

## Two new species of the terrestrial isopod genus *Lucasioides* Kwon, 1993 (Isopoda: Oniscidea: Agnaridae) from Central Asia

### Два новых вида мокриц рода *Lucasioides* Kwon, 1993 (Isopoda: Oniscidea: Agnaridae) из Средней Азии

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КЛЮЧЕВЫЕ СЛОВА: мокрицы, СЭМ, морфология, таксономия, Узбекистан, Кыргызстан.

ABSTRACT. Two new species of terrestrial isopods from the family Agnaridae are described: *Lucasioides lekarevi* sp.n. from the Issyk-Kul Region, eastern Kyrgyzstan, and *L. temerevae* sp.n. from the Surxondaryo Region, southern Uzbekistan. These are among the westernmost locations for the genus. The diagnostic characters of the new species, as well as their affinities within the genus, are provided and discussed.

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РЕЗЮМЕ. Описаны два новых вида мокриц, принадлежащих к семейству Agnaridae, *Lucasioides lekarevi* sp.n. из Иссык-Кульской области с востока Кыргызстана, и *L. temerevae* sp.n. из Сурхандарьинской области с юга Узбекистана. Это одни из самых западных точек находок рода. Приведены диагностические признаки этих видов, а также родственные связи внутри рода.

### Introduction

The genus *Lucasioides* was established by Arcangeli [1952] as a subgenus of *Protracheoniscus* Verhoeff, 1917,

because its members differ from all other subgenera of that genus, including *Protracheoniscus* s.str. and *Monogoloniscus*, in having pereon epimeron 1 with a sinuous posterior margin. Vandel [1969] treated *Lucasioides* as a full genus, noting that the cephalon possesses well-developed median and lateral lobes. However, since neither Arcangeli nor Vandel designated a type species for *Lucasioides*, the name was unavailable under Article 13.3b of the International Code of Zoological Nomenclature. To validate the genus name, *Porcellio (Lucasius) gigliotosi* (Arcangeli, 1927) was selected as the type species of the genus [Kwon, 1993].

The genus includes 38 species [Boyko *et al.*, 2025] with a number of species recently described from China [Wang *et al.*, 2024], where it has presumably a hotspot. The genus is distributed throughout the south-eastern Palearctic spreading to the Central Asia westwards [Kashani, 2020] and Siberia northwards [Gongalsky *et al.*, 2021]. However, there are doubts that the latter species belongs to this genus: there is straight distal edge of pereon, no tuberculation on dorsal surface, different position of noduli laterales. This situation invites a revision. We have discovered two more species differing from all known species, which are described below.

### Material and methods

The material has been collected in southern Uzbekistan in 2022–2025 and in western Kyrgyzstan in 2024. The specimens



Fig. 1. *Lucasioides lekarevi* sp.n., alive specimen (male) kept in culture.

Рис. 1. *Lucasioides lekarevi* sp.n. (самец), общий вид животного из культуры.

were collected by hand and fixed in 70% or 96% ethanol. Processing and dissections were done by using a Leica MZ8 binocular microscope. Micro preparations of diagnostic body appendages were done in euparal (Carl Roth GmbH). Line drawings were executed with the help of an Olympus BX41 microscope supplied with an Olympus U-DA camera lucida. Some individuals were attached to stubs, coated with gold in a S150A Sputter Coater, and studied under a Tescan Vega TS5130MM scanning electron microscope.

The type materials is deposited in the Zoological Museum of the Lomonosov Moscow State University, Moscow, Russia (ZMMU), and other material in the Severtsov Institute of Ecology and Evolution, Moscow, Russia (KG), as indicated below.

Terminology used in the species description is mainly based on Vandel [1960].

## Taxonomy

Family Agnaridae Schmidt, 2003

Genus *Lucasioides* Kwon, 1993

Type species: *Lucasioides gigliotosi* (Arcangeli, 1927)

Diagnosis is provided by Kwon [1993].

*Lucasioides lekarevi* Gongalsky et Byzov **sp.n.**

Figs 1–6.

**MATERIAL EXAMINED:** Holotype (ZMMU, Mc-1474) ♂, Kyrgyzstan, Issyk-Kul Region, Balykchy, 42.465298°N, 76.191528°E. Dry field, under stone. 21.04.2024. A.-A. A. Kanatbekov leg.

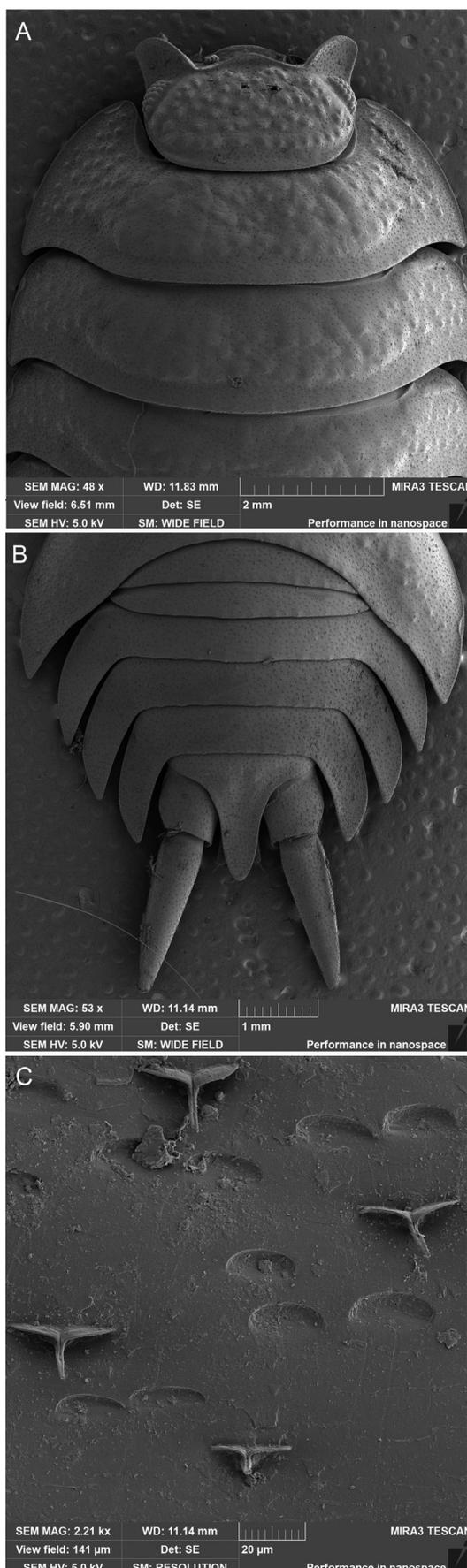
Paratypes: 2 ♂♂, 1 ♀ (ZMMU, Mc-1475) same date, locality and collector; 3 ♂♂, 1 ♀ (KG) same date, locality and collector.

