

Two new water mite species of the superfamily Hygrobatoida from Japan (Acariformes: Hydrachnidia)

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Tuzovskij, P.V. 2003. Two new water mite species of the superfamily Hygrobatoida from Japan (Acariformes: Hydrachnidia). *Zoosystematica Rossica*, **12**(1): 49-54.

Forelia orientalis sp. n. (fam. Pionidae) and *Axonopsis (Axonopsis) japonicus* sp. n. (fam. Aturidae) are described from the Japanese lake Biwa. Both species are known from females only.

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The nomenclature of body setae and lyriform organs in the work follows Tuzovskij (1987); dc.1-dc.4 – dorsocentral plates, vl.1-vl.3 – ventrolateral plates. Types are deposited in the collection of the Institute for Biology of Inland Waters, Borok.

Family **PIONIDAE** Thor, 1900

Subfamily **FORELIINAE** Thor, 1923

Forelia orientalis sp. n.
(Figs 1-12)

Holotype. ♀, **Japan**, *Honshu*, northern part of Biwa Lake, depth 2.0 m, stony bottom substratum, 18.IV.1996, slide 7636 (O. Timoshkin).

Paratype. ♀, same locality but at depth of 0.5 m, sandy bottom substratum, 16.VII.1996 (O. Timoshkin).

Description. Female. Body egg-shaped. Seta of cheliceral segment (Fch) long, thick, plumose (Fig. 1); other body setae thin, short, smooth. Most of the body surface soft, with thin wrinkles. Dorsum with 4 pairs of dorsocentral plates: dc.1 very small, round; dc.2 large, close to bases of setae Oi, but not fused with them; dc.3 and dc.4 of moderate size (Fig. 2). Dorsal plates dc.2 and dc.4 parallel, plates dc.3 arranged obliquely to longitudinal axis of body. Posterior plates (dc.4) close to each other.

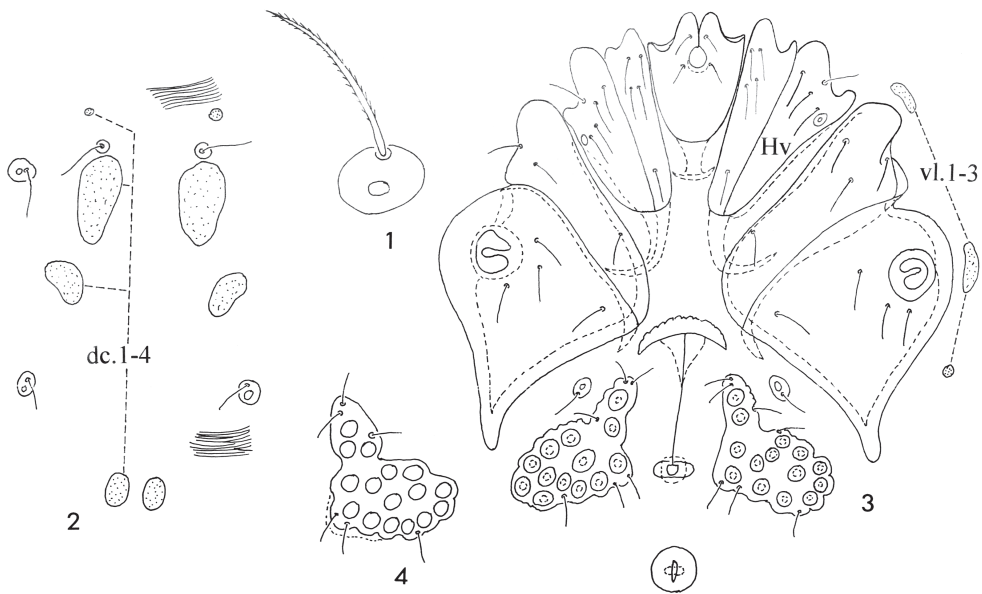
Hypostomal plate with well expressed anchor process; anterior and posterior pairs of setae not differing in shape and size (Fig. 3). Anterior coxae with long bent apodemes. Setae and glandularia Hv arranged on posterior margins of coxae II. Medial margin of coxae III with small hypodermic tongue, scarcely shorter than lateral margin. Medial margin of coxae IV longer than lateral; medial and posterior margins of these coxae converging at sharp angle and forming a

