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PSEUDOCRANGONYX ELENAE, SP. N. (CRUSTACEA: AMPHIPODA: PSEUDOCRANGONYCTIDAE) FROM SHALLOW SUBTERRANEAN HABITATS (SSHs) OF EASTERN SIKHOTE-ALIN

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[Сидоров Д.А. *Pseudocrangonyx elenae*, sp. n. (Crustacea: Amphipoda: Pseudocrangonyctidae) из субповерхностных подземных местообитаний (СпПМ) Восточного Сихотэ-Алиня]
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Key words: *Amphipoda, Pseudocrangonyx, new species, stygobionts, SSHs, eastern Sikhote-Alin*

Ключевые слова: *Amphipoda, Pseudocrangonyx, новый вид, стигобионты, СпПМ, Восточный Сихотэ-Алинь*

Summary. The new stygobiont amphipod species, *Pseudocrangonyx elenae*, sampled in shallow subterranean habitats (SSHs) of Eastern Sikhote-Alin Mountain Ridge, the Serebryanka River basin (Russia, Primorskii Krai) is described.

Резюме. Описывается новый вид стигобионтных амфипод, *Pseudocrangonyx elenae*, найденный в субповерхностных подземных местообитаниях (СпПМ) Восточного Сихотэ-Алиня, бассейн р. Серебрянка (Россия, Приморье).

INTRODUCTION

The stygobiont amphipod genus *Pseudocrangonyx* Akatsuka et Komai, 1922 inhabits exclusively subterranean freshwaters in the Asian-Pacific region. Hitherto about 15 described species of *Pseudocrangonyx*, including 8 species from the Far East of Russia are known [Sidorov, 2006, 2009].

Recent explorations of the subterranean waters in the eastern part of Primorskii Krai yielded a new species. *Pseudocrangonyx elenae* sp. n. was collected from mesovoid shallow substratum (MSS) type 2 [Juberthie, 2010]. Material was sampled in the Serebryanka River basin (Terney region) at the source of the Solontsovy brook near Shanduy cordon. Soil horizon is slight at this place: about 15 cm, and the hill slope is throughout drained by underground waters of the upstream karstic lake Tsarskoye placed on the Shanduy plateau [Kolesnykov, 1936]. Greensward was removed by trowel up to the underground waters level flowing through the layer of medium-sized scree (fig. 1). Amphipods were collected directly by forceps from the bottom of pit. The geographic coordinates were obtained using a Garmin 72 GPS navigator.

Samples were preserved in 80% ethanol solution. The body length of amphipods was recorded by holding the specimen straight and measuring the distance along the dorsal side of body from the base of first antennae to the base of telson. Lomo MBS-9 stereomicroscope with scaled micrometer eyepiece was used to make this measurement, and appendages were drawn using Carl Zeiss NU-2 compound microscope equipped with drawing device as modified by Gorodkov [1961]. Permanent preparations were made using polyvinyl lactophenol (PVL) and a methylene blue staining solution as described by Holsinger [1967].

In the descriptions, the descriptive term "defining angle" of the gnathopod propodi refers to the "angle" formed at the end of palm and the beginning of posterior margin or the point at which the tip of dactyl closes on the propodus [Holsinger, 1974]; the term "lateralia" or "stomachic grinder" refers to the lateral invaginations of the anterior stomach region [Coleman, 1991]. The nomenclature for setal patterns on article 3 of the mandibular palp follows the standard introduced by Karaman [1970] and Stock [1974].

The following descriptions are based on the type series. The materials examined in this study were deposited in Zoological Museum of the Far East State University, Vladivostok (FESU) and in the research collection of the Institute of Biology and Soil Science, Vladivostok (IBSS).

Classis MALACOSTRACA Latreille, 1806
Superordo PERACARIDA Calman, 1904
Ordo AMPHIPODA Latreille, 1816
Familia PSEUDOCRANGONYCTIDAE Holsinger, 1989

Pseudocrangonyx elenae, sp. n. (figs. 2-8)

Material. Holotype, ♀ (9.5 mm), X30305/Cr-1362-FESU,

Fig. 1. Photography of biotope of *Pseudocrangonyx elenae*, sp. n., shallow subterranean habitats (SSHs).
Рис. 1. Фотография биотопа *Pseudocrangonyx elenae*, sp. n., субповерхностное подземное местообитание (СпПМ).

Russia, Primorye territory, Terney region, ~ 44 km N of Terney, NNBR Sikhote-Alinsky, source of Solontsovy brook (45º24.618' N; 136º30.283' E), 28.06.2006, D.A. Sidorov. Paratypes: 11/4sd-IBSS, ♀ (8.0 mm), 3 ♂♂ (7.3 mm, 7.0 mm, 6.0 mm), with same data as holotype.

Fig. 2. *Pseudocrangonyx elenae*, sp. n., from left side, male, 7.3 mm, paratype.
Рис. 2. *Pseudocrangonyx elenae*, sp. n., вид сбоку, самец, 7.3 мм, паратип.

