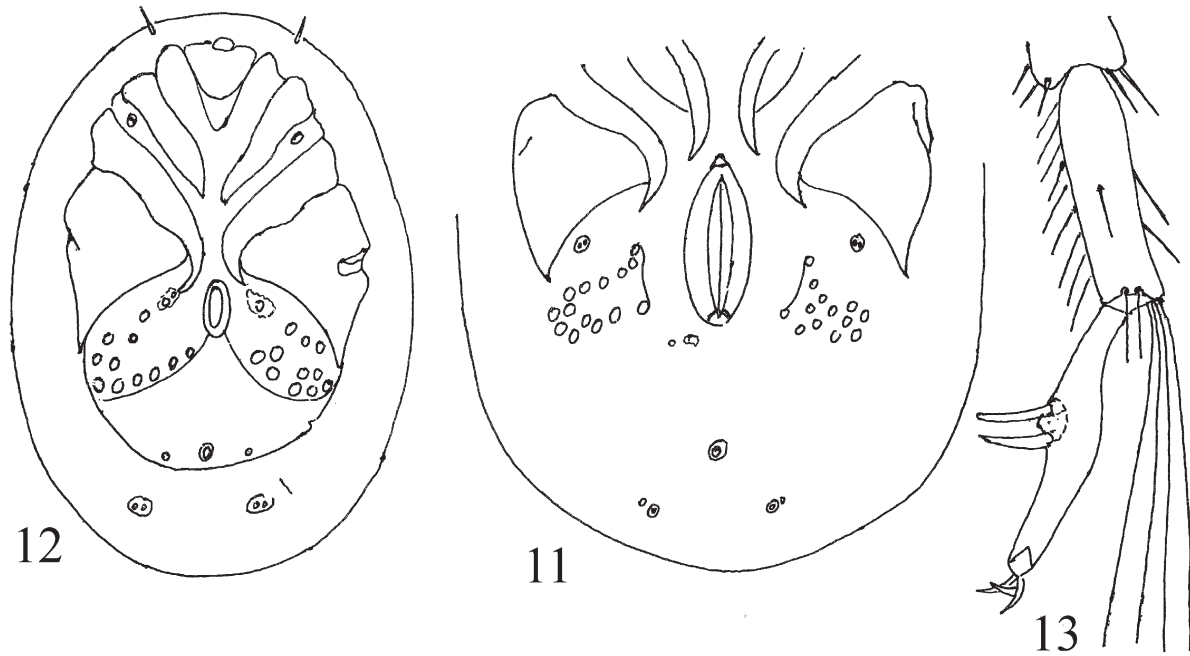
***Forelia diaphana* (Croneberg, 1899)**

Figs. 11–13

I was not able to examine any specimens of *F. diaphana*. The diagnosis of this species is based on the reference data (Sokolow 1940). Unfortunately, the species description was not presented adequately.

Female. Idiosoma 800 µm long. Color white-yellowish, dorsum with dark-brown spots. Integument with rough sculpture laterally, dorsum with reticulation. Legs short, I/II-Leg-6 expanded. Coxal plate III with pointed posteromedial projection (Fig. 11). Coxal plate IV longer than wide. Genital field with 12–13 acetabula on each side, pregenital sclerite not developed.

Male. Idiosoma length 500 µm. Dorsum entirely covered by shield. Ventral shield includes



Figs. 11–13. *Forelia diaphana* (Croneberg, 1899): 11–12—ventral view, 11—female, 12—male; 13—IV-Leg-5–6 of male (modified after Sokolow 1940).

coxal plates, genital field and excretory pore (Fig. 12). Coxal plates IV longer than wide. Genital field with 12 acetabula on each side. IV-Leg-6 ventrally with two curved peg-like setae (Fig. 13).

Larva. Unknown.

Deutonymph. Unknown.

Habitat. Standing waters.

Distribution. Europe, Russia, Moscow Region (Croneberg 1899, Sokolow 1940).

***Forelia liliacea* (Müller, 1776)**

Figs. 14–22

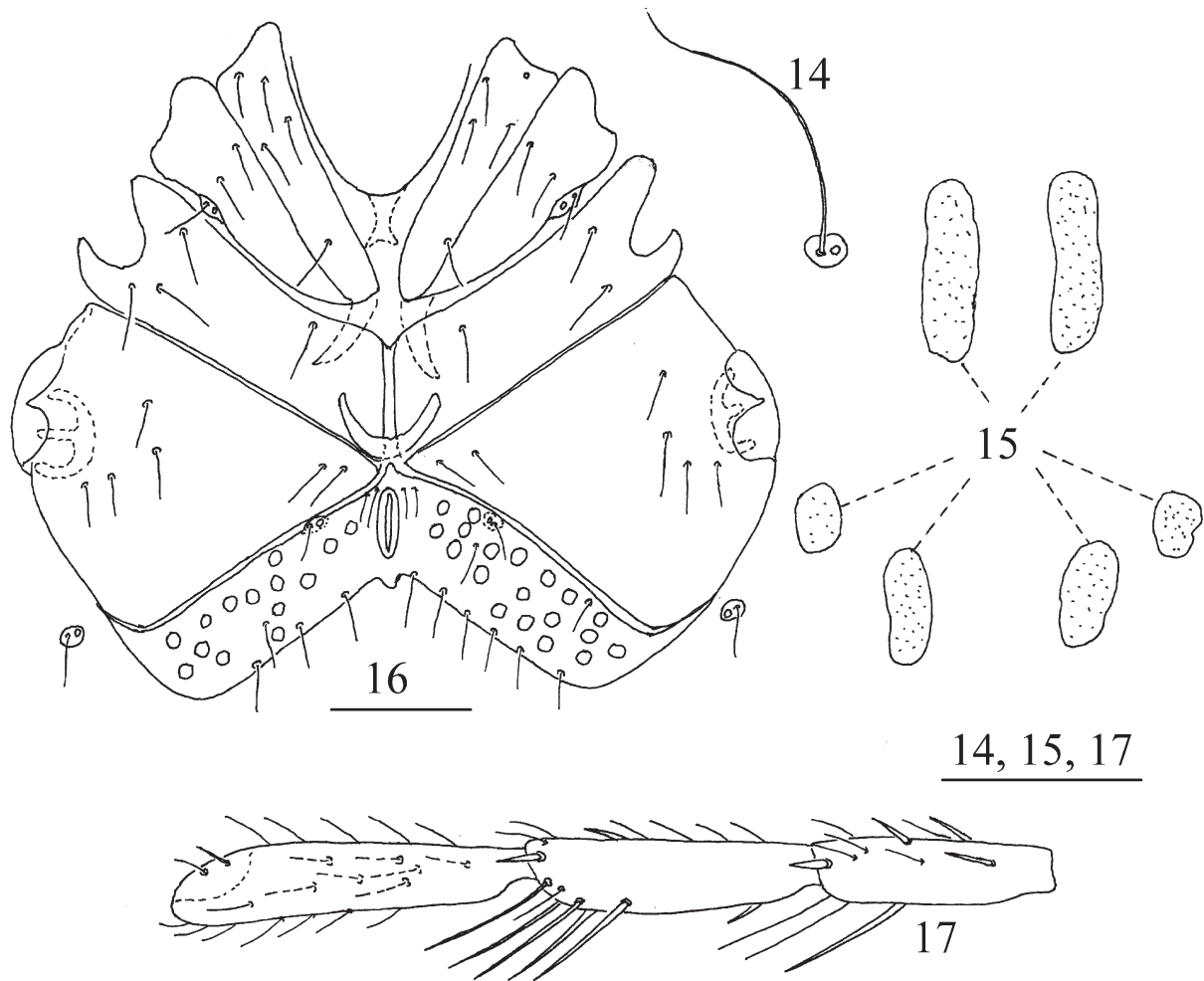
Material examined. 3 males, 3 females, Asia, Russia, Kamchatka Region, Ust-Kamchatsky District, Dyakonovskoe Lake near the biologic station “Raduga”, June–July 1983; 3 males, 7 females, Europe, Russia, Samara Region, Stavropol District, National Natural Park “Samarskaya Luka”, small lakes near the village Koltsovo, June–July 1992; 1 male and 1 female, Russia, Yaroslavl Region, Nekouz District, Rybinsk Reservoir near the village Pogorelka, 10 October 1969, leg P.V. Tuzovsky.

Both sexes. Color yellow with dark-brown spots. Integument lined; all idiosomal setae thin and approximately equal in length, but setae *Fch* (Fig. 14) much longer than other idiosomal setae. Pedipalp without sexual dimorphism, P-2 ventral margin slightly concave or nearly straight, P-4 ventral margin straight, with two setal tubercles

(lateral tubercle somewhat distal to medial tubercle) and short distal peg-like seta. I/II-Leg-6 slender, with straight parallel margins (Fig. 17). 12–24 pairs of genital acetabula; sclerite bearing glandularium and seta *Hv* fused with posterior margin of coxal plate II. P-3 with three unequal setae shorter than dorsal margin of segment. Number of swimming setae as follows: three to four on II-Leg-5, six to seven on III/IV-Leg-4.

Male. Idiosoma reversed egg-shaped, posteriorly tapering, anterior margin straight to slightly concave. Dorsum with three pairs of platelets, anterior and posterior platelets relatively large elongated, central pair comparatively small and rounded (Fig. 15). Anterior coxal groups separated, coxal plates IV wider than long (Fig. 16). Apodeme beneath the posteromedial edge of coxal plate I moderately long, not reaching posteriorly to the suture line between coxal plates II and III. Genital plates relatively narrow, with parallel anterior and posterior margins, bears 15–24 acetabula and 5–11 thin setae on each side.

