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FIRST RECORD OF THE HEMATOPHAGOUS LEECH *LIMNATIS PALUDA* (*HIRUDINEA*: PRAOBDELLIDAE) IN THE NAKHCHIVAN AUTONOMOUS REPUBLIC, AZERBAIJAN, WITH COMMENTS ON ITS GEOGRAPHIC DISTRIBUTION AND ENVIRONMENTAL PREFERENCES

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This research provides a detailed report on a new record of *Limnatis paluda* (Tennent, 1859) from the Nakhchivan Autonomous Republic, Azerbaijan, emphasizing its significance and the morphological features that confirm its identification. This finding is particularly significant as it fills a geographical gap, provides insights into the distribution patterns of *Limnatis* leeches and underscores their reliance on water bodies frequented by livestock. The new record corroborates the previously hypothesized distribution range of the species extending from Central Asia to the South Caucasus and the Middle East.

Keywords: Annelida, Clitellata, parasites, South Caucasus, biogeography

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Ovo istraživanje pruža detaljno izvješće o novom nalazu pijavice Limnatis paluda (Tennent, 1859) iz Autonomne Republike Nakčivan, Azerbajdžan, naglašavajući njegov značaj i morfološke značajke koje potvrđuju njezinu identifikaciju. Taj nalaz je posebno značajan jer popunjava geografsku prazninu u arealu, pruža uvid u obrasce rasprostranjenosti pijavica roda Limnatis i naglašava njihovu ovisnost o vodenim površinama koje posjećuje stoka. Novi nalaz potvrđuje prethodno pretpostavljeni areal vrste koji se proteže od srednje Azije do južnog Kavkaza i Bliskog istoka.

Ključne riječi: Annelida, Clitellata, paraziti, južni Kavkaz, biogeografija

INTRODUCTION

Leeches of the genus *Limnatis* Moquin-Tandon, 1827, specifically *Limnatis nilotica* (Savigny, 1822) and *Limnatis paluda* (Tennent, 1859), are known for their parasitism on the mucous membranes of domestic animals and occasionally humans (Lukin, 1976; Nakano *et al.*, 2015; Utevsky *et al.*, 2022). Understanding their impact, biological characteristics and occurrence is essential for veterinary and human healthcare, particularly in regions where these leeches are prevalent.

A new record of *L. paluda* was documented in the Nakhchivan province of Azerbaijan, extending the known range of this species. Previously, *L. paluda* had been found in more northerly regions of the country, and its range was anticipated to span from the Middle East to the South Caucasus and Central Asia (Nakano *et al.*, 2015; Utevsky *et al.*, 2022). In contrast, *L. nilotica*, another species within the same genus, is known to inhabit North Africa (Utevsky *et al.*, 2022). The new finding further supports the distribution hypothesis of the two species (see Utevsky *et al.*, 2022).

This research aims to thoroughly document the new finding and summarize the available evidence on the habitats and environmental preferences of Limnatis leeches in Azerbaijan and Morocco.

MATERIAL AND METHODS

During routine biodiversity monitoring in the Nakhchivan Autonomous Republic, Azerbaijan, in 2021, Nataly Snegovaya collected one specimen of an arhynchobdellid leech from an animal watering site in Goynuk village, Babek district (Fig. 1). The specimen was collected on 09/07/2021 in an area where the local population is engaged in farming and animal husbandry, at an altitude of 1,541 m above sea level (coordinates: 39°17′25.0′′ N, 45°39′34.0′′ E; see Fig. 1). Subsequent surveys conducted on 06/07/2024 in Goynuk village and additional localities in Nakhchivan including sites near Batabat Lake (39°32′27.39′′ N, 45°47′09.17′′ E) and Zor Bulag Spring (39°32′30.8′′ N, 45°48′15.9′′ E) - failed to detect any additional leech specimens.