Diagnosis. Dorsal surface of body segments smooth, relatively stout, teretial, bearing detached fine setae (figs. 2, 3a, b). Eyes absent. Vital body color is white. Lateral lobe of the head rounded, slightly tapered; inferior antennal sinus moderate, sub-rounded (fig. 3a). Antenna 1 about 50-60% length of body. Ventral surface of pereonites 2-7 with sternal humps (blisters), sternal gills absent. Pereopod 6 largest. Urosome without ecdysial setae. Uropod 1 with 1 basofacial seta. Inner rami of ♂ uropod 2 with serrate setae. Body length ♀♀ 8.0-9.5 mm, ♂♂ 6.0-7.3 mm.

Description. Female. (9.5 mm). Antenna 1 (fig. 5a): about 60% length of body, 40% longer than antenna 2; peduncular articles 1-3 have a length ratio of 1:0.8:0.5; primary flagellum with 22 articles; last 16 articles bearing lanceolate aesthetascs accompanied by setae; accessory flagellum 2-articulate, some shorter than accompanying flagellar article.

Antenna 2 (fig. 5b): gland cone tapered without setae; peduncular article 4 as long as article 5, both articles setose with stiff setae; flagellum with 7 articles, as long as peduncular article 5; calceoli absent.

Upper lip (fig. 6g): sub-romboid, with minute setae at

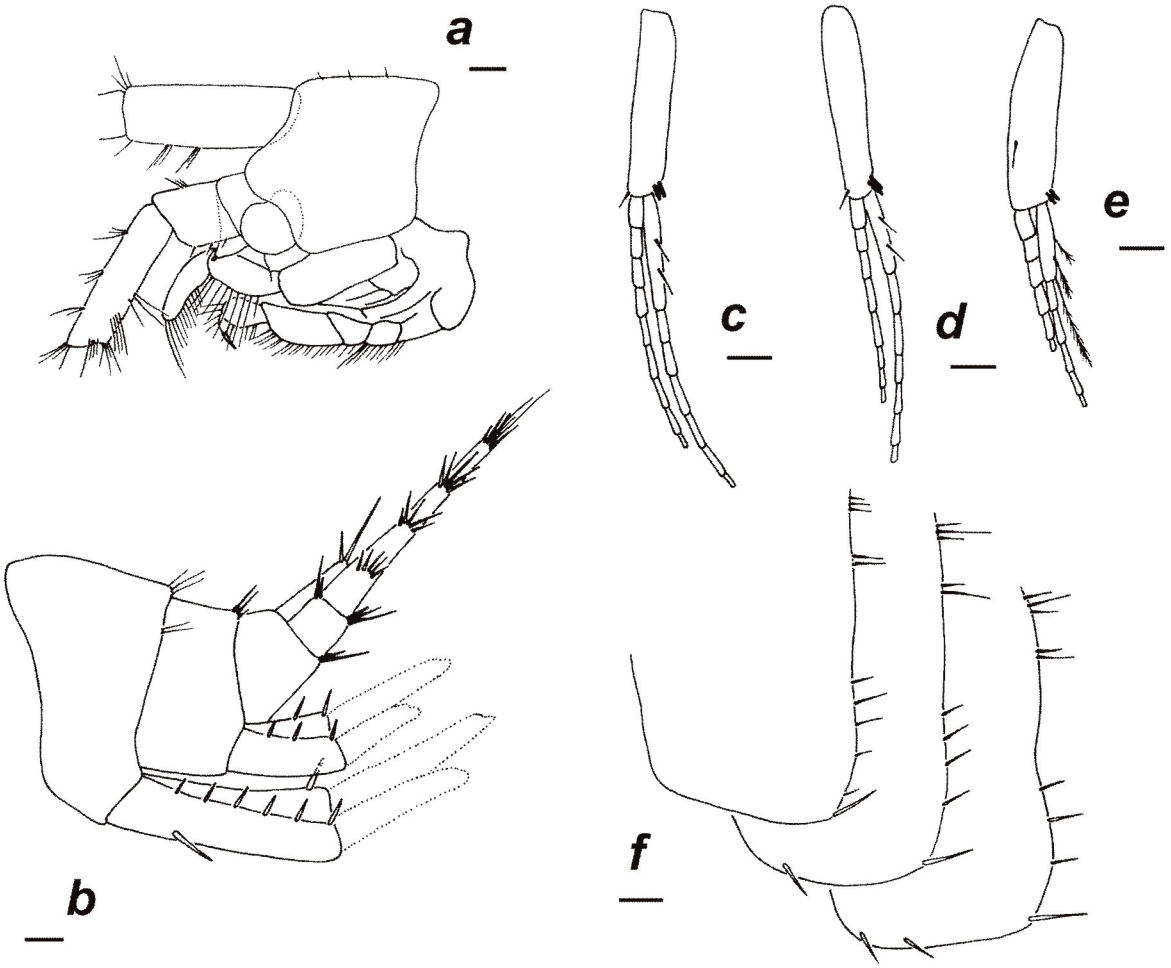

Fig. 3. *Pseudocrangonyx elenae*, sp. n., holotype, female: a – cephalon, b – urosome, c – pleopod 1, d – pleopod 2, e – pleopod 3, f – pleonal plates 1-3. Scale bars 0.2 mm.
Рис. 3. *Pseudocrangonyx elenae*, sp. n., голотип, самка: a – цефалон, b – уросома, c – плеопод 1, d – плеопод 2, e – плеопод 3, f – плеональные пластинки 1-3. Линейки 0.2 мм.

