First record of *Hesseola bactriana* (Mollusca: Gastropoda: Hygromiidae) in Uzbekistan

Abduvaeit P. Pazilov[1], Farrukh U. Umarov[2*], Zarina A. Soatova[3], Dilfuza S. Umarova[4]

[1] Department of Biology, Gulistan State University, Mavze 4, Gulistan, 120100 Uzbekistan.
[2] Department of Ecology and Botany, Andijan State University, 170100, St. Universitet 129, Andijan, 170100 Uzbekistan.
[3] Department of Zoology, Termez State University, St. Barkamol avlod 43, Termez, 190111 Uzbekistan.
[4] Andijan Machine Building Institute, Andijan, St. Babur Shoh, Andijan, 170100 Uzbekistan.
** Corresponding author*
Abduvaeit Pazilov: vahid_pazilov@mail.ru ORCID 0000-0002-2587-1377
Farrukh Umarov: eco_umarov@mail.ru ORCID 0000-0003-3530-1500
Zarina Soatova: soatova.zarina@mail.ru ORCID 0000-0002-0493-9811
Dilfuza Umarova: tex.umarova@gmail.com ORCID 0000-0002-7494-0332

ABSTRACT: In the southern part of Uzbekistan, the abundance of mountains, rivers and vegetation cover, as well as the heat of the climate allowed the widespread distribution of terrestrial molluscs. Research on molluscs was carried out in this area, that is, in the Boysuntau Ridge in the south of Uzbekistan, during the years 2017–2021. During the study of the collected materials, it was discovered for the first time that a terrestrial snail species, *Hesseola bactriana* (Hutton, 1849), for the fauna of Uzbekistan. The conchological variability of *H. bactriana* found in Uzbekistan was studied. The results showed that high variability was noted in shell color, the peripheral band and the palata lip. In our opinion, Uzbekistan population of this species may have originated through natural dispersal from the territory of Afghanistan.
How to cite this article: Pazilov A.P., Umarov F.U., Soatova Z.A., Umarova D.S. 2024. First record of *Hesseola bactriana* (Mollusca: Gastropoda: Hygromiidae) in Uzbekistan // Invert. Zool. Vol.21. No.4. P.487–494. doi: 10.15298/invertzool.21.4.04

KEY WORDS: *Hesseola bactriana*, shell, variability, reproductive anatomy, Uzbekistan.

Первая находка *Hesseola bactriana* (Mollusca: Gastropoda: Hygromiidae) в Узбекистане

Абдуваит Пазилов[1], Фаррух Умаров[2*], Зарина Соатова[3], Дилфуза Умарова[4]

[1] Кафедра биологии Гулистанский государственный университет, Мавзе 4, Гулистан, 120100 Узбекистан
[2] Кафедра экологии и ботаники, Андижанский государственный университет, ул. Университет 129, Андижан, 170100 Узбекистан.
[3] Кафедра зоологии, Термезский государственный университет, ул. Баркамола, 43, Термез, 190111 Узбекистан.
[4] Андижанский машиностроительный институт, Андижан, ул. Бабур Шох, Андижан, 170100 Узбекистан.
** Автор для корреспонденции: eco_umarov@mail.ru*

РЕЗЮМЕ: В южной части Узбекистана обилие гор, рек и растительного покрова, а также жаркий климат способствовали широкому распространению наземных моллю-

ков. Исследования моллюсков проводились в этом районе, то есть в хребте Бойсунтау на юге Узбекистана, в течение 2017–2021 гг. При изучении собранного материала впервые для фауны Узбекистана обнаружен вид наземной улитки *Hesseola bactriana* (Hutton, 1849). Изучена конхологическая изменчивость *H. bactriana*, обнаруженной в Узбекистане. Результаты показали, что высокая изменчивость была отмечена по цвету раковины, периферической перемычки и палатальные губы. По нашему мнению, узбекская популяция этого вида могла возникнуть в результате естественного расселения с территории Афганистана.
Как цитировать эту статью: Pazilov A.P., Umarov F.U., Soatova Z.A., Umarova D.S. 2024. First record of *Hesseola bactriana* (Mollusca: Gastropoda: Hygromiidae) in Uzbekistan // Invert. Zool. Vol.21. No.4. P.487–494. doi: 10.15298/invertzool.21.4.04

КЛЮЧЕВЫЕ СЛОВА: *Hesseola bactriana*, раковина, изменчивость, репродуктивная анатомия, Узбекистан.

