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ORIGINAL ARTICLE

NEW SPECIES OF THE GENUS *FRUTICICOLA* HELD, 1838 (GASTROPODA, PULMONATA) FROM AFGHANISTAN

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ABSTRACT

In May 2021, one of the authors collected 22 specimens of land mollusks in the Khoja Mohammed Ridge, located in the northeastern part of Afghanistan. Shell is extraordinary, similar to *Fruticicola perlucens* (Rosen, 1903). However, having a number of differences, including a finely grained sculpture of the embryonic whorls, smoothly ribbed last whorl, evenly turned edges of the aperture, a strongly blurred white lip, and a clearly pronounced swollen base of the stylophore of this species, makes it describe of *Fruticicola pseudoperlucens* sp. nov. as new species to science.

Keywords: Afghanistan, Habitat, New species, Reproductive tract, Shell.

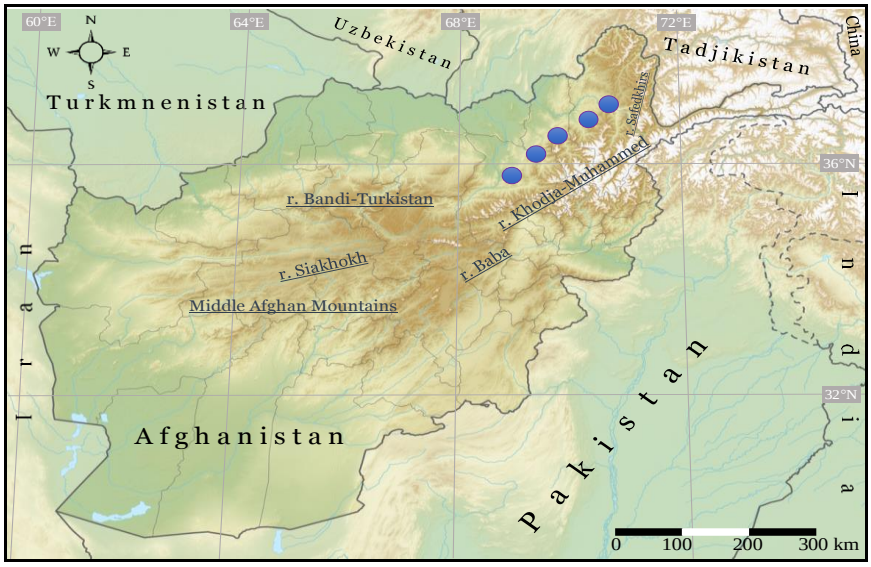
INTRODUCTION

From the malacological point of view, the territory of Afghanistan is one of the most unexplored regions of Central Asia; in terms of the mollusk fauna, no systematic and targeted study has been carried out at all (Kantor *et al.*, 2009). The earliest reports on Afghanistan molluscs consists of scattered descriptions of materials gathered on various military expeditions (Solem, 1979). Only the reports of Hutton (1850), who recorded 21 species, and Ancey (1893), who listed 27 taxa, are at all comprehensive.

However, information on terrestrial mollusks of Afghanistan from the genus *Fruticicola* Held, 1838, is available in the works of Jaeckel (1956), Likharev and Starobogatov (1967), and Solem (1979). For example, in the vicinity of Fayzabad, Jaeckel (1956) notes the presence of *"Cathaica" fedtschenkoi* (Martens, 1874), and Likharev and Starobogatov (1967) *"Cathaica" perlucens* (Rosen, 1901), and Solem (1979) *"Bradybaena" fedtschenkoi.*

MATERIALS AND METHODS

Research material: In 22 specimens, 20 of them were alive, the remaining 2 were empty shells, on May 17, 2021. Collected by M. Sohail from the northern slopes of Khodja-Muhammad Ridge: Fayzabad, Taloqan, Baghlani Jadid City, Kalafgan District, Mangal Village (Map 1). However, this species differs from *F. perlucens* in some conchological characteristics, and this difference necessitated a detailed conchological and anatomical study of this species. Therefore, in this research, our materials and the collection of mollusks (*F. fedtschenkoi*, *F. perlucens*) at the Zoological Museum of the Russian Academy of Sciences (Sankt-Peterburg) and Moscow State University (Moscow) were analyzed.