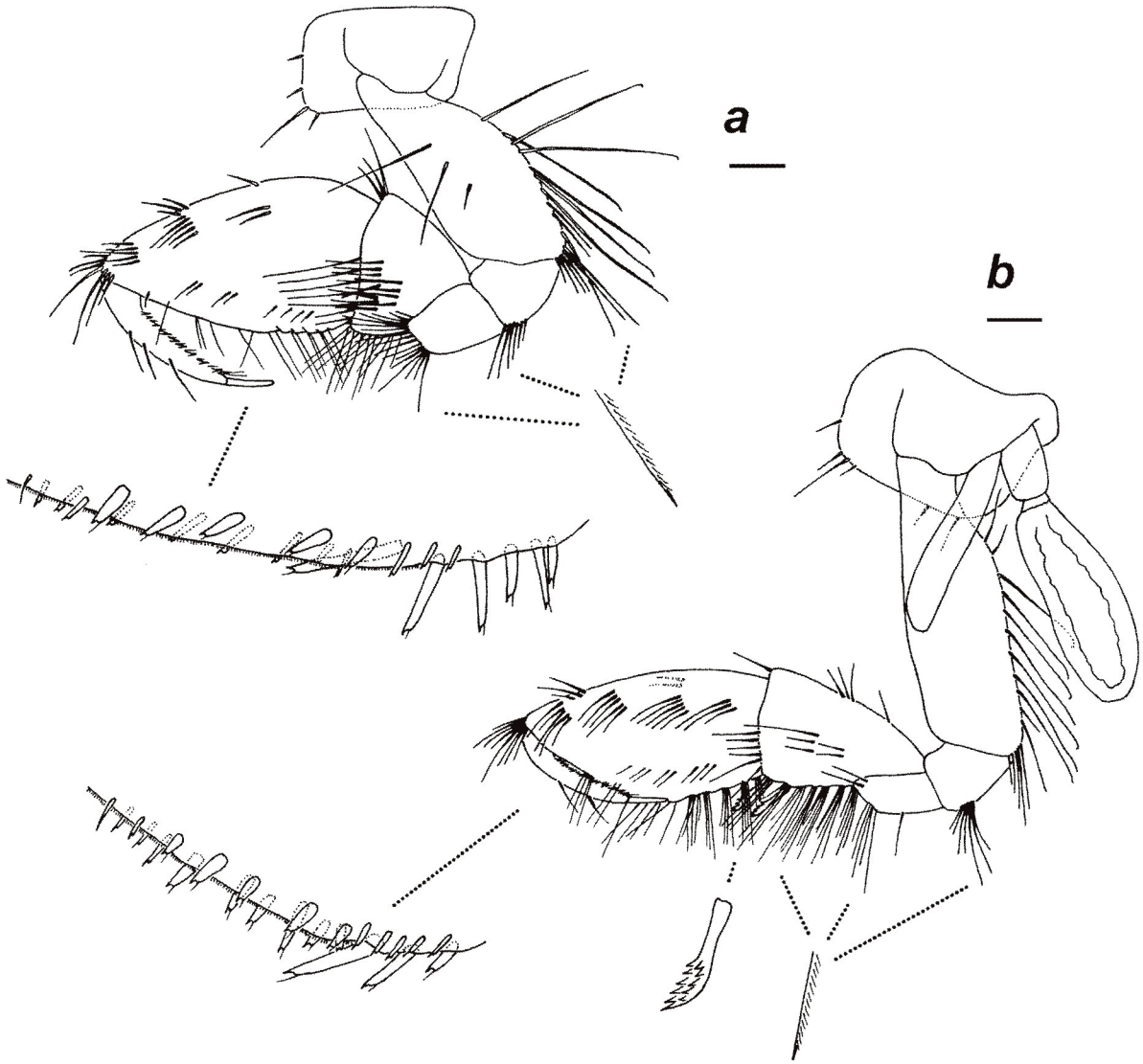

Fig. 4. *Pseudocrangonyx elenae*, sp. n., holotype, female: a – gnathopod 1, b – gnathopod 2. Scale bars 0.2 mm.
Рис. 4. *Pseudocrangonyx elenae*, sp. n., голотип, самка: a – гнатопод 1, b – гнатопод 2. Линейки 0.2 мм.

apex. Lower lip (fig. 6f): inner lobes present.

Mandibles subequal: left mandible (fig. 6d) with incisor 5-dentate, lacinia mobilis 5-dentate, setal row with 6 serrated setae, triturative molar without seta; incisor of right mandible (fig. 6e) 5-dentate, lacinia mobilis bifurcate, setal row with 6 serrated setae, molar with long plumose seta; palp article 2 as long as article 3 with 14 setae, article 3 bearing 3 A-seta, 15 D-setae and 3 E-setae.

