

Complexes of land mollusks of various biotopes of the ugam and pskom mountain ranges

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Abstract: High numbers, wide distribution, large species diversity, low mobility and low ability to overcome geographical barriers, ease of material collection and sensitive response to changes in the environment make a group of land mollusks a convenient object of biogeographically and ecological research.

Key words: Malacofauna, land mollusks, Palearctic and Holarctic, xerophiles, complex, Central Asian, upland Asian, anteroasian

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Materials and methods

During the inventory of land malacofauna of Uzbekistan, there was compiled a complete list of species and determined the features of their geographical distribution in the main natural areas of Uzbekistan. The material for the study was the collection of land mollusks on the Ugam and Pskov mountain ranges. There were studied 1500 examples.

Results and discussion

The natural conditions of the vertical profiles of these ranges are similar, that is why we consider the distribution of land mollusks in high-altitude zones and biotopes in them together.

It should be noted that prior to our researches, the distribution of land mollusks in landscape zones and biotopes of the Ugam and Pskom mountain ranges were unknown.

According to V.N. Pavlov (1980), allocated 5 altitude-landscape zones: 1 – high-zone area of ephemeral-ephemeroid vegetation; 2 – high-zone area

of Turan diverse herb-gramineous steppes; 3 – high-zone of meadow steppes and meadows, white-winged restharrow; 4 – high zone of subalpine meadows; 5 – high zone of Alpine vegetation.

The zone of ephemeral-ephemeroid vegetation in the research area is distributed at an altitude of 500-800 (1000) m above the sea level.

Ephemeral vegetation is confined to the sub-mountain plains and inter-mountain valleys. The lower limit of distribution of the communities of the named zone is uncertain – without significant changes, they pass into the foothill plains - the desert zone, where they occupy vast areas that are currently significantly developed for agricultural crops.

The malacofauna of this type of vegetation is very small. Along the banks of rivers and in cultural biotopes, there can be met *Cochlicopanitens* (15), *C. lubrica* (8), *Deroceraslaeve* (12), *Valloniocostata* (11), *Pupillamuscorum* (15); among wormwood and grassy-wormwood (on gravelly and gravelly-stony slopes) there can widely be met *Xeropictacandaharica* (53), *Gibbulinopsissignata* (17), *Sphyradiumdoliolum* (17). This complex of species is also found on the Pskom range in these types of vegetation. The difference is in the number of species, for example, *Cochlicopanitens* (6), *C. lubrica* (15), *Deroceraslaeve* (18), *Xeropictacandaharica* (30).

Thus, in the Ugam and Pskom mountain ranges in the high-zone of ephemeral-ephemeroid vegetation there were found 8 species of land mollusks, which consists of 3 zoogeographic groups. The main core of the malacological complex includes Palearctic and holarctic species. They are characterized by a high density of dispersal of

xerophiles of *Xeropictacandaharica* and *Gibbulinopsissignata*.

Turan zone of gramineous-diverse grassy mountain steppes. Turan gramineous-diverse grassy mountain steppes are confined to the foothill, low-mountain and middle-mountain stages of the Ugam and Pskom mountain ranges. They are more or less evenly represented at medium altitudes-800-2000 m above the sea level. Mollusks live here on the banks of rivers and reservoirs among thickets of grasses, xerophytic woodlands, on gravelly-stony slopes and on the scree with shrubs.

On the banks of rivers and reservoirs, interzonal species are mainly distributed among grass thickets, such as: 1. *Cochlicopa nitens* (12)^U–(20)^P; 2. *C. lubrica* (9)^U–(15)^P; 3. *Vallonia costata* (17)^U–(13)^P; 4. *Pupilla muscorum* (14)^U–(17)^P; 5. *Deroceras laeve* (5)^U–(3)^P; 6. *Vertigo antivertigo* (7)^U–(6)^P.

On gravelly-stony slopes among xerophytic shrubs live the followings: 1. *Sphyradium doliolum* (20)^U–(17)^P; 2. *Vallonia pulchella* (13)^U–5^P; 3. *V. ladacensis* (5)^U–(5)^P; 4. *Columella edentula* (6)^U–(-)^P; 5. *C. intermedia* (6)^U–(3)^P; 6. *Phenacolimax annularis* (3)^U–(2)^P; 7. *Xeropicta candaharica* (21)^U–(24)^P.

In the scree under the stones there are found the followings: 1. *Gibbulinopsissignata* (19)^U–(17)^P; 2. *Pupilla triplicata* (27)^U–(20)^P; 3. *P. sterrii* (10)^U–(14)^P; 4. *Pseudonapaeus albiplicata* (7)^U–(10)^P; 5. *Archaicaheptapotamica* (4)^U–(3)^P.

Thus, in this zone, we have identified 17 species of land mollusks, consisting of 5 zoogeographic complexes.