Pedipalp (Fig. 18) compact: P-1 short, with single short dorsodistal seta; P-2 large, with slightly concave ventral margin and five short unequal dorsal setae; P-3 with three (occasionally with four) unequal setae, lateral setae longest and located usually proximally or occasionally near the middle of the segment; P-4 ventral margin straight, with two minute setal tubercles (lateral tubercle some-



Figs. 14–17. *Forelia liliacea* (Müller, 1776), male: 14—seta *Fch*; 15—dorsal platelets; 16—idiosoma, ventral view; 17—I-Leg-4–6. Scale bars: 14, 15, 17 and 16=100 μ m.

what distal to medial tubercle) and short distal peg-like seta.

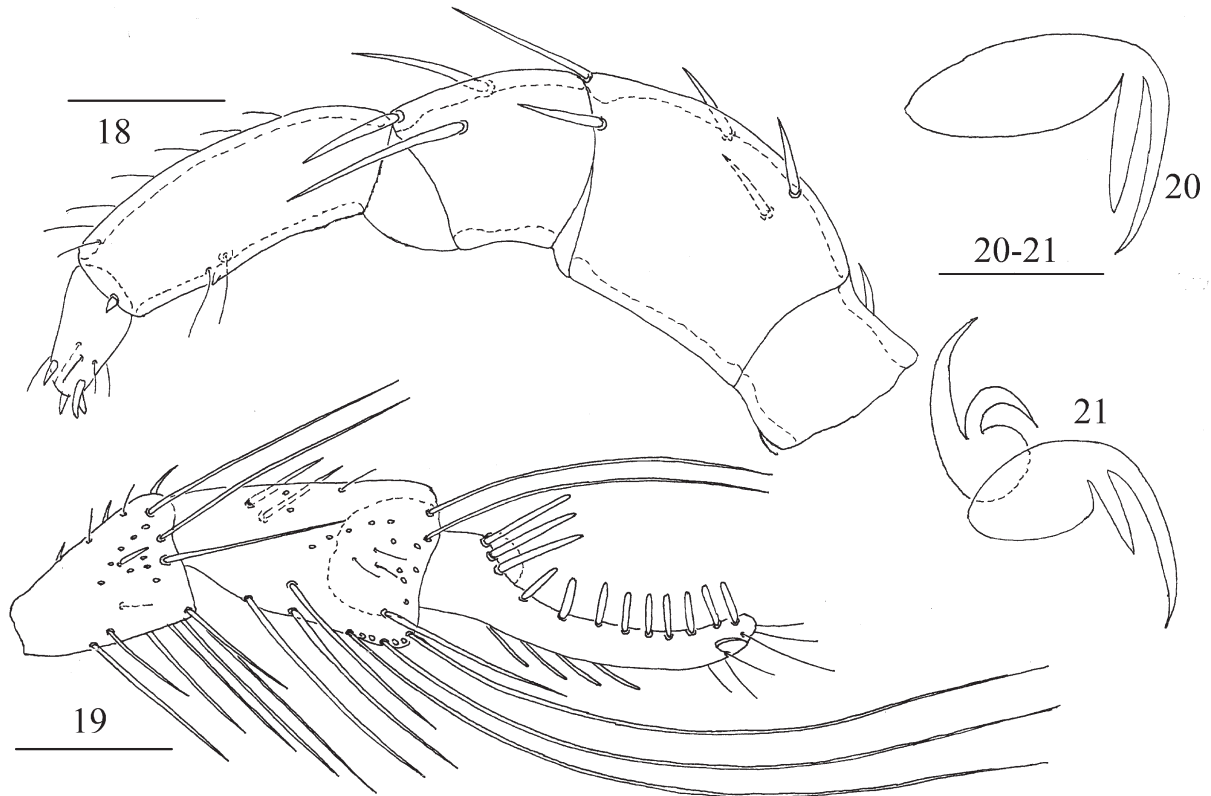
IV-Leg-4 usually with long thin distal setae, IV-Leg-5 distally broadened, IV-Leg-6 with two to three longer setae and seven to eleven short distal setae (Fig. 19). Claws of tarsi I–II relatively large, external clawlet longer than internal clawlet (Fig. 20). Claws of III-Leg-6 asymmetrical (Fig. 21): large claw with long slightly curved external clawlet and short straight internal one; small claw with relatively long relatively slightly curved external clawlet and short strong curved internal clawlet.

Measurements (n=10). Idiosoma L 560–750; coxal plates III+IV L 185–200, W 200–240, setae *Fch* 95–105; cheliceral segments L: base 125–140, chela 45–50; pedipalp segments (P-1–5) L: 33–35, 87–100, 50–65, 100–110, 35–40; leg segments L: I-Leg-1–6: 70–90, 75–90, 85–100, 100–125, 125–150, 160–175; II-Leg-1–6: 75–90, 75–90, 85–100, 125–140, 175–190, 185–215; III-Leg-1–6:

75–90, 75–90, 100–115, 135–155, 180–200, 125–150; IV-Leg-1–6: 135–150, 100–115, 85–115, 85–105, 135–145, 160–200.

Female. Idiosoma elliptical. Dorsum as in male, but occasionally central and posterior pairs of platelets not developed. Anterior coxal groups with relatively short apodeme (Fig. 22). Coxal plates IV wider than long. Posterior coxal groups each have a small posteromedial projection. Acetabular plates triangular, extended anteriorly, with 14–29 pairs of acetabula and 9–11 thin setae on each side. Gonopore longer than acetabular plate, pregenital and postgenital sclerites subequal in size. All acetabula and genital setae located on plates.

Measurements (n=10). Idiosoma L 600–1,070; coxal plates III+IV L 160–190, W 225–250; setae *Fch* L 105–115; acetabular plates: L 100–115, W 150–165; cheliceral segments L: base 145–150, chela 50–60; pedipalp segments (P-1–5) L: 35–45, 110–125, 75–90, 105–115, 35–40; leg segments L:



Figs. 18–21. *Forelia liliacea* (Müller, 1776), male: 18—pedipalp; 19—IV-Leg-4–6; 20—claw of leg I; 21—claws of leg III. Scale bars: 18=50 µm, 19 and 20–21=100 µm.

I-Leg-1–6: 60–75, 65–90, 85–95, 105–125, 125–140, 150–165; II-Leg-1–6: 65–75, 80–100, 100–115, 125–150, 170–190, 175–190; III-Leg-1–6: 75–90, 85–100, 110–125, 150–165, 205–225, 170–200; IV-Leg-1–6: 135–150, 100–120, 135–150, 180–195, 210–230, 200–215.

Larva. See (Wainstein 1980).

Deutonymph. See (Tuzovsky 1990).

Habitat. Lakes, pools, reservoirs, slow running waters (Sokolow 1940, Lundblad 1968, Gerecke *et al.* 2016).

Distribution. Palearctic. Widespread in Europe (Sokolow 1940, Lundblad 1968, Gerecke *et al.* 2016).

***Forelia markovensisa* sp.n.**

Figs. 23–29

Holotype. Female (slide 2795), Asia, Russia, Chukotka, Anadyr District, small lake near the Markovo settlement (N 64°66.5425', E 170°41.4425'), 10 July 1981, coll. P.V. Tuzovsky.

Description. *Female.* Idiosoma elliptical. Color yellow with dark-brown spots. Integument lined; all idiosomal setae thin and approximately equal in length, but setae *Fch* much longer than

other idiosomal setae (Fig. 23). Dorsum with two elongated anterior platelets and small rounded lateral platelets.

Anterior coxal groups with short apodeme each (Fig. 24). Sclerite bearing glandularium and seta *Hv* fused with posterior margin of coxal plate II. Coxal plate IV wider than long. Gonopore longer than acetabular plates. Acetabular plate anterior margin with distinct indentation, medial margin concave and slightly extended anteromedially, with 19 acetabula and 9 thin setae on each side. All acetabula and genital setae located on plates.

Chelicera basal segment large, with obtuse dorsal hump, chela comparatively small, sickle-shaped (Fig. 25).

Pedipalp (Fig. 26) compact: P-1 short, with single short dorsodistal seta; P-2 large, with straight ventral margin and three to four dorsoproximal and two to three dorsodistal setae; P-3 ventral margin slightly concave, with three unequal setae, two proximal setae longer than distal seta, lateral setae located near the middle of the segment; P-4 ventral margin straight, with two minute setal tubercles (lateral tubercle somewhat distal to medial tubercle) and short distal peg-like seta.

