



Khayrulla Solijonov

Andijan State University, khsolijonov1991@gmail.com,
Andijan-Uzbekistan

Naim Sağlam

Fırat University, nsaglam@firat.edu.tr, Elazığ-Türkiye

DOI	http://dx.doi.org/10.12739/NWSA.2022.17.4.5A0175	
ORCID ID	0000-0002-7371-0244	0000-0002-3163-8432
Corresponding Author	Khayrulla Solijonov	

NEW RECORD OF LEECH *Limnatis paluda* (Hirudinida: Praobdellidae) FROM FERGANA VALLEY: ECOLOGICAL FEATURES AND COMPARISON WITH OTHER REGIONS

ABSTRACT

The article describes the results of the study of leeches in the Fergana Valley, located in the eastern part of Uzbekistan. For the first time, the blood-feeding leech *Limnatis paluda* (Tennent, 1859) was recorded from the study area. It was found that small populations of this species are distributed in ten different biotopes of the Fergana Valley. Distribution coordinates of collected leech samples were determined, and ecological features were studied. Some external and internal morphologies of leeches were compared with species recorded from other regions, and similarities and differences were analyzed. It has been determined that *L. paluda* feeds on frogs in the wild, and the presence of more than two in a frog is fatal. 107 *L. paluda* were collected in the study, and it was determined that an average of 10.70 ± 8.22 (range, 2-26) leeches could be collected per unit time. The density of this leech species per unit area in the Fergana Valley region of Uzbekistan was calculated as 0.27 ± 0.21 (range, 0.05-0.65) leech/m².

Keywords: Leech, *Limnatis paluda*, Morphology, Ecological Features, Geographic Distribution

1. INTRODUCTION

Leeches belong to the phylum Annelida, invertebrates comprising more than 900 species that make up the class Hirudinea [1]. Leeches in this class have 2 (anterior and posterior) suckers, are common in marine and freshwater basins, and some live on land. Leeches are parasitic and predatory. Among them, *L. paluda* (Tennent, 1859) is one of the endoparasitic species. When humans [2, 3, and 4] and domestic animals such as cattle, sheep, horses, goats, and dogs [5, 6, 7, and 8] come to a natural water basin, it sticks firmly in the oral cavity, nasal cavity, and respiratory tract during drinking and it sucks their blood. As a result, it causes the host to lose a large amount of blood. At the same time, leeches are also involved in the spread of disease-causing trichomonas [2, 9, and 10]. This leech was introduced to science for the first time in 1859 by British politician and traveler James Emerson Tennent from Ceylon (now Sri Lanka) under the name *Haemopsis paludum* [11]. Later, it was transferred to the genus *Limnatis* and recorded as *L. paluda* [4]. By many scientists, *L. paluda* Saudi Arabia [12], Iran [3, 8, 10, and 13], India [5], Israel [12], Afghanistan [14], Kazakhstan [15], Tajikistan [7], Turkmenistan [14, 15, 16, and 17], it was found that it is distributed in the regions of Uzbekistan: Samarkand [2, 9, 18, and 19]. During the last century,

How to Cite:

Solijonov, K. and Sağlam, N., (2022). New Record of Leech *Limnatis paluda* (Hirudinida: Praobdellidae) From Fergana Valley: Ecological Features and Comparison with Other Regions. Ecological Life Sciences, 17(4):162-169, DOI: 10.12739/NWSA.2022.17.4.5A0175.



this species was recorded in Central Asia as *Limnatis turkestanica* and *L. nilotica* [20].

2. RESEARCH SIGNIFICANCE

The biodiversity of leeches in Uzbekistan has not been systematically studied; therefore, the species composition and systematics of leeches have not been done. In particular, there is no scientific information about leeches belonging to the genus *Limnatis* distributed in the Fergana Valley. Therefore, we aimed to research water basins in the Fergana Valley area.

