

A new stygobiotic species of the genus *Proasellus* (Crustacea: Isopoda: Asellidae) from South Dagestan, Russia

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ABSTRACT. A new species of the stygobiotic pond slater, *Proasellus precaspicus* sp.n. (Crustacea: Isopoda), was described from groundwater of the Samur River in the Samursky National Park (Southern Dagestan, Russia). This is the first finding of the genus from the territory of the East Caucasus and Caspian Sea coast. The new species is morphologically close to other species known for the Caucasus region, especially to those described from North Ossetia. However, it can be easily recognized due to the combination of the following characters: inner margin of dactylus of pereopodes I with five to nine robust stiff setae; inner margin of dactylus of pereopodes II–VII with single robust stiff spiniform seta; inferior margin of propodus of pereopodes I with three long robust stiff setae; pleopod I with single coupling hook in retinacula of pleopod I. The new species inhabits various springs in the sources of small rivers and streams, as well as hyporheic waters.

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KEY WORDS: Crustacea, Isopoda, Asellidae, *Proasellus*, new species, stygobionts, North Caucasus, Dagestan.

Новый стигобионтный вид рода *Proasellus* Dudich, 1925 (Crustacea: Isopoda: Asellidae) из Южного Дагестана

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РЕЗЮМЕ. Новый стигобионтный вид водяного ослика рода *Proasellus* Dudich, 1925 (Crustacea: Isopoda), *P. precaspicus* sp.n., описан из грунтовых вод дельты реки Самур на территории национального парка «Самурский», Южный Дагестан. Представители этого рода впервые указываются с территории Восточного Кавказа, с западного побережья Каспия и из бассейна реки Самур. Новый вид морфологически достаточно близок к остальным видам, известным с территории Кавказского региона, особенно к описанным из Северной Осетии. Однако, он легко может быть распознан благодаря сочетанию следующих признаков: внутренняя поверхность дактилуса переопод I несет от пяти до девяти крепких шиповидных щетинок; внутренняя поверхность дактилулов переоподов II–VII с единственной крепкой шиповидной щетинкой; внутренняя поверхность проподуса переопода I с тремя длинными крепкими щетинками; плеопод I с единственным крючком в ретинакуле. Новый вид распространен только в пределах дельты Самура, где населяет разнообразные родники в истоках лесных речек – карасу, а также гипорейные воды.

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КЛЮЧЕВЫЕ СЛОВА: Crustacea, Isopoda, Asellidae, *Proasellus*, новый вид, стигобионты, Северный Кавказ, Дагестан.

Introduction

The genus *Proasellus* Dudich, 1925 (Crustacea: Isopoda) currently includes about 125 recent species. It is widely distributed in groundwaters of Europe, southern coast of Minor Asia, and the Caucasus (Capderrey et al., 2013; Morvan et al., 2013; Palatov, Sokolova, 2021). The eastern border of this genus' range apparently passes through the Caucasian Isthmus: it has not been found so far neither in Iran and Central Asia, nor in the Kura basin in eastern Transcaucasia (Turbanov et al., 2016; Malek-Hosseini et al., 2022). The most eastern species are known for the Terek basin within North Ossetia. These are *Proasellus uallagirus* Palatov et Sokolova, 2021 and *P. irystonicus* Palatov et Sokolova, 2021 which inhabit various subterranean and hyporheic biotopes in the mountainous part of the Ardon River basin (Palatov, Sokolova, 2021). The present study shifts the range boundary even further eastward, to the Caspian Sea coast.

The stygo- and crenobiotic macrofauna of the plain part of the Caspian coast is almost unstudied. Only one peculiar endemic of the Apsheron Peninsula groundwaters is known – the stygomorphic amphipod *Synurella apscheronia* Derzhavin, 1945 (Amphipoda: Crangonyctidae). It was described based on juvenile specimens and never encountered again, despite special searches (Derzhavin, 1945a, original data). Another stygobiotic amphipod, *Niphargus pseudocaspicus* G. Karaman, 1982 (described as *Niphargus caspius* Derzhavin 1945), was described from the Caspian Sea bottom near the present coast of Turkmenistan, thus marking the most eastern point of distribution of this European genus (Derzhavin, 1945b). However, in northern Azerbaijan, especially rich in groundwater, stygobionts have not been previously noted, despite special studies conducted (Veysig, 1930).

In 2021, we discovered a rich complex of relict creno- and stygobiotic species of mollusks and crustaceans, including a new *Proasel-*

lus species in the groundwater of the Samurskii National Park (Southern Dagestan) (Anistratenko *et al.*, 2022; Palatov, Marin, 2023). Description of this species, the seventh representative of the genus for the Caucasian region and the first one for the Caspian Sea coast, is given here.

Material and methods

The samples were collected with a dip net in various subterranean and epigeal water sources of the Samursky Forest directly on the Caspian coast. Specimens were immediately fixed in 90% solution of ethanol. Photos were made with a digital camera Toupcam 9.0 MP attached to a light microscope Olympus CX21. The Scanning Electron Microscopy (SEM) images were made using Vega3 Tescan. The body length (bl., mm), *i.e.* the dorsal length from the anterior margin of head to the posterior margin of pleotelson without uropods and both antennae, was used as a standard measurement. The type material is deposited at the collection of Zoological Museum of Moscow State University, Moscow, Russia (ZMMU); other material is deposited in the personal authors' collection (PD).

New taxa were established based on the morphological species concepts. The morphological description was compiled using the most widely used terminology by Veronik *et al.* (2009).

Abbreviations: P — pereopod; PL — pleopod; U — uropod.

Results

The new *Proasellus* was found in two habitats situated in the Samursky National Park (Magaramkentsky District) (Fig. 1). The first habitat: a helocrene spring in a lowland forest, 1.6 km SW of Primorsky village, 41°50'35"N, 48°33'31"E (type locality, Fig. 1C). The second habitat: a rheocrene spring and hyporhea on a bank of the Karasu River, 2.2 km NW of Primorsky village, 41°51'53"N, 48°33'22"E (Fig. 1D). We failed to find any morphological differences between these two populations.

Taxonomic account

Order Isopoda Latreille 1817
Suborder Asellota Latreille, 1802
Superfamily Aselloidea Latreille, 1802
Family Asellidae Rafinesque-Schmaltz, 1815
Genus *Proasellus* Dudich, 1925

Proasellus precaspicus sp.n.
Figs 1A, 2–5.

