

A new species of the genus *Proasellus* (Crustacea: Isopoda: Asellidae) from the Abin River basin, with the preliminary data on the diversity of the genus in the southwestern foothills of the Russian Caucasus

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ABSTRACT. A new stygobiotic species of the genus *Proasellus* Dudich, 1925 (Crustacea: Isopoda: Asellidae), *Proasellus abini* sp.n., is described from the hyporheic habitats and groundwater of the Abin River basin, located in the southwestern foothills of the Caucasian Ridge. The new species is morphologically and genetically close to *Proasellus linearis* Birštein, 1967, known from the Evstafiev Schel (=Ashamba River) near Gelendzhik. Data on phylogeny, ecology and feeding of the species and other SW Caucasian species of the genus are also presented in the paper.
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KEY WORDS: Crustacea, diversity, *Proasellus*, new species, hyporhea, stygobiotic, southwestern Caucasus, Russia.

Новый вид рода *Proasellus* (Crustacea: Isopoda: Asellidae) из бассейна реки Абин, с предварительными данными по разнообразию рода из юго-западных предгорий российского Кавказа

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РЕЗЮМЕ. Новый стигобионтный вид рода *Proasellus* Dudich, 1925 (Crustacea: Isopoda: Asellidae), *Proasellus abini* sp.n., описывается из гипогейных биотопов и подземных вод бассейна реки Абин, расположенной в юго-западных предгорьях Кавказского хребта. Новый вид морфологически и генетически близок к *Proasellus linearis* Birštein, 1967, известному из Евстафьевской щели (= река Ашамба) близ Геленджика. В статье также представлены данные о филогении, экологии и питании этого вида и других представителей рода с юго-западных предгорий Кавказа.

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КЛЮЧЕВЫЕ СЛОВА: ракообразные, разнообразие, *Proasellus*, новые виды, гипогея, стигобионтный, юго-западный Кавказ, Россия.

Introduction

Groundwater ecosystems are among the most understudied habitats of our planet (Saccò *et al.*, 2023). Current knowledge on the diversity of subterranean and hyporheic crustaceans of the Caucasus is still fragmentary, despite the fact that quite a lot of publications with a description of stygobiotic diversity have appeared recently (Marin, 2017, 2019, 2020; Marin, Palatov, 2019a, 2023a, b; Grego *et al*., 2020; Palatov, Sokolova, 2021; Marin *et al*., 2021b, 2022, 2023; Rendoša *et al.,* 2021; Anistratenko *et al.,* 2022; Palatov *et al.,* 2023). Most likely the reason is that Caucasus is the second region of the Western Palearctic (after the Balkan Peninsula) in terms of the size of karst area, the variety of landscapes and climatic conditions (Myers *et al.*, 2000; Krever *et al.*, 2001), as well as groundwater-adapted biodiversity is mainly composed of short-range species with restricted distributions (Trontelj *et al*., 2009; Eme *et al*., 2018). Most of the hyporheic crustaceans of the Caucasus are narrowly endemic (Marin *et al*., 2021; Palatov, Marin, 2021). It is also important that the study of groundwater organisms is hindered by the inaccessibility and complexity of their collection.

The genus *Proasellus* Dudich, 1925 (Crustacea: Isopoda: Asellidae) is one of the most diverse and most widely distributed genera of groundwater crustaceans in the western Palaearctic, currently including about 125 valid species (Boyko *et al.*, 2023). The understudy in the Caucasus is also true for this group of crustaceans, especially in the western part of the Caucasus Mountains. Currently only 7 species of the genus *Proasellus* are known from different localities in the Caucasus, mostly described by J.A. Birštein (1936, 1967) (after Palatov, Sokolova, 2021; Palatov *et al*., 2023). At the same time, only one species of this genus has been described, namely *Proasellus linearis* Birštein, 1967 from the western foothills of the Caucasus, exactly from the Evstafiev Schel near Gelendzhik (Birštein, 1967). This location most likely refers to the sources of the small mountainous river Ashamba (Yashamba), originating on the southern slope of the Markhoth Ridge and flowing into the Black Sea in the Blue Bay area (Gelendzhik). The endemism of this area has already been shown on another group of hyporheic crustaceans, representatives of the genus *Niphargus* Schiödte, 1849 (Crustacea: Amphipoda: Niphargidae) (Marin *et al*., 2021a) and representatives of the genus *Lyurella* Derzhavin, 1939 (Crustacea: Amphipoda: Crangonyctidae) (Marin, Palatov, 2021b).

Recent sampling of representatives of the genus *Proasellus* have shown that they are much more diverse than previously thought, inhabiting the hyporhea of all large rivers in the area. In this article we present data on the molecular diversity, distribution, ecology of representatives of the genus in the western foothills of the southwestern Caucasus, as well as describe a new species from the Abin River basin and nearby small mountainous rivers.

Material and Methods

SPECIMEN SAMPLING and MORPHOLOGICAL STUDY. Groundwater isopods were collected by hand net in springs and wells in the foothill area of the southwestern Caucasus (see Fig. 1). All specimens were fixed in 70–90% solution of ethanol. The type material is deposited in the collection of Zoological Museum of Moscow State University, Moscow (ZMMU) and author’s collection in A.N. Severtsov Institute of Ecology and Evolution of Russian Academy of Sciences, Moscow, Russia (LEMMI). The body length (bl., in mm), the dorsal length from the anterodorsal margin of the head to the margin of the pleotelson, without the length of uropods and antennas, was used as a standard measurement. Line drawings were made using camera lucida attached to Olympus SZX10 light stereomicroscope.

