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Articles

New records of the adventive land snail Helix lucorum (Gastropoda: Helicidae) in Kazakhstan

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Snail *Helix lucorum* Linnaeus, 1758, was first found on the territory of Kazakhstan in 2020. This species is invasive for the country. A stable population of the snail has been discovered in parklands in Kentau and Shymkent cities in the Turkistan oblast, in the city of Taraz in the Jambyl oblast, South Kazakhstan, and in the Almaty city in the South-East Kazakhstan. The nearest point where *H. lucorum* lives is the city of Tashkent (Uzbekistan), where this species was found in 2012. According to the local residents, tree seedlings were brought from Tashkent for landscaping the cities of Kentau and Shymkent. Thus, Tashkent was the most probavle source of the invasion. Further dispersal of *H. lucorum* in the South and South-East Kazakhstan, on the territory of Turkestan, Jambyl and Almaty oblasts is expected.

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Keywords

Snail, *Helix lucorum*, invasive species, new records, South and South-East Kazakhstan

Introduction

Helix lucorum Linnaeus, 1758 (the mountain snail) is a large terrestrial snail, often leading synanthropic life. It belongs to the family Helicidae Rafinesque, 1815 (Neubert 2014). This is a large snail with a spherical shell, whose diameter varies from 35 to 60 mm. The height of the shell is from 25 to 45 mm. Adult snails weigh about 20-25 g. The general color background is light, wide red-brown transverse stripes run along it (Akramovskij 1976; Likharev and Rammelmeyer 1952; Horsak et al. 2010; Balashov 2016).Few different lineages of *Helix lucorum* are characterized by distinct shell coloration, and in some regions snails from different lineages independently arrived as invasive species in different time, forming populations that differs from each other (Korábek et al. 2018).

The snail lives in deciduous forests, along river valleys, in thickets of bushes, forest belts, and parks and in a host of anthropogenic habitats. It is active at night or after heavy rains. In the dry summer months, *H. lucorum* buries itself in the ground and falls into a state of torpor or climbes high on walls, rocks and trees, just as is shown below (Akramovskij 1976; Mumladze 2013; Balashov 2016). The snail prefers gardens and parks in newly colonized habitats, with shaded plant community (Mumladze 2013; Temreshev et al. 2023b; Zając et al. 2023). Under natural conditions, *H. lucorum* prefers to feed on rotting green parts of plants, fallen leaves. Sometimes it consumes soil and fungi. Young snails also eat agricultural crops (apple trees, walnuts, sunflowers, grapes, vegetables, etc.), so this species can act as a pest (Ljurin and Petrusenko 1973; Akramovskij 1976; Mumladze 2013). The optimum comfortable temperature for the mountain snail is 25-300C, with humidity of 85 percent. The decrease in the motor activity of mollusks begins with an increase in temperature from 300C and above. The incubation period for eggs takes from 22 to 27 days, though under the most comfortable conditions (200C, 85% humidity) it can be reduced to 19. The diameter of the egg is 4.4 mm. Juvenile snails that are two to three months old weigh 0.5-0.9 g. *H. lucorum* is used in cuisine as escargots and is also reared for cosmetic and medical purposes (Thompson and Cheney 1996; Reznik and Popov 2010). Is a facultative host of helminths of the subgenus *Protosrongylus* (*Synthetocaulus*) (Likharev and Rammelmeyer 1952).

The native range of *H. lucorum* covers Caucasus, Anatolia and, arguably, Balkans; it also invaded many other regions since the Antiquity (Korábek et al. 2018). Presently *H. lucorum* is distributed in Europe (Albania, Armenia, Azerbaijan, Bela- rus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, France, Georgia, Great Britain, Greece, Hungary, Italy, Macedonia, Poland, Romania, Russia, Serbia, Slovakia, Turkey, Ukraine), Asia (China, Iran, Israel, Kyrgyzstan, Syria, Turkey, Uzbekistan), North Africa (Algeria, Lybia) and North America (USA) (Akramovskij 1976; Commonwealth of Australia 2002; Horsak et al. 2010; Palmer 2010; Peltanova et al. 2011; Balashov and Gural-Sverlova 2012; Balashov et al. 2013; Izatullaev 2013; Mumladze 2013; Čejka and Čačaný 2014; Shikov, 2017; Korábek et al. 2018; Páll-Gergely et al. 2019; Baschirova 2022; Doležal 2022; GBIF Secretariat 2022; Zając et al. 2023; MolluscaBase 2024) (Fig. 1). In Kazakhstan, the species was for the first time found in Turkistan oblast, Kentau urban agglomeration, Kentau Town in 2020 (Temreshev et al. 2023b). This communication reports new discoveries of the mountain snail in the southern and southeastern parts of the country (Fig. 2).