Introduction

The first information about the malacofauna of Uzbekistan was recorded in the works of Martens (1870, 1871), and it was shown that 3 taxa of land molluscs are distributed around Samarkand. Further information on the systematics of molluscs in Uzbekistan is given in the works of Likharev & Rammelmeyer (1952), Schileyko (1978, 1984), Daminova (2002), Pazilov & Azimov (2003), Izzatullayev (2018, 2019), Umarov & Pazilov (2022), Solijonov & Umarov (2022), Abdulazizova *et al.* (2023).

According to results of the terrestrial mollusc survey of Uzbekistan started during the 90s, more than 170 terrestrial molluscs have been recorded (Pazilov, Azimov, 2003). It should be noted that the studies have an uneven nature in terms of regions, and the main malacological studies covered the eastern and central regions of Uzbekistan (Likharev, Rammelmeyer, 1952; Pazilov, Azimov, 2003; Sysoev, Schileyko, 2009). Information on the malacofauna of the northwestern and southern regions is very scarce, and the existing ones are fragmentary (Daminova, 2002; Abdulazizova, 2019; Solijonov *et al.*, 2023).

Expeditions were organized by A. Pazilov, Sh. Abdulazizova and Z. Soatova in 2017–2021 in order to study the malacofauna of the southern regions of Uzbekistan, and materials related to terrestrial molluscs were collected. According to the analysis of collected materials, 2 camaenid genera (*Kugitangia* Schileyko, Pazilov et Abdulazizova, 2017; *Neofruticola* Schileyko, Pazilov et Abdulazizova, 2020) and 2 species (*Kugitangia hatagica* Schileyko, Pazilov et Abdulazizova, 2017; *Neofruticola donum* Schileyko, Pazilov et Abdulazizova, 2020) new to science were recorded by Schileyko *et al.* (2017, 2020).

Among the collected material, presence of a new record for the fauna of Uzbekistan was recognized. Conchology and reproductive anatomy of this newly recorded taxon are described in this paper with notes on conchological variability among different populations.

Materials and methods

Material collection was carried out according to the method of Schileyko (1978) and the material was picked by hand with tweezers, mainly in wet weather in the morning. This is because most molluscs are active in the morning and can be easily found. The collected materials were placed in separate labeled boxes. The label shows the name of the place where the material was collected, the biotope, and by whom and when it was collected.

Fixation was performed according to the methods of Bratchik (1976) and Schileyko (1978, 1984). Live terrestrial molluscs are kept in vials (50–500 ml) filled with water and tightly closed for 20–30 hours. During this time, the mollusc dies in the water. In this case, the water used must first be boiled and then cooled to room temperature. Dead molluscs drowned in water are stored in 40% ethyl alcohol for 4–7 days. It is then stored at 80% for 1–2 weeks, after which it is transferred to 75% for permanent storage. The soft body of well-processed molluscs can be easily separated from the shell and studied anatomically.

Anatomical research of molluscs was performed based on the methods of Schileyko & Rymzhanov (2013). MBS-9 stereomicroscope is used for anatomic study of molluscs. To dissect the molluscs, the genital opening below the right eye tentacles is first found, cut short transversely, and the underside of the body down to the mantle folds is dissected with sharp surgical scissors or a sharpened needle. The reproductive

Fig. 1. *Hesseola bactriana*; Uzbekistan: Gummatak Village. Photo by A.P. Pazilov.
Рис. 1. *Hesseola bactriana*; Узбекистан: село Гумматак. Фото А.П. Пазилова.

organ is completely removed from the inside of the body and its structure is studied.