long projection. Body with 3 pairs of ventrolateral plates along lateral margins: two anterior pairs (vl.1-vl.2) rather large and oblong, vl.3 small and round. Genital opening longer than plate; anterior genital sclerite twice as large as posterior. Genital plates with 13-17 acetabulae and 6-7 thin hairs. Anteromedial parts of genital plates with well expressed angles each bearing 2 or 3 acetabulae (Fig. 4). Anterior margins of genital plates with small notches. Anal opening situated on a round plate.

Trochanter of pedipalp (Fig. 5) very short, with one dorsodistal seta. Femur of pedipalp very large, with 5 dorsal setae forming 2 groups: proximal (3) and distal (2). Ventral margin of femur straight or weakly concave. Genu of pedipalp short, with concave ventral side and convex dorsal side bearing 3 setae. All setae on pedipalp segments 1-3 approximately equal in length and thickness. Tibia of pedipalp shorter than its femur. Bases of ventral hairs close to each other, located on tiny tubercles slightly distal to the middle of a tibia. Distolateral spine on tarsus of pedipalp very short, with rounded tip. Tarsus of pedipalp long, with 10 setae: proximal solenidion, 5 thin hairs and 4 thick distal spines of equal length (Fig. 6).

Basal segment of chelicera (Fig. 7) large, with convex dorsal and concave ventral side. Mobile segment of chelicera short, with pointed tip.

Tibia of leg I (Fig. 8) with two short (not longer than tarsus) swimming hairs. Dorsal side of tarsi I-II straight, ventral side convex; claw hollow large, about 1/2 length of tarsus. Apical segments of legs III-IV equal in width along the entire length (Fig. 9). Swimming hairs on legs II-IV long, their numbers: 5-6 on tibia II, 5-7 on tibia III, and 3-5 on tibia IV.



Figs 1-4. *Forelia orientalis* sp. n., female: 1, seta Fch; 2, dorsocentral plates; 3, ventral view of body; 4, genital plate.

Ambulacra of anterior three pairs of legs larger than ambulacra of leg IV. Ambulacra of legs I-II (Fig. 10) with long wide inner and thin short outer tooth; ambulacra of leg III with teeth of equal length (Fig. 11); ambulacra of leg IV with short plate and differently-shaped teeth (Fig. 12).

Measurements (μm). Length: body, 650-735; basal segment of chelicera, 120-130; mobile segment of chelicera, 40; segments of pedipalp: 32, 90-96, 68-76, 52-56; segments of legs: I – 48-57, 65-75, 65-75, 80-85, 80-85, 105-115; II – 55-70, 80-85, 70-75, 85-90, 115-125, 120-125; III – 65-75, 95-105, 80-85, 105-115, 155-165, 130-140; IV – 95-115, 90-105, 105-125, 155-165, 170-180, 155-165.

Comparison. *Forelia orientalis* sp. n. is similar to *F. brevipes* (Neuman). Female of *F. orientalis* is characterized by the presence of 4 pairs of dorsocentral plates, of which dc.2 large and wide; setae and glandularia Hv are located at the posterior edge of coxae II; the anterior margin of the genital plate bears a notch; the genu of pedipalp bears short and thick setae (which are not longer than the ventral side of the segment).

On the contrary, on the dorsum of *F. brevipes* female, only one pair of narrow longitudinal plates (dc.2) is well expressed; setae and glandularia Hv are situated on separate plate, which is fused with the posterior edge of coxae II (the

sutural line between them is distinct); the anterior margin of genital plates is without a notch; setae on the genu of pedipalp are longer than the ventral side of the segment.

