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TERRESTRIAL MOLLUSK COMPLEXES IN VARIOUS BIOTOPES IN ZARAFSHAN RANGE

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Annotation: High abundance, widespread, large species diversity, low mobility and insignificant ability to overcome geographical barriers, ease of collecting materials and sensitive reaction to changes in the environment make the group of terrestrial mollusk a convenient object of bio-geographical and ecological researches.
Key words: Malacofauna, terrestrial mollusks, palearctic and holarctic, xerophiles, complex, Central Asian, Asian highland, front Asian

Materials and methods

In the inventory process of terrestrial malacofauna in Uzbekistan it was composed a complete list of species and it was determined the peculiarities of their geographical spread along the main natural areas of Uzbekistan. The collections of terrestrial mollusks of Zarafshan range are chosen as the research material.

Results and discussion

Zarafshan Range differs from Hissar Range with its continental climate. Some of its peculiarities are due to openness of the territory of the range from the west that promotes periodic invasion of arctic and moderate air masses causing precipitation and lowering temperatures to levels too low for subtropical areas. These air masses due to cyclones penetrate here in the cold season of the year, in the summer the same air masses transforming over strongly heated spaces of Turan lowland lead to the erosion of fronts and establishment of relatively wet and dry weather.

Distribution of terrestrial mollusks along a vertical belt and biotope in Zarafshan Range is studied in the basin of the Urgutsay river (northern part) and in the basin of the Langar (southern part) in which their spread is unequal (Table 1).

In accordance with the data of K.Z.Zakirov (1955) in the area of our interest the following high-altitude landscape belts are highlighted.

Chul is flat part which is usually described under the name “desert” and partly “semi-desert”. Soil conditions are very different in physicochemical properties here. However, the basis is light earth or light grey earth.

In the chul belt malacofauna was studied in the biotopes: in the gardens and vegetable gardens where it was discovered: Candaharia levanderi $(5)^{Сч}$-$(-)^{Юч}$, Deroceras caucasium$(3)^{Сч}$- $(1)^{Юч}$.

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The following species live along the canals under the canopies of woody plants and under the stones: Cochlicopa nitens (15) Сч- (-)ЮЧ, Cochlicopa lubrica (22) Сч- (14)ЮЧ, Vallonia costata (12) Сч- (13)ЮЧ, Pupilla muscorum (9) Сч- (7)ЮЧ, Zonitoides nitidus (6) Сч- (4)ЮЧ.
Totally 7 species were found in this zone.

Adirr – splits into two subzones or two tiers: 1) lower adirr where the relief is calm, the height is 500-900 m.above the sea level; 2) upper one where the relief is relatively sharp with frequent exposure of subsoil rocks, the height is 700-1500 m.

Lower adirr – in this subzone malacofauna is discovered in the following biotopes: along the banks among plants: Cochlicopa nitens (15) Сч- (12)ЮЧ, C.lubrica (2) Сч- (8)ЮЧ, Vallonia costata (9) Сч- (11)ЮЧ, Pupilla muscorum (15) Сч- (10)ЮЧ, Deroseras agreste (2) Сч- (1)ЮЧ.
On the slopes among plants it can be found Xeropicta candaharica (10) Сч- (8)ЮЧ, Candaharia izzatullaevi (2) Сч- (-)ЮЧ, Deroceras agresta (1) Сч- (-)ЮЧ.
Totally in the lower adirr 7 species of terrestrial mollusk are discovered.
Upper adirr – represented by almonds that survived only in places more or less distant from settlements.
Here mollusks inhabit among tree and shrub vegetation. In these biotopes it is found: Vertigo antivertigo (2) Сч- (3)ЮЧ, Leucozonella retteti (1) Сч- (-)ЮЧ, L. angulata (3) Сч- (2)ЮЧ, Deroceras agreste (2) Сч- (-)ЮЧ, Sphuradium doliolum (25) Сч- (17)ЮЧ, Gibbulinopsis signata (27) Сч- (10)ЮЧ, G. nanosignata (15) Сч- (14)ЮЧ, P. triplicata (14) Сч- (-)ЮЧ, Lytopelte maculata (3) Сч- (1)ЮЧ.
In upper adirr in the northern part of Zarafshan Range it is discovered 9 species and in the lower part – 7 species of terrestrial mollusk.