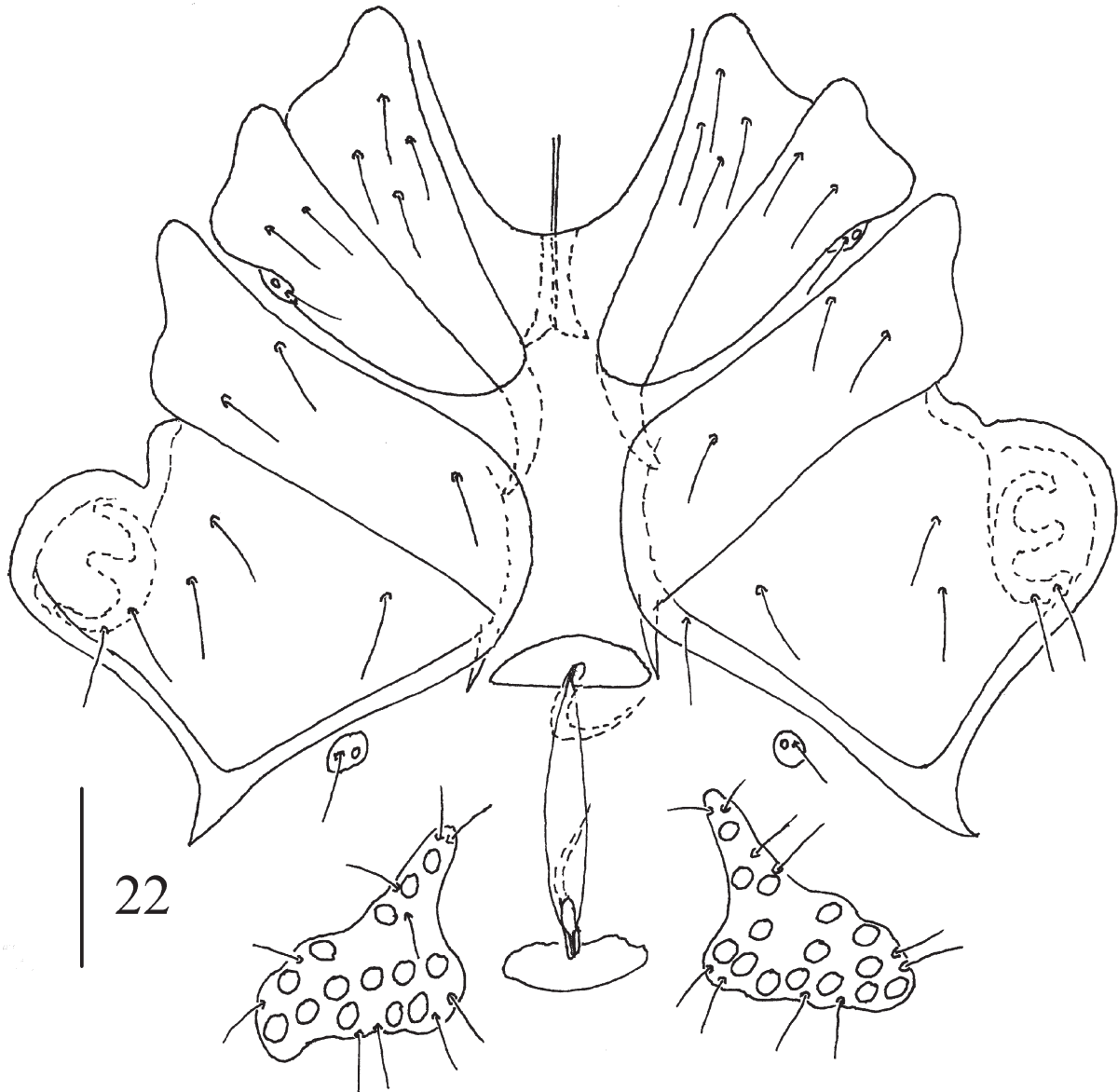


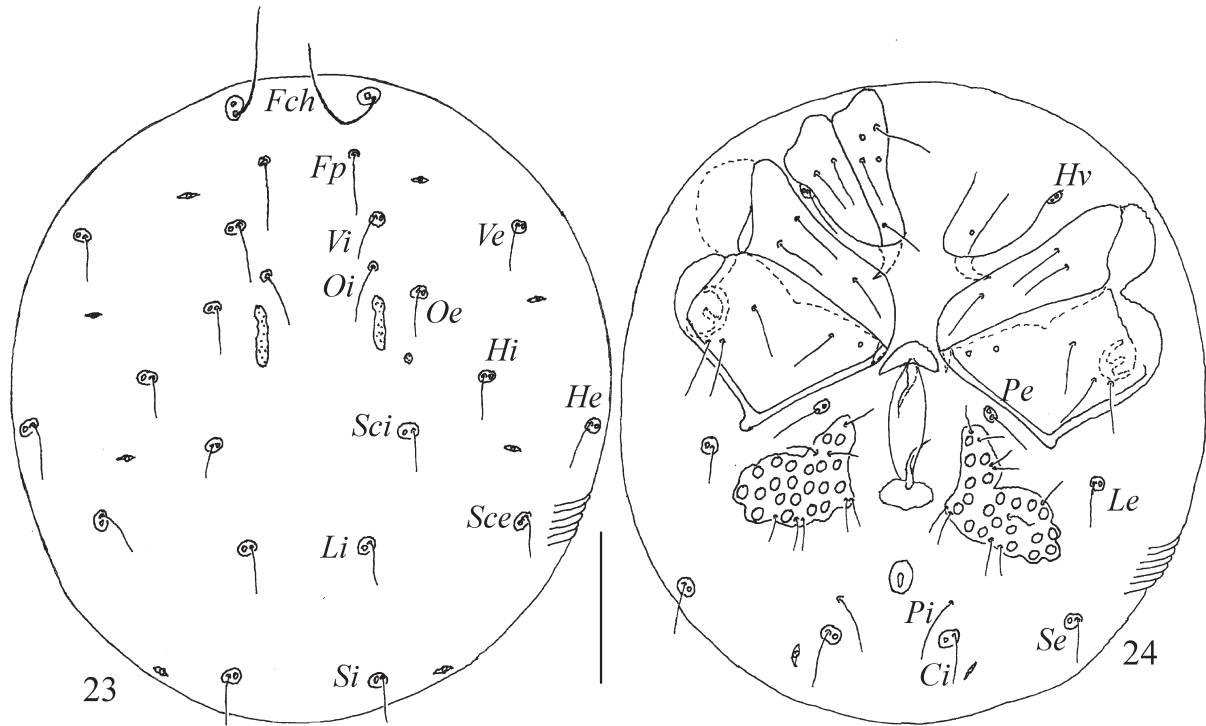
Fig. 22. *Forelia liliacea* (Müller, 1776), female: 22—ventral view. Scale bar: 22=100 μ m.

I/II-Leg-6 with straight parallel dorsal and ventral margins (Fig. 27). Number of swimming setae as follows: two on I-Leg-5, four on II-Leg-5, seven on III-Leg-5, eight on IV-Leg-5. Swimming setae on I-Leg-5 short, and on II-IV-Leg-5 long. IV-Leg-6 with four thick setae (Fig. 28). Claws of anterior pair of legs with clawlets that are nearly subequal in length (Fig. 29).

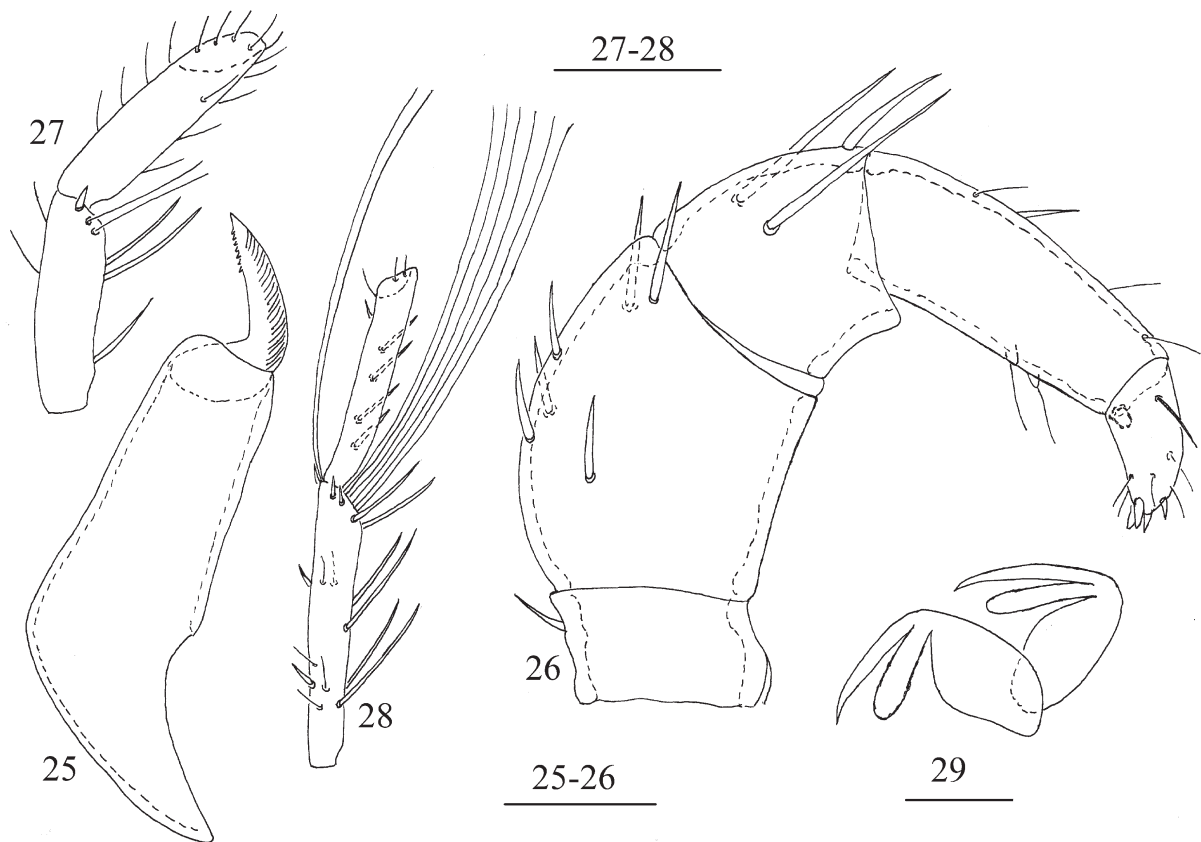
Measurements (n=1). Idiosoma L 690; coxal plates III+IV L 240, W 210; setae *Fch* L 115; acetabular plates: L 100–110, W 125–130; cheliceral segments L: base 132, chela 50; pedipalp segments (P-1–5) L: 30, 102, 60, 95, 42; leg segments L: I-Leg-1–6: 55, 72, 78, 102, 120, 140; II-Leg-1–6: 60, 78, 84, 115, 150, 155; III-Leg-1–6: 72, 80, 102, 125, 180, 150; IV-Leg-1–6: 108, 95, 120, 155, 200, 175.

Differential diagnosis. The present species is similar to *Forelia liliacea*. The female of *F. markovensis* differs from the female of *F. liliacea* in the following characters (character states of *F. liliacea* are indicated in parenthesis): genital plate anterior margin with indentation (Fig. 24; without indentation—Fig. 22); coxal plates III+IV long, 240 μ m (comparatively short, 160–190 μ m); chelicera basal segment short 132 μ m (relatively long, 145–150); I-Leg-5 with two thin, long distal setae—Fig. 27 (with three thin, long distal setae—Fig. 17); I-IV-Leg-5/6 and pedipalp short, see description (comparatively long, see description).