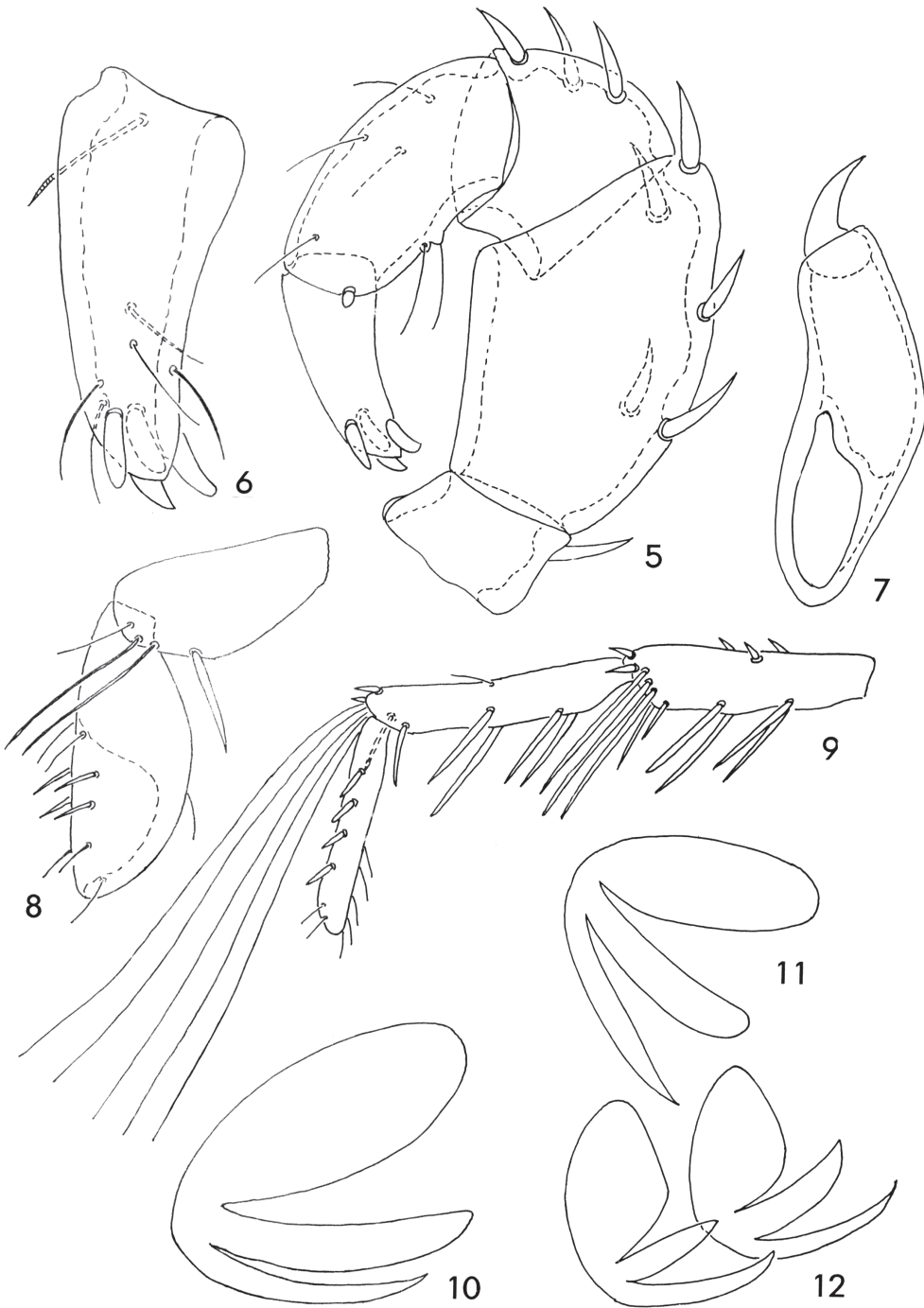
Family **ATURIDAE** Thor, 1900

Subfamily **AXONOPSINAE** Viets, 1929

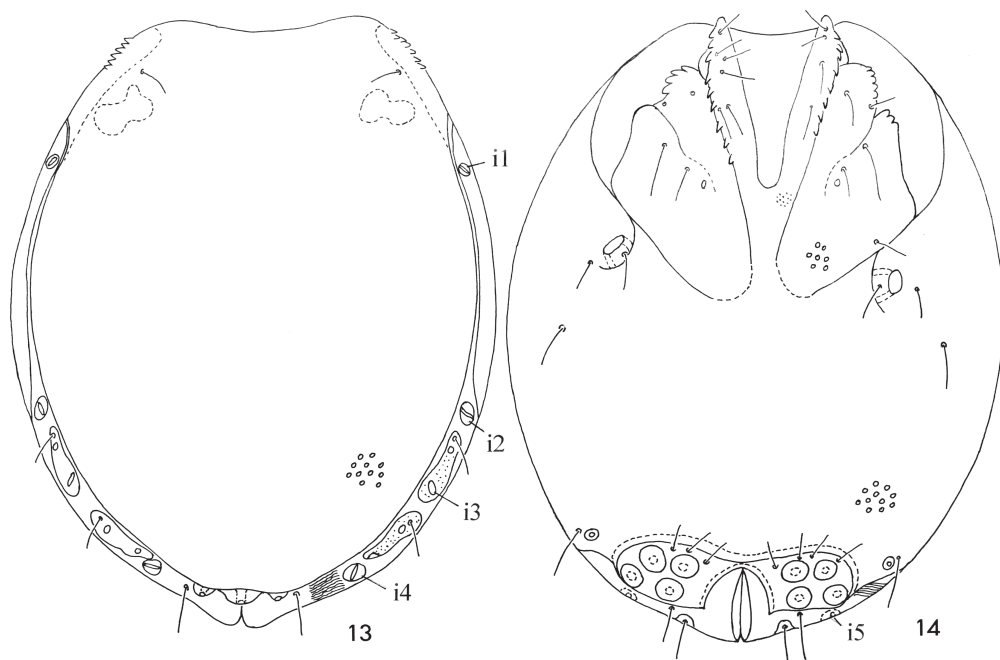
Axonopsis (Axonopsis) japonicus sp. n.
(Figs 13-18)

Holotype. ♀, **Japan, Honshu**, northern part of Biwa Lake, depth 2.0 m, stony bottom substratum, 18.IV.1996, slide 7611 (O. Timoshkin).

Description. Female. Body oval, flat; frontal edge wide and concave (Fig. 13). Dorsal shield very large, covering almost the entire dorsum. Dorsal shield with setae Fp in front of eyes. Other setae and accompanying glandularia not found. In posterior part of body, interscutal membrane with 3 pairs of setae with glandularia: 2 pairs in anterior parts of narrow longitudinal plates and one pair at posterior edge of dorsal shield on either side lateral to anal plate. First 4 pairs of lyri-form organs situated along lateral edges of body: i1 at lateral margins of ventral shield, i2 and i4 on interscutal membrane, i3 on posterior parts of anterolateral plates. Dorsal shield with rough porous sculpture; interscutal membrane wrinkled.



Figs 5-12. *Forelia orientalis* sp. n., female: 5, pedipalp; 6, tarsus of pedipalp; 7, chelicera (ventrolateral view); 8, tibia and tarsus of leg I; 9, genu, tibia and tarsus of leg IV; 10, claw of leg I; 11, claw of leg III; 12, claws of leg IV.



Figs 13-14. *Axonopsis japonicus* sp. n., female: **13**, dorsal view of body; **14**, ventral view.

