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A revision of the genus *Pontonyx* Palatov et Marin, 2021 (Amphipoda: Crangonyctidae), with an overview of crangonyctid diversity in the Palaearctic

Ревизия рода *Pontonyx* Palatov et Marin, 2021 (Amphipoda: Crangonyctidae), с обзором разнообразия амфипод-крангониктид Палеарктики

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KEY WORDS: Crangonyctidae, *Pontonyx*, diversity, phylogeny, Caucasus, Northern Black/Azov Sea Lowland, Eurasia, Palaearctic.

КЛЮЧЕВЫЕ СЛОВА: Crangonyctidae, *Pontonyx*, разнообразие, филогения, Кавказ, Северная Азово-Черноморская равнина, Евразия, Палеарктика.

ABSTRACT. The article represents a review and partial revision of the genus *Pontonyx* Palatov et Marin, 2021 (Amphipoda: Crangonyctidae). A new species of the genus, *Pontonyx abchasicus* sp.n., is described from the mountainous forests springs of eastern Abkhazia, Caucasus, representing the highest mountain habitat (about 760 m a.s.l.), while previous records did not exceed 60 m a.s.l. *Synurella donensis* Martynov, 1919 is re-described in details on the basis of topotypic material and transferred to the genus *Pontonyx*. Discussion on phylogeny and distribution of the genus, as well as a differential key for all species are provided. The article also presents a general list of currently described Palearctic species of the family Crangonyctidae.

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РЕЗЮМЕ. Статья представляет собой обзор и частичную ревизию рода *Pontonyx* Palatov et Marin, 2021 (Amphipoda: Crangonyctidae). Новый вид рода, *Pontonyx abchasicus* sp.n., описан из горных лесных источников восточной Абхазии, демонстрируя самое высокогорное обитание (на высоте 760 м над уровнем моря) в пределах рода. Предыдущие находки его представителей сделаны на высотах до 60 м над уровнем моря. *Synurella donensis* Martynov, 1919 повторно описывается на основе топотипического материала и переносится в род *Pontonyx*. Приводится обсуждение филогении и распространения рода, а также дифференциальный ключ для всех видов. В статье также представлен общий список описанных в настоящее время палеарктических видов семейства Crangonyctidae.

Introduction

The Holarctic groundwater or epigean amphipods of the family Crangonyctidae Bousfield, 1973 (Crustacea: Amphipoda) currently includes 14 valid genera with more than 230+ species widely distributed in the Nearctic and Palaearctic continental fresh water habitats [Horton *et al.*, 2022; Palatov, Marin, 2020, 2021, 2023; Marin, Palatov, 2021a, b, 2022a, b; Cannizzaro *et al.*, 2021]. At the same time, the actual diversity of the family is still far from being completely studied, especially in the Palaearctic.

The crangonyctid genus *Pontonyx* Palatov et Marin, 2021 was suggested [Marin, Palatov, 2021a] for *Synurella odessana* Sidorov et Kovtun, 2015 found in coastal flooded parts of the catacombs under Odessa [Sidorov, Kovtun, 2015], and *S. osellai* Ruffo, 1972 known from the Black Sea coastal habitats of the northeastern Turkey [Ruffo, 1972; Özbek, 2018]. Two more species, *Pontonyx adjaricus* Palatov et Marin, 2021 and *P. colchicus* Marin et Palatov, 2021, were currently described from the Black Sea coastal swamps of SW Georgia, Caucasus [Palatov, Marin, 2021]. The validity and monophyly of the genus *Pontonyx* is verified by the recent molecular genetic studies [Palatov, Marin, 2020; Marin, Palatov, 2021a, b], where it is usually considered as a sister clade of the genus *Diasynurella*

Behning, 1940 [Marin, Palatov, 2021a]. However, the phylogenetic position of both genera is currently not clearly resolved [Copilaş-Ciocianu *et al*., 2019; Palatov, Marin, 2020; Marin, Palatov, 2021a, b].

The area of modern distribution of the genus *Pontonyx* is clearly correlated with the coastline of the Black Sea, and historically with the borders of the Euxinian basin of the Eastern Paratethys and even Paratethys before its separation in Miocene [Popov *et al.*, 2006]. All currently known species have been described from its coastal habitats, and mostly, with the exception of *P. odesssana*, from the Kolkhida Lowland of the Eastern Black Sea (Colchis). The altitude of the known habitats of the genus does not exceed 10–20 m a.s.l., with the only record of *P. osellai* in the mountainous area near the Solakli stream (northeastern Turkey) about 60 m a.s.l. [Özbek, 2018], representing the highest currently known altitude of the habitats for the genus.

Currently, it is obvious that not all species of the genus have been discovered and described, as well as we have only a fragmentary idea of its diversity and origin. Recent studies have confirmed that *Synurella donensis* (Martynov, 1919), known from several neighboring springs at the mouth of the Don River near the city of Rostov-on-Don, belongs to the genus *Pontonyx* [Palatov, Marin, 2023]. Moreover, extensive zoological studies in 2021–2022 along the southern slope of the Great Caucasian Ridge revealed the presence of an undescribed species of the genus in the mountainous forest regions of the eastern Abkhazia, Caucasus. Thus, herewith we are revising the crangonyctid genus *Pontonyx* and its known diversity, distribution and phylogeny.

Material and methods

SAMPLE COLLECTION AND PROCESSING. Amphipods were collected using a hand net in various epigean and subterranean water resources of the Ciscaucasian Plain and the southern slope of the Great Caucasian Ridge in 2011–2022. All samples were fixed in 90% solution of ethanol. Photographs of alive coloration *in situ* were made using a Canon G16 digital camera CanonG16. Photographs of morphological features were made with a digital camera attached to light microscope Olympus ZX10 and Olympus CX21. The scanning electron microscopy (SEM) images were made using the Vega 3 Tescan microscope in the Yu.A. Orlov Paleontological Museum of the Paleontological Institute of the Russian Academy of Sciences, Moscow. Amphipods were placed in 95% ethanol, cleaned in an ultrasonic cleaner then dehydrated with acetone, critical-point dried (CPD), fixed on specimen stubs with double-sided and coated with gold by sputtering using Polaron PS 100.

The body length (bl., mm), the dorsal length from the distal margin of head to the posterior margin of telson, without uropod III and both antennas, is used as a standard measurement. The type material is deposited at the collection of Zoological Museum of Moscow State University, Moscow, Russia (ZMMU). Additional material is deposited in the author's personal collection at the A.N. Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences, Moscow, Russia (LEMMI).

PCR AMPLIFICATION AND DNA SEQUENCING. The mitochondrial cytochrome oxidase c subunit I (COI mtDNA) gene has been proving as extremely informative in previous studies at both population and species level [Avise, 1993; Palatov, Marin, 2020; Marin, Palatov, 2021a, b]. Total genomic DNA was extracted from muscle tissue using the innuPREP DNA Micro Kit (AnalitikJena, Germany). The COI mtDNA gene marker was amplified with the using of the universal primers LCO1490 (5'–GGTCAACAAATCATAAAGATATTGG–3') and HC02198 (5'–TAAACTTCAGGGTGACCAAAAAATCA–3') under the standard protocol conditions [Folmer *et al*., 1994]. PCR products were then sequenced using a Genetic Analyzer ABI 3500 (Applied Biosystems, USA) and BigDye 3.1 (Applied Biosystems, USA) with forward and reverse primers. Dataset of aligned sequences of the COI mtDNA gene markers, about 617 base pairs in length used in the study were taken from GenBank (NCBI) (Table 1) and author's personal data.

Pairwise genetic divergences (*p*-distances) was calculated based on available COI sequences using MEGA 7.0 [Kumar *et al.*, 2016] with the Kimura 2-Parameter (K2P) model of evolution [Kimura, 1980].

PHYLOGENETIC ANALYSIS. Dataset of consensus sequence was obtained with MEGA 7.0. The best evolutionary substitution model was determined using MEGA 7.0 and jModeltest2.1.141. A phylogenetic analysis was conducted using PhyML 3.0 (http://www.atgc-montpellier.fr/phyml/) [Guindon *et al.*, 2010] (standard bootstrap analysis) with several models based on BIC (Bayesian Information Criterion) and AIC (Akaike Information Criterion). All obtained trees were used only to satisfy the phylogenetic position of the genus within the family Crangonyctidae and are not presented in the article (see Palatov and Marin [2021]).

MOLECULAR CLOCK ANALYSIS was performed based on Bayesian Inference (BI) trees generated with the BEAST2 package [Bouckaert *et al*., 2014] (1 billion MCMC generations, and Yule tree prior). The Maximum Clade Credibility Tree (MCMC) was obtained using TreeAnnotator v2.5.1, with 10% burn-in and selected mean node height [Bouckaert *et al.*, 2014, 2019]. The resulting trees were visualized with FigTree v1.4.3. Calibration points were chosen based on the adapted time-scale [McInerney *et al.*, 2014] and the analysis of historical events.

ABBREVIATIONS: Mx — maxilla; Gn — gnathopod; P — pereopod; Pp — pereopods; Pl — pleopod; Ep — epimeral plate; U — uropod.

Results

Order Amphipoda Latreille, 1816
Infraorder Gammarida Latreille, 1802
Family Crangonyctidae Bousfield, 1973
Pontonyx Palatov et Marin, 2021

INCLUDED SPECIES. *Pontonyx odessana* (Sidorov et Kovtun, 2015) (the type species of the genus)*, Pontonyx osellai* (Ruffo, 1972), *Pontonyx adjaricus* Palatov et Marin, 2021, *Pontonyx colchicus* Marin et Palatov, 2021, *Pontonyx donensis* (Martynov, 1919) comb.n. and *Pontonyx abchasicus* sp.n.

DIAGNOSIS. Total body size from 6 to 13 mm, males larger than females. *Body* smooth, in some cases troglomor-

Table 1. Comparison of pairwise genetic (COI mtDNA) distances (*p*-distances) (substitutions per 100 nucleotides±SE) between the studied species of the genus *Pontonyx*.
Таблица 1. Сравнение попарных генетических (COImtDNA) дистанций (*p*-distances) (замен на 100 нуклеотидов±SE) между изучаемыми видами рода *Pontonyx*.

Pontonyx odessana (type species of the genus)		*P. donensis* comb.n.	*P. colchicus*	*P. adjaricus*
P. donensis comb.n.	0.113±0.016			
P. colchicus	0.260±0.031	0.234±0.028		
P. adjarcius	0.232±0.025	0.223±0.025	0.120±0.016	
P. abchasicus sp.n.	0.228±0.023	0.235±0.026	0.126±0.016	**0.052±0.011**

phic, urosomites fused with marked suture between segments, without dorsal spines. *Head* without rostrum, lateral lobe rounded anteriorly; with black eyes (ommatidia) and large yellow spots dorsally. *Antenna I* longer than antenna II, with small aesthetascs; accessory flagellum 2-segmented. *Antenna II* with small calceoli on peduncle and flagellum in males or without them. *Maxilla I*: inner plate with 4–5 long plumose setae apically; outer plate with 7 robust serrate spines apically; palp 2-segmented. *Maxilla II*: inner plate oval, broader than outer plate, with oblique row of 3–4 long plumose setae along inner margin. *Gnathopods I–II* robust, unequal in size and dissimilar shape (GnI smaller than GnII). Propodus of GnI mostly trapezoidal in shape, with distal margin almost straight, slightly oblique, armed with double row of 6–7 inner and outer bifurcate robust setae. Propodus of GnII close to teardrop-shaped, wide at the base and tapering distally, with palm groove (depression) feebly developed, palmar corner with 2 strong palmar spiniform setae, 1–2 supporting spiniform setae on inner surface. *Epimeral plates I–III* sharply produced and curved posterior corners, ventral margins with several spines, differing in size. *Pleopods* with 4–8 coupling hooks in retinacula. *Uropod III* uniramous, peduncle cone-shaped, with a terminal "pointed knob" on lateral margin. *Telson* elongated and rectangular, as long as uropod III, distal margin with deep V-shaped distal notch, reaching almost 1/2 of the length of telson.

DIFFERENTIAL DIAGNOSIS. The genus *Pontonyx* is well distinguished from all other Palearctic genera of the family Crangonyctidae by the following features: 1) pigmented body with well-developed pigmented eyes (vs. depigmented *Crangonyx*, *Amurocrangonyx, Uralocrangonyx*, *Diasynurella* and *Palearcticarellus*); 2) fused urosomal segments with feebly visible sutures (vs. free urosomal segments in *Amurocrangonyx*, *Crangonyx*, *Uralocrangonyx* and *Palearcticarellus*, while urosomal segments II–III partially fused in *Diasynurella* and completely fused in *Synurella*); 3) well-developed inner lobes of labium (vs. almost completely reduced in *Eosynurella*); 4) trapezoidal or subquadrate propodus of GnI (vs. oval or teardrop-shaped in *Amurocrangonyx*, *Crangonyx*, *Uralocrangonyx* and *Palearcticarellus*); 5) distoventral palmar angle of propodus of GnII with 1–2 strong simple bristles on the inner face (vs. with a row of 3–5 bifurcated bristles in *Amurocrangonyx*, *Crangonyx*, *Uralocrangonyx*, *Lyurella*, *Eosynurella*, *Palearcticarellus*, *Synurella* and *Volgonyx*); 6) single spine-like seta on ventral margin of dactyli of PpIII–VII (vs. several spine-like setae in *Amurocrangonyx*, *Eosynurella* and *Lyurella*); 7) simple endopodite of UI (vs. paddle-like endopodite in *Volgonyx*); 8) rudimentary two-segmented UIII (vs. well-developed two-segmented UIII in *Amurocrangonyx*, *Crangonyx* and *Uralocrangonyx*; and mostly reduced uni-segmented in *Lyurella*); 9) the presence of an additional terminal knob on the peduncle of UIII (vs. absent in *Amurocrangonyx*, *Crangonyx*, *Uralocrangonyx*, *Lyurella*, *Eosynurella*, *Palearcticarellus* and *Synurella*); 10) more than 2 coupling hooks in retinacula of pleopods (vs. with 2 hooks in *Synurella* and *Diasynurella*); and 11) elongated telson with deep apical cleft, reaching about half of its total length (vs. shallow cleft in *Lyurella*, *Palearcticarellus*, *Uralocrangonyx*, *Synurella* and *Volgonyx*).

PHYLOGENY. The molecular genetic analysis [Palatov, Marin, 2023: fig. 21] clearly confirmed the monophyly (Bayesian–PP=1.00; ML–BS=95%) of the genus *Pontonyx*, which is well separated from other lineages (genera) of the family Crangonyctidae; the clade is a sister to the genus *Diasynurella*, possibly diverged about 14–40 Mya [Copilaº-Ciocianu *et al.*, 2019; Palatov, Marin, 2023].

The interspecific genetic divergence based on the COI mtDNA gene marker between the known species of the genus *Pontonyx*, except *P. osellai* because of the absence molecular genetic data, vary from 0.052±0.011 substitutions per 100 nucleotides (about 5%) (see Table 1), up to 0.260±0.031 substitutions per 100 nucleotides (about 26%) between *P. odessana* and *P. colchicus*, showing a long-time isolation of all species.