Other material: 3 juv. (KG) same date, locality and collector, CBF1 in laboratory culture. 1 ♂ partially used in SEM 47s, 1 ♂ partially mounted on slide #594 and in SEM #67s.

**DIAGNOSIS.** Median lobe not shorter than side lobes. The antennal flagellum with the article I equal to article II; male exopod of pleopod 1 bearing deep hollow at apex; tip of male endopod of pleopod 1 slightly curved; position of noduli laterales at increasing distance on pereonites I–IV.

**DESCRIPTION. Somatic characters.** Maximum body length: male 10.0 mm (holotype 9.5 mm), female 8.0 mm. Body colour light grey-brown, head of the same coloration as rest of body. Rows of light spots at medial part of coxal plates of pereon segments (Fig. 1). Central parts of tergites with pale spots decreasing in brightness and density towards distal segments. Dorsal surface of tergites slightly tuberculated (Fig. 2A). Posterior edge of coxal plate 1 almost straight, of coxal plates of pereonites 2–7 curved (Fig. 1). Dorsal side covered with scattered thickened T-shaped dorsal scale-setae with width: length ratio 1:1 (Fig. 2C). Noduli laterales on all pereonites at approximately the same distance from rear margin; at increasing distance from lateral margin on pereonites 1–4 (Fig. 6). Body relatively oval, pleon forms continuous margin with pereon (Fig. 1). Animals unable to conglobate. Cephalic lobes well developed; median lobe not shorter than side lobes (Fig. 2A). Telson triangle (Fig. 2C).

**Appendages.** Uropods (Figs 1, 2B) colored yellow-orange. Exopods sexual dimorphic, in males almost twice as long as telson, in females as long as telson; with widest part on 1/5 proximal distance (Fig. 2B). Antennula with three articles (Fig. 3G): first article's width equals approximately of its 1.5 length; second article shorter than first; third almost as long as first and narrow, bearing tuft of setae at apex. Antenna long,



reaching pereonite 3; flagellum with 2 almost equal in length articles (Fig. 3F).

Left mandible (Fig. 3A) with molar process with 3 teeth and lacinia mobilis with straight edge. Basal to lacinia hairy lobe with 2 plumose penicils and row of penicils. Right mandible with molar process with 3 teeth and lacinia mobilis with straight edge. Basal to lacinia hairy lobe with 5 plumose penicils and row of penicils (Fig. 3B). Maxillula (Fig. 3E): medial corner of inner endite with 2 strong hirsute setae. Apical edge of outer endite bearing 10 spines divided into two groups: 6 medial slender spines, and 4 lateral stouter spines. Tip of endite covered with dense brush of setae. Maxilla with bilobate edge, medial half of apical edge of inner lobe with dense brush of short hairs (Fig. 3D). Inner margin with subapical tubercle. Maxilliped with outer corner of endite with 2 acute tips and large spine near inner corner (Fig. 3C). Basal article of endopod with 1 large spine.

**Male.** Pereopods (Fig. 4A–C). Pereopod 7 carpus ventral edge slightly curved. Ischiopod 7 with straight frontal margin, and long setae on distal margin. Pereopod 6 carpus ventral edge straight. Genital papilla bottle-shaped, with bulbous tip (Fig. 5A). All exopods on lateral margin with monospiracular lungs (Fig. 5B). Exopod of pleopod 1 (Fig. 5B) oval, bearing deep hollow at apex. Endopod of pleopod 1 with row of spines and slightly bent at apex (Fig. 5C). Pleopod 2: exopod triangular with concave outer margin bearing numerous setae; endopod much longer than exopod, narrow (Fig. 3D, E). Pleopods 3–4: exopods (Fig. 3F, G) are trapezoidal, slightly decreasing in size from 3 to 4. Pleopod 5 exopod almost quadrangular (Fig. 5H).

**ETYMOLOGY.** The new species is named in honor of Mr. Artem Yu. Lekarev, who graduated from the Department of Entomology of Moscow State University and to his 50<sup>th</sup> anniversary.

**DISTRIBUTION AND HABITAT.** The species is only found in the type locality so far under rocks (Fig. 7).

**REMARKS.** The species belongs to the genus *Lucasioides* due to the following parameters: body is relatively flat; dorsum is granulated; gland pores are absent; the cephalon is with frontal line separated from vertex by a groove; both median and lateral lobes are well-developed; the epimeron of pereonite 1 is bent outwards; the noduli laterales on pereonites 2–4 are farther from lateral margin than ones on pereonites 1 and 5–7. The new species differs from all other species in the genus by the very well-developed frontal lobe of cephalon. All other species have much less developed lobe [Borutzky, 1975; Kwon, 1993; Wang *et al.*, 2024].

*Lucasioides temerevae* Gongalsky et Byzov **sp.n.**  
Figs 8–13.

**MATERIAL EXAMINED:** Holotype (ZMMU, Mc-1476) ♂, Uzbekistan, Surxondaryo Region, 40 km W of Sherabad, up of youth camp of Termez University, river banks in *Juniperus* sp. shrubland, Surxondaryo Nature Reserve; 37.862870°N, 66.630663°E; 400 m a.s.l.; May 09, 2025, K.B. Gongalsky leg.

Paratypes: 2 ♂♂, 2 ♀♀ (ZMMU, Mc-1477), same date, locality and collector; 2 ♂♂, 2 ♀♀ (KG), same date, locality and collector.