All statistical data on the variability of conchological and anatomical characters were analyzed according to the method of Lakin (1980).

In the statistical analysis of morphometric indicators, the arithmetic average index (M), average statistical error (m), coefficient of variation (CV) of each character was calculated.

Morphometric parameters were measured and standard shell indices were calculated (Snegin, Adamova, 2016): shell width [SW], shell large width [SLW], shell small width [SSW], shell height [SH], spire height [SpH], aperture height [AH], aperture width [AW]; shell volume was calculated ($V = SW^2 \times SH/2$); aperture area was calculated ($S = 3{,}145 \times AH \times AW/4$); Indexes were determined (SW/SH, AH/AW, SpH/SH, V/S).

Results and discussion

As a result of the conducted research, *Hesseola bactriana* was recorded for the first time in Uzbekistan. Below is its systematic place.

Systematical part

Class Gastropoda Cuvier, 1797
Subclass Pulmonata Cuvier, 1817
Order Geophila Férussac, 1812
Suborder Helicoidei Schileyko, 1979
Superfamily Helicoidea Rafinesque, 1815
Family Hygromiidae Tryon, 1866
Subfamily Hesseolinae Schileyko, 1990
Genus *Hesseola* Lindholm, 1927
Hesseola bactriana (Hutton, 1849)
Figs 1–4.

Reeve, 1854: 195, fig. 1376 (*Helix bactriana*); Gude, 1914: 209–210 (*Cathaica bactriana*); Jaeckel, 1956: 350–351, figs 9, 10, Likharev, Starobogatov, 1967: 191, Solem, 1979: figs 28d–f, 32 (*Euomphalia bactriana*); Schileyko, 1978: 265, figs 335, 336, Pl. XV, fig. 142 (*Hesseola transcaspia*); Sysoev, Schileyko, 2009: 222, fig. 141: E, F.

The research material was collected from the south of Uzbekistan (123 individuals, of which 40 are alive, the remaining 83 are dry shells). These materials were collected on 17.04.2017 in the vicinity of the village of Gummatak in the south-eastern part of the Boysuntou Ridge (38°20′22.2″N 67°21′49.6″E); 9.05.2018 among grass near the water in Jurgati pass (38°26′02.7″N 67°24′42.7″E); 15.04. 2020 in the village of Yukori Machay (38°20′21.7″N 67°05′11.3″E) in the north-western part of the Boysuntou Ridge and among the bushes in the open ground, and in the village of Pastki Machay (38°19′05.4″N 67°02′58.7″E) collected from various herbaceous plants (Fig. 1). In addition, material provided by I.V. Muratov at the Zoological Museum of the Moscow State University (Russia) with collection numbers Lc-20777-20795, 21888, 21889, 21897-21899, 22697, 22756, 22758, 22763, 22767, 25506, 25509 was used to study the processes of variation in the *Hesseola bactriana.*

To our knowledge, no research has reported *Hesseola bactriana* from Uzbekistan so far (Likharev, Rammelmeyer, 1952; Schileyko, 1978; Pazilov, Azimov, 2003; Schikov, 2017). The results of this study hence provide the first evidence of the occurrence of this species in Uzbekistan.

CONCHOLOGICAL REMARKS. The structure of the shell corresponds to the literature (Schileyko, 1978; Solem, 1979), but has a variable character. Shell is ± spherical, spire dome-shaped, its height almost equal to the height of the shell aperture. Shell whorls are 4.5–5.5, slightly convex, separated from each other by a shallow suture. The edges of the last whorl are rounded, 1.5 times wider than the preceding whorl, and suddenly bent at the aperture. The color of the shell is horn-red, with a pale white band on the edge. Shell sculpture is made up of thick growth lines and short hairs. The aperture of the shell is slightly curved, rounded, margins are reflected, columellar margin is slightly covering the cylindrical umbilicus marginally. A little inside the apertural margins, a white, thickened internal lip is present. Morphometric measurements of *H. bactriana* are presented in Table 1.

