

## Geographical and ecological analysis of dry mollusks in uzbekistan and adjacent regions

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**Abstract:** High abundance, wide distribution, large species diversity, low mobility and low ability to overcome geographical barriers, ease of material collection and sensitive reaction to changes of external environments make the group of terrestrial mollusk in this territory convenient object of biographical and environmental studies.

**Key words:** malacofauna, terrestrial mollusk, palearctic and holarctic species, xerophiles, complex, Central Asian, highland Asian, front Asian groups, biological variety, areal, endemic species.

### INTRODUCTION

A large variety of natural conditions in Uzbekistan and contiguous territories causes in high degree complex forms of distribution within it, both individual species and entire faunal complexes [1]. In this aspect terrestrial mollusks represent a very interesting group to study and determine, due to their ability to inhabit a wide variety of biotopes and landscapes. Mollusks – primary-cirrus secondary-celled invertebrates with soft, non-segmented, often asymmetric body, protected by more or less developed shell, are considered rightfully one of the richest in species of content type of animals. High abundance, wide distribution, large species diversity, low mobility and low ability to overcome geographical barriers, ease of material collection and sensitive reaction to changes of external environments make the group of terrestrial mollusk in this territory convenient object of biographical and environmental studies [2], and due to the good maturity of shells in sediments of different geological eras, mollusks can serve as a powerful basis for the reconstruction of the ways of formation of the animal world of the studied regions [3].

### MATERIAL AND RESEARCH METHODOLOGY

On the base of the work laid proper collections and observations, based on the results of the expeditions conducted at separate points of Uzbekistan (2011-2019). The materials were collected and worked out according to standard methodologies [1]. When determining the species common determinants were used [1]. As one of the most important source of information about species composition served manual by Pazilov A., Azimov D. A. “Terrestrial mollusks (Gastropoda, Pulmonata) of Uzbekistan and contiguous territories” [2]. About 100 works by the authors of our country and abroad were also thoroughly studied.

In the process of inventory of terrestrial malacofauna of Uzbekistan it was compiled complete list of species and it was identified features of their geographical distribution over the main natural area of Uzbekistan.

### RESULTS AND DISCUSSION

Many years of research of A. Pazilov, F. Gaibnazarova, M. Saidov on patterns of distribution of terrestrial mollusk of Uzbekistan and contiguous territories finds that in connection with the vertical zoning in the studied territories 172 species of terrestrial mollusks inhabit.

Studies show that faunal spectrum of terrestrial mollusks is very diverse in Uzbekistan and contiguous territories in which representatives of 17 families inhabit.

The Valloniidae family is very broad, known in the Palearctic. In the studied area it is noted 2 subfamilies: Acanthinulinae (with 1 genus and

species) and Valloniinae (with 1 genus and 3 species). The Pupillidae family in the fauna of the studied territory is represented by 11 species belonging to 2 genera. The Vertiginidae family is represented by 2 subfamilies: Vertigininae, Truncatellinae. The Vertigininae subfamily consists of the only genus *Vertigo* that includes 2 species. The Truncatellinae subfamily is represented by 2 genera (*Columella*, *Truncatellina*) and 5 species. The Chondrinidae family in the studied territories is represented by one genus *Chondrina*. The Buliminidae family is represented by 2 subfamilies: Pseudonapaeinae, Chondrulopsininae. The Pseudonapaeinae subfamily stands out for diversity and richness in the species. In the studied territories 6 genera and 45 species inhabit. The Chondrulopsininae is represented by 2 genera. The Vitrindae family in the studied territories is represented by a single genus and the species of *Phenacolimax annularis*. The Bradybaenidae family in the studied territories is represented by 2 genera: *Bradybaena* (much younger, represented by 14 species), *Ponsadenia* (much older, 2 species). The Hygromiidae family in the malacofauna of Uzbekistan and contiguous territories stands out for diversity and richness in species (after the Buliminidae family). Here it is represented by 5 subfamilies, 12 genera and 38 species. The Agriolimacidae family in the studied area is represented by 2 genera - *Deroceras*, *Lytopena*. The Limacidae family is represented by the only endemic species *Turcolimax* in the studied area. The Parmacellidae family is represented by 2 species: *Parmacella* и *Candacharia*. The Ariophantidae family is represented by the only species - *Macrochlamys*. The Gastrodontiidae family of which the main part of species inhabit in western Palaearctic in the studied area is presented by the genus *Zonitoides* with a single species - *Zonitoides*. The Succinidae family is presented by 4 species.

