

Three new species of Clausiliidae (Gastropoda, Pulmonata) from Abkhazia

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ABSTRACT. *Acrotoma (Castelliana) likharevi* sp. nov., *Acrotoma (Castelliana) reshaviensis* sp. nov., and *Micropontica (Baleopsina) olgae* sp. nov. are described from the Bzyb Mountains of Abkhazia. The taxonomic position, relation to congeneric taxa, and zoogeographical significance of the new taxa are discussed.

Introduction

The mountainous terrain between the Greater Caucasus and the Black Sea is one of the world's malacologically most diverse regions, particularly rich in endemic species belonging to the family Clausiliidae. Most of these taxa had been described by the end of the 19th century, but it took more than six decades to get the first comprehensive assessment of this fauna published by Likharev [1962]. Only in recent years was his fundamental work followed by other works that dealt with particular groups [Majoros *et al.*, 1994; Suvorov, 2002; Kijashko, 2005; Pokryszko *et al.*, 2011; Fehér *et al.*, 2014; Koch *et al.*, 2016] or gave updated overviews [Egorov 2001, 2002; Sysoev, Schileyko, 2009] of these snails. This renewed interest resulted in the discovery of new endemic species, as well as valuable taxonomic and zoogeographical contributions, in which further progress is foreseen. In the present study we describe three new species that are endemic to the Bzyb Mountains of Abkhazia.

Materials and methods

The studied material was hand-collected during a field trip to the eastern part of the Bzyb Mountain Range in 2014. Measurements of shell height (Hs), shell width (Ws), aperture height (Ha), and aperture width (Wa) were taken from photographic images. Subfamily-level classification of the taxa followed

the molecular phylogeny-based concept proposed by Uit de Weerd and Gittenberger [2013].

Type material of the new taxa are deposited in collections of the Hungarian Natural History Museum, Budapest (HNHM), Natural History Museum, London (NHMUK), and the Zoological Institute of the Russian Academy of Sciences, St. Petersburg (ZIN), as well as in the private collections of Vladimir M. Kotsur (KVM, Vitebsk), Igor A. Solodovnikov (SIA, Vitebsk), and Miklós Szekeres (SZ, Szeged).

Results

Family Clausiliidae Gray, 1855 Subfamily Clausiliinae

Genus *Acrotoma* Boettger, 1881

Type species: *Clausilia komarowi* Boettger, 1881 (OD).

Subgenus *Acrotoma (Castelliana)* Suvorov, 2002

Type species: *Acrotoma (Castelliana) tunievi* Suvorov, 2002 (OD).

Acrotoma (Castelliana) likharevi sp. nov. (Fig. 1A)

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Type material. Holotype: ZIN 1/509-2017, Abkhazia, Gudauta District, Bzyb Mountains, near the headwaters of the Khipsta River (43°18'31.4"N, 40°41'27.6"E, 1830 m to 43°18'37.0"N, 40°41'46.0"E, 1920 m), coll. I. A. Solodovnikov and E. V. Tatur, 05–06.08.2014. Paratypes, all from Abkhazia, Gudauta District, Bzyb Mountains: HNHM 100141 (1 spm), NHMUK 20170138 (1 spm), KVM (21 spms), SIA (22 spms), SZ (19 spms), same data as those of the holotype;

SIA (11 spms), SZ (7 spms), southeastern slope of the Mt. Dshykva ($43^{\circ}19'04.1''N$, $40^{\circ}41'38.5''E$, 2280–2300 m), coll. I. A. Solodovnikov and E. V. Tatum, 07.08.2014; SIA (2 spms), southeastern slope of the Mt. Dshykva ($43^{\circ}19'04.1''N$, $40^{\circ}41'51.2''E$, 2250 m), coll. I. A. Solodovnikov and E. V. Tatum, 12.08.2014; SIA (9 spms), southeastern slope of the Mt. Dshykva ($43^{\circ}18'59.0''N$, $40^{\circ}41'47.3''E$, 2190 m), coll. I. A. Solodovnikov and E. V. Tatum, 12.08.2014; SIA (1 spm), southeastern slope of the Mt. Dshykva ($43^{\circ}18'41.7''N$, $40^{\circ}41'28.0''E$, 1910 m), coll. I. A. Solodovnikov, 07.08.2014.

