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The zoogeographical analysis of true bugs (Cimicomorpha, Heteroptera) of the Western Tien Shan

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Abstract. This article presents a zoogeographic study of true bugs of the infraorder Cimicomorpha (Heteroptera) in the Western Tien Shan. Species were collected from several localities in the Western Tien Shan, ranging from lower elevations to high-altitude areas. The recorded species were assigned to 18 zoogeographical regions based on their distribution trends. A total of 89 species were identified and assigned to five families: Miridae, Tingidae, Nabidae, Anthocoridae and Reduviidae.

The results showed that the Holarctic zoogeographic region is represented by 15 species, including 12 species (80%) of the family Miridae, 2 species of Nabidae, and 1 species of Anthocoridae. The Trans-Palaearctic realm contains 15 species, primarily Miridae (10 species). The Trans-Eurasian and Western Eurasian zones display the greatest species richness, with 16 species (18%) and 17 species (19%), respectively, where in Miridae constitute 50-65% of the species in these locales. In other regional zones, such as the Holarctic-Oriental, Holarctic-Neotropical, Trans-Palaearctic-Oriental, Western Palaearctic, Eastern Palaearctic, Central Tethyan, Iran-Turan, Euxino-Iran-Turan, Turan-Turkestan-Altai-Gobi, Euxino-Kazakh-Altai-North Turan, Euro-Siberian-Kazakh, European-Kazakh, Central Asian-Kazakh and Turkestan Mountain areas, 1 to 3 species of true bugs were noted, with particular territories showing dominance by Nabidae, Tingidae and Reduviidae.

The gathered information supplements the understanding of the zoogeographic spread of Cimicomorpha in the mountain environments of the Western Tien Shan and can act as a foundation for future exploration of biodiversity and the safeguarding of native species.

Keywords: Cimicomorpha, Western Tien Shan, Heteroptera, Miridae, zoogeography, species diversity, mountain ecosystems

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Introduction

The Western Tien Shan is a biogeographically unique area characterized by intricate topography, a high variety of plant communities, and a marked degree of endemism [1, 2]. True bugs (Cimicomorpha) represent a sizable and ecologically vital group of insects performing central roles in terrestrial ecosystems: predatory species regulate populations of invertebrates, including agricultural and forest pests, while plant-eating species impact the structure and dynamics of plant communities [3, 4]. Heteroptera make up a large insect assemblage including over 40,000 species spread across roughly 50 families globally [5, 6].

Research into the true bug fauna of Central Asia has continued for over 170 years [7]. These inquiries led to the discovery of hundreds of true bug species, and their zoogeography was systematically examined and recorded in local catalogues, notably the Catalogue of Palaearctic Heteroptera [8, 9].

Over 1,250 species of Heteroptera are presently known from Central Asia [10, 11], yet despite these advances, the documentation concerning the terrestrial true bugs inhabiting diverse habitats of Kazakhstan and neighboring areas remains scarce. Mountain ranges in the southeastern portion of the region, which constitute significant biogeographical centers [12], are especially underexplored. Examining the extents and distributional trends of Cimicomorpha allows for the recognition of zoogeographical principles, appraisal of ecological specialization levels, and estimation of environmental factors' impact on community organization. Under current circumstances of worldwide climate alteration, growing human impact, and rangeland deterioration [13, 14], such research is particularly pertinent, as ecological shifts might result in range alterations, species decline, and reorganization of biological communities.

The objective of this research is to perform a zoogeographical examination of Cimicomorpha in the Western Tien Shan, to ascertain patterns of species distribution across faunal ranges, and to appraise their part in the composition of mountain ecosystems in the area.

Materials and research methods

Cimicomorpha samples were collected in various habitats of the Western Tien Shan, including mountain meadows, forest edges, shrubs, and coastal areas, between 2023 and 2025. The study area covered a wide range of heights, from about 1300 m above sea level in the foothills to 4236 m at the top of Mount Sairam (Fig.1). Subsequently, the collected species were identified and assigned to 18 zoogeographic areas of the Western Tien Shan in accordance with the classification of Yemelyanov (1974) [15]. This approach made it possible to assess the patterns of species distribution and identify both widespread and regionally limited species.