MOLECULAR STUDY. A fragment of the mitochondrial gene coding for cytochrome c oxidase subunit I (COI mtDNA) gene marker was amplified with the help of the universal primers LCO1490

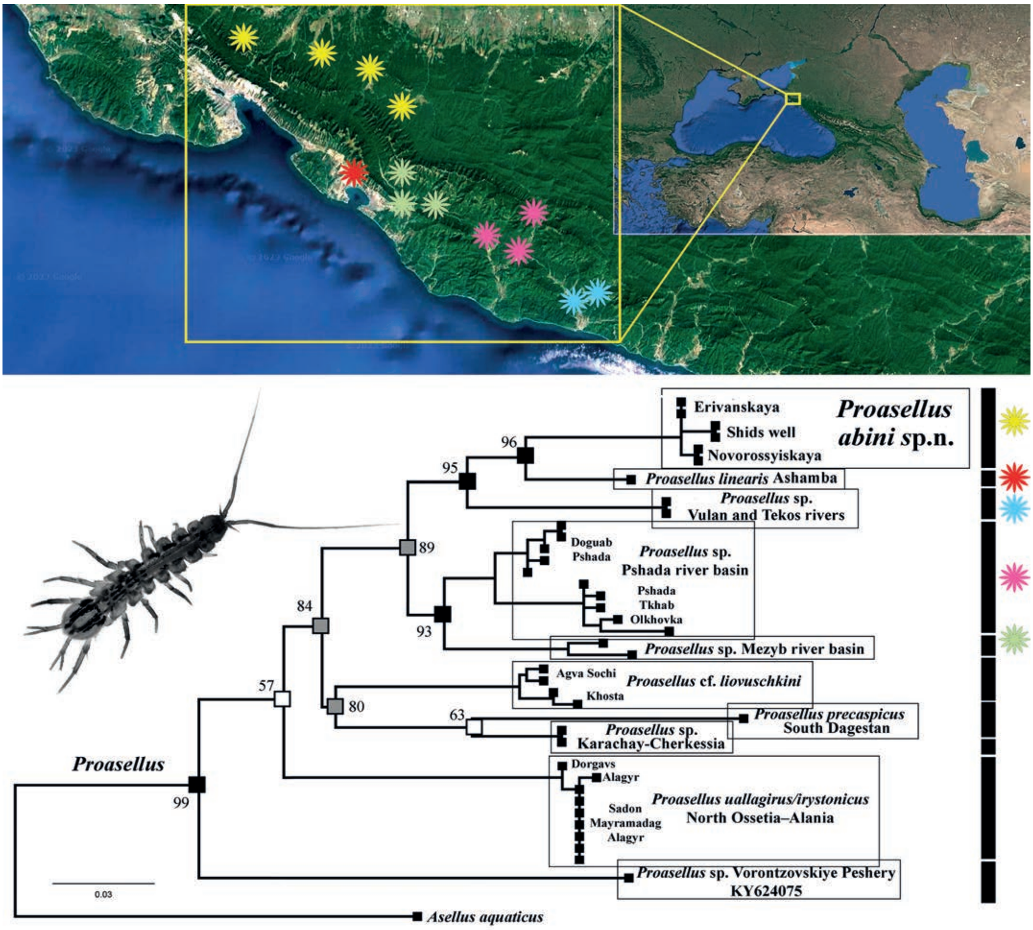

Fig. 1. Map of collection sites and phylogenetic relationships of *Proasellus abini* sp.n. Bootstrap support of all nodes is reported.

Рис. 1. Карта мест сбора и филогенетические взаимоотношения *Proasellus abini* sp.n. Поддержка узлов (клад) представлена.

(5'-ggtcaacaaatcataaagatattgg-3') and HC02198 (5'-taaacttcagggtgaccaaaaaatca-3') (Folmer *et al.*, 1994). The obtained sequences of the new species are deposited in the GenBank (NCBI) database for the further genetic studies. The aligned sequences of COI mtDNA gene markers, 658 base pairs in length, were analyzed for pairwise sequence divergence (uncorrected *p*–distances) with the sequences of the related species, deposited in GenBank (NCBI) database using MEGA 7.0 (Kumar *et al.*, 2016). Only Caucasian species of the genus *Proasellus* were used for the phylogenetic analysis. The best evolutionary substitution model was determined using MEGA 7.0. and jModeltest2.1.141 (Diego Darriba, Universidade da Coruña as part of the Computer Architecture Group (GAC), Coruña, Spain) on XSEDE via the CIPRES (Cyber Infrastructure for Phylogenetic Research) Science Gateway V. 3.3 (http://www.phylo.org/, accessed on 10 September 2023). Phylogenetic analysis was performed using PhyML 3.0 (Guindon *et al.*, 2010) using GTR+G+I model for Maximum-Likelihood analysis (ML).

Uncorrected pairwise genetic divergence (*p*-distances) was calculated using MEGA 7.0 with the Kimura 2-Parameter (K2P) model of evolution (Kimura, 1980).

STABLE ISOTOPE ANALYSIS. Material for the analysis of stable isotope ($\delta^{13}C/\delta^{15}N$) was collected in springs of Novorossiyskaya Schel, 44°44′27.39″N 37°54′03.71″E. The muscles tissues of collected animals were oven-dried at 50 °C for 4–5 days, and then were wrapped in tin foil (1200–1500 µg and 400–600 µg, respectively). The isotopic composition was determined using a Thermo-Finnigan Delta V

Table 1. Pairwise genetic (COI mtDNA) distances (*p*-distances) (substitutions per 100 nucleotides) of *Proasellus adegoyi* sp.n. and congeners from the Russian Caucasus.
Таблица 1. Попарные генетические (COI мтДНК) расстояния (*p*-дистанции) (замены на 100 нуклеотидов) *Proasellus adegoyi* sp.n. и родственных видов с Российского Кавказа.

	***Proasellus abini* sp.n.** (Abin River Basin)	***P. linearis***	Pshada Basin	Mezyb Basin	Vulan Basin	***P. liovuschkini***	Vorontsovka caves	***P. irystonicus***	***P. precaspicus***
P. linearis	**0.086**								
Proasellus sp. Pshada Basin	0.112	**0.089**							
Proasellus sp. Mezyb Basin	0.120	0.93	**0.087**						
Proasellus sp. Vulan Basin	0.124	0.103	0.110	0.091					
P.* cf. *liovuschkini	0.153	0.132	0.127	0.103	0.141				
Proasellus sp. Vorontsovka caves	0.170	0.180	0.199	0.171	0.187	0.196			
P. irystonicus	0.145	0.144	0.139	0.099	0.154	0.147	0.188		
P. precaspius	0.151	0.149	0.133	0.141	0.137	0.169	0.181	0.154	
Proasellus sp. Karachaevo-Cherkessiya	0.128	0.130	0.121	0.111	0.125	0.122	0.175	0.131	0.101

Plus continuous-flow mass spectrometer (Thermo Electron GmbH, Bremen, Germany) coupled with an elemental analyzer (Thermo Flash 1112, Thermo Electron) at the Joint Usage Center at the A.N. Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences. The isotopic composition of N and C was expressed in the δ-notation relative to the international standard (atmospheric nitrogen or VPDB): $\delta X(‰) = [(R_{sample}/R_{standard}) - 1] \times 1000$, where R is the ratio of the heavier isotope to the lighter isotope. Samples were analyzed with reference gases calibrated against IAEA (Vienna, Austria), reference materials USGS 40 and USGS 41 (glutamic acid). The drift was corrected using internal laboratory standards (acetanilide, casein). The standard deviation of $\delta^{15}N/\delta^{13}C$ values in are laboratory standards (n=8) was <0.15‰.