Maxilla 1 (figs. 5c, d): inner plate with 5 plumose setae, outer plate with 7 pectinate robust setae; palp articles 1-2 have a length ratio of 0.5:1, article 2 bearing 5 robust setae, one of which serrated and 2-3 stiff setae on apex, article 2 densely setose.

Maxilla 2 (fig. 6h): inner plate with oblique row of 5 plumose setae on inner margin; outer plate broad with 16 slender setae on apex; both plates densely setose.

Lateralia (stomachic grinder) (fig. 5e): sub-rectangular, bearing 11 unguliform slightly pectinate setae accompanied by 2 stiff setae.

Maxilliped (fig. 5f): peduncle sub-rectangular without setae; inner plate sub-linear with 5 simple strong setae apically, 9 plumose setae extending from inner margin to apex; outer plate sub-ovoid with a row of 3 medial robust serrated setae, 11 naked setae and 3 apical plumose serrated setae; palp articles 1-2 have a length ratio of 0.6:1, article 2 stout with a row of simple setae on inner margin and 1 simple setae on outer margin; dactylus with 3 setae along inner margin and 1 long seta at nail base.

Coxal plates shallow, coxal plates 1-4 sub-rectangular (figs. 4a, b, 7a, b) with several marginal setae; coxal plates 5-7 sub-triangular (figs. 7c-e), plates 5 and 6 bilobate, posterior lobes smaller than anterior and armed with some setae, plate 7 semilunar with 1 seta.

Gnathopod 1 (fig. 4a): basis stout without setae on anterior margin, with 7 long and 2 short setae on posterior margin and with some setae on inner face; carpus 0.3× as long as propodus; propodus of gnathopod 1 larger than propodus of gnathopod 2; propodus truncated, palm convex with cutting margin crenulated, armed with 17 distally notched robust setae in 2 rows and 6 distally notched robust setae near defining angle; posterior margin as long as palm with sets of setae; dactylus dentate along inner margin with 3 seta on outer face, nail long with 2 minute setae at hinge.

