

**A NEW WATER MITE SPECIES OF THE GENUS *ARRENURUS* DUGÈS, 1834  
(ACARIFORMES: HYDRACHNIDIA: ARRENURIDAE)  
FROM EASTERN PALAEARCTIC**

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ABSTRACT: An illustrated description of the male, female, deutonymph, and larva of a new species, *Arrenurus* (*Megaluracarus*) *praeclarus*, from the Asian part of Russia is given.

KEY WORDS: Hydrachnidia, Arrenuridae, *Arrenurus*, *Megaluracarus*, *Arrenurus praeclarus*, water mite, male, female, deutonymph, larva

### INTRODUCTION

The genus *Arrenurus* Dugès, 1834 includes nearly 800 species (Smit 2010). At present, about 70 species of this genus are known from Russia and 20 from the Far East of Russia (Sokolow 1940; Tuzovsky 1997; Semenchenko 2008, 2010; Tuzovsky and Semenchenko 2011, Tuzovsky 2012). Investigations of the water mite fauna of the Russian North-East and Kamchatka have yielded a new species of the genus *Arrenurus*, which is described below.

### MATERIAL AND METHODS

Mites were sampled with a common hand net with 250 µm mesh size. Specimens were not fixed in Koenike liquid, but slides were made from the fresh material. Most specimens were not dissected, thus preserving the natural shape of the body. For several males, females and deutonymph the gnathosoma was mounted in a position that allows investigating pedipalp in a lateral view. All mite specimens were mounted in Hoyer's medium. The type material deposited in the research collections of the Institute for Biology of Inland Waters, Borok, Russia (IBIW).

Terminology of idiosomal setae and lyriform organs follows Tuzovsky (1987): *Fch* — frontales chelicerae, *Fp* — frontales pedipalporum, *Vi* — verticales internae, *Ve* — verticales externae, *Oi* — occipitales internae, *Oe* — occipitales externae, *Hi* — humerales internae, *He* — humerales externae, *Hv* — humerales ventralia, *Sci* — scapulares internae, *Sce* — scapulares externae, *Li* — lumbales internae, *Le* — lumbales externae, *Si* — sacrales internae, *Se* — sacrales externae, *Ci* — caudales internae, *Pi* — praeanales internae, *Pe* — praeanales externae, *Ai* — anales internae, *Ae* — anales externae (Figs. 1–2, 11–13).

Furthermore, the following abbreviations were 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; s — solenidion; L — length, W — width; n = number of specimens measured. The length of the segments was measured along their dorsal margin; all measurements are given in µm.

**Family Arrenuridae Thor, 1900**

**Genus *Arrenurus* Dugès, 1834**

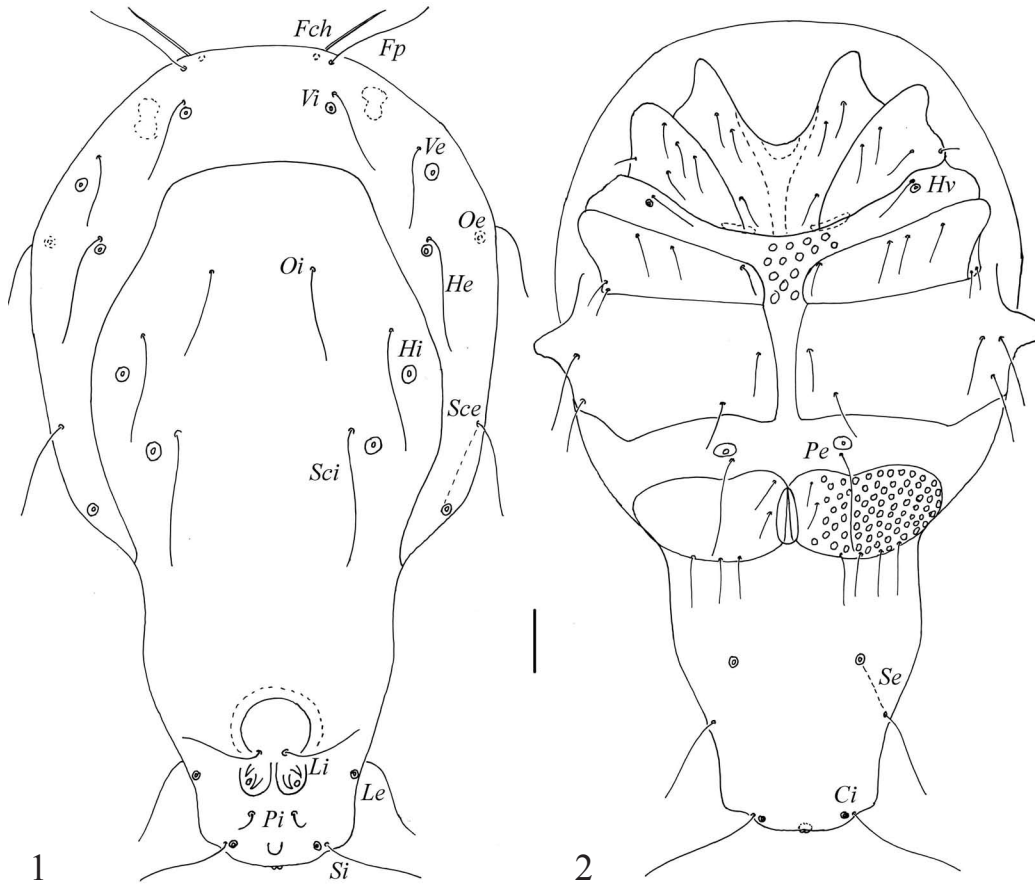
***Arrenurus* (*Megaluracarus*) *praeclarus*, sp. n.**