In the manual it is thoroughly analyzed the structure and distribution of terrestrial mollusks along vertical landscape zones and biotopes.

Researches show that, on mountain ranges and along vertical landscape belts and biotopes terrestrial mollusks are unevenly distributed.

For instance, on the Karzhantau ridge found all the 33 species of terrestrial mollusks are distributed as follows: in the "chul" (desert) belt 3 biotopes were studied and 10 species of terrestrial mollusks were discovered. In the "adirr" (hill) belt it was studied 4 biotopes where 19 species were discovered and in the "tow" (mountain) it was studied 4 biotopes and discovered 27 species, in the "yaylow" (pasture) - 12 species inhabit in three biotopes. The greatest species diversity and high density are noted in the biotopes, on the banks of the rivers and spring waters among herbs; tree and shrub vegetation and both rocks and talus involving shrubby plants among which 10 species of terrestrial mollusk inhabit whose density levels to every 1 m<sup>2</sup> 46-86 individuals.

36 species of terrestrial mollusks inhabiting in the Ugam Range are distributed as follows: in the belt of ephemeral-ephemeroïd vegetation - 8 species, in the belt of Turan grass-mixed mountain steppes - 18, in the belt of meadow steppes and meadows, in fir-tree woods - 24 species. In the Ugam Range the largest species diversity is noted in the biotope of shrubs in the gravel area where inhabit 8 species of terrestrial mollusks.

With the highest density of terrestrial mollusks stand out biotopes of wormwood and grass-wormwood (on gravelly and gravelly-stony slopes) plants, in which found from 50 to 83 ind.m<sup>2</sup> are found.

In the Pskem Range discovered 34 species are distributed as follows: in the belt of ephemeral-ephemeroïd vegetation - 8 species, in the belt of Turan grass-mixed mountain steppes - 17, in the belt of meadow steppes and meadows, in fir-tree woods - 28.

In the Chatkal Range inhabiting 42 terrestrial mollusks are distributed as follows: in the belt of ephemeral vegetation and grass-wormwood deserts it was studied 4 biotopes and discovered 7 species of terrestrial mollusks, in 5 biotopes of the belt of

Turanian grass-mixed mountain steppes 27 species inhabit, in the belt of subalpine steppe meadows and steppes, in fir-tree woods and mountain xerophytes it was studied 4 biotopes and discovered 17 species. In the Alpean vegetation in two biotopes 4 species inhabit.

The largest species diversity with a high density is noted in the biotope of bushes and under stones in which 9 species of terrestrial mollusks are discovered, their density is more than 60 ind. m<sup>2</sup>.

In the Kuramin Range discovered 35 species of terrestrial mollusks along vertical landscape belts and biotopes are distributed as follows – in four biotopes of the “chul” belt 6 species of mollusks, in the three biotopes of the belt “adirr” – 7, in the studied 5 biotopes of the belt “tow” - 27 species.

In the Kuramin Range the largest species diversity and a high density is noted in the biotope of wormwood-shrub plants.

The Fergana Range is distinguished with the largest species diversity and here 57 species of terrestrial mollusks inhabit. These species are distributed as follows: in the belt of dessert it was studied 2 biotopes and discovered 9 species, in 3 biotopes of hot foothill belts – 7 species, in 3 biotopes of warm foothill belts 17 species are discovered. In the belt of medium mountains 4 biotopes were investigated and 15 species were identified, in two biotopes of the Alp 11 species of terrestrial mollusks inhabit.