Other material: 1 ♂ (KG) same date, locality and collector; partially mounted on slide #598. 3 ♀♀ (KG), Uzbekistan, Surxondaryo Region, Kugitang ridge (=Kugitangtau), vicinity of Neftchi camp (37.861217°N, 66.619133°E), pebbles on the riverbank, 1900 m a.s.l., 5.07.2022. A.A. Fomichev leg.

Fig. 2. *Lucasioides lekarevi* sp.n., male, scanning electronic microscopy: A — head and tergite 1; B — pleon, telson and uropods; C — dorsal scale-setae.

Рис. 2. *Lucasioides lekarevi* sp.n. (СЭМ фото), самец: А — голова и тергит 1; В — плеон, тельсон и уropоды; С — дорзальные сеты.

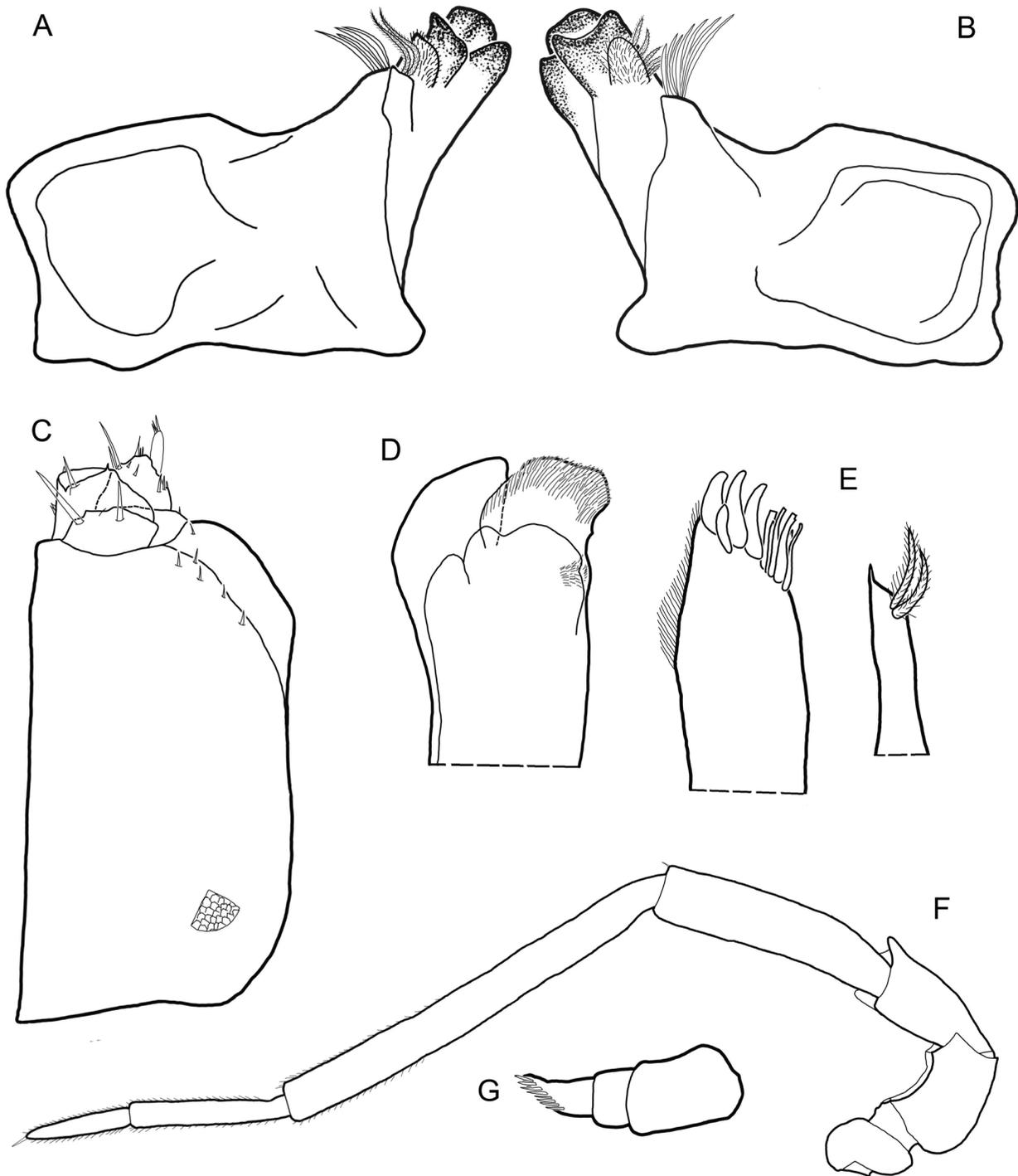


Fig. 3. *Lucasioides lekarevi* sp.n., male: A — left mandible; B — right mandible; C — maxilliped; D — maxilla; E — maxillula (inner endite, left, and outer endite, right); F — antenna; G — antennula.

Рис. 3. *Lucasioides lekarevi* sp.n., самец: А — левая мандибула; В — правая мандибула; С — максиллипед; D — максилла; E — максиллула (внутренний эндит слева и внешний эндит справа); F — антенна; G — антеннула.

DIAGNOSIS. The antennal flagellum with the article I 1.5 times longer than article II; male exopod of pleopod 1 bearing only slight hollow at apex; position of noduli laterales at increasing distance on pereonites I–IV.

DESCRIPTION. **Somatic characters.** Maximum body length: male 18.0 mm (holotype 17.0 mm), female 20.0 mm.