Figs 1–20

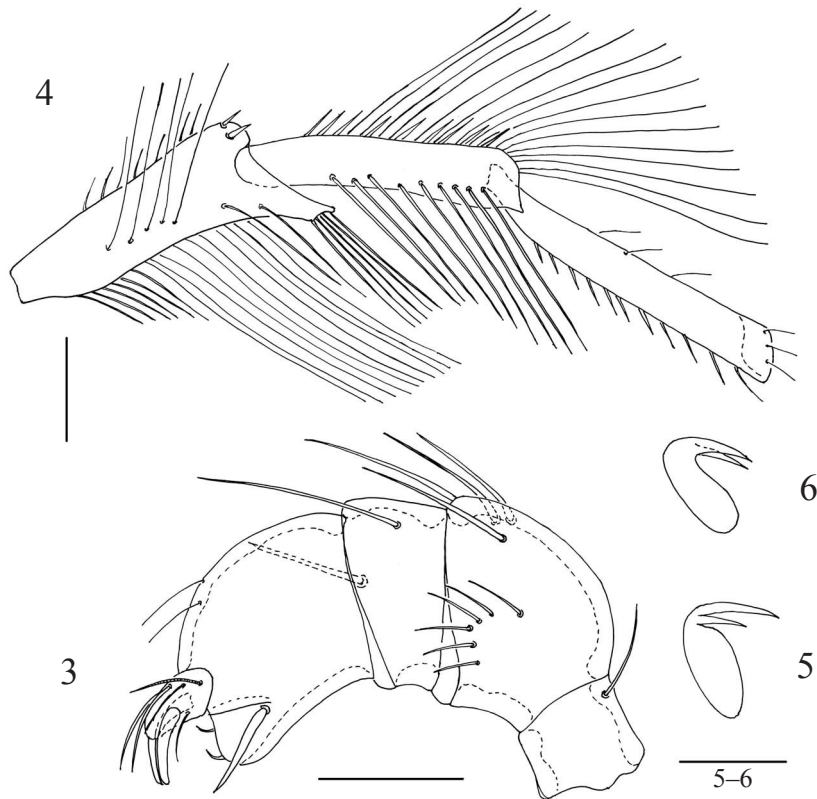
**Type series.** Holotype male (IBIW 2602) Russia, Magadan Province, Tenka Distr., village Agrobasa, sedge bog, 16 July 1979, coll. P.V. Tuzovsky. Paratypes: 6 males, 4 females and 7 larvae reared in laboratory, Russia, Magadan Province, Tenka Distr., village Agrobasa, sedge bog, June–July 1979.

**Additional material:** 3 females, 1 deutonymph and 17 larvae reared in laboratory, Russia, Magadan Province, Tenka Distr., village Sibik-Tyellakh, pond, July 1987; 2 males, 1 female, 1 deutonymph and 4 larvae reared in laboratory: Russia, Kamchatka Province, Ust'-Kamchatsk Distr., sedge-sphagnum bog on right bank of the Kamchatka river, 40 km upstream from Ust'-Kamchatsk city, June–July 1983.