Table 1. Morphometric parameters of *Hesseola bactriana* (dimensions in mm / mm^2 / mm^3).
Таблица 1. Морфометрические параметры *Hesseola bactriana* (размеры в мм/мм^2/мм^3).

Site*	SW	SH	SpH	AH	AW	SH/SW	AH/AW	SpH/SH	V	S	V/S
I	7.2 ±0.06	12.6 ±0.05	3.4 ±0.04	6.04 ±0.03	6.8 ±0.04	1.75 ±0.002	0.89 ±0.003	0.27 ±0.0003	326.59 ±6.07	32.24 ±0.32	10.13 ±0.17
II	7.4 ±0.06	12.9 ±0.08	3.5 ±0.05	6.12 ±0.04	7 ±0.05	1.74 ±0.004	0.87 ±0.003	0.27 ±0.003	353.2 ±8.75	33.63 ±0.48	10.5 ±0.21
III	7.9 ±0.08	13 ±0.09	3.6 ±0.05	6.6 ±0.04	7.1 ±0.05	1.65 ±0.004	0.93 ±0.004	0.28 ±0.002	405.67 ±12.1	36.79 ±0.74	11.03 ±0.29
IV	8.2 ±0.05	13.3 ±0.05	3.9 ±0.04	6.8 ±0.03	7.2 ±0.04	1.62 ±0.003	0.94 ±0.003	0.29 ±0.002	447.15 ±15.88	38.43 ±0.05	11.63 ±0.11

*I — Yukori Machay Village; II — Pastki Machay Village; III — Gummatak Village; IV — Jurgati Pass.

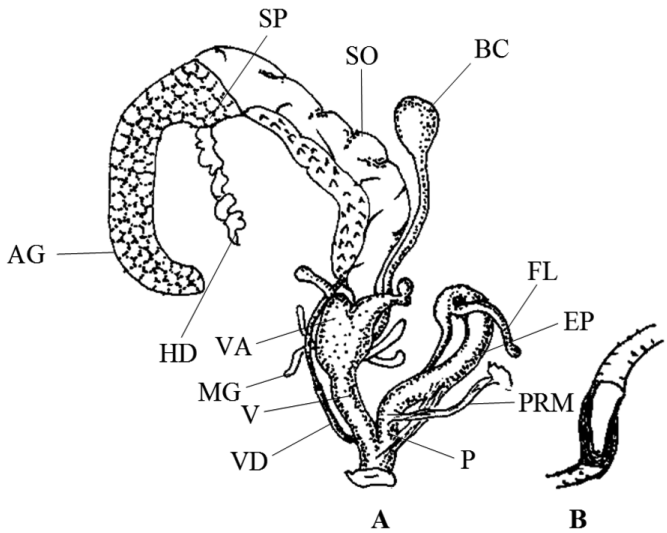
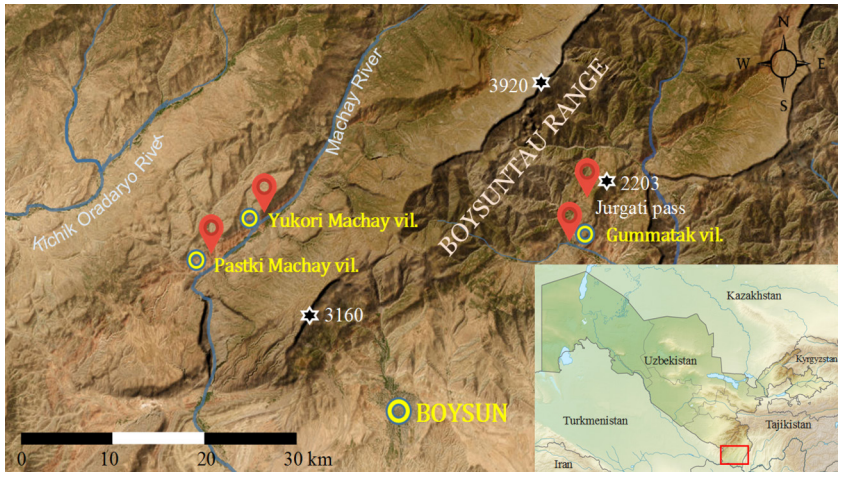