The estimated divergence time based on the COI mtDNA gene marker between the species within the genus *Pontonyx* vary from 10.4 (5.04–33.7) Mya (maximal) (*P. odessana* vs. *P. colchicus*) to 2.08 (1.007–2.93) Mya (minimal) (*P. adjaricus vs. P. abchasicus* sp.n.) (the average as 2.5%Mya^{-1}; minimal as 0.77%Mya^{-1}; and maximal as 5.16%Mya^{-1} after Guy-Haim *et al.* [2018]), and 14–2.93 Mya, respectively, according to Copilaş-Ciocianu *et al*. [2019] (about 1.773% Mya^{-1} for the COI mtDNA gene marker).

Two phylogenetic lineages are presented within the genus *Pontony*x: *P. odessana* and *P. donensis* comb.n. known from northwestern Black/Azov Sea Lowland, including the lower parts of Dnipro and Don rivers, respectively; and the Caucasian lineage, including *P. colchicus*, *P. adjarcius* and *P. abchasicus* sp.n., known from the southwestern slope of the Great Caucasian Ridge within the northeastern coastal habitas of the Kolkhida Lowland (Colchis)) [Palatov, Marin, 2023]. The genetic divergence based on the COI mtDNA gene marker between the lineages is 0.236±0.024 substitutions per 100 nucleotides (about 24%), with the estimated divergence time close to 9.4 (4.57–30.64) Mya (after Guy-Haim *et al*. [2018]) or 13.31 Mya (after Copilaş-Ciocianu *et al*. [2019]).

ECOLOGICAL REMARKS. The genus is known from both underground waters (springs and wells) and epigean habitats (swamps and ponds) around the coastline of the Black and Azov Seas, mainly at an altitude of no more than 30–60 m a.s.l., with only *P. abchasicus* sp.n. known from mountainous forest springs at the altitude of 760 m a.s.l. All

known species are local endemics, their distribution is narrowly limited to several neighboring springs or one swamp/pond area.

Pontonyx donensis (Martynov, 1919) **comb.n.**
Figs 1–7.

MATERIAL EXAMINED. Neotype, ♂ (bl. 12.0 mm), ZMMU Mb-1255, Russian Federation, northwestern Ciscaucasian Plain, Rostov Oblast', Rostov-on-Don, Proletarskiy district, 47°13′59.9″N 39°47′00.1″E, about 40 m a.s.l., a small spring on a shore of Kiziterinka river, hand net sampling, 18 May 2022, coll. D. Palatov et I. Marin.

Additional material: Russian Federation, northwestern Ciscaucasian Plain, Rostov Oblast', Rostov-on-Don: 1♀ (bl. 10.0 mm), 1♂ (bl. 10.0 mm), ZMMU Mb-1256, same locality and data as for neotype; 1♂, LEMMI, Mozhaisk ponds cascade, 47°15′54.0″N 39°48′07.0″E, in the stream flowing in the 1st pond, hand net sampling, 18 May 2022, coll. D. Palatov et I. Marin; 1♂, 1♀, LEMMI, Mozhaisk ponds cascade, 47°16′16.7″N 39°48′45.2″E in the stream flowing in the 3d pond, hand net sampling, 18 May 2022, coll. D. Palatov et I. Marin; 1♀, LEMMI, the cascade of ponds in the bed of the Temernik River, 47°17′25.5″N 39°43′22.4″E, in a small spring near Armenian Church of Surb Khach Monastery, hand net sampling, 18 May 2022, coll. D. Palatov et I. Marin; 1♂, LEMMI, the cascade of ponds in the bed of the Temernik River, 47°16′39.1″N 39°43′07.3″E, captured spring flowing into the river, hand net sampling, 18 May 2022, coll. D. Palatov et I. Marin.

DESCRIPTION. Body (Fig. 1): moderately stout; the largest collected ♂ has bl. 12 mm.

Head with concave distoventral lobe (Fig. 7*a*), with well-marked ommatidia (black eyes) and feebly marked dorsal yellow spots (Fig. 1).

Antenna I (Fig. 2*a*) about 83% of body length, about 2.7X longer than antenna II; primary flagellum with about 31–32 segments, with aesthetascs on distal segments; accessory flagellum 2-segmented, distal segment about 2.6X shorter than basal one (Fig. 2*b*).

Antenna II (Fig. 2*c*, *d*): gland clone distinct, distally pointed; peduncle about 2.0–2.2X longer than flagellum, with robust setae tightly covering segments 3 and 4, peduncle of segment 4 about 1.2X longer than segment 5; flagellum 8-segmented, calceoli absent.

Labrum (upper lip) (Fig. 3*a*): oval, apical margin with numerous small fine setae.

Labium (lower lip) (Fig. 3*b*): inner lobes feebly developed.

Mandible (Fig. 3*c–f*): left mandible (Fig. 3*c*, *d*) incisor 5-dentate, *lacinia mobilis* 4-dentate, with 5 robust plumose accessory setae; molar process with 1 seta. Right mandible (Fig. 3*e*, *f*) incisor 4-dentate, *lacinia mobilis* toothed, triturative, lobes with numerous protuberances; underlying with a row of 5 robust plumose setae; molar process similar to left mandible. Palp 3-segmented, segment 2 with 5–6 setae; segment 3 about 3.8X longer than wide, with 10–11 separate D-setae, 3 B-setae, 3 C-setae, and 5 separate E-setae (Fig. 3*c, e*).

Maxilla I (Fig. 3*g*): inner plate with 4 plumose marginal setae, outer plate with 7 apical comb-spines (Fig. 3*h*); palp 2-segmented, distal segment pubescent, apical margin of distal segment with simple setae.

Maxilla II (Fig. 3*i*): inner and outer plates covered in pubescent setae, subequal in length; outer plate with numerous apical simple setae; inner plate narrowing explicitly distally, with group of dense short setae on apex, with oblique row of 3–4 short plumose setae.

Maxilliped (Fig. 3*j*): inner plate much shorter than outer plate, with 5–6 spines and 4–5 simple setae apically, and 1–2 simple setae laterally; outer plate narrow, with a row of 12–14 medial stiff simple setae of different length; palp quadriarticulate, article 1 without setae on outer margin, article 2 with a row of 22–24 simple setae on inner margin and without setae on outer margin, article 3 sub-quadrate; dactylus with 1 seta on outer margin and without setae at inner margin, nail long, slender, with 1 thin seta at hinge.

Gnathopod I (Fig. 2*e*, *g*): smaller than GnII; coxal plate oval, distally tapering and rounded, with rounded corners and with 5 apical setae, width/depth ratio 0.75–0.80; basis about 2.2X longer than wide; ischium about as long as wide; merus about as long as ischium, about 0.4X of basis and 0.48X of propodus, with numerous serrated setae in inner margin; carpus trapezoidal in shape, with rounded distoventral margin, covered with tuft of long simple setae; propodus about 1.3X longer than broad, with distal margin of palm almost straight, slightly oblique, armed with row of 8 distally notched robust spines on inside and 10 on outside, 13 short bifurcate robust setae at arranged in a semicircle (Figs 2*f*; 7*g*), anterior margin densely setose with paired setae, posterior margin short with 5 sets of simple setae; dactylus simple, with 4 outer setae.

Gnathopod II (Figs 2*h*, *j*, 7*e*, *f*): coxal plate oval, distally bluntly rounded, with rounded corners and with 4–6 apical setae, width/depth ratio 0.80–0.87; basis about 3.0X longer than wide; ischium about as long as wide; merus about as long as ischium, about 0.31X of basis and 0.3X of propodus, with numerous serrated setae in inner margin; carpus triangular in shape, with bluntly produced distoventral projection; propodus teardrop-shaped, widening posteriorly and sharpening distally, about 1.5X longer than broad, with distal margin oblique, armed with double row of inner and outer bifurcate robust setae, palm groove (depression) feebly developed, palmar corner with 3 strong palmar spiniform setae and 1 supporting spiniform seta on inner surface (Figs 2*i*, 7*h*); dactylus simple, with 4 outer setae along anterior margin and few short setae along inner margin.

Pereopod III (Figs 4*a*, 5*a*): coxal plate mostly rounded, with rounded distal margin, with 5–7 apical setae, width/depth ratio is 0.86; basis about 4.4X as long as wide, armed with long anterior and posterior simple setae; ischium about as long as wide; merus about 4.0X longer than wide and ischium, widening distodorsally, about 0.7X of basis, about 1.4X of carpus and propodus in length; carpus about 4.2X longer than wide, similar to propodus in length, armed with 3–4 strong spine-like setae along posterior margin; propodus about 6.0X longer than wide, armed with 4–5 strong spine-like setae along posterior margin; dactylus (Figs 4*b,* 5*b*) about 0.35X of propodus, with 1 plumose seta on outer margin and 1 additional spine accompanying with seta along ventral margin.

Pereopod IV (Figs 4*c*, 5*c*): subequal to PIII in length: coxal plate mostly quadrate, with rounded margins, with 8 apical setae, width/depth ratio is 1.1; basis about 4.7X as long as wide, armed with long anterior and posterior simple setae; ischium about as long as wide; merus about 4.0X longer than wide and ischium, widening distodorsally, about 0.7X of basis, about 1.4X of carpus and 1.3X of propodus in length; carpus about 4.5X longer than wide, slightly shorter than propodus in length, armed with 3–4 strong spine-like setae along posterior margin; propodus about 5.7X longer than wide, armed with 4–5 strong spine-like setae along posterior margin; dactylus (Figs 4*d*, 5*d*) about 0.33X of propodus, with 1 plumose seta on outer margin and 1 additional spine accompanying with seta along ventral margin.

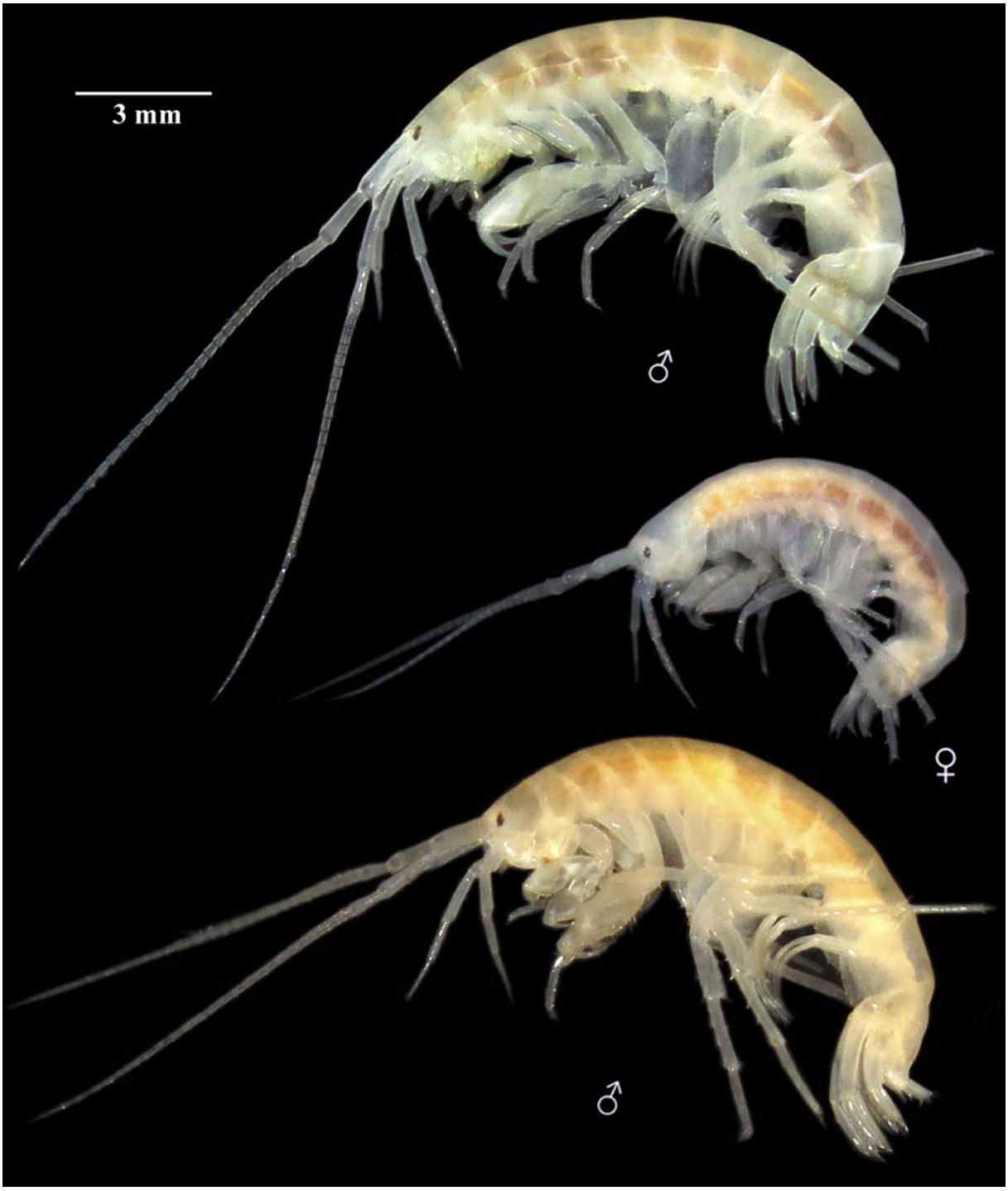

Fig. 1. *Pontonyx donensis* (Martynov, 1919) comb.n., Rostov-on-Don, Rostov Oblast', Russia: general view.
Рис. 1. *Pontonyx donensis* (Martynov, 1919) comb.n., Ростов-на-Дону, Ростовская область, Россия: общий вид.

Pereopods V, VI, VII mostly similar in shape, with the length ratio 1/1.43/1.40 in males and 1/1.34/1.36 in females.