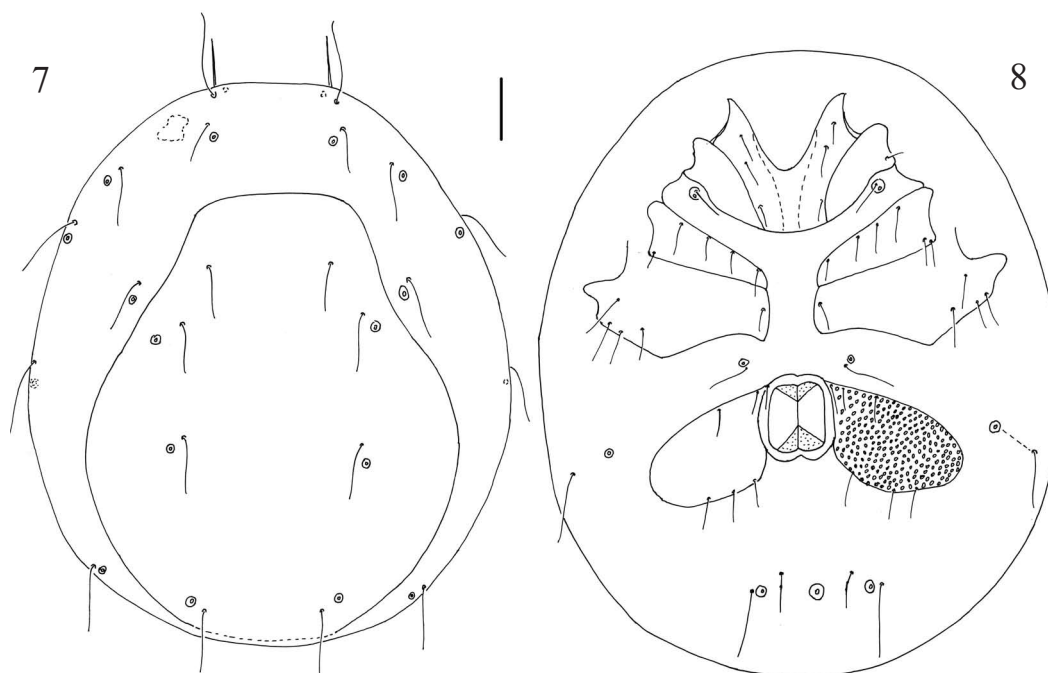
**Description. Male.** Idiosoma (Fig. 1) elongate (L/W ratio 1.44–1.70), with straight or slightly convex anterior margin, cauda moderately long and distinctly separated from remainder of idiosoma. Dorsal shield large, straight or slightly convex anteriorly, bearing setae *Oi*, *Hi* and *Sci* in anterior half and setae *Li*, *Le*, *Pi* and *Si* in posterior half. Setae and glandularia *Li* located on somewhat rounded humps, bases of setae *Li* and *Pi* close together medially, *Le* placed laterally and *Si* caudally in posterior half of the shield. Dorsal fur-



Figs. 1-2. *Arrenurus praeclarus*, male: 1 — dorsal view, 2 — ventral view. Scale bar: 150  $\mu$ m.



Figs. 3-6. *Arrenurus praeclarus*, male: 3 — pedipalp; 4 — genu, tibia and tarsus of leg IV; 5 — claw of leg I, 6 — claw of leg IV. Scale bars: 3, 5-6 = 50  $\mu$ m; 4 = 100  $\mu$ m.



Figs. 7–8. *Arrenurus praeclarus* female: 7 — dorsal view, 8 — ventral view. Scale bar: 100  $\mu$ m.