Other material. All from Abkhazia, Gudauta District, Bzyb Mountains. Northwestern slope of the Mt. Akugra, above the headwaters of the Reshava River ($43^{\circ}18'26.6''N$, $40^{\circ}42'48.3''E$, 2030 m), coll. I. A. Solodovnikov and E. V. Tatum, 08.08.2014, SIA (14 spms), SZ (2 spms); northwestern slope of the Mt. Akugra ($43^{\circ}18'16.2''N$, $40^{\circ}42'18.4''E$, 2030–2070 m), coll. I. A. Solodovnikov and E. V. Tatum, 11.08.2014, SIA (3 spms), SZ (1 spm).

Type locality. Abkhazia, Gudauta District, Bzyb Mountains, near the headwaters of the Khipsta River ($43^{\circ}18'31.4''N$, $40^{\circ}41'27.6''E$, 1830 m to $43^{\circ}18'37.0''N$, $40^{\circ}41'46.0''E$, 1920 m).

Diagnosis. Medium-size *Acrotoma* with strongly emerged lamellae superior and inferior, downward straightening lunella fused to the plica subclaustral, and blunt-tipped clausilium plate.

[**Диагноз.** Среднего размера *Acrotoma* с сильно явственной верхней и нижней пластинками, направленная вниз полуулунная складка соединена с нижней палатальной складкой, клаузилий с тупой вершиной.]

Description. The purple-brown, decollated shell consists of 5.3 to 6.7 flat whorls that are separated by a whitish suture. The widest last whorl has fine striae and a weak spiral sculpture, except for the neck that is strongly and densely striate. Above the penultimate whorl the surface becomes increasingly striae and even densely costate, a pattern shared with the early whorls that are shed upon decollation. Below the suture the riblets show a regular periodic flammulation. The strong and sharp crest at the basis tapers off before reaching the navel. The ovoid aperture with broad, whitish, reflexed margin and large sinus is widest at or above mid-height. The well developed and long lamella superior reaches as deep as the outer end of the lamella spiralis. The half a whorl long lamella spiralis is highest and bent toward the columella at its lateral section. The lamella inferior initiates laterally, as deep as the spiralis. Its arched terminal part is well emerged, strongly thickened. Often there is a strong straight fold in the interlamellar region, which joins the inferior at its outer end. The retracted lamella subcolumellaris is visible only in oblique view at the aperture. The short plica principalis spans only quarter of a whorl, starting from the dorsal-dorsolateral side. Dorsally the plica superior bends downward and forms a smooth arch as becomes fused to the lunella. The lower, somewhat diffuse and straight part of the lunella joins a long plica subclaustral.

perpendicularly. The elongate clausilium plate widens gradually before ending in a rounded tip. It is mostly obscured from view through the aperture by the strongly emerged lamella inferior.

Measurements. Holotype: Hs 21.1 mm (decollated), Ws 6.3 mm, Ha 5.9 mm, Wa 5.8 mm. Paratypes (type locality, n = 20): Hs 19.5–23.8 mm (decollated), Ws 5.8–6.9 mm, Ha 5.7–6.1 mm, Wa 5.4–6.0 mm.

Habitat. *Acrotoma (C.) likharevi* sp. nov. is an obligatory rock-dwelling clausiliid that inhabits limestone cliffs and boulders in the alpine zone.

Remarks. The new species resembles *A. (C.) tunievi*, which is known from the vicinity of Khos-ta, and likely also the lower valley of the Mzymta River, in the Krasnodar Territory. It is, however, distinguishable from that species by the more conical than spindle-like shell, the stronger, characteristically flammulate sculpture of the upper whorls, and the straight basal part of the lunella that is fused to the long plica subclaustral. At four of the known localities *Acrotoma (C.) likharevi* sp. nov. was found sympatrically with *Microponica (Baleopsis) olgae* sp. nov., and at one site with *A. (C.) reshaviensis* sp. nov.

Etymology. The new species is named in honour of the late Ilya M. Likharev, an outstanding figure of Clausiliidae research.