Etymology. The species epithet “*markovensis*” is derived from the name of the settlement where it was collected (Markovo).



Figs. 23–24. *Forelia markovensis* sp.n., female: 23—idiosoma, dorsal view; 24—idiosoma, ventral view. Scale bar: 23–24=200 μ m.



Figs. 25–29. *Forelia markovensis* sp.n., female: 25—chelicera; 26—pedipalp; 27—I-Leg-5–6; 28—IV-Leg-5–6; 29—claws of leg III. Scale bars: 25–26=50 μ m, 27–28=100 μ m, 29=25 μ m.

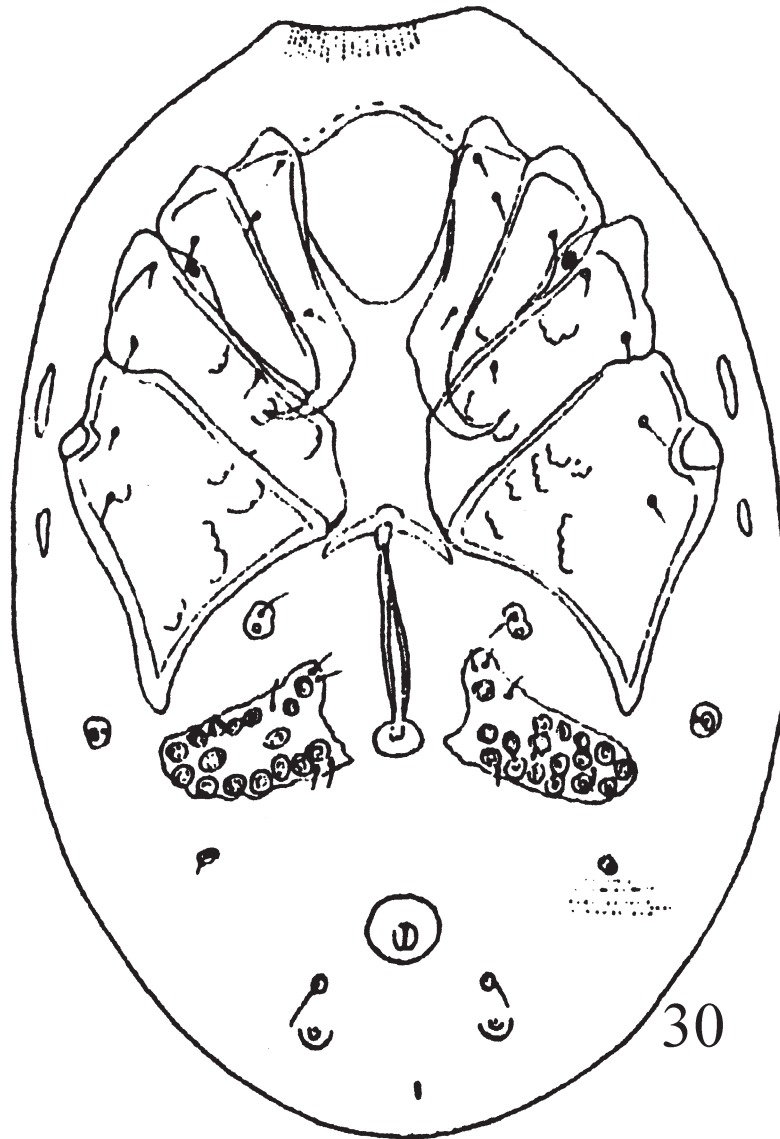


Fig.30. *Forelia mutata* (Piersig, 1901), female: 30—idiosoma, ventral view (after Uchida 1936).

Male. Unknown.

Larva. Unknown.

Deutonymph. Unknown.

Habitat. Lake.

Distribution. Asia (Russia: Chukotka).

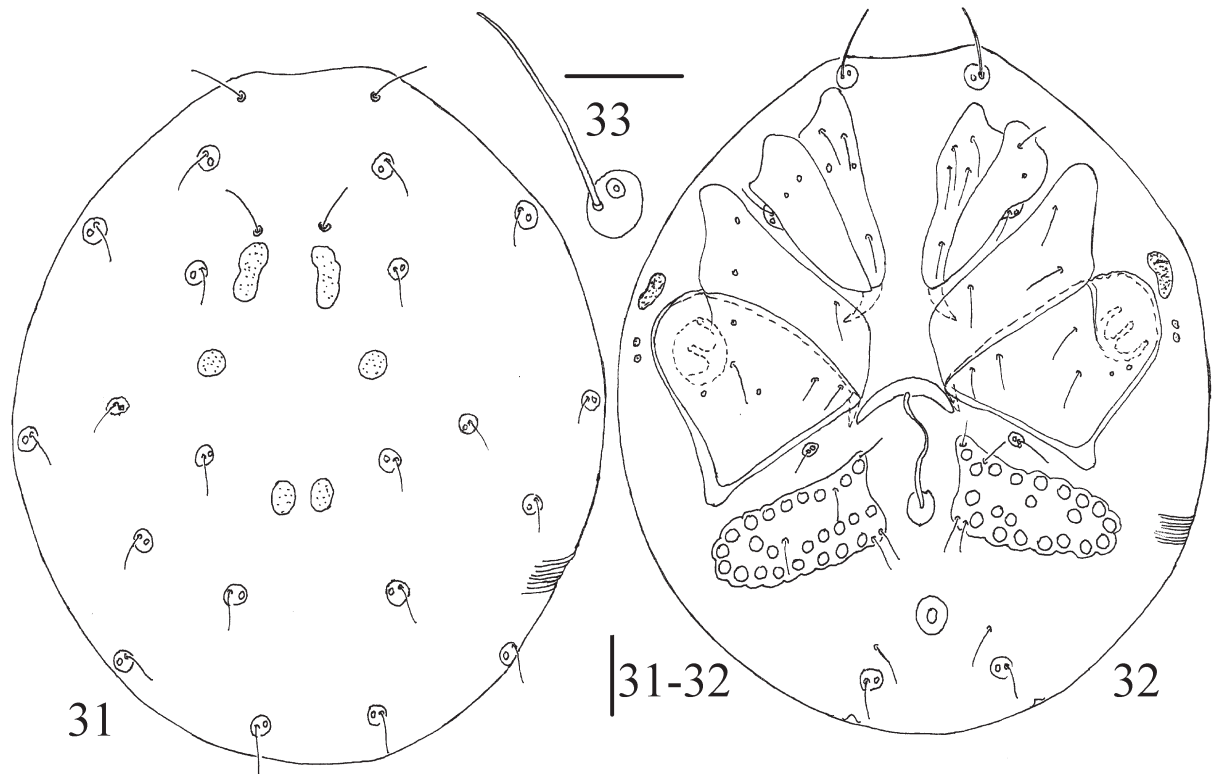
***Forelia mutata* (Piersig, 1901)**

Fig. 30

I was not able to examine any specimens of *F. mutata*. The diagnosis of this species is based on reference data (Piersig 1896–1900, Koenike 1909, Viets 1936, Uchida 1936).

Female. Idiosoma oval, L 850 μm, color same as *F. liliacea*. Integument with reticulation. Anterior coxal groups with moderately long apodeme (Fig. 30). Coxal plate IV longer than wide, with pointed

posteromedial corner. Pedipalp a little thicker than anterior legs. All setae on P-3 shorter than dorsal margin of segment, lateral seta located proximally to the middle of the segment; P-4 with distinct ventral protrusion near the middle of the segment which bears two rather long setae and a short distal peg-like seta. Gonopore longer than acetabular plates, pre-genital sclerite much larger than postgenital sclerite. Acetabular plate width two times larger than length, with concave medial margin, subparallel anterior and posterior margins, without distinct anteromedial projection, one to two acetabula located in anteromedial corner of the plate and a little separated from other acetabula on each side. Genital field with 13–18 pairs of acetabula and 4–5 pairs of thin setae, all acetabula and genital setae located on the plates. Legs very short, I/II-Leg-6 expanded.



Figs. 31–33. *Forelia mutatella* sp.n., female: 31—idiosoma, dorsal view; 32—idiosoma, ventral view, 33—seta *Fch*. Scale bar: 31–32=200 μ m, 33=50 μ m.

Male. Unknown.

Larva. Unknown.

Deutonymph. Unknown.

Habitat. Standing waters.

Distribution. Europe, Asia (Russia: Sakhalin) (Uchida 1936, Viets 1936).

***Forelia mutatella* sp.n.**

Figs. 31–38

Type material. Holotype: female (slide 9500), Asia, Russia, Amur Region, Skovorodinsky District, Bolshoi Oldoi River, creek near the Madalan settlement (N 54°02.582'; E 123°26.887'), 22 July 2005, coll. K.A. Semenchko and D.A. Sidorov.

Description. *Female.* Idiosoma oval with slightly concave anterior edge (Figs. 31–32). Integument lineated, all idiosomal setae thin and approximately equal in length. Setae *Fch* (Fig. 33) longer and thicker than other idiosomal setae. Dorsum with three pairs of platelets, anterior pair elongate, other pairs of platelets comparatively small, oval or rounded.