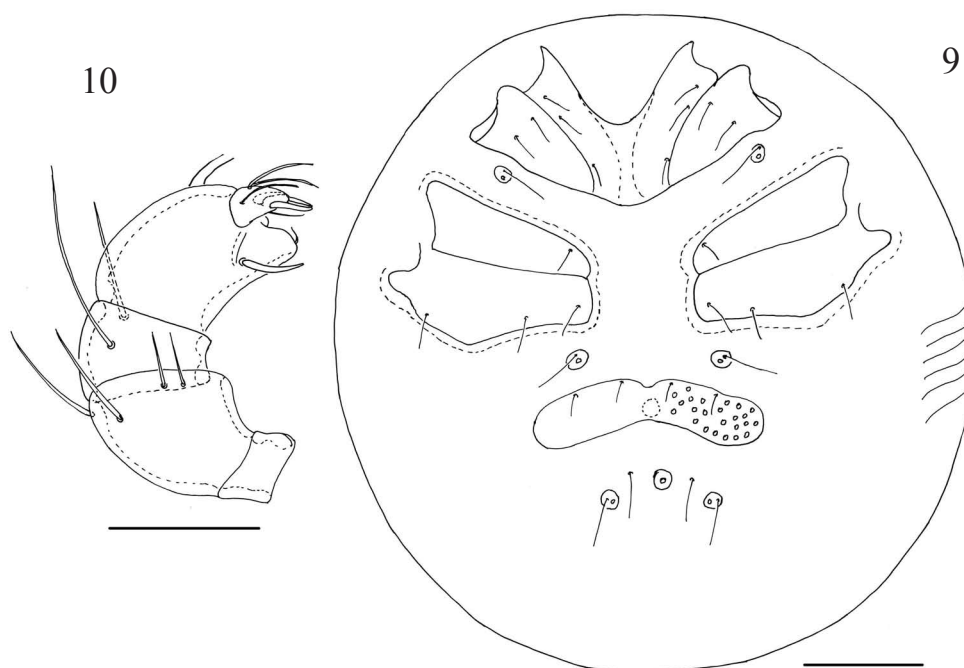
row passing ventrally at base of cauda, incomplete, ending blindly on each side well posterior to acetabular plates. Petiole very small, with rounded tip and situated near distal end of cauda. Setae *Fch* thicker than other idiosomal setae; trichobothria *Fp*, *Oi* and setae *Pi* without glandularia, other idiosomal setae associated with glandularia, *Pi* considerably shorter than other dorsal setae. Setae and glandularia *Ve*, *Hi* and *Sci* slightly separated, and setae and glandularia *Sce* well separated. Distance between setae *Oi–Oi* nearly twice shorter than distance between setae *Hi–Hi*. Posterior margin of cauda more or less convex, in mature specimens it straight with posterolateral indentations. Excretory pore situated caudally.

Anterolateral corners of coxal plates I and II rounded, not reaching to anterior margins of idiosoma (Fig. 2). Coxal plates I fused to each other medially. Medial margin of coxal plate III nearly three times shorter than medial margin of coxal plate IV, anterolateral corner of coxal plates III and lateral projection of coxal plates IV with rounded tips, the latter extending beyond lateral idiosoma margin. Gonopore small; acetabular plates wide and reaching to lateral margins of idiosoma, with rather numerous acetabula and 5–6 fine setae (2 short medial and 3–4 relatively long posterolateral). Setae *Ci* long, situated caudally, *Se* shorter than *Ci*. Setae and glandularia *Se* distinctly separated. Setae *Hv* situated near posterolateral margin of coxal plates II, *Pe* located beyond acetabular plates.

Pedipalp thick (Fig. 3): P-1 short, with a single dorsodistal seta; P-2 thick, with short, concave ventral margin, 5–8 short mediolateral and 4–5 long dorsodistal setae; P-3 relatively short, with 2 (internal and external) unequal setae; P-4 relatively long, with stout and rather long antagonistic setae, 2 thin dorsodistal setae and 2 short curved distal setae; P-5 with single solenidion, 4 thin setae and 3 unequal spines.

Distal end of IV–Leg–4 extending well beyond proximal end of IV–Leg–5 and bearing 4–6 relatively short setae (Fig. 4). Genu and tibia of legs III and IV with many, genu of second leg with a few swimming setae. Claws of leg I–III with 2 unequal clawlets (Fig. 5), claws of leg with 2 subequal clawlets IV (Fig. 6); claw lamella with straight or slightly convex ventral margin in all claws.

Measurements (n=10). L of idiosoma 1250–1390, W 735–910; L of petiole 18–22, W 18–25; L of dorsal shield 1050–1150, W 525–625; distance between setae *Oi–Oi* 120, distance between setae *Hi–Hi* 390, distance between setae *Sci–Sci* 360, distance between setae *Li–Li* 12–15; distance between medial margins of coxal plates IV 50–70; L of basal segment of chelicera 130–135, L of cheliceral stylet 65–90; L of pedipalpal segments (P-1–5): 30–40, 72–90, 48–55, 84–90, 30–35; L of leg segments: I–Leg–1–6: 85–110, 120–125, 135–150, 175–215, 200–225, 235–265; II–Leg–1–6: 85–110, 135–150, 150–165, 185–230, 225–255, 280–290; III–Leg–1–6: 100–115, 135–150, 160–175, 225–245, 225–



Figs. 9–10. *Arrenurus praeclarus*, deutonymph: 9 — ventral view, 10 — pedipalp. Scale bars: 9 = 100  $\mu$ m; 10 = 50  $\mu$ m.