MATERIAL EXAMINED. Holotype: 1♂ (bl. 5.6 mm), ZMMU Mc-1452, Russia, the Republic of Dagestan, Magaramkentsky District, the Samursky National Park, a helocrene spring in a lowland forest, 1.6 km SW of Primorskiy village, 41°50'35"N, 48°33'31"E (Fig. 1C), 31 December 2021, coll. D. Palatov.

Paratypes: 2♀♀ (bl. 5.0–5.5 mm), ZMMU Mc-1453; 1♂ (bl. 4.5 mm), ZMMU Mc-1454 same locality and data as holotype.

Other material: 2♀♀, 1♂, Russia, the Republic of Dagestan, Magaramkentsky District, the Samursky National Park, a rheocrene spring on a bank of the Karasu River, 41°51'53"N, 48°33'22"E (Fig. 1D), 7 August 2021, coll. A. Sokolova, D. Palatov.

ETYMOLOGY. Name of the species refers to the geographic position of the habitats where it was found: ground waters of the Precaspian landscapes.

DIAGNOSIS. Medium sized, depigmented species. Antenna I with seven to ten flagellar articles, flagellum of antenna II with 34–63 articles. Inner plate of maxillula with five apical pappose setae. Propodus I elongate, oval, its inferior margin without proximal apophysis, with three robust spiniform setae. Dactylus I with five to nine short robust setae on inferior margin and five or six simple setae on superior margin. Dactylus of pereopods II–VII with a single robust stiff seta on inferior margin. Retinacula on medial margin of pleopod I with a single hook. Endopodite of pleopod II in males with distinct basal apophysis, elongated distal apophysis and with weakly expressed goulot without lips. Endopodite of pleopod II in females subtriangular, nine or ten short marginal simple setae. Lateral and terminal margins of pleopod III with 28–30 short simple setae, its endopodites about 1.7 times shorter than exopodites. Lateral margin of exopodite of pleopod IV without setae. Endopodite of pleopods IV suboval, about 1.3 times shorter than exopodite. Exopodite of pleopods V ovoid, elongated, 2.3 times as long as wide, lateral margins without setae. Endopodite suboval, its length constitutes 85% of exopodite length. Uropods different in males and females, proto-, endo- and exopodite length relation is 1 : 1.2 : 1.4 in males and 1 : 1.0 : 1.2 in females.

DESCRIPTION. Stygobiont, blind and depigmented.

Body about four times as long as wide (Fig. 1A), slim, elongated.

Head (Fig. 5A) with frontal margin bisinuate, medially concave, without rostral process, lateral margins straight, each with small posterolateral protuberance, with several short stiff setae. Pigmented spots absent.

Pereonites (Fig. 5B) depigmented, anterolateral, lateral and posterolateral margins fringed with long and short spiniform setae. Coxopods well developed, margins of all epimerae dorsally visible.

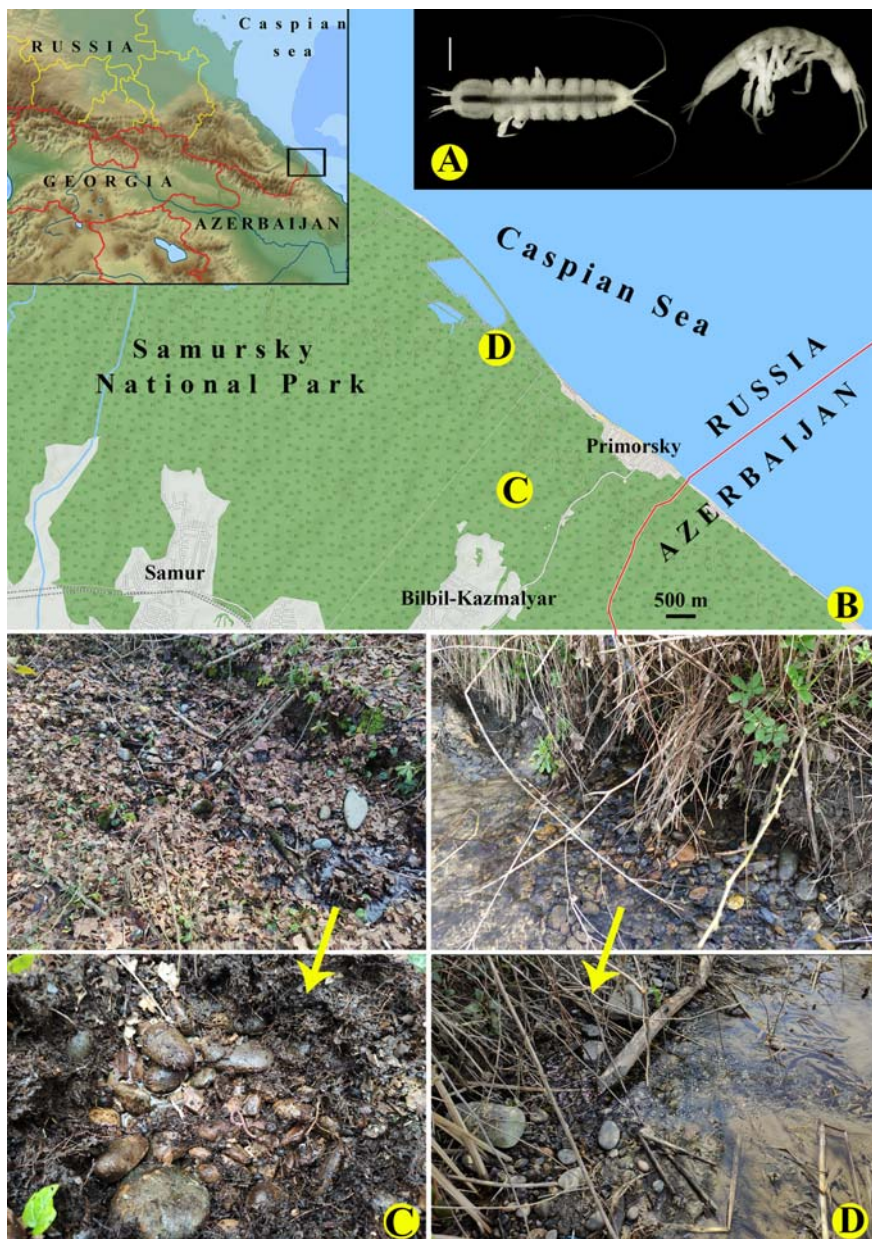


Fig. 1. Map of collection sites for *Proasellus precaspicus* sp.n. in the Republic of Dagestan, general view and natural habitat of described species: A — general view *P. precaspicus* sp.n., paratype (♀); B — map of collection sites for *P. precaspicus* sp.n.; C — a helocrene spring in a lowland forest, 1.6 km SW of Primorskiy village, 41°50'35"N, 48°33'31"E (type locality of *P. precaspicus* sp.n.); C — a rheocrene spring on a bank of the Karasu Riv., 41°51'53"N, 48°33'22"E (second habitat of *P. precaspicus* sp.n.). Scale bars: A — 1 mm; B — 500 m.