Standard abbreviations: A — antenna; Ep — epimeral plate; Gn — gnathopods; M — maxilla; Mx — maxilliped; P — pereopod; PL — pleopod; Pp — pereopods; T — telson; U — uropod; Ur — urosomite.

Results

PHYLOGENETIC DATA. The interspecific genetic divergence of the new species is the lowest comparing with *P. linearis* from Ashamba, representing about 0.086 substitutions per 100 nucleotides (8.6%), while the divergence from other Caucasian congeneric species reaches more than 10% (see Table 1), which indicates prolonged isolation and the absence of a gene flow.

Phylogenetically the new species is also close to *P. linearis*, probably being its sister species (see Fig. 1). At the same time, all SW Caucasian species of the genus *Proasellus* represent the monophyletic clade, with the species inhabiting hyporhean and underground habitats in the basins of different local mountainous rivers, such as Ashamba, Abin, Pshada, Mezyb, Vulan, which were separated during last 2 Mya in the result of mountain grow.

TROPHIC POSITION BASED ON ISOTOPIC ANALYSIS. The studied new species, *Proasellus abini* sp.n., is situated in the low tropic position (–22.67±0.12 for $\delta^{13}C$ and 4.40±0.32 for $\delta^{15}N$) close to primary herbivorous animals in the general scheme of isotopic values of $\delta^{13}C$ and $\delta^{15}N$ for macrozoobenthos (see Marin *et al*., 2021a). The similar trophic position is characteristic for herbivorous crustaceans co-occurring in the springs of the Novorossiyskaya Schel, such as undescribed species of the genus *Niphargus* from the “*tauricus*” species complex (Amphipoda: Niphargidae), *Synurella adegoyi* Marin et Palatov, 2022 (Amphipoda: Crangonyctidae) (see Marin & Palatov, 2022) and *Gammarus* cf. *komareki* Schäferna, 1923 (Amphipoda: Gammaridae), which are probably feed on primary organic matter, like the remains and roots of various forest plants that fall into the hyporhea and groundwater (pers. observ.; unpublished).

Taxonomic account

Isopoda Latreille, 1817
Suborder Asellota Latreille, 1802
Family Asellidae Rafinesque-Schmaltz, 1815
Genus *Proasellus* Dudich, 1925
***Proasellus abini* sp.n.**
Figs 2D–F, 3–5.

MATERIAL EXAMINED. Holotype: ♀ (bl. 6.2 mm), ZMMU Mc-1458, Russian Federation, south-western Caucasus, Krasnodar Krai, Gelendzyk area, the upper stream of the Adegoy River, Novorossiyskaya Schel, 44°44′27.39″N 37°54′03.71″E, in the river hyporheic habitats, hand net sampling, coll. I. Marin, S. Sinelnikov & S. Marina, 8 Nov. 2021.

Paratypes: ♀ (bl. 5.5 mm), ♂ (bl. 6.0 mm), ZMMU Mc-1459, Russian Federation, south-western Caucasus, Krasnodar Krai, Krymsky district, the upper stream of the Shids River, 44°48′09.03″N 37°59′26.54″E, inside a small well, coll. I. Marin, S. Marina, 24 July 2021.

Other material: Russian Federation, south-western Caucasus, Krasnodar Krai: 2♀♀, 6♂♂, LEMMI, Abin area, the upper stream of the Abin River, 44°43′32.3″N 38°10′04.5″E, coll. I. Marin, S. Marina, 12 Aug. 2021; 5♀♀, 7♂♂, LEMMI, the upper stream of the Adegoy River, Afonka, 44°42′53.2″N 37°58′27.1″E, in the river hyporheic habitats, hand net sampling, coll. I. Marin, S. Marina, 18 July 2021; 2♀♀, 4♂♂, LEMMI, Abin area, Adegoy River, near Shapsugskaya village, 44°43′31.8″N 38°02′13.8″E, in the river hyporheic habitats, hand net sampling, coll. I. Marin, S. Marina, 19 July 2021; 5♀♀, 6♂♂, LEMMI, Abin area, Abin River, Shapsugskaya village, 44°45′30.2″N 38°04′50.0″E, in the river hyporheic habitats, hand net sampling, coll. I. Marin, S. Marina, 19 July 2021; 3♀♀, 6♂♂, LEMMI, Abin river, 44°43′43.6″N 38°06′35.6″E, in the river hyporheic habitats, hand net sampling, coll. I. Marin, S. Marina, 3 Aug. 2021.

ETYMOLOGY. The new species is named after the Abin River (SW Caucasus), in the basin of which the new species was discovered.

DIAGNOSIS. Medium-sized, depigmented species. Head bisinuate, medially concave, about 1.4