260, 26–275; IV–Leg–1–6: 135–175, 185–225, 225–250, 225–265, 200–270, 260–300, L of distal projection of IV–Leg–4 65–90.

**Female.** Idiosoma oval and without humps (Fig. 7). Dorsal shield tapering anteriorly with straight anterior margin, fused with the ventral shield posteriorly and bearing four pairs of setae (*Oi*, *Hi*, *Sci*, *Li*). Anterolateral corners of coxal plates I pointed; anterolateral corner of coxal plates II and III rounded (Fig. 8). Medial margin of coxal plates III 1.8–2.4 times shorter than medial margin of coxal plates IV, posterior coxal groups separated by wide interspace; lateral projection of coxal plates IV with rounded tips, the latter not extending beyond lateral idiosoma margin. Anterior coxal group with convex posterior margin.

Gonopore rectangular, surrounded by narrow ring, genital flaps elongate (L/W ratio 1.8–2.2), posterior to middle of idiosoma; each genital flap with two well separate triangular patches; width of genital flap less than distance between medial margins of coxal plates IV. Acetabular plates wide, bearing numerous minute acetabula, 3 anteromedial and 3 posterior thin setae. Setae and glandularia *Se* well separated. Setae *Pi* nearly twice times shorter than *Ci*.

Measurements (n=8). L of idiosoma 1350–1475, distance between medial margins of coxal plates IV 110–125; L of genital plates 205–240, W 310–375; L of genital flaps 135–165, W 62–75; L

of basal segment of chelicera 125–150, L of cheliceral stylet 55–62; L of pedipalpal segments (P–1–5): 40–50, 85–90, 55–65, 85–90, 30–35; L of leg segments: I–Leg–1–6: 65–85, 95–105, 135–165, 185–200, 185–200, 200–215; II–Leg–1–6: 75–100, 100–135, 135–155, 185–200, 200–240, 200–250; III–Leg–1–6: 85–105, 110–130, 160–175, 210–230, 225–265, 230–250; IV–Leg–1–6: 135–175, 175–190, 210–240, 275–290, 275–290, 275–290.

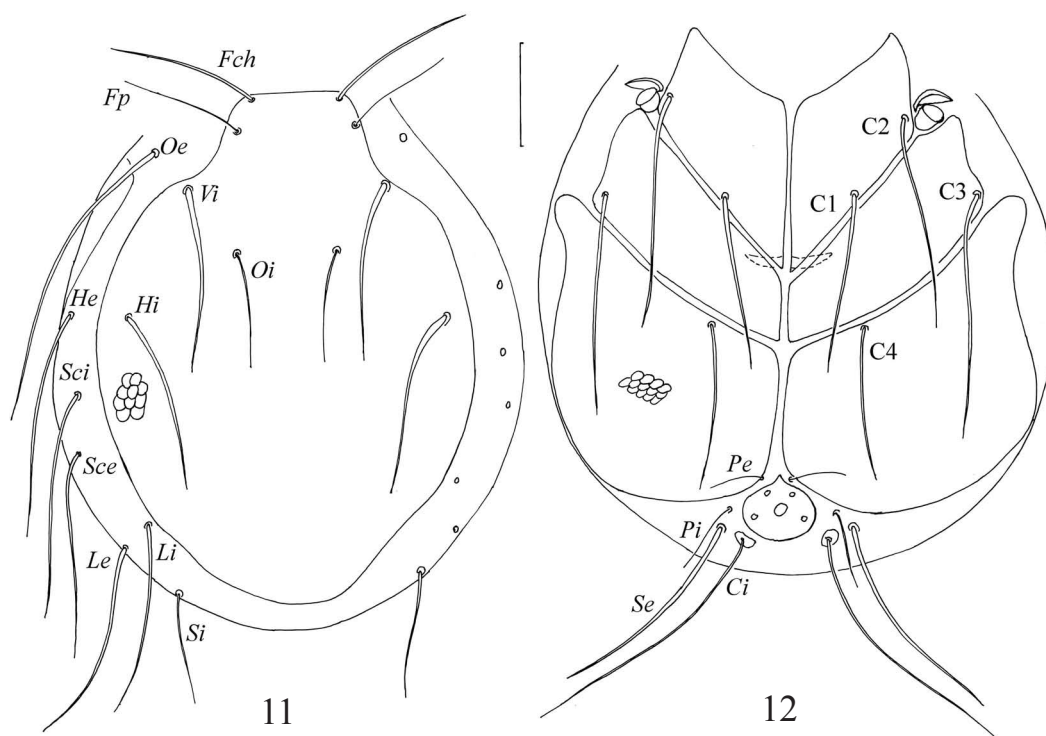
**Deutonymph.** Similar to female, differs mainly by smaller size and external structures of genital field.