Рис. 1. Карта мест сбора *Proasellus precaspicus* sp.n. на территории республики Дагестан, общий вид и природные местообитания описываемого вида: А — общий вид *P. precaspicus* sp.n., паратип (♀); В — карта мест сбора *P. precaspicus* sp.n.; С — гелокрен в низменном лесу, 1,6 км юго-западнее поселка Приморский (типичное местообитание *P. precaspicus* sp.n.); D — реокрен на берегу реки Карасу (второе местообитание *P. precaspicus* sp.n.). Масштабная линейка: А — 1 мм; В — 500 м.

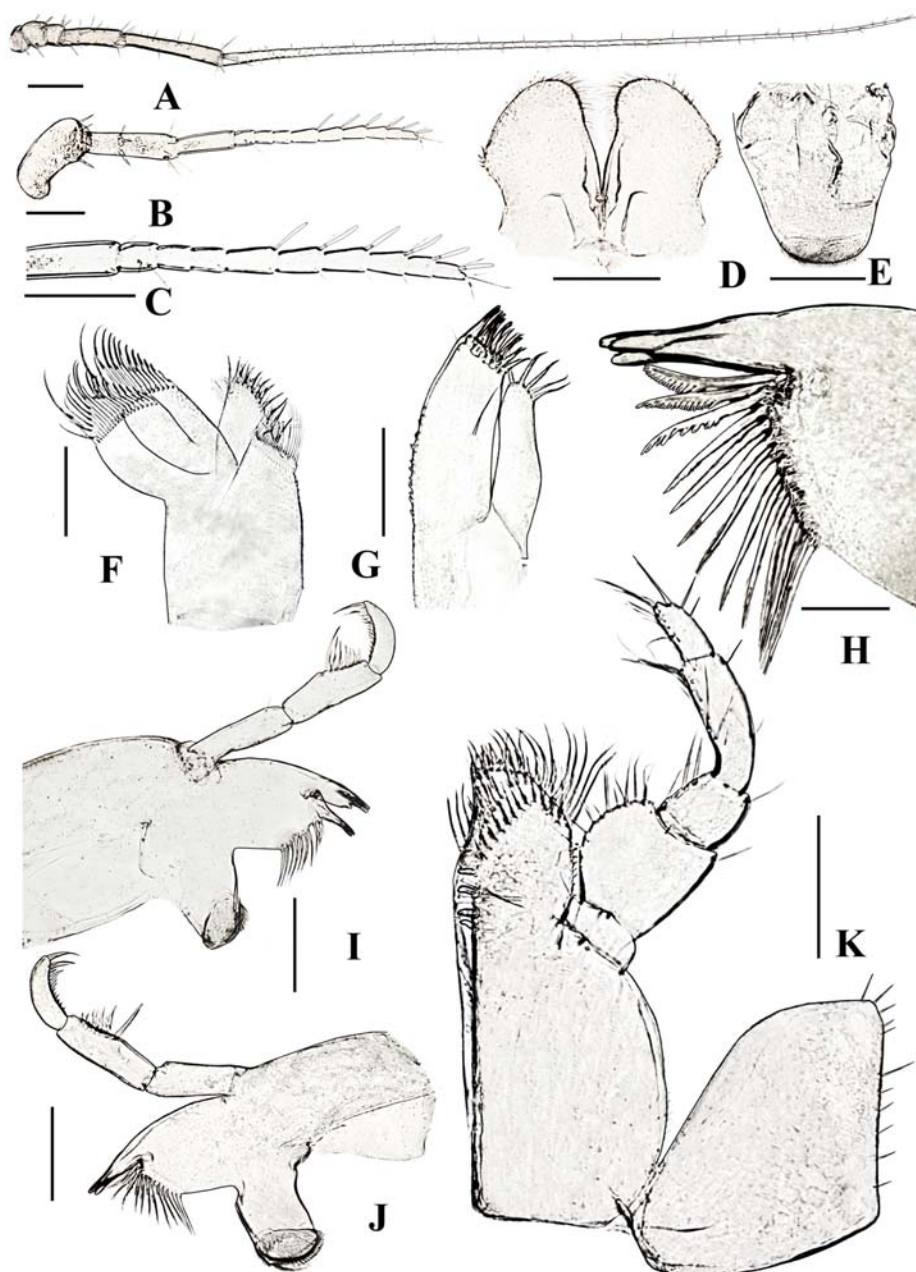


Fig. 2. *Proasellus precaspicus* sp.n. Holotype (♂) from a helocrene spring in a lowland forest, 1.6 km SW of Primorskiy village: A — antenna II; B — antenna I; C — flagellum of antenna I; D — labium; E — labrum; F — maxilla; G — maxillula; H — *pars incisiva* (incisor) of right mandible; I — left mandible; J — right mandible; K — maxilliped. Scale bars: A–G, I–K — 0.2 mm; H — 0.025 mm.

Рис. 2. *Proasellus precaspicus* sp.n. Голотип (♂) из гелокрена в низменном лесу, 1,6 км юго-западнее поселка Приморский: А — антенна II; В — антенна I; С — жгутик антенны I; D — лабиум (нижняя губа); E — лабрум (верхняя губа); F — максилла; G — максиллула; H — резец (инцизор) правой мандибулы; I — левая мандибула; J — правая мандибула; K — максиллипод. Масштабная линейка: A–G, I–K — 0,2 мм; H — 0,025 мм.

