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GROUND MALACOFUNA (MOLLUSCA, GASTROPODA) OF FIELDS OF FODDER CROPS OF THE ALMATY OBLAST

Abstract. As a result of the conducted studies in the Almaty region, 9 species of terrestrial malacofauna belonging to 4 genera and 4 families (Limacidae, Parmacellidae, Agriolimacidae, Bradybaenidae) have been identified in fodder crops (alfalfa, soybean, maize, triticale). More than half of its species (5 slugs from the genus *Deroceras*) are invasive, and harm plants, as well as livestock, as carriers of helminths - round, flat and tapeworms. Two of the four aboriginal species – the slug *Turcomilax turkestanus* (Simroth, 1898) and the snail *Fruticolaplectotropis* (E. Martens, 1864) found are in single quantities. Probably representatives of these species accidentally brought were to fields with soil or planting material, as their self-reproducing population not noted was. Caucasian slug *Deroceras caucasicum* (Simroth, 1901) had dominance in the number of all kinds of land malacofauna in the fields of fodder crops (up to 210 ex./m² on crops of alfalfa, up to 105 ex./m² on corn, up to 96 ex./m² on soybean and up to 85 ex./m² on triticale). This species in agroecosystems displaces both native species of terrestrial gastropods (*Fruticolalantzi* (Lindholm, 1927), *Candahariarutellum* Hutton, 1849), and other close to it invasive slugs (*Deroceras agreste* (Linnaeus, 1758), *D. laeve* (O.F. Müller, 1774), *D. sturanyi* (Simroth, 1894), *D. reticulatum* (O.F. Müller, 1774)). Of the food crops examined, the most affected by shellfish were soybean and alfalfa. Corn was damaged medium, and irrigation is stronger than with drip irrigation. Triticale was the least damaged culture. In the List of pesticides (toxic chemicals) permitted for use in the territory of the Republic of Kazakhstan, not a single molluscicide has been registered against terrestrial gastropods. On this basis, further research needed is to find effective and environmentally safe methods of limiting their numbers.

Keywords: ground malacofauna, gastropods, Gastropoda, Mollusca, species composition, forage crops, Almaty oblast, Kazakhstan.

Introduction. Gastropods, or snails (Gastropoda) - most numerous class in the type of Mollusks (Mollusca), that includes around 110 000 species. In Kazakhstan, there are 385 species of gastropods belonging to 92 genera and 35 families. In Kazakhstan and adjacent territories there known are 194 species and subspecies of 53 genera and 24 families of terrestrial mollusks. The main sign of gastropods is the torsion, that is, the rotation of the inner sack is on 180°. The majority of snails characterized are by the presence of a turbo-spiral shell, but some of it is devoid of - bare slugs, part of the species of the fusiform and all nudibranch mollusks. Ecologically gastropods are represented both by inhabitants of the sea, and by fresh and terrestrial species. Food specialization - there are both herbivorous species, and predators, scavengers and detritophages. Some have mixed nutrition. A small number of species from families Melanellidae, Stiliferidae, Entoconchidae are parasite of echinoderms. The practical importance of gastropods is very diverse. Shells of individual marine species (*Cassis*, *Strombus*, *Murex*, *Chicoreus* and other) traded are, used to make souvenirs and ornaments. Some marine and terrestrial gastropods mined are and even bred (*Haliotis*, *Buccinum*, *Neptunea*, *Pattella*, *Achatina*, *Helix* and other) as objects suitable for food. Snails play a significant role in the circulation of substances in water bodies. Inhabited at the

bottom and consuming organic remains of various origins, they accelerate their decomposition. Plankton and nektonic species serve as feed for commercial fish, whales and pinnipeds. The above-mentioned *Murex* have special glands, from the secret of which they receive purple dye. Venom of the snails of the genus *Conus* mortally dangerous to humans when bitten, but at the same time promising for use in medicine. For example, the drug Ziconotidis a synthetic form of the non-opioid analgesic – one of the peptides of the cone, the action of which surpasses all known drugs. They are supposed to replace the addictive morphine. Slug snails used are in cosmetology for rejuvenating procedures. Plant-eating species prevent the overgrowing of water bodies or aquariums. Some species (*Achatina*, *Helix* and other) used for scientific experiments. Some representatives of terrestrial malacofauna listed are in the Red Books of the Republic of Kazakhstan and the Almaty region. The terrestrial gastropods take part in the processes of soil formation, enriching the soil with organic and mineral substances, and serve as one of the important indicators of the state of soils during soil-zoological studies. They can damage various crops, fruit bodies of mushrooms. The damage caused to plants by mollusks is aggravated by the fact that they can carry many phytopathogenic organisms (viruses, bacteria, fungi), particles and spores of which pass through intestines intact. Many species of gastropods serve as intermediate hosts of parasitic helminths of humans and domestic animals *Fasciola hepatica*, *Opisthorchis felineus*, *Schistosoma mansoni* and other. Carnivorous sea gastropods (*Rapana* and other) can harm, destroying artificially bred bivalve molluscs - mussels, oysters, etc. Harmful gastropods, accidentally or intentionally brought by humans to new habitats, like other pests, often cause even greater economic damage than at home. Even in developed countries such as the US and South Africa, it is necessary to spend considerable sums on the study of biology and the development of measures to combat introduced species of land mollusks [1-13, 16-31].