Tow – as the foothills rise in the additional direction, they pass into mountains, the whole set of natural-historical conditions changes.
Chestnut soil and burozems prevail here. The height is from 1200-1500 till 2700-2800 м. above sea level and in economic terms mountainous sown areas for legumes and hayfields.

Table 1 Distribution of terrestrial mollusk along vertical belts and biotopes of Zarafshan Range

№	Name of species	BELTS																					
		I – chul (desert)						II – adirr (hill)						III – tow (mountain)				IV – yaylow (pasture-land)					
		1		2		3		4		5		6		7		8		9		10		11	
		Сч	Юч	Сч	Юч	Сч	Юч	Сч	Юч	Сч	Юч	Сч	Юч	Сч	Юч	Сч	Юч	Сч	Юч	Сч	Юч	Сч	Юч
1	Cochlicopa nitens	-	-	+	+	+	+	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-
2	Cochlicopa lubrica	-	-	+	+	+	+	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-
3	Sphuradium doliolum	-	-					-	-	+	+	-	-	+	+	-	-					-	-
4	Vallonia costata	-	-	+	+	+	+	-	-	-	-	-	-			-	-	+	+	+	+	-	-
5	V. pulcella	-	-		-		-	-	-			-	-		-	-	-	+	+	-	-	-	-
6	Gibbulinopsis signata	-	-		-	-	-	-	-	+	+	-	-	+	+		-	-	-	-	-	-	-	-
7	G. nanosignata	-	-	-	-	-	-	-	-	+	+	-	-	+	+	+	+	-	-	-	-	-	-

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8	Pupilla muscorum	-	-	+	+	+	+	-	-			+	-	-	-	-	-	-	-	+	+		-
9	P. triplicate	-	-	-	-	-	-	-	-	+	-		-	+	+	-	-	-	-	-	-	+	+
10	Pupilla turcmenica	-	-	-	-	-	-	-	-			-	+			-	-	-	-	-	-	-	-
11	Pupilla anzobica	-	-	-	-	-	-	-	-			-	-	-	+	-	-	-	-	-	-	-	-
12	Vertigo antivertigo	-	-	-	-	-	-	-	-	+	+	-	-			-	-	-	-	-	-	-	-
13	Ps. sogdiana	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
14	Ps. zerafschanicus	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
15	Turanena martensiana	-	-	-	-	-	-	-	-	-	-	-	-		-	+	+	-	-	-	-	-	-
16	T. conicula	-	-	-	-	-	-	-	-	-	-	-	-			-	+	-	-	-	-		-
17	Laevozebrinus urgutensis	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-		-
18	Chondrulopsina fedtschenkoi	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	+	-
19	Leucozonella rufispira	-	-	-	-	-	-	-	-	-	-	-		+	-	-	-	-	-	-	-	+	-
20	L. retteti	-	-	-	-		-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-