Medial margin of coxal plates III twice as short as medial margin of coxal plates IV, posterior coxal groups separated by wide interspace (Fig. 9). Gonopore absent, acetabular plates fused to each other medially, situated posterior to middle of idiosoma. Acetabular plates wide with a few acetabula and two anterior setae only.

Pedipalp thick (Fig. 10): P–1 short without dorsodistal seta; P–2 thick with short, concave ventral margin, 2 short distolateral and 2 long dorsodistal setae; P–3 relatively short, with two (internal and external) unequal setae; P–4 relatively long, with stout and rather long antagonistic bristle, 2 thin dorsodistal setae and 2 short curved distal setae; P–5 with a single solenidion, 3 thin setae and 3 unequal spines.

Measurements (n=2). L of idiosoma 650–700, W 625–650; L of genital field 42–48, W 210–230;





Figs. 11–12. *Arrenurus praeclarus*, larva: 11 — dorsal view, 12 — ventral view. Scale bar: 50  $\mu$ m.

L of pedipalpal segments (P-1-5): 15-18, 50-55, 33-36, 54-62, 17-18; L of leg segments: I-Leg-1-6: 42-48, 48-54, 60-63, 72-78, 84-90, 100-105; II-Leg-1-6: 48-50, 55-60, 65-68, 85-90, 100-108, 120-125; III-Leg-1-6: 48-50, 60-65, 65-70, 85-90, 110-115, 120-125; IV-Leg-1-6: 72-78, 78-85, 85-90, 115-120, 120-125, 130-138.

**Larva.** Idiosoma flat, dorsal plate in unengorged larva covers almost whole dorsum (Fig. 11), with slightly convex lateral margins, its anterior margin straight, posterior margin rounded, with reticulated pattern consisting of oval or circular cells and bearing five pairs of setae (*Fch*, *Fp*, *Vi*, *Oi* and *Hi*). Simple setae on the dorsal plate long and thick, both pairs of trichobothria (*Fp*, *Oi*) relatively short, thin and equal in length. Seven pairs of setae (*Oe*, *He*, *Sci*, *Sce*, *Li*, *Le*, *Si*) situated in soft integument; *Oe* longer than other dorsal setae, setae *He*, *Sci*, *Sce*, *Li* and *Le* subequal and distinctly longer than *Si*.