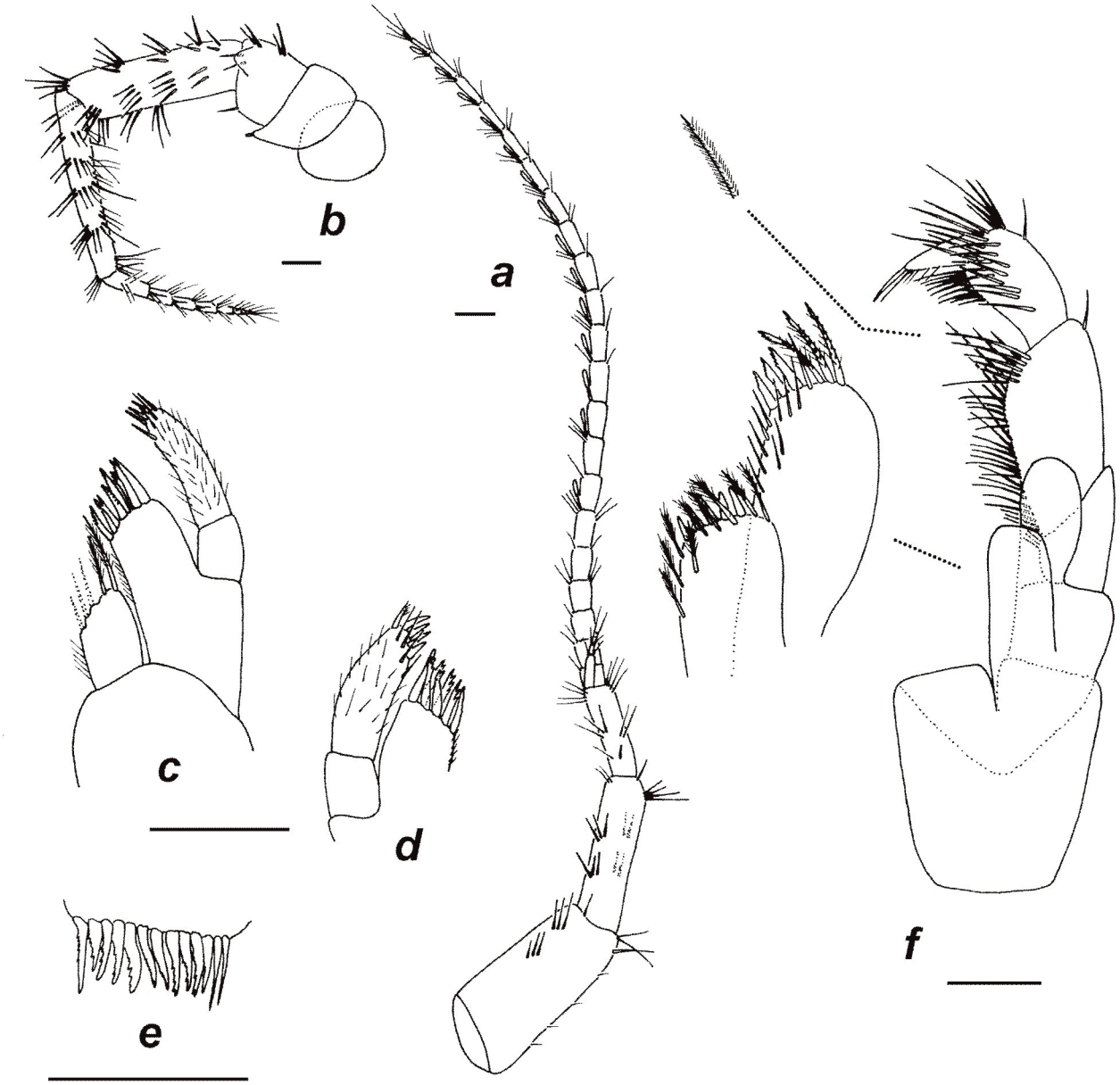

Fig. 5. *Pseudocrangonyx elenae*, sp. n., holotype, female: a – antenna 1, b – antenna 2, c, d – left and right maxilla 1, e – lateralia, f – maxilliped. Scale bars 0.2 mm.
Рис. 5. *Pseudocrangonyx elenae*, sp. n., голотип, самка: a – антенна 1, b – антенна 2, c, d – правая и левая максиллы 1, e – латералия, f – ногочелюсть. Линейки 0.2мм.

Gnathopod 2 (fig. 4b): basis sub-linear without setae on anterior margin, with 7 long and 2 short setae on posterior margin; carpus some shorter than propodus, with 4 rastellate setae; propodus sub-ovoid, palm convex with cutting margin crenulated, armed with 15 distally notched robust setae in 2 rows and 3 distally notched robust setae near defining angle; posterior margin 2× longer than palm with sets of setae; dactylus similar to that of gnathopod 1.

Pereopods 3 and 4 (figs. 7a, b) shorter than pereopods 5-7; basis sub-linear with a row of long setae on posterior margin; carpus as long as propodus; dactylus about 30% length of corresponding propodus, bearing 1 seta in base of nail.

Pereopods 5-7 (figs. 7c-e): sub-similar but 5 and 7 shorter than 6; bases sub-linear with short stiff setae on anterior and posterior margins; dactyli about 30% length of corresponding propodi, bearing 1 stiff seta on inner face and 1 seta in base of nail.

Pleonal plates 1-3 (fig. 3f): posterior margins weakly convex but more in plate 3, with 3-5 setae; posterior corners obtuse, armed with 1 stiff seta each; ventral margin of plate 1 without setae, plate 2 with 1 seta and plate 3 with 2 setae.

Pleopods 1-3 (figs. 3c-e): sub-equal, but 3 shortest; peduncular articles with 2 retinacula each and a fine seta on outer or distal margin; 2-3 simple or plumose setae on outer margin of first article of inner ramus; inner rami longer than outer and fringed with plumose setae.

Urosome (fig. 3b): urosomites with sparse fine setae on dorsal margin; ecdysial setae absent.

Uropod 1(fig. 6a): peduncle with 6 setae on outer margin, 1 long seta on inner margin on distal corner and with 1 basofacial seta; outer ramus 0.7× as long as inner ramus, about 50% length of peduncle; inner ramus armed