Highlights:

- For the first time, systematic and ecological studies of leeches were carried out in the water basins of the Fergana Valley of Uzbekistan.
- For the first time, it was found that the leech species *L. paluda* is distributed in the Fergana Valley.
- Some internal and external morphological and ecological features of the *L. paluda* were compared with the information provided in the sources.

3. MATERIAL AND METHODS

Fergana Valley is a valley located among the mountains in Central Asia, one of the large mountain ranges of Central Asia. It is surrounded by the Tian Shan Mountain range in the north and the Hisar-Alai Mountain range in the south. Mainly Uzbekistan, partly in the territory of the Republics of Kyrgyzstan and Tajikistan. It is 300km long, 60-20km wide, and 170km wide at its widest point. 22 thousand km². There are about 6.500 rivers and streams, 140 lakes, more than 150 springs, and other bodies of water in the Fergana Valley. The Syr Darya river, one of the big rivers, is formed by the confluence of the Kara Darya and Naryn rivers in the Baliqchi district of the Andijan region of the Fergana Valley [21].

Hair, tweezers, and hand-collected research materials from the regions of Fergana Valley of Uzbekistan (Figure 1) and the place coordinates were determined through the mobile application "Maps me". Leeches and their habitats are photographed. Specimens were narcotized in 10% ethanol, then fixed in 96% ethanol, and numbered.

In the study, an Avicon Tex XPS-500E model biological microscope and an MBC-9 model stereomicroscope were used to determine the morphological structure of leech samples. Photographs of the leech samples were taken using the Canon EOS 5D camera. The identities of the collected leeches were made based on morphological and anatomical data, according to Nesemann and Neubert [22] and Sawyer [23]. In addition, the morphological data obtained were collected from various regions and compared with *L. paluda* specimens whose morphological characteristics were determined [5, 6, 11, 15, 16, 19, 20, and 24].

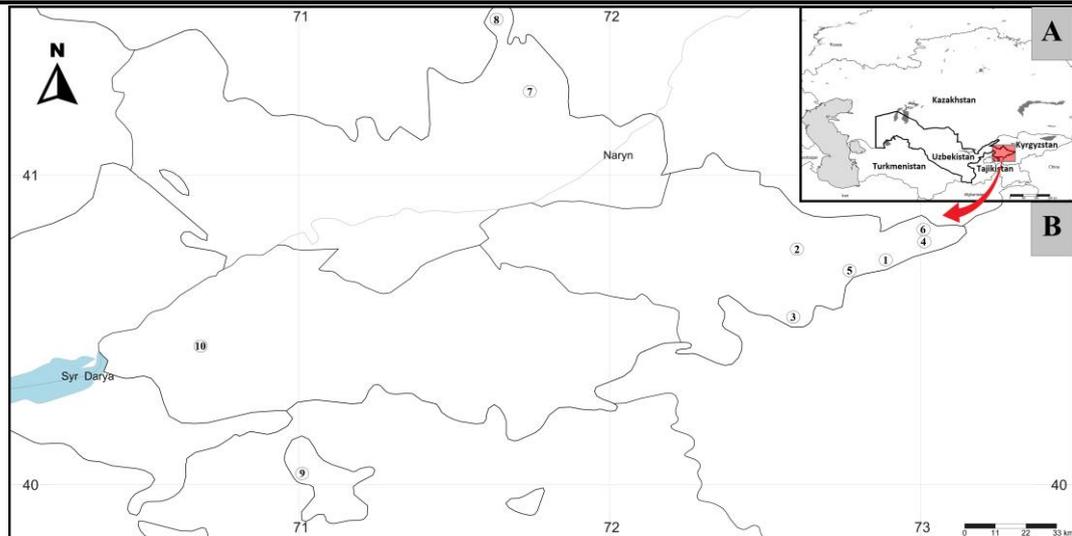


Figure 1. Map of Central Asia and the Red zone Fergana Valley (A) and sampling stations of *Limnatis paluda* in Fergana Valley (B)

4. RESULTS AND DISCUSSIONS

For the first time, we identified *L. paluda* species from Fergana Valley basins, defined distribution areas, studied its morphological, anatomical, and ecological description, and compared it with the information provided in the sources.