The specimen was fixed and preserved in strong ethanol, photographed, examined, and compared with existing taxonomic descriptions (Nakano *et al.*, 2015; Utevsky *et al.*, 2022). It is now stored in the invertebrate collection of the Institute of Zoology in Baku, Azerbaijan.

Furthermore, *L. nilotica* from Morocco was examined for comparative purposes to distinguish reliably between the two related species. A live individual of the North African species was photographed to reveal its characteristic coloration pattern. This individual was found in Gîte Tagma, Tafoughalt, Bni Snassen, 34°49′26.3″ N 2°25′46.1″ W, on 03/03/2024. Detailed environmental data are presented for the locality of the previous finding of *L. paluda* in the village of Hashi, Guba District of Azerbaijan, 41°01′19″N 48°40′22″E, on 12/08/2016 (see Utevsky *et al.*, 2022).

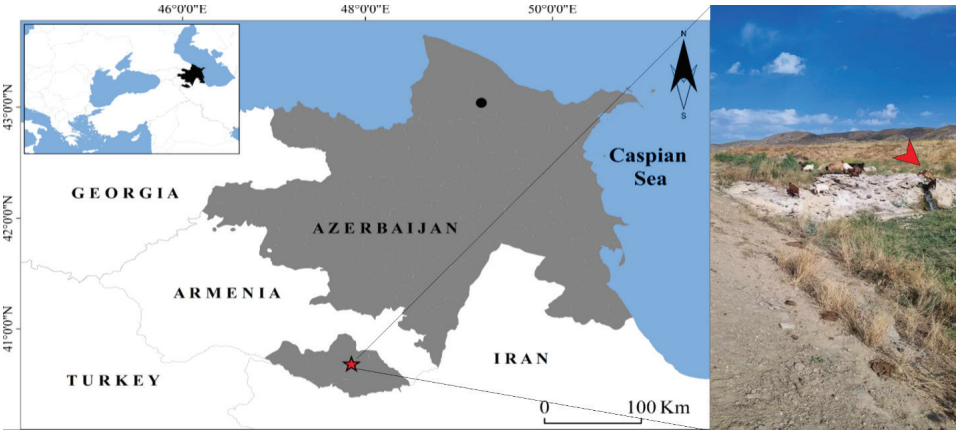

Fig. 1. Distribution of *Limnatis paluda* (Tennent, 1859) in Azerbaijan. The new record from Nakhchivan is indicated with a red asterisk, while the previous record from the Guba District (Utevsky *et al.*, 2022) is marked with a black dot. Animal watering site (arrow indicates the location) (Photos by S. Farzali).

RESULTS

First record of Limnatis paluda *in the Nakhchivan Autonomous Republic of Azerbaijan*

The morphological characteristics of the specimen from Nakhchivan (Fig. 2) conform to the previous descriptions of *L. paluda*. The body length of the specimen, from the centre of the posterior sucker to the anterior sucker, is 60 mm. The body width is 12 mm. The posterior sucker diameter is 0.9 mm. The leech exhibits a dark green dorsal surface without any black pattern, distinguishing it from the related species. The body margins are marked with distinctive yellow stripes. A large posterior sucker is present, which is a key identifying feature of the genus.

The individual of *L. nilotica* exhibits distinct dark dots arranged in five longitudinal stripes on its dorsal surface (Fig. 3), a key feature that distinguishes it from the related L. paluda, which lacks any such pattern on its dorsum.

Additional information on the record from the Guba District of Azerbaijan

Fig. 2. External morphological features of *Limnatis paluda* (Tennent, 1859) collected in Nakhchivan, Azerbaijan: dorsal view with the posterior sucker bent dorsally and the lack of any pattern consisting of black dots (left); ventral view with yellow margins (right).