In Kazakhstan, the implementation of protective measures to limit the number of harmful terrestrial gastropods is a problematic issue. In the Handbook on Plant Protection [12, 13] some means indicated are. However, in the List of pesticides (toxic chemicals) [14], approved for use on the territory of the Republic of Kazakhstan, no harmful mollusc has been officially registered with any molluscicidal preparation. In the "State Catalog of Pesticides and Agrochemicals Permitted for Use on the Territory of the Russian Federation" [15] there are 2 pesticides against slugs and snails, but they basically contain toxic metaldehyde. Its use is dangerous for humans, domestic animals and non-target fauna.

Materials and methods. Basis for this work was the collection of authors, made in 2015-2017 years on the fields of fodder crops out of the Almaty region (Almaty region, Panfilov district, Bayserke settlement, ERPC "Bayserke Agro" LLP and Karasai district, RF "Kaskelenskoe") in the framework of the project "Development of environmentally friendly methods for increasing the yield of fodder and industrial crops (alfalfa, soybean, maize, triticale)". When performing one of the subtasks of the project, pests of fodder crops studied were, among which were terrestrial gastropods. Data on the abundance and species composition of mollusks were obtained by conventional methods - manual collection and excavation of soil on trial plots of 1 m². The collected mollusks counted were and then fixed for subsequent determination in 70% alcohol. The number of mollusks in the examined field was expressed by the number of individuals per 1 m². To identify species and determine information about their bioecological features and distribution, sources from the list of literature [1-13, 16-22].

Results of the study. In the course of the surveys on the fields of fodder crops in the Almaty region, material was collected on land mollusks belonging to 4 families of gastropods. The types and damages caused by them found are in the photographs (figures 1-10). List of species with a short characteristic given is below:

Type Mollusca Linnaeus, 1758 – Mollusks
Class Gastropoda Cuvier, 1797 – Gastropoda
Clade Pulmonata Cuvier, 1797 – Pulmonary snails
Superfamily Limacoidea Lamarck, 1801 – Limacoid
Family Limacidae Lamarck, 1801 – Keelback slugs
Genus *Turcomilax* Simroth, 1901

Turcomilax turkestanus (Simroth, 1898). The length of the contracted slug is 55 mm, the width is 10-12 mm, length of the mantle is up to 15 mm, respectively. The upper body is black with a bluish tint, the sole is white with dark edges. Sometimes there are dark brown specimens with light gray sides (figure 1).

Adult specimens found are throughout the warm season. Reproduces in June-July. Eggs develop 20 days, duration of hatching is 27 days. Inhabits within the meadow-steppe and mountain forest zones, among rocks and stones, along moist slopes and shores of reservoirs. In the foothills it occurs in orchards and vegetable fields. In the dry season, hiding in shelters - cracks of rocks and trees, under rocks, winding trees, debris, in the soil. It feeds mainly on green vegetation, but it also has food for mushrooms and lichens, plant litter, and corpses of small animals (rodents). The possibility of transferring eggs of helminths - parasites of humans and livestock. Distribution: South and South-East Kazakhstan (Ile-Alatau, Kungey-Alatau, Korday Pass), Kirghizstan (Terskey-Alatau and Kyungey-Alatoo). It listed is in the Red Book of the Republic of Kazakhstan and the Red Book of the Almaty Region as a shrinking species.

On fields of fodder crops in the Almaty region in single quantities. Within 3 years of research, only 4 exemplars of this species were found on irrigated corn. Perhaps, these individuals were accidentally brought to fields with soil, or to nearby planting of trees with planting material, where they then migrated to the corn field, as there was no stable self-reproducing population, as was already noted in the literature.



Figure 1 – *Turcomilaxturkestanus* (Simroth, 1898)



Figure 2 – Greenhouse slug *Candahariarutellum* Hutton, 1849

Family Parmacellidae Gray, 1860

Genus *Candaharia* Godwin-Austen, 1888

Candahariarutellum Hutton, 1849 - Greenhouse slug. The length of the contracted slug is 55 mm, the length of the mantle is 20 mm, the length of the back is 13 mm. Color gray or yellow. On the mantle there are well-marked longitudinal bands located along the right and left edges of the body, to the posterior end of the leg and on the occiput (figure 2). It lives in both natural and anthropogenic biotopes in wet places - along the banks of reservoirs, irrigation canals, etc. In the mountains rises up to 2300 m, and in semi-deserts can penetrate quite far along the irrigation system. In nature, the population is usually small, but in agrocenoses it can significantly increase. Wintering of young individuals, depending on weather conditions in late February-early March. Mating and egg laying takes place in May-June. Fecundity from 10 to 80 eggs. After 25-30 days, the fry hatches, which in 3-4 days digs into the soil and diapause till the end of August and beginning of September. Then the juvenile intensively feeds and grows until the onset of cold weather and wintering (until November). It feeds mainly on plants, but eats other types of mollusks, worms and other inactive animals, and also notes cannibalism. Harms leguminous plants, winter crops, protected soil cultures. Distribution: South and South-East Kazakhstan (Ile-Alatau, Talas Alatau, Syrdarya Karatau, Almaty and Almaty region), Kyrgyzstan, Uzbekistan and Tajikistan (Kyrgyz and Alai Ridges, Pamir-Darvaz), Afghanistan.