Ventral side of body almost completely sclerotised, only a narrow strip behind genital organ soft and wrinkled (Fig. 14). Coxae I completely fused forming deep V-shaped notch; their anterior ends slightly protruding beyond the frontal margin of body. Coxae II-III fused on either side of body, with sutural line visible only in their lateral parts. Medial borders of coxae II+III scarcely distinct. Setae and glandularia Hv located at anterior margin of coxae III. Borders of coxae IV unclear. Genital plates transverse, fused with posterior edge of ventral shield; sutural line between them smoothly bent. Anteromedial parts of genital plates connected by a narrow strip. Each plate with 4 large acetabulae and 3-4 thin anterior hairs. Acetabulae form 2 parallel transverse rows, the distance between acetabulae less than diameter of acetabula. Genital opening almost twice as long as plates. Posterior end of body with 5 pair of lyriform organs (i5) and 3 pairs of setae: one pair with glandularia (on ventral shield) and 2 pairs without glandularia (behind genital plates). Coxae I with fine sculpture, other sclerotised surfaces with rough porous sculpture.

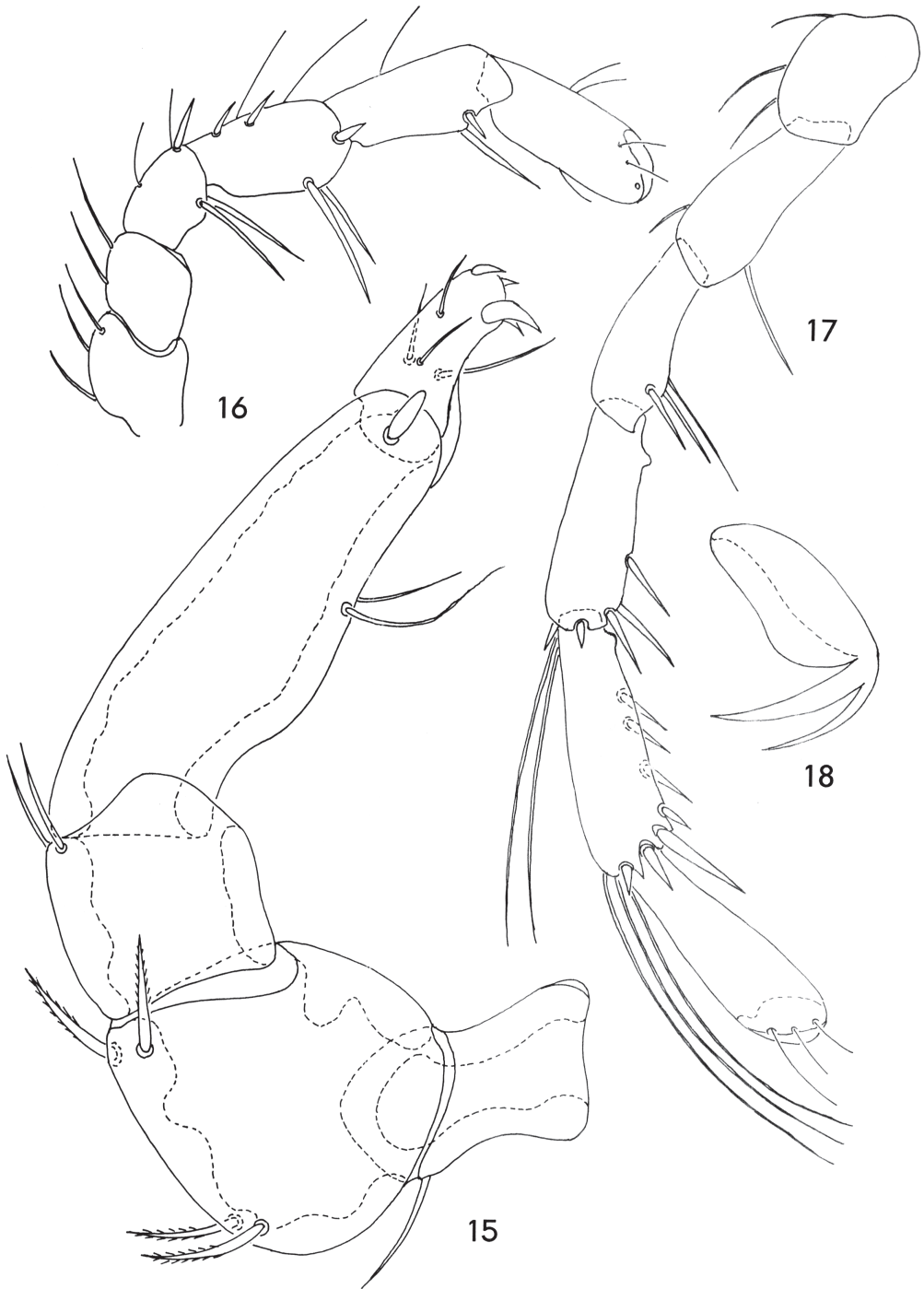
Trochanter of pedipalp (Fig. 15) long, with one dorsodistal seta. Femur of pedipalp rather short,