Pereopod V (Figs 4*e*, 5*e*): coxal plate large, bilobate, with distinct anterior and posterior lobes; posterior lobe with 3 marginal simple setae, anterior lobe with 1 marginal simple seta; basis about 1.43X as long as wide, posterior margin convex, armed with 8–9 shallow serrations, with distinct bluntly rounded distal corner, anterior margin with 7–9 robust and 2–3 long simple setae distoventrally; ischium about as long as wide; merus about 2.8X times longer than wide, about 0.7X of basis, 0.9X of carpus in length; carpus about 5.3X longer than wide, slightly shorter than propodus in length, armed with 3–4 doubled robust spine-like setae along posterior margin; propodus about 8.0X

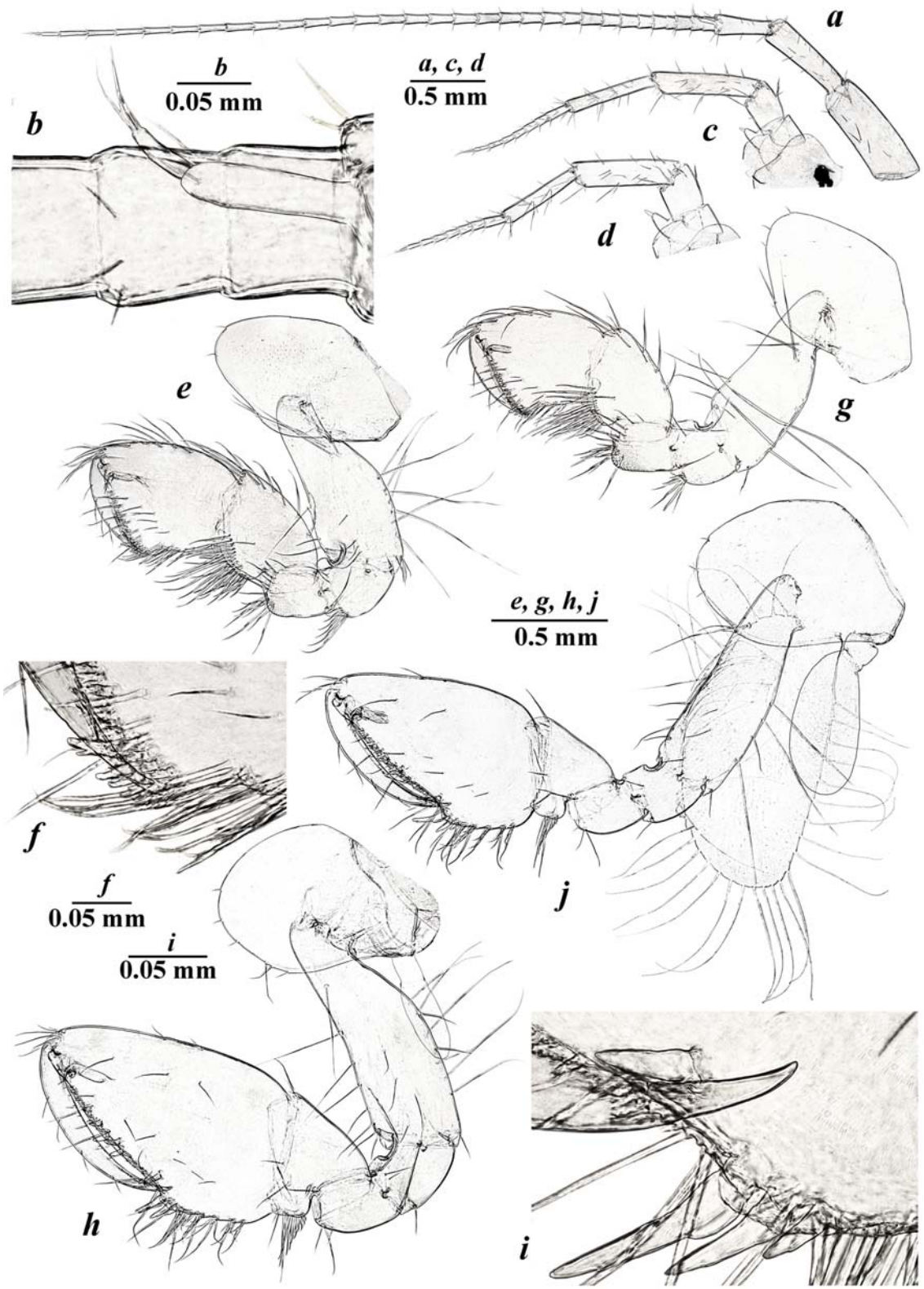

Fig. 2. *Pontonyx donensis* (Martynov, 1919) comb.n., Rostov-on-Don, Rostov Oblast', Russia, ♂ (*a–c*, *e*, *f*, *h*, *i*), ♀ (*d*, *g*, *j*): *a* — antenna I; *b* — accessory flagellum of antenna I; *c*, *d* — antenna II; *e*, *g* — gnathopod I; *f* — distoventral palmar margin of chela of GnI; *h*, *j* — gnathopod II; *i* — distoventral palmar margin of chela of GnII.

Рис. 2. *Pontonyx donensis* (Martynov, 1919) comb.n., Ростов-на-Дону, Ростовская область, Россия, ♂ (*a–c*, *e*, *f*, *h*, *i*), ♀ (*d*, *g*, *j*): *a* — антенна I; *b* — вспомогательный жгутик антенны I; *c*, *d* — антенна II; *e*, *g* — гнатопода I; *f* — дистовентральный край ладони клешни GnI; *h*, *j* — гнатопода II; *i* — дистовентральный край ладони клешни GnII.

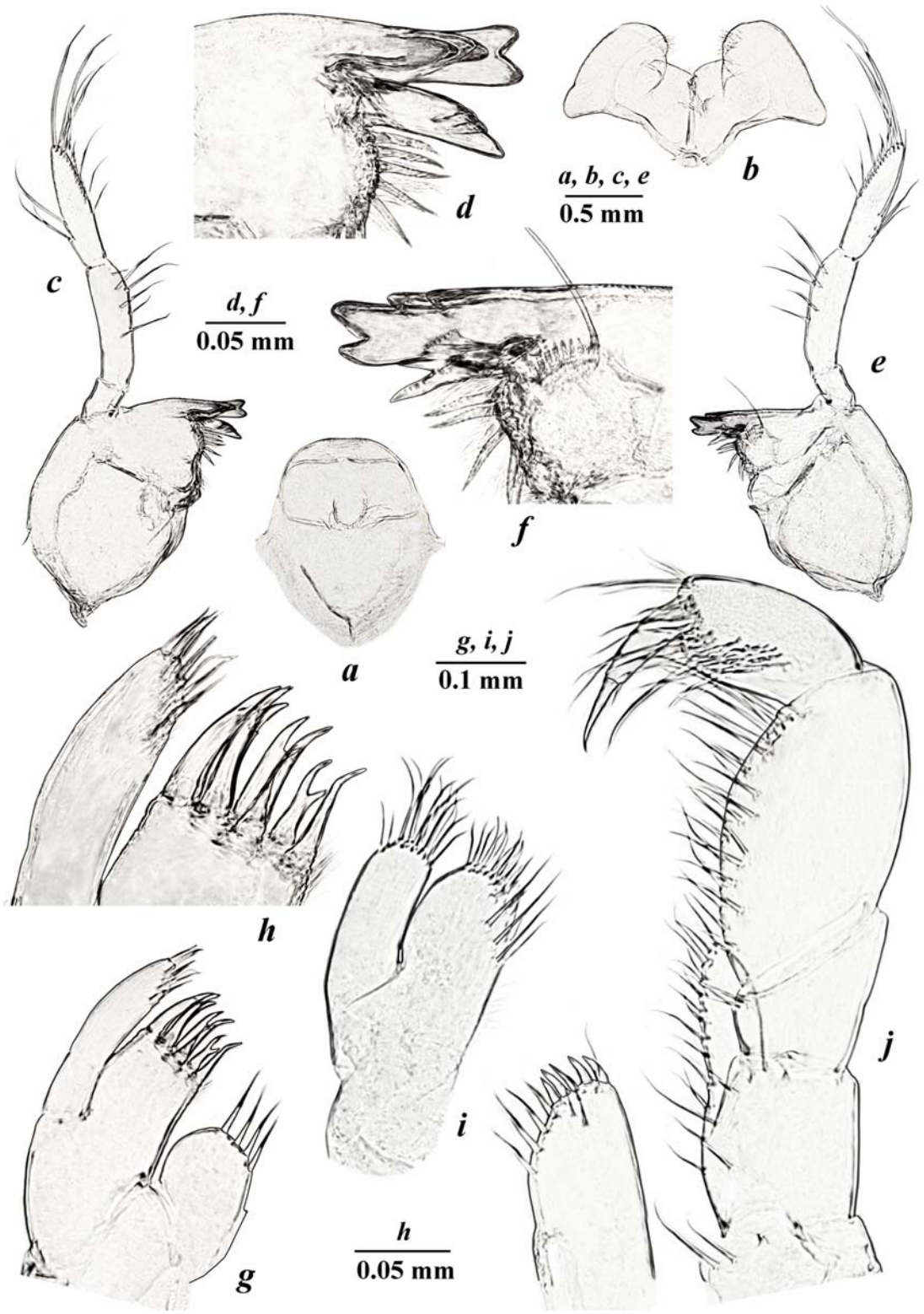

Fig. 3. *Pontonyx donensis* (Martynov, 1919) comb.n., Rostov-on-Don, Rostov Oblast', Russia, ♂: *a* — labrum (upper lip); *b* — labium (lower lip); *c* — left mandible; *d* — same, incisor process and *pars incisiva*; *e* — right mandible; *f* — same, incisor process and *pars incisiva*; *g* — maxilla I; *h* — distal spines of the outer lobe of maxilla I; *i* — maxilla II; *j* — maxilliped.

Рис. 3. *Pontonyx donensis* (Martynov, 1919) comb.n., Ростов-на-Дону, Ростовская область, Россия, ♂: *a* — верхняя губа; *b* — нижняя губа; с — левая мандибула; *d* — то же самое, резцовый отросток и pars incisiva; *e* — правая мандибула; *f* — то же самое, резцовый отросток и pars incisiva; *g* — максилла I; *h* — дистальные шипы наружной доли максиллы I; *i* — максилла II; *j* — максиллипед.

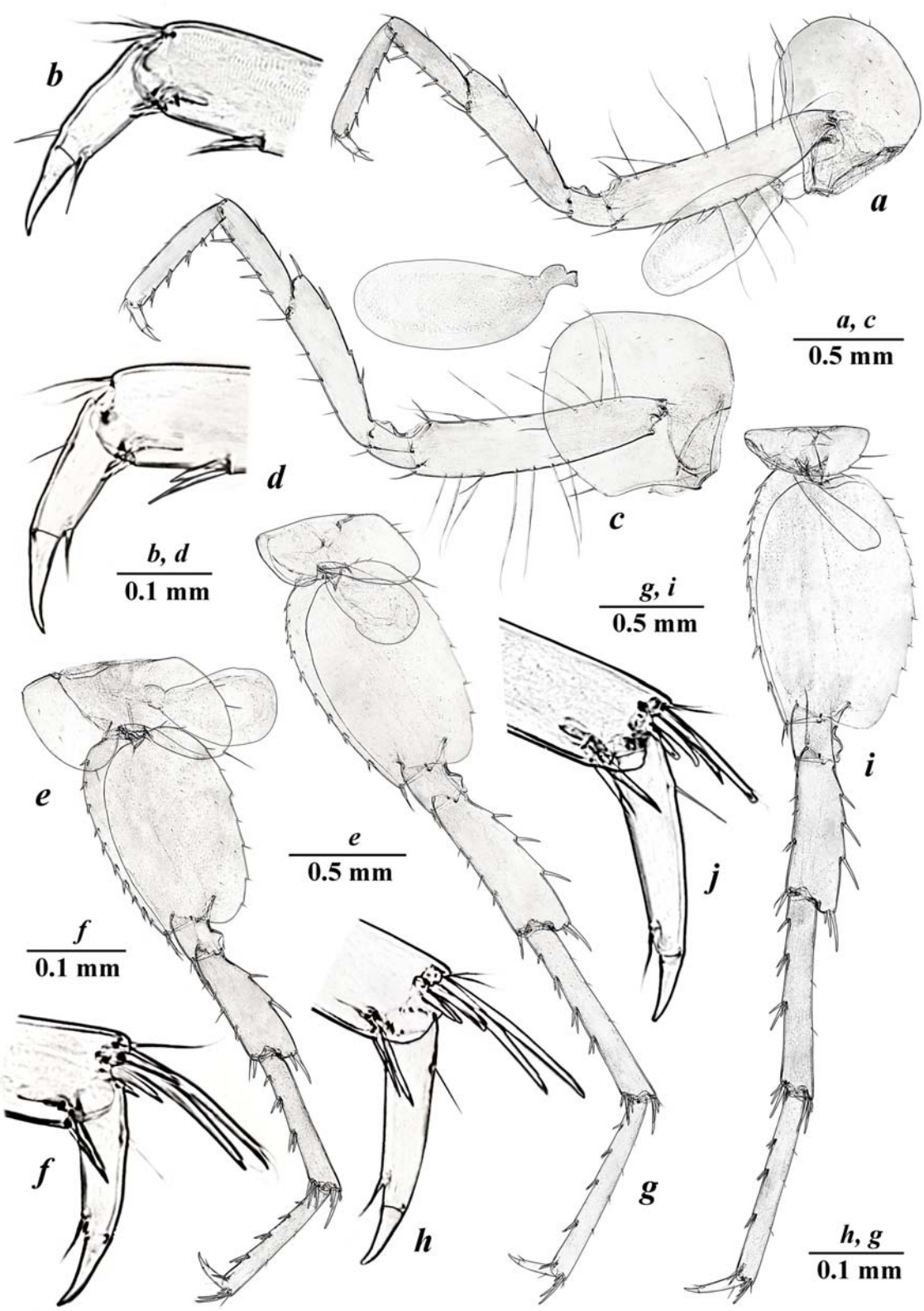

Fig. 4. *Pontonyx donensis* (Martynov, 1919) comb.n., Rostov-on-Don, Rostov Oblast', Russia, ♂: *a* — pereopod III; *b* — dactylus of PIII; *c* — pereopod IV; *d* — dactylus of PIV; *e* — pereopod V; *f* — dactylus of PV; *g* — pereopod VI; *h* — dactylus of PVI; *i* — pereopod VII; *j* — dactylus of PVII.

Рис. 4. *Pontonyx donensis* (Martynov, 1919) comb.n., Ростов-на-Дону, Ростовская область, Россия, ♂: *a* — переопода III; *b* — дактилус PIII; *c* — переопода IV; *d* — дактилус PIV; *e* — переопода V; *f* — дактилус PV; *g* — переопода VI; *h* — дактилус PVI; *i* — переопода VII; *j* — дактилус PVII.

