

Biotopic Distribution And Ecology Of Terrestrial Molluscs (Mollusca: Gastropoda, Pulmonata) In Some Cities Of Uzbekistan

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Annatation. As A Result Of The Study, 26 Species Of Terrestrial Gastropods Were Found In The Studied Territories. For The First Time, Four Biotopes Of Molluscs Have Been Identified On The Territory Of Cities, Among Them Parks And Arboreal Communities Are The Richest In Terms Of The Number Of Mollusk Species. Taking Into Account The Need Of Terrestrial Mollusks For Biotope Moisture, They Are Divided Into Three Main Groups And One Intermediate. According To The Stationary Confinement, The Biotopes Of Terrestrial Gastropods Are Divided Into 8 Groups. The Characteristics Of Each Of Them Are Given.

Key Words: Fauna, City, Terrestrial Molluscs, Biotope, Ecological Groups.

Introduction. Currently, One Of The Progressive Processes In The World Is The Process Of Urbanization. It Directly Affects The Flora And Fauna Of Cities, Flattens The Relief, Destroys Animal Shelters And Food Supply, And Completely Transforms The Soil Cover. Because Of These Reasons, The Malacofauna Of Cities Is Much Poorer Than In Other Territories. Therefore, The Relief Of The Cities Is Strongly Smoothed. At The Same Time, Here, Firstly, The Mollusks Inhabiting The Dissected Relief Are Being Destroyed (These Are Complexes That Are The Richest In The Number Of Species Included In Them), And Secondly, Such An Exceptional Geomorphological Uniformity Has A Detrimental Effect On The Flora And Fauna. In The Years Of Extreme Climatic Influences, When In Many Respects It Is The Dissected Relief With Its Diversity And Microclimatic Conditions That Saves Many Species From Extinction.

The Degree Of Study Of The Problem. Malakofauna Of Cities Has Not Been Studied Enough. The Data Available In The Literature Are Either Fragmentary Or Concern Individual Urban Biotopes. The Urban Malacofauna Was Studied By Z. Izzatullaev And R. Urazova (1997). The Results Of Their Research Was The Discovery Of 8 Species Of Terrestrial And 3 Species Of Aquatic Gastropods. Data On The Malacofauna Of Greenhouses And Greenhouses In The City Of Samarkand Are Given In The Work Of U. Toshplatova, Z. Izzatullaev (2002), Where 11 Species Of Gastropods Were Found. According To The Data Of Z. Izzatullaev And G. Murtazaeva (2000), 20 Species Of Terrestrial Mollusks Have Been Established In The City Of Tashkent. Z.I. Izzatullaev, Kh.Kh. Solizhonov (2002), Studying The Malacofauna Of The City Of Andijan And Its Environs, Noted Here 7 Species Of Terrestrial And 4 Species Of Aquatic Mollusks. Based On The Foregoing, We Believe That The Study Of The Species Composition Of Terrestrial And Aquatic Mollusks Of The Urban Fauna Is One Of The Topical Issues In The Study Of The Malacofauna.

Research Material And Methodology. The Collection And Fixation Of The Collected Material Was Carried Out According To The Methods Of I.M. Likhareva, E.S. Rammelmeyer (1952), I.M. Likhareva, A.Y. Victor (1980). Terrestrial Molluscs Were Collected From Plants, Stones, Soil, Etc., By Hand Or With A Net. It Is Convenient To Mow Mollusks From Plants With A Butterfly Net Early In The Morning. When Collecting Small Mollusks, Soil Samples Were Taken With A Bedding Area Of 0.25 M2 In Cloth Bags. Live Slugs And Shell Mollusks Were Placed In A Vessel, Poured 1/4 With Cold Water Up To The Throat And Closed Tightly For A Day. Then The Mollusks

Were Fixed With 70% Ethyl Alcohol For Permanent Preservation. The Autopsies Were Carried Out In A Paraffin Bath Filled With 70% Alcohol According To The Method Of A.A. Shileiko (1978). The Collection Of Material Was Carried Out From 2016 To 2020 Years In Four Cities Of Uzbekistan: Samarkand, Kattakurgan, Navoi And Zarafshan (Fig. 1).