This complex consists of palearctic and holarctic - 7 species; European - 4; Central Asian - 3; upland Asian- 1 and anteroasiatic – 2 species.

The numbers are dominated by *P. triplicata*, *X. candaharica*, *G. signata* and *S. doliolum*.

It should be noted that in this zone vegetation occurs in conditions where low air and soil temperatures are combined with low precipitation. These conditions, apparently, affect the living mollusks, so the majority of species in ecological terms refers to xerobionts.

The zone of meadow steppes and meadows, red-mantled restharrow. In the Ugam and Pskom mountain ranges, this zone is located at an altitude of 2000-2800 m above the sea level where almost dominates families of *Prangospabularia*, *Ferulatenuisecta* and others.

Thickets of red-mantled restharrow *Juniperusturkestanica* is a characteristic feature of the southern slopes. On the northern slopes it is type of colorful, variegated composition, more mesophilic meadows of the boreal type.

Here we explored the banks of reservoirs, shrubs on gravelly areas, wooded slopes, scree, rocks.

On the banks of reservoirs among thickets of grasses there were found: *Cochlicopanitens* (13)^U–(11)^P; *C. pseudonitens* (-)^U–(7)^P; *C. lubrica* (9)^U–(12)^P; *Valloniacostata* (6)^U–(8)^P; *V. pulchella* (11)^U–(10)^P; *V. ladacensis* (6)^U–(11)^P; *Zonitoidesnitidus* (9)^U–(5)^P; *Candachariaaethiops* (3)^U–(-)^P.

In shrubs on gravelly areas there live the followings: *G. signata* (31)^U–(23)^P; *Pseudonapaeusalbiplicata* (7)^U–(11)^P; *Ps. stabilis* (-)^U–(5)^P; *Ps. schnitnikovi* (3)^U–(-)^P; *Ps. galinae* (4)^U–(6)^P; *Turancatellinacostulata* (11)^U–(-)^P; *Bradybaenacavimargocavimargo* (-)^U–(2)^P; *Br. tomyris* (3)^U–(-)^P; *Leucozonella boeviana* (5)^U–(-)^P; *Archaica labianix* (-)^U–(3)^P; *Subzebrinus labiellus* (3)^U–(-)^P.

On wooded slopes and scree with shrubs there were identified: *Ponsadenia duplocincta* (3)^U–(-)^P; *Bradybaena lantzi* (2)^U–(3)^P; *Nanaja cumulata* (-)^U–(5)^P; *N. illuminata* (-)^U–(5)^P; *Leucozonella rubens* (4)^U–(-)^P; *L. mesoleuca* (7)^U–(3)^P; *Deroceras altaicum* (3)^U–(3)^P; *D. reticulatum* (2)^U–(5)^P.

On rocks, among shrubs and semi-shrubs there were found: *Turanena meshkovi* (-)^U – (2)^P; *T. leptogyra* (3)^U – (1)^P; *T. martensiana* (-)^U – (2)^P; *P. sterrii* (10)^U – (-)^P; *P. gallae*

(9)^U – (-)^P; *Gibbulinopsis signata* (17)^U – (20)^P; *Sphyradium doliolum* (15)^U – (18)^P; *Nanaja chatcalica* (-)^U – (3)^P.

Note. Ranges: U – Ugam, P – Pskom. The average number of samples per 1 m² is shown in parentheses.

In red-mantling tracing with a shrubby litter there are met: *Pupillatriplicata* (10)^U – (13)^P; *G. signata* (10)^U – (12)^P; *V. costata* (15)^U – (13)^P; *V. ladacensis* (10)^U – (8)^P.

Thus, 24 species were found in the zone of meadow - steppes and red-mantling restharrow in the Ugam range, and 28 in the Pskom range.

This complex of species consists of 6 zoogeographic groups. The main core of malacological complexes (in both mountain ranges) is made up of Central Asian endemics, supplemented by palearctic and holarctic, European - 6 species each; the rest: East Asian, upland Asian and anteroasiatic - 1 species each. High density differs in *G. signata*, *P. triplicata*, *V. costata*, *C. nitens*, *S. doliolum*.

The zone of subalpine meadows. Subalpine meadows occupy a significant area at an altitude of 2800-3200 m above sea level. It is composed of specific types: Alpine heaths and carpet cenosis, cryophyte polster plant, in some places there are Alpine gardens, areas of high-altitude steppes and upland xerophytes. Here the biotopes were examined: thickets of grasses, rocks and scree. In the nearby of new water springs in grass thickets there were found *Zonitoidesnitidus* (10), *Cochlicopanitens* (19), *Valloniacostata* (8), в Угамском хребте – *Novosuccineamartensiana* (3), *Phenacolimaxannularis* (5).

Rocks and scree are widely represented. The vegetation of the rocks is poorer compared to the meadow-steppe zone: there were found only *P. sterrii* и *T. martensiana*.