On the fields of fodder crops of the Almaty region is noted on the crops of alfalfa and soybean. Here the species is present in very small numbers - the maximum number in alfalfa was 5 ex./m², in soybean crops - 7 ex./m².

Family Agriolimacidae H. Wagner, 1935 – Field slugs

Genus *Deroceras* Rafinesque, 1820

Derocerascaucasicum (Simroth, 1901) - Caucasianslug. The length of the crawling slug to 40, contracted - usually about 30 mm. Body soft, watery. The length of the mantle is 1/2-1/3 of the body length, and not less than half of it is in the large hood. Stains without spots. The background is whitish, creamy,

gray-yellow, gray-pink, brown or dark brown. The head is darker than the general color almost black (figure 3). Mantle is also often darker. Around the pneumostome there is a bright spot, which is often lighter than the background, but if the background is light, it can merge with it. Synanthropic form. Inhabits usually in forests, less often in wet meadows. In the anthropogenic landscape inhabits a variety of sites - in parks, gardens, fields, kitchen gardens, roadsides, dumps, in the sleeping areas of cities on the facades of high-rise houses above the front gardens, on lawns and planted green areas of kindergartens, etc. Polyphagous pest, damaging a variety of cereals, vegetables, fodder, technical, fruit and berry and ornamental crops, meadow grasses, edible mushrooms. Causes significant harm until the complete destruction of the crop. On the damaged leaves there are large irregularly rounded holes (most often in the middle of the leaf, less often along the edge), on the fruits - large pitted holes (Figure 4). Distribution: the main area in the Caucasus and the Crimea, from where it reaches Asia Minor and Iran. It is imported to Ukraine, to the European part and the Far East of Russia, to Kazakhstan, Uzbekistan, Tajikistan.



Figure 3 – Caucasianslug *Derocerascaucasicum* (Simroth, 1901)

In the Almaty region, on forage crops, the usual, sometimes massive type. The maximum abundance according to our observations reached 90 ex./m² on alfalfa, up to 75 ex./m² in corn, up to 56 ex./m² on soybeans and up to 45 ex./m² on triticale. It dominates in number among other species of terrestrial mollusks in all examined agrocenoses.

Derocerasagreste (Linnaeus, 1758) - Grey field slug. The length of the expanded slug is 30-60 mm, width 4-5 mm. Body slender, movable, with short blunt keel. The skin smooth, the surface of the body is colored yellowish white, light or dark gray or reddish-brown, sometimes with weak dark streaks and spots (figure 4). The day hides in shelters, and at dusk goes to eat. In dry years, when the soil dries out drastically, slugs with a drop in moisture to 10-15% perish. Wet and cool summer is especially favorable for life and reproduction. Hibernate eggs, less often adults. The last of the wintering grounds come from the middle of April to the beginning of May. In late May-early June slugs mated, after which they lay up to 600 eggs in groups of 20-30 pieces. After 2-3 weeks young individuals come out, after about 1.5 months they become sexually mature and in the autumn lay wintering eggs. In the humid and cool summer, mass reproduction accompanied is by severe damage to plants, the areas of which sometimes amount to several thousand hectares. Damage as in the Caucasian slug. In autumn and winter, strong damage to the field slug causes in cellars and vegetable stores. Damages cereals, legumes, technical, medicinal, vegetable, fruit and berry, fodder crops, meadow grasses, edible mushrooms, as well as vegetable and ornamental crops in greenhouses, greenhouses, greenhouses, storages. The carrier of tape and round helminths - parasites of cattle. Distribution: Europe, European part of Russia, Crimea, Caucasus, Siberia, Far East, Kazakhstan (North Kazakhstan, Kostanay, Pavlodar, East Kazakhstan and Almaty oblast, Almaty and surroundings), Kyrgyzstan, Uzbekistan.

Reported on alfalfa and soybean crops, the number was medium – up to 16 ex./m² and up to 14 ex./m², respectively.



Figure 4 – Leaves of soy and alfalfa damaged Caucasianslug



Figure 5 – Grey field slug *Derocerasagreste* (Linnaeus, 1758)

Deroceraslaeve (O.F. Müller, 1774) - Marsh slug. Body length 25-30 mm, width 2.5-3 mm. The color is dark brown, downwards lighter, the head and tentacles dark (figure 6). The skin is dense, with rather large flat wrinkles. The edges of the mantle rounded are in front and back, its surface covered is with rare concentric lines, the center of which shifted is aside. The back in the back of the body goes into a steep short keel. The most active in the twilight-night hours of the day and in the afternoon hide in various shelters. Hibernating adults and eggs laid in the fall. In May and June young slugs appear, the maturity of which begins 1.5-2 months after hatching from the eggs. Omnivorous species. Plants damage germinating seeds, young shoots and leaves, and other organs, in mushrooms - mycelium and fruiting bodies, lichen - leaf blades. Of animals, this species eats worms that live in the soil of larvae, eggs and pupae of insects, as well as corpses of animals (mostly invertebrates). Damages cereals, legumes, technical, vegetable, fruit and berry, forage crops, meadow grasses, edible mushrooms. One of the most cold-resistant and hygrophilous slugs. Distribution: cold and temperate regions of the Northern Hemisphere. In Kazakhstan it noted was in Pavlodar (Pavlodar and its surroundings), South-Kazakhstan (Syrdarya-Karatau Ridge) and Almaty regions (Ile-Alatau Ridge, Almaty and its environs, imported).