Acrotoma (Castelliana) reshaviensis sp. nov. (Fig. 1B)

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Type material. Holotype: ZIN 1/510-2017, Abkhazia, Gudauta District, Bzyb Mountains, northwestern slope of the Mt. Akugra, above the headwaters of the Reshava River ($43^{\circ}18'22.5''N$, $40^{\circ}43'13.4''E$, 2130 m to $43^{\circ}18'31.4''N$, $40^{\circ}43'34.6''E$, 2230 m), coll. I. A. Solodovnikov and E. V. Tatum, 08.08.2014. Paratypes, all from Abkhazia, Gudauta District, Bzyb Mountains: SIA (11 spms), SZ (2 spms), same data as those of the holotype; NHMUK 20170139 (1 spm), SIA (3 spms), SZ (1 spm), northwestern slope of the Mt. Akugra ($43^{\circ}18'16.2''N$, $40^{\circ}42'18.4''E$, 2030–2070 m), coll. I. A. Solodovnikov and E. V. Tatum, 11.08.2014.

Type locality. Abkhazia, Gudauta District, Bzyb Mountains, northwestern slope of the Mt. Akugra, above the headwaters of the Reshava River ($43^{\circ}18'22.5''N$, $40^{\circ}43'13.4''E$, 2130 m to $43^{\circ}18'31.4''N$, $40^{\circ}43'34.6''E$, 2230 m).

Diagnosis. Small *Acrotoma* with conical shell, short, with the lunella perpendicularly fused plica superior, and blunt-tipped clausilium plate.

[**Диагноз.** Маленькая *Acrotoma* с конической короткой раковиной, с полуулунной складкой перпендикулярно соединенной с верхней палатальной складкой, клаузилий с тупой вершиной.]

Description. The decollated, upward gradually



FIG. 1. **A.** *Acrotoma (Castelliana) likharevi* sp. nov., holotype (ZIN 1/509-2017, 21.1 mm). **B.** *Acrotoma (Castelliana) reshaviensis* sp. nov., holotype (ZIN 1/510-2017, 17.3 mm).

РИС. 1. **A.** Раковина *Acrotoma (Castelliana) likharevi* sp. nov., голотип (ZIN 1/509-2017, 21,1 mm). **B.** Раковина *Acrotoma (Castelliana) reshaviensis* sp. nov., голотип (ZIN 1/510-2017, 17,3 mm).

tapering purple-brown shell consists of 5.7 to 6.3 whorls. The neck and the ultimate whorl are finely striate, whereas the whorls toward the decollation become finely costate. The basal crest reaches to the dorsolateral side. The light-brown aperture has

narrow, strongly reflexed margin with wide sinulus. The lamella superior is moderately emerged but long, extending as deep as the end of the only slightly more peripheral lamella spiralis. The lamella inferior is not conspicuous in front view. Its smooth-

ly bent and thickened lower part terminates behind the peristome margin. The lamella subcolumellaris is retracted, its end is far apart from that of the inferior, and visible only in oblique view. The plica principalis extends only a quarter whorl or less from the dorsal side. Underneath a short dorsal plica superior is fused perpendicularly to the straight lunella. The plica subclaustral is absent. The clausilium plate with a rounded tip is partly visible through the aperture.

Measurements. Holotype: Hs 17.3 mm (decollected), Ws 5.2 mm, Ha 4.3 mm, Wa 3.4 mm. Paratypes (type locality, n = 12): Hs 13.8–18.7 mm (decollected), Ws 4.1–5.4 mm, Ha 3.9–4.4 mm, Wa 3.3–3.8 mm.

Habitat. *Acrotoma (C.) reshaviensis* sp. nov. was found in very similar alpine habitats as *A. (C.) likharevi* sp. nov.

Remarks. The new species seems to be a closely related sister species of *A. (C.) likharevi* sp. nov., from which it is distinguishable by the smaller, more conical shell, weaker developed basal crest and lamellae, perpendicularly connected plica superior and lunella, as well as the absence of the plica subclaustral.

Etymology. This species is named after the Reshava (also called Reshavie) River, which has its headwaters near the type locality.

Genus *Micropontica* Boettger, 1881

Type species: *Clausilia closta* Boettger 1881 (OD)

Subgenus *Micropontica (Baleopsina)* Lindholm, 1924

Type species: *Clausilia retowskii* Boettger 1888 (OD)

Micropontica (Baleopsina) olgae sp. nov. (Fig. 2A)