Body colour dark grey, head of the same coloration as rest of body. Light longitudinal stripes on boundary of epimera and tergites of pereonites 1–7 (Fig. 8). Central parts of tergites with pale spots decreasing in brightness and density towards distal segments. Dorsal surface of tergites slightly tuberculated (Fig. 9A). Posterior edges of coxal plates of pereonites slightly 1–5

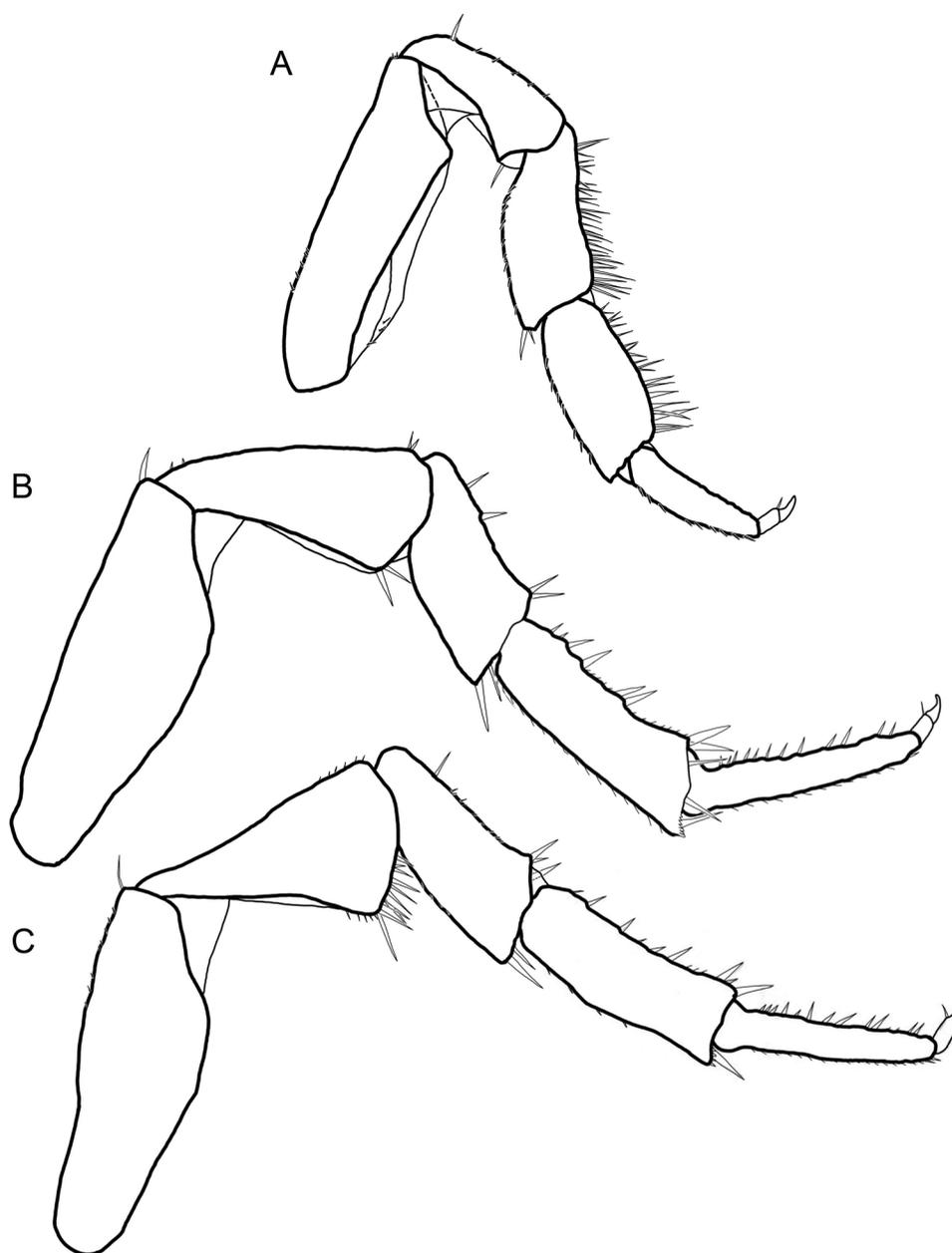


Fig. 4. *Lucasioides lekarevi* sp.n., male: A — pereopod 1; B — pereopod 6; C — pereopod 7.

Рис. 4. *Lucasioides lekarevi* sp.n., самец: А — переопод 1; В — переопод 6; С — переопод 7.

curved (Fig. 8). Dorsal side covered with scattered T-shaped dorsal scale-setae with width: length ratio 4:5 (Fig. 9C). Noduli laterales on all pereonites at approximately the same distance from rear margin getting closer to margin in posterior segments; at increasing distance from lateral margin on pereonites 1–4 (Fig. 13). Body relatively oval, pleon forms continuous margin with pereon (Fig. 8). Animals unable to conglobate. Cephalic lobes well developed; median lobe twice shorter than side lobes (Fig. 9A). Telson with elongated distal part (Fig. 9C).

**Appendages.** Uropods (Figs 8, 9B) colored as dorsal surface of body. Exopods almost twice as long as telson; with widest part on 1/5 proximal distance (Fig. 9B). Antennula with three articles (Fig. 10G): first article's width equals approximately of its 0.5 length; second article shorter than first; third almost as

long as first and narrow, bearing tuft of setae at apex. Antenna long, reaching pereonite 3; flagellum with 2 articles, proximal one 1.5 times longer than distal one (Fig. 10F).

Left mandible (Fig. 10A) with molar process with 3 teeth and lacinia mobilis with straight edge. Basal to lacinia hairy lobe with 5 plumose penicils and row of penicils. Right mandible with molar process with 3 teeth and lacinia mobilis with straight edge. Basal to lacinia hairy lobe with 2 plumose penicils and row of penicils (Fig. 10B). Maxillula (Fig. 10E): medial corner of inner endite with 2 strong hirsute setae. Apical edge of outer endite bearing 10 spines divided into two groups: 6 medial slender spines, and 4 lateral stouter spines. Tip of endite covered with dense brush of setae. Maxilla with bilobate edge, medial half of apical edge of inner lobe with dense brush of short hairs (Fig.