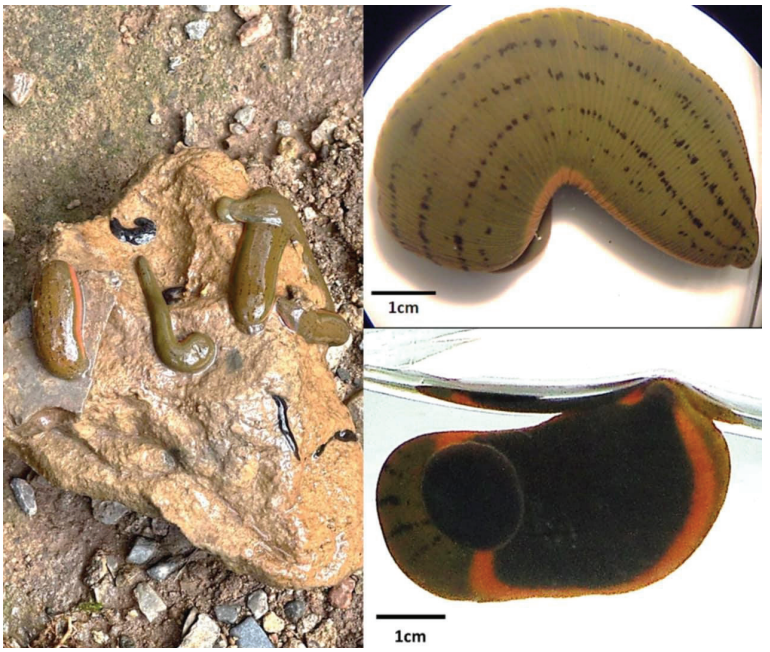

Fig. 3. *Limnatis nilotica* (Savigny, 1822) from Morocco in its natural habitat along with smaller black turbellarians (left) and in the laboratory (right). The dorsal surface exhibits a characteristic pattern of black dots arranged in longitudinal stripes (top right). The ventral side is uniformly black, with prominent orange stripes along the margins (bottom right).

More data on the habitat of *L. paluda* in the Guba district of northern Azerbaijan (Fig. 1) are provided. The leech was found in the Jimi River, approximately 15 km from the village of Hashi (Utevsky *et al.*, 2022). The area around the section of the river where the leech *L. paluda* was found is surrounded by steep cliffs, making it impossible for animals to enter. Approximately

1.5–2 km upstream and downstream, where there is unrestricted access to the river, large numbers of sheep, goats, and cows are grazed. In addition, both in the village of Hashi itself and in its environs near the river, there are numerous cattle farms.

Fifty meters downstream from the point where the leech was found, on both banks of the river, there are hot hydrogen sulphide Istisu springs, the waters of which flow into the river. Despite careful search within a radius of 1 km both upstream and downstream, no leeches were found.

According to local shepherds, large numbers of leeches are periodically found in both natural and artificial ponds formed by spring waters, which are commonly used by animals. These leeches often attach themselves to the animals, including the tongues of sheepdogs. Some of these ponds also have outlets that are connected to the Jimi River.

Based on this information, we can conclude that the *L. paluda* leech we discovered is likely not a permanent resident of the Jimi River. Instead, it prefers stagnant bodies of water, such as the spring-fed ponds, but will occasionally end up in the river. In sections of the river into which spring waters feed, leeches may be present, but the

conditions in the lower parts of the river, particularly where hot hydrogen sulfide springs flow in, are likely unsuitable for their survival.

DISCUSSION

Limnatis paluda: *occurrence patterns and environmental preferences*

The specimen of *L. paluda* was discovered in a watering place, a typical environment for the species, often frequented by livestock (Lukin, 1976). While it was previously believed that mammals played a key role in the feeding of *L. paluda*, recent studies suggest that amphibians can also be a significant source of blood for this leech (Solijonov & Saglam, 2022). Despite evidence from this and previous records (Utevsky *et al*., 2022) indicating that *L. paluda* occurs in highland mountainous landscapes in Azerbaijan, the numbers of this species appear to be low in these areas, as only single individuals have been found in the Nakhchivan Autonomous Republic and the Guba District. Additional surveys in various wetland habitats of Nakhchivan did not yield additional specimens of *L. paluda*, suggesting that the species has rather strict habitat preferences, including access to hosts.