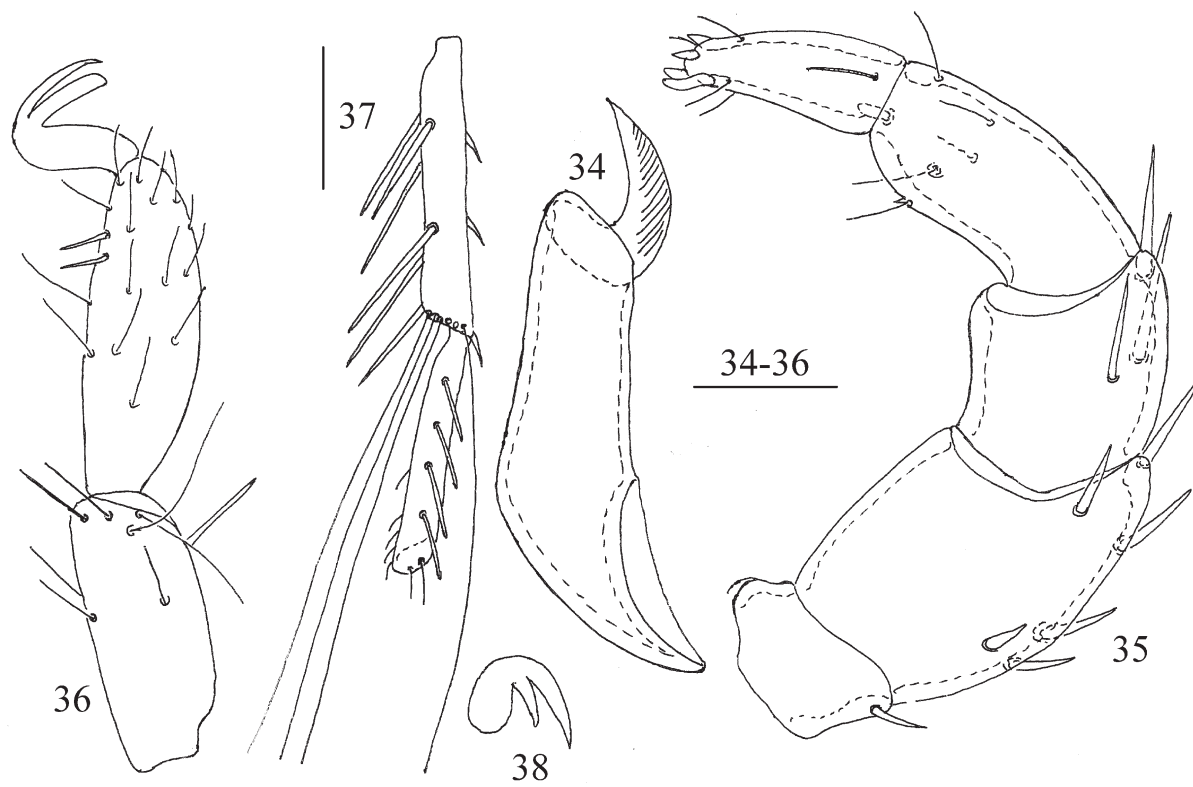
Anterior coxal groups with short apodeme each. Sclerite bearing glandularium and seta *Hv*

fused with posterior margin of coxal plate II on each side. Coxal plate IV wider than long. Gonopore a little longer than acetabular plates. Pregenital sclerite larger than postgenital sclerite. Acetabular plate anterior and posterior margins subparallel, medial margin slightly concave, with 21–25 of acetabula and four to five thin setae on each side. All acetabula and genital setae located on plates.

Chelicera basal segment large, with obtuse dorsal hump, chela comparatively small sickle-shaped (Fig. 34).

Pedipalp (Fig. 35) compact: P-1 short, with single short dorsodistal seta; P-2 large, with straight ventral margin, three dorsoproximal and three dorsodistal setae; P-3 ventral margin slightly concave, with three unequal setae, lateral setae located near the middle of the segment; P-4 ventral margin slightly convex, with two minute setal tubercles located distally to the middle of the segment and small distal peg-like seta.

I/II-Leg-6 with convex ventral margins (Fig. 36). Number of swimming setae as follows: two on I-Leg-5, five to six on II-Leg-5, six to seven on III-Leg-5, six on IV-Leg-5. Swimming setae short on I-Leg-5, and long on II–IV-Leg-5. IV-Leg-6 with four thick setae (Fig. 37). Claws of anterior pairs



Figs. 34–38. *Forelia mutarella* sp.n., female: 34—chelicera; 35—pedipalp; 36—I-Leg-5–6; 37—IV-Leg-5–6; 38—claw of leg IV. Scale bars: 34–36 and 38=50 µm, 37=100 µm.

of legs with nearly subequal clawlets in length, claws of IV-Legs with long external clawlet and relatively short internal clawlet (Fig. 38).

Measurements (n=1). Idiosoma L 760; coxal plates III+IV L 315–320, W 215–240; setae *Fch* L 90; acetabular plates: L 90–95, W 180–190; cheliceral segments L: base 150, chela 55; pedipalp segments (P-1–5) L: 35, 114, 65, 99, 60; leg segments L: I-Leg-1–6: 65, 95, 85, 95, 100, 125; II-Leg-1–6: 65, 90, 90, 110, 132, 145; III-Leg-1–6: 70, 95, 102, 125, 185, 185; IV-Leg-1–6: 130, 100, 130, 180, 200, 180.

Differential diagnosis. The present species is similar to *Forelia mutata*. The female of *F. mutarella* differs from the female of *F. mutata* in the following characters (characters of *F. mutata* are indicated in parenthesis). The integument lineated (with reticulation); the coxal plates IV wider than long—Fig. 32 (longer than wide—Fig. 30); the genital field with 21–25 pairs of acetabula—Fig. 32 (13–18 pairs of acetabula—Fig. 30).

Etymology. The species epithet “*mutarella*” is derived from the name of a similar species, *Forelia mutata*.

Male. Unknown.

Larva. Unknown.

Deutonymph. Unknown.

Habitat. Slowly running waters.

Distribution. Asia (Russia: Far East).

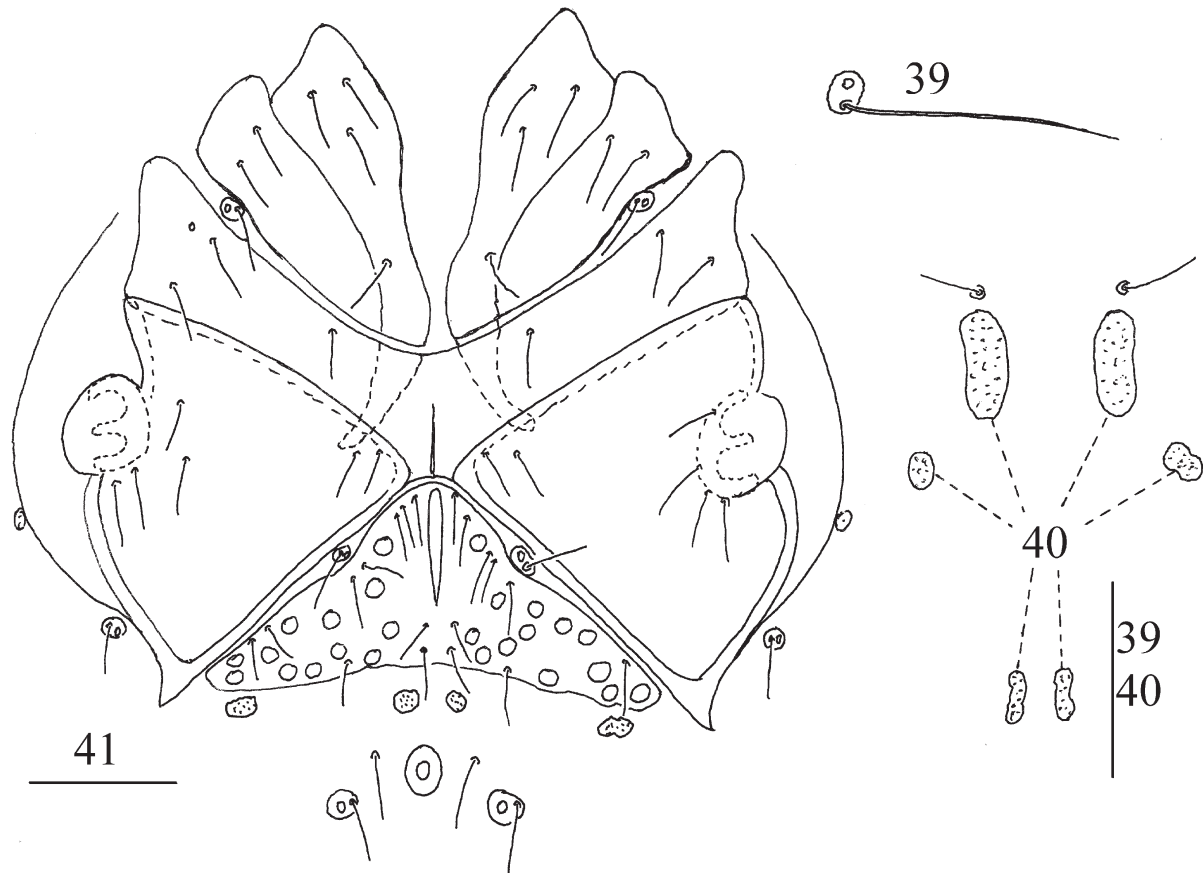
***Forelia spatulifera* (Marucci, 1907)**

1997 *Forelia samarica* Tuzovsky, Biological indication, 3: 162–177

Material examined. 4 males, 15 females: Europe, Russia, Samara Region, Stavropol District, National Natural Park “Samarskaya Luka”, small lakes near the village of Koltsovo, May–June 1992–1993; 1 male, Samara Region, Volzhsky District, Chapaevka River mouth, 18 July 1990, coll. P.V. Tuzovsky.

Both sexes. Integument lineated; setae *Fch* (Fig. 39) much longer than other idiosomal setae; dorsum with three pairs of platelets, anterior pair large than other platelets (Fig. 40); 11–17 pairs of genital acetabula; P-3 with three unequal setae, which are shorter than dorsal margin of segment; I/II-Leg-6 with convex ventral margin, number of swimming setae as follows: five to six on II-Leg-5 and IV-Leg-5, seven to nine on III-Leg-5.