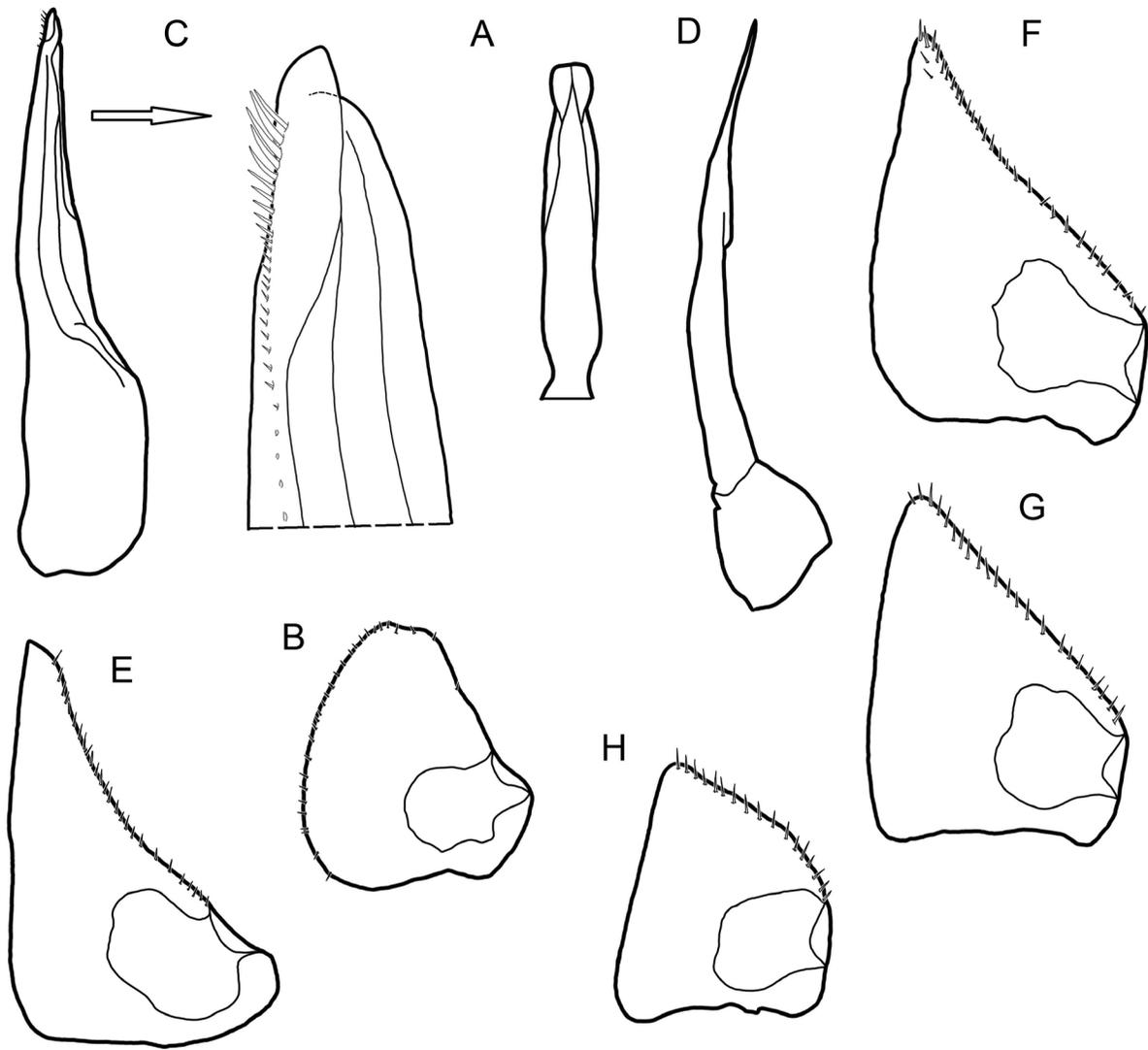


Fig. 5. *Lucasioides lekarevi* sp.n., male: A — genital papilla; B — exopod of pleopod 1; C — endopod of pleopod 1; D — exopod of pleopod 2; E — endopod of pleopod 2; F — exopod of pleopod 3; G — exopod of pleopod 4; H — exopod of pleopod 5.

Рис. 5. *Lucasioides lekarevi* sp.n., самец: А — генитальная папилла; В — экзопод плеопода 1; С — эндопод плеопода 1; D — экзопод плеопода 2; E — эндопод плеопода 2; F — экзопод плеопода 3; G — экзопод плеопода 4; H — экзопод плеопода 5.

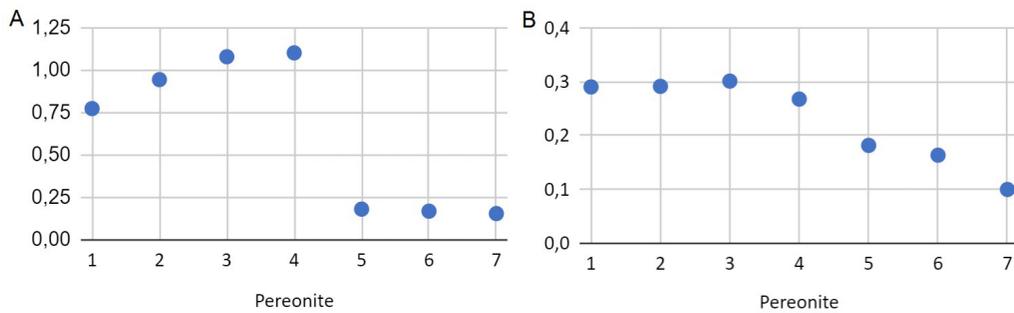


Fig. 6. *Lucasioides lekarevi* sp.n., male, position of noduli lateralis: A — b/c; B — d/c.

Рис. 6. *Lucasioides lekarevi* sp.n., самец: положение щетинконосных пор: А — b/c; В — d/c.



Fig. 7. Habitat of *Lucasioides lekarevi* sp.n. in dry rock field in Balykchy, Issyk-Kul Region, Kyrgyzstan.

Рис. 7. Местобитание *Lucasioides lekarevi* sp.n. на сухом каменистом поле около Балыкчи, Иссык-Кульская область, Кыргызстан.

10D). Inner margin with subapical tubercle. Maxilliped with outer corner of endite with 2 acute tips and large spine near inner corner (Fig. 10C). Basal article of endopod with 1 large spine.

**Male.** Pereopods (Fig. 11A–C). Pereopod 7 carpus ventral edge slightly curved. Ischiopod 7 with straight frontal margin, and large triangular protrusion with long setae on distal margin. Pereopod 6 carpus ventral edge straight. Genital papilla with bulbous tip (Fig. 12A). All exopods on lateral margin with monospiracular lungs (Fig. 12). Exopod of pleopod 1 (Fig. 12B) rounded, bearing slight hollow at apex. Endopod of pleopod 1 with row of spines and slightly bilobate (Fig. 12C). Pleopod 2: exopod triangular with concave outer margin bearing numerous setae; endopod much longer than exopod, narrow (Fig. 12D, E). Pleopods 3–4: exopods (Fig. 12F, G) are trapezoidal, slightly decreasing in size from 3 to 4. Pleopod 5 exopod almost quadrangular (Fig. 12H).