Samarkand Is Located In The Southwestern Part Of Uzbekistan, In The Middle Part Of The Zerafshan Valley ($39^{\circ} 39'15''$ $66^{\circ} 57'34''$), At An Altitude Of 695 M Above Sea Level. Its Area Is 120 Km². Kattakurgan Is A City Of The Samarkand Region, Located In The Valley Of The Zerafshan River On The Left Bank Of The Narpai Canal, Located 88 Km From Samarkand In The Northwest (39.903504° ; 66.265035°), At An Altitude Of 485 M Above Sea Level, Its Area Is 43 Km². The Kattakurgan Reservoir Is Located In The Southern Part Of The City. The City Of Navoi Is Located In The Valley Of The Zerafshan River, In The South Of The Navoi Region ($40^{\circ} 5.0664'$ $65^{\circ} 22.7502'$), 360 Km South-West Of Tashkent, At An Altitude Of 347 M Above Sea Level. Its Area Is 60 Km². The City Of Zarafshan Is Also Located In The Navoi Region, 200 Km Away From The Center Of The Region, In The Central Part Of The Kyzyl Kum Desert ($41^{\circ} 34'00''$ $64^{\circ} 10'14''$), At An Altitude Of 397 M Above Sea Level.



Fig. 1. Map Of The Study Area (Collection Site)

Research Results And Discussion. In Cities, The Soil Cover Is Completely Transformed And Strongly Compacted, Its Heat Capacity And Lumpiness Are Sharply Reduced, As A Result, More Severe Habitat Conditions For Terrestrial Molluscs Arise. Abundant Application Of Organic Fertilizers To The Soil Of Gardens And Vegetable Gardens Leads To The Formation Of Air-Permeable, Lumpy, Heat-Intensive Soils, Favorable For The Settlement And Successful Wintering Of Many Species.

Purposeful And Comprehensive Studies Of The Urban Malacofauna Were Carried Out By Us In 2007-2020. As A Result Of The Research In The City Of Samarkand, 26 Species Of Terrestrial Gastropods Belonging To 13 Families And 16 Genera Were Found, In Kattakurgan - 11 Species Belonging To 7 Families And 9 Genera, In Navoi - 10 Species Belonging To 9 Families And 9 Genera, In Zarafshan - 5 Species Belonging To 5 Families And 5 Genera (Table 1).

The Distribution Of Molluscs In Cities Is Peculiar. It Has Been Established That The Urban Malacofauna Is Formed By Indigenous, Synanthropic And Introduced Species. In The Formation Of The Urban Malacofauna, The Main Place Is Occupied By The Following Species: *Macrohlamys Sogdiana*, *Candaharia Levanderi*, *Candaharia Izzatullaevi*; Synanthropic Species Include *Lytopenete Maculata*, *Candaharia Levanderi*, *Candaharia Izzatullaevi*, *Zonitoides Nitidus*, And Types Of Introduced Species: *Deroceras Sturanyi*, *D. Caucasicum*, *D. Reticulatum*, *Oxychilus Translucidus*.

Palaeartic Species Also Live Here: *Succinea Putris*, *Oxoloma Elegans*, Goleartic Species - *Cochilicopa Lubrica*, Near East - *Xeropicta Candaharica* And Mountain Central Asian Species *Leucozonella Mesoleuca*. In The Study Area, Adventive Species Are Divided Into Several Groups According To The Degree Of Naturalization: Domesticoids (*O. Translucidus*), Colonozoids (*Deroceras Agreste*, *D. Laeve*), Epemezoids (*Deroceras Sturanyi*, *Deroceras Reticulatum*, *Deroceras Caucasicum*).

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Samarkand Differs From Other Cities In Terms Of Area And Scale Of Landscaping. Therefore, The Malacofauna Of The City Of Samarkand Is Slightly Richer In The Number Of Species Of Mollusks, In Contrast To Other Cities. The Green Areas Of Kattakurgan And Navoi Are Similar, The Area Of Parks, Squares And Gardens Is Small And The Man-Made Meadows Are Mosaic. However, In Terms Of The Number Of Parks, Squares And The Community Of Tree Plantations, Kattakurgan Is Inferior To Navoi. Zarafshan Is Very Different In Physical And Geographical Location, Soil Composition And Urban Type. Firstly, The City Is Located In The Center Of Kyzyl Kum. The Building Type Of The Former Union Has Been Preserved In The City, I.E. The Type Of Micro-Districts Has Been Preserved, The Green Areas Are Very Small And Mosaic, Sand Is Found Everywhere In The Soils. For This Reason, The Species Composition Of Mollusks Is Poorer Here.