Fig. 2. *Hesseola bactriana*. A — reproductive tract; B — penis opened.
AG — albumen gland; BC — bursa copulatrix; EP — epiphallus; FL — flagellum; HD — hermaphroditic duct; MG — mucus glands; P — penis; PRM — penial retractor muscle; SP — spermathecae; SO — spermoviduct; VD — vas deferens; V — vagina; VA — vaginal appendages.
Рис. 2. *Hesseola bactriana*. A — репродуктивный тракт; B — пенис.
АГ — белковая железа; BC — копулятивная сумка; EP — эпифалл; FL — жгутик; HD — гермафродитный проток; MG — слизистые железы; P — пенис; PRM — пениальная мышца-ретрактор; SP — сперматеки; SO — спермояйцепровод; VD — семяпровод; V — влагалище; VA — придатки влагалища.

REPRODUCTIVE ORGANS. Spermoviduct and the distal part of the ovary are slightly curved. Mucous gland is 2×2 and is located at the base of the spindle-shaped vaginal protuberance. The penis is developed in various degrees, very short (in this case, a long and thin penial retractor attached near the cloaca) or normal (in this case, the penial retractor is located near the middle of the penis).

Flagellum is 2.5 times shorter than epiphallus. The well developed seminal vesicle, having a sac-like structure and its length reaching the upper part of the spermatoviduct (Fig. 2).

DISTRIBUTION. In Uzbekistan (Map): South-eastern part of Boysuntou Ridge, around Gummatak Village, Jurgati Pass, the North-western part of Boysuntou Ridge, Pastki Machay, around Yukori Machay Village (Fig. 3). Outside Uzbekistan, it is distributed in central and western Kopet Dagh area and Afghanistan (Solem, 1979; Sysoev, Schileyko, 2009).



Map. Collection sites of *Hesseola bactriana*.
Карта. Места сбора *Hesseola bactriana*.

Fig. 3. The biotope of *Hesseola bactriana* (Hutton, 1849). Uzbekistan, Surkhandarya region Near the village of Yukori Machay. Photo by Z.A. Soatova.
Рис. 3. Биотоп *Hesseola bactriana* (Hutton, 1849). Узбекистан, Сурхандарьинская область возле села Юкори Мачай. Фото З.А. Соатовой.

Due to similarity of our specimens to the figured specimen (Fig. 4) in Solem (1979), from Kandahar area, as well as the collected material from the area inspected by us in 2020, it is concluded that our material reflects a range extension from Afghanistan.

CONCHOLOGICAL VARIATION. The variability of conchological characteristics is reflected in the color of the shell, the structure of the shell aperture, and the morphometric dimensions.

In the vicinity of Gummatak village, the shell color of the representatives living among the grassy plants is horn-red. In the specimens of the Jurgati Pass, found amongst the grass near the water, the shell color is reddish. The shell color of the representatives found among the bushes in the open lands around the village of Yukori Machay is pale yellow.

The development of the peripheral band and palatal lip also reflects the process of adaptation to the environment. For example, the white peripheral band and palatal lip are well developed in the snails living among the bushes in the open lands around the village of Yukori Machay, while they are hardly noticeable in the representatives living among the grassy plants around the village of Gummatak. In the Jurgati Pass, among the grasses near the water's edge, the peripheral white band and the palatal lip are not developed at all. We believe that the different degrees of development of the peripheral band depend on the