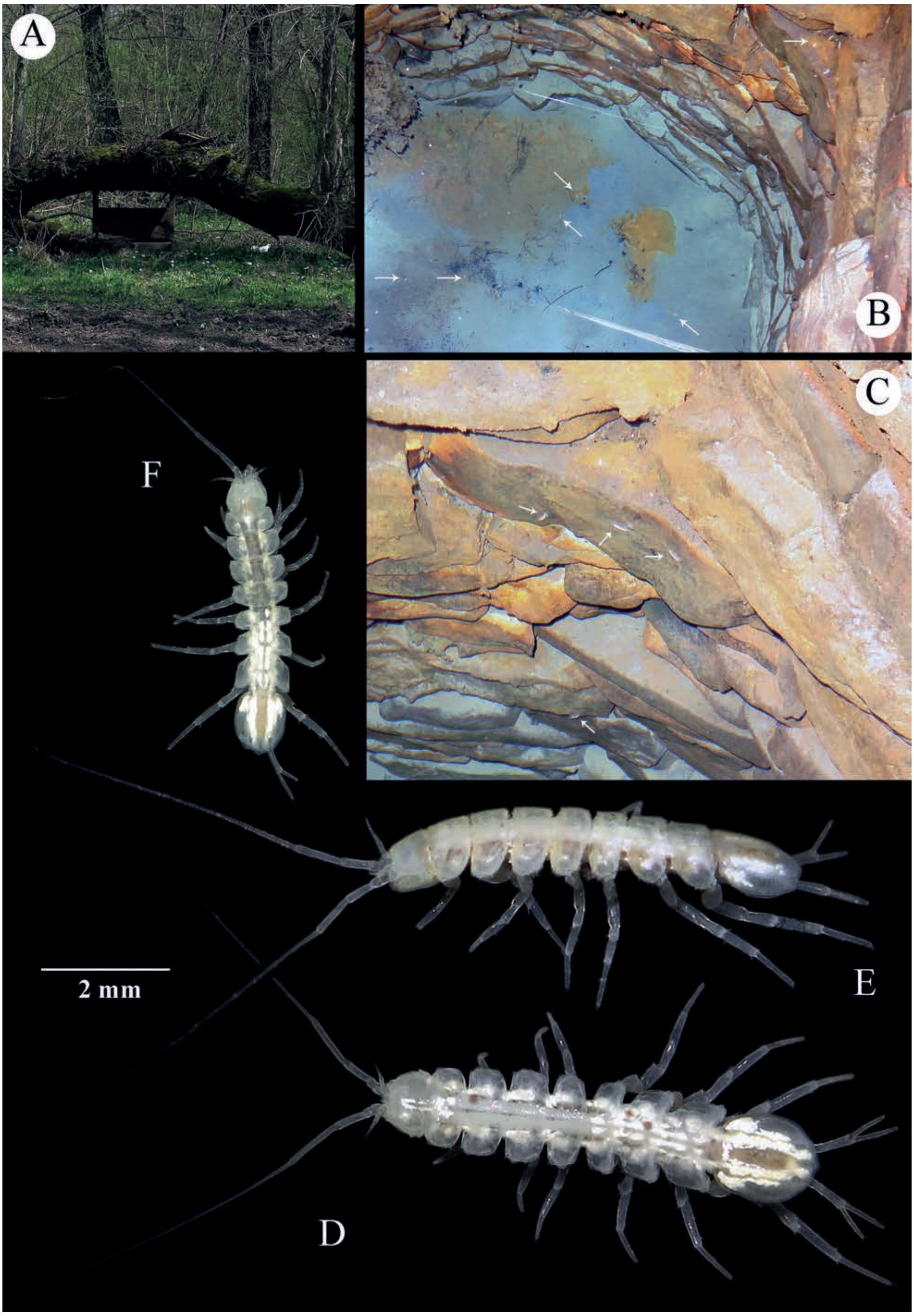

Fig. 2. General view and natural habitat of *Proasellus abini* sp.n.: A — a forest well, Shids, general view; B, C — individuals of the new species on the bottom and walls of the well; D, F — general dorsal view of alive individual of the new *Proasellus abini* sp.n. and its lateral view (E).

Рис. 2. Общий вид и природные местообитания *Proasellus abini* sp.n.: A — лесной колодец, Шидс, общий вид; B, C — особи нового вида на дне и стенках колодца; D, F — общий дорсальный вид живой особи *Proasellus abini* sp.n. и ее вид сбоку (E).