Initially, the inventory of the aquatic invertebrates of the Nakhchivan Autonomous Republic was conducted by Gasimov (1972), identifying the endoparasitic leech *L. nilotica* (see also Musayev, 2002). However, subsequent molecular DNA analysis reclassified leeches from Azerbaijan as *L. paluda*, with its presence first documented in northern Azerbaijan, specifically in Hashi, Guba District (Utevsky *et al*., 2022). This study marks the first confirmed record of *L. paluda* in the Nakhchivan Autonomous Republic, Azerbaijan. Commonly known as the "cattle leech", *L. paluda* is thought to be prevalent in the Nakhchivan region, particularly in water sources like springs, streams, and ponds frequented by livestock.

Azerbaijan has a long history of domestic animal breeding, the natural and geographical conditions contributing significantly to the development of livestock farming, particularly sheep, goat, and cattle rearing. In the Nakhchivan Autonomous Republic, sheep farming, integral to the local economy, focuses on the production of meat, wool, and milk (Basrat, 2022). The grazing of domestic animals around freshwater bodies, such as springs and ponds, may have favored the distribution of *L. paluda*.

Limnatis nilotica: *occurrence patterns and environmental preferences*

Limnatis nilotica is a bloodsucking leech that is widespread in North African countries, where it infests the mucous membranes of various mammals (Ben Ahmed *et al*., 2008; 2015a; 2015b; Utevsky *et al*., 2022). This eurytopic species, is one of the most widespread leeches in the northern part of Morocco, where it can be found in almost all aquatic bodies, from temporary ponds, including large and small rivers, springs and lakes but also frequently occurs in artificial structures, such as drainage basins, as ditch lines or in cattle troughs, under stones or in the midst of riparian vegetation, roots and various objects (Mabrouki *et al*., 2019).

Its distribution in Morocco seems to be linked to the availability of freshwaters on the one hand, and to livestock and grazing activities on the other. Landrace sheep in Northern Morocco are an important reservoir of genetic diversity, play a vital economic and social role for the rural population, and play a ritual role in religious festi-

vals and other socio-cultural traditions (Kandoussi *et al.*, 2021). The sheep population is estimated at around 19.9 million head, i.e. more than 0.5 sheep per inhabitant (Boujenane 1999; FAOSTAT FAO, 2020).

Human hirudiniasis caused by *L. nilotica* still occurs in Morocco and North Africa in general; leech infestation usually occurs when people drink or bathe in infested waters such as streams or lakes, but some rare cases of human endoparasitism have been reported, a condition known as mucosal hirudiniasis; clinical presentation depends on the location of the leech, and serious complications may occur (Bijou *et al.*, 2020).

The discovery of *L. paluda* in the Nakhchivan Autonomous Republic is significant as it confirms the species' expected range extension into the South Caucasus (see Utevsky *et al.*, 2022). This finding is consistent with the ecological and geographical distribution patterns observed for *Limnatis* leeches (Utevsky *et al.*, 2022; Solijonov & Saglam, 2022; Bilal & Ahmed, 2023; Ayhan *et al.*, 2024). *Limnatis paluda* occurs from Afghanistan and Central Asia to the Middle East and the Southern Caucasus, while its congener *L. nilotica* is restricted to Palearctic North Africa (Utevsky *et al.*, 2022).

CONCLUSION

The identification of *L. paluda* in the Nakhchivan Autonomous Republic of Azerbaijan marks an important addition to the known range of this species. Found in a habitat typical for *Limnatis* leeches, the specimen exhibits morphological features consistent with previous taxonomic descriptions. Furthermore, this discovery highlights the need for continued biodiversity surveys and research to further understand the distribution and ecology of the leech species in the region.

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