Figure 1. Field surveys conducted in the territories of the Western Tien Shan

The study area covered a wide range of habitats, including mountain meadows, forest edges, shrub communities, floodplain areas, and coastal areas along watercourses. The descriptive nomenclature of the distribution of species corresponds to the concepts of physical geography, in which the latitudinal axis runs from north to south and reflects climatic conditions, in particular temperature regimes, while the longitudinal axis runs from west to east. In some species, the distribution ranges correspond to the boundaries of certain landscape zones, such as mountain meadows, forest edges, and semi-desert habitats [16]. The geographical distribution analysis was based on modern catalogues and databases of Palearctic Heteroptera [17], as well as on data from previous regional studies. The occurrence and abundance of species were studied using field observation methods on various species of vegetation, including grassy and shrubby communities, as well as on forest edges. 60-80 plants were examined daily at each sampling site and the number of adults, larvae of all ages, and egg clutches were recorded.

Species frequency of occurrence was calculated using the formula (1):

$$F\,(\%) = 100x\frac{P_i}{P} \qquad (1)$$

where P_i is the number of recorded individuals of a given species, and P is the total number of all observed individuals.

The relative abundance of species was calculated using the formula (2) [7]:

$$Ar\,(\%) = 100x\frac{K_i}{K} \qquad (2)$$

where K_i denotes the number of individuals recorded for a given species, and K represents the total number of individuals recorded during the observations.

Results

As a result of a comprehensive survey of the true bug fauna in the Western Tien Shan, 89 species were determined, belonging to five families: Tingidae, Nabidae, Anthocoridae, Reduviidae, and Miridae. To evaluate the zoogeographical spread of the species, a biogeographical categorization including 18 faunal zones of the Western Tien Shan was applied (Table 1).

Table 1.

Zoogeographical distribution of predatory Cimicomorpha species in the Western Tien Shan

№	Zoogeographical range	Family	Species	Number
1	Holarctic	Nabidae	*Nabis flavomarginatus* Scholtz, 1847, *Himacerus apterus* (Fabricius, 1798)	2
		Anthocoridae	*Orius minutus* (Linnaeus, 1758)	1
		Miridae	*Capsus cinctus* (Kolenati, 1845), *Chlamydatus pullus* (Reuter, 1870), *Agnocoris rubicundus* (Fallén, 1807), *Apolygus lucorum* (Meyer-Dur, 1843), *Leptopterna dolobrata* (Linnaeus, 1758), *Lygus rugulipennis* Poppius, 1911, *Orthocephalus saltator* (Hahn, 1835), *Orthotylus lenensis* Lindberg, 1928, *Polymerus brevicornis* (Reuter, 1879), *Polymerus cognatus* (Fieber, 1858), *Polymerus unifasciatus* (Fabricius, 1794), *Trigonotylus caelestialium* (Kirkaldy, 1902)	12
2	Holarctic-Oriental	Anthocoridae	*Orius niger* (Wolff, 1811)	1
3	Holarctic-Neotropical	Miridae	*Deraeocoris ruber* (Linnaeus, 1758)	1

4	Trans-Palaearctic	Tingidae	*Galeatus inermis* (Jakovlev, 1876)	1
		Nabidae	*Nabis ferus* (Linnaeus, 1758)	1
		Anthocoridae	*Anthocoris confusus* Reuter, 1884, *Orius horvathi* (Reuter, 1884)	2
		Reduviidae	*Coranus subapterus* (De Geer, 1773)	1
		Miridae	*Deraeocoris punctulatus* (Fallén, 1807), *Adelphocoris lineolatus* (Goeze, 1778), *Lygus pratensis* (Linnaeus, 1758), *Lygus wagneri* Remane, 1955, *Polymerus nigrita* (Fallén, 1807), *Plagiognathus chrysantemi* (Wolff, 1804), *Notostira elongata* (Geoffroy, 1785), *Stenodema calcarata* (Fallén, 1807), *Stenodema laevigata* (Linnaeus, 1758), *Trigonotylus ruficornis* (Geoffroy, 1785)	10
5	Trans-Palaearctic-Oriental	Miridae	*Lygus gemellatus gemellatus* (Herrich-Schäffer, 1835)	1
6	Western Palaearctic	Nabidae	*Himacerus mirmicoides* (O. Costa, 1834), *Pirates hybridus* (Scopoli, 1763)	2
		Reduviidae	*Rhynocoris iracundus* (Poda, 1761)	1
		Miridae	*Deraeocoris serenus* (Douglas & Scott, 1868), *Charagochilus gyllenhalii* (Fallén, 1807), *Adelphocoris vandalicus* (Rossi, 1790), *Orthops campestris* Linnaeus, 1758, *Orthops kalmi* (Linnaeus, 1758), *Trigonotylus brevipes* Jakovlev, 1880	6
7	Eastern Palaearctic	Miridae	*Deraeocoris ater* Linnaeus, 1758	1