On The Territory Of Cities, 4 Biotopes Are Distinguished: Parks And Squares, Orchards, Vegetable Gardens And Anthropogenic Meadows (Cereal, Forb And Humid). The Distribution Of Malacofauna In Urban Biotopes Is Of A Peculiar Character.

Parks And Squares Are Varied And In Most Cases With Broad-Leaved Plantations. The Species Composition Of The Herbaceous Layer Is Sharply Depleted, Often Completely Formed By Seeded Grasses. A Feature Of Squares And Parks Is The Constant Destruction Of Litter And Other Shelters, Which Reduces The Food Supply Of Terrestrial

Table 1.

Taxonomic Composition Of Terrestrial Mollusks In Some Cities Of Uzbekistan

Families	Genus		Views	Views			
				Samarqand	Kattakurgan	Navoi	Zarafshan
Succineidae	Succinea	Draparnaud, 1801	<i>Succinea Putris (L.1758)</i>	+			
	Oxyloma	Westerlund, 1885	<i>Oxyloma Elegans (Risso, 1826)</i>	+	+		
Cochlicopidae	Cochlicopa	A.E.I. Ferussac, 1821	<i>Cochlicopa Lubrica (Müller, 1774)</i>	+	+	+	+
Pupillidae	Pupilla	Turton, 1831	<i>Pupilla Muscorum (L., 1758)</i>	+	+	+	+
Orculidae	Sphyradium	Charpintier, 1837	<i>Sphyradium Doliolum (Brugiere, 1792)</i>	+			
Valloniidae	Vallonia	Risso, 1826	<i>Vallonia Pulchella (Müller, 1774)</i>	+		+	
			<i>V. Costata (Müller, 1774)</i>	+			
Agriolimacidae	Deroceras	Rafinesque, 1820	<i>Deroceras Sturanyi (Simroht, 1894)</i>	+			
			<i>D. Caucasicum (Simroth, 1901)</i>	+			
			<i>D. Reticulatum (Müller, 1774)</i>	+			
			<i>D. Laevi (Müller, 1774)</i>	+	+		
			<i>D. Agreste (L, 1758)</i>	+			
	Lytopenelte	Boettger, 1886	<i>Letopenelte Maculate (Koch Et Heynemann, 1874)</i>	+	+	+	
Parmacellidae	Candacharia	Gudwin - Austen, 1888	<i>Candacharia Levanderi (Simroht, 1901)</i>	+	+	+	
			<i>C. Izzatulaevi Et Wiktor 1980</i>	+	+		
			<i>C. Rozeni</i>	+			
Zonitidae	Oxychilus	Fitzinger, 1831	<i>Oxychilus Translucidus (Mortillet, 1854)</i>	+			

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Gastrodontiidae	Zonitodes 1862	Lehmann,	<i>Zonitoides Nitidus</i> (Müller,1774)	+	+	+	+
Ariophantidae	Macrochlamys 1832	Benson,	<i>Macrochlamys Sogdiana</i> (Martens, 1871)	+	+	+	+
			<i>M. Turanica</i> (Martens, 1784)	+		+	
Vitrinidae	Phenacolimax 1859	Stabile,	<i>Phenacolimax Annularis</i> (Studer,1820)	+			
Hygromidae	Leucozonella 1927	Lindhol,	<i>Lencozonella Mesoleuca</i> (Martens, 1882)	+	+	+	
			<i>L.Rubens</i> (Martens, 1882)	+			
			<i>L.Rufispira</i> (Martens, 1874)	+			
	Xeropicta 1892	Montirosato,	<i>Xeropicta Candaharica</i> (L. Pfeiffer, 1846)	+	+	+	+
Helicidae	Helix Linnaeus, 1758		<i>Helix Lucorum</i>	+			
Bcero: 13	16			26	11	10	5