- ✓ **Family:** Praobdellidae Sawyer, 1986
- ✓ **Genus:** *Limnatis* Moquin-Tardon, 1826
- ✓ ***Limnatis paluda*:** Tennent, 1859
- ✓ **Synonyms:** *Haemopsis paludum* Tennent, 1859
- **Body size:** A large leech. Length in young leeches: 40-60 mm, width 6-8 mm; in adults, 90-120 mm, width 12-18 mm (Figure 2). During movement, the thickness reaches 180 mm. The diameter of the rear sucker is very large, and the width of large representatives when sticking to the substrate is more than 15 mm.
- **Body color:** The dorsal surface is brown-green, light-green, and yellowish-green. The coloring of the ventral surface is different from other leeches, i.e., the ventral surface is dark: dark-green, bluish-purple. There is an orange (dark yellow) stripe along the lateral two sides, and there are no dark spots or patterned lines on the dorsal surface.
- **Edges of the body:** Plain, there is much mucus on the body's surface.
- **Eyes:** It has five pairs of eyes in a parabolic position. The first and second pairs are located in somites II-III, then the three pairs on somite IV(a1+a2), the fourth pair on somite V(a1+a2), and the last fifth pair on somite VI (a2)
- **Annulation:** The total number of rings is 101-102. Somites:
I (1) annulate,
II-III (1) annulate,
IV-V (2) biannulate,
VI-VII (2) triannulate,
VIII (1) quadrannulate,
IX-XXIII (15) quinquannulate,
XXIV (1) quadrannulate,
XXV-XXVI (2) biannulate,
XXVII annus.



Figure 2. View of *Limnatis paluda*
(A) dorsal (B) ventral (C) lateral

- **Jaws:** There are three jaws located on the anterior sucker, each of which has 37 to 48 monostichodont teeth, and the teeth are of different sizes. The external and internal morphology of the nasal leech *L. paluda* detected in our study was compared with the leeches detected in other studies [3, 6, 8, 11, 15, 16, 17, 18, 19, and 24]. The similarities and differences of *L. paluda* recorded from various parts of the world were analyzed. Our study determined that *L. paluda*, which we determined as the first record from the Fergana Valley region of Uzbekistan, has a longer and wider structure than the leeches from the Samarkand region of Uzbekistan [19]. Likewise, it was also observed that it was larger than the *L. paluda* species determined from Kazakhstan [15] and other regions in Central Asia [6, 16, and 17]. While the samples of *L. paluda* determined in Ceylon (Sri Lanka), India, and Saudi Arabia region [11 and 24] were smaller than the samples in our study, it was observed that the species determined from Iran [19] were almost similar in size. It should be noted that the size of leeches increases after feeding, but it is not a mistake to conclude based on the materials. In all studies [3, 6, 8, 11, 15, 16, 17, 18, 19, and 24], *L. paluda* was determined that has a characteristically flat pattern and reddish-orange bands on the lateral side. The color and pattern of dorsal and ventral of *L. paluda* have been shown by studies to have green or dark green in samples recorded in the Middle East region [3 and 8]. It was determined that the dorsal parts of *L. paluda* samples collected from India [24] and Kazakhstan [15] were brownish red, and the ventral parts were paler than the dorsal ones. On the other hand, Turkistan and Turkmenistan samples were defined to be blue-purple [6 and 17]. Our study determined that the colors of the *L. paluda* samples collected from the Fergana Valley region of Uzbekistan and the samples collected from the Samarkand region [19] were almost similar. Differences in coloration are likely to be shaped by the genetics of leeches and environmental factors in their habitat. More in-depth research based on molecular, ecological, and morphological data is required to make a definitive judgment on this issue. The fact that *L. paluda* has five pairs of eyes, the total number of rings is determined between 99-102, and the presence of 30-50 teeth in each jaw constitute the common findings of the studies conducted on this species [3, 6, 8, 11, 15, 16, 17, 18, 19, and 24]. *L. paluda* is a leech that maintains