8	Trans-Eurasian	Tingidae	*Oncochila simplex* (Herrich-Schäffer 1830), *Physatocheila smreczynskii* China, 1952	2
		Nabidae	*Nabis brevis* Scholtz, 1847, *Nabis limbatus* Dahlbom, 1851, *Nabis rugosus* (Linnaeus, 1758)	3
		Anthocoridae	*Anthocoris nemorum* (Linnaeus, 1761), *Anthocoris pilosus* (Jakovlev, 1877), *Deraeocoris olivaceus* (Fabricius, 1777)	3
		Miridae	*Deraeocoris scutellaris* (Fabricius, 1794), *Capsodes gothicus gothicus* (Linnaeus, 1758), *Chlamydatus pulicarius* (Fallén, 1807), *Apolygus spinolae* (Meyer-Dur, 1841), *Lygus punctatus* (Zetterstedt, 1838), *Phytocoris insignis* Reuter, 1876, *Stenodema holsata* (Fabricius, 1787), *Stenodema virens* (Linnaeus, 1767)	8
9	Western Eurasian	Tingidae	*Agramma confusum* (Puton, 1879), *Dictyla lupuli* (Herrich-Schäffer, 1837), *Lasiacantha capucina* Germar, 1837, *Tingis reticulata* (Herrich-Schäffer, 1835)	4
		Nabidae	*Nabis punctatus punctatus* O. Costa, 1847	1
		Reduviidae	*Rhynocoris annulatus* (Linnaeus, 1758)	1
		Miridae	*Deraeocoris ventralis* Reuter, 1904, *Closterotomus biclavatus biclavatus* (Herrich-Schäffer, 1835), *Liocoris tripustulatus* (Fabricius, 1781), *Brachycoleus decolor* Reuter, 1887, *Oncotylus setulosus* (Herrich-Schäffer, 1837), *Orthocephalus brevis* (Panzer, 1798), *Plagiognathus bipunctatus* Reuter, 1883, *Phytocoris incanus* Fieber, 1864, *Phytocoris ulmi* (Linnaeus, 1758), *Phytocoris varipes* Boheman, 1852, *Notostira erratica* (Linnaeus, 1758)	11
10	Central Tethyan	Tingidae	*Catoplatus fulvicornis* (Jak., 1890)	1
		Miridae	*Psallopsis similis* Wagner, 1958	1
11	Iran-Turanian	Tingidae	*Tingis leptochila* (Bull.)	1
		Nabidae	*Himacerus maracandicus* (Reuter, 1890)	1
12	Euxino-Iranian-Turanian	Miridae	*Myrmecophyes variabilis* Drapolyuk, 1989	1

13	Turan-Turkestan-Altai-Gobi	Miridae	*Salicarus halimodendri* Putshkov, 1977	1
14	Euxino-Kazakh-Altai-North Turan	Miridae	*Phytocoris issykensis* Poppius, 1912	1
15	Euro-Siberian-Kazakh	Reduviidae	*Coranus contrarius* Reuter, 1881	1
16	European-Kazakh	Tingidae	*Galeatus sinuatus* (Herrich-Schäffer, 1838)	1
17	Central Asian-Kazakh	Miridae	*Dicyphus thoracicus* Sharp, 1875, *Cyllecoridea decorata* (Kiritshenko), *Myrmecophyes tibialis* Rolfe 1917	3
18	Turkestan Mountain	Nabidae	*Nabis nigrovittatus tianshanicus* (Kerzhner, 1981)	1