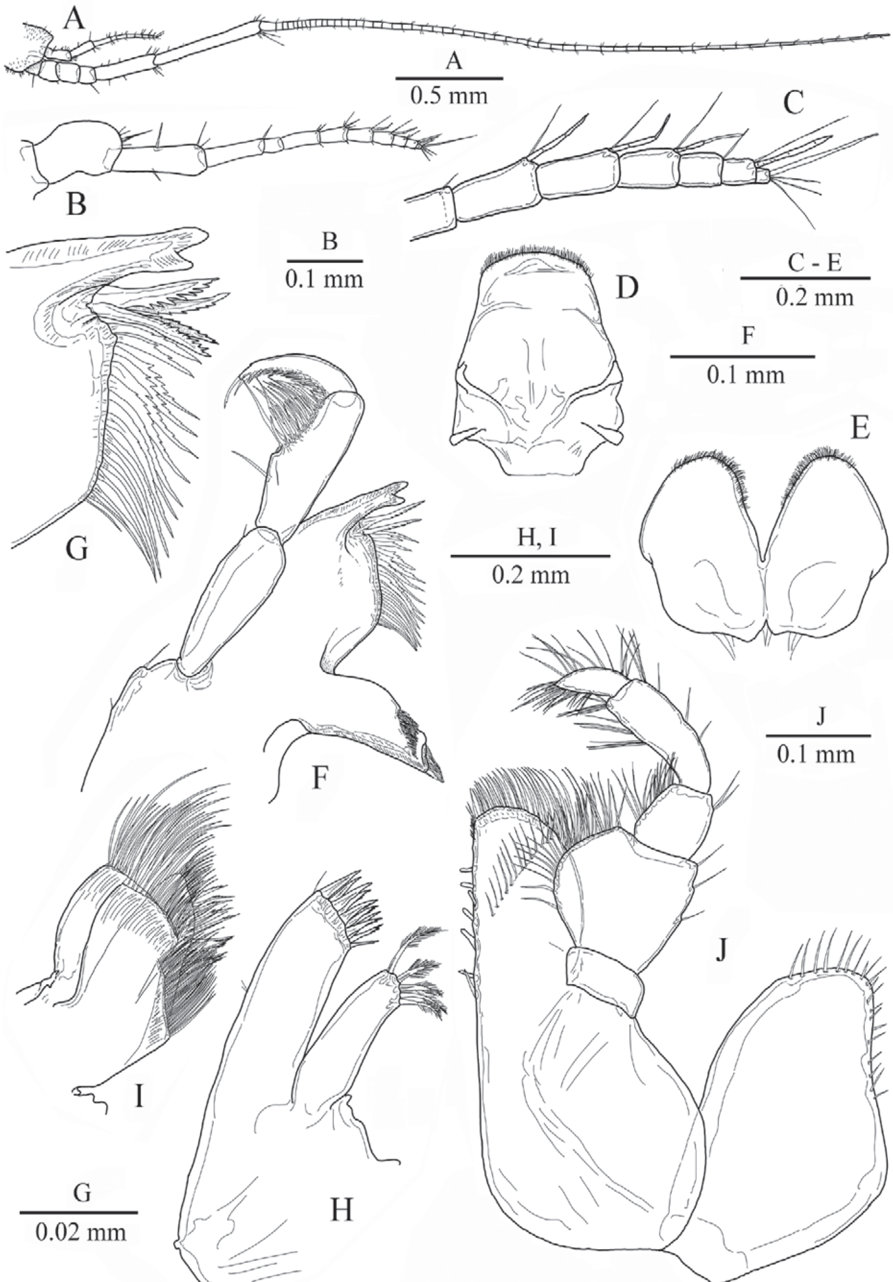

Fig. 3. *Proasellus abini* sp.n., ♂ from the hyporhean habitats of the upper stream of Adegoy river (right tributary of Abin river), Novorossiyskaya Schel: A — both antenna I and II; B — antenna I; C — distal flagellum of antenna I; D — labium; E — labrum; F — right mandible; G — *pars incisiva* (incisor) of right mandible; H — maxilla; I — maxillula; J — maxilliped.

Рис. 3. *Proasellus abini* sp.n. ♂ из гипогеи верхнего течения реки Адегой (правого притока реки Абин), Новороссийская щель: A — антенны I и II; B — антенна I; C — дистальный жгутик антенны I; D — лабиум (нижняя губа); E — (лабрум) верхняя губа; F — правая мандибула; G — резцовый отросток правой мандибуды; H — максилла; I — максиллула; J — максиллипед.

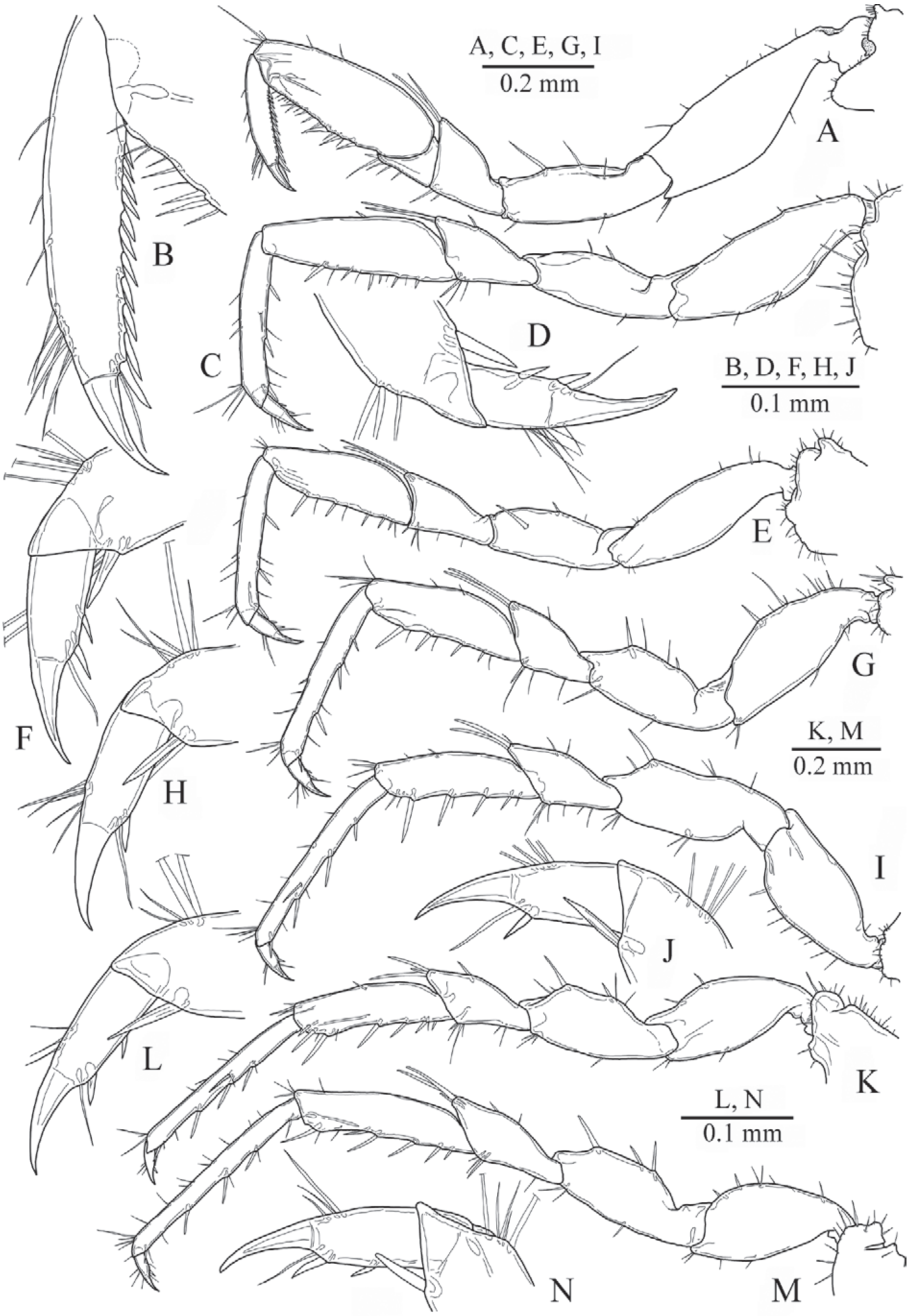

Fig. 4. *Proasellus abini* sp.n., ♂ from the hyporhean habitats of the upper stream of Adegoy river, Novorossiyskaya Schel: A — pereopod I; B — dactylus of PI; C — pereopod II; D — dactylus of PII; E — pereopod III; F — dactylus of PIII; G — pereopod IV; H — dactylus of PIV; I — pereopod V; J — dactylus of PV; K — pereopod VI; L — dactylus of PVI; M — pereopod VII; N — dactylus of PVII.
Рис. 4. *Proasellus abini* sp.n., ♂ из гипогеи верхнего течения реки Адегой, Новороссийская щель: A — переопода I; B — дактилус PI; C — переопода II; D — дактилус PII; E — переопода III; F — дактилус PIII; G — переопода IV; H — дактилус PIV; I — переопода V; J — дактилус PV; K — переопода VI; L — дактилус PVI; M — переопода VII; N — дактилус PVII.