a parasitic life by attaching especially to the nasal region [4, 25]. It has been determined that it prefers wild and domestic mammals as hosts and aquatic amphibians [3, 6, 8, 11, 15, 16, 17, 18, 19, and 24]. Our studies observed that this leech species attacked the marsh frog (*Pelophylax ridibundus*) in its ecological environment (Figure 2). We determined that more than two leeches simultaneously can suck the blood of one marsh frog and kill it in laboratory conditions. Again, this study found that *L. paluda* lived for 27 months without food. However, despite the leech's survival, its size was seen to have decreased by 2.5 times.

- **Geographic distribution:** Palearctic and Oriental regions.
- **New records:** Local pond and its surroundings, (Nr.1), n=12, 23.03.2020, collected by Kh.Solijonov; Otchopar reservoir, (Nr.2), n=26, 22.03.2020, collected by Kh.Solijonov; Shirgambulak spring, (Nr.3), n=20, 2.05.2020, collected by Kh.Solijonov; Olchalik spring, (Nr.4), n=8, 20.06.2020, collected by Kh.Solijonov; Local stream, (Nr.5), n=3, 10.05.2020, collected by Kh.Solijonov; Local stream, (Nr.6), n=4, 11.05.2020, collected by Kh.Solijonov; Chartak stream and its surroundings, (Nr.7), n=18, 9.06.2020, collected by Kh.Solijonov; Local pond and stream (Nr.8), n=2, 19.06.2020, collected by Kh.Solijonov; Surati spring (Nr.9), n=10, 20.09.2020, collected by Kh.Solijonov; Local stream and field (Nr.10), n=4, 19.08.2021, collected by Kh. Solijonov.
- **Density:** 107 *L. paluda* were collected from 10 different stations in the study. It has been determined that the average collection amount of a person per unit time in the collection areas of this leech species is 10.70 ± 8.22 (range, 2-26) number of leeches/person/hour. The density of *L. paluda* per unit area was calculated as 0.27 ± 0.21 (range 0.05-0.65) leech/m² (Table 1).

Table 1. Distribution areas of a new record of the leech *Limnatis paluda* in the Fergana Valley

№	Locality (District, Region)	Coordinates	Altitude	Number of Leeches/Person	Leech/m ²
1	Sultonobod District, Andijan Region	40°45'57.9"N 72°59'43.0"E	772	12	0.30
2	Otchopar District, Andijan Region	40°48'07.3"N 72°31'50.8"E	628	26	0.65
3	Markhamat District, Andijan Region	40°26'29.7"N 72°24'06.6"E	783	20	0.50
4	Kurgantepa District, Andijan Region	40°48'36.0"N 73°04'54.7"E	1056	8	0.20
5	Kurgantepa District, Andijan Region	40°44'44.3"N 72°55'31.7"E	753	3	0.08
6	Khan Abad District, Andijan Region	40°50'07.8"N 73°02'08.4"E	754	4	0.10
7	Chartak District, Namangan Region	41°12'05.9"N 71°48'55.9"E	698	18	0.45
8	Yangikurgan District, Namangan Region	41°31'51.8"N 71°42'13.8"E	1425	2	0.05
9	Sokh District, Fergana Region	40°03'32.8"N 71°02'01.1"E	1396	10	0.25
10	Besharik District, Fergana Region	40°26'28.3"N 70°42'19.6"E	944	4	0.10
	Mean±SD			10.70±8.22	0.27±0.21