Male. All coxal groups fused medially, forming ventral shield with genital field (Fig. 41). Coxal



Figs. 39–41. *Forelia spatulifera* (Marucci, 1907), male: 39—seta *Fch*; 40—dorsal platelets; 41—idiosoma, ventral view. Scale bars: 39–40 and 41=100 μ m.

plates I separate. Apodemes beneath the postero-medial edge of anterior coxal groups long, extending posteriorly to beneath the medial edge of coxal plates III. Genital field triangular, with nearly straight posterior margin, bearing 11–15 acetabula and 7–12 thin setae on each side.

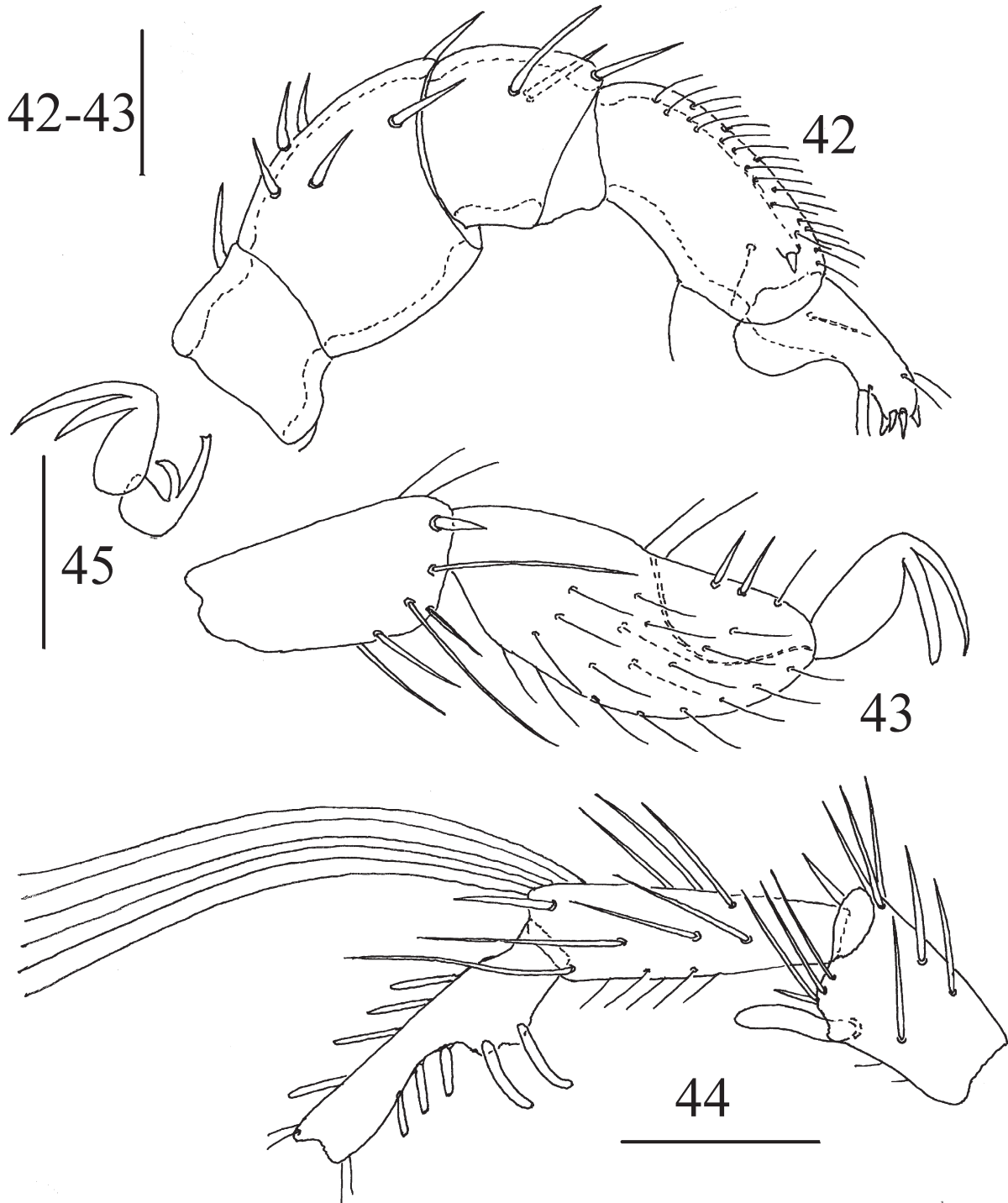
Pedipalp (Fig. 42) compact: P-1 short, with single short dorsodistal seta; P-2 large, with convex ventral margin and six short subequal dorsal setae; P-3 with three unequal setae, all these setae shorter than dorsal margin of segment, lateral setae located near the middle of the segment; P-4 and P-2 subequal in length, without setal tubercles, ventrodistal peg-like seta short; P-5 strong broadened proximally.

I/II-Leg-6 with convex ventral margin (Fig. 43). IV-Leg-4 with a large pointed, slightly S-shaped sword-like seta, its base located distally to the middle of the segment; IV-Leg-6 with two longer, curved setae and one to three short, club-shaped setae (Fig. 44). Claws of tarsi I–II relatively large, both clawlets subequal in length and pointed, internal clawlets thicker than external clawlets.

Claws of III-Leg-6 asymmetrical (Fig. 45): large claw with long external clawlet and relatively short internal one, both clawlets pointed; small claw with relatively long nearly straight external clawlet and comparatively short curved internal clawlet.

Measurements (n=5). Idiosoma L 550–605; coxal plates III+IV L 330–375, W 230–260, setae *Fch* L 90–105; cheliceral segments L: base 115–100, chela 40–50; pedipalp segments (P-1–5) L: 32–40, 90–100, 50–60, 90–100, 55–65; leg segments L: I-Leg-1–6: 55–65, 75–90, 75–80, 75–80, 80–100, 120–130; II-Leg-1–6: 65–75, 95–105, 80–85, 90–100, 120–125, 130–140; III-Leg-1–6: 65–75, 80–100, 80–90, 95–105, 145–165, 120–130; IV-Leg-1–6: 130–145, 80–90, 80–90, 85–100, 130–145, 135–145.

Female. All coxal groups separated and covering about half of the ventral surface in mature specimens, anterior coxal groups with moderately long apodeme (Fig. 46). Coxal plates IV wider than long. Gonopore longer than acetabular plates, pregenital sclerite large than posterior one. Acetabular

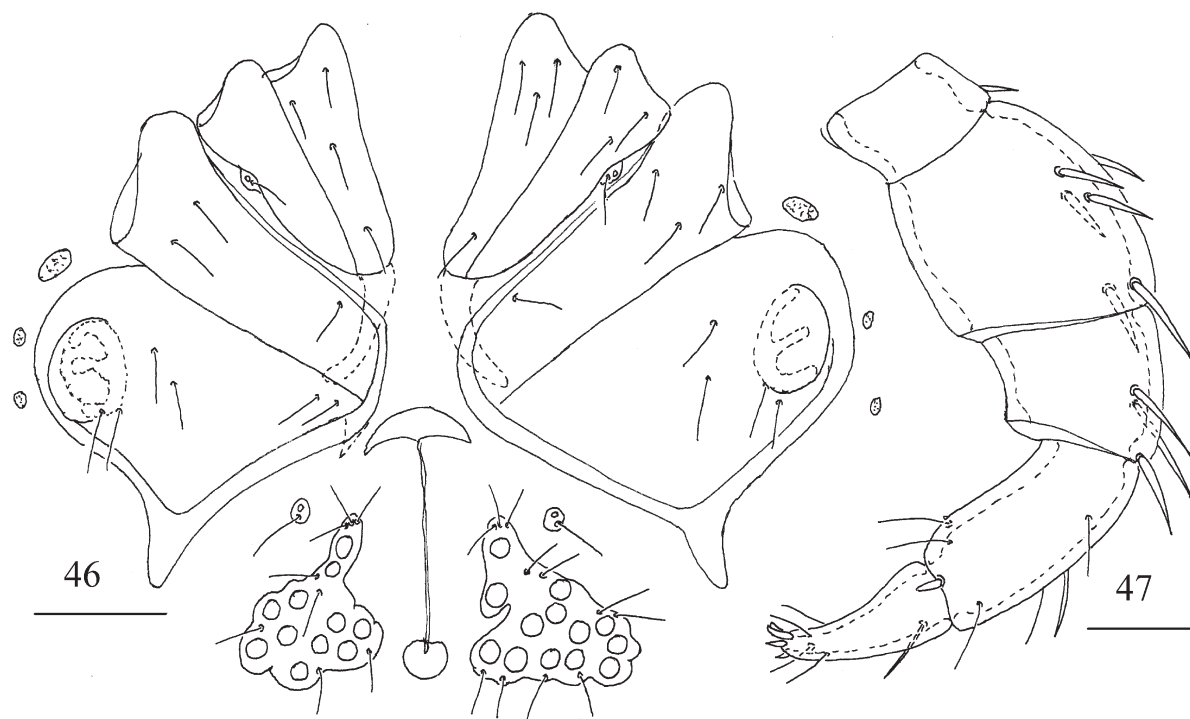


Figs. 42–45. *Forelia spatulifera* (Marucci, 1907), male: 42—pedipalp; 43—I-Leg-5–6; 44—IV-Leg-4–6; 45—claws of leg III. Scale bars: 42–43, 45=50 μm , 44=100 μm .

plates triangular, medially indented, with 11–17 acetabula and 6–12 thin setae on each side. All acetabula and genital setae located on plates. Pedipalp (Fig. 47) is similar to male but P-5 not as broadened as in male. Posterior pair of legs and III-Leg-6 claws not modified.