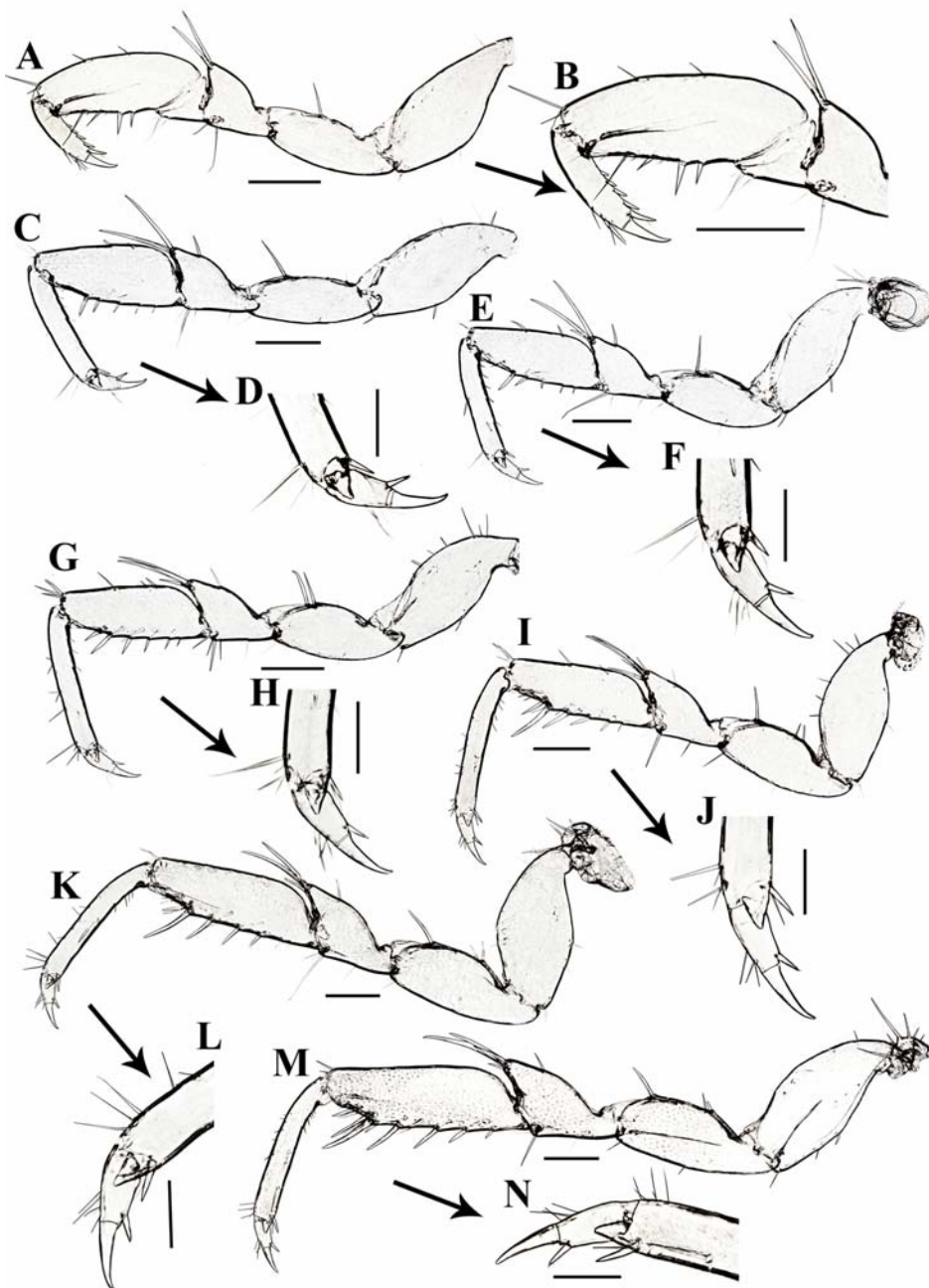


Fig. 3. *Proasellus precaspicus* sp.n. Holotype (σ^7) from a helocrene spring in a lowland forest, 1.6 km SW of Primorskiy village: A — PI; B — dactylus of PI; C — PII; D — dactylus of PII; E — PIII; F — dactylus of PIII; G — PIV; H — dactylus of PIV; I — PV; J — dactylus of PV; K — PVI; L — dactylus of PVI; M — PVII; N — dactylus of PVII. Scale bars: 0.2 mm.

Рис. 3. *Proasellus precaspicus* sp.n. Голотип (σ^7) из гелокрена в низменном лесу, 1,6 км юго-западнее поселка Приморский: А — PI; В — дактилус PI; С — PII; D — дактилус PII; E — PIII; F — дактилус PIII; G — PIV; H — дактилус PIV; I — PV; J — дактилус PV; K — PVI; L — дактилус PVI; M — PVII; N — дактилус PVII. Масштабная линейка: 0,2 мм.