The zone of Alpine vegetation. The absolute height of 3000-3800 m above the sea level. To the main geobotanical characteristics of the Alpine zone include Alpine low-grassy meadows with kobrez, Alpine low-grass steppes and grasslands with fescue. The following biotopes were examined: Alpine meadows, rocks and scree.

Table 4

Distribution of land mollusks in vertical zones and biotopes of the Ugam and Pskom mountain ranges

No.	Name of species	Zones															
		vegetation zone		Turan diverse-grassy gramineous steppe zone			The zone of meadow-steppes, meadows, red-mantled restharrow			The zone of Alpine meadows		The zone of Alpine vegetation					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14		
1	<i>Cochlicopanitens</i>	U , P		U , P			U , P							P			
2	<i>C. pseudonitens</i>						P										
3	<i>C. lubrica</i>	U , P		U , P			U , P										
4	<i>Sphyradium doliolum</i>		U , P		U , P					U , P							
5	<i>Vallonia costata</i>	U , P		U , P			U , P				U , P	P				U , P	
6	<i>V. pulchella</i>				U , P		U , P										
7	<i>V. ladacensis</i>				U , P		U , P				U , P						
8	<i>Gibbulonopsis signata</i>		U , P			U , P		U , P		U , P	U , P						

semi-shrubs, 10 - among creeping red-mantled with shrub litter, 11-in the grasslands near spring waters, 12-among rocks and scree, 13-in Alpine meadows among grasses and soil, 14-in Alpine rocks and scree.

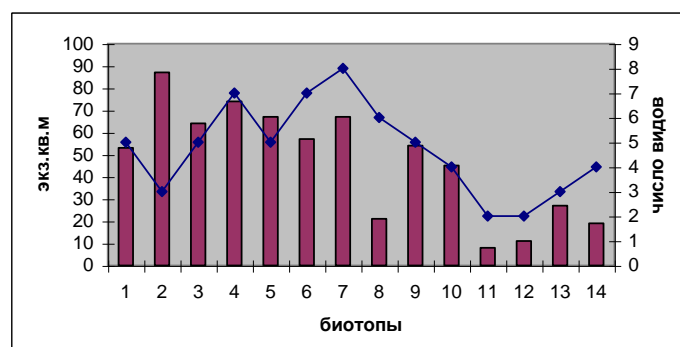
In Alpine meadows, among grasses on the soil were found single samples of *Pupillamuscorum*, *Valloniacostata*, *Derocerasleave*, and on rocks and scree under stones – *Pupillatriplicata*, *P. gallae*, *P. sterrii*, *Turanenamartensiana*.

In total, in the zone of subalpine meadows, (5)^U - (4)^P there were identified 6 species of land mollusks in the zone of Alpine vegetation. As can be seen, both zones are characterized by an extremely poor composition of malacofauna.

Analysis of the distribution of land mollusks in these mountain ranges shows that the high-altitude landscape zones and biotopes of mollusks are distributed unevenly: in the Ugam and Pskov ranges of ephemeral-ephemeral vegetation-8 species, in the Turan diverse-grasslands - 17; in the zone of grasslands and meadows, red-mantled restharrow – 24^U – 27^P, in the subalpine 5^U – 4^P, in the Alpine – 7 species. It should be noted that the number of species in the landscape zones on both mountain ranges is distributed equally. However, there is also a variety of species. For example, living in the Pskov range, *Cochlicopapseudonitens*, *Pseudonapaeusstabilis*, *Turanenameshkovi*, *T. martensiana*, *Bradybaenacavimargocavimargo*, *Nanajacumulata*, *N. illuminate* are not present in the Ugam range, and living there habitats, do not exist in the Pskom range. The richness of mollusks in the zone of meadow-steppe and red-mantled restharrow (24^U-27^P species), apparently, is explained by a large variety of natural conditions of this zone, associated primarily with highly dissected relief, abundant moisture (650 - 800

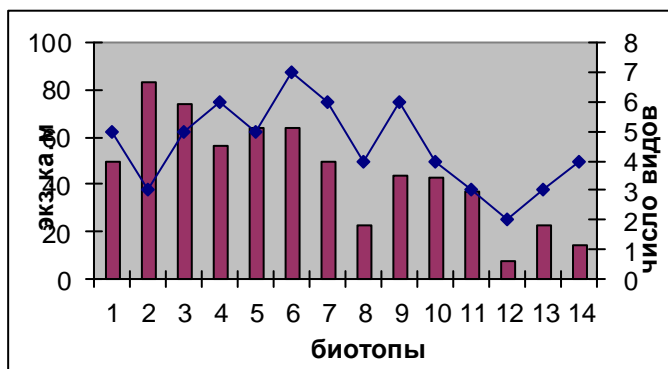
mm per year), more moderate temperature regime and formational richness of vegetation, and the poverty of malacofauna in the subalpine and Alpine zones – with unfavorable harsh climatic conditions.