Measurements (n=10). Idiosoma L 815–980; coxal plates III+IV L 350–380, W 250–270; setae

Fch L 95–110; acetabular plates: L 105–125, W 120–135; cheliceral segments L: base 130–140, chela 45–55; pedipalp segments (P-1–5) L: 40–43, 90–105, 55–65, 90–100, 60–65; leg segments L: I-Leg-1–6: 65–90, 90–100, 80–100, 90–100, 90–105, 130–140; II-Leg-1–6: 65–80, 100–115, 80–100, 105–115, 130–1150, 140–150; III-Leg-1–6: 75–105, 95–105, 105–115, 120–140, 195–205,



Figs. 46–47. *Forelia spatulifera* (Marucci, 1907), female: 46—idiosoma, ventral view; 47—pedipalp. Scale bars: 46=100 μ m, 47=50 μ m

145–165, 70–85, 85–90, 95–105, 125–135, 185–200, 155–165; IV-Leg-1–6: 145–165, 105–115, 130–145, 180–195, 210–235, 185–205.

Larva. See (Tuzovsky 1997).

Deutonymph. See (Meyer and Schwoerbel 1981; Tuzovsky 1997).

Habitat. Lakes, slow lowland flowing streams.

Distribution. Western Palaearctic. Widespread in Europe (Lundblad 1968, Gerecke *et al.* 2016). Russia, Samara Region (Tuzovsky 1997).

***Forelia variegator* (Koch, 1837)**

Figs. 48–56

Material examined. 4 males, 2 females: Europe, Russia, Yaroslavl Region, Nekouz District, Rybinsk Reservoir near the village Pogorelka, June–July 1975; 2 males, 4 females: Samara Region, Stavropol District, National Natural Park “Samarskaya Luka”, small lakes near the village Koltsovo, June–July 1990, 1992; 1 female, Samara Region, Volzhsky District, Chapaevka River mouth, 13 June 1990, coll. P.V. Tuzovsky.

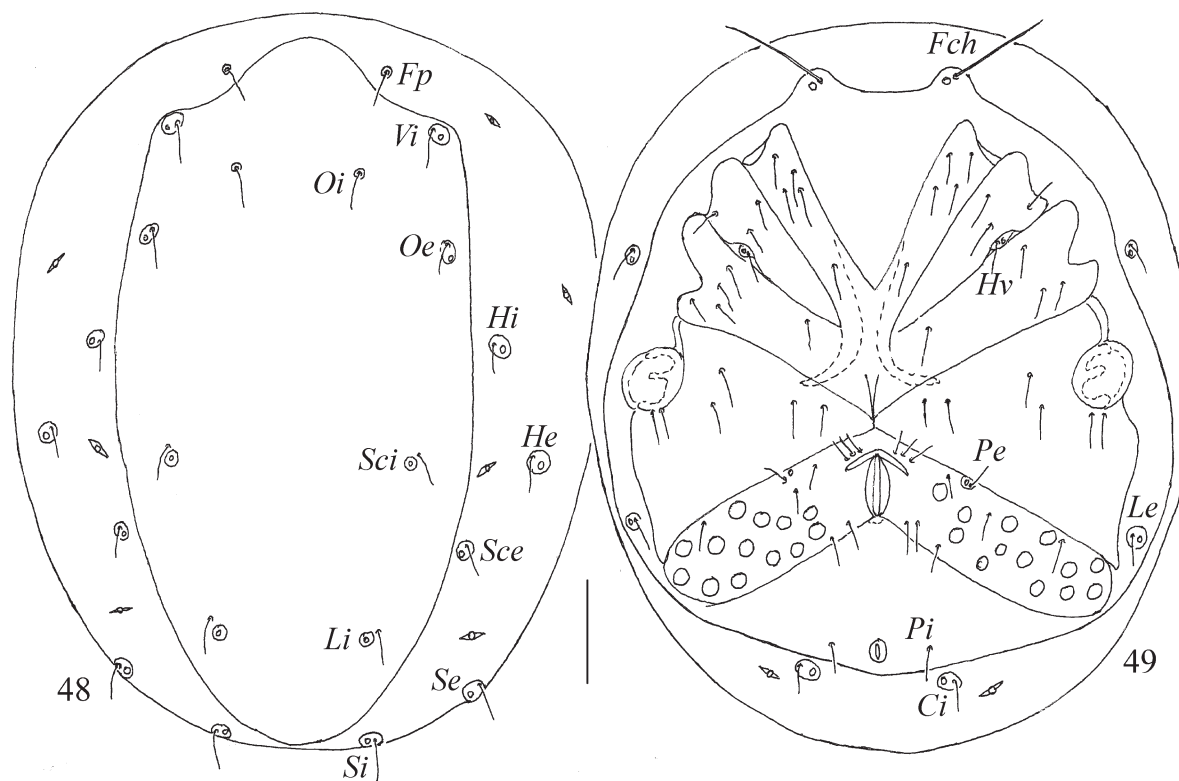
Both sexes. Colour yellowish with brown dorsal dots. Integument lineated, occasionally reticulated. Idiosoma oval in shape, anterior margin slightly convex. Apodeme beneath the posteromedial edge of anterior coxal groups long, extending

posteriorly to beneath the medial edge of coxal plate III. P-4 ventral setae associated with minute tubercles, peg-like seta very small, P-5 with slightly sexual dimorphism. I/II-Leg-6 with convex ventral margin, number of swimming setae as follows: five to seven on II-Leg-5, six to eight on III-Leg-5, six to nine on IV-Leg-5.

Male. Dorsum (Fig. 48) nearly entirely covered by an elongate shield bearing trichobothria *Oi* (not associated with glandularia) and four pairs of setae associated with glandularia (*Vi*, *Oe*, *Sci*, *Li*). Trichobothria *Fp*, setae *Hi*, *Sce*, *Si* and *Se* located on soft integument. Coxal plates fused medially and with genital field and excretory pore to form a ventral shield, which bears setae *Fch*, *Hv*, *Le*, *Pe* and *Pi* (Fig. 49). Genital plates with 9–17 acetabula and 8–11 thin setae.

Pedipalp (Fig. 50) compact: P-1 short, with single short dorsodistal seta; P-2 large, with convex ventral margin and five to six short unequal dorsal setae; P-3 with three unequal setae, all these setae shorter than dorsal margin of segment, lateral setae located proximally to the middle of the segment; P-4 with convex medial margin, ventral setae associated with minute tubercles, peg-like seta very short; P-5 slightly broadened proximally.

I/II-Leg-6 with convex ventral margin (Fig. 51). IV-Leg-4 distally broadened, with two basally



Figs. 48–49. *Forelia variegator* (Koch, 1837), male: 48—idiosoma, dorsal view; 49—idiosoma, ventral view. Scale bar: 48–49=100 μ m.

thickened sword-like setae; IV-Leg-6 ventrally with two rather large curved peg-like setae (Fig. 52). Numbers of swimming setae as follows: five to seven on II-Leg-5, six to eight on III-Leg-5, six to nine on IV-Leg-5. Claws of tarsi I–II relatively large, external clawlet shorter than internal clawlet (Fig. 53). Claws of III-Leg-6 asymmetrical (Fig. 54): large claw with long external clawlet and relatively short internal one, both clawlets pointed; small claw's internal clawlet a little longer than short external clawlet, the latter with bifurcated tip.

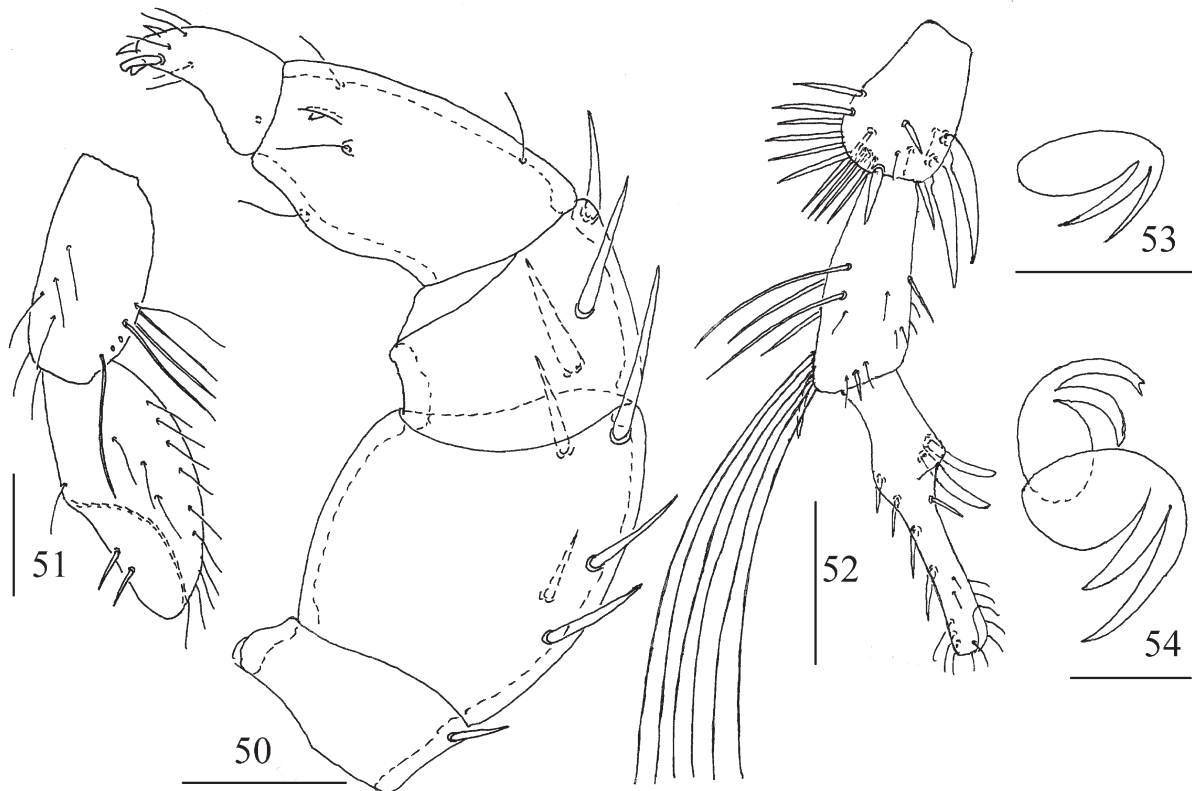
Measurements (n=5). Idiosoma L 500–615; coxal plates III+IV L 270–320, W 200–210, setae *Fch* 95–105; cheliceral segments L: base 115–120, chela 42–48; pedipalp segments (P-1–5) L: 30–33, 95–102, 48–57, 95–105, 36–42; leg segments L: I-Leg-1–6: 50–55, 55–68, 65–70, 75–80, 78–85, 115–125; II-Leg-1–6: 48–55, 55–60, 70–80, 90–95, 110–120, 120–125; III-Leg-1–6: 65–72, 60–65, 70–80, 100–110, 155–165, 135–145; IV-Leg-1–6: 100–120, 54–60, 75–85, 85–90, 110–120, 145–165.