Continuation of Table.16

21	L. angulata	-	-	-	-		-	-	-	+	+	+	-			-	-	-	-	-	-	-	-
22	Xeropicta candaharica	-	-	-	-		-	+	+		-	-	-	-	-	-	-	-	-	-	-	-	-
23	Candaharia levanderi	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	C. izzatullaevi	-	-	-	-		-	+	-		-	-	-	-	-	-	-	-	-	-	-	-	-
25	C. rutellum	-	-	-	-		-	-	-		-	-	+		-	-	-	-	-	-	-	-	-
26	C. rozeni	-	-	-	-		-	-	-		-	+	+			-	-	-	-	-	-	-	-
27	C. langarica	-	-	-	-		-	-	-		-	-	-	-	+	-	-	-	-	-	-	-	-
28	Deroceras caucasium	+	+	-	-		-	-	-		-					-	-	-	-	-	-	-	-
29	D. agreste	-	-	-	-	+	+	+	+	+	-	-	-	-	-	-	-	-	+	-	-	-	-
30	D. caucasium	-	-	-	-		-	-	-							-	-	+	+	-	-	-	-
31	Lytopelte maculata	-	-		-		-	-	-	+	+	+	-				-			-	-	-	-
32	Macrochlamys sogdiana	-	-	-	-		-	-	-	-	-	-		+	+	-	-	-	-	-	-	-	+
33	Zonitoides nitidus	-	-	+	+		-	-	-		-	-	-	-	-	-	-	+	+	-	-	-	-
34	Oxuloma eleegans	-	-	-	-			-	-		-	-	-	-	-	-	-	+	+	-	-	-	-

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Note. Сч – northern parts; Юч- southern parts. Biotopes: 1-gardens and vegetable gardens, 2- along the canals under the canopy of tree plantations and under stones, 3 – along the river banks among plants, 4-on the hill slopes among plants, 5-tree and shrub vegetation, 6-at the foot of the slopes among plants, 7- among shrubs on gravelly slopes, 8- on the open and dry slopes, 9 – on the banks of streams and springs among rotting remains of vegetation, 10-subalpine meadows, 11- on the slopes and talus among remains of vegetation.

Here malacofauna was studied in the biotopes: at the foot of the slopes among vegetation inhabit: Vertigo antivertigo (3) ^{Сч} - (2)^{Юч}, Pupilla muscorum(5) ^{Сч} - (-)^{Юч}, Leucozonella angulata(2) ^{Сч}- (3)^{Юч}, Lutopelte maculata (1) ^{Сч}- (-)^{Юч}, Pupilla turcmenica (-)^{Сч}- (14)^{Юч}, Candaharia rutellum (-)^{Сч}- (3)^{Юч}, Candaharia rozeni(4)^{Сч}- (2)^{Юч}.

Among shrubs on the gravelly slopes it was discovered: Pupilla triplicata (10) ^{Сч3}- (15)^{Юч}, Sphuradium doliolum (25) ^{Сч}- (15)^{Юч}, Gibbulinopsis signata(17) ^{Сч}- (15)^{Юч}, G. nanosignata (5) ^{Сч}- (9)^{Юч}, Pupilla anzobica(-) ^{Сч}- (6)^{Юч}, Ps.sogdiana(-) ^{Сч}-(1)^{Юч}, Ps. serafschanicus(-) ^{Сч}-(3)^{Юч}, Chondrulopsina fedtschenkoi (8)^{Сч}- (5)^{Юч}, Leucozonella rufispira(3) ^{Сч}- (-)^{Юч}, Candaharia langarica (-) ^{Сч}- (3)^{Юч}, Macrochlamys sogdiana (2) ^{Сч}- (2)^{Юч}, Laevozebrinus urgutensis(2) ^{Сч}- (2)^{Юч}.

On the open and dry slopes inhabit: Turanena martensiana(1) ^{Сч}- (3)^{Юч}, T. conicula(-) ^{Сч}-(4)^{Юч}, G. signata(22) ^{Сч}- (23)^{Юч}.

On the banks of the streams and springs, among rotting remains of vegetation and in the plants themselves inhabit: Cochlicopa nitens (5) ^{Сч}- (10)^{Юч3}, C.lubricata (8) ^{Сч}- (11)^{Юч}, Vallonia costata (10) ^{Сч}- (7)^{Юч}, V. pulcella (5) ^{Сч}- (5)^{Юч}, Deroceras agreste (-)^{Сч}- (3)^{Юч}, D. caucasium (2) ^{Сч}- (5)^{Юч}, Zonitoides nitidus (15) ^{Сч}- (16)^{Юч}, Oxuloma eleegans (1) ^{Сч}-(4)^{Юч} In the upper zone of tow (mountain) in different biotopes 33 species of terrestrial mollusk inhabit, of which 13 are characteristic only for this zone.