**ETYMOLOGY.** The new species is named in honor of Prof. Elena N. Temereva, who graduated from the Department of Invertebrate Zoology of Moscow State University and to her 50<sup>th</sup> anniversary.

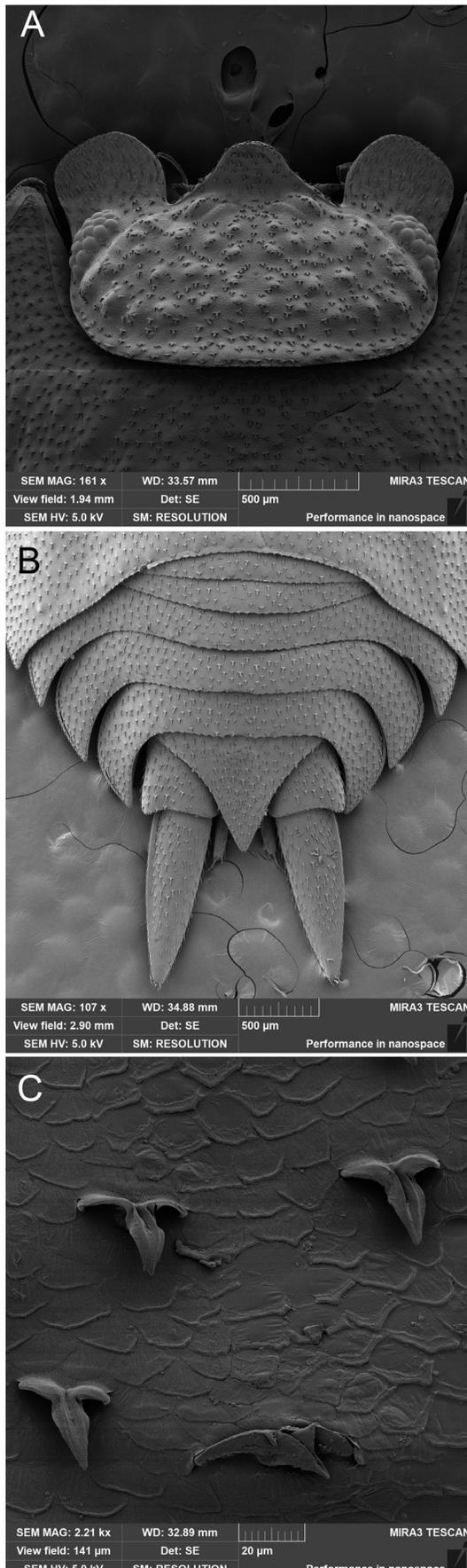
**DISTRIBUTION AND HABITAT.** The species is only found in the type locality in Köýtendag Range in Gissar-Alay Mt. Range under *Juniper*-shrubland at the border with Turkmenistan (Fig. 14).

**REMARKS.** The species belong to the genus *Lucasioides* due to the syndrome of characters listed for *L. lekarevi* sp.n. It differs from all other species in the genus by the very shallow concavity at the apex of pleopod exopod I. All other species have either deep hollow [Kwon, 1993; Wang *et al.*, 2024], or nor straightly cut apex [Borutzky, 1975].



Fig. 8. *Lucasioides temerevae* sp.n., alive specimen (female) kept in culture.

Рис. 8. *Lucasioides temerevae* sp.n. (самка), общий вид животного из культуры.



## Discussion

Both new species fit the diagnosis of the genus [Kwon, 1993]. They are among the westernmost distribution of the genus *Lucasioides*, with only *Lucasioides latus* (Uljanin, 1875) occurring further to the west in Central Asia [Kuznetsova, Gongalsky, 2012; Kashani, 2020]. The northernmost species, *Lucasioides altaicus* Gongalsky, Turbanov et Nefediev, 2021 [Gongalsky *et al.*, 2021], inhabits a wide range of ecosystems in southern Siberia [Nefediev, Byzov, 2024]. This species most probably belongs to another genus due to the morphological differences indicated above. However, the hotspots of the genus diversity are in southeast China [Kwon, 1993; Wang *et al.*, 2024] and in Japan [Nunomura, 1987; Nunomura, 2010]. At the same time, the generic relationship of many species from Japan is questionable. The situation invites a revision, including an analysis of both mitochondrial and nuclear genes.

### Compliance with ethical standards

**CONFLICT OF INTEREST:** The authors declare that they have no conflict of interest.

**Ethical approval:** No ethical issues were raised during our research.

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Fig. 9. *Lucasioides temerevae* sp.n., male, scanning electronic microscopy: A — head and tergites 1–3; B — pleon, telson and uropods; C — dorsal scale-setae.

Рис. 9. *Lucasioides temerevae* sp.n. (СЭМ фото), самец: А — голова и тергиты 1–3; В — плеон, тельсон и уropоды; С — дорзальные сетки.