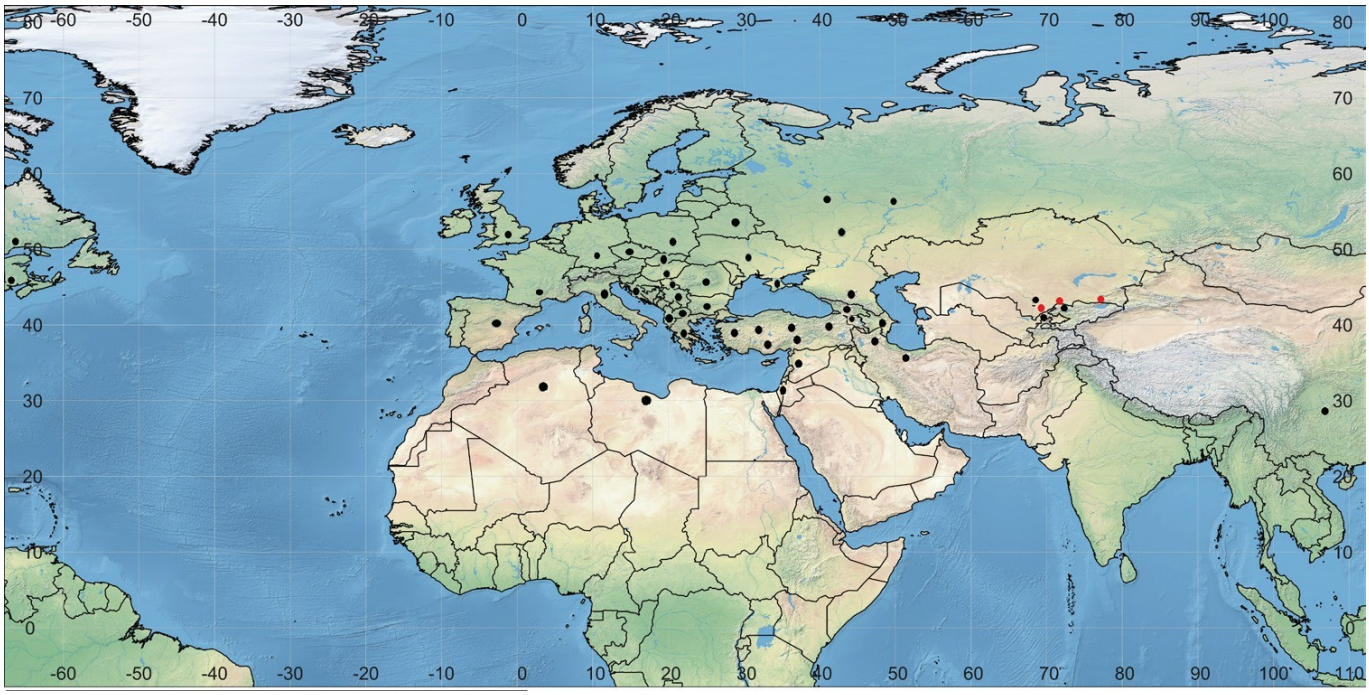

Figure 1. *Distribution of Helix lucorum in the world and Kazakhstan. New records are indicated by red dots. The black dots correspond to the previous records, known from the literature.*

Figure 2. *Distribution of Helix lucorum in Kazakhstan. New records are designated by red dots. The black dot denotes the previously known locality.*

Materials and methods

The studied material was collected in 2020-2024 in the Turkistan, Zhambyl and Almaty oblasts in southern and southeastern Kazakhstan in cities of Kentau, Shymkent, Taraz and Almaty out within the framework of the project NTP "Comprehensive assessment of the state of the environment and health of the population of the city of Kentau and adjacent settlements", "Works on environmental design JSC Intergas Central Asia" and BR 22885887 "Improvement and implementation of pest

management system".The snails were picjed by hands. The Identification of species, as well as clarification of the features of its biology and distribution were made by I.I. Temreshev using a series of literary sources (Likharev and Rammelmeyer 1952; Akramovskij 1976; Shileiko 1978; Uvalieva 1990; Commonwealth of Australia 2002; Horsak et al. 2010; Palmer 2010; Peltanova et al. 2011; Balashov and Gural-Sverlova 2012; Balashov et al. 2013; Mumladze 2013; Shileiko and Rymzhanov 2013; Čejka and Čačaný 2014; Izatullaev 2013; Shikov 2017; Korábek et al. 2018; Páll-Gergely et al. 2019; Bashirova 2022; Doležal 2022; Zając et al. 2023; MolluscaBase 2024). The material is stored in the personal collections of authors and in Laboratory of Entomology of the Zhazken Zhyembayev Kazakh Research Institute of Plant Protection and Quarantine.