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Type material. Holotype: ZIN 1/511-2017, Abkhazia, Gudauta District, Bzyb Mountains, southeastern slope of the Mt. Dshyvka (43°18'41.7"N, 40°41'28.0"E, 1910 m), coll. I. A. Solodovnikov, 07.08.2014. Paratypes, all from Abkhazia, Gudauta District, Bzyb Mountains: HNMUK 100142 (1 spm), NHMUK 20170140 (1 spm), KVM (3 spms), SIA (22 spms), SZ (10 spms), same data as those of the holotype; SIA (6 spms), SZ (1 spm), southeastern slope of the Mt. Dshyvka (43°19'04.1"N, 40°41'38.5"E, 2280–2300 m), coll. I. A. Solodovnikov and E. V. Tatun, 07.08.2014; SIA (1 spm), southeastern slope of the Mt. Dshyvka (43°19'04.1"N, 40°41'51.2"E, 2250 m), coll. I. A. Solodovnikov and E. V. Tatun, 12.08.2014; SIA (19 spms), northwestern slope of the Mt. Akugra, above the headwaters of the Reshava River (43°18'22.5"N, 40°43'13.4"E, 2130 m to 43°18'31.4"N,

40°43'34.6"E, 2230 m), coll. I. A. Solodovnikov and E. V. Tatun, 08.08.2014.

Other material. Abkhazia, Gudauta District, Bzyb Mountains, northwestern slope of the Mt. Akugra, above the headwaters of the Reshava River (43°18'26.6"N, 40°42'48.3"E, 2030 m), coll. I. A. Solodovnikov and E. V. Tatun, 08.08.2014, SIA (1 spm).

Type locality. Abkhazia, Gudauta District, Bzyb Mountains, southeastern slope of the Mt. Dshyvka (43°18'41.7"N, 40°41'28.0"E, 1910 m).

Diagnosis. Slender, vigorously costate *Micropontica* with strongly projected aperture, high ending lamella inferior, missing lunella, and broad, through the aperture almost entirely visible clausilium plate.

[**Диагноз.** Тонкая, сильно ребристая *Micropontica* с сильно спроектированным устьем и высоко заканчивающейся нижней пластинкой, полуулунная складка отсутствует, клаузилий широкий, хорошо видимый через устье.]

Description. The elongate, conical, reddish-brown shell is comprised of 13.3 to 14.3 bulging whorls. The surface is covered by sharp, wide-spaced whitish ribs that gradually become weaker and denser toward the narrow apex. The last quarter whorl is detached, at its basis a weak crest is recognizable. The oblique, pear-shaped aperture is strongly projected, its wide brownish margin is non-reflexed. The weakly emerged but long lamella superior makes an almost straight transition into the laterally initiating lamella spiralis, with a slight trough at the contact. The lamella inferior descends close and parallel to the lamella spiralis and lamella superior, ending close to the latter at the upper part of the aperture. It initiates somewhat less deep than the lamella spiralis, and its outer end is not, or only barely visible in front view. The retracted lamella subcolumellaris bends far off, and then back to the columella where it ends horizontally, visible only in oblique view. The plica principalis reaches from the dorsal to the left lateral side. The dorsal plica superior is parallel to the principalis. No lunella is discernable. The lower palatal plica is long. Its anterior part is moderately emerged, but inward it becomes strong and reaches the lamella subcolumellaris. The broad clausilium plate widens abruptly, becomes broadest at two thirds of its length, and then bends strongly backward at its thick, rounded tip. Almost the entire plate is visible through the aperture.

Measurements. Holotype: Hs 13.2 mm, Ws 2.8 mm, Ha 2.4 mm, Wa 2.0 mm. Paratypes (type locality, n = 20): Hs 13.1–14.1 mm, Ws 2.6–2.9 mm, Ha 2.3–2.6 mm, Wa 1.9–2.2 mm.

Habitat. The new species occurs under the same habitat conditions and sympatrically with *A. (C.) likharevi* sp. nov. and at one of the localities with *A. (C.) reshaviensis* sp. nov.

Remarks. *Micropontica (B.) olgae* sp. nov. resembles *M. (B.) circassica* (Boettger, 1888), but easily distinguishable from that by its slender shell



FIG. 2. A. *Micropontica (Baleopsina) olgae* sp. nov., holotype (ZIN 1/511-2017, 13.1 mm). B. Alpine side valley above the headwaters of the Khipsta River, a typical habitat of *Acrotoma (Castelliana) likharevi* sp. nov. and *Micropontica (Baleopsina) olgae* sp. nov.