Map (1): Location map *Fruticicola pseudoperlucens.* [(Symbol: ●) collection points for material]. The points on the map are in order from top to bottom:(1) 37°05'26.0"N 70°33'34.5"E (Fayzabad City); (2) 36°50'42.2"N 70°05'40.1"E (Kalafgan District); (3) 36°40'26.5"N 69°37'43.6"E (Taloqan City); (4) 36°16'14.8"N 68°42'18.6"E (Baghlani Jadid City); (5) 35°59'18.1"N 68°32'08.3"E (Mangal Village).

Material collection and study of reproductive organ structure: The material is mainly hand-picked, as hand-picking provides a greater opportunity to fully explore the diverse biotopes of natural landscapes.The study of the composition and number of species is carried out as follows: species with a shell size of up to 8 mm are counted on an area of 0.25 sq.m., and those with a shell larger than 8 mm are counted on an area of 1 sq.m. The material is mainly collected in the morning in humid weather because at this time, the dew has not yet dried and many mollusks are actively moving, so they can be easily found.

The material was acquisition procedure and analysis of reproductive organ structures was carried out according to the methods of Schileyko (1978), Pazilov and Azimov (2003),

Pazilov and Umarov (2022). To study the structure of the genital organ of molluscs, it is necessary to first remove the soft body part from the shell. If the typed material is well fixed, it can be easily removed from the shell. Otherwise, the shell is broken and the soft body is separated. After the soft body is separated, it is placed in a paraffin bath with the right side up and the leg facing the observer, and a 70 % ethyl alcohol solution is poured into it. Specimens were studied using an OLYMPUS SZ61-SET Stereo Microscope.

Fixation of materials: Fixation is carried out by the method of Bratchik (1976), the mollusk is placed in a jar, water at room temperature is poured over it, and the mouth of the jar is tightly closed with a lid. Then the jar is placed in a container with water, and temperature of the water is gradually raised to 70°C in 40-50 minutes, after the molluscs die, they are taken out and placed in 70 % ethyl alcohol (Schileyko, 1978).

Identification: The study of collected materials in laboratory conditions began with the determination of species composition. First of all, shell markings were studied. That is, the shape of the shell, the number of rolls is determined, and the size and color of the shell are taken into account (Pazilov and Azimov, 2003). Secondly, the reproductive organ of molluscs is studied anatomically. The reason is that the reproductive organ of molluscs differs in each species. To study the reproductive organ, the genital opening under the right eye tentacles of the mollusk is found and cut transversely. It is then cut with sharp surgical scissors from the lower part of the body up to the folds of the mantle. Five specimens of each species were studied in order to determine the genital organ (Schileyko, 1978).

RESULTS AND DISCUSSION

It should be noted that during the last 50 years, the first Malacological studies were conducted in the territory of Afghanistan, in 2021 found specimens of a species similar to *Fruticicola perlucens* (Rosen, 1901) from the northern slopes of Khoja-Muhammad Ridge (Solem, 1979).

According to the results of the conducted research, the mollusc collected from the northern slopes of the Khoja-Muhammad Ridge differed from the close morphological group (*F. fedtchenkoi, F. perlucens*) in terms of conchological and reproductive organ structure, and was recognized by us as a new scientific species *Fruticicola pseudoperlucens.*

Systematic

According to Sysoev and Schilleyko (2009), the taxonomic rank of this species is as follow:

Phylum: Mollusca
Class: Gastropoda
Order: Stylommatophora
Superfamily: Helicoidea Rafinesque, 1815
Family: Camaenidae Plisbry, 1939
Subfamily: Bradybaeninae Plisbry, 1939
Genus: *Fruticicola* Held, 1838
Species: *Fruticicola pseudoperlucens* sp. nov. (Pl. 2)

Type locality: Khoja Mohammed Ridge (North-Eastern part of Afghanistan).
Materials: 22 specimens. from a typical location, May 17.v.2021; 7 specimens were anatomized.

The holotype **(**№ Bm-707) and 11 paratypes **(**№ Bm-708) are deposited at Gulistan State University.

Etymology: Derived from the combination of the words “pseudo” and “perlucens”, “pseudo” is a Greek word that means “false”, and “perlucens” is the species name, that is, *pseudoperlucens* means “false perlucens”.