Photographs of *H. lucorum* and its habitat were taken with a camera Redmi 7 and Samsung by authors (Figs 3–5).

Abbreviations: c – city; ex – exemplar.

Result

Material examined. 1 ex., 2.08.2020, Turkistan oblast, Kentau urban agglomeration, Kentau city, New city park, on the ground, dead, N.A. Yakovleva; 1 ex., 8.08.2020, Turkistan oblast, Kentau urban agglomeration, Kentau city, New city park, on the ground, N.A. Yakovleva; 7 ex., 21.08.2020, Turkistan oblast, Kentau urban agglomeration, Kentau city, Old Miners' park, on tree trunks of honey locust *Gleditsia triacanthos* L., N.A. Yakovleva, E. Sadvakassov; 147 ex., 26.08.2020, Turkistan oblast, Kentau urban agglomeration, Kentau city, Old Miners' park, on tree trunks: scots pine *Pinus sylvestris* L. and black pine *Pinus nigra* Arnold, lacebark elm *Ulmus parvifolia* Jacq., honey locust and Osage orange *Maclura pomifera* (Raf. ex Sarg.) C.K. Schneid., and metal irrigation pipes, I.I. Temreshev, A.M. Makezhanov; 38 ex., 1.10.2020, Turkistan oblast, Kentau urban agglomeration, Kentau city, New city park, on the ground, dead, N.A. Yakovleva; 5 ex., 4.10.2020, Turkistan oblast, Kentau urban agglomeration, Kentau city, New city park, on the ground, dead, N.A. Yakovleva; 60 ex., 4.10.2020, Turkistan oblast, Kentau urban agglomeration, Kentau city, Old Miners' park, on the ground, dead, N.A. Yakovleva; 6 ex., 1.08.2022, Almaty oblast, Almaty city, park "Dostyk", on tree trunks of lacebark elm *U. parvifolia* and *Malus domestica* L., G.Ye. Kozhabayeva; 2 ex., 23.08.2022, Almaty oblast, Almaty city, microdistrict Koktem-2, in the green space to riverbed of Esentai River, on tree trunks of small-leaved lime *Tilia cordata* Mill., 1768, I.I. Temreshev; 5 ex., 16.08.2022, Jambyl oblast, Taraz city, live and dead on the ground in the green space, A. Ibraev; 7 ex., 8.08.2022, Turkistan oblast, Shymkent city, on tree trunks of honey locust *G. triacanthos* and ashleaf maple *Acer negundo* L., I.I. Temreshev; 9 ex. – 15.04.2024, Turkistan oblast, Shymkent city, on the ground after rain, A.M. Makezhanov.

According to data provided by Kudaibergen Amirekul (Shymkent, Kazakhstan), the snail is quite common in the vicinity of Shymkent city, especially in areas where grapes are grown. According to his information, in the Turkistan oblast, *H. lucorum* was also recorded in the following points: Tolebi district, Koksayak village, green plantings, 43 km from Shymkent city, Tulkibas district, Balykty village, planting of fruit trees, 57 km from Shymkent city, Tulkibas district, vicinity of the village of Balykty, grape plantations, 62 km from Shymkent city. These localities are known to us only from reports, the coordinates were provided by the author of the message and photographs. The coordinates of the material collection sites are given in Table 1.

Helix lucorum snails collected in Kazakhstan are characterized by the presence of bright and wide transverse stripes on the shell. Shell height is 39-45, shell width – 40-47 mm. Adult snails weigh about 21-25 g. The conchological traits of studied snails correspond to the literary data (Akramovskij 1976; Likharev and Rammelmeyer 1952; Horsak et al. 2010; Balashov 2016).

The found numerous live and dead individuals of different age indicate the presence of stable populations of *H. lucorum* in the green spaces of Kentau, Shymkent, Taraz and Almaty cities (Figs

3–5).