thick, with ventral side weakly convex. Dorsal side of femur strongly convex, with 4 setae: 2 proximal and 2 distal. Genu of pedipalp equal in thickness along the entire length, with 2 dorso-distal setae. Tibia of pedipalp long, its ventral side with small convexity before the middle of segment. Ventral setae on tibia different in length, their bases situated slightly behind the middle of segment; distolateral spine rather large, with rounded apex.

Leg I without swimming hairs, with not numerous thick and thin setae (Fig. 16). Tarsi of legs I-II equal in thickness along the entire length, their dorsal and ventral sides straight. Legs II-IV with swimming hairs, their numbers: 1 on genu II, 2 on tibiae II and genua III-IV, 3-4 on tibia III-IV (Fig. 17). Ambulacra with well developed plate, long wide inner and thin short outer teeth (Fig. 18).

Measurements, μm . Length: body, 420; basal segment of chelicera, 85; mobile segment of chelicera, 30; segments of pedipalp: 35, 50, 32, 87, 30; segments of legs: I – 35, 35, 30, 45, 60, 65; II – 35, 35, 30, 50, 55, 65; III – 35, 40, 40, 55, 65, 70, IV – 50, 55, 55, 65, 80, 75. Body width 335.

Comparison. *A. japonicus* is similar to *A. complanata* (Müller, 1776). Female of *A. complanata*



Figs 15-18. *Axonopsis japonicus* sp. n., female: 15, pedipalp; 16, leg I; 17, leg IV; 18, claw.

is characterized by the following: U-shaped notch on coxae I, sutural lines between coxae I-II and coxae II-III are not distinct; sutural line between the ventral shield and genital plate is strongly bent in medial part; genital acetabulae are small, the distance between posterior acetabulae is more than the diameter of one acetabula (Davids, 1979).

Female of *A. japonicus* is characterized by the V-shaped notch of coxae I, sutural lines between coxae I-II and coxae II-III are clearly expressed; sutural line between the ventral shield and genital plates is very weakly bent in medial part; genital acetabulae are large, the distance between all acetabulae is less than the diameter of one acetabula. In addition, *A. japonicus* well differs from the other species of the subgenus *Axonopsis* in the absence of glandularia on the dorsal shield; according to Cook (1967, 1974), number of these glandularia may vary from 2 to 3 pairs. Therefore, it is offered to modify the diagnosis of the subgenus *Axonopsis* to include the following: "Dorsal shield usually bears glandularia (2-3 pairs), but in some species glandularia on dorsal shield may be absent". In female of *A. japonicus*, only 8 pairs of setae are revealed, though a full set of setae in water mites of the genus *Axonopsis* and the family Aturidae consists of 18 pairs (Tu-

zovskij, 1987, 1990). When making slides, especially if the fixed material is used, setae frequently break out, and it is practically impossible to see their bases on a porous sculpture of the body surface.

Acknowledgements

The author expresses sincere gratitude to Oleg Timoshkin (Limnological Institute, Irkutsk, Russia) for the material.

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Received 11 April 2002