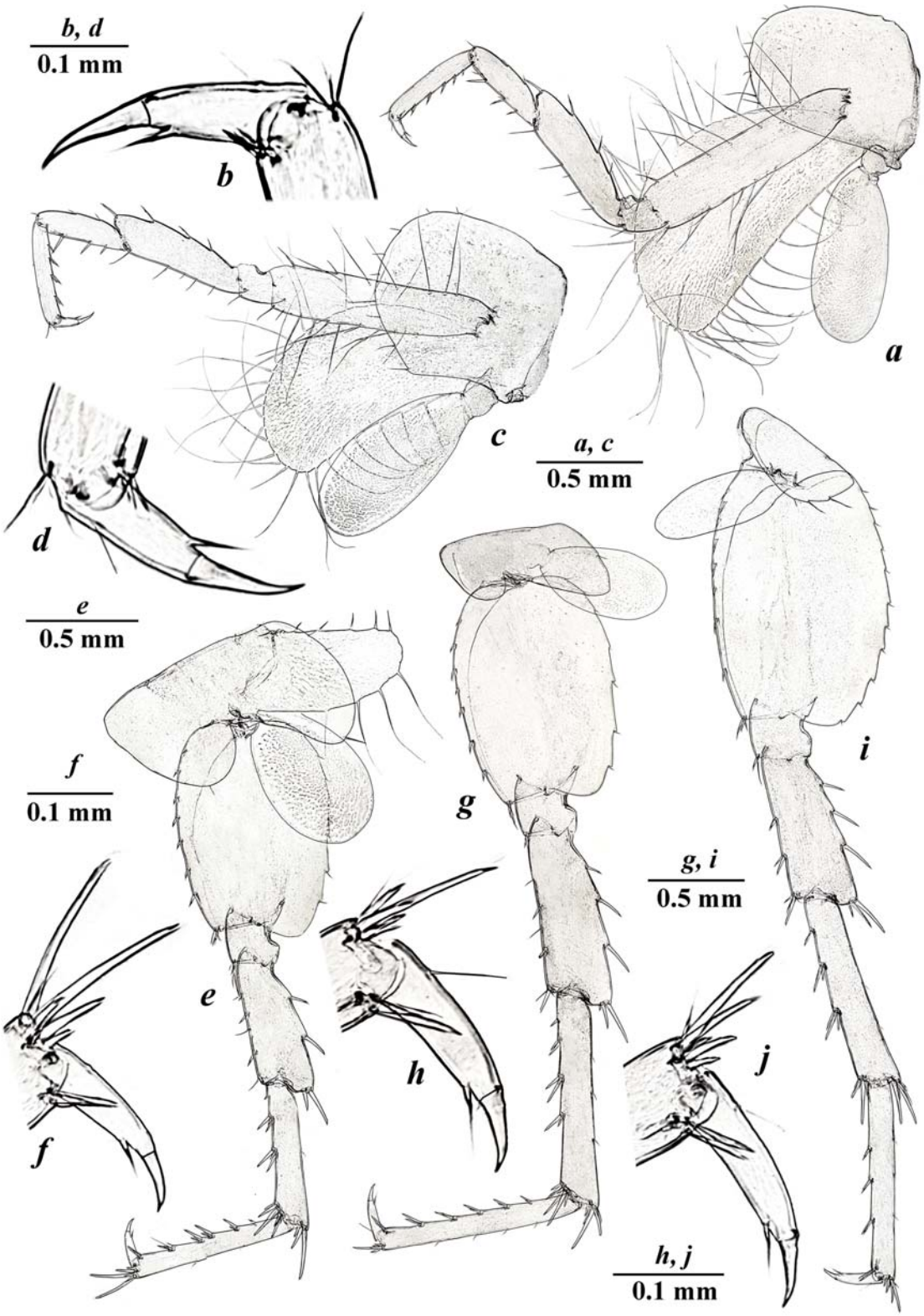

Fig. 5. *Pontonyx donensis* (Martynov, 1919) comb.n., Rostov-on-Don, Rostov Oblast', Russia, ♀: *a* — pereopod III; *b* — dactylus of PIII; *c* — pereopod IV; *d* — dactylus of PIV; *e* — pereopod V; *f* — dactylus of PV; *g* — pereopod VI; *h* — dactylus of PVI; *i* — pereopod VII; *j* — dactylus of PVII.

Рис. 5. *Pontonyx donensis* (Martynov, 1919) comb.n., Ростов-на-Дону, Ростовская область, Россия, ♀: *a* — переопода III; *b* — дактилус PIII; *c* — переопода IV; *d* — дактилус PIV; *e* — переопода V; *f* — дактилус PV; *g* — переопода VI; *h* — дактилус PVI; *i* — переопода VII; *j* — дактилус PVII.

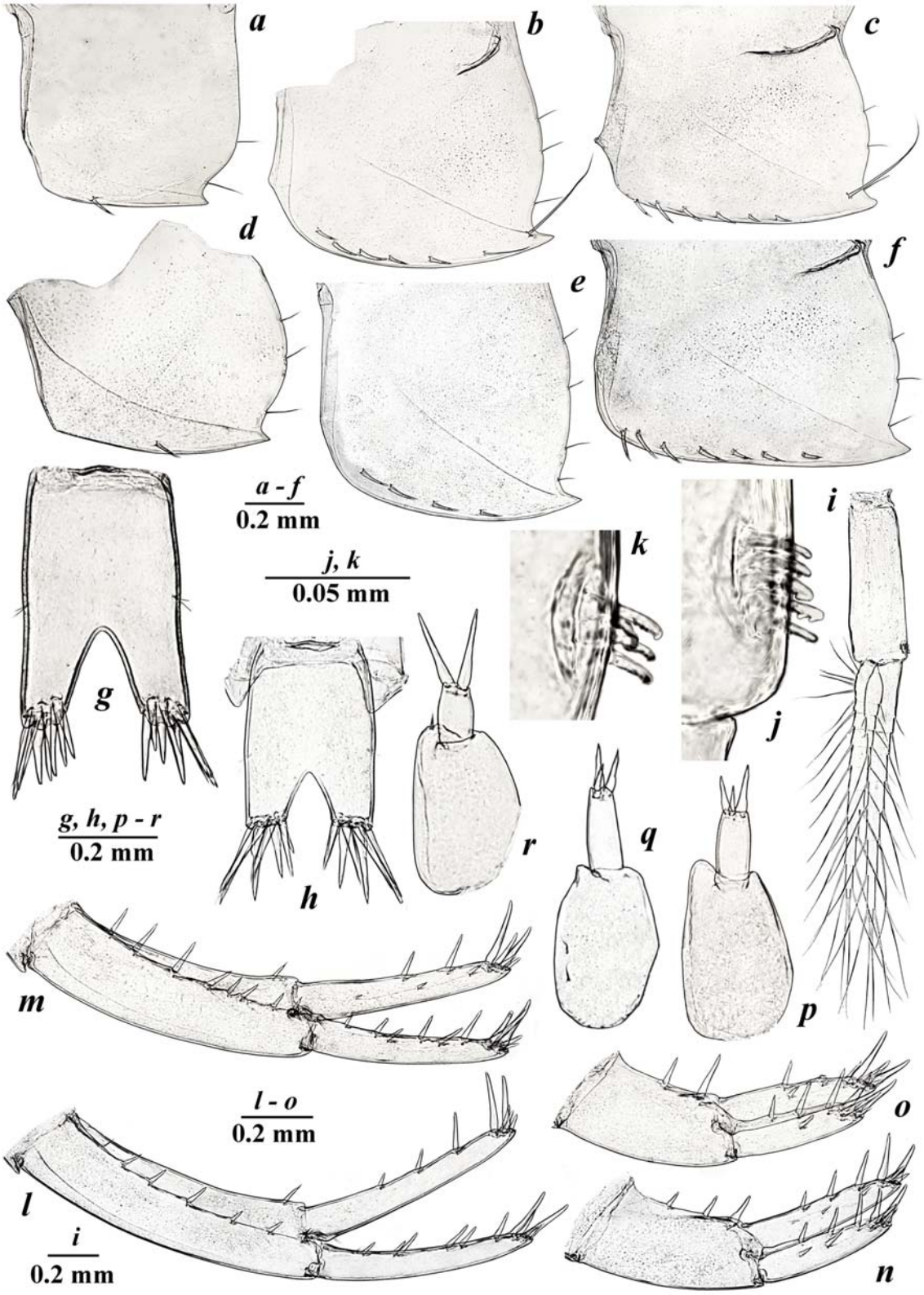

Fig. 6. *Pontonyx donensis* (Martynov, 1919) comb.n., Rostov-on-Don, Rostov Oblast', Russia, ♂ (*a–c*, *g*, *i*, *j*, *l*, *n*, *p*, *q*), ♀ (*d–f*, *h*, *k*, *m*, *o*, *r*): *a*, *d* — epimeral plate I; *b*, *e* — epimeral plate II; *c, f* — epimeral plate III; *g*, *h* — telson; *i* — pleopod III; *j, k* — hooks of retinacula of pleopod II; *l*, *m* — uropod I; *n*, *o* — uropod II; *p–r* — uropod III.

Рис. 6. *Pontonyx donensis* (Martynov, 1919) comb.n., Ростов-на-Дону, Ростовская область, Россия, ♂ (*a–c*, *g*, *i*, *j*, *l*, *n*, *p*, *q*), ♀ (*d–f*, *h*, *k*, *m*, *o*, *r*): *a*, *d* — эпимеральная пластинка I; *b*, *e* — эпимеральная пластинка II; *c*, *f* — эпимеральная пластинка III; *g*, *h* — тельсон; *i* — плеопода III; *j*, *k* — крючки ретинакулы плеопод II; *l*, *m* — уропода I; *n*, *o* — уропода II; *p–r* — уропода III.

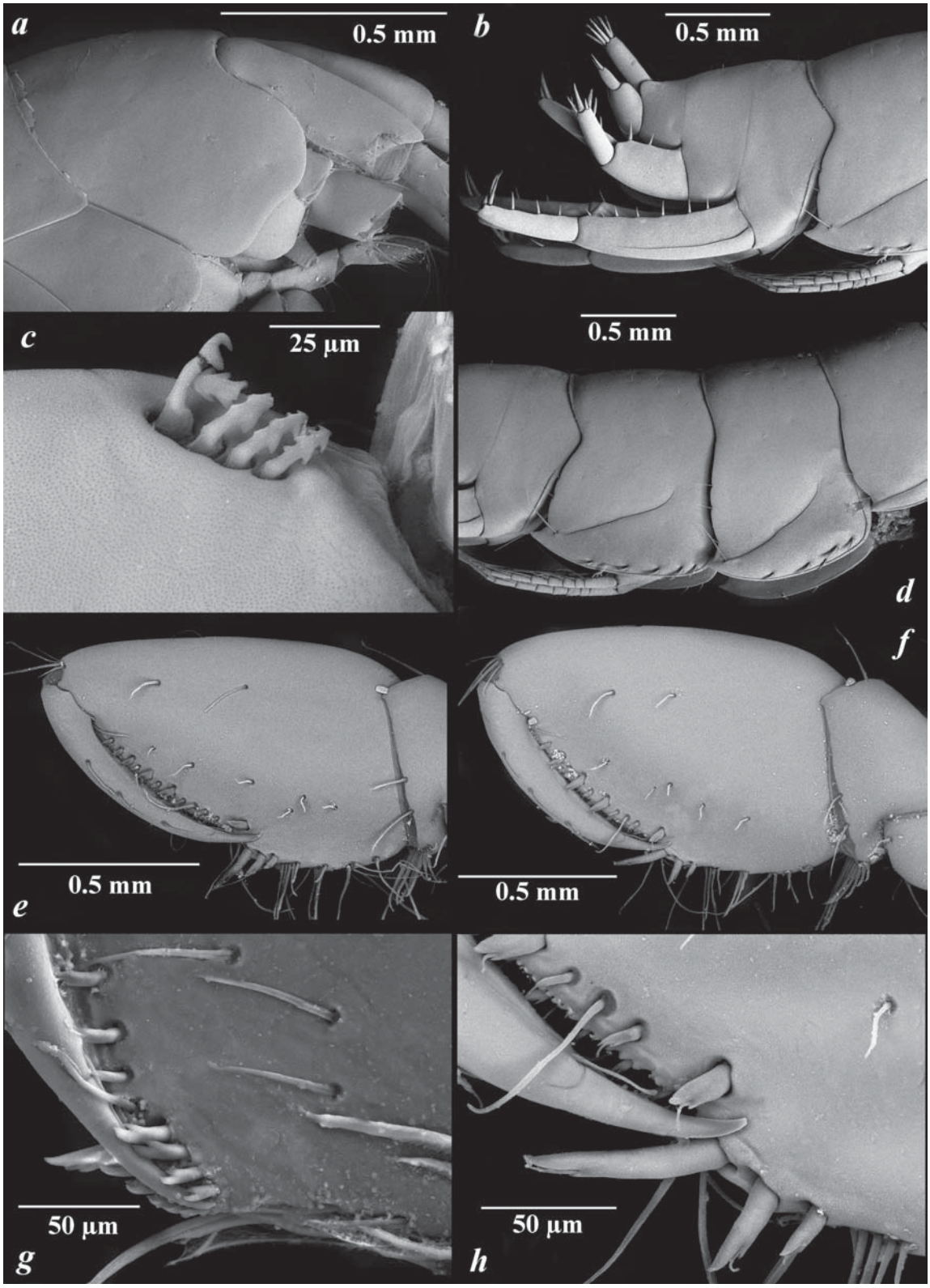

Fig. 7. *Pontonyx donensis* (Martynov, 1919) comb.n., Rostov-on-Don, Rostov Oblast', Russia, ♂ (*a*, *b*, *d*, *e*, *g*, *h*), ♀ (*c*, *f*): *a* — head; *b* — urosome; *c* — hooks of retinacula of pleopod; *d* — epimeral plates I–III; *e*, *f* — palm (chela) of gnathopod II; *g* — distoventral margin of palm (chela) of gnathopod I; *h* — palmar groove of palm (chela) of gnathopod II.

Рис. 7. *Pontonyx donensis* (Martynov, 1919) comb.n., Ростов-на-Дону, Ростовская область, Россия, ♂ (*a*, *b*, *d*, *e*, *g*, *h*), ♀ (*c*, *f*): *a* — голова; *b* — уросома; *c* — крючки ретинакулы плеопод; *d* — эпимеральные пластинки I–III; *e*, *f* — клешня гнатопода II; *g* — дистовентральный край клешни гнатоподаы I; *h* — клешня гнатоподы II.

longer than wide, armed with 4–5 doubled strong spine-like setae along posterior margin; dactylus (Figs 4*d*, 5*d*) about 0.30X of propodus, with 1 plumose seta on outer margin and 1 additional spine accompanying with seta along ventral margin.

Pereopod VI (Figs 4*g*, 5*g*): coxal plate bilobate, with distinct posterior and vestigial anterior lobes; anterior lobe without setae, posterior lobe with 2–3 marginal setae; basis about 1.55X as long as wide, posterior margin convex, armed with 8–9 shallow serrations, with distinct bluntly rounded distal corner, anterior margin with 7–9 robust and 2–3 long simple setae distoventrally; ischium about as long as wide; merus about 3.1X times longer than wide, 0.78X of basis, 0.88X of carpus in length; carpus about 6.7X longer than wide, equal to propodus in length, armed with 3–4 doubled robust spine-like setae along posterior margin; propodus about 9.0X longer than wide, armed with 4–5 doubled strong spine-like setae along posterior margin; dactylus (Figs 4*h*, 5*h*) about 0.25X of propodus, with 1 plumose seta on outer margin and 1 additional spine accompanying with seta along ventral margin.

Pereopod VII (Figs 4*i*, 5*i*): coxal plate small, semi-lunar, with 3–4 posterior setae; basis about 1.53X as long as wide, posterior margin convex, armed with 10–11 shallow serrations, with distinct bluntly rounded distal corner, anterior margin with 8–9 robust and 2–3 long simple setae distoventrally; ischium about as long as wide; merus about 1.4X times longer than wide, 0.64X of basis, 0.8X of carpus in length; carpus about 6.1X longer than wide, equal to propodus in length, armed with 3–4 doubled robust spine-like setae along posterior margin; propodus about 9.7X longer than wide, armed with 4–5 doubled strong spine-like setae along posterior margin; dactylus (Figs 4*h*, 5*h*) about 0.3X of propodus, with 1 plumose seta on outer margin and 1 additional spine accompanying with seta along ventral margin.