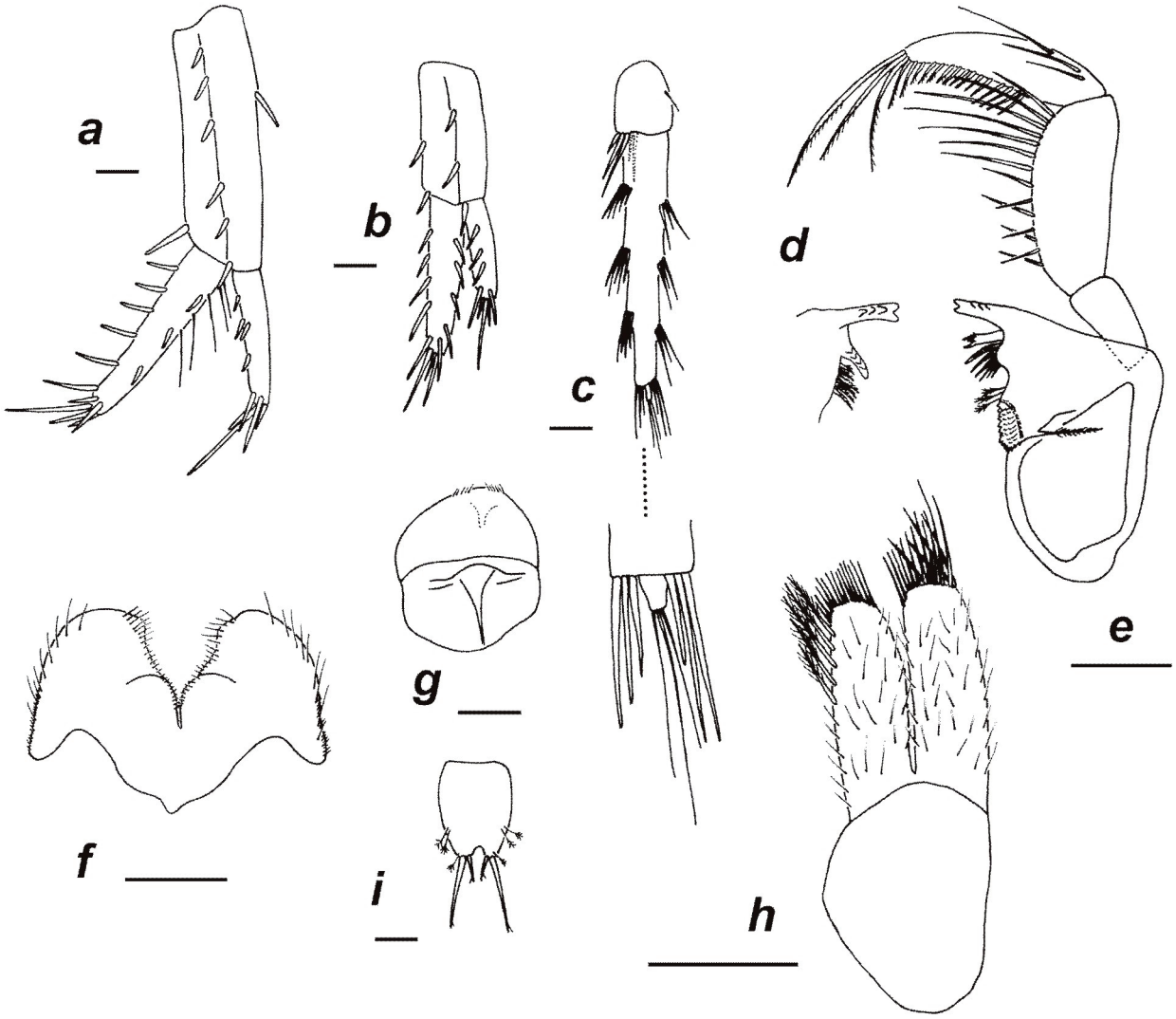

Fig. 6. *Pseudocrangonyx elenae*, sp. n., holotype, female: a – uropod 1, b – uropod 2, c – uropod 3, d, e – left and right mandibles, f – lower lip, g – upper lip, h – maxilla 2, i - telson. Scale bars 0.2 mm.
Рис. 6. *Pseudocrangonyx elenae*, sp. n., голотип, самка: a – уропод 1, b – уропод 2, c – уропод 3, d, e – левая и правая мандибулы, f – нижняя губа, g – верхняя губа, h – максилла 2, i - тельсон. Линейки 0.2 мм.

with setae on both margins and with 5 long setae on ventral face; outer margin of outer ramus unarmed; rami with 5 setae on apices, one of them very long.

Uropod 2 (fig. 6b): peduncle with 3 setae on outer margin and 2 setae on inner margin; outer ramus 0.6× as long as inner ramus; inner ramus as long as peduncle, armed with setae on both margins; outer margin of outer ramus unarmed; rami with 5 setae on apices, one or two of them very long.

Uropod 3 (fig. 6c): uniramous; peduncle with 1 seta on medial face and with set of stiff setae on distal margin; proximal article of outer ramus 3.5× as long as peduncle, bearing 6 sets of setae on inner and outer margins; terminal article 0.05× as long as proximal article, with 3 setae on apex.

Telson (fig. 6i): 1.4× as long as uropod 3 peduncle; 0.7× longer than broad, with minute notch; tips of lobes with 2 strong setae apically, one of them long.

Coxal gills 2-6 (figs. 4b, 7a-d) stalked and sacciform. Ventral surface of pereonites 2-7 bearing sternal humps (blisters). Oostegites on gnathopod 2 and pereopods 3-5 (figs. 4b, 7a, b) sub-linear, unmatured without marginal setae.

Male (7.0 mm). Similar to female but with smaller body size and differing in the following characteristics.

Antenna 2 (fig. 8a): flagellum with 6 articles, 0.7× as long as peduncular article 5; calceoli of crangonyctid type present on peduncular article 5 and 3 first flagellar articles; rod-like structures accompanied with setae on first 5 flagellar articles.

Gnathopod 1 (fig. 8b): basis with 10 long and 1 short setae on posterior margin and with some setae on inner face; propodus of gnathopod 1 about as long as propodus of gnathopod 2.

Gnathopod 2 (fig. 8c): basis with 1 short seta on anterior margin, with 9 long setae on posterior margin; carpus 0.5× as long as propodus, without rastellate setae.

Uropod 2 (fig. 8e): inner ramus 1.3× as long as peduncle, with 4 serrate robust and 4 simple setae on distal part; outer ramus about as long as peduncle.

Variation. Length of antenna 1 consist about 50-60% of total body length. Outer plate of maxilla 1 in holotype (fig.