Yaylow – it is highlands of Central Asia. K.Z.Zakirov (1955) distinguishes alpine and subalpine belts. The belts are rich in talus of stones and rubble, partly glacial marines, marine valleys.

The height is 2700-2800 m. above sea level and higher. Lower boundary of the yaylow belt touches the upper point of the development of tree and shrub vegetation of the underlying belt.

Malacofauna of the upper zone is very poor. There aren't species characteristic to this zone. Therefore when studying malacofauna we divide the altitude zone of yaylow into sub-zones.

Malacofauna was studies in the following biotopes: subalpine meadows. Here inhabit: Cochlicopa nitens(5)^{Сч}-(8)^{Юч}, Valionia costata (3) ^{Сч}- (3)^{Юч}, Pupilla muscorum (7) ^{Сч}- (10)^{Юч}.

On the slopes and talus among vegetation remains in single copies are found: Leucozonella rufispira (2)^{Сч}-(-)^{Юч}, P. triplicata (13)^{Сч}-(12)^{Юч},Ch.fedtschenkoi(-)^{Сч}-(1)^{Юч}, M.sogdiana (-)^{Сч}- (1)^{Юч}.

Totally in this zone 7 species of terrestrial mollusk inhabit.

The poorness of the malacofauna is evidently due to, firstly, the lack of food, and secondly, the severe climate of this zone is not good for mollusks, as well as for many other creatures.

The density of terrestrial mollusks varies in the biotope shown in Fig.13-14.

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For instance, on the northern slope 2, 5, 7 and southern slope 7,9 biotopes (Fig.53,64) the density varies from 61 till 105 ind.m^2. The least density of the terrestrial mollusks is observed on the northern and southern slopes in 1,4,6,10,11 biotopes, in which the density is equal to from 1 till 15 ind.m^2.

In species diversity, the richest turned to be the biotopes: tree and shrub vegetation and shrubs on the gravelly slopes. Here 11 species of terrestrial mollusks were noted. (Fig.1,2).

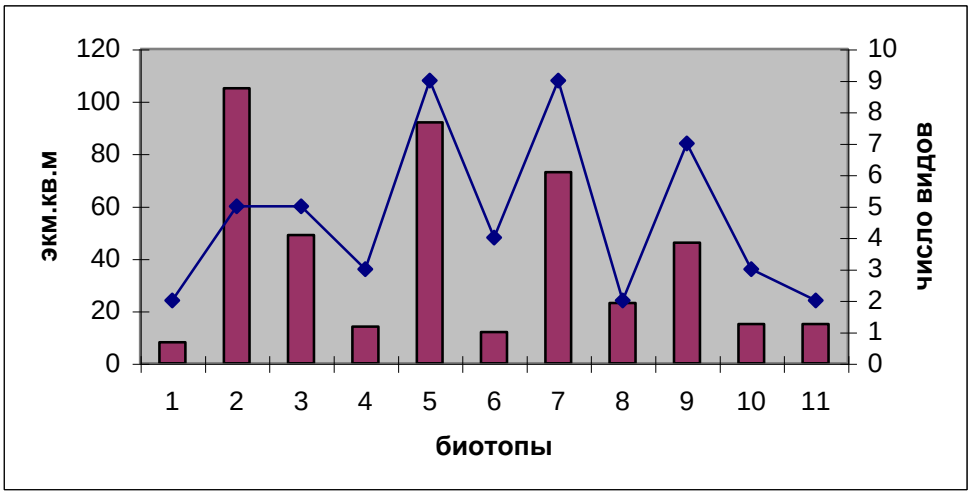
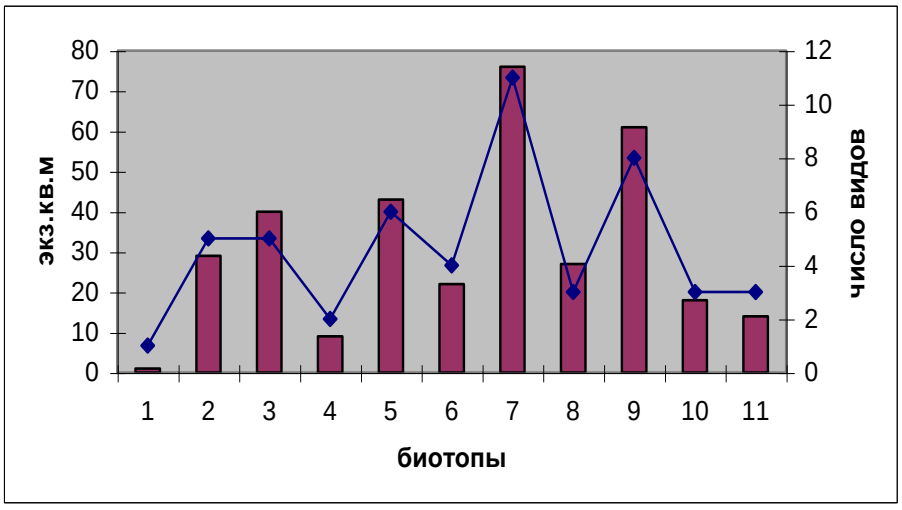