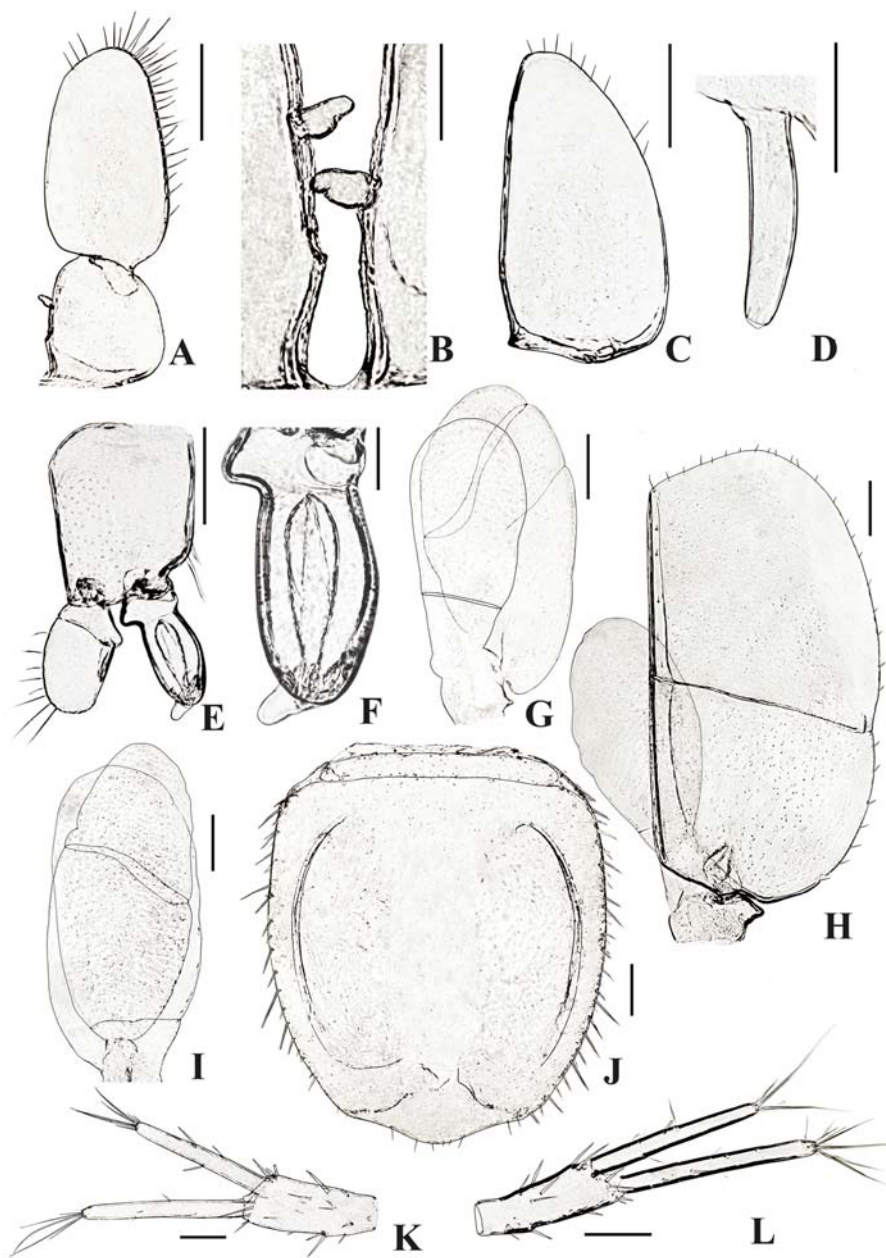


Fig. 4. *Proasellus precaspicus* sp.n. Holotype (♂) and paratype (♀) from a helocrene spring in a lowland forest, 1.6 km SW of Primorskiy village: A — PLI (♂); B — retinacula on medial margin of PLI protopodite; C — PLII (♀); D — genital papilla (♂); E — PLII (♂); F — endopodite of PLII (♂); G — PLIV (♂); H — PLIII (♂); I — PLV (♂); J — pleotelson (♂); K — U (♀); L — U (♂). Scale bars: A, C–E, G–I — 0.1 mm; J–L — 0.1 mm; B, F — 0.025 mm.

Рис. 4. *Proasellus precaspicus* sp.n. Голотип (♂) и паратип (♀) из гелокрена в низменном лесу, 1,6 км юго-западнее поселка Приморский: А — PLI (♂); В — ретинакула на медиальной поверхности протоподита PLI (♂); С — PLII (♀); D — генитальный сосочек (♂); E — PLII (♂); F — эндоподит PLII (♂); G — PLIV (♂); H — PLIII (♂); I — PLV (♂); J — плеотельсон (♂); K — U (♀); L — U (♂). Масштабная линейка: А, С–Е, G–I — 0,1 мм; J–L — 0,1 мм; В, F — 0,025 мм.