The largest species diversity is noted in the biotope of tree and shrub vegetation (12 species). The highest density is noted among thickets of grass and shrubs on gravelly areas where 127 ind. m<sup>2</sup> were discovered.

Discovered 36 species of terrestrial mollusk in the Turkestan Range are distributed as follows: in 2 biotopes of the desert belt 11 species were discovered, in the belt of low and upper foothills two biotopes were studied and it was identified in the low foothills inhabiting 9 species and in the upper foothills 22

species of terrestrial mollusks. In the belt of fir-tree woods and highlands 3 biotopes were studied. In the belt of fir-tree woods 18 and in the highland belt 16 species of terrestrial mollusks inhabit.

The largest species diversity with a high density is noted on gravelly areas in the wood-shrubs (15 species).

In the Alai Range discovered 33 species are distributed as follows: in two biotopes of the Osh valley 8 species inhabit, in the belt of foothill wormwood-ephemeral-salty semi-deserts and savannoid grassland steppes 2 biotopes were studied and 10 species were noted. In the belt of tall grasses and grassy meadows, shrubs and small villages 4 biotopes were examined where 31 species of terrestrial mollusks inhabit. In the belt of fir-tree woods and light forests, shrubs and tall grassy meadow steppes 12, in the belt of subalpine meadows 11 species were discovered.

In the Alai Range the largest species diversity is characteristic to the biotopes among shrubs and under stones – 13 species. The highest diversity is noted along the banks of streams and springs, among rotting remains of vegetation almost 137 ind. m<sup>2</sup> were discovered.

In the Zarafshan Range inhabiting 34 species of terrestrial mollusks along the vertical landscape zones and biotopes are distributed as follows: in the belt of “chul” (desert) 2 biotopes were studied and 7 species of terrestrial mollusks were discovered. In the belt of “adirr” (hill) in three biotopes – 15, in 4 biotopes of the belt “tow” (mountain) 33 species of terrestrial mollusks inhabit and in the belt of “yaylow” – 5 species do.

The largest species diversity and high density is noted in the biotopes among shrubs on gravelly slopes and wood-shrub vegetation – 11 species.

The Nurata Range is the poorest in terms of species number among mountain systems of Uzbekistan, here inhabiting 23 species of terrestrial mollusks are distributed as follows: in the belt of chul

2 species, in the adirr along the banks of rivers among plants and on the outskirts of the slopes under stones 5 species of terrestrial mollusks inhabit. In the belt of "tow" 3 biotopes were studied and 18 species were discovered.

The largest species diversity with a high density is noted in the biotopes among wood-shrub vegetation where 11 species inhabit and the density is equal to 100 ind. m<sup>2</sup>.

In the Hissar Range 46 species of terrestrial mollusks were discovered of which in the 2 biotopes of the belt of chul 11 species of terrestrial mollusks inhabit. In 3 biotopes of the belt of adirr (hill) 17 species were discovered. In 4 biotopes of the belt "tow" (mountain) – 32, in 2 biotopes of the belt "yaylow" (pasture) 14 species of terrestrial mollusks inhabit.

In the Hissar Range the largest species diversity with the highest density is noted in the biotopes near the springs among grasses (11 species).

In the Baisuntow Range 30 species of terrestrial mollusks inhabit that are distributed as follows: in the belt of "chul" (dessert) -5 species, in adirr (hill) -14, in tow - 27, in yaylow - 10 species of terrestrial mollusks.

The largest species diversity and a high density is noted in the biotopes at the roots of plants and in stony-gravelly soils (11 species), that diversity is equal to 80 ind.m<sup>2</sup>.

In the belts "chul" of the Babatag and Kuhitangtow Ranges, in the former 6, in the latter 5 species of terrestrial mollusks inhabit. 3 biotopes studied in every range and in Babatag 8, Kuhitangtow 10 species were discovered. In Babatag in the belt of "tow" 15 species of terrestrial mollusks were discovered, and in Kuhitang – 22.