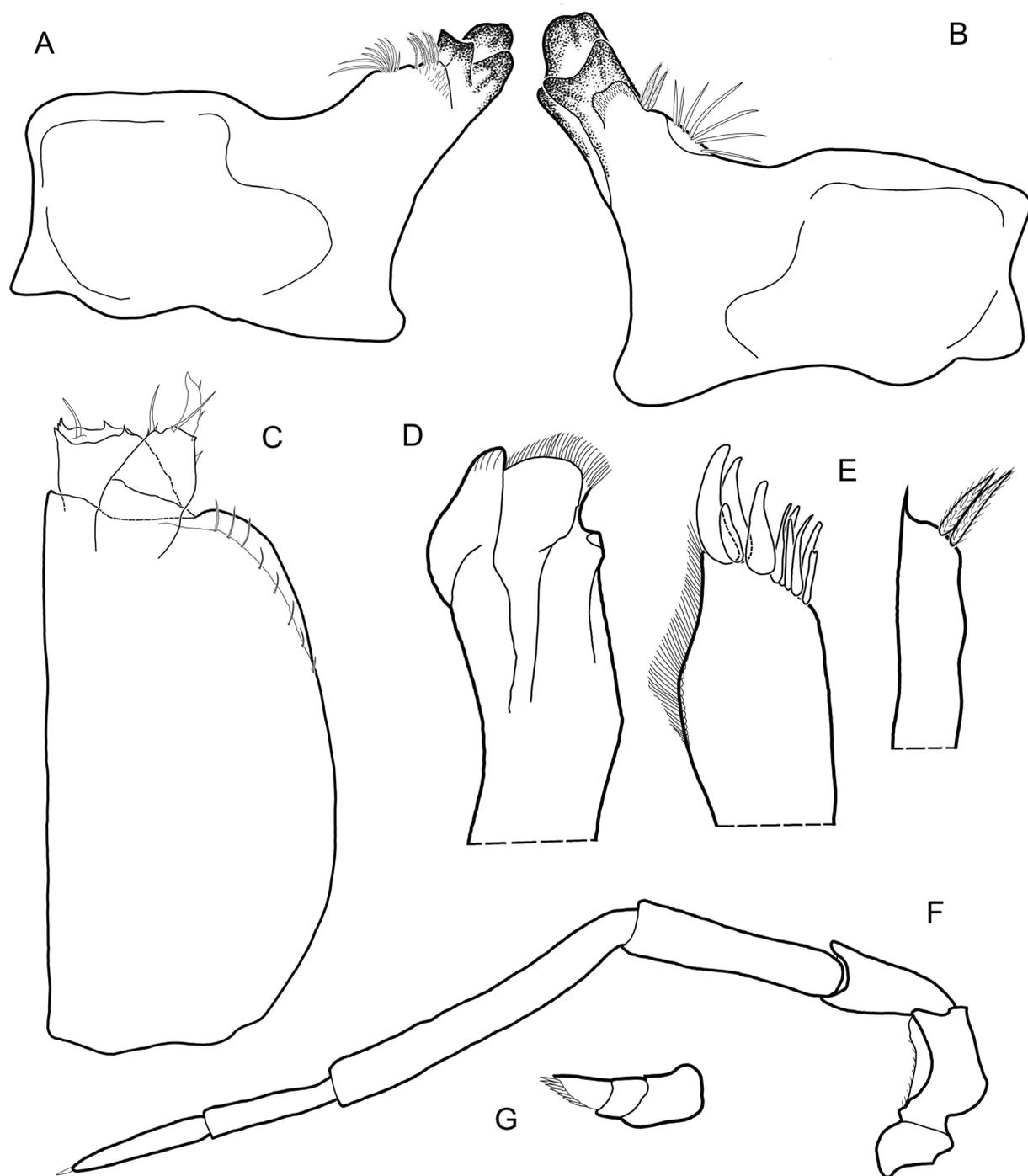


Fig. 10. *Lucasioides temerevae* sp.n., male: A — left mandible; B — right mandible; C — maxilliped; D — maxilla; E — maxillula (inner endite, left, and outer endite, right); F — antenna; G — antennula.

Рис. 10. *Lucasioides temerevae* sp.n., самец: А — левая мандибула; В — правая мандибула; С — максиллипед; D — максилла; E — максиллула (внутренний эндит слева и внешний эндит справа); F — антенна; G — антеннула.

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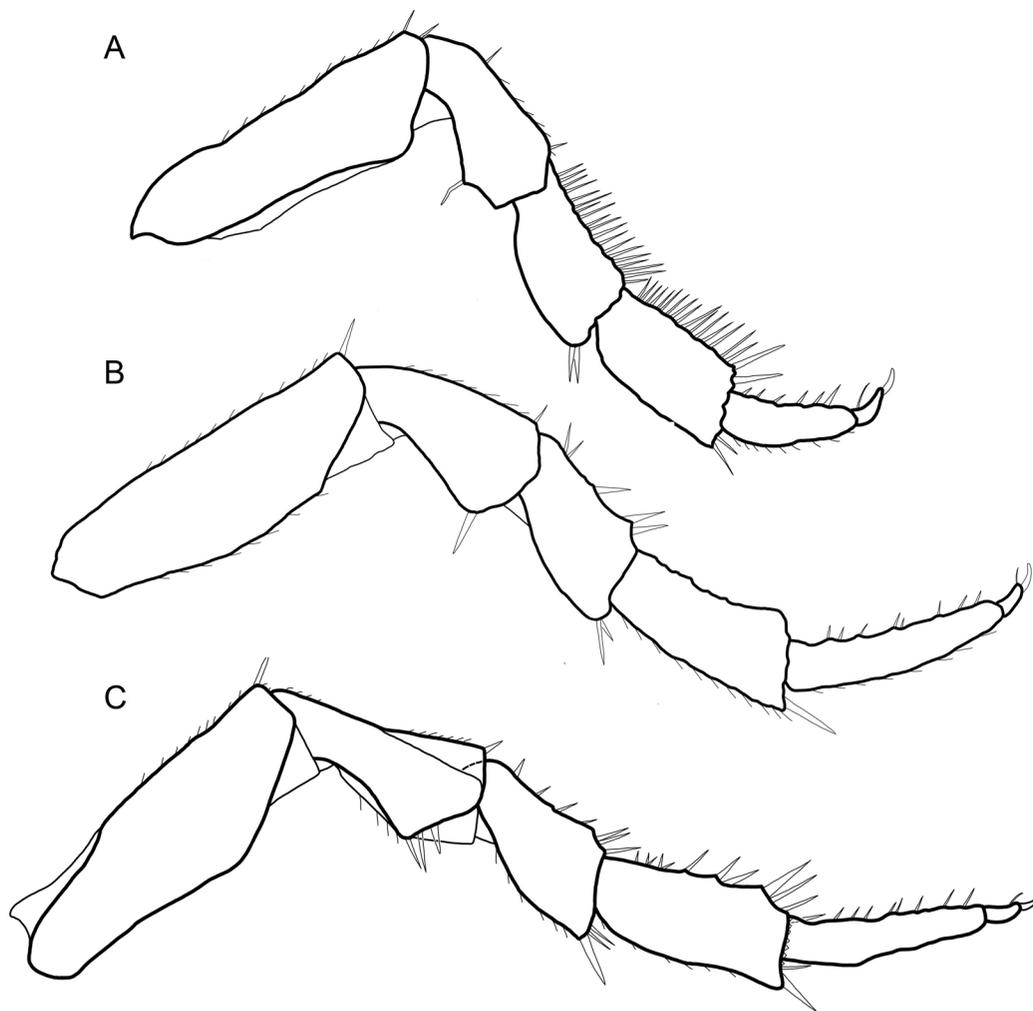


Fig. 11. *Lucasioides temerevae* sp.n., male: A — pereopod 1; B — pereopod 6; C — pereopod 7.