Like the previous species, it was noted only on crops of one fodder crop-corn, the number was relatively low - as much as 14 ex./m². Probably, the temperature regime and humidity of irrigated corn sowings were the most suitable for him.

Derocerassturanyi (Simroth, 1894) - Yellowslug, or Shturanaslug. The length of the expanded slug body is 60-70 mm, compressed - 35 mm. Skin is very thin, translucent. Color uni-color, without pattern in the form of spots and stripes, dirty-cream or grayish-brownish (figure 7). Mantle, occupying about half the length of the body, and the middle of the back colored are slightly darker than the sides and sole. Sometimes there are individuals of chocolate or brown color, or with an almost black back. Slime watery, colorless. Synanthropic form. Dwells in gardens, parks, gardens, wastelands, meadows, roadside ditches,

Figure 6 – Marsh slug *Deroceras laeve* (O.F. Müller, 1774)Figure 7 – Yellow slug *Deroceras sturanyi* (Simroth, 1894)

in greenhouses, greenhouses, cellars and vegetable stores. In nature found is in floodplain meadows and broad-leaved forests. Hibernating mainly eggs, individual sometimes adults. Mating and laying of eggs take place in the middle of summer and in autumn. It feeds on green parts of plants, fruits and vegetables. Harmful to perennial grasses, vegetable, berry and ornamental crops. Distribution: originally inhabited the European part of the former USSR, Kazakhstan was imported and acclimatized in Almaty and the Almaty region.

In the fields of fodder crops in the Almaty region, alfalfa and maize planted were. The maximum number of alfalfa was noted up to 12 ex./m², on corn up to 9 ex./m².

Deroceras reticulatum (O.F. Müller, 1774) - Grey garden slug. The length of the expanded slug body is 50-60 mm, width 5-7 mm. Coloration yellowish-white, gray or reddish-brown. The skin is dense, wrinkled and, together with the mantle, covered is with numerous small black spots or strokes (figure 8). The keel is sharp. Slugs are most active in the twilight-night hours of the day, and in the daytime - in the spring and in cloudy weather in the summer. Hibernating eggs and adults. The last of the wintering grounds are in mid-April-early May at an average daily air temperature of 10-11°C. Egg laying takes place from June to October. Lay them in a loose and moist soil in groups of 10-20 pieces in 8-10 receptions. The total number of eggs laid by one slug reaches 150-200 pieces. Young individuals appear in about 2 weeks. They live 3-4 years. An omnivorous species. The plants eat germinating seeds, young shoots, leaves, fruits, in mushrooms – mycelium and fruiting bodies. Animals eat worms in the soil of the egg, larvae, sometimes pupae of insects, as well as eggs and young specimens of various terrestrial mollusks. It damages cereals, legumes, technical, vegetable, fruit and berry, fodder crops, edible fungi, as well as greenhouse, hothouse and greenhouse crops. Distribution: Europe, the Baltic States, Ukraine, the European part of Russia, the Crimea, the Caucasus, Transcaucasia, Kazakhstan (imported to Almaty and surrounding areas of the Almaty region, Ile-and Kungey-Alatau ridges), Kyrgyzstan. Also imported to North and South America, Australia, New Zealand, South Africa.

Figure 8 – Grey garden slug *Deroceras reticulatum* (O.F. Müller, 1774)

The number of species in the fields of fodder crops was average, reaching a maximum of 15 ex./m² in alfalfa crops, and 18 ex./m² in soybean crops.

Family Bradybaenidae Pilsbry, 1934

Genus *Fruticolala* Held, 1838

Fruticolalantzi (Lindholm, 1927) - Lanzigarden snail. Shell spherical or whirligig, thick-walled, curly conical, with a narrow apex. Turning the shell 5-6, convex, with a slow and smooth rise. The background of the coloring of the shell is yellow in different shades with 3 spiral brown ribbons. The middle tape is more distinct, the upper and lower are blurred to varying degrees. There are specimens with poorly expressed ribbons or without tapes at all, shell retains then an intensely colored background or not colored is at all (figure 9). Sometimes, on the contrary, the tapes are too developed, and the shell as a whole has a dark color. It lives in both natural and anthropogenic biocenoses - mainly on medium-sized meadows, along streams and rivers, in narrow shady gorges, gardens, gardens, gardens, fields, from where it can migrate to open spaces. In open places during the day, it hides in various shelters - under rocks, winding trees, rubbish, in cracks of rocks, trees and walls of buildings, or buried in sandy soil. If excessive dryness in the summer can fall into a hibernation, covering the opening of the shell with a film. It feeds mainly on green higher plants, but can also eat leaf litter, mushrooms and lichens. It damages various garden, field and ornamental crops, grapes and fruit. The carrier of tape, flat and round helminths - parasites of cattle. Distribution: South and South-Eastern Kazakhstan (Ile-Alatau, Zhetysu-Alatau, Kungey-Alatau, Chu-Ili Mountains, Kirghiz Range, Ile River floodplain, Almaty and surroundings, other settlements of the Almaty region with adjacent territories), Kyrgyzstan.