Gills, brood plates (Figs 4, 5): coxal gills on somites II–VII, somites V–VII with lanceolate sternal gill on each. Coxal gills of pereopods II–VII ovoid, gills/bases pereopod ratios are 0.40/1, 0.70/1, 0.73/1, 0.58/1, 0.47/1 and 0.40/1, respectively.

Pleopods (Fig. 5*i*): pleopod I peduncle with 4–5 coupling hooks in retinacula (Figs 6 *k*, *j*, 7*c*), without lateral setae; outer and inner rami with 11 and 16 segments, respectively. Pleopod II peduncle with 5 coupling hooks in retinacula, without setae; outer and inner rami with 10 and 13 segments, respectively. Pleopod III peduncle with 5 coupling hooks in retinacula, without lateral setae; outer and inner rami with 9 and 11 segments, respectively.

Epimera. Epimeral plate I (Fig. 5*a*, *d*) distally produced and sharply pointed, ventral margin with 1 spine, posterior margin convex, with 2–3 setae. Epimeral plate II (Figs 5*b*, *e*, 7*d*) distally produced and sharply pointed, slightly curved upward, ventral margin convex and armed with 4–5 spines and 1 additional posterior long simple seta in males (Fig. 5*b*), posterior margin convex, with 3–4 setae. Epimeral plate III (Figs 5*c*, *f*, 7*d*) distally produced and sharply pointed, curved upward, ventral margin almost straight and armed with 6–7 spines and 1 additional posterior long simple seta in males (Fig. 5*c*), posterior margin convex, with 3 setae.

Urosomites fused, with distinct sutures (Fig. 7*b*).

Uropod I (Fig. 5*l*, *m*): peduncle about 4.0X as long as wide, with dorsointernal row of 6–7 thin short setae, 1 subdistal short and 1 dorsoexternal thin short spine-like setae; rami slightly shorter than peduncle in length, exopodite subequal to endopodite; endopodite not paddle-like, about 8.7X longer than wide, with 3 dorsolateral and 5 apical spine-like setae; exopodite about 8.0X longer than wide, with 3–4 pairs of dorsolateral and 5 apical spine-like setae.

Uropod II (Fig. 5*n*, *o*): peduncle about 2.2X as long as wide, subequal to rami in length, with 2–3 outer short spine-like setae; exopodite about 0.8X of endopodite in length, with 3 outer and 5 apical robust spine-like setae; endopodite with 3–4 pairs of outer and 5 apical robust spines.

Uropod III (Fig. 5*p–r*): uniramous, peduncle cone-shaped, about 1.7X as long as wide, with a terminal "pointed knob" and a single simple seta on lateral margin or without it; apical margin of ramus armed with 2–3 robust spine-like setae.

Telson (Fig. 5*g*, *h*): weakly expanding distally, elongate, 1.6X longer than broad, as long as or equal to uropod III; apical margin cleft about 0.37X of total length; with 7 short and long spines and with 2 additional submarginal plumose setae on each lobe.

COLORATION. The body and appendages transparently yellow-grayish; well-pigmented brown eyes (ommatidia) well-marked, yellow spot is feebly marked on the head dorsally (see Fig. 1).

GENBANK ACCESSION NUMBERS. MZ449250, MZ449251.

TAXONOMIC REMARKS. The new species can be clearly separated from *P. odessana* [Sidorov, Kovtun, 2015], phylogenetically closest species within the genus, in the following morphological features: 1) less developed molar process of mandibles; 2) only 4 distal setae on the inner lobe of MxI (vs. 6 setae); 3) stronger and less numerous spines on peduncle and rami of UI–II; 4) more produced terminal knob of UIII; 5) only one row of ventral setae, without additional upper seta; and 6) more slender (elongated) telson, especially in males.

The new species can be clearly separated from *P. osellai* [Ruffo, 1972] by: 1) larger body size (the largest collected ♂ has bl. 12 mm) (vs. the largest ♂ has bl. 10.5 mm in *P. osellai*); 2) longer palm of GnII, which is about 1.5 times longer than wide in basal part; 3) longer spines in palmar corner of GnII; 4) less serrated posterior margins of basis of PpV–VII; 5) stronger spinulation of peduncle and rami of UI–II; 6) less produced posteroventral angles of epimeral plates, especially in EpI; 7) more numerous ventral setae on EpI–III; and 8) the absence of calceoli on AII in males.

From *P. adjaricus* [Palatov, Marin, 2021], it can be separated by: 1) larger body size (the largest collected ♂ has bl. 12 mm) (vs. the largest ♂ has bl. 6 mm); 2) only 4 distal setae on the inner lobe of MxI (vs. 6 setae); 3) longer palm of GnII, which is about 1.5 times longer than wide in basal part; 4) longer spines in palmar corner of GnII; 5) serrated posterior margins of basis of pereiopods V–VII; 6) longer rami of UI, which are equal to peduncle; 7) less produced terminal knob of UIII; 8) significantly less produced posteroventral angles of EpI–III; 9) more numerous ventral setae on EpI–III, with almost straight ventral margin of EpIII; and 10) the absence of calceoli on AII in males.

From *P. colchicus* [Palatov, Marin, 2021], it can be separated by: 1) larger body size (the largest collected ♂ has bl. 12 mm) (vs. the largest ♂ has bl. 8 mm); 2) longer palm of GnII, which is about 1.5 times longer than wide in basal part; 3) longer spines in palmar corner of GnII; 4) slightly serrated posterior margins of basis of PpV–VII; 5) longer rami and peduncle of UI; 6) less produced and rounded terminal knob of UIII; 7) significantly less produced poster-

oventral angles of EpI–III; 8) more numerous ventral setae on EpI–III, with almost straight ventral margin of EpIII; and 9) the absence of calceoli on AII in males.

DISTRIBUTION AND ECOLOGY. Currently, the species is known from a spring system associated with the Kiziterinka River, flowing in the lower delta of the Don River, and springs flowing into the neighboring system of ponds (Mozhaisk ponds and Temernik River) within the borders of the eastern part of the city of Rostov-on-Don (Nakhivevan area). We assume that the species may live in other nearby springs and wells.

Pontonyx abchasicus **sp.n.**
Figs 8–14.

MATERIAL EXAMINED. Holotype, ♂ (bl. 13.0 mm), ZMMU Mb-1257, southwestern Caucasus, Abkhazia, Ochamchira District, about 20 km east of Tkvarcheli (Tqwarchal), the area of the former Akarmara Railway Station, 42°51′04.1″N, 41°48′48.14″E, 760 m a.s.l., 18 June 2022, coll. D. Palatov et I. Marin. Paratype, 1♀ (bl. 10.0 mm), ZMMU Mb-1258, same locality and data as for holotype.

Additional material: 1♂, 8♀♀, LEMMI, same locality and data as for holotype.

DESCRIPTION. Body (Fig. 8): moderately stout; the largest collected ♂ has bl. 13 mm.

Head with concave distoventral lobe (Fig. 14*a*), with well-marked ommatidia (black eyes) and feebly marked dorsal yellow spots (Fig. 8).

Antenna I (Fig. 9*a*) from 56% of body length in females to 68% of body length in males, about 1.8–2.2X longer than antenna II; primary flagellum with about 20 (in females)–36 (in males) segments, with aesthetascs on distal segments; accessory flagellum 2-segmented, distal segment about 2.2X shorter than basal one (Fig. 9*b*).

Antenna II (Fig. 9*c*, *d*): gland clone distinct, distally pointed; peduncle about 2.0–2.3X longer than flagellum, with robust setae tightly covering segments 3 and 4, peduncle of segment 4 about 1.3X longer than segment 5; flagellum 8–12-segmented, with small calceoli on pedunclar segments 2 and 3 (Fig. 14*c*).

Labrum (upper lip) (Fig. 10*a*): oval, apical margin with numerous small fine setae.

Labium (lower lip) (Fig. 10*b*): inner lobes feebly developed.

Lateralia (Fig. 10*c*) with 10 serrated teeth.

Mandible (Fig. 10*d*–*g*): left mandible (Fig. 10*d*, *e*) incisor 5-dentate, *lacinia mobilis* 4-dentate, with 5 robust plumose accessory setae; molar process with 1 seta. Right mandible (Fig. 9*f*, *g*) incisor 4-dentate, *lacinia mobilis* toothed, triturative, lobes with numerous protuberances; underlying with a row of 5 robust plumose setae; molar process similar to left mandible. Palp 3-segmented, segment 2 with 7–9 setae; segment 3 about 4.9X longer than wide, with 10–13 separate D-setae, 4–5 B-setae, 4 C-setae and 6 separate E-setae (Fig. 10*d*, *f*).

Maxilla I (Fig. 10*i*): inner plate with 5 plumose marginal setae, outer plate with 7 apical comb-spines (Fig. 10*j*); palp 2-segmented, distal segment pubescent, apical margin of distal segment with simple setae.

Maxilla II (Fig. 10*h*): inner and outer plates covered in pubescent setae, subequal in length; outer plate with numerous apical simple setae; inner plate narrowing explicitly distally, with group of dense short setae on apex, with oblique row of 3 short plumose setae.

Maxilliped (Fig. 10*k*): inner plate much shorter than outer plate, with 8 spines and 3–4 simple setae apically, and 2–4 simple setae laterally; outer plate narrow, with a row of 18–20 medial stiff simple setae of different length; palp quadriarticulate, article 1 without setae on outer margin, article 2 with a row of 35–42 simple setae on inner margin and without setae on outer margin, article 3 sub-quadrate; dactylus without setae on outer margin and with 4 thin setae at inner margin, nail long, slender, with 1 thin seta at hinge.

Gnathopod I (Fig. 9*f*, *h*): smaller than GnII; coxal plate oval, distally tapering and rounded, with rounded corners and with 5–6 apical setae, width/depth ratio 0.58–0.60; basis about 2.5X longer than wide; ischium about as long as wide; merus about as long as ischium, about 0.45X of basis and 0.62X of propodus, with numerous serrated setae in inner margin; carpus trapezoidal in shape, with rounded distoventral margin, covered with tuft of long simple setae; propodus about 1.2X longer than broad, with distal margin of palm almost straight, slightly oblique, armed with row of 8 distally notched robust spines on inside and 10 on outside, 17 short bifurcate robust setae at arranged in a semicircle (Figs 9*g*, 14*e*, *f*), anterior margin densely setose with paired setae, posterior margin moderately short with 4–5 groups of simple setae; dactylus simple, with 4 outer setae.

Gnathopod II (Fig. 9*i*, *k*): coxal plate oval, distally bluntly rounded, with rounded corners and with 5–6 apical setae, width/depth ratio 0.70–0.73; basis about 3.2X longer than wide; ischium about as long as wide; merus about as long as ischium, about 0.40X of basis and 0.45X of propodus, with numerous serrated setae in inner margin; carpus triangular in shape, with bluntly produced distoventral projection; propodus teardrop-shaped, widening posteriorly and sharpening distally, about 1.3X longer than broad, with distal margin oblique, armed with double row of inner and outer bifurcate robust setae, palm groove (depression) feebly developed, palmar corner with 3 strong palmar spiniform setae, 1 supporting spiniform seta on inner surface (Figs 9*j*, 14*g*, *h*); dactylus simple, with 5 outer setae along anterior margin and few short setae along inner margin.

Pereopod III (Figs 11*a*, 12*a*): coxal plate mostly rounded, with rounded distal margin, with 6–7 apical setae, width/depth ratio is 0.77; basis about 4.4X as long as wide, armed with long anterior and posterior simple setae; ischium about as long as wide; merus about 3.4X longer than wide and ischium, widening distodorsally, about 0.7X of basis, about 1.3X of carpus and propodus in length; carpus about 4.0X longer than wide, similar to propodus in length, armed with 3–4 strong spine-like setae along posterior margin; propodus about 5.5X longer than wide, armed with 4–5 strong spine-like setae along posterior margin; dactylus (Figs 11*b*, 12*b*) about 0.38X of propodus, with 1 plumose seta on outer margin and 1 additional spine accompanying with seta along ventral margin.

Pereopod IV (Figs 11*c*, 12*c*): subequal to PIII in length: coxal plate mostly quadrate, with rounded margins, with 8–10 apical setae, width/depth ratio is 0.9; basis about 4.4X as long as wide, armed with long anterior and posterior simple setae; ischium about as long as wide; merus about 3.8X longer than wide and ischium, widening distodorsally, about 0.73X of basis, about 1.3X of carpus and propodus in length; carpus about 4.3X longer than wide, slightly shorter than propodus in length, armed with 3–4 strong spine-like setae along posterior margin; propodus about 6.0X longer than wide, armed with 4–5 strong spine-like setae along posterior margin; dactylus (Figs 11*d*, 12*d*) about 0.35X of propodus, with 1 plumose seta on outer margin and 1 additional spine accompanying with seta along ventral margin.

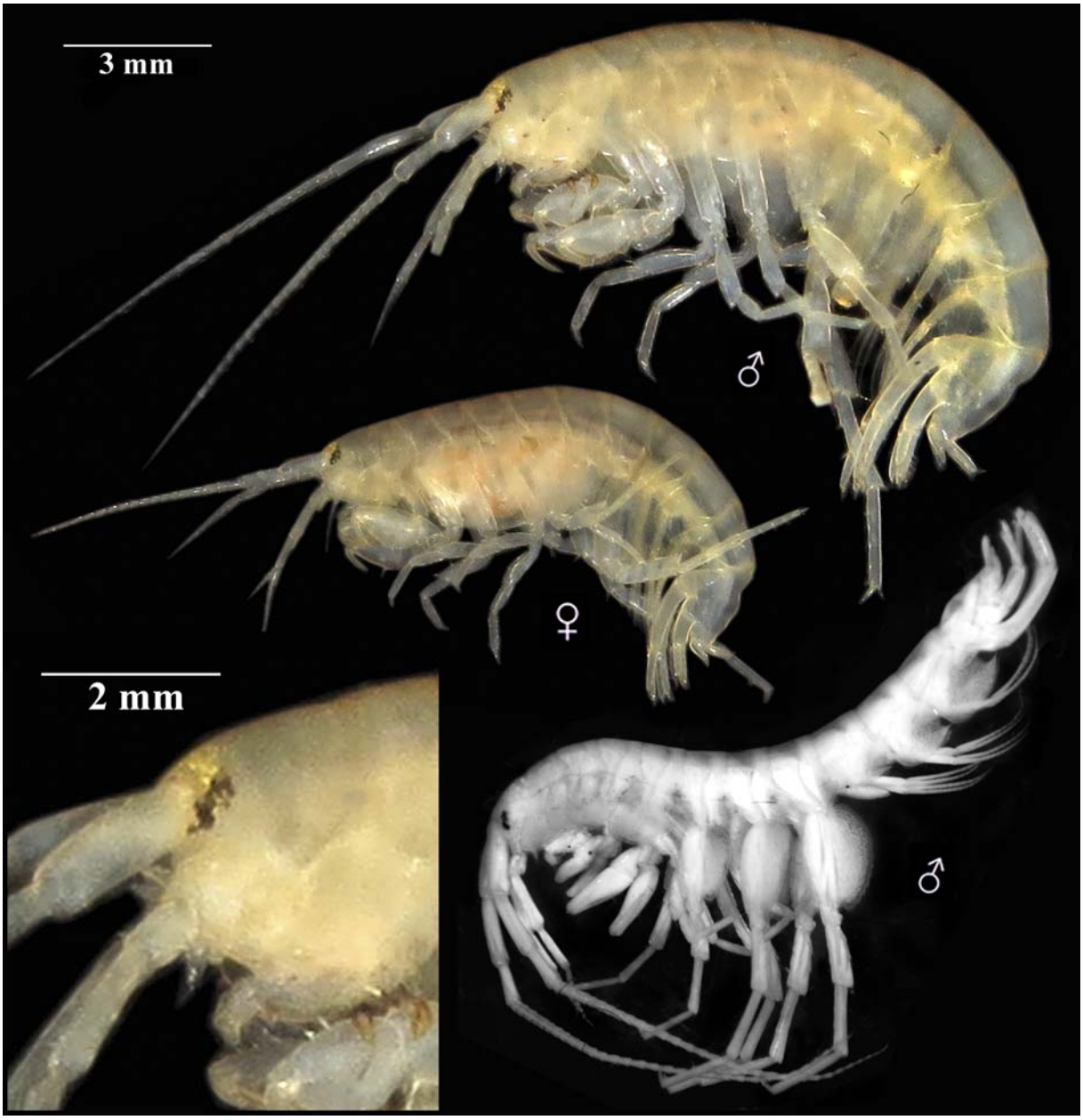

Fig. 8. *Pontonyx abchasicus* sp.n., Tkvarcheli (Tqwarchal), former Akarmara Railway Station, Ochamchira District, Abkhazia: general view of alive and freshly fixed specimens, and enlarged head.