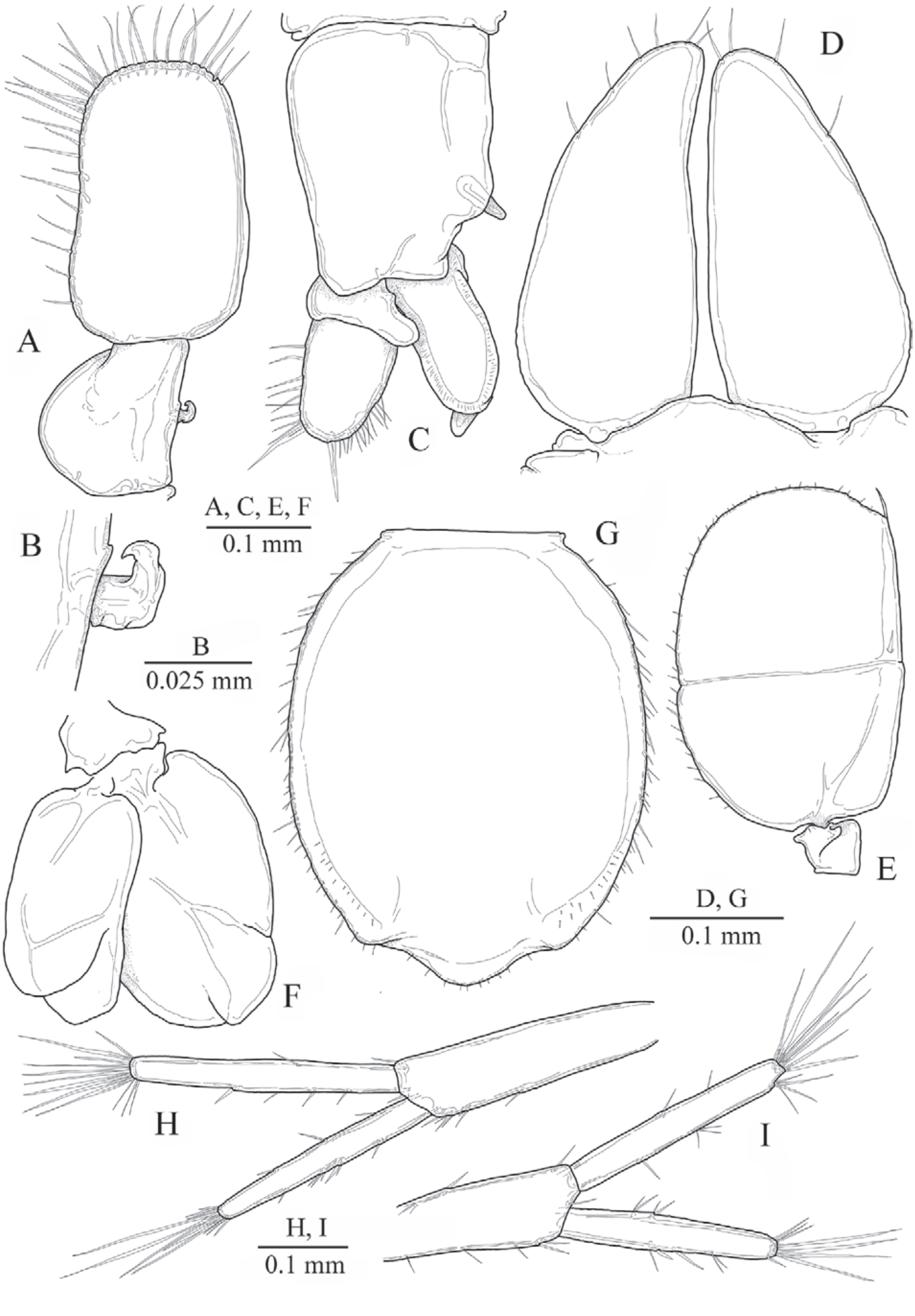

Fig. 5. *Proasellus abini* sp.n., ♂ (A–C, E, F, G, H) and ♀ (D, I) from the hyporhean habitats of the upper stream of Adegoy river, Novorossiyskaya Schel: A — pleopod I; B — retinacula on medial margin of protopodite of PLI; C — pleopod II (♂); D — pleopod II (♀); E — pleopod III (♂); F — pleopod IV and V (♂); G — pleotelson; H, I — uropod.

Рис. 5. *Proasellus abini* sp.n., ♂ (A–C, E, F, G, H) и ♀ (D, I) из гипогеи верхнего течения реки Адегой, Новороссийская щель: A — плеопода I; B — ретинакула на медиальном краю протоподита PLI; C — плеопода II (♂); D — плеопода II (♀); E — плеопода III (♂); F — плеопода IV и V (♂); G — плеотельсон; H, I — уропода.

times as wide as long, frontal margin lateral margins rounded, each with posterolateral setose prominence; eyes absent. AI with 8–9 flagellar articles, flagellum of AII with more than 50 articles. Inner plate of maxillula with 5 apical pappose setae. Pereopod I with propodus lumpy and swollen, about to 3.2 times as long as maximal width, inferior margin armed with 3–4 robust spiniform setae; dactylus about 0.8 length of propodus, with a row of short robust setae along inferior margin, unguis about ¼ of length of dactylus. Dactylus of pereopods II–VII with 2 robust spine-like seta along inferior margin. Pleopod I with 1 hook in retinacula. Endopodite of pleopod II in males with distinct elongated basal apophysis and with weakly expressed goulot without lips. Endopodite of pleopod II in females subtriangular, fringed with marginal simple setae. Uropods similar in shape in both males and females, but slightly differing in size: protopodite shorter in females; ratio of proto-, endo- and exopodite length is 1.0/1.1/1.1 in males and 1.0/1.0/1.2 in females.

DESCRIPTION. Stygobiotic species, blind, with depigmented body and appendages. Body elongated, about 4.5 times as long as wide (Fig. 2D–F). Head (Fig. 2D, E) with frontal margin bisinuate, medially concave, without rostral process, lateral margins straight, each with small posterolateral protuberance, with several short stiff setae. Eyes or pigmented spots absent.