As for the species diversity, this indicator reaches its maximum importance in biotopes: in a tree-shrub biotope, in gravelly areas, and also on rocks and talus, among stones and plant debris where 6-7 species inhabit.

With the highest density of terrestrial mollusks in Kuhitangtow and Babatag the biotopes are distinguished: banks of the rivers and spring waters, among plants and wood-shrubby biotopes, in gravelly areas where it was discovered from 60 to 70 ind. m<sup>2</sup>.

Vertical distribution of terrestrial mollusk along the main ridges of the region under research gives the opportunity to establish a number of common patterns. One of the common patterns observed in the mountain conditions – gradual depletion of malacofauna when moving down and up from the mountain belt.

Research has shown that in all the mountain ranges malacofauna of tow (mountain) is rich and diverse, the tow belt also has a wide variety of natural landscapes, with a strongly dissected relief, abundant moisture and a more moderate temperature regime. In addition, under the canopy of shrubs and trees and bushes there is a five to six centimeter litter which serves for terrestrial mollusks as food and nesting material.

It should be noted that in all the mountain ridges with the change of climate – high temperature and high dryness of the lower zone (adirr, chul) and vice versa – low temperature with sufficient humidity in upper belt (yaylow) the diversity of the fauna decreases.

It has also been established that it decreases due to Central Asian species. For instance, in the Turkestan range in the adirr (hill) belt 23 species of terrestrial mollusks were discovered, from which 8 ones are Central Asian. In the yaylow belt from 13 species 4 ones are Central Asian (such kind of patterns are characteristic to all mountain ridges).

One of the common patterns observed in the mountain conditions – the presence of palearctic and holarctic species in all high-altitude landscape zones. This is due to the fact that mollusks live in interzonal biotopes (banks of the rivers, streams, spring waters). In the interzonal biotopes mollusks find the same conditions in all altitude zones.



Other features include the fact that in all studied mountain ridges most species are found at least in two – *Pupilla sterrii*, *Ps. subobscura*, *Ps. asiatica*, *Br. plectotropis*, *L. caryodes*, or in three - *L. mesoleuca*, *A. regeliana*, *Ps. sogdiana*, *D. reticulatum* – high altitude belts. It is due to the fact that natural biotopes populated by mollusks because of complex mosaic structure of high altitude belts are not strictly limited to a certain altitude limits.

When comparing malacological complexes of the studied mountain ridges it can be seen that malacological composition of adirr (hill) belts in all the studied ridges is very similar. Firstly, this is due to almost identical environmental conditions (vegetation, climate, relief structure); secondly, location at a small absolute height, open towards neighboring territories. This prevents the penetration of many arid forms from neighboring territories and creation of broad faunal complexes.

Thus in the result of research on malacofauna of Uzbekistan and contiguous territories it was revealed regularities inherent in the peculiarities of the formation, distribution and penetration of fauna characteristic not only to the studied region but for all the mountain areas in Central Asia.

Considering exactingness of terrestrial mollusks to varying degrees of biotope moisture, they are divided into three large groups: hygrophils, mesophylls and xerophiles. In turn, these groups are divided into a number of intermediate subgroups: mesoxerophiles, cryomesoxerophiles.

Among identified ecological groups, mesophiles are the most numerous - 46 species which constitute or 35%, mesoxerophiles - 33 species or 26 %, hygrophils - 18 species (14%) and xerophiles 19 species (15%) and cryomesoxerophiles -13 species (10%).

Considering the static confinement of terrestrial mollusks of the studied region they are divided into the following groups: saprogeobionts (21 species), saprobionts (4 species), petorbionts (26

species), epiphytostrabionts (37 species), epiphytopetrobionts (19 species), epiphytobionts (6 species), epiphytogeobionts (10 species), epiphytoripabionts (4 species), saproxylobionts (a species).

Conclusion: Achieved results permit to speak about species multi-diversity of various biotopes in Uzbekistan and contiguous territories and can serve as the basis for the reconstruction of the likely ways of the forming the wildlife of the region under discussion.

## LITERATURE

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