Within the Holarctic zone, 15 true bug species were recorded. The most diverse family is Miridae, shown by 12 species (80% of the total species in this region), such as *Capsus cinctus, Chlamydatus pullus, Agnocoris rubicundus, Apolygus lucorum, Leptopterna dolobrata, Lygus rugulipennis, Orthocephalus saltator, Orthotylus lenensis, Polymerus brevicornis, Polymerus cognatus, Polymerus unifasciatus* and *Trigonotylus caelestialium*. These Miridae are largely phytophagous, feeding on plant sap, and display high ecological plasticity, allowing them to occupy diverse habitats from lowland steppes to montane ecosystems, some species also act as secondary predators, regulating populations of smaller insects [18]. The family Nabidae includes 2 species (*Nabis flavomarginatus* and *Himacerus apterus*), making up 14% of the total species in the zone, where as Anthocoridae is present with just one species (*Orius minutus*), tiny predatory bugs that pursue aphids and ticks in plant microsites unavailable to larger predators [19].

In the Holarctic-Oriental region, just one predatory species, *Orius niger* (Anthocoridae), was recorded, whereas in the Holarctic-Neotropical region, one species of the family Miridae *Deraeocoris ruber*, was observed. Across the Trans-Palaearctic expanse, 15 species belonging to 5 families were ascertained. The family Miridae comprised 10 species, such as *Deraeocoris punctulatus, Adelphocoris lineolatus, Lygus pratensis, Lygus wagneri, Polymerus nigrita, Plagiognathus chrysantemi, Notostira elongata, Stenodema calcarata, Stenodema laevigata* and *Trigonotylus ruficornis*. Miridae in this region are mainly phytophagous, but their ability to occupy different plant communities allows them to thrive across large geographic ranges [20]. Nabidae (*Nabis ferus*), Reduviidae (*Coranus subapterus*), Tingidae (*Galeatus inermis*) and Anthocoridae (*Anthocoris confusus, Orius horvathi*) finalize the local life forms. Nabidae and Reduviidae are active predators, contributing to population control of smaller insects, while Tingidae are strictly phytophagous and closely associated with specific host plants, often reflecting the composition of the vegetation [21]. In the Trans-Palaearctic-Oriental territory, a solitary Miridae species, *Lygus gemellatus*, was recorded.

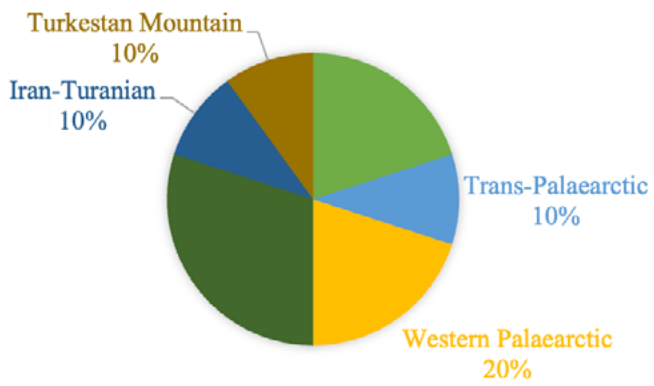
In the Western Palaearctic region, 9 species belonging to 3 families were recorded. The Miridae family predominated with six species, comprising *Deraeocoris serenus, Charagochilus gyllenhalii, Adelphocoris vandalicus, Orthops campestris, Orthops kalmi and Trigonotylus brevipes*. The Nabidae family was shown by two species (*Himacerus mirmicoides* and *Pirates hybridus*), and Reduviidae by just one species (*Rhynocoris iracundus*). Again, Miridae species are phytophagous and ecologically flexible, Nabidae and Reduviidae are predators regulating insect populations and this structure mirrors their functional parts in these habitats [18, 22]. In the Eastern Palaearctic area, one species of Miridae (*Deraeocoris ater*) was recorded.

In the Trans-Eurasian region, 16 species belonging to 4 families were found. The family Miridae comprised eight species (*Deraeocoris scutellaris, Capsodes gothicus, Chlamydatus pulicarius, Apolygus spinolae, Lygus punctatus, Phytocoris insignis, Stenodema holsata* and *Stenodema virens*), making up 50% of the local fauna. The families Nabidae (*Nabis brevis, Nabis limbatus* and *Nabis rugosus*) and Anthocoridae (*Anthocoris nemorum, Anthocoris pilosus* and *Deraeocoris olivaceus*) were represented by three species apiece, while Tingidae included two species (*Oncochila simplex* and *Physatocheila smreczynskii*).