РИС. 2. А. Раковина *Micropontica (Baleopsina) olgae* sp. nov., голотип (ZIN 1/511-2017, 13.1 mm). В. Альпийские склоны долины выше истоков реки Хипста, типовое место обитания *Acrotoma (Castelliana) likharevi* sp. nov. и *Micropontica (Baleopsina) olgae* sp. nov.

with thin apex, strongly projected oblique aperture, very high positioned lamella inferior, missing lunella, and long, far forward-reaching lower plica.

Etymology. The new species is dedicated to Olga I. Solodovnikova, the elder daughter of the first author.

Discussion

On the basis of shell and genital morphology the genus *Acrotoma* is divided into five subgenera [Nordsieck, 2005; Suvorov, 2002; Likharev, Schileyko, 2007], namely the nominotypical subgenus, *A. (Acrotomina)* Nordsieck, 1977 (type species: *Clausilia semicincta* Boettger, 1881), *A. (Bzybia)* Nordsieck, 1977 [type species: *Acrotoma (Bzybia) claussi* Nordsieck, 1977], *A. (Castelliana)* Suvorov, 2002, and *A. (Iliamneme)* Likharev et Schileyko, 2007 [type species: *A. (Iliamneme) baryshnikovi* Likharev et Schileyko, 2007]. The above described two new species of the genus are most similar to the type species of *A. (Castelliana)*, and they share the spiral sculpture and blunt-tipped clausilium with both already known species of this subgenus. It is to be noted, however, that the current subgeneric classification of the *Acrotoma* species still needs molecular phylogenetic confirmation.

Acrotoma (C.) likharevi sp. nov. and *A. (C.) reshaviensis* sp. nov. seem to be closely related sister species, which occur next to each other, even with some overlap. They may have diverged from a common ancestor via allopatric speciation, which was initiated by range separation and accelerated by small population sizes. Then the present partial sympatry, the basis on which they are considered distinct species, would have resulted from more recent expansion and eventual contact of the formerly separate ranges.

The morphology-based subgeneric division of *Micropontica* by Nordsieck [1975] is consistent with the recent molecular phylogenetic result of Koch *et al.* [2016]. Whereas the monotypic nominotypical subgenus occurs at low altitude localities near Gagra, *M. (Baleopsina)* species inhabit subalpine and alpine regions of the Western Caucasus [Likharev, 1962]. *Micropontica (B.) olgae* sp. nov. shares the habitat preference of other *M. (Baleopsina)* species, and also the partial reduction of the clausiliar system, as opposed to that of *M. (M.) closta*, having deep positioned lunella, strong, elongate plica superior, and an elongate clausilium. These features indicate that the new species belongs to the subgenus *M. (Baleopsina)*, within which it is closest related to *M. (B.) circassica*.

The above described new species live in alpine habitats of the Bzyb Massif (Fig. 2B), roughly between 1800 and 2300 m. It seems possible that the isolation of this high altitude environment from

those of the main range of the Western Caucasus may have played a major role in the speciation of these highly endemic taxa.

Whereas it is typical for *M. (Baleopsina)* species to inhabit alpine regions, this is quite unusual for the members of *Acrotoma*. Most species of this genus occur at altitudes below 1000 m, with the notable exception of *A. (I.) baryshnikovi* from South Ossetia, which was collected at 1700 m [Likharev, Schileyko, 2007]. Intriguingly, the populations of *A. (C.) likharevi* sp. nov. at 1830 to 1920 m and 2280 to 2300 m do not show noticeable difference, nor do they differ in size from the *A. (C.) tunievi* specimens collected near Khosta (Krasnodar Territory) at about an altitude of 200 m [Suvorov, 2002]. Though *A. (C.) reshaviensis* sp. nov. is one of the smallest species of the genus, and the smallest if members of the small-size subgenus *A. (Acrotomina)* are not considered, this is clearly not only an altitudinal effect, because specimens of the sympatrically occurring *A. (C.) likharevi* sp. nov. have normal, undiminished shell size.

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Три новых вида Clausiliidae (Gastropoda, Pulmonata) из Абхазии

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РЕЗЮМЕ. Приводится описание *Acrotoma (Castelliana) likharevi* sp. nov., *Acrotoma (Castelliana) reshaviensis* sp. nov. и *Microponica (Baleopsina) olgae* sp. nov. с Бзыбского хребта с Абхазии. Обсуждается таксономическое положение, отношение к близким таксонам и зоогеографическое значение новых таксонов.