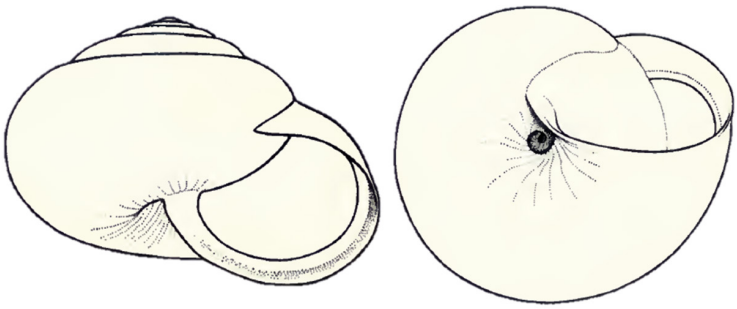


Fig. 4. *Hesseola bactriana* (=*transcaspia*) (Hutton, 1849), SH 13.2 mm; Kandahar, Afghanistan (after Solem, 1979).
Рис. 4. *Hesseola bactriana* (=*transcaspia*) (Hutton, 1849), SH 13,2 мм; Кандагар, Афганистан (по Solem, 1979).

Table 2. Variability of morphological characters of *Hesseola bactriana* in different populations (dimensions in mm).
Таблица 2. Изменчивость морфологических признаков *Hesseola bactriana* в разных популяциях (размеры в мм).

No.	Population	SH	SLW	SSW	AH
1.	Yukori Machay Village	6.15 ± 0.5 CV % 2.85	11.09 ± 0.5 CV % 2.04	10.58 ± 0.7 CV % 3.13	6.64 ± 0.4 CV % 3.14
2.	Pastki Machay Village	6.34 ± 0.5 CV % 2.65	12.05 ± 0.5 CV % 2.24	10.95 ± 0.7 CV % 2.94	6.8 ± 0.4 CV % 3.27
3.	Gummatak Village	7.16 ± 0.5 CV % 2.84	12.55 ± 0.1 CV % 3.25	11.15 ± 0.5 CV % 1.83	6.05 ± 0.2 CV % 1.23
4.	Jurgati Pass	8.19 ± 0.5 CV % 5.42	13.15 ± 0.5 CV % 1.62	12.15 ± 0.5 CV % 1.93	7.56 ± 0.1 CV % 1.16

degree of control of light and temperature. That is, the whitish peripheral band is well developed in molluscs living in open areas on the southern slopes with a lot of sunlight, and on the contrary, it is almost not developed on the northern slopes. Likewise, due to correlation with the drier and higher habitats, the degree of development in the palatal lip can be considered as an adaptation of molluscs to drought conditions as the lip can reduce the intensity of evaporation from the body of the mollusk.

In *H. bactriana*, compared to the qualitative variability of the conchological characters, it was found that there is a significant variability in the morphometric dimensions (Tab. 2).

From the data in this table it is clear that the most stable of the studied characters are: the height of the large and small diameters, as well as the height of the aperture, having a CV of less than 5%, and the most variable is the height of the shell. The high stability of relative characteristics indicates the proportionality of growth processes during ontogenesis and, obviously, is an adaptive reaction that provides mollusks with an optimal ratio of shell size and energy costs for movement. Stable ratios of the diameter of the aperture ensure, in addition, minimal loss of moisture due to evaporation through the aperture, which is especially important in conditions of episodic extreme droughts characteristic of the arid landscapes of southern Uzbekistan.

Conclusions

As a result of the malacological research conducted in the understudied southern regions, *Hesseola bactriana* was determined as a new record for the fauna of Uzbekistan. The current range of this species includes the Boysuntau Ridge, and outside Uzbekistan, central and western Kopet Dag and Afghanistan.

Qualitative variability of the conchological features such as shell color, development of the peripheral band and palatal lip, and morphometric

dimensions. The variability of all the characteristics of the shell in arid climates depends on the place of residence and is one of the features of adaptation of land molluscs to arid landscapes.

Conflict of interest
The authors declare no conflicts of interest.

Author contributions. Abduvaeit P. Pazilov and Zarina A. Soatova planned the experiments and interpreted the results. Abduvaeit P. Pazilov, Farrukh U. Umarov and Dilfuza S. Umarova wrote the manuscript, statistically analyzed the data, and created illustrations.