Figure 1. The density and number of the terrestrial mollusk in various biotopes of the northern slope of Zarafshan Range



Note: in Fig. 1, 2 the graph represents the number of the species, the diagram-density. Biotopes:1-gardens and vegetable gardens, Biotopes: 1-gardens and vegetable gardens, 2-along the canals under the canopy of tree plantations and under stones, 3 – along the river banks among plants, 4-on the hill slopes among plants, 5-tree and shrub vegetation, 6-at the foot of the slopes among plants, 7- among shrubs on gravelly slopes, 8- on the open and dry slopes, 9 – on the banks of streams and springs among rotting remains of vegetation, 10-subalpine meadows, 11- on the slopes and talus among remains of vegetation.

Figure 64. The density and number of species of terrestrial mollusk in various biotopes of southern slope in Zarafshan Range

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Table 2 Coefficient of species similarity of malaco-complexes of various biotopes in Zarafshan Range

K	2	3	4	5	6	7	8	9	10	11
1	0	0	0	0	0	0	0	0	0	0
2		66.6	0	0	10	0	0	30	66.6	0
3			14.2	7.69	10	0	0	44.4	60	0
4				0	0	0	0	10	0	0
5					15.3	21.5	9.09	6.25	0	8.3
6						0	0	7.6	0	0
7							7.1	0	0	33.3
8								0	0	0
9									22.2	0
10										0

Note. Biotopes:1-gardens and vegetable gardens, Biotopes: 1-gardens and vegetable gardens, 2- along the canals under the canopy of tree plantations and under stones, 3 – along the river banks among plants, 4-on the hill slopes among plants, 5-tree and shrub vegetation, 6-at the foot of the slopes among plants, 7- among shrubs on gravelly slopes, 8- on the open and dry slopes, 9 – on the banks of streams and springs among rotting remains of vegetation, 10-subalpine meadows, 11- on the slopes and talus among remains of vegetation.

The largest species diversity and highest density is noted in the biotopes among shrubs on the gravelly sloped and tree and shrub vegetation – 11 species.

In Zarafshan Range coefficient of species similarity in more than half cases is equal to 0 (Table 2). It must be noted that from 11 biotopes only in two ones: along the canals under the canopy of tree plantations and at the foot of slopes among vegetation species similarity is equal to 66.6%.

According to the results of studies in the Zarafshan Range, 34 species of terrestrial mollusks inhabiting along the vertical landscape zones and biotopes have the following distribution: in the chul belt it was studied 2 biotopes and 7 species of terrestrial mollusks were discovered. In the adirr belt in three biotopes – 15, in the tow belt in four biotopes inhabit 33 species of terrestrial mollusks, in the yaylow belt – 5.

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