Рис. 8. *Pontonyx abchasicus* sp.n., Ткварчели (Ткуарчал), бывшая железнодорожная станция Акармара, Очамчирский район, Абхазия: общий вид живых и свежефиксированных экземпляров, и увеличенная голова.

Pereopods V, VI, VII mostly similar in shape, with the length ratio 1/1.43/1.36 in males and 1/1.57/1.34 in females.

Pereopod V (Figs 11*e*, 12*e*): coxal plate large, bilobate, with distinct anterior and posterior lobes; posterior and anterior lobes with 1 marginal simple seta each; basis about 1.40X as long as wide, posterior margin convex, armed with 7–8 shallow serrations, with distinct bluntly rounded distal corner, anterior margin with 10–15 robust and 2–3 long simple setae distoventrally; ischium about as long as wide; merus about 3.0X times longer than wide, about 0.75X of basis, 0.9X of carpus in length; carpus about 6.5X longer than wide, slightly shorter than propodus in length, armed with 3–4 doubled robust spine-like setae along posterior margin; propodus about 7.5X longer than wide, armed with 4–5 doubled strong spine-like setae along posterior margin; dactylus (Figs 11*d*, 12*d*) about 0.32X of propodus, with 1 plumose seta on outer margin and 1 additional spine accompanying with seta along ventral margin.

Pereopod VI (Figs 11*g*, 12*g*): coxal plate bilobate, with distinct posterior and vestigial anterior lobes; anterior lobe without setae, posterior lobe with 1–2 marginal setae; basis about 1.58X as long as wide, posterior margin convex, armed with 11–12 shallow serrations, with distinct bluntly rounded distal corner, anterior margin with 8–13 robust and 2–3 long

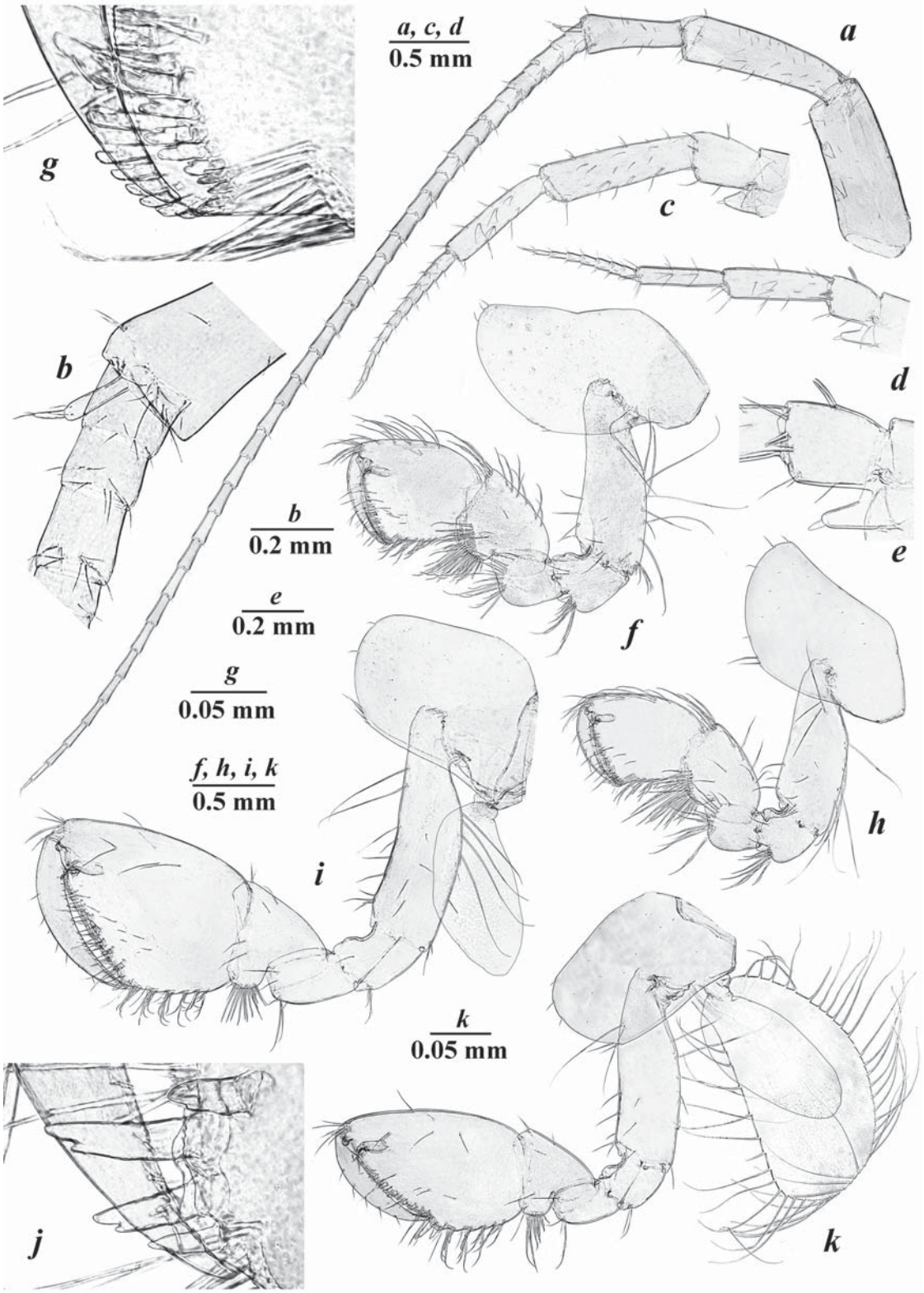

Fig. 9. *Pontonyx abchasicus* sp.n., Tkvarcheli (Tqwarchal), former Akarmara Railway Station, Ochamchira District, Abkhazia, ♂ (*a*–*c*, *e*, *f*, *g*, *i*, *j*), ♀ (*d*, *e*, *h*, *k*): *a* — antenna I; *b* — accessory flagellum of antenna I; *c*, *d* — antenna II; *e* — same, basal peduncular segment; *f*, *h* — gnathopod I; *g* — distoventral palmar margin of chela of GnI; *i*, *k* — gnathopod II; *j* — distoventral palmar margin of chela of GnII.

Рис. 9. *Pontonyx abchasicus* sp.n., Ткварчели (Ткуарчал), бывшая железнодорожная станция Акармара, Очамчирский район, Абхазия, ♂ (*a*–*c*, *e*, *f*, *g*, *i*, *j*), ♀ (*d*, *e*, *h*, *k*): *a* — антенна I; *b* — вспомогательный жгутик антенны I; *c*, *d* — антенна II; *e* — тоже, базальный сегмент стебелька; *f*, *h* — гнатопода I; *g* — дистовентральный край ладони клешни GnI; *i*, *k* — гнатопода II; *j* — дистовентральный край ладони клешни GnII.

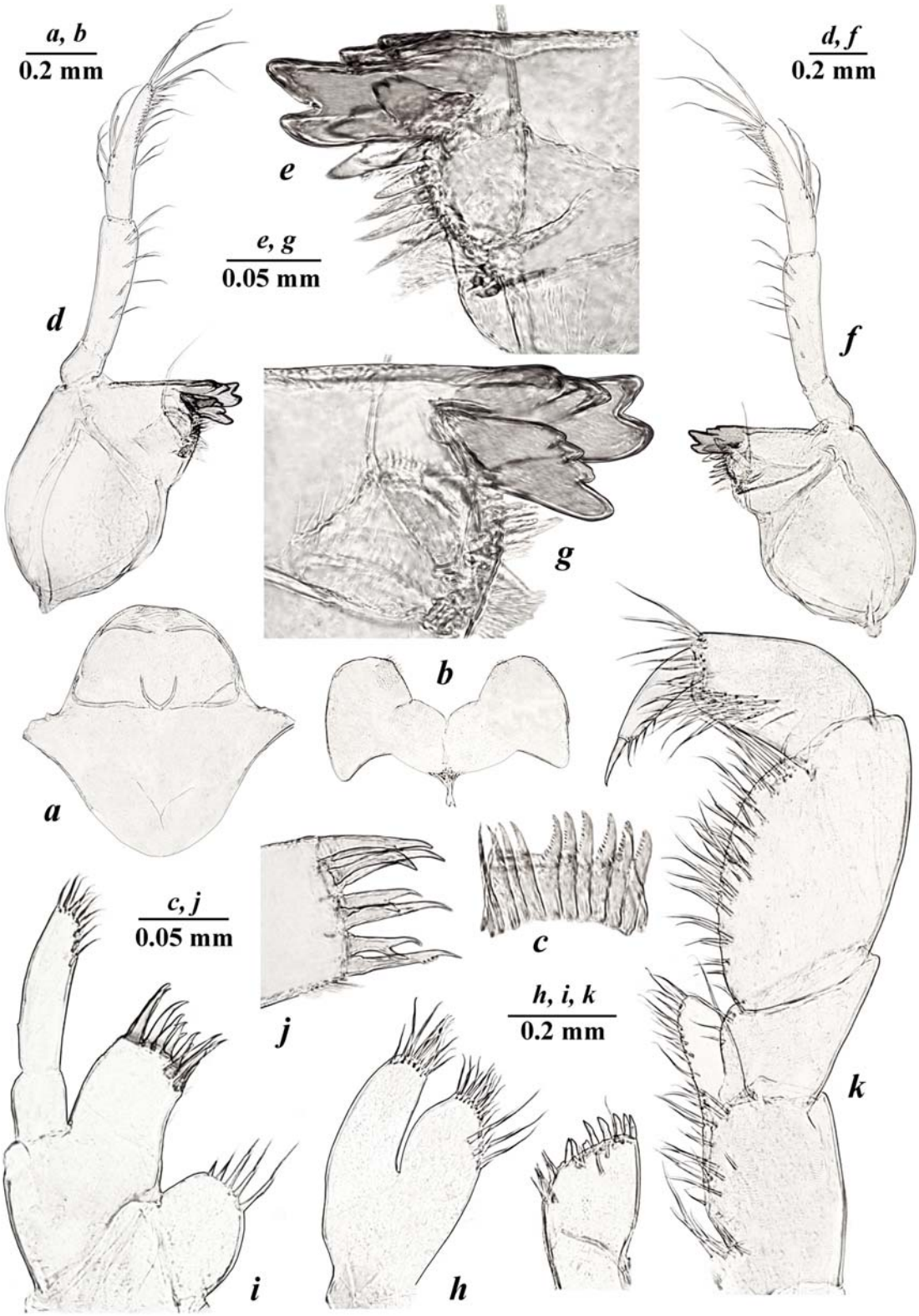

Fig. 10. *Pontonyx abchasicus* sp.n., Tkvarcheli (Tqwarchal), former Akarmara Railway Station, Ochamchira District, Abkhazia, ♂: *a* — labrum (upper lip); *b* — labium (lower lip); *c* — lateralia; *d* — left mandible; *e* — same, incisor process and pars incisiva; *f* — right mandible; *g* — same, incisor process and pars incisiva; *h* — maxilla II; *i* — maxilla I; *j* — same, distal spines of outer lobe; *k* — maxilliped.

Рис. 10. *Pontonyx abchasicus* sp.n., Ткварчели (Ткуарчал), бывшая железнодорожная станция Акармара, Очамчирский район, Абхазия, ♂: *a* — верхняя губа; *b* — нижняя губа; *c* — левая мандибула; *d* — латералия; *e* — то же самое, резцовый отросток и *pars incisiva*; *f* — правая мандибула; *g* — то же самое, резцовый отросток и *pars incisiva*; *h* — максилла II; *i* — максилла I; *j* — тоже, дистальные шипы наружней доли; *k* — максиллипед.