Acknowledgments. We are grateful to Mehrangiz Sohail, an employee of Faryab University, who helped us in collecting materials from the territory of Afghanistan.

References

Abdulazizova Sh.K. 2019. [Biological diversity of land mollusks in Surkhan-Sherobad Valley and surrounding mountains]. [Thesis of Candidate (Ph.D.) of Biological Sci. Degree]. Tashkent: Institute of Zoology Uzbekistan Acad. of Sci. 20 p. [In Uzbek, with Russian and English summaries]

Abdulazizova Sh.K., Pazilov A.P., Sohail M., Umarov F.U. 2023. New species of the genus Fruticicola Held, 1838 (Gastropoda, Pulmonata) from Afghanistan // Bull. Iraq nat. Hist. Mus. Vol.17. No.4. P.549–557. https://doi.org/10.26842/binhm.7.2023.17.4.0549

Boettger O. 1889. Die Binnenmollusken Transkaspiens und Chorassans // Zool. Jahrb., Abth. Syst. Geog. Biol. No.4. P.925–992. [in German].

Bratchik R.Ya. 1976. [A method of rapid fixation in terrestrial molluscs] // Zoologichesky Zhurnal. Vol.55. No.7. P.1078–1079 [in Russian].

Daminova D.R. 2002. [Terrestrial mollusks of the northwestern part of the Pamir-Alai mountain system]. [Thesis of Candidate (Ph.D.) of Biological Sci. Degree]. Tashkent: Institute of Zoology Uzbekistan Acad. of Sci. 20 p. [In Uzbek, with Russian and English summaries]

Gude G.K. 1914. The Fauna of British India. Mollusca-II. (Trochomorphidae-Janellidae). London: Taylor & Francis. 520 p.

Hesse P. 1931. Zur Anatomie und Systematik palaerktischer Stylommatophoren // Zoologica. Bd.31. H.81. S.1–118.

Hutton T. 1849. Notices of some Land and Fresh Water Shells occurring in Afghanistan // J. Asiatic Society of Bengal. Vol. 2. No.18. P.649–661.

Izzatullaev Z.I. 2018. [Molluscs water ecosystems of Central Asia]. Tashkent: Lesson-Press. 232 p. [In Russian]

Izzatullaev Z.I. 2019. [Fauna of the molluscs of water ecosystems of Central Asia and the contiguous country territories]. Tashkent: Lesson-Press. 339 p. [In Russian]

Jaeckel S. 1956. Die Weichtiere (Mollusca) der Afghanistan-Expedition (1952 und 1953) // Mitt. Zool. Mus. Berlin. Bd.32. H.2. S.337–353.

Kantor Yu.I., Vinarski M.V., Schileyko A.A., Sysoev A.V. 2010. Catalogue of the continental mollusks of Russia and adjacent territories. Version 2.3.1. http://konstantinz.byethost32.com/books/kantor_2010.pdf

Lakin G. F. 1990. [Biometrics]. Moscow: Vysshaya Shkola. 352 p. [In Russian]

Likharev I.M., Rammelmeyer E.S. 1952. [Surface shellfishes of fauna of the USSR] // Opredeliteli po faune SSSR, izdavaemye Zoologicheskim Institutom. Moscow- Leningrad: AN SSSR Publ. 512 p. [In Russian]

Likharev I.M., Starobogatov Y.I. 1967. [On the molluscan fauna of Afghanistan] // Trudy Zoologicheskogo Instituta AN SSSR. Vol.42. P.159–197 [in Russian].

Martens E. 1870. Ueber eninge conchylien aus Samarkand // Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin. S.56–57.

Martens E. 1871. Die ersten Landschnecken von Samarkand // Malakozool. B1. Bd.18. S.61–69.