Pereonites (Fig. 2D–F) depigmented, mostly smooth, lateral margins fringed with spiniform setae. Coxopods well developed, margins of all epimerae dorsally visible.

Pleotelson (Fig. 5G) suboval, about 1.5 times longer than wide, with distal margin bisinuate with obtusely triangular median prominence; dorsal surface smooth; lateral margins convex, fringed with spiniform setae; distal margin also fringed with numerous short setae, without large spines.

Antenna I (Figs 2D, E; 3A–C) small, about 5% of body length, and about 7 times shorter than AII; basal peduncular article robust, with strongly convex inferior (shorter) margin; second and third pedunclular articles cylindrical; ratio is about 1.0/1.1/0.8; flagellum (Fig. 3C) consists of 8–9 articles, usually with last four or three articles bearing one aesthetascs.

Antenna II (Figs 2D, E; 3A) is about 90% of body length; peduncle (Fig. 3A) with 6 articles, with ratio is about 1.0/1.0/1.0/2.6/4.4/0/8; flagellum long, with more than 50 articles.

Labrum (Fig. 3D) trapezoidal, with fine simple setae at slightly convex apex, epistome tapering, with fine setae along margin.

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

Mandibulae robust (Fig. 3F). Right mandible with *pars molaris* (molar process) U-shaped, with toothed margin and wrinkled crushing surface (Fig. 3G); *pars incisiva* (incisor) formed by 4 blunt cusps arranged in semicircle; palp 3-articulated; second article with numerous biserrate setae along external margin; third (distal) article sickle-shaped, with row of robust short biserrate setae along external margin. Left mandible mostly similar to right one; *pars molaris* U-shaped, with toothed margin and wrinkled crushing surface; pars incisiva (incisor) formed by 5 blunt cusps arranged in semicircle; palp 3-articulated.

Maxillulae (Fig. 3H) with inner plate with five apical pappose setae; outer plate with 12–13 dentate robust setae distally.

Maxilla (Fig. 3I) with inner plate slightly longer than outer plate, rounded sub-triangular, with longer row of serrate robust setae, and with oblique row of numerous simple setae; distal margin of lateral and middle plates also fringed with striated setae.

Maxilliped (Fig. 3J) with endite armed with 6–7 stout hook-like setae along the mesial inner margin, and numerous fine distomesial setae. Palp 5-articulated; basal article short, second article about 3.0 times as long as first one, subtrapezoidal, with row of long medially directed simple setae on inner margin; third article short about half of the second one, less broad, with row of several setae on inner margin; fourth article slender, about 2.5 times as long as wide, fringed with simple setae along outer and inner margin, respectively; fifth article ovoid, fringed with slender setae along lateral margins and stiff apical setae. Epipodite ear-shaped, distolateral margin fringed with short setae.

Pereopod I (Fig. 4A) subchelate, about 20% of body length, with stout articles, length relation of articles from basis (article I) to dactylus (article VII) is 1/0.8/0.5/0.15/0.9/0.7; basis smooth, subcylindrical, convex in the central part, about 3 times as long as distal width; ischium about 0.8 length of basis, subcylindrical, convex in the central part, armed with several stiff-like setae along dorsal margin; merus triangular in shape, with 2 large stiff-like setae distodorsally; carpus short, about as long as wide, armed with simple setae anteroventrally; propodus lumpy and swollen, about to 3.2 times as long as maximal width, inferior margin armed with 3–4 robust spiniform setae; dactylus (Fig. 3B) about 5 times as long as wide, about 0.8 length of propodus, with a row of short robust setae along inferior margin, with unguis strong, robust and slightly curved, about ¼ of length of dactylus.

Pereopods II–III similar in structure (Fig. 4C, E): basis smooth, subcylindrical, convex in the central part, about 3 times as long as distal width; ischium about 0.8 length of basis, subcylindrical, convex in the central part, armed with several short simple setae along dorsal margin; merus triangular in shape, with 2 large stiff-like setae distodorsally; carpus elongated, subcylindrical, about 3 times as long as wide, armed with several strong and several simple setae along inferior margin; propodus subcylindrical, with straight margins, about to 4 times as long as maximal width, inferior margin armed with 2–3 robust spiniform and several smaller simple setae; dactylus (Fig. 4D, F) about 2.5–3 times as long as wide, about 0.3 length of propodus, with 2 short robust setae along inferior margin, unguis strong, robust, curved, about 0.7 of length of dactylus.

Pereopods IV–VII very similar in structure (Fig. 4G, I, K, M): basis smooth, subcylindrical, convex in the central part, about 2–2.5 times as long as distal width; ischium equal to basis, swollen, usually convex in the central part, armed with several short simple setae along dorsal margin; merus triangular in shape, about as long as wide, with 2 large stiff-like setae distodorsally; carpus elongated, subcylindrical, about 3–3.5 times as long as wide, slightly swollen in medial part, armed with several strong and several simple setae along inferior margin; propodus subcylindrical, with straight margins, about 6–7.5 times as long as maximal width, inferior margin armed with 2–3 robust spiniform and several smaller simple setae; dactylus (Fig. 4H, J, L, N) about 3.5–4 times as long as wide, about 0.2–0.25 length of propodus, with 2 short robust setae along inferior margin, unguis strong, robust, curved, about half of length of dactylus.

Genital papillae in males is robust, cylindrical, straight.

Pleopod I (Fig. 5A) with protopodite elongated, about 2 times as long as distal width, with strongly convex outer margin, with 1 hook in retinacula (Fig. 5B). Exopodite subrectangular, about 1.7 times as long as wide, with numerous simple setae on lateral margin, without concavity on lateral margin.

Pleopod II different in males (Fig. 5C) and females (Fig. 5D). Male (Fig. 5C): with protopodite subtrapezoidal, about 1.2 times as long as wide, anteromedial corner without setae, with small papillae; exopodite suboval, elongated, about 2 times as long as wide, with distal article distally rounded, armed with several distal and lateral simple setae anterolaterally; proximal segment short, without setae; endopodite elongated, about 2 times as long as wide, subequal of protopodite in length, with distinct elongated distal apophysis and with weakly expressed goulot without lips, basal apophysis feebly marked. Female (Fig. 5D): with protopodite subtriangular, about 2.5 times as long as wide, fringed with medium marginal simple setae.