Plate (1): *Fruticicola pseudoperlucens* sp. nov. Khoja Mohammed Ridge (Afghanistan).

The description

Shell pressed, moderately hard-walled, composed of 4.5 more convex whorls. Last whorl to mouth, with smoothly lowered and slightly more than 1.5 times wider than the penultimate one. Shell with grayish-pink color; embryonic turns (about 1.5) light yellow. Surface of embryonic whorls, shiny, with fine grains. Sculpture of upper definitive turns in form of a rather frequent radial wrinkling; last whorl toward aperture smoothly ribbed; lower ones often represented by a thin trickle striation and sometimes rough folds. Aperture with wide-oval, rather strongly beveled, edges evenly turned away, the places of its attachment are slightly brought together and connected by a thin callus. At the aperture, there is a very blurred lip. umbilicus with funnel-shaped promising, its width about 1/7 of the diameter of shell. The height of the shell is 10-12, the large diameter is 21-23 mm; the holotype is 10.5- 22.5, respectively.

Vas deferens thin, forming several unstable bends before the penis attaches. Penis retractor very short, and located at the attachment points of vas deferens and penis; penis thin, cylindrical. Stylophore massive, club-shaped. Additional sac is well developed, squeezed between stylophore and wall of vagina. The mucous glands flow in on the basis of an additional sac. Stylophore with pronounced swelling basally; vagina wide; free ovid very

steeply curved twice, length of which is about 1.5 times longer than vagina. Duct of vas deferens thickened at basal part. Reservoir of a seed receptacle with a spherical shape (Pl. 2).

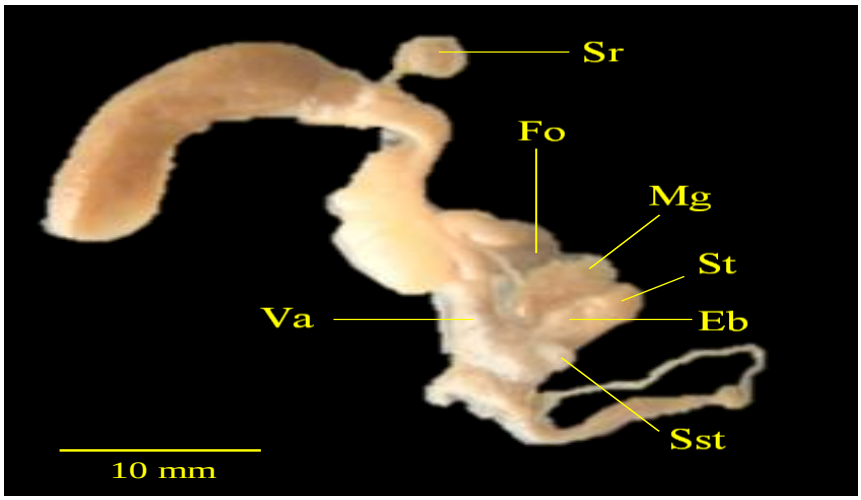


Plate (2): *Fruticicola pseudoperlucens.* Reproductive tract. (Va-Vagina, Sr-spermathecal reservoir, Fo-free oviduct, Mg-mucous glands, St-stylophore, Eb- extra bag, Sst- swollen stylofor).

Distribution and habitats

The species is known only from a typical location and inhabits large-scale talus.

The Conchological and anatomical differences of the new species from the related species

The difference in conchological signs: *F. Pseudoperlucens* sp. nov. is very similar to *F. perlucens* (Pl. 3) in shell structure. However, it is distinguished by the following conchological characters: sculpture of embryo shells has a fine-grained, sandy appearance; last whorl covered with a smooth rib-like growth near aperture of shell; conch aperture edges evenly turned back; aperture of shell has a strongly spreading white lip; last whorl strongly bent towards aperture.