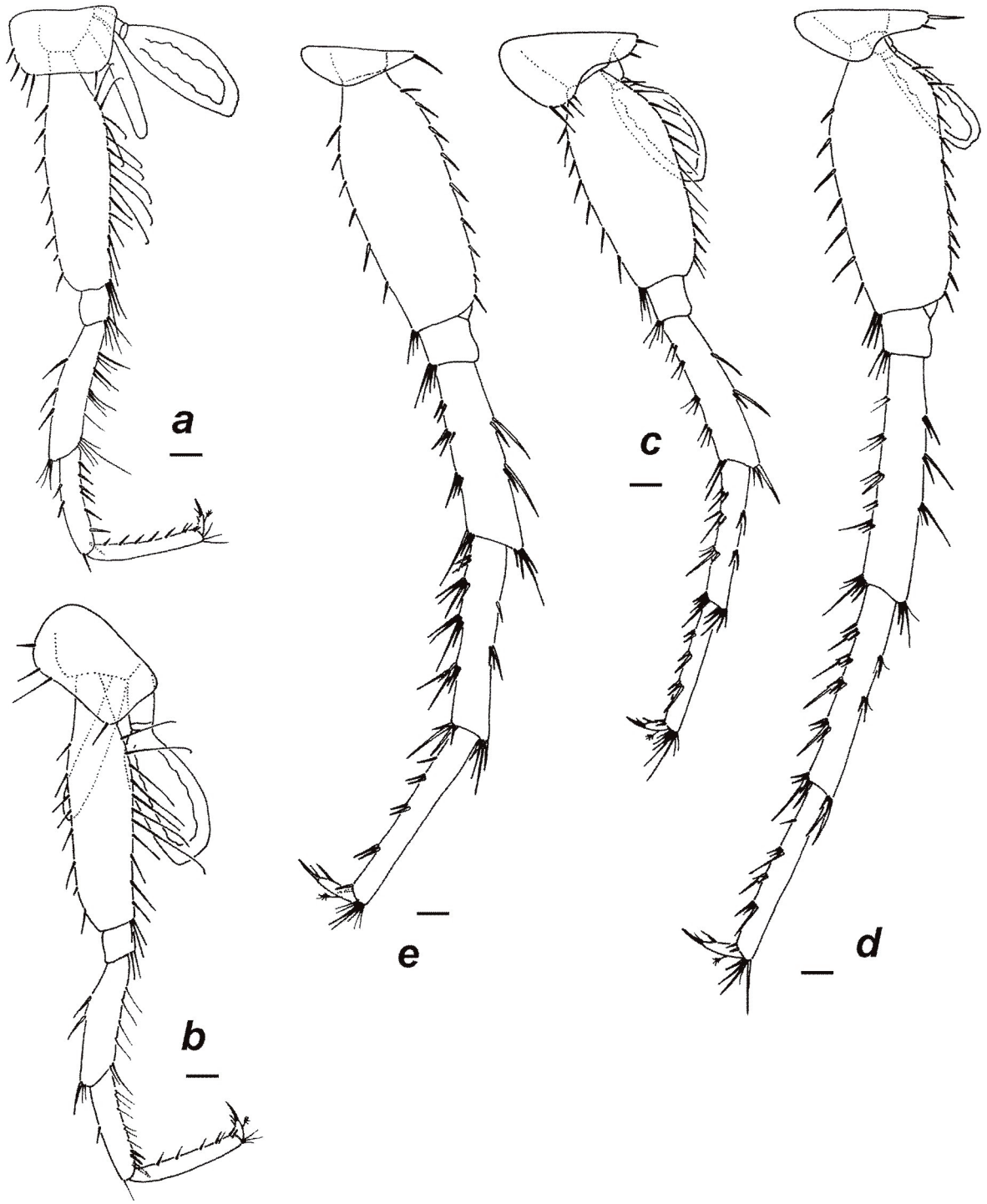

Fig. 7. *Pseudocrangonyx elenae*, sp. n., holotype, female: a – pereopod 3, b – pereopod 4, c – pereopod 5, d – pereopod 6, e – pereopod 7. Scale bars 0.2 mm.
Рис. 7. *Pseudocrangonyx elenae*, sp. n., голотип, самка: a – переопод 3, b – переопод 4, c – переопод 5, d – переопод 6, e – переопод 7. Линейки 0.2 мм.

5c, d) with 7-8 pectinate robust setae.

Taxonomic comments. *P. elenae*, sp. n. resembles *P. levanidovi* Birstein, 1955 by the shape of the lateral lobe of the head and inferior antennal sinus. The presence of calceoli on male antenna 2 creates an affinity to *P. shikokunis* Akatsuka et Komai, 1922, *P. korkishkoorum* Sidorov, 2006 and *P. febras* Sidorov 2009. The absence of ecdysial setae is similar feature with *P. levanidovi*, *P. cavernarius* Hou et Li, 2003 and *P. febras*. The shape and structure of uropod 3 with sets of setae on the proximal article of outer ramus and minute terminal article is similar in *P. elenae*, sp. n. and in *P. levanidovi* and *P. shikokunis*. The character setation of inner and outer plates of maxilliped is unique feature distinguishing *P. elenae*, sp. n. from all known species of the genus [Sidorov, 2006, 2009].

Type locality. Russia, Far East, eastern slope of Sikhote-Alin Mountain Ridge, Shanduy plateau, Solontsovy brook (45º24.618' N; 136º30.283' E), Maisa River (Zabolochennaya) source, Serebryanka River basin, subterranean waters.