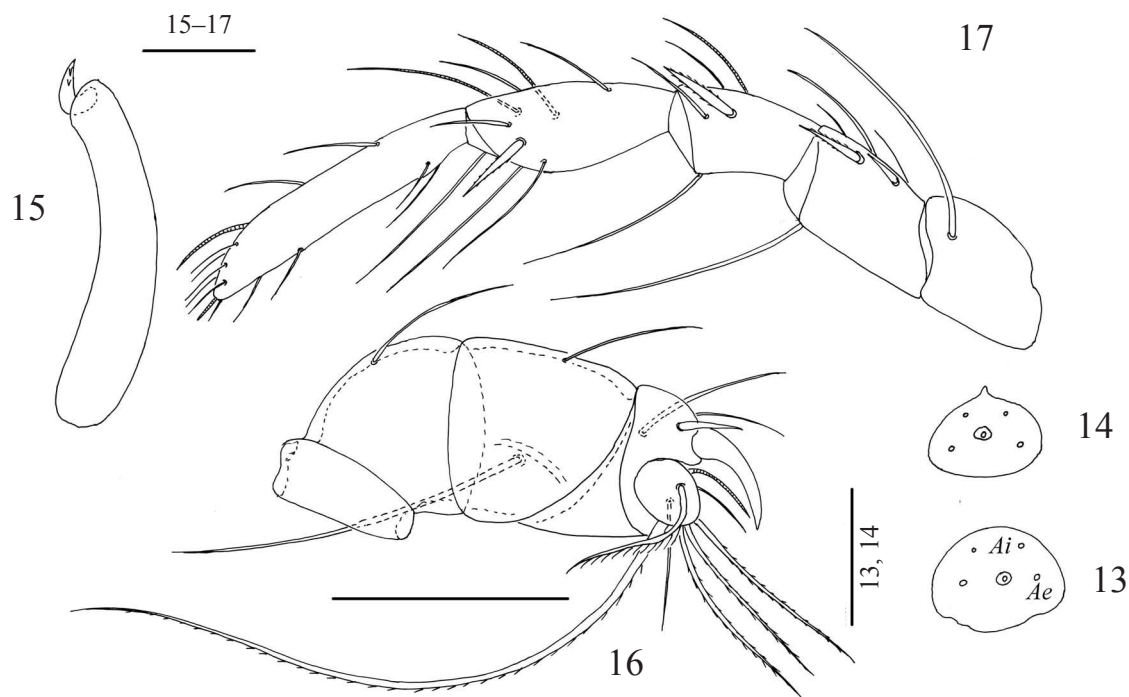
Medial margin of coxal plates I and III longer than coxal plates III (Fig. 12). Coxal plates I with posterior apodemes. Medial coxal setae C1 and C4 equal in length and shorter than lateral setae C2 and C3. All coxae with reticulated pattern consisting of oval or circular cells. Setae *Ci* and *Se* very long, but *Se* distinctly thicker and slightly shorter than *Ci*. Excretory pore plate (Figs 13-14), wider than long. L/W 0.65-0.75, often with more

or less developed anterior median protrusion (Fig. 14). Excretory pore plate setae (*Ai* and *Ae*) usually reduced and represented by alveoli, *Ai* located moderately away from anterior margin, *Ae* slightly posterior to middle of plate, flanking excretory pore; distance between setae *Ae-Ae* almost twice longer distance between setae *Ai-Ai*; setae *Pi* and *Pe* relatively short, but *Pe* slightly longer than *Pi*.

Basal segments of chelicerae long, curved cylinder with dorsal and ventral margin parallel to each other (Fig. 15). Cheliceral stylet small, crescent-shaped with two minute subapical teeth.

Pedipalps relatively short (Fig. 16): P-1 very short, without setae; P-2 with one short, thin dorsal seta near middle of segment; P-3 with very long, thick proximal seta and short, fine dorsal one; P-4 with three unequal setae and massive, dorsodistal claw; P-5 small, with one short solenidion and seven simple setae: one very long seta and six relatively short unequal setae.

Legs 5-segmented slender. Shape and arrangement of setae on legs segments as shown in Figs 17-19. Total number of leg setae, excluding eupathidia, as follows (specialized setae indicated in parentheses): I-Leg-1-5: 1, 7, 5 (s), 9 (2s), 14 (s, ac); II-Leg-5: 1, 7, 5 (s), 11 (2s), 14 (s, ac); III-Leg-1-5: 1, 6, 5 (s), 10 (s), 11. II-Leg-1 and III-Leg-1 each with rather long seta, with longer than seta on I-Leg-1. Solenidion on I-Leg-3, II-Leg-3 and III-Leg-3 subequal and longer than



Figs. 13–17. *Arrenurus praeclarus*, larva: 13–14 — excretory pore plate, 15 — chelicera, 16 — pedipalp, 17 — leg I. Scale bars: 13–15, 17 = 50  $\mu$ m; 16 = 25  $\mu$ m.

solenidion on I-Leg-5. Proximal solenidion on I-Leg-4 and II-Leg-4 slightly longer than distal solenidion on these segments. Acanthoid seta situated distally on tarsus of legs I and II. Central claw of all legs thicker than lateral claws and bearing two minute subapical spurs (Fig. 20).