In the Western Eurasian region, 17 species belonging to four families were recorded. The Miridae family was the most species-rich with 11 species, followed by Tingidae with four species, and Nabidae and Reduviidae with one species each.

In the Central Tethyan, Iran-Turan, Euxino-Iran-Turan, Turan-Turkestan-Alatau-Gobi, Euxino-Kazakh-Altai-North Turan, Euro-Siberian-Kazakh, European-Kazakh, Central Asian-Kazakh, and Turkestan Mountain region, between one and three species were recorded. In these locales, the Miridae family is prevalent, apart from some specific zones where Tingidae, Nabidae, or Reduviidae are prevalent.

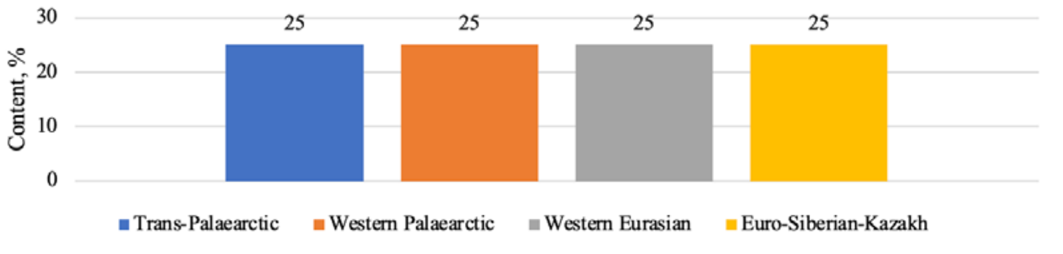
Figure 2 demonstrates the zoogeographical spread of species from the Nabidae family in the Western Tien Shan. The research showed that members of this family are present in six zoogeographical zones. The greatest species diversity was seen in the Trans-Eurasian region, where three species were noted: *Nabis brevis, Nabis limbatus* and *Nabis rugosus*.



№	Zoogeographical range	Number of species
1	Holarctic	2
2	Trans-Palaearctic	1
3	Western Palaearctic	2
4	Trans-Eurasian	3
5	Iran-Turanian	1
6	Turkestan Mountain	1
Total		11

Figure 1. Zoogeographical distribution of Nabidae species (Cimicomorpha) in the Western Tien Shan

The Holarctic region is represented by two species, *Nabis flavomarginatus* and *Himacerus apterus*, which are broadly spread and characteristic for the temperate zone's wildlife. Within the Western Palaearctic region, two species were likewise noted: *Himacerus mirmicoides* and *Pirates hybridus*. In the Trans-Palaearctic region, a single species, *Nabis ferus*, was spotted, which has a broad distribution throughout the Palaearctic.

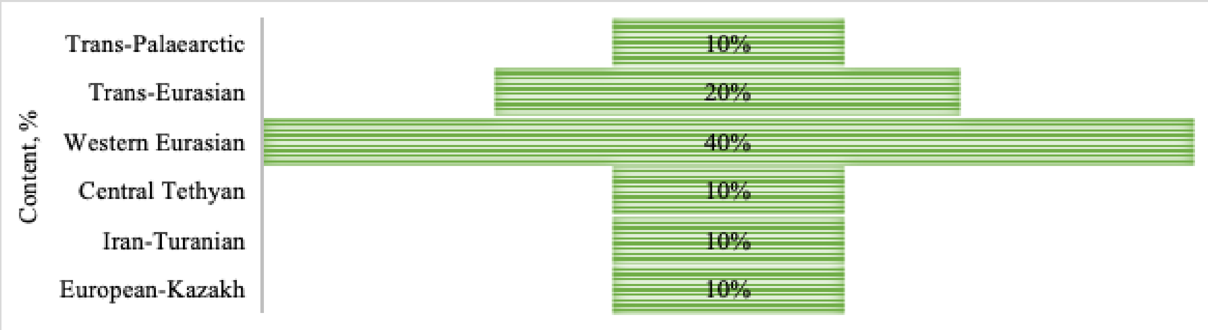


№	Zoogeographical range	Number of species
1	Trans-Palaearctic	1
2	Western Palaearctic	1
3	Western Eurasian	1
4	Euro-Siberian-Kazakh	1
Total		4

Figure 2. Zoogeographical distribution of Reduviidae species (Cimicomorpha) in the Western Tien Shan

Regarding the family Reduviidae, four species were recorded in the Western Tien Shan, distributed across four zoogeographical areas (Figure 2). In the Trans-Palaearctic zone, *Coranus subapterus* was observed. The Western Palaearctic domain is represented by *Rhynocoris iracundus*, typical of the European fauna and nearby locales. In the Western Eurasian area, *Rhynocoris annulatus* was found. The Euro-Siberian-Kazakh region is represented by *Coranus contrarius*, linked to the temperate and continental conditions of Eurasia.