Figure 9 – Different age and color Garden snails *Fruticolalantzi* (Lindholm, 1927)

The species was noted on all forage crops, but the number was everywhere small, reaching a maximum of 12 ex./m² in alfalfa crops, 8 ex./m² in soybean crops, 10 ex./m² in maize and only 5 ex./m² on triticale crops.

Fruticolaplectotropis (E. Martens, 1864) (figure 10). Variable species consisting of several subspecies. The shell color is dark or light brown with white impregnations. Turning the shell to 6.5. Sculpture of the shell in the form of thin frequent rather regular ribs. During the period of activity, especially in spring, it occurs in all biotopes with steppe and meadow vegetation and shrubs. The greatest density forms under the stones near the constant watercourses. During the hibernation summer and winter forms accumulations in screes, cracks of rocks and under separate large stones. Plant-eating species. Sometimes harms fruit and berry crops. Distribution: Southern and South-Eastern Kazakhstan (Ile-Alatau, Kungey-Alatau, Terskey-Alatau, Talas Ridge), Kyrgyzstan, Tajikistan, Uzbekistan, Western China, Northern India.

For all the years of research, only 3 exemplars of this species were found in 2018 on alfalfa and soybean crops. It is possible that these individuals accidentally brought were into fields with soil or planting material, since no stable population found was.



Figure 10 – *Fruticolaplectotropis* (E. Martens, 1864)

The discussion of the results. Total, on the fields of fodder crops of the Almaty oblast 9 species of mollusks belonging from 4 genera and 4 families (Limacidae, Parmacellidae, Agriolimacidae, Bradybaenidae). Greatest variety is the genus *Deroceras* from the family Agriolimacidae - 5 species, of which the Caucasian slug was everywhere in the lead *Derocerascaucasicum* (Simroth, 1901) (up to 210 ex./m² on alfalfa, up to 105 ex./m² on corn, up to 96 ex./m² on soybeans and up to 85 ex./m² on triticale). All of them are invasive - spread as result of human activities, and serious pests of agriculture, damaging a variety of grains, legumes, fodder, fruit and berry and technical crops. They are capable of causing serious economic damage not only damaging and eating plants, but also carrying helminths - round, flat and tapeworms - human and livestock parasites.

Two species of bush snails from the genus *Fruticola* family Bradybaenidae and slug *Candaharitarutellum* Hutton, 1849 (Parmacellidae) and *Turcomilaxturkestanus* (Simroth, 1898) (Limacidae) - native species for southeast Kazakhstan and Central Asia. The number of all other identified species of terrestrial fauna of mollusks was relatively small, with the exception of the Caucasian slug. Due to weather and climate conditions (high humidity and frequent rains), 2016-2017 in the beginning proved to be favorable for the development and reproduction of pests from the class of gastropods. However, they could not do much harm, because the rainy weather replaced was by a strong heat, adversely affecting their livelihoods. However, under favorable conditions more, the damage caused by terrestrial gastropods can be much more palpable. Migrating from one plant to another, mollusks promote the spread among agricultural crops of various phytopathogenic diseases - spotting, gray mold, downy mildew, potato blight, potato viruses, etc. Moreover, unlike harmful insects, they are resistant to low temperatures and high humidity, and can damage plants even under weather and climate conditions where insect pests are inactive or susceptible to diseases caused by entomopathogenic microorganisms. Many damages to agricultural and ornamental plants applied in cool and humid weather, attributed to Lepidoptera caterpillars, beetles or other pests, often actually inflicted are by terrestrial gastropods.

Of the fodder crops we examined in Almaty region, alfalfa and soybean were the most damaged mollusks - plants with more tender, juicy and thick fairly leaves, providing gastropods with shelter from sunlight and high humidity at the base of the stems. Corn in the middle position for damage was, and the crops of irrigated corn suffered from mollusks more strongly than when drip irrigation. This due to the fact that is on irrigation lands for terrestrial gastropods a more favorable regime for humidity was established, and there their concentration increased. Triticale relatively insignificantly affected was by mollusks. Damage even in the period of shoots and earing, when gastropods scraped along the veins parenchyma leaf cereals, were insignificant. Adverse damage from land mollusks is the heavy contamination of plant products with slime and feces. The most harmful of the identified gastropods are slugs of the genus *Deroceras*, due to its large number and ecological plasticity. Preparations based on methaldehyde are toxic to non-target invertebrates and warm-blooded animals, and not be can used in forage crops. One possible alternative may be a biological preparation Nemaslug® the basis on of a nematode *Phasmarhabditishermaphrodita* (A. Schneider, 1859), which is currently sold in 15 European countries and is widely used by farmers and growers [32]. The drug affects only slugs and snails, without harming the non-target fauna - earthworms, insects, soil mites, etc. To use it, it will be necessary to conduct appropriate tests on the territory of Kazakhstan.