Measurements (n=10). L of dorsal plate 220–240, W 175–200; *Fch* 64–70, *Fp* and *Oi* 50–60, *Vi* 90–96, *Hi* 57–64, *Oe* 110–120, *He*, *Sci*, *Sce*, *Li* and *Le* 90–100, *Si* 45–52, *Se* 110–122, *Ci* 120–130, *Pi* 38–42, *Pe* 18–25, C1 75–80, C2 100–110, C3 80–90, C4 105–120; L of medial edges of coxae I–III: 80–90, 35–40, 60–70; diameter of urstigma 15–17; L of excretory pore plate 30–35, W 44–48; L of basal segment of chelicera 100–112, L of cheliceral stylet 15–17; L of pedipalpal segments (P-1–5): 12–14, 37–39, 33–36, 19–23, 13–16; L of leg segments: I-Leg-1–5: 44–48, 41–48, 48–52, 65–70, 102–106; II-Leg-1–5: 44–48, 50–55, 48–52, 70–75, 112–120; III-Leg-1–5: 50–55, 50–56, 50–55, 70–75, 115–125.

**Differential diagnosis.** The new species is similar to the European species *Arrenurus mediorotundatus* (Thor, 1898) and North American species *A. opiparus* Cook, 1976. *A. mediorotundatus* is characterized by the following features: (adults) P-2 with a patch of numerous short, spine-like mediobasal setae; (male) the cauda without a dorsodistal hump, the posterior end of the cauda is distinctly convex; (female) the idiosoma with dis-

tinct posterolateral corners, the genital flaps without patches (Koenike 1908, 1909; Viets 1936); in contrast, the P-2 in the adults of *A. praeclarus* sp. n. with 5–8 short mediobasal setae; (male) the cauda with a dorsodistal hump, the posterior end of the cauda is straight; (female) the genital flaps with patches, and the idiosoma without posterolateral corners.

The North American species is described based on a single male from the USA (Cook 1976). The cauda end in the male of *A. opiparus* bears a pair of small flap-like structures which extend beyond the posterior end, P-2 with 4 long and 3 short mediobasal setae (Cook 1976); in contrast, in the male of *A. praeclarus* sp. n., the flap-like structures are not developed and P-2 with 5–8 short mediobasal setae only.

**Etymology.** The species epithet *praeclarus* means clear, distinct, fine.

**Habitat.** Sedge bogs, lakes.

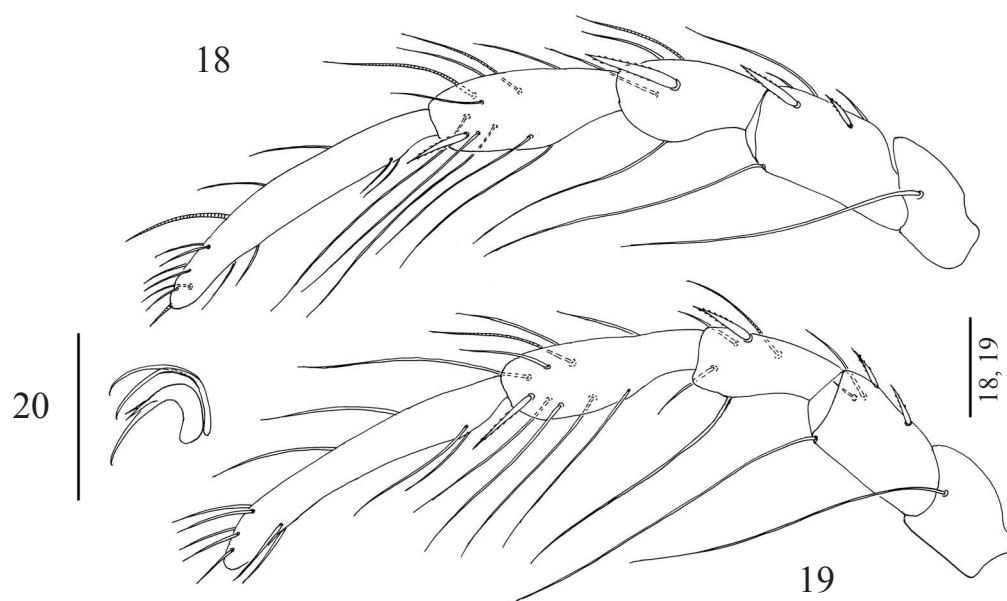
**Distribution.** Asia: Russia, Magadan and Kamchatka Provinces.

#### ACKNOWLEDGEMENTS

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Figs. 18–20. *Arrenurus praeclarus*, larva: 18 — leg II, 19 — leg III, 20 — claws. Scale bars: 18–19 = 50  $\mu$ m; 20 = 25  $\mu$ m.

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