No	Material collection sites	Coordinates
1	Turkistan oblast, Kentau urban agglomeration, Kentau city, New city park	43°31'5.47"N 68°30'5.32"E
2	Turkistan oblast, Kentau urban agglomeration, Kentau city, Old Miners' park	43°31'14.93"N 68°30'54.69"E
3	Almaty oblast, Almaty city, park "Dostyk"	43°7'58.9800"N 76°33'15.4368"E
4	Almaty oblast, Almaty city, microdistrict Koktem-2	43°8'3.2208"N 76°33'8.6400"E
5	Jambyl oblast, Taraz city	42°31'18.0804"N 71°13'25.3236"E
6	Turkistan oblast, Shymkent city	42°11'8.0268"N 69°21'29.7360"E
7	Turkistan oblast, Shymkent city, on the ground after rain	42°19'6.88"N 69°35'18.36"E
8	Turkistan oblast, Tolebi district, Koksayak village, green plantings, 43 km from Shymkent city	42°8'40.5276"N 70°0'27.3456"E
9	Turkistan oblast, Tulkibas district, Balykty village, planting of fruit trees, 57 km from Shymkent city	42°21'6.2352"N 69°37'40.6236"E
10	Turkistan oblast, Tulkibas district, vicinity of the village of Balykty, grape plantations, 62 km from Shymkent city	42°20'38.9580"N 69°38'15.6264"E

Table 1. *Coordinates of material collection sites of Helix lucorum snail in Kazakhstan*

Figure 3. *Shells of Helix lucorum from South Kazakhstan.*

Discussion

In the territory of Kazakhstan, the snail *H. lucorum* was not recorded until 2023 (Temreshev et al., 2023b); this species is absent from the country's mollusk inventories (Uvalieva 1990; Shileiko and Rymzhanov 2013). During our research on mollusks in the Almaty oblast (Temreshev et al. 2018, 2020, 2022a), we also did not detect it. This species is invasive for the country. It is currently the only representative of the family Helicidae in the fauna of Kazakhstan. Stable, self-reproducing populations of the snail have been identified in parklands in the cities of Kentau, Taraz and Shymkent in the Turkistan oblast, southern Kazakhstan, and in the city of Almaty in southeastern Kazakhstan. The nearest point where the snail is presentis the city of Tashkent (Uzbekistan), where this species was found in 2012 (Izzatullaev 2013; Shikov 2017). According to information from the local residents, tree seedlings were brought from Tashkent for landscaping the city of Kentau. Thus, the invasion of the species most likely occurred from that city. It is indicative that in Taraz

the snail was found in the green areas near the railway station. That is, the species was found near the transport hub, through which it was most likely introduced from the Turkistan oblast. In the city of Almaty, the snail can be imported from the southern regions, from Kentau or Shymkent and Turkistan oblast, or from Jambyl, or it can be transported from other countries with planting material. In these regions of Kazakhstan, there are a fairly large number of cases of the penetration of adventive species of various invertebrates (Temreshev 2017; Temreshev et al. 2018; Temreshev and Makezhanov 2019; Temreshev and Kazenas 2020; Temreshev 2021; 2023; Temreshev et al. 2022a, b; 2023a, b, c). Another suggestions is that the snails could have been brought to Almaty through pet trade and managed to escape and settle outdoors. Morphological comparison of specimens of *H. lucorum* of invasive populations from Kentau, Taraz, Shymkent and Almaty revealed no differences.

A B

C

Figure 4. *Helix lucorum on tree trunks: black pine Pinus nigra (**A**), lacebark elm Ulmus parvifolia (**B**) and honey locust Gleditsia triacanthos (**C**).*

Figure 5. *Live individuals of Helix lucorum from Kentau (**A**), Shymkent (**B**), Taraz (**C**) and Almaty (**D**).*

Conclusions

The further dispersal of *H. lucorum* throughout the South Kazakhstan is expected, primarily in the Turkistan and Jambyl oblasts. Its penetration into territory of the Kyzylorda oblast is quite possible, but the successful introduction is questionable, since this region has, in its large part, an extremely arid hot climate that is not very suitable for this snail. One of localities of the oblast, where *H. lucorum* could likely gain a foothold, is the regional center, the city of Kyzylorda, which has irrigated park zones and crop production facilities in protected ground (greenhouses). In the South-East Kazakhstan, the introduction of the mountain snail into the Almaty oblast is likely over time. Since *H. lucorum* can harm agricultural plants and green spaces (Ljurin and Petrusenko 1973; Akramovskij 1976; Mumladze 2013), listed in EPPO Global Database (EPPO 1996), plant protection

and quarantine services should take control on its further spread. It is also a facultative host of helminths found in the gastrointestinal tracts of ruminants, horses, and swine (Likharev and Rammelmeyer 1952). It should be noted that in Kazakhstan the conduct of protective measures to limit the number of harmful ground snail is a problematic issue. In the list of pesticides allowed for use in the territory of the Republic of Kazakhstan (List of pesticides … 2022), not a single molluscicide is officially registered.

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