Pazilov A., Azimov D.A. 2003. [Land mollusca (Gastropoda, Pulmonata) of Uzbekistan and Contiguous Territories]. Tashkent: Fan Publ. 316 p. [In Russian]

Pazilov A.P., Umarov F.U. 2022. Conchological variability of terrestrial mollusk *Chondrulopsina fedtschenkoi* (Ancey, 1886) (Gastropoda, Pulmonata, Enidae) from the Zarafshan Range, Uzbekistan // Bull. Iraq nat. Hist. Mus. Vol.17. No.1. P.103–113. https://doi.org/10.26842/binhm.7.2022.17.1.0103

Reeve L. 1851–1854. Monograph of the genus Helix // Conchologia iconica, or, illustrations of the shells of molluscous animals. Vol.7. 898 p.

Schikov E. V. 2017. [Some adventitious species of terrestrial molluscs Central Asia] // Ruthenica. Vol.27. No.2. P.81–86 [in Russian, with English summary]. https://doi.org/10.35885/ruthenica.2017.27(2).3

Schileyko A.A. 1978. [Terrestrial mollusks of the superfamily Helicoidea] // Fauna SSSR. Mollyuski. Vol.3. Vyp.6. Leningrad: Nauka Publ., Leningradskoe otdelenie. 384 p. [In Russian]

Schileyko A.A. 1984. [Terrestrial molluscs of the suborder Pupillina of the USSR fauna (Gastropoda, Pulmonata, Geophila)] // Fauna SSSR. Mollyuski. Vol.3. Vyp.3. Leningrad: Nauka Publ., Leningradskoe otdelenie. 399 p. [In Russian]

Schileyko A., Pazilov A., Abdulazizova Sh. 2017. [A new genus of the Bradybaenidae family (Gastropoda, Pulmonata) from Central Asia] // Ruthenica. Vol.27. No.1. P.31–37 [in Russian, with English summary]. https://doi.org/10.35885/ruthenica.2017.27(1).3

Schileyko A., Pazilov A., Abdulazizova Sh. 2020. One more surprise from Bradybaenidae (Gastropoda, Pulmonata) // Ruthenica. Vol.30. No.4. P.217–221 [in Russian, with English summary]. https://doi.org/10.35885/ruthenica.2021.30(4).6

Schileyko A.A., Rymzhanov T.S. 2013. [Fauna of land mollusks (Gastropoda, Pulmonata terrestria) of Kazakhstan and adjacent territories]. Moscow-Almaty: KMK Sci. Press. 389 pp. [In Russian]

Snegin E.A., Adamova V.V. 2016. [Analysis of demographic and morphological parameters of adventitious Stenomphalia ravergiensis (Mollusca, Gastropoda, Pulmonata) populations in the south of the Central Russian Upland] // Vestnik Tomskogo Gosudarstvennogo Universiteta, Biologiya. Vol.3. No.35. P.149–160 [in Russian, with English summary]. https://doi.org/10.17223/19988591/35/9

Solem A. 1979. Some mollusks from Afghanistan // Fieldiana Zoology, New Series. Vol.1. P.1–89. https://doi.org/10.5962/bhl.title.3037

Solijonov Kh., Izzatullaev Z., Umarova D. 2023. New record of Malacophagous leech of the genus Alboglossiphonia Lukin, 1976 from Fergana Valley, Uzbekistan // Bull. Iraq nat. Hist. Mus. Vol.17. No.3. P.459–468. https://doi.org/10.26842/binhm.7.2023.17.3.0459

Solijonov Kh., Umarov F.U. 2022. Ecology of leeches and gastropods of the lower Ak-Buura river, Fergana Valley, Uzbekistan // Bull. Iraq nat. Hist. Mus. Vol.17. No.2. P.229–250. https://doi.org/10.26842/binhm.7.2022.17.2.0229

Starmuhlner F., Edlauer A. 1957. Beiträge zur Kenntnis der Molluskenfauna des Iran // Sitzber. Österr. Akad. Wiss., Math.-Naturwiss. Kl. Bd.166. H.9–10. S.435–494.

Sysoev A.V., Schileyko A. 2009. Land Snails and Slugs of Russia and Adjacent Countries. Sofia-Moscow: Pensoft. Series Faunistica. Vol.87. 454 p.

Responsible editor K.G. Mikhailov