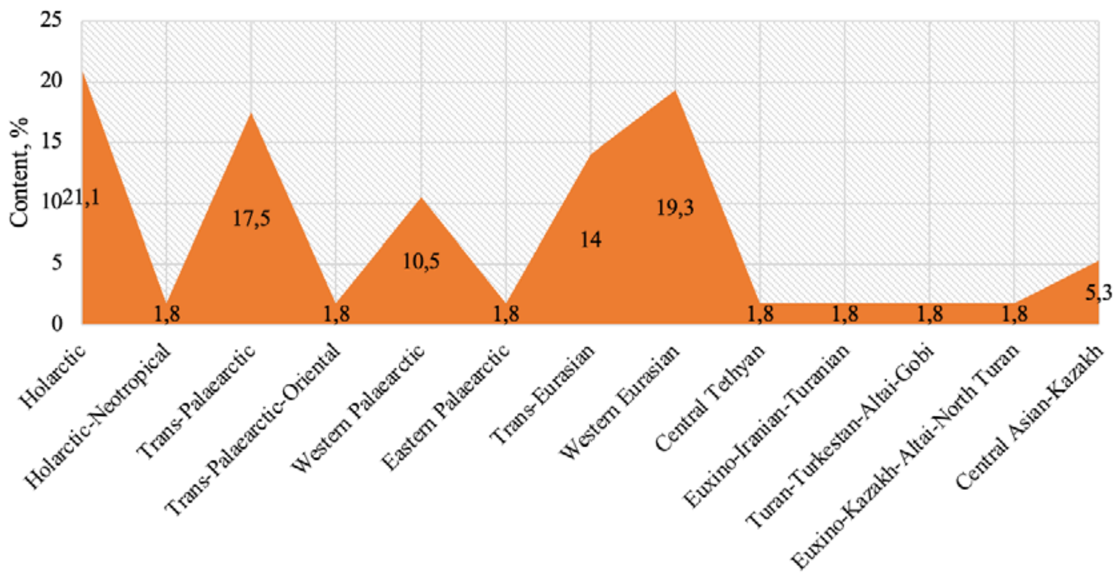
For the family Tingidae, ten species were recorded in the Western Tien Shan, distributed among six zoogeographical regions (Figure 3). The highest variety of Tingidae was seen in the Western Eurasian area (four species), making up 40 % of all noted species. Two species (20%) were recorded in the Trans-Eurasian region, whereas each of the remaining zoogeographical regions contained only one species, representing 10% of the total.



№	Zoogeographical range	Number of species
1	Trans-Palaearctic	1
2	Trans-Eurasian	2
3	Western Eurasian	4
4	Central Tethyan	1
5	Iran-Turanian	1
6	European-Kazakh	1
Total		10

Figure 3. Zoogeographical distribution of Tingidae species (Cimicomorpha) in the Western Tien Shan

Concerning the family Miridae, 57 species were recorded in the Western Tien Shan, spread across 13 zoogeographical regions (Figure 4). The greatest species variety was seen in the Holarctic regions (12 species, 21 % of the sum), the Western Eurasian regions (11 species, 19 %), and the Trans-Palaearctic zone (10 species, 18 %). Reduced species variety defined local and territorial areas, such as the Holarctic-Neotropical, Trans-Palaearctic-Oriental, Eastern Palaearctic, Central Tethyan, Euxino-Iranian-Turanian, Turan-Turkestan-Alatai-Gobi and Euxino-Kazakh-Altai-North Turan areas, each featuring just one species (2 % of the sum), while the Central Asian-Kazakh area contained three species.