Рис. 11. *Lucasioides temerevae* sp.n., самец: А — переопод 1; В — переопод 6; С — переопод 7.

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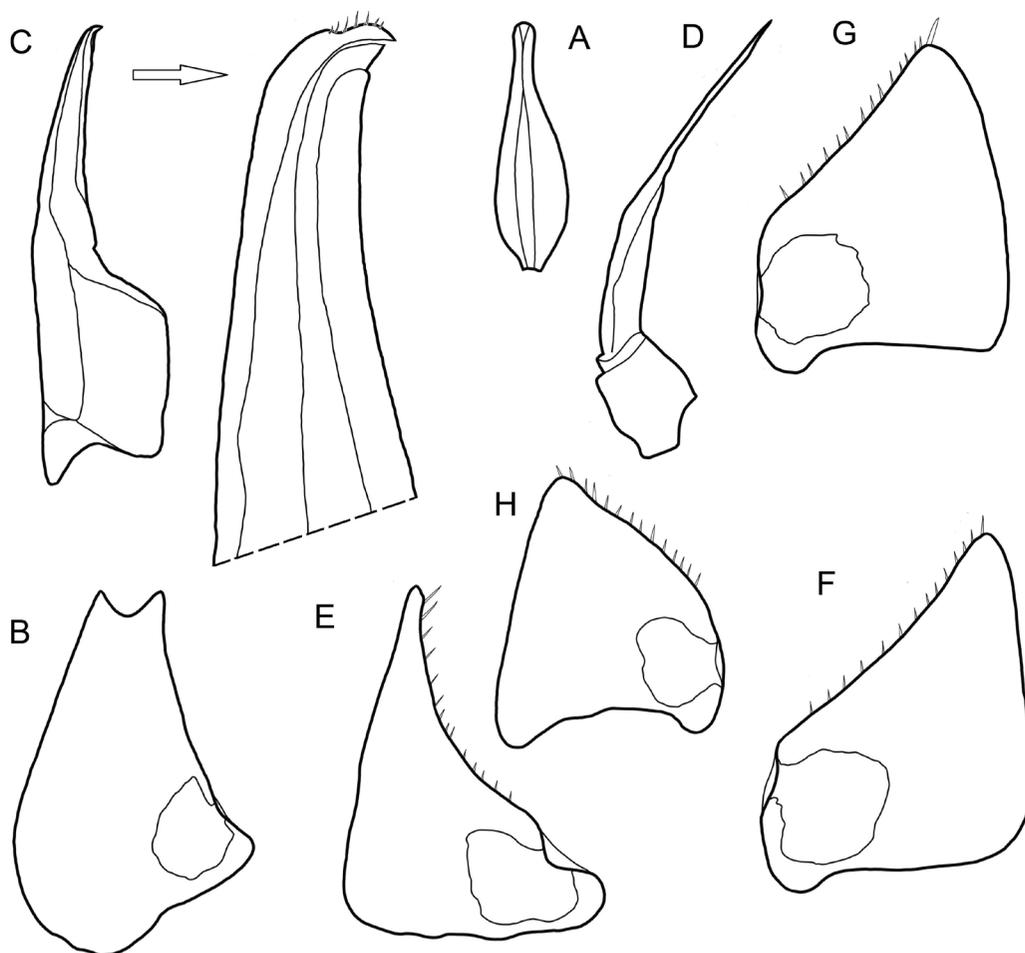


Fig. 12. *Lucasioides temerevae* sp.n., male: A — genital papilla; B — exopod of pleopod 1; C — endopod of pleopod 1; D — exopod of pleopod 2; E — endopod of pleopod 2; F — exopod of pleopod 3; G — exopod of pleopod 4; H — exopod of pleopod 5.

Рис. 12. *Lucasioides temerevae* sp.n., самец: А — генитальная папилла; В — экзопод плеопода 1; С — эндопод плеопода 1; D — экзопод плеопода 2; E — эндопод плеопода 2; F — экзопод плеопода 3; G — экзопод плеопода 4; H — экзопод плеопода 5.

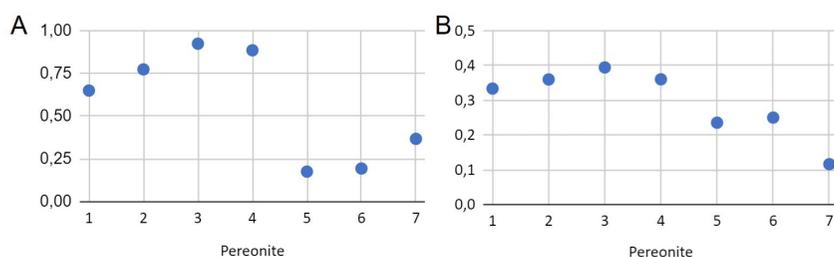


Fig. 13. *Lucasioides temerevae* sp.n., male, position of noduli lateralis: A — b/c; B — d/c.

Рис. 13. *Lucasioides temerevae* sp.n., самец: положение щетинконосных пор: А — b/c; В — d/c.

Fig. 14. Habitat of *Lucasioides temerevae* sp.n. in *Juniper*-shrubland in Gissar-Alay Mt. Range, Surxondaryo Region, Uzbekistan.

Рис. 14. Местообитание *Lucasioides temerevae* sp.n. в арчевнике в горах Гиссаро-Алая, Сурхандарьинская область, Узбекистан.