Mollusks, Sharply Worsens Wintering Conditions, Survives Dry Periods Of Summer And Excludes The Existence Of Litter Species. Under The Canopy Of Trees And Shrubs, Species Such As *Cochlicopa Lubrica*, *Vallonia Pulchella*, *Lytopenia Maculata*, *Zonitoides Nitidus*, *Phenacalimax Annularis*, *Xeropicta Candahica*. Coniferous Plantations Take Up Very Little Space And Are Distinguished By Their Litter. The Coniferous Litter Is Not Suitable For Mollusks, It Is Always Thin, Densely Compacted. Mostly Xerophiles Are Found Here - *Xeropecta Candaharica* And *Sphyradium Doliolum*. The Density Of Terrestrial Molluscs In Biotopes Is Variable. In The Sogdiana Park Of The City Of Samarkand, The Density Of *Leucozonella Mezoleuca* Per 1m² Is 10-12 Specimens, In The City Of Kattakurgan In The Park Named After Alisher Navoi This Figure Is 10-12 Specimens Per 1m². The Density Of *M. Sogdiana* Depends On The Presence Of Wet Biotopes. In The City Of Samarkand In The Yoshlik Park, The Density Of This Species Per 1m² Is 8-10 Specimens, In The City Of Navoi In The Park Named After Alisher Navoi - 4-6 Specimens, In The Central Park Of The City Of Zarafshan - 2-3 Specimens. Slugs *Candaharia Levanderi* And *Lytopenia Maculata* Were Found In Litters At Different Ages (1.5 Mm, 20 Mm, 40 Mm, 43-45 Mm). On The University Boulevard Of Samarkand, The Density Of *Lytopenia Maculata* Per 1 M² Was 8-9 Copies, In The Marifat Park Of The City Of Navoi, This Figure Was 7-9 Copies. The Density Of *Candaharia Levanderi* In The Sogdiana Park Of The City Of Samarkand Per 1m² Is 12-15 Copies, In The Alisher Navoi Park In The City Of Kattakurgan - 3-7 Copies. Among Terrestrial Molluscs, *Xeropicta Candahica* Is Distinguished By Its High Density And Occurrence. In The Yoshlik Park Of The City Of Samarkand, Its Density Reached 21-38 Copies Per 1m², On The Chupan-Ata Hill - Up To 40-50 Copies, In The Alisher Navoi Park In The City Of Navoi, This Figure Was 25-34 Copies.

In Terms Of The Species Composition Of Mollusks, The Gardens Are Close To Squares And Parks. Here *Macrochlamys Sogdiana*, *Phenacalimax Annularis*, *Zonitoides Nitidus*, *Cochlicopa Lubrica*, *Candaharia Levandera* Are Considered The Dominant Species Of This Biotope. In The Gardens Of The Regional Hospital In The City Of Samarkand, The Density Of *Zonitoides Nitidus* Per 1m² Reached 10-12, In The Gardens Of The City Of Kattakurgan This Figure Was 6-11 Specimens.

The Area Of The Vegetable Gardens Is Small, Mainly Tomatoes, Cucumbers, Cabbage And Greens Are Grown Here. Slugs-Pests *Deroceras Reticulatum*, *D. Caucasicum*, *Lytopenia Maculata*, *Candaharia Levanderi*, *C. Izzatullaevi* Live Here. Today, Urban Gardens Are Dominated By The Species *Deroceras Reticulatum* And *Deroceras Caucasicum*. In The Gardens Of The City Of Samarkand In April, The Density Of The Last Slug Per 1m² Was 17-24 Specimens, At The End Of May This Figure Rose To 70-200 Specimens, Because At This Time, Hatching Of Fry From Eggs Occurs. The Introduced Species, *Oxychilus Translucidus*, Was Found Only Indoors, With A Density Of 23-30 Specimens. At First, *Deroceras Reticulatum* Was Found Only In Greenhouses, But Now It Is Found Everywhere And Even In Basements.

Anthropogenic Meadows Include Lawns, Cereal And Herb Meadows. They Are Widespread In Cities And Along The Streets. During The Summer, They Are Periodically Mown, Which Increases The Possibility Of Wind Drying The Soil. The Malacofauna Is Very Poor And The Dominant Species Are *Xeropicta Candaharica*, *Zonitoides Nitidus*, And *Cochlicopa Lubrica*. In The City Of Samarkand, On The Lawns Of Mahmud Koshgari Street, The Density Of *Lytopenia Maculata* Per 1m² Reached 3-8 Specimens, In The City Of Kattakurgan On A Similar Biotope This Figure Was Equal To 2-3 Specimens. (Figure 2).