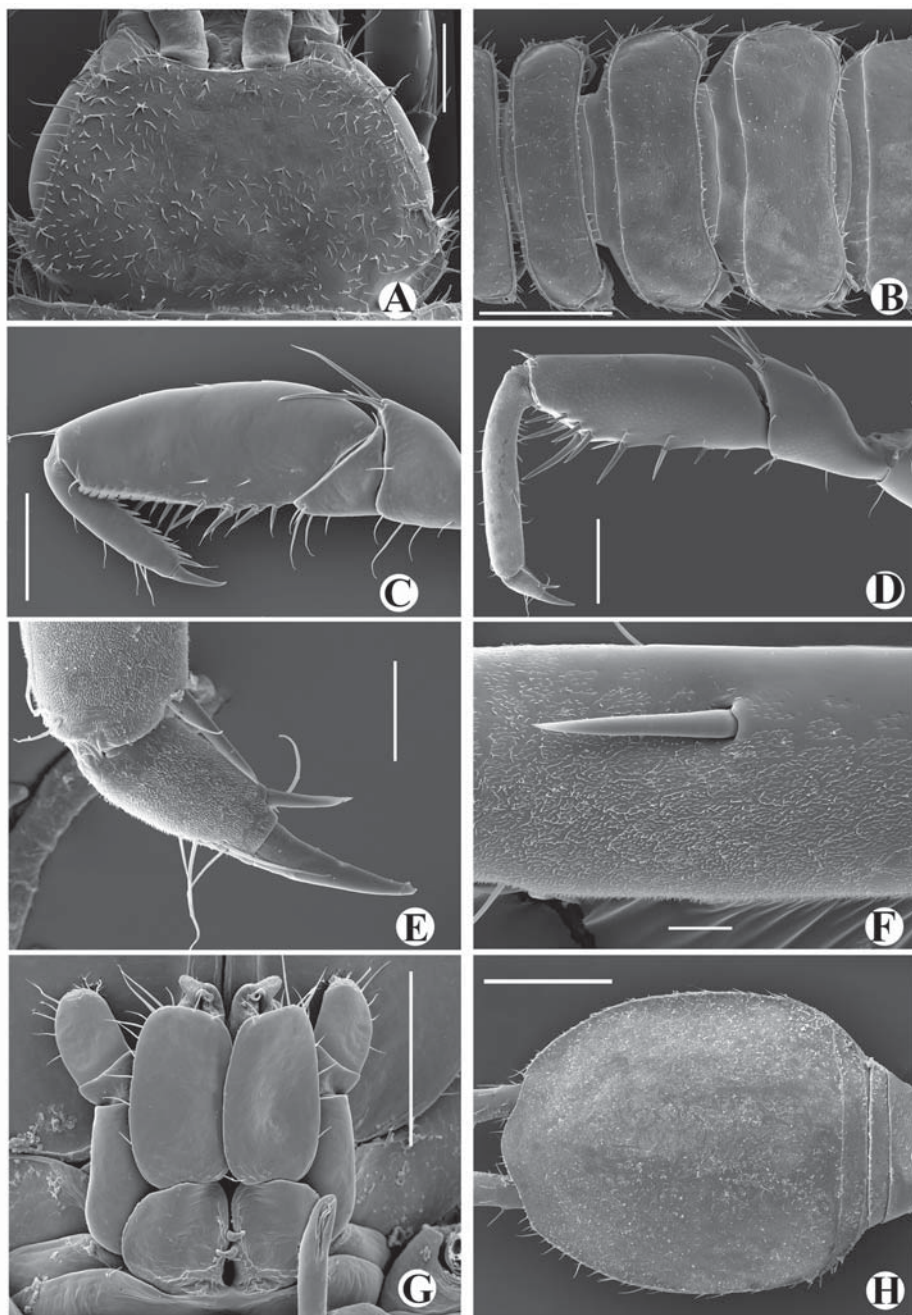


Fig. 5. *Proasellus precaspicus* sp.n., ♂: A — head; B — pereonites II–IV; C — distal part of PI with a dactylus; D — distal part of PVI with a dactylus; E — dactylus of PVI; F — mesial surface of pereopod VI; G — genital papilla and PLI–II; H — pleotelson. Scale bars: A, C, D — 200 μ m; B, H — 500 μ m; E — 50 μ m; F — 20 μ m; G — 100 μ m.

Рис. 5. *Proasellus precaspicus* sp.n., ♂: A — голова; B — перонеиты II–IV; C — дистальная часть PI с дактилусом; D — дистальная часть PVI с дактилусом; E — дактилус PVI; F — мезиальная поверхность проподуса PVI; G — генитальный сосочек и PLI–II; H — плеотельсон. Масштабная линейка: 200 μ m; B, H — 500 μ m; E — 50 μ m; F — 20 μ m; G — 100 μ m.

Pleomere I–II small (Fig. 5H), their width constitutes only 30% of pereonite VII width, forming a stalk largely covered by posterior margin of pereonite VII. Pleotelson (Figs 4J; 5H) rounded or suboval, with length 1.0–1.2 times of its width, terminal edge bisinuate with obtusely triangular median prominence. Lateral margins with few (four to five) long spiniform setae, approximately three or four shorter setae placed between two longer ones. Terminal edge with numerous short setae, subterminal margin with scarce short setae. Dorsal surface covered with numerous short delicate setae (Fig. 5H).

Antenna I (Fig. 2B, C) length 13% of body length, with three peduncular articles. First article robust, with straight superior (longer) and curved inferior (shorter) margin, other two articles cylindrical. First and second article about subequal in length, third article 1.6 times shorter than each of them. Longest setae on articles I and II with length 0.3 of articles length. Flagellum (Fig. 2C) of ten (in holotype) or seven to ten (in paratypes) articles, usually with four to six articles bearing one aesthetasc. Proximal aesthetascs mainly as long or a little longer as their parallel articles.

Antenna II (Fig. 2A) length 95–103% of body length, with six peduncular and 63 flagellar articles (in holotype) or 34–45 flagellar articles (in paratypes). Sixth peduncular article 1.2 times as long as fifth, both with long and short setae on superior margins. Flagellum length 70–76% of antenna II length.

Labrum (Fig. 2E) trapezoidal, with fine simple setae at rounded apex, epistome tapering, with fine setae along margin.

Labium (Fig. 2D) wide, subquadrate, divided almost to 2/3 of length.

Mandibulae robust (Fig. 2H, I, J): *Pars molaris* (molar process) U-shaped, with toothed margin and wrinkled crushing surface. *Pars incisiva* (incisor) formed by four (right mandibular) or five (left mandibula) blunt cusps arranged in semicircle (Fig. 2H). Left *lacinia mobilis* with four cusps, spine row of 10–14 biserrate setae (Fig. 2I), right mandible without *lacinia mobilis* (Fig. 2J). Palp of three articles. First and second article of subequal length. First article narrow, with one or two small simple setae on extero-subapical margin. Second article with about 10–12 robust long and short biserrate setae along external margin. Third article length 0.7 times of second, with row of about 12–16 robust biserrate setae along external margin.

Maxillulae (Fig. 2G) with inner plate with five apical pappose setae; outer plate with 13 dentate robust setae and a single simple seta situated subapically on lateral margin.

Maxilla (Fig. 2F) with inner plate longer than outer plate, rounded sub-triangular, with longer row of nine to eleven serrate robust setae, shorter row of

ten bifid setae situated laterally and apically, and with oblique row of 27–30 simple setae; lateral and middle plates with 20 and 12 striated setae, respectively.

Maxilliped (Fig. 2K) endite distal margin bearing about 16 serrated robust setae. Mesial margin with about 20–22 biserrate setae, distomesial margin with setulose fringe and five coupling hooks, lateral margin with dense setulose fringe. Palp has five articles. First article short, with a single short seta situated apically on inner margin, second about 3.0 times as long as first, subtrapezoidal, with row of about 11–15 long medially directed simple setae on inner margin and a stout seta on outer margin. Third article length 62–65% of second article length, less broad, with one or two short setae on outer margin and row of about four to six setae on inner margin. Fourth article 1.8 times as long as third, slender, with row of two to four and about nine to eleven slender setae along outer and inner margin, respectively. Fifth article length 50–52% of fourth article length, ovoid, fringed with 11 slender setae and two stiff apical seta. Epipodite subrectangular, lateral margin fringed with about nine to eleven short setae.

With exception of first pair, seven pairs of pereopods ambulatory and similar in structure, increasing in length towards posterior pairs.

Pereopod I (Figs 3A, B; 5C) with short oval articles, its length 25% of body length, length relation of articles from basis (article I) to dactylus (article VII): 1 : 0.77 : 0.49 : 0.16 : 0.96 : 0.61, unguis length 41% of dactylus length. Propodus I elongate, oval, up to 2.7 times as long as wide, inferior margin without proximal apophysis, straight or weakly convex, armed with three robust spiniform setae. Mesial surface with a two–three short simple setae. Dactylus I (Figs 3B; 5C) about 1.5 times as short as propodus, with five to nine short robust setae on inferior margin and five or six simple setae on superior margin.