Pleopod III (Fig. 5E) with exopodite suboval, about 1.5 times as long as wide, with slightly convex medial margin. Lateral and terminal margins fringed with short simple setae. Endopodite about 1.6 times shorter than exopodite.

Pleopod IV (Fig. 5F) with exopodite broadly ovoid, about 1.8 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 0.9 of length of exopodite.

Pleopod V (Fig. 5F) with exopodite ovoid, elongated, 2.2 times as long as wide, lateral margins without setae. Distal margin rounded. Endopodite suboval, about 0.8 of length of exopodite.

Uropods similar in shape, but slightly different in size in males (Fig. 5H) and females (Fig. 5I), equal in size to pleotelson. Male (Fig. 5H): ratio of proto-, endo- and exopodite length is 1.0/1.0/1.1; protopodite about 3 times as long as wide, subcylindrical, with several stout spiniform setae on inner and outer margins; exopodite subcylindrical, about 6–6.5 times as long as wide, shorter than endopodite, about 0.8 times of its length, with short simple setae on inner and outer margins and a group of long simple terminal setae; endopodite subcylindrical, about 7–7.5 times as long as wide, with short simple setae on inner and outer margins and a group of long simple terminal setae. Female (Fig. 5I): ratio of proto-, endo- and exopodite length is 1.0/1.0/1.2; protopodite about 4.5 times as long as wide, subcylindrical, with several stout spiniform setae on inner and outer margins; exopodite subcylindrical, about 7 times as long as wide, shorter than endopodite, about 0.8 times of its length, with short simple setae on inner and outer margins and a group of long simple terminal setae; endopodite subcylindrical, about 7–7.5 times as long as wide, with short simple setae on inner and outer margins and a group of long simple terminal setae.

BODY SIZE. The largest collected female had bl. 6.5 mm; the largest male had bl. 6.0 mm.

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DISTRIBUTION AND ECOLOGY. The species lives in the hyporheic habitats and groundwater of the Adegoy/Abin River basin, as well as a number of small neighboring rivers, for example, the Shids River. Usually, co-occuring with other stygobiotic crustaceans, such as the representatives of the genus *Niphargus* from the "*tauricus*" and "*submersus*" species complexes (Amphipoda: Niphargidae), *Synurella adegoyi* Marin et Palatov, 2022 (Amphipoda: Crangonyctidae) (see Marin & Palatov, 2022) and *Gammarus* cf. *komareki* Schäferna, 1923 (Amphipoda: Gammaridae).

TAXONOMIC REMARKS. The species morphologically and phylogenetically (see Fig. 1; Tab. 1) related to *Proasellus linearis* Birštein, 1967, which also depigmented, has no yes, has only one hook in retinacula of PLI and protopodite of PLII without long plumose setae (see Birštein, 1967). At the same time, the new species can be clearly separated from *P. linearis* by 1) slenderer peduncular articles of AI; 2) stouter and oval pleotelson with convex lateral margins (vs. pleotelson mostly rectangular with slightly convex lateral margins); and 3) significantly longer uropods both in males and females. At the same time, it is likely that the individual described by Birštein [1967] may be immature, and a detailed re-description of the species in the future will further clarify the morphological differences between these related species.

The species can be easily separated from both *Proasellus uallagyrus* Palatov et Sokolova, 2021 and *P. irystonicus* Palatov et Sokolova 2021, which also have 1 hook in retinacula of PLI (see Palatov, Sokolova, 2021), the new species can be separated by: 1) slenderer peduncular articles of AII, especially article 3 and 4; 2) inferior margin of dactylus of pereopod I with numerous robust stiff setae (vs only 3 setae); 3) moderately swollen carpus of PpII–VII (vs. strongly swollen); 4) inferior margin of dactyli of PpII–VII with 2 robust spine-like setae (vs a single seta).

The species can be easily separated from *Proasellus precaspius* Palatov, Dzhamirzoev et Sokolova, 2023, which also has 1 hook in retinacula of PLI (see Palatov *et al.*, 2023), the new species can be separated by: 1) inferior margin of dactylus of pereopod I with numerous robust stiff setae (vs only 4–5 setae); 2) moderately swollen carpus of PpII–VII; 3) inferior margin of dactyli of PpII–VII with 2 robust spine-like setae (vs a single seta); and 4) protopodite of PLII without long plumose setae.

The species can be easily separated from *Proasellus ljovuschkini* Birštein, 1967 (after Birštein, 1967) by: 1) only 1 coupling hook in retinacula of PLI (vs 2 hooks); 2) protopodite of PLII without long plumose setae; 3) inferior margin of dactylus of pereopod I with numerous robust stiff setae (vs only several setae); and 4) the lack of a large setae on mesial margin of basal article exopodite of PLII in males (vs large setae present).

The species can be easily separated from *Proasellus similis* Birštein, 1967 (after Birštein, 1967) by: 1) only 1 coupling hook in retinacula of PLI (vs 2 hooks); 2) almost parallel rami of uropods (vs arranged at the angle of almost 80); 3) inferior margin of dactyli of PpII–VII with 2 robust spine-like setae (vs a single seta); and 4) completely different shape of exopodite and endopodite of PLII in males (see Birštein, 1967, fig. 4).

Currently, the generic status of *Proasellus infirmus* Birštein, 1936 (after Birštein, 1936), originally described within the genus *Asellus* Geoffroy, 1762, remains questionable, but the new species can be easy distinguished by the following features: 1) lack of eyes, white depigmented body (vs eyes with three facets and pigmented body); 2) only 1 coupling hook in retinacula of PLI (vs 2 hooks); 3) lack of long plumose setae on protopodite of PLII (vs setae plumose, long, exceed half of their length); and 4) completely different shape of exopodite and endopodite of PLII in males (see Birštein, 1936).

In conclusion, it would like to note that in order to more accurately identify and compile a diagnostic key of the Caucasian species of the genus *Proasellus*, it is necessary to re-describe most of the species described by J.A. Birštein at a modern level and modern equipment, as well as to obtain molecular genetic data for them. It is also obvious that the diversity of the genus is much higher than is currently expected, and even in the area of the south-western foothills, about 5–6 undescribed species most likely present, each associated with hyporhean biotopes of the separate river basins.

Conflict of interest. The authors declare that they have no conflict of interest.

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