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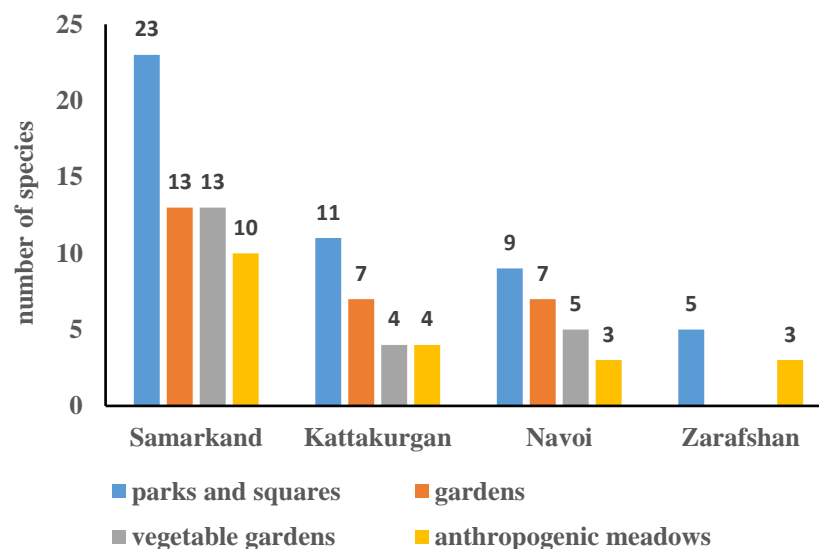


Fig. 2. Distribution Of Terrestrial Gastropods By Biotopes In Some Cities Of Uzbekistan

Common Species Found In Each Of The Studied Cities Are: *Zonitoides Nitidus*, *Xeropicta Candaharica*, *Pupilla Muscorum*, *Macrochlamys Sogdiana*, *Cochlicopa Lubrica*. The Families *Agrolimacidae*, *Parmacelledae*, *Hygromeidae*, *Valloniidae*, *Ariophantidae* Are Considered Dominant In Terms Of The Number Of Species.

Considering The Exactness Of Terrestrial Mollusks To Biotope Moisture, They Were Divided Into Three Main Groups And One Intermediate: Hygrophils - *Succinea Putris*, *Oxyloma Elegans*, *Cochlicopa Lubrica*, *Deroceras Laeve*, *D. Reticulatum*, *Lytopelte Maculata*, *Oxychilus Translucidus*, *Zonitoides Nitidus*, Mesophiles – *Vallonia Costata*, *V. Pulchella*, *Deroceras Sturanyi*, *D. Caucasicum*, *D. Agreste*, *Candaharia Izzatulaevi*, *C. Levanderi*, *Pupilla Muscorum*, *Phenacolimax Annularis*, *Macrochlamys Turanica*, *M. Sogdiana*, *Leucozonella Mesoleuca*, *Helix Lucorum*, Xerophiles - *Leucozonella Rufispira*, *Xeropicta Candaharica*, And Intermediate – Mesoxerophiles - *Leucozonella Rubens*, *Candaharia Rozeni*, *Sphyradium Doliolum* (Fig. 3). Hygrophiles And Mesophiles Are Well Represented In The Studied Territories.

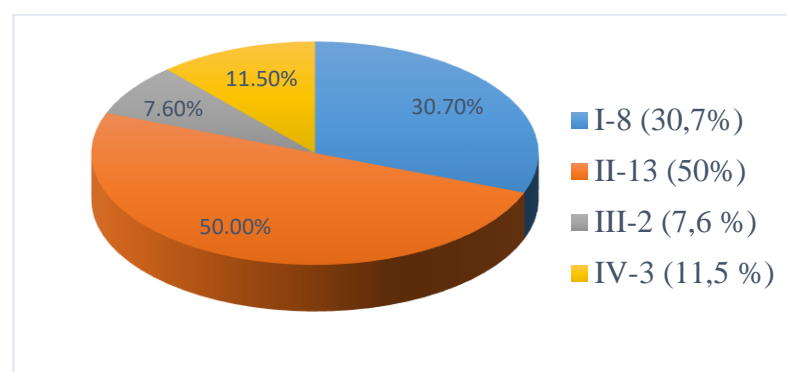


Fig. 3. Ecological Groups Of Terrestrial Molluscs: I-Hygrophiles, Ii-Mesophiles, Iii-Xerophiles, Iv-Mesoxerophiles According To The Stationary Confinement Of Biotopes, We Divided Terrestrial Gastropods Into 8 Groups (Fig. 4).