Plate (3): *Fruticicola perlucens.* Shell from the same locality as *F. pseudoperlucens.*

The difference in anatomical structure

The structure of the reproductive organ of the new species is distinguished by the following features: an additional sac-like growth is indistinctly developed and is not sensitized at the base of a large stylophore; the claw-like mucous gland is attached to the base of the extra saccular tumor. In *F. perlucens*, the accessory sac-like growth is well developed, even larger than the stylophore (Pl. 4); the claw-like mucous gland is adjoined in the apical position to the extra saccular tumor. The new species has a swelling at the base of the stylophore, which is not found in the free-growing *F. perlucens.*

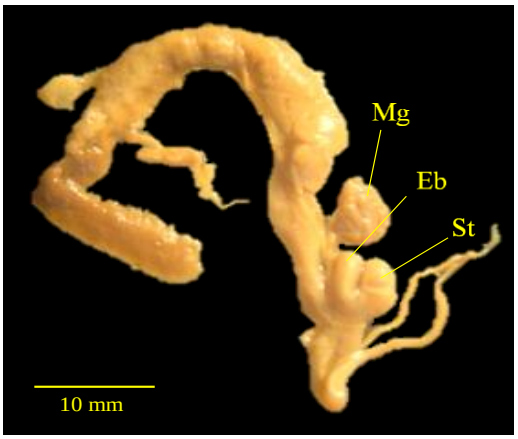


Plate (4): *Fruticicola perlucens.* Reproductive tract. (Mg-mucous glands, St-stylophore, Eb- extra bag.

Based on the facts presented in the material, the following conclusions can be drawn. First, do the *Cathaica fedtschenkoi* (Martens, 1874) mentioned by Jaeckel (1956) and the *Bradybaena fedtschenkoi* (Martens, 1874) mentioned by Solem (1979) really occur in Afghanistan? At this point, it should be noted that the current range of *F. fedtschenkoi*

(Martens, 1874) is limited to Western Tien-Shan and is not found in other regions of Central Asia, especially in Afghanistan.

Secondly, Likharev and Starobogatov (1967) in their work noted that "*Cathaica*" *perlucens* is distributed around Fayzabad. In fact, the occurrence of *F. perlucens* in the Kuhitang mountain range in southern Uzbekistan, adjacent to Afghanistan, was reported in our works (Schileyko *et al.*, 2017, 2020). However, during the malacological research conducted by M.Sohail in Afghanistan in 2021, the distribution of F. perlucens species from the above-mentioned Fayzabad (and other) areas was not detected.

Currently, *Cathaica perlucens* (Rosen, 1901), included in the genus *Fruticicola* by Schileyko and Rymzhanov (2013), is in the same morphological line with *F. pseudoperlucens*, which is recognized as a new species. While the structure of the shell is similar to each other, they differ sharply in terms of the structure of the reproductive organ. This sharp difference led to the recognition of *F. pseudoperlucens* as a new species.

In our opinion, it is necessary to continue extensive malacological research in the territory of Afghanistan. This allows enriching the malakofauna not only of Central Asia, but also of the world with new information.

CONCLUSIONS

Thus, considering the above data, we can draw the following conclusions, including: these species, living within the same scree, do not differ in anything except the structure of the organs of the female reproductive tract, which was the main reason for the description of a new species, *F. pseudoperlucens.*

CONFLICT OF INTEREST STATEMENT

We declare that there is no conflict of interest between the authors. We confirm that all the pictures in the manuscript belong to us. We note in this study that there is no conflict of interest regarding the use of the Gulistan State University laboratory.

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نوع جديد للجنس *Fruticicola* Held, 1838 من أفغانستان (Gastropoda, Pulmonata)

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الخلاصة

في ايار 2021، جمع أحد المؤلفين 22 عينة من الرخويات البرية في سلسلة جبال خوجة محمد الواقعة في الجزء الشمالي الشرقي من أفغانستان. قشرتها غير عادية، تشبه النوع *Fruticicola perlucens* (Rosen, 1903) . مع ذلك، هناك عدد من الاختلافات بما في ذلك النحت الدقيق للحلقات الجنينية embryonic whorls؛ الحلقة الأخيرة مضلعة بسلاسة؛ حواف الفتحة مستديرة بشكل متساوٍ، الشفة بيضاء غير واضحة بشدة؛ إن وجود قاعدة منتفخة واضحة المعالم لـ stylophore لهذه العينة جعلها ان توصف كنوع جديد للعلم *Fruticicola pseudoperlucens* sp. nov.