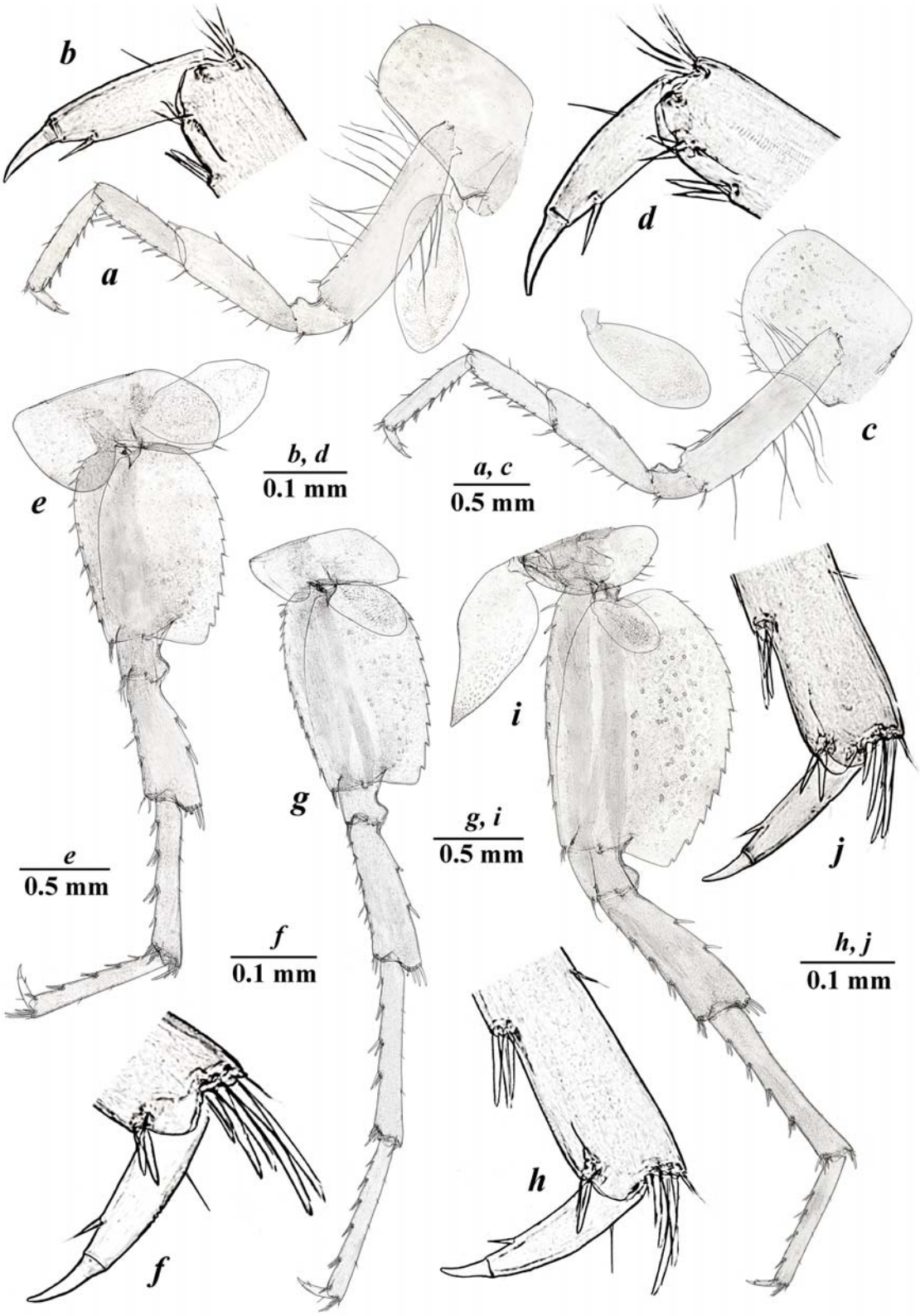

Fig. 11. *Pontonyx abchasicus* sp.n., Tkvarcheli (Tqwarchal), former Akarmara Railway Station, Ochamchira District, Abkhazia, ♂: *a* — pereopod III; *b* — dactylus of PIII; *c* — pereopod IV; *d* — dactylus of PIV; *e* — pereopod V; *f* — dactylus of PV; *g* — pereopod VI; *h* — dactylus of PVI; *i* — pereopod VII; *j* — dactylus of PVII.

Рис. 11. *Pontonyx abchasicus* sp.n., Ткварчели (Ткуарчал), бывшая железнодорожная станция Акармара, Очамчирский район, Абхазия, ♂: *a* — переопода III; *b* — дактилус PIII; *c* — переопода IV; *d* — дактилус PIV; *e* — переопода V; *f* — дактилус PV; *g* — переопода VI; *h* — дактилус PVI; *i* — переопода VII; *j* — дактилус PVII.

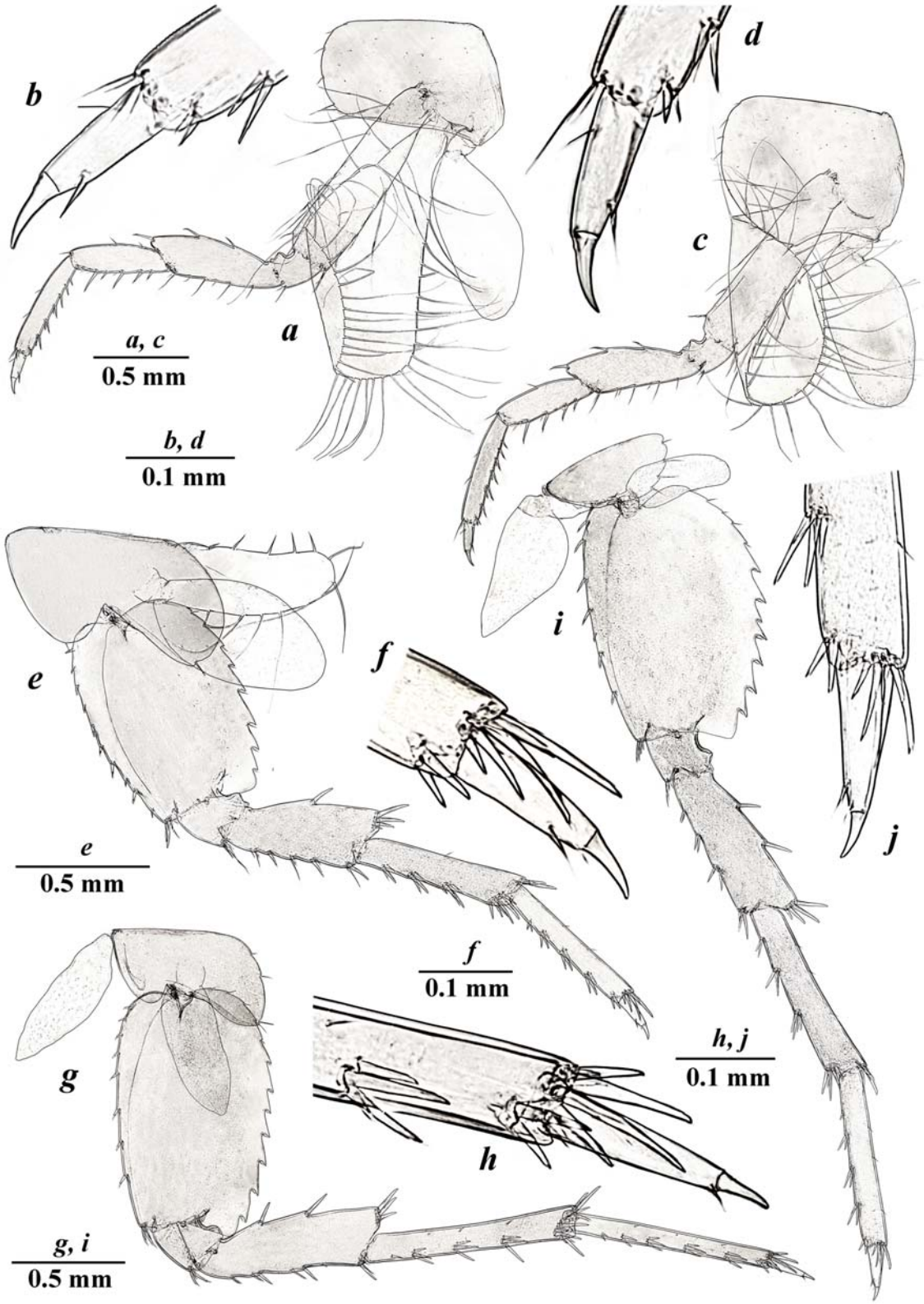

Fig. 12. *Pontonyx abchasicus* sp.n., Tkvarcheli (Tqwarchal), former Akarmara Railway Station, Ochamchira District, Abkhazia, ♀: *a* — pereopod III; *b* — dactylus of PIII; *c*– pereopod IV; *d* — dactylus of PIV; *e* — pereopod V; *f* — dactylus of PV; *g* — pereopod VI; *h* — dactylus of PVI; *i*– pereopod VII; *j* — dactylus of PVII.

Рис. 12. *Pontonyx abchasicus* sp.n., Ткварчели (Ткуарчал), бывшая железнодорожная станция Акармара, Очамчирский район, Абхазия, ♀: *a* — переопода III; *b* — дактилус PIII; *c* — переопода IV; *d* — дактилус PIV; *e* — переопода V; *f* — дактилус PV; *g* — переопода VI; *h* — дактилус PVI; *i* — переопода VII; *j* — дактилус PVII.

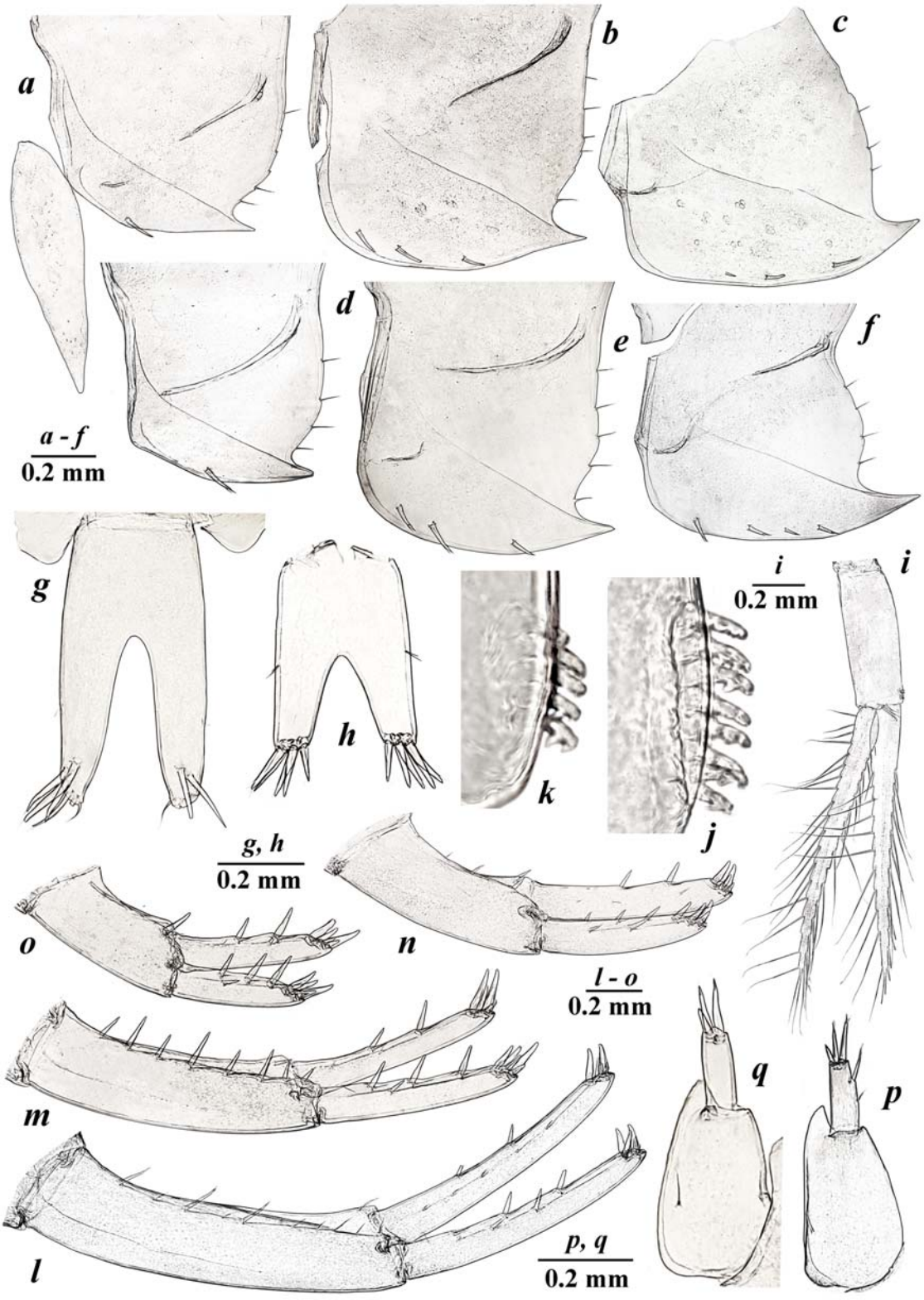

Fig. 13. *Pontonyx abchasicus* sp.n., Tkvarcheli (Tqwarchal), former Akarmara Railway Station, Ochamchira District, Abkhazia, ♂ (*a–c*, *g*, *i*, *j*, *l*, *n*, *p*), ♀ (*d–f*, *h*, *k*, *m*, *o*, *q*): *a*, *d* — epimeral plate I; *b*, *e* — epimeral plate II; *c*, *f* — epimeral plate III; *g*, *h* — telson; *i* — pleopod III; *j*, *k* — hooks of retinacula of pleopod II; *l*, *m* — uropod I; *n*, *o* — uropod II; *p, q* — uropod III.

Рис. 13. *Pontonyx abchasicus* sp.n., Ткварчели (Ткуарчал), бывшая железнодорожная станция Акармара, Очамчирский район, Абхазия, ♂ (*a–c*, *g*, *i*, *j*, *l*, *n*, *p*), ♀ (*d–f*, *h*, *k*, *m*, *o, q*): *a*, *d* — эпимеральная пластинка I; *b*, *e* — эпимеральная пластинка II; *c*, *f* — эпимеральная пластинка III; *g*, *h* — тельсон; *i* — плеопода III; *j*, *k* — крючки ретинакулы плеопод II; *l*, *m* — уропода I; *n*, *o* — уропода II; *p*, *q* — уропода III.

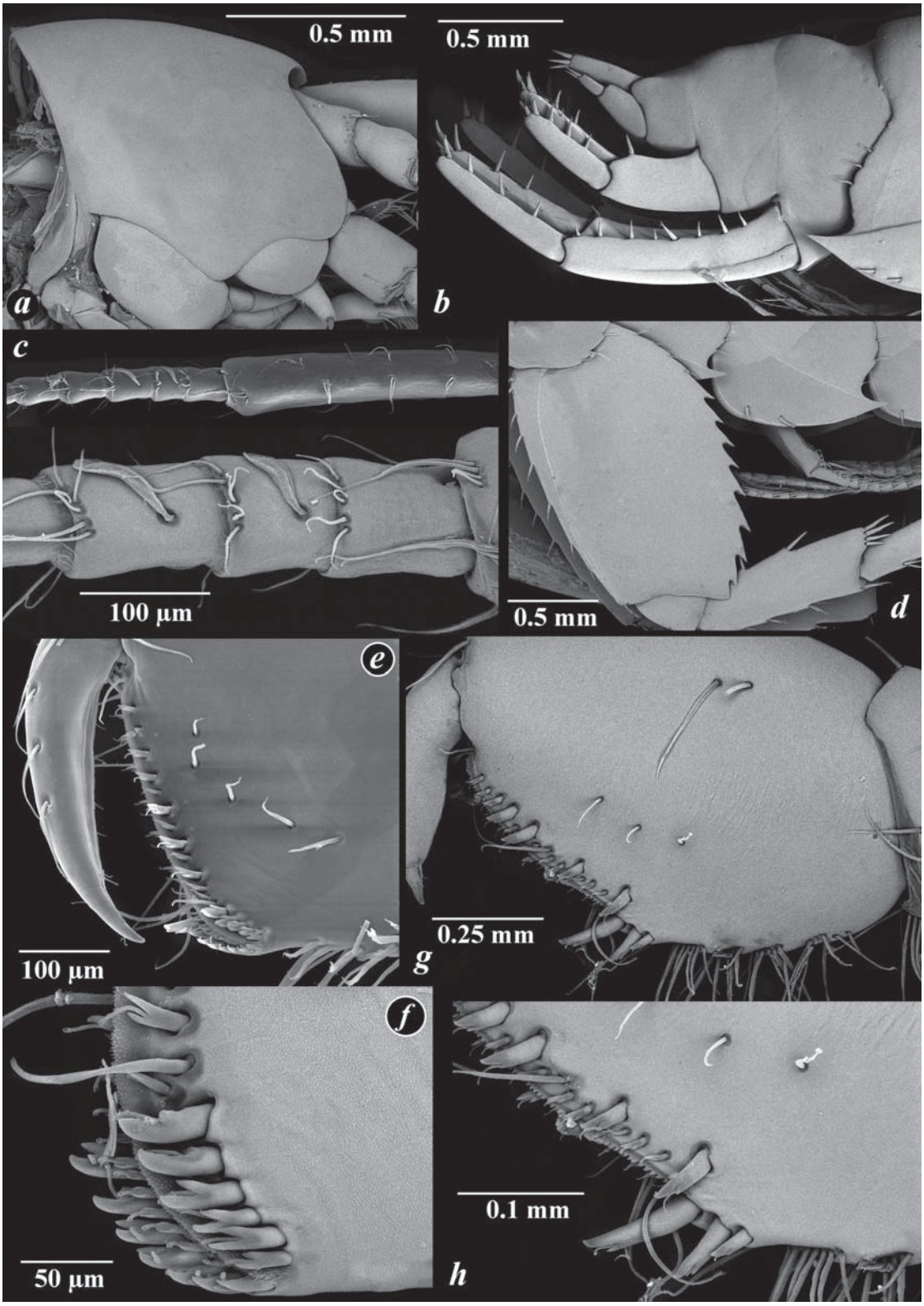

Fig. 14. *Pontonyx abchasicus* sp.n., Tkvarcheli (Tqwarchal), former Akarmara Railway Station, Ochamchira District, Abkhazia, ♂ (*a–c*, *e*, *f*), ♀ (*d*, *g*, *h*): *a* — head; *b* — urosome; *c* — antenna II; *d* — basis of pereopod VII; *e* — distal margin of palm (chela) of gnathopod I; *f* — same, distoventral margin; *g* — distal margin of palm (chela) of gnathopod II; *h* — same, distoventral margin.