Epiphytogeobionts (Inhabiting Plants And Soil) - *Deroceras Sturanyi*, *D. Caucasicum*, *D. Reticulatum*, *D. Laevi*, *D. Agreste*, *Candaharia Levanderi*, *C. Izzatulaevi*, *C. Rozeni* (30,70 %).

Saprobeobionts (Living In Spreading Plants And In The Soil) - *Cochlicopa Lubrica*, *Sphyradium Doliolum*, *Vallonia Pulchella*, *V. Costata*, *Oxychilus Translucidus*, *Pupilla Muscorum*, *Helix Lucorum* (26,90%).

Epiphytostrobionts (Living On Plants And Leaf Litter Surfaces) - *Macrochlamys Sogdiana*, *M. Turanica*, *Leucozonella Mesoleuca*, *L. Rubens* (15,3%).

Epiphytopetrobionts (Living Among Bushes And Under Stones) - *Lytopelte Maculata*, *Phenacolimax Annularis* (3,80%).

Epiphytoripabionts (Living Along The Banks Of Water Bodies And Coastal Plants) - *Succinea Putris*, *Oxloma Elegans* (3,80%).

Saprokislobionts (Living Under The Bark Of Plants) - *Zonitoides Nitidus* (7,60%).

Petorbionts (Living In Scree) - *Leucozonella Rufispira* (7.60%).

Epiphytobionts (Living On The Surface Of Plants For A Certain Period Of Life) - *Xeropicta Candaharica* (7.60%).

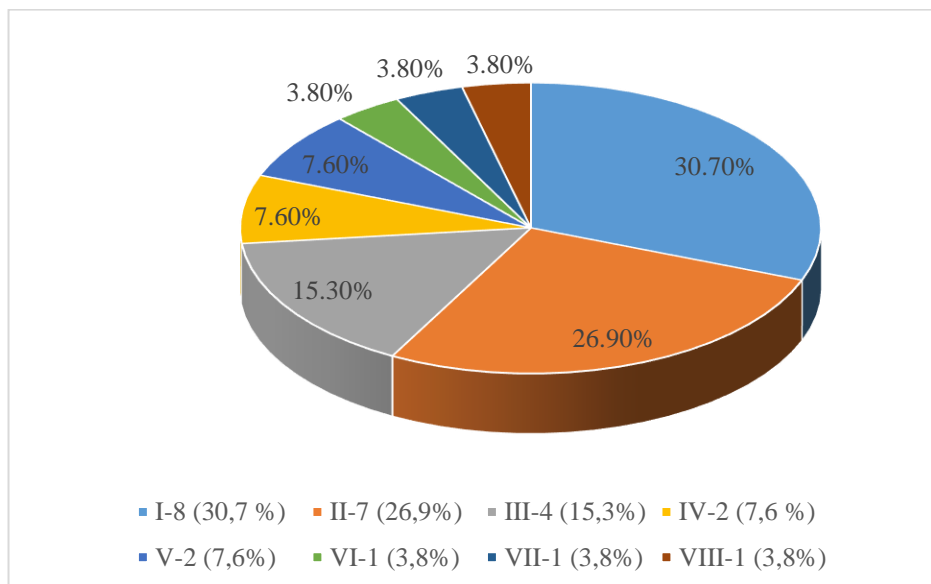


Fig. 4. Ecological Groups Of Terrestrial Mollusks By Habitat: I-Epiphytogeobionts, Ii-Saprobeobionts, Iii-Epiphytostrabionts, Iv-Epiphyto-Petrobionts, V-Epiphytorypabionts, Vi-Saprokislobionts, Vii-Petorbionts, Viii-Epiphytobionts.

Conclusions

In The Studied Cities, The Species Composition Of Terrestrial Gastropods Has A Relative Average Degree Of Faunistic Similarity. In An Urban Landscape In Certain Areas, The Distribution Of Terrestrial Molluscs Primarily Depends On The Formed Plant Communities And Their Condition. Lawns Are The Poorest In Terms Of The Number Of Species, And Tree Communities Are The Richest. Under The Influence Of Anthropogenic Factors, There Is Not Only A Change In The Ratio Of Species In The Biotope And Changes In The Dynamics Of Their Number, A Number Of Features Of The Shell Of Mollusk Species Change.

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