Conclusions. In Almaty region, a relatively small species diversity of terrestrial malacofauna been has identified in forage crops. More than half of the species (5) of its composition are invasive, imported man, and damage both crop production and livestock. Of 4 native species 2 - slug *Turcomilaxturkestanus* (Simroth, 1898) and a snail *Fruticolaplectotropis* (E. Martens, 1864) are found in single quantities. Probably, few of the individuals found in these species accidentally brought were into fields with soil or planting material, since there was no stable self-reproducing population. Of all the terrestrial malacofauna species in the fields of fodder crops, the Caucasian slug *Derocerascausicum* (Simroth, 1901). Apparently, this species in agrocenoses displaces both aboriginal species of terrestrial gastropods (*Fruticolalantzi* (Lindholm, 1927), *Candahariarutellum* Hutton, 1849), and other close to it invasive slugs (*Derocerasagreste* (Linnaeus, 1758), *D. laeve* (O.F. Müller, 1774), *D. sturanyi* (Simroth, 1894), *D. reticulatum* (O.F. Müller, 1774)). In the List of pesticides (toxic chemicals) [14] permitted for use in the territory of the Republic of Kazakhstan, not a single preparation has been registered against mollusks - neither chemical nor biological. Therefore, further research needed is to find effective and environmentally safe methods of limiting their numbers.

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REFERENCES

- [1] Kantor Ju.I., Sysoev A.V. (2005). Katalog molljuskov Rossii i sopredel'nyh stran. M.: Tovarishestvo nauchnyh izdanij KMK. ISBN: 5-87317-191-2 (In Russian).
- [2] Uvalieva K.K. (1990). Nazemnye molljuski Kazahstana i sopredel'nyh territorij. AlmaAta: Nauka. (In Russian).
- [3] Kazenas V.L. (2012). Predvaritel'naja ocenka taksonomicheskogo sostava fauny molljuskov Kazahstana. KazNU Bulletin. Ecological series [Vestnik KazNU. Serija jekologicheskaja]. 1 (33): 263-265 (In Russian).
- [4] Liharev I.M., Rammel'mejer E.S. (1952). Nazemnye molljuski fauny SSSR. M.; L.: Izd-vo AN SSSR. (In Russian).
- [5] Kantor Ju.I., Sysoev A.V. (2006). Morskie i solonovatovodnye brjuhonogie molljuski Rossii i sopredel'nyh stran: illjustrirovannyj katalog = Marine and brackish water Gastropoda of Russia and adjacent countries: an illustrated catalogue. In-t problem jekologii i jevoljucii im. A. N. Severcova RAN, Programma fundamental'nyh issled. Prezidiuma RAN «Bioraznoobrazie i dinamika genofondov». M.: Tovarishestvo nauchnyh izdanij KMK. ISBN 5-87317-292-7 (In Russian).
- [6] Dogel' V.A. (1981). Zoologija bespozvonocnyh: Uchebnik dlja un-tov. Pod red. prof. Ju.I. Poljanskogo. Izd. 7-e, pererab. i dop. M.: Vysshaja shkola. (In Russian).
- [7] Shilejko A.A., Rymzhanov T.S. (2013). Fauna nazemnyh molljuskov Kazahstana i sopredel'nyh territorij. M.-Almaty: Tovarishestvo nauchnyh izdanij KMK. ISBN 978-5-87317-902-2 (In Russian).
- [8] Kantor Yu.I., Vinarski M.V., Schileyko A.A., Sysoev A.V. Catalogue of the continental mollusks of Russia and adjacent territories. Version 2.3.1 (published online on March 2, 2010) http://www.ruthenica.com/documents/Continental_Russian_molluscs_ver2-3-1.pdf. (In Eng).
- [9] Gaponov S.P., Hicova L.N. (2005). Pochvennaja zoologija: uchebnoe posobie dlja studentov klassicheskikh universitetov Rossii. Voronezh: Voronezhskij gosudarstvennyj universitet. ISBN 5-9273-0659-4 (In Russian).
- [10] Vrednye zhivotnye Srednej Azii (Spravochnik). (1949). Sostaviteli: Arnol'di LV, Borhsenius NS, i dr. M.-L.: Izd-vo AN SSSR. (In Russian).
- [11] Vasil'ev V.P. (1987). Vrediteli sel'skohozjajstvennyh kul'tur i lesnyh nasazhdenij. Vol. 1: Vrednye nematody, molljuski, chlenistonogie. 2-e izd., ispr. i dop. Kiev: Urozhaj. (In Russian).
- [12] Spravochnik agronoma po zashhite rastenij (1983) / Pod red. T.N.Nurmuratova, G.H.Sheka. Alma-Ata: Kajnar (In Russian).
- [13] Spravochnik po zashhite rastenij (2004) / Pod red. A.O.Sagitova, Zh.D.Ismuhambetova. Almaty: Rond (In Russian).
- [14] Spisok pesticidov (jadohimikatov), razreshennyh k primeneniju na territorii RK na 2013-2022 gody. (2013). Astana. (In Russian).
- [15] Gosudarstvennyj katalog pesticidov i agrohimikatov, razreshennyh k primeneniju n aterritorii Rossijskoj Federacii. (2015). M.: Minsel'hozRossii. (In Russian).
- [16] Hlus L., Sverlova N. (2004). Nazemnaja malakofauna Prut-Dnestrovskogo mezhdurech'ja // Mater. konf. «Integrirovannoe upravlenie prirodnyimi resursami transgranichnogo bassejna Dnestra». Kishinev: Eco-TIRAS. P. 352-355. (In Russian).
- [17] Prozorova L.A., Fomenko K.V. (2015). Chuzherodnye vidy nazemnyh sliznej na Dal'nem Vostoke Rossii. Vestnik DVO RAN. 1: 72-78. (In Russian).
- [18] Bajdashnikov A.A. (1987). Nazemnaja malakofauna kak pokazatel' sostojanija nazemnyh jekosistem odnogo iz leso-stepnyh rajonov Ukrainy. Avtoref. dokl. konf. "Molljuski: rezul'taty i perspektivy ih issledovanij". L.: Nauka. P. 169-171. (In Russian).