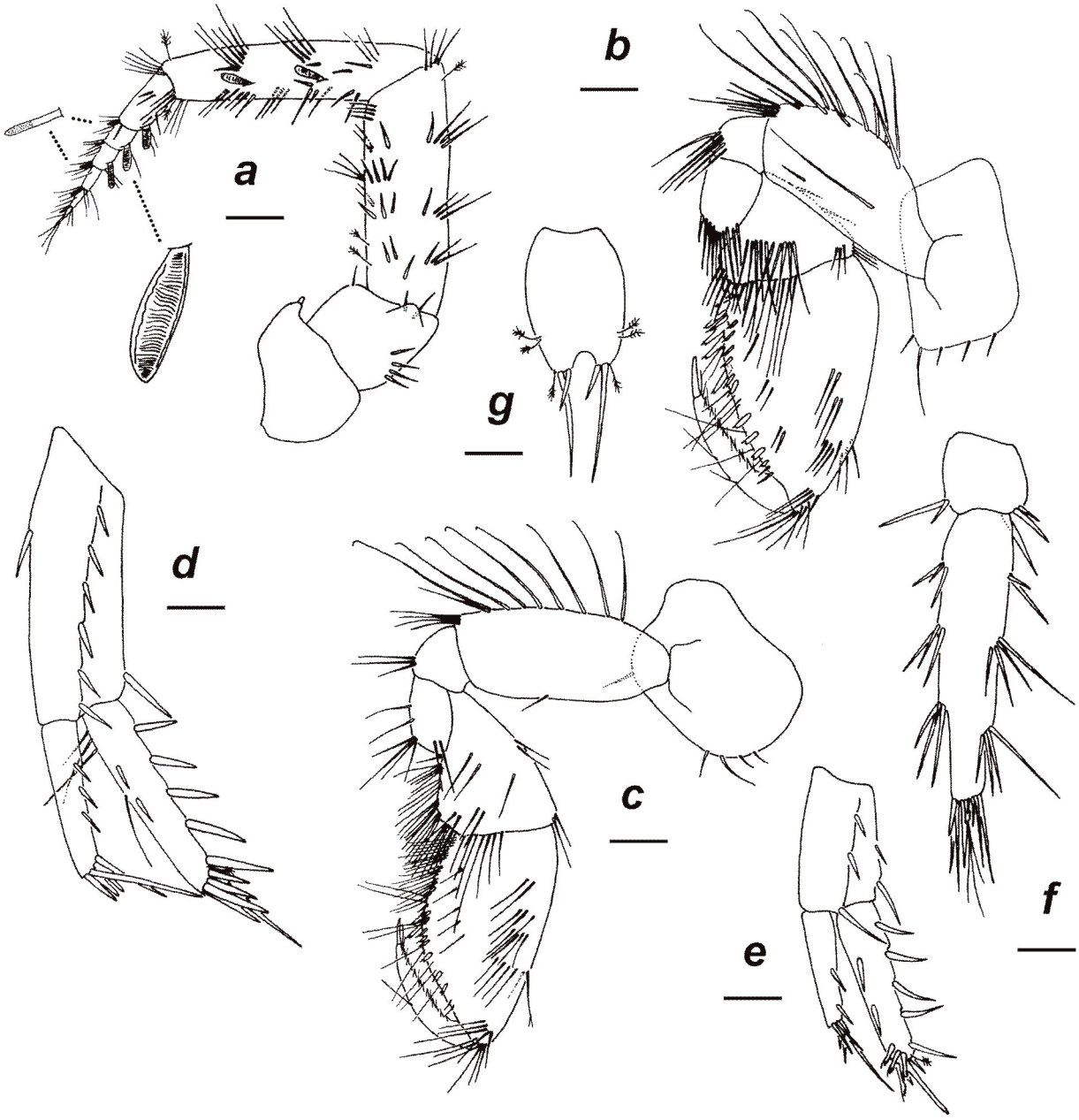

Fig. 8. *Pseudocrangonyx elenae*, sp. n., paratype, male: a – antenna 1, b – gnathopod 1, c – gnathopod 2, d – uropod 1, e – uropod 2, f – uropod 3, g – telson. Scale bars 0.2 mm.
Рис. 8. *Pseudocrangonyx elenae*, sp. n., паратип, самец: a – антенна 1, b – гнатопод 1, c – гнатопод 2, d – уропод 1, e – уропод 2, f – уропод 3, g – тельсон. Линейки 0.2 мм.

Distribution and Ecology. *P. elenae*, sp. n. dwells shallow subterranean habitats type 2 in upper part of the Serebryanka River basin. Depth 5-10 cm, water temperature 3.0° C, coarse limestone, coarse-grained sand, detritus. The millipedes *Skleroprotopus coreanus* (Pocock, 1895) (Mongoliulidae) – 6 juveniles and 1 unidentified juvenile of centipede (Lithobiidae) were collected from this same locality.

Etymology. Species named in honor of our colleague geobotanist Elena Aleksandrovna Pimenova (NNBR Sikhote-Alinsky, Terney).

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