Pereopod II (Fig. 3C, D) with long slender articles, its length 35% of body length, length relation of articles from basis to dactylus: 1 : 0.84 : 0.53 : 1.01 : 0.82 : 0.42, unguis length 47% of dactylus length. Carpus II inferior margin with row of five robust setae. Propodus II inferior margin with row of three or four simple setae, mesial surface with one or two simple setae, inferodistal corner with a single stiff acute robust seta, superior margin and submarginal surface with six to eight simple setae. Dactylus II (Fig. 3D) inferior margin with a single robust stiff seta, superior margin distally with three simple setae.

Pereopod III (Fig. 3E, F) with long slender articles, its length 39% of body length, length relations of articles from basis to dactylus: 1 : 0.78 : 0.53 : 0.91 : 0.90 : 0.34, unguis length 47% of dac-

tylus length. Corpus III inferior margin with row of five robust setae. Propodus III inferior margin with row of four to six simple setae, mesial surface with a single robust seta, inferodistal corner with a single stiff acute robust seta, superior margin and submarginal surface with four or five simple and one or two robust setae. Dactylus III (Fig. 3F) inferior margin with a single robust stiff seta, superior margin with four simple distal setae.

Pereopod IV (Fig. 3G, H) with long slender articles, its length 42% of body length, length relation of articles from basis to dactylus: 1 : 0.79 : 0.57 : 0.88 : 0.96 : 0.35, unguis length 48% of dactylus length. Carpus IV inferior margin with row of six robust setae, mesial surface with two to six short robust setae. Propodus IV inferior margin with row of three or four simple setae, mesial surface with one or two simple or robust setae, inferodistal corner with a single stiff acute robust seta, superior margin and submarginal surface with six to eight simple setae. Dactylus IV (Fig. 3H) inferior margin with a single robust stiff seta, superior margin distally with four simple setae.

Pereopod V (Fig. 3I, J) with long slender articles, its length 45% of body length, length relation of articles from basis to dactylus: 1 : 0.86 : 0.58 : 0.96 : 1.02 : 0.35, unguis length 47% of dactylus length. Carpus V inferior margin with row of five to seven robust setae, mesial surface with two to four short robust setae. Propodus V inferior margin with row of five to seven simple or robust setae, mesial surface with one or two robust setae, inferodistal corner with a single stiff acute robust seta, superior margin and submarginal surface with seven or eight simple setae. Dactylus V (Fig. 3J) inferior margin with a single robust stiff seta, superior margin distally with four simple setae.

Pereopod VI (Figs 3K, L; 5D–F) with long slender articles, its length 49% of body length, length relation of articles from basis to dactylus: 1 : 0.88 : 0.67 : 1.06 : 0.95 : 0.40, unguis length 33% of dactylus length. Carpus VI inferior margin with row of seven to ten robust setae, mesial surface with one or two short robust setae (Fig. 5D). Propodus VI inferior margin with row of five or six simple or robust setae, mesial surface with one or two robust setae (Fig. 5F), inferodistal corner with a single stiff acute robust seta, superior margin and submarginal surface with 11–13 simple setae. Dactylus VI (Figs 3L; 5E) inferior margin with a single robust stiff seta, superior margin distally with five simple setae.

Pereopod VII (Fig. 3M, N) with long slender articles, its length 53% of body length, length relations of articles from basis to dactylus: 1 : 0.92 : 0.67 : 1.10 : 0.92 : 0.36, unguis length 46% of dactylus length. Carpus VII inferior margin with row of eight to ten robust setae, mesial surface with three or

four robust setae. Propodus VII inferior margin with row of eight simple setae, mesial surface with three or four short robust setae, inferodistal corner with a single stiff acute robust seta, superior margin and submarginal surface with nine or ten simple setae. Dactylus VII (Fig. 3N) inferior margin with a single robust stiff seta, superior margin distally with four simple setae.

Genital papillae of males (Figs 4D; 5G) is thin, cylindrical, slightly curved.

Pleopod I (Figs 4A, B; 5G) with protopodite subtrapezoidal, 1.12 times as long as wide, retinacula on medial margin of a single hook (Fig. 4B). Exopodite elongated ovoid or subrectangular, its width 57% of its length, with 12–30 simple setae on lateral margin, without concavity on lateral margin.

Pleopod II (Fig. 4E, F) different in males and females. Male: with protopodite subrectangular, its width 75% of its length. Anteromedial corner with 2 simple setae. Exopodite suboval, elongated, 1.7 times as long as wide. Distal article rounded, with five to eight lateral simple setae. Proximal segment of exopodite without setae. Endopodite elongated, its width 42% of its length, subequal of protopodite in length, with distinct basal apophysis, elongated distal apophysis and with weakly expressed goulot without lips (Fig. 4F).

Pleopod II of female (Fig. 4C) subtriangular, about two times as long as wide, with nine or ten short marginal simple setae.

Pleopod III (Fig. 4H) with exopodite suboval, about 1.9 times as long as wide, with almost straight medial margin. Lateral and terminal margins with 28–30 short simple setae. Endopodite about 1.7 times shorter than exopodite.

Pleopod IV (Fig. 4G) with exopodite broadly ovoid, about two times as long as wide, lateral margins without setae. Linea transversalis very well defined, linea conjungens clearly visible near outer margin only. Endopodite suboval, about 1.3 times shorter than exopodite.

Pleopod V (Fig. 5I) with exopodite ovoid, elongated, 2.3 times as long as wide, lateral margins without setae. Distal margin rounded. Endopodite suboval, its length 85% of exopodite length.

Uropods (Fig. 4K, L) different in males and females.

Male uropods (Fig. 4L): with long slender articles, as long as 65% of pleotelson. Proto-, endo- and exopodite length relation: 1 : 1.18 : 1.35, respectively. Basis with three or four stout spiniform setae on inner and outer margins each and with distal group of three or four spiniform setae. Exopodite with two to four short simple setae on inner and outer margins each and with terminal group of long simple setae, longest seta length 65% of exopodite length. Endopodite with two to four short simple setae on inner

and outer margins each and with terminal group of long simple setae, longest seta length 68% of exopodite length.