- [19] Rymzhanov T.S. (2009). Zhiznennyj cikel kavkazskogo sliznja – *Deroceras (Liolytopelte) caucasicum* (Simroth, 1901) (Mollusca, Gastropoda) v uslovijah Alma-Atinskoy regionii. KazNU Bulletin. Biological series [Vestnik KazNU. Serija biologicheskaja]. 1 (40): 43-50. (In Russian).
- [20] Michalak P.S., Price T., Hitchcox M., Jones E. et al. (2010). Tropical Terrestrial Gastropods. New Pest Response Guidelines. First Edition Issued. U.S. Department of Agriculture (USDA). (In Eng)
- [21] Krasnaja kniga Almatinskoy regionii. (2006) / Pod red.: A.M. Meldebekov, V.L. Kazenas, A.B. Bekenov, A.M. Tojbaev. Almaty. (In Russian).
- [22] Krasnaja kniga Respubliki Kazahstan. (2006). Vol. 1: Zhivotnye. Chast' 2: Bespozvonochnye / Pod red. I.D. Mitjaev. Almaty: Oner. (In Russian).
- [23] Capinera, J.L. (2013). Cuban brown snail, Zachrysiaprovistoria (Gastropoda): damage potential and control, Crop Protection, 52: 57-63. (In Eng).
- [24] Capinera, J.L., Guedes Rodrigues C. (2015). Biology and control of the leatherleaf slug *Leidyula floridana* (Mollusca: Gastropoda: Veronicellidae), Florida Entomologist, 98:243-253. (In Eng).
- [25] Capinera, J.L. (2016). Some effects of copper-based fungicides on plant-feeding terrestrial molluscs: A role for repellents in mollusc management, Crop Protection, 83: 76-82. (In Eng).
- [26] Sallam A., El-Wakeil N. (2012). Biological and Ecological Studies on Land Snails and Their Control. In Book: Integrated Pest Management and Pest Control - Current and Future Tactics. Edited by Dr. Sonia Soloneski. InTech, February. ISBN:978-953-51-0050-8. (In Eng).
- [27] Baronio et al. (2014). First record of qualitative losses caused by *Meghimatium pictum* in vineyards of Southern Brazil and the effects of two molluscicides for its control, Ciência Rural, Santa Maria, 44, 10: 1715-1720. <http://dx.doi.org/10.1590/0103-8478cr20130522>. (In Eng).
- [28] Mahlfeld K. (2000). Impact of introduced gastropods on molluscan communities, northern North Island, Conservation Advisory Science Notes, 277:18. Department of Conservation, Wellington. (In Eng).
- [29] Howlett S.A. (2012). Terrestrial slug problems: classical biological control and beyond, CAB Reviews. Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources, 7, 051: 2-10 (In Eng).
- [30] Skelley P.E., Dixon W.N., Hodges G. (2010). Giant African Land Snail and Giant South American Snails: Field Recognition, Pest Alert created 09-February-2010: 5. (In Eng).
- [31] Herbert D.G. (2010). The introduced terrestrial Mollusca of South Africa. SANBI Biodiversity Series 15. South African National Biodiversity Institute, Pretoria. ISBN: 978-1-919976-56-3. (In Eng).
- [32] Iglesias J., Castillejo J., Castro R. (2003). The effects of repeated applications of the molluscicide metaldehyde and the biocontrol nematode *Phasmarhabditis hermaphrodita* on molluscs, earthworms, nematodes, acarids and collembolans: a two-year study in north-west Spain, Pest management science, 59 (11), 1217-1224. (In Eng).