- **Ecological features:** Leech populations are distributed in ponds, springs, streams, and small water biotopes where livestock come to drink. Shallow, stagnant, or slow-flowing water basins with a muddy bottom (swamp) are a favorable environment for them. Leech

specimens were collected from warm waters of 13-24°C. Algae (*Myriophyllum verticillatum*), marsh frogs (*Pelophylax ridibundus*), freshwater mollusks (*Radix auricularia*, *Lymnaea stagnalis*) were also found in the biotope where this species was found (Figure 2). Studies have shown that these parasitic leeches wait in the water for their hosts: sheep, cattle, and horses, and quickly enter their oral cavity when they drink water. They stick to their host's lips and under the tongue, even inside the nose, and live for several days, sucking their blood from the mucous membrane.



Figure 2. Biotope of *Limnatis paluda* leech and attack on marsh frog *Pelophylax ridibundus* (Pallas, 1771)

5. CONCLUSION AND RECOMMENDATIONS

We systematically studied the leeches in the Fergana Valley region. For the first time, it was found that the *L. paluda* leech belonging to the genus *Limnatis* lives in the water basins of the Fergana Valley. It can be concluded that this leech feeds on the blood of livestock in the mouth and nose cavity. The influence of anthropogenic factors causes this species' widespread population. In particular, it happens because local livestock animals are not allowed to drink safe water in biotopes where leeches are spread. As a result, endoparasitic leeches spread from one area to another area through host animals. The wide spread of this species causes an increase in blood-borne diseases in livestock, and as a result, it causes economic losses in livestock farming. Therefore, it is necessary to study the areas of the *L. paluda* leech, and the obtained results can be monitored.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

FINANCIAL DISCLOSURE

The authors declare that this study has received no financial support.

DECLARATION OF ETHICAL STANDARDS

The authors of this article declare that the materials and methods used in this study do not require ethical committee permission and/or legal-special permission.



REFERENCES

- [1] Magalhães, W.F., Hutchings, P., Ocegüera-Figueroa, A., Martin, P., Schmelz, R.M., Wetzel, M.J., Wiklund, H., Maciolek, N.J., Kawauchi, G.Y., and Williams, J.D., (2021). Segmented worms (Phylum Annelida): a celebration of twenty years of progress through Zootaxa and call for action on the taxonomic work that remains. *Zootaxa*, 4979(1):190-211.
- [2] Pavlovsky, E.N., (1934). Parasitization of leeches in humans and mammals in Turkmenistan. Tr. Karakala and Kzyl-Atrek expeditions. L. pp:149-154 (in Russian).
- [3] Bennike, S.A.B., (1940). On some Iranian freshwater Hirudinida. In 'Danish Scientific Investigations in Iran, Part II, Danske Zoologiske Tidsskrift. Copenhagen, pp:1-10.
- [4] Montazeri, F., Bedayat, A., Jamali, L., et al., (2009). Leech endoparasitism: report of a case and review of the literature. *European Journal of Pediatrics*, 168:39-42.
- [5] Moore, J.P., (1938). Additions to our knowledge of african leeches (Hirudinea). *Academy of Natural Sciences of Philadelphia*, 90:297-360.
- [6] Shchegolev, G.G. and Shchegoleva, Z.A., (1951). Leech Turkmenistan. Tr. Murgabsk. hydrobiol. st., 1:77-102 (in Russian).
- [7] Kazantsev, B.N., (1957). Materials on the distribution and ecology of the leech *Limnatis nilotica* in Tajikistan. News. Dep. Natural Sciences of the Academy of Sciences of Taj. SSR, 18:195-204 (in Russian).
- [8] Darabi-Darestani, K., Sari, A., and Sarafrazi, A., (2016). Five new records and an annotated checklist of the leeches (Annelida: Hirudinida) of Iran, *Zootaxa*, 4170(1):41-70.
- [9] Jakimov, V.L., (1916). Trichomonas in the intestinal canal of the Turkestan leech (*Limnatis turkestanica*). Preliminary message, *Russian Journal of Zoology*, 9:305-306 (in Russian).
- [10] Khalili, Z., Malek, M., Seiedy, M., Darabi-Darestani, K., Aminjan, A.R., and Latif, R., (2021). Reproduction of *Limnatis paluda* (Tennent 1859) in laboratory conditions *Animal. Reprod. Sci.*, 234, Article 106857.
- [11] Tennent, J.E., (1859). Ceylon. An Account of the Island, etc. 2 vols. London. 4th. ed., 1860. Leeches, pp:301-307.
- [12] Borda, E. and Siddall, M.E., (2004). Arhynchobdellida (Annelida: Oligochaeta: Hirudinidae): Phylogenetic relationships and evolution. *Molecular Phylogenetics and Evolution* 30:213-225.
- [13] Darabi-Darestani, K., Sari, A., Khomenko, A., Kvist, S., and Utevsky, S., (2021). DNA barcoding of Iranian leeches (Annelida: Clitellata: Hirudinida). *Journal of Zoological Systematics and Evolutionary Research*, 59:1438-1452.
- [14] Phillips, A.J. and Siddall, M.E., (2009). Poly-paraphyly of Hirudinidae: many lineages of medicinal leeches. *BMC Evolutionary Biology*, 9(1):246.
- [15] Nakano, T., Dujsebayeva, T., and Nishikawa, K., (2015). First record of *Limnatis paluda* (Hirudinida, Arhynchobdellida, Praobdellidae) from Kazakhstan, with comments on genetic diversity of *Limnatis* leeches. *Biodiversity Data Journal*, 3:e5004.
- [16] Plotnikov, V., (1907). Glossosiphonidae, Hirudinidae and Herpobdellidae. *Zoological Museum of the Academy of Sciences*. 10(3):133-158 (in Russian).
- [17] Shchegolev, G.G., (1912). The fauna of leeches of Turkestan. *Proceedings of the hydrobiological station on the Deep Lake*. 4:163-192 (in Russian).