Data on the total density of land mollusks in the Ugam and Pskom ranges are shown in figure 52.53



Note: the graph shows the number of species, and the diagram shows the density. Biotopes: 1-river banks among cultivated plants, 2-among sagebrush and grassy-sagebrush (on gravelly and gravelly-stony slopes) plants, 3 - banks of rivers and reservoirs among thickets of grasses, 4-on gravelly-stony slopes among xerophytic shrubs, 5-in scree under stones, 6-near reservoirs among thickets of grasses, 7-in bushes on gravelly areas, 8 - on wooded slopes and scree with shrubs, 9 - on rocks, among shrubs and semi-shrubs, 10 - among creeping red-mantled with shrub litter, 11-in the grasslands near spring waters, 12-among rocks and scree, 13-in Alpine meadows among grasses and soil, 14-in Alpine rocks and scree.

Figure 52. - Density and number of land mollusk species in various biotopes of the Ugam range



Note: the graph shows the number of species, and the diagram shows the density. Biotopes: 1-river banks among cultivated plants, 2-among sagebrush and grassy-sagebrush (on gravelly and gravelly-stony slopes) plants, 3 - banks of rivers and reservoirs among thickets of grasses, 4-on gravelly-stony slopes among xerophytic shrubs, 5-in scree under stones, 6-near reservoirs among thickets of grasses, 7-in bushes on gravelly areas, 8 - on wooded slopes and scree with shrubs, 9 - on rocks, among shrubs and semi-shrubs, 10 - among creeping red-mantled with shrub litter, 11-in the grasslands near spring waters, 12-among rocks and scree, 13-in Alpine meadows among grasses and soil, 14-in Alpine rocks and scree.

Figure 53. Density and number of land mollusk species in various biotopes of the Pskom range

As can be seen from the above data (Fig. 52,53), the highest density of land mollusks is characterized by biotopes - sagebrush and grasses-sagebrush (on gravelly and gravelly-stony slopes) of plants; banks of rivers and reservoirs among thickets of grasses; gravelly-stony slopes among xerophytic shrubs and various scree, which are found from 50 to 83 samples/m².

The lowest density of mollusks is observed in the biotope-wooded slopes and scree with shrubs; rocks, among shrubs and semi-shrub rocks and scree; Alpine meadows among grasses and on the soil; Alpine rocks and scree. The density of land mollusks is from 8 to 23 samples/m².

Table 5

Coefficient of species similarity of small complexes of different biotopes of the Pskom range

K	2	3	4	5	6	7	8	9	10	11	12	13	14
1	0	8 3 3	0	0	3 3 3	0	0	0	0	0	0	0	6 0
2		0	2 5	1 4 2 8	0	0	0	3 3 3	1 6 6	0	0	0	0
3			0	0	3 0	0	0	0	1 1 1	0	0	5 0	0
4				0	1 6 6	0	0	9 1 0 9	1 2 0 5	0	0	0	0
5					0	1 8 8	0	2 5 5	2 8 5	0	1 6 6	0	2 8 5
6						0	0	0	2 0	0	0	1 1 1	0
7							0	8 3 3	0	0	0	0	0
8								0	0	0	0	0	0
9									1 2 5	0	1 6 6	0	2 8 2
10										0	0	1 6 6	1 4 2 8

1																				0	0	0	
1																						0	5
2																						0	0
1																							0
3																							

Uzbekistan and neighboring territories. - Tashkent: Fan, 2014. –p. 192.

Note. Biotopes: 1-river banks among cultivated plants, 2-among sagebrush and grassy-sagebrush (on gravelly and gravelly-stony slopes) plants, 3-banks of rivers and reservoirs among thickets of grasses, 4-on gravelly-stony slopes among xerophytic shrubs, 5 - in scree under stones, 6 - near reservoirs among thickets of grasses, 7 - in bushes on gravelly areas, 8-on wooded slopes and scree with shrubs, 9-on rocks, among shrubs and semi-shrubs, 10-in creeping junipers with shrub litter, 11-in overgrown grasses near spring waters, 12 - in rocks and scree, 13-in Alpine meadows among grasses and soil, 14-in Alpine rocks and scree.

When comparing pairs of malacocomplexes of different biotopes (Tab.5) the Pskom range revealed that the banks of rivers and reservoirs, as well as Alpine meadows, have a high similarity index. Here the coefficient of species similarity is from 60 to 83.3%.

The lowest indicators of species similarity were observed in the biotopes: sagebrush and grass-sagebrush, gravelly-stony slopes, among xerophytic shrubs, wooded slopes and scree with shrubs, rocks and scree, in which the similarity coefficient is equal to zero (Tab. 5).

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