Female. Dorsum with three pairs of platelets, anterior pair larger than other pairs of platelets (Fig. 55). All coxal groups separated and covering about half of the ventral surface in mature specimens, anterior coxal groups with relatively short

apodemes (Fig. 56). Coxal plates IV wider than long. Gonopore longer than acetabular plates, pregenital and postgenital sclerites nearly subequal in width. Acetabular plates mediolaterally twice longer than the straight medial margin, bears 11–28 acetabula and 4–7 thin setae on each side. All acetabula located on plates. In addition, anterior to genital plates, some small setae lie free in idiosoma, flanked by two to three setae on small platelets. P-5 not broadened proximally. Numbers of swimming setae are as follow: five to six on II-Leg-5, seven to eight on III-Leg-5, seven to nine on IV-Leg-5.

Measurements (n=9). Idiosoma L 750–900; coxal plates IV mL 190–210, mW 215–225; setae *Fch* L 95–115; acetabular plates: L 72–90, W 138–155; cheliceral segments L: base 115–130, chela 45–50; pedipalp segments (P-1–5) L: 30–35, 90–108, 55–63, 80–85, 45–50; leg segments L: I-Leg-1–6: 55–65, 65–90, 80–90, 90–95, 115–120; II-Leg-1–6: 60–70, 75–90, 75–85, 100–110, 125–135, 125–135; III-Leg-1–6: 65–75, 80–110, 90–105, 115–120, 170–180, 145–155; IV-Leg-1–6: 110–125, 85–100, 120–140, 160–170, 170–180, 165–175.

Larva. See (Wainstein 1969, 1980).



Figs. 50–54. *Forelia variegator* (Koch, 1837), male: 50—pedipalp; 51—I-Leg-5–6; 52—IV-Leg-4–6; 53—claw of leg I; 54—claws of leg III. Scale bars: 50, 51, 53=50 μ m, 52=100 μ m, 54=25 μ m.

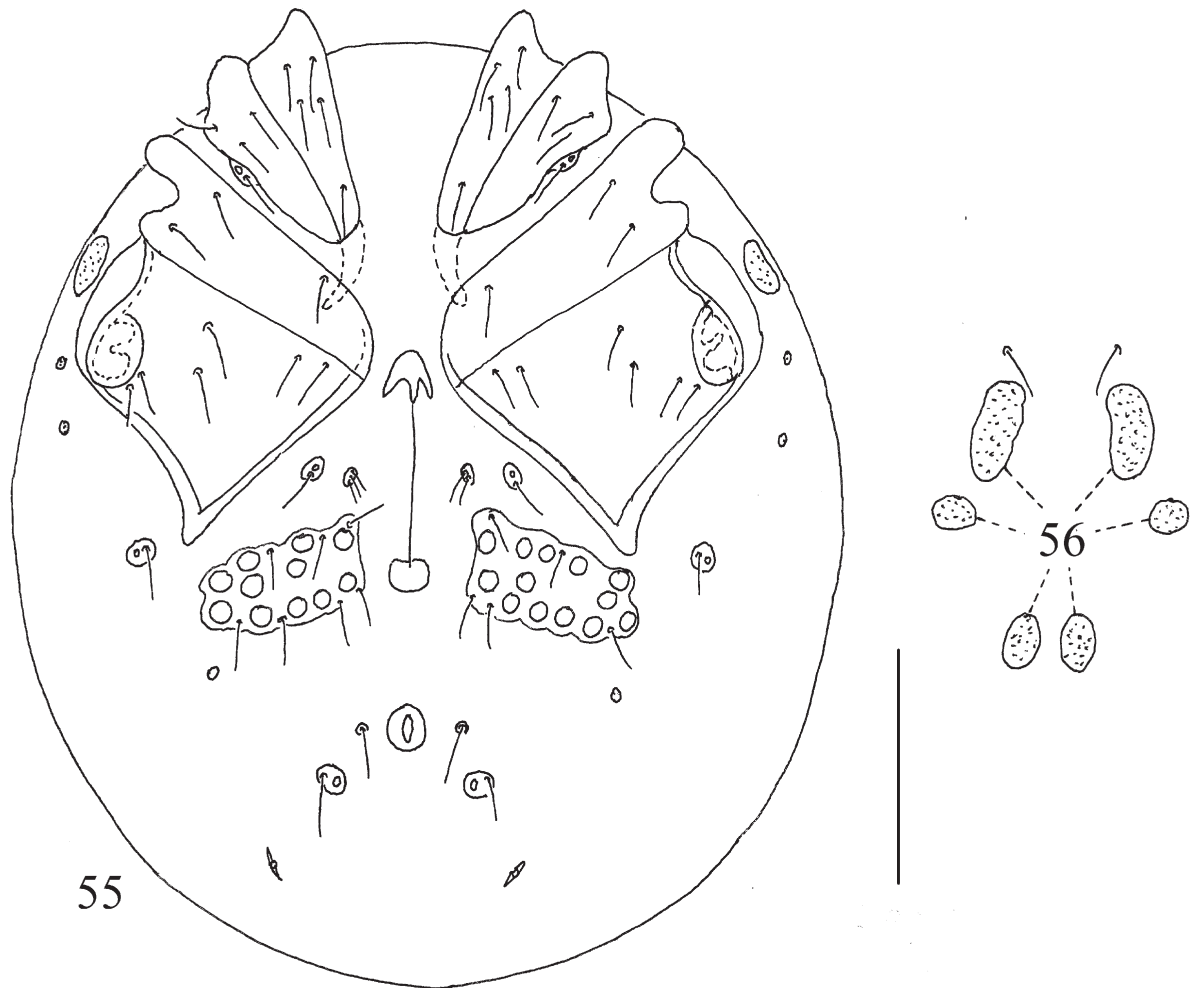
Deutonymph. See (Tuzovsky 1990).

Habitat. Lakes and slowly running waters.

Distribution. Palearctic. Widespread in Europe (Lundblad 1968).

Key to adults of the Russian species of the genus *Forelia*

- | | |
|--|--|
| <p>1. Coxal groups fused medially, genital field fused to posterior margins of coxal plates IV, IV-Leg-4–6 modified, males 2
 — Coxal groups separated, genital field not fused to posterior margins of coxal plates IV, IV-Leg-4–6 not modified, females..... 6</p> <p>2. Dorsum with a large shield covering nearly entire dorsal surface 3
 — Dorsum with several pairs of small platelets... 4</p> <p>3. Coxal plates III with distinct posteromedial projection (Fig. 12), posterior margin of acetabular plate convex on each side <i>F. diaphana</i>
 — Coxal plates III without posteromedial projection (Fig. 49), posterior margin of acetabular plates straight on each side..... <i>F. variegator</i></p> <p>4. IV-Leg-4 without sword- or peg-like setae (Fig. 19); P-5 not broadened proximally (Fig. 1)..... <i>F. liliacea</i>
 — IV-Leg-4 with sword- or peg-like setae, P-5 broadened proximally 5</p> | <p>5. IV-Leg-4 with a large pointed S-shaped sword seta (Fig. 6)<i>F. brevipes</i>
 — IV-Leg-4 with a relatively short obtuse sword seta (Fig. 45)<i>F. spatulifera</i></p> <p>6. I/II-Leg- 6 with straight subparallel dorsal and ventral margins..... 7
 — I/II-Leg-6 with more or less convex ventral margin 8</p> <p>7. Acetabular plate anterior margin without indentation, Fig. 22; coxal plates III+IV relatively short, L 160-190 μm<i>F. liliacea</i>
 — Acetabular plate anterior margin with indentation, Fig. 24; coxal plates III+IV comparatively long, L 240 μm..... <i>F. markovensis</i> sp.n.</p> <p>8. Coxal plates III with well-developed posteromedial hook-like projection (Fig. 11), pregenital sclerite not developed (Sokolow 1940)<i>F. diaphana</i>
 — Coxal plate III with slightly developed posteromedial projection, pregenital sclerite present ... 9</p> <p>9. Acetabular plates with subparallel dorsal and ventral margins, their medial margin not extended anteriorly 10
 — Acetabular plates nearly triangular, their medial margin extended anteriorly 12</p> <p>10. Coxal plates IV longer than width (Fig. 30) ...
 <i>F. mutata</i></p> |
|--|--|



Figs. 55–56. *Forelia variegator* (Koch, 1837), female: 55—dorsal platelets; 56—idiosoma, ventral view. Scale bar: 55–56=200 µm.

- Coxal plate IV wider than long..... 11
- 11. All genital setae located on acetabular plates (Fig. 32)..... *F. mutarella* sp.n.
- Two to three genital setae lying free in the soft integument between pregenital sclerite and acetabular plate on each side (Fig. 56)..... *F. variegator*
- 12. Anterior coxal groups with long apodeme reaching suture line between coxal plates III+IV (Fig. 46); II-Leg-5 with six, III-Leg-5 with seven to nine swimming setae.....*F. spatulifera*
- Anterior coxal groups with comparatively short apodeme not reaching suture line between coxal plates III+IV (Fig. 9); II-Leg-5 with four, III-Leg-5 with six swimming setae.....*F. brevipes*

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