Рис. 14. *Pontonyx abchasicus* sp.n., Ткварчели (Ткуарчал), бывшая железнодорожная станция Акармара, Очамчирский район, Абхазия, ♂ (*a–c*, *e*, *f*), ♀ (*d*, *g*, *h*): *a* — голова; *b* — уросома; *c* — антенна II; *d* — базис переоподы VII; *e* — дистальный край ладони (чела) гнатоподы I; *f* — то же самое, дистовентральный край; *g* — дистальный край ладони (чела) гнатоподы II; *h* — то же самое, дистовентральный край.

simple setae distoventrally; ischium about as long as wide; merus about 3.6X times longer than wide, 0.80X of basis, 0.87X of carpus in length; carpus about 6.7X longer than wide, subequal to propodus in length, armed with 3–4 doubled robust spine-like setae along posterior margin; propodus about 8.8X longer than wide, armed with 4–5 doubled strong spine-like setae along posterior margin; dactylus (Figs 11*h*, 12*h*) about 0.25X of propodus, with 1 plumose seta on outer margin and 1 additional spine accompanying with seta along ventral margin.

Pereopod VII (Figs 11*i*, 12*i*): coxal plate small, semilunar, with 3–4 posterior setae; basis about 1.55X as long as wide, posterior margin convex, armed with 10–12 serrations, with distinct bluntly rounded distal corner (Fig. 14*d*), anterior margin with 7–8 robust and 2–3 long simple setae distoventrally; ischium about as long as wide; merus about 3.2X times longer than wide, 0.64X of basis, 0.9X of carpus in length; carpus about 6.4X longer than wide, 1.4X of propodus in length, armed with 3–4 doubled robust spine-like setae along posterior margin; propodus about 8.6X longer than wide, armed with 4–5 doubled strong spine-like setae along posterior margin; dactylus (Figs 11*h*, 12*h*) about 0.23X of propodus, with 1 plumose seta on outer margin and 1 additional spine accompanying with seta along ventral margin.

Gills, brood plates (Figs 11, 12): coxal gills on somites II–VII, somites V–VII with lanceolate sternal gill on each. Coxal gills of pereopods II–VII ovoid, gills/bases pereopod ratios are 0.74/1, 0.72/1, 0.66/1, 0.67/1, 0.43/1 and 0.26/1, respectively.

Pleopods (Fig. 13*i*): pleopod I peduncle with 4 (in females)–7 (in males) coupling hooks in retinacula, without lateral setae; outer and inner rami with 15 and 18 segments, respectively. Pleopod II peduncle with 5 (in females)–8 (in males) coupling hooks in retinacula, without setae; outer and inner rami with 13 and 16 segments, respectively. Pleopod III peduncle with 5 (in females)–8 (in males) coupling hooks in retinacula, without lateral setae; outer and inner rami with 11 and 12 segments, respectively.

Epimera. Epimeral plate I (Fig. 13*a*, *d*) distally produced and sharply pointed, ventral margin with 1 spine, posterior margin convex, with 4–6 setae. Epimeral plate II (Fig. 13*b*, *e*) distally produced and sharply pointed, slightly curved upward, ventral margin convex and armed with 3–4 spines, posterior margin convex, with 5setae. Epimeral plate III (Fig. 13*c*, *f*) distally produced and sharply pointed, curved upward, ventral margin almost straight and armed with 3–4 spines, posterior margin convex, with 3–4 setae.

Urosomites fused, with distinct sutures (Fig. 14*b*).

Uropod I (Fig. 13*l*, *m*): peduncle about 3.8–4.3X as long as wide, with dorsointernal row of 8–10 thin short setae, 1 subdistal short and 1 dorsoexternal thin short spine-like setae; rami slightly shorter than peduncle in length, exopodite subequal to endopodite; endopodite not paddle-like, about 6.5–6.8X longer than wide, with 2 dorsolateral and 5 apical spine-like setae; exopodite about 7.0–7.5X longer than wide, with 3–4 pairs of dorsolateral and 5 apical spine-like setae.

Uropod II (Fig. 13*n*, *o*): peduncle about 2.3–2.8X as long as wide, subequal to rami in length, with 1–3 outer short spine-like setae; exopodite about 0.8X of endopodite in length, with 2 outer and 5 apical robust spine-like setae; endopodite with 3–4 pairs of outer and 5 apical robust spines.

Uropod III (Fig. 13*p–r*): uniramous, peduncle cone-shaped, about 1.7–1.9X as long as wide, with a terminal "pointed knob" and 1 simple seta on lateral margin or without it; apical margin of ramus armed with 2–3 robust spine-like setae; lateral margin of ramus with 2 spine-like setae in male.

Telson (Fig. 13*g*, *h*): elongated, about 1.5–2X longer than wide, as long as uropod III or longer; apical margin cleft about 0.46–0.60X of total length; with 5–6 short and long spines and with 2 additional submarginal plumose setae on each lobe.

COLORATION. The body and appendages transparently yellow-grayish; well-pigmented brown eyes (ommatidia) well-marked, yellow spot is feebly marked on the head dorsally (see Fig. 8).

GENBANK ACCESSION NUMBERS. MZ449250, MZ449251.

TAXONOMIC REMARKS. The new species can be clearly separated from *P. odessana* [Sidorov, Kovtun, 2015] and *Pontonyx donensis* comb.n., by: 1) trapezoidal palm of GnII (vs. tear-drop shaped); 2) strongly serrated posterior margins of basis of PpV–VII; 3) stronger spinulation of on peduncle and rami of UI–II; 4) strongly produced and curved upward posteroventral angles of epimeral plates, with the less number of ventral epimeral spines; 5) the presence of 8 hooks in retinacules of pleopods in male (vs. 5–6); and 6) strongly produced telson with the cleft overreaching the half of the telson.

From *P. osselai* [Ruffo, 1972; Özbek, 2018], *P. adjaricus* and *P. colchicus* (after Palatov and Marin [2021]), it can be separated by: 1) the presence of 8 hooks in retinacules of pleopods in male (vs. 4–6); 2) strongly produced telson with the cleft overreaching the half of telson; 3) presence of 2 spine-like setae on lateral margin of ramus UIII in male (vs. the absence of setae on lateral margin of ramus of UIII in male).

DISTRIBUTION AND ECOLOGY. Currently, the species is known only in several neighboring springs flowing along a mountain slope (about 760 m a.s.l.), overgrown with forest, about 20 km east of Tkvarcheli (Tqwarchal) in the Ochamchira District of Abkhazia, southwestern Caucasus.

Discussion

It is obvious, that the genus *Pontonyx* and its probably sister genus *Diasynurella* Behning, 1940 originated and separated a long time ago, at times of the existence of the Paratethys (see above). The estimated time of their divergence from related genera vary from 100 Mya [Copilaş-Ciocianu *et al.*, 2019] to 40 Mya or less [Palatov, Marin, 2023; Marin, Palatov, 2023 (in press)]. *Pontonyx* and *Diasynurella* probably diverged from one another about 35–30 Mya [Palatov, Marin, 2023]. The current distribution of *Pontonyx* is associated with the coastal habitats of the Black and Azov Seas, while *Diasynurella* has also been known from the mountainous springs (200–2400 m a.s.l.) of the Lesser Caucasus (Armenia) and the coastal habitats of northern Caspian Sea refugium (Hyrcania) from Dagestan, Azerbaijan and the northwestern Iran [Palatov, Marin, 2023]). It is very likely that such a difference in habitats and habitat height can be explained by the fact that *Diasynurella* are very small strictly stygobiotic crustaceans, and were able to survive in underground habitats after the retreat of Paratethys [Palatov, Marin, 2023], whereas *Pont-*

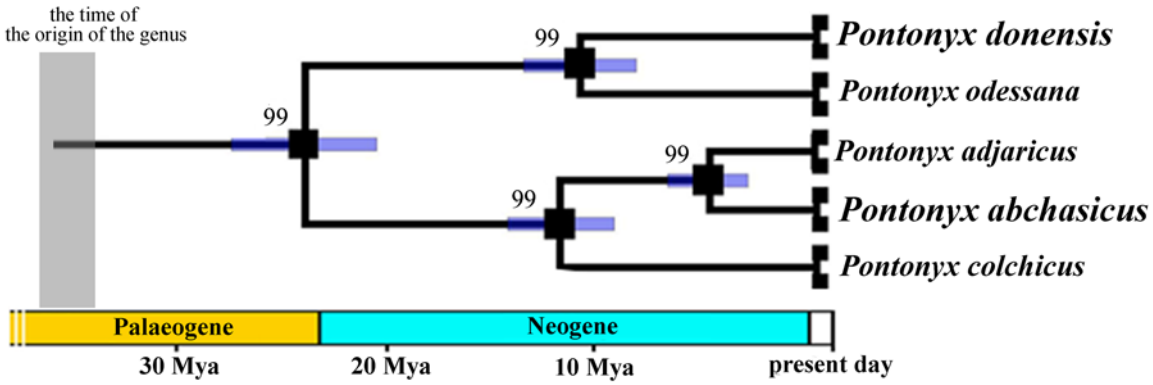

Fig. 15. Time-calibrated phylogenetic relationships of the genus *Pontonyx* Palatov et Marin, 2021 based on the COI mtDNA gene marker. Posterior probabilities of the nodes are reported. Blue horizontal bars show the 95% HPD (the highest posterior density) of node ages on an arbitrary time scale.

Рис. 15. Откалиброванные по времени филогенетические взаимоотношения рода *Pontonyx* Palatov et Marine, 2021 г. на основе генного маркера COI мтДНК. Апостериорные вероятности указаны для каждого узла. Синие горизонтальные полосы показывают 95% HD (наивысшую заднюю плотность) каждого узла в произвольном масштабе времени.

onyx is a more epigean-dwelling genus of rather large sized crangonyctid crustaceans, the distribution of which somehow follows the coastline of the sea (for example, Black Sea), with some recent species living in coastal swamps [Palatov, Marin, 2022], and only some species are able to survive in the subterranean/stygobiotic habitats for some time (present paper, see above). The exact phylogenetic position, the time of separation and radiation of both genera will be clarified using multilocus phylogenetic analysis in further studies.

THE DIFFERENTIAL KEY TO THE KNOWN SPECIES OF THE GENUS *PONTONYX* PALATOV ET MARIN, 2021:

1. Relatively large-sized species, with the total body length of mature specimens reaching up to 10–12 mm; GnII with clearly teardrop-shaped form of propodus (palm) in males; posterior margin of basis of PpV–VII feebly serrated; posterodistal corners of epimeral plate not significantly produced and non-curved, with strong and long posterior setae on EpII–III in males. Distributed in the Northern Black/Azov Sea Lowland 2
– Smaller species, with the total body length of mature specimens not reaching 10 mm; gnathopods II with clearly teardrop-shaped form in males; GnII with trapezoidal form of propodus (palm) in males; posterior margin of basis of PpV–VII markedly serrated; posterodistal corners of epimeral plate significantly sharply produced and curved upward, strong and long posterior setae on EpII–III is absent in males. Distributed in the Eastern Black Sea Lowland (Colchis 3
2. Peduncles and rami of UI–II with numerous (up to 12–13) small dorsoexternal and dorsointernal setae; ventral margin of EpII–III with a row of ventral setae and 1–3 additional upper located smaller setae .... *Pontonyx odessana* (Sidorov et Kovtun, 2015)
– Peduncles and rami of UI–II with 6–7 medium-sized dorsoexternal and dorsointernal setae; ventral margin of EpII–III with a row of ventral setae only .... *Pontonyx donensis* (Martynov, 1919) comb.n.
3. Relatively small species, not exceeding 6 mm in total body length. EpIII with long posteroventral spine and distinct convex posterior margin 4
– Relatively large species, exceeding 8 mm in total body length. EpIII with short posteroventral spine and weakly convex, almost straight posterior margin 5
4. The telson clearly expands towards the distal margin, with wide notch .... *Pontonyx colchicus* Marin et Palatov, 2021
– The telson is rectangular, not expanding to the distal margin, with narrow notch .... *Pontonyx adjaricus* Palatov et Marin, 2021
5. The distal segment of UIII with 2 strong spine-like setae along lateral margin; with 7–8 hooks in retinacules of pleopods in males ..... *Pontonyx abchasicus* sp.n.
– The distal segment of UIII without setae or bristles along lateral margin; with 4 hooks in retinacules of pleopods ..... *Pontonyx osellai* (Ruffo, 1974)

Additionally, in this article we formally would like to summarize the general description of the generic diversity of the family Crangonyctidae of the Palearctic, with more in-depth studies of the Caucasus and adjacent areas. A summary table of 49 known Palearctic species from 10 described genera is presented below (see Suppl. Table). Of course, this list is not final, and we are sure that the species diversity of crangonyctid is still very far from being fully studied; moreover, a thorough revision is needed for the Western European *Synurella*. Invading North America *Eucrangonyx pseudogracilis* (Bousfield, 1958) and *Eucrangonyx floridanus* (Bousfield, 1963), currently widespread in Western Europe, are excluded from Suppl.Table.

Compliance with ethical standards

CONFLICTS OF INTEREST: The authors declare that they have no conflicts of interest.

Supplementary data. The following Table is available online.

Supplemenraty Table. Diversity of the family Crangonyctidae in the Palearctic.

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