Female uropods (Fig. 4K): with short robust articles, as long as 70% of pleotelson. Proto-, endo- and exopodite length relation: 1 : 1.04 : 1.20, respectively. Basis with three or four stout spiniform setae on inner and outer margins and with distal group of three to six spiniform setae. Exopodite with one to three short simple setae on inner and outer margins each and with terminal group of long simple setae, longest seta with length 50% of exopodite length. Endopodite with one to three short simple or spiniform setae on inner and outer margins each and with terminal group of long simple setae, longest seta length 52% of exopodite length.

BODY SIZE. The largest collected female had bl. 5.5 mm; the largest male had bl. 5.6 mm.

TAXONOMIC REMARKS. The species can be most easily separated from *Proasellus infirmus*, by the following features: 1) a single coupling hook in retinacula of pleopod I (vs two hooks, see Birstein, 1936, fig. 7); 2) lack of eyes, white depigmented body (vs eyes frothree facets, pigmented body, "brighter than *Asellus aquaticus*", see Birstein, 1936, p. 237 and Birstein, 1951, p. 85 and fig. 112); 3) lack of long plumose setae on pleopod II (vs setae on pleopod II plumose, long, exceed half of their length, see Birstein, 1936, figs 8, 9).

The species can be most easily separated from *P. linearis*, by: 1) significantly larger endopodites of pleopodes III–V, exopodite/endopodite ratio of pleopodes III–V is 1.7, 1.3, 1.1 vs 3.0, 1.9, 1.4, respectively (see Birstein, 1967, fig. 1); 2) long uropods consisting 65–70% of pleotelson length and having with thin rami that clearly exceeds basis (vs short uropods consisting no more than 25% of pleotelson length and having wide and short rami that do not exceed basis length, see Birstein, 1967, fig. 1).

The species can be easily separated from *P. ljuvuschkini*, by: 1) a single coupling hook in retinacula of pleopod I (vs two hooks, see Birstein, 1967, fig. 2); 2) lack of a large setae on mesial margin of pleopodes III and pleopodes II in female (vs prominent large setae, see Birstein, 1967, fig. 2).

The species can be easily separated from *P. similis*, by: 1) a single coupling hook in retinacula of pleopod I (vs two hooks, see Birstein, 1967, fig. 3); 2) rami of uropod almost parallel (vs arranged at the angle of almost 80°, see Birstein, 1967, fig. 3); 3) pleopod IV wide, its exopodite about 1.9 times as long as wide, without a lateral seta (vs pleopod IV narrow and blunt pointed apically, its exopodite about 2.20 times as long as wide, with a lateral seta, see Birstein, 1967, fig. 3).

The species can be easily separated from *P. uallagyryus*, by: 1) inferior margin of dactylus of pereopodes I with five to nine robust stiff setae (vs

three setae, see Palatov, Sokolova, 2021, figs 4B and 9C); 2) inferior margin of propodus of pereopodes I with three long robust stiff setae (vs a single seta, see Palatov, Sokolova, 2021, figs 4B and 9C).

The species can be easily separated from *P. irystonicus*, by: 1) inferior margin of dactylus of pereopodes II–VII with a single seta (vs two robust stiff setae, see Palatov, Sokolova, 2021, fig. 7); 2) exopodite of pleopod II of male is oval in shape, without mesial setae (vs exopodite of pleopod II of male is subtriangular in shape, with mesial seta, see Palatov, Sokolova, 2021, fig. 8E).

DISTRIBUTION AND ECOLOGY. Currently known as strictly distributed endemic species from two closely located springs on the Samursky National Park (41°50'35"N, 48°33'31"E and 41°51'53"N, 48°33'22"E). The species was found together with the following spring-dwelling invertebrates: *Gammarus cf. pulex* (Linnaeus, 1758) (Amphipoda: Gammaridae), *Niphargus* spp. (Amphipoda: Niphargidae), *Diasynurella dzhamirzoevi* Palatov et Marin, 2023 (Amphipoda: Crangonyctidae), larvae of *Plectrocnemia latissima* Martynov, 1913 (Trichoptera: Polycentropodidae) and larvae of *Ernodes palpatus* (Martynov, 1909) (Trichoptera: Beraeidae).

Discussion

To date, the described species is the first representative of the genus *Proasellus* in the Samur River basin, on the Caspian Sea coast, and in the Eastern Caucasus as a whole. It is also the third species of *Proasellus* for the territory of Northern Caucasus. The eastern border of distribution of the genus is thus significantly shifted. Morphologically, the closest species are *P. uallagyryus* and *P. irystonicus*, endemics of the Terek River basin from central part of the North Caucasus. Based on pereopod structure, the new species shows an intermediate position between them.

Probably, this species is a local endemic as well as many other stygobiotic crustaceans (Lefébure *et al.*, 2007; Foulquier *et al.*, 2008; Trontelj *et al.*, 2009) and recently described crenobiont mollusk *Clathrocaspia laevigata* V. Anistratenko, Palatov, Chertoprud et Vinarski, 2022, inhabiting small watercourses of the Samur River (Anistratenko *et al.*, 2022). We assume that the distribution of *P. precapicus* is limited to the groundwater of the Samur River delta in the territory of southern Dagestan and northern Azerbaijan.

The Samur River delta is under protection in Russia as a part of the national park. Its freshwa-

ter fauna is highly endemic (Anistratenko *et al.*, 2022). The finding of a presumably endemic new freshwater crustacean increases the conservation value of this area. The specificity of the freshwater fauna here is somewhat surprising, since the area has been periodically flooded by the Caspian Sea waters which should prevent developing of local freshwater endemics (Novikova, Polyanskaya, 1994). In the groundwater of the studied valley upstream, relict crustaceans also occur, but they are different and include no *Proasellus* (original data). Probably, further studies of the groundwater fauna of the western Caspian coast should clarify this situation.

This finding once again indicates that the hyporheic fauna of the Caucasus is poorly studied. Obviously, representatives of *Proasellus* can be found in other regions of the eastern part of the North Caucasus, such as Ingushetia and Chechnya. They are also likely to be found in northern Azerbaijan, both in the Samur River basin and in the groundwater of Gobustan, Shirvan, and Kura River basins. In any case, the diversity of this group in the region is, obviously, significantly underestimated.

Conflict of interest

The authors declare that they have no conflict of interest.

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