-
- [18] Kovalenko, M.V. and Utevsky, S.Y., (2015). Comparative structural analysis of jaws of selected blood-feeding and predacious arhynchobdellid leeches (Annelida: Clitellata: Hirudinida). *Zoomorphology*, 134:33-43.
- [19] Utevsky, S., Mabrouki, Y., Taybi, A.F., Huseynov, M., Manafov, A., Morhun, H., Shahina, O., Utevsky, G., Khomenko, A., and Utevsky, A., (2022). New records of leeches of the genus *Limnatis* (Hirudinea, Praobdellidae) from the South Caucasus and Central Asia: phylogenetic relationships of Eurasian and African populations. *Animal Biodiversity and Conservation*, 45(1):43-52.
- [20] Lukin, E.I., (1976). *Leeches of fresh and saline waters (Fauna of the USSR. Leeches)*. Nauka, Leningrad, 484 pp (in Russian).
- [21] Khalikov, R.Y., (2020). *Fergana Valley (Natural Geography)*. Navruz, Tashkent, 168 pp (in Uzbek).
- [22] Neesemann, H. and Neubert, E., (1999). *Annelida: Clitellata: Branchiobdellida, Acanthobdellea, Hirudinea*, Vol. 6. Spektrum Akademischer Verlag, Heidelberg, Berlin, 178 pp.
- [23] Sawyer, R.T., (1986). *Leech Biology and Behavior*, Vol I-III. Clarendon Press, Oxford, United Kingdom, 1065 pp.
- [24] Moore, J.P., (1927). *Arhynchobdellæ*. In: *The Fauna of British India, including Ceylon and Burma. Hirudinea* (W.A. Harding, J.P. Moore, Eds.). Taylor and Francis, pp:201-206, London.
- [25] Boye, E.S. and Joshi, D.C., (1994). Occurrence of the leech *Limnatis paluda* as a respiratory parasite in man: case report from Saudi Arabia. *The Journal of Tropical Medicine and Hygiene*, 97(1):18-20.