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АЛМАТЫ ОБЛЫСЫНЫҢ МАЛААЗЫҚТЫҚ ДАҚЫЛДАР ТАНАПТАРЫНЫҢ ЖЕР ҮСТІМ АЛАКОФАУНАСЫ (MOLLUSCA, GASTROPODA)

Аннотация. Алматы облысы малазықтық дақылдардың (жоңышқа, майбұршақ, жүгері, тритикале) танаптарында жүргізілген зерттеулердің нәтижесінде 4 туысқа және 4 тұқымдасқа (*Limacidae*, *Parmacellidae*, *Agriolimacidae*, *Bradybaenidae*) жататын жерүсті малакофаунаның 9 түрі анықталды. Оның құрамындағы жартысынан көп түрі ивазивті болып келеді, және өсімдіктерге, сонымен қатар малшаруашылығына зиян тигізеді, сонымен қатар, олар гельминттердің - домалақ, жалпақ және таспалық құрттарды тасымалдаушылары болып табылады. Жергілікті төрт түрінің екеуі - шырыштылар *Turcomilax turkestanus* (Simroth, 1898) және ұлулар *Fruticicola plectotropis* (E. Martens, 1864) бірлі-жарым мөлшерде табылды. Бәлкім, аталмыш түрлердің өкілдері танаптарға топырақ немесе егіс материалдарымен кездейсоқ әкелінді, себебі, олардың өзін-өзі шығаратын популяциялары байқалмады. Малазықтық дақылдардың танаптарында жерүсті малакофаунаның барлық түрінен сандық мөлшері бойынша қауқаздық шырыштар *Deroceras caucasicum* (Simroth, 1901) (жоңышқа егістерінде 210 дана/м² дейін, жүгеріде 105 дана/м², майбұршақта 96 дана/м² және тритикаледе 85 дана/м² дейін) басым болып келді. Агроценоздарда бұл түр жергілікті жерүсті гастроподтарды (*Fruticicola lantzi* (Lindholm, 1927), *Candaharia rutellum* Hutton, 1849), сонымен қатар оған жақын шырыштардың ивазивті түрлерін (*Deroceras agreste* (Linnaeus, 1758), *D. laeve* (O.F. Müller, 1774), *D. sturanyi* (Simroth, 1894), *D. reticulatum* (O.F. Müller, 1774)) ығыстырады. Тексерілген малазықтық дақылдардың ішінде майбұршақ және жоңышқа дақылдары ұлулардан аса көбірек зақым шекті. Жүгері дақылы орташа дәрежеде зақымдалып, соның ішінде, тамшылап суарудан көрі суармалы танаптары көбірек зақымданды. Ең төмен зақымданған тритикале дақылы болды. Қазақстан Республикасының территориясында рұқсат етілген пестицидтердің (ульхимикат) тізімінде жерүсті гастроподтарға қарсы бірде-бір моллюскоцид тіркелмеген. Осы-

ған орай, болашақта олардың сандық мөлшерін төмендететін экологиялық тұрғыда қауіпсіз тәсілдерді іздестіру мақсатында зерттеу жұмыстарын жалғастыру қажет.

Түйін сөздер: жерүсті малакофауна, бауыраяқты ұлулар, Gastropoda, Mollusca, түр құрамы, мал азықтық дақылдар, Алматы облысы, Қазақстан.

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НАЗЕМНАЯ МАЛАКОФАУНА (MOLLUSCA, GASTROPODA) ПОЛЕЙ КОРМОВЫХ КУЛЬТУР АЛМАТИНСКОЙ ОБЛАСТИ

Аннотация. В результате проведенных исследований в Алматинской области на посевах кормовых культур (люцерна, соя, кукуруза, тритикале) выявлено 9 видов наземной малакофауны, относящихся к 4 родам и 4 семействам (Limacidae, Parmacellidae, Agriolimacidae, Bradybaenidae). Больше половины видов ее состава (5 слизней из рода *Deroceras*) являются инвазивными, и вредят растениям, а также животноводству, являясь переносчиками гельминтов – круглых, плоских и ленточных червей. Два из четырех аборигенных видов – слизень *Turcomilaxturkestanus* (Simroth, 1898) и улитка *Fruticicolaplectotropis* (E. Martens, 1864) обнаружены в единичных количествах. Вероятно, представители данных видов были случайно завезены на поля с грунтом или посадочным материалом, так как их самовоспроизводящейся популяции отмечено не было. Доминировал по численности из всех видов наземной малакофауны на полях кормовых культур кавказский слизень *Derocerascaucasicum* (Simroth, 1901) (до 210 экз./м² на посевах люцерны, до 105 экз./м² на кукурузе, до 96 экз./м² на сое и до 85 экз./м² на тритикале). Этот вид в агроценозах вытесняет как аборигенные виды наземных гастропод (*Fruticicolalantzi* (Lindholm, 1927), *Candahariarutellum* Hutton, 1849), так и другие близкие к нему инвазивные виды слизней (*Derocerasagreste* (Linnaeus, 1758), *D.laeve* (O.F. Müller, 1774), *D.sturanyi* (Simroth, 1894), *D.reticulatum* (O.F. Müller, 1774)). Из обследованных кормовых культур наиболее страдали от повреждений моллюсками соя и люцерна. Кукуруза повреждалась средне, причем поливная сильнее, чем при капельном орошении. Тритикале было наименее повреждаемой культурой. В Списке пестицидов (ядохимикатов), разрешенных к применению на территории Республики Казахстан, против наземных гастропод не зарегистрировано ни одного моллюскоцида. Исходя из этого, необходимо проведение дальнейших исследований с целью поиска действенных и экологически безопасных методов ограничения их численности.

Ключевые слова: наземная малакофауна, брюхоногие моллюски, Gastropoda, Mollusca, видовой состав, кормовые культуры, Алматинская область, Казахстан.

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