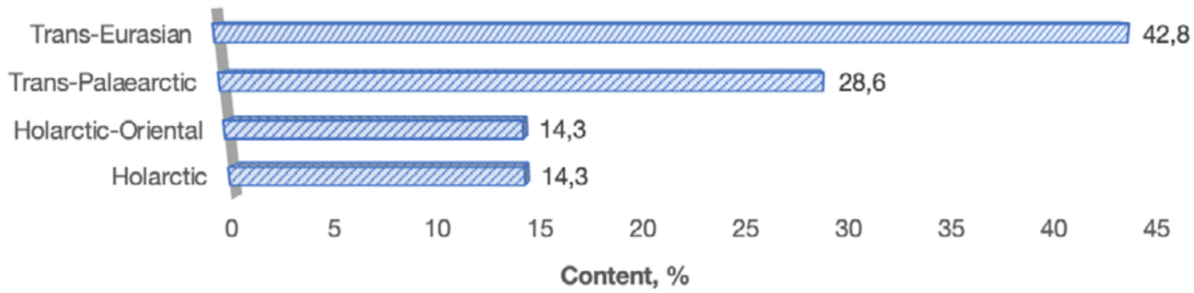


№	Zoogeographical range	Number of species
1	Holarctic	12
2	Holarctic-Neotropical	1
3	Trans-Palaearctic	10
4	Trans-Palaearctic-Oriental	1
5	Western Palaearctic	6
6	Eastern Palaearctic	1
7	Trans-Eurasian	8
8	Western Eurasian	11
9	Central Tethyan	1
10	Euxino-Iranian-Turanian	1
11	Turan-Turkestan-Altai-Gobi	1
12	Euxino-Kazakh-Altai-North Turan	1
13	Central Asian-Kazakh	3
Total		57

Figure 4. Zoogeographical distribution of Miridae species (Cimicomorpha) in the Western Tien Shan

The resulting zoogeographical distribution suggests that the bulk of the Miridae in the Western Tien Shan comprises species with broad dispersal areas, able to adjust to the area's varied environmental and weather conditions.

Figure 5 shows the zoogeographical layout of Anthocoridae species in the Western Tien Shan.



№	Zoogeographical range	Number of species
1	Holarctic	1
2	Holarctic-Oriental	1
3	Trans-Palaearctic	2
4	Trans-Eurasian	3
Total		7

Figure 5. Zoogeographical distribution of Anthocoridae species (Cimicomorpha) in the Western Tien Shan

The largest proportion of species pertains to the Trans-Eurasian region, which contains three species, making up 42.8 % of all documented members of the family. A notable segment of the fauna is also comprised of species from the Trans-Palaearctic region, including two species (28.6 %). Species of Holarctic and Holarctic-Oriental ranges are represented by one species each.

Discussion

The performed zoogeographical analysis of Cimicomorpha (Heteroptera) in the Western Tien Shan uncovered a complex faunal composition, made up of a mixture of broadly spread and locally confined species. This spatial arrangement mirrors the general template of entomofauna in the temperate section of the Palaearctic. Comparable layouts have been noted in numerous Palaearctic territories, including Central Asia, within other examined terrestrial true bug species. For example, in Uzbekistan, zoogeographical assessments of Heteroptera have indicated that a prominent segment of the fauna comprises Holarctic, Trans-Palaearctic, and Trans-Eurasian species. Similar zoogeographical frameworks with a majority of Holarctic and Trans-Palaearctic components have been recorded in other Central Asian faunas [23]. This aligns with widely dispersed species, encompassing species of Nabidae, Miridae, Reduviidae and other families, which is mainly ascribed to their ecological adaptability [24, 25].

The results of our study also confirm that Miridae dominate in species richness in the Western Tien Shan, which is consistent with data from other Palaearctic regions [26], where this family represents the most diverse group among Heteroptera. The dominance of Miridae in most zoogeographical regions may be associated with the high diversity of herbaceous and shrub vegetation in the Western Tien Shan. Most representatives of this family are phytophagous and exhibit a close association with particular host plants. The mosaic distribution of mountain meadows, shrub communities, forest edges, and endemic plant assemblages creates a wide range of ecological niches that promote species diversification and persistence of Miridae. Such trophic specialization combined with ecological plasticity likely explains the predominance of this family in the studied region. The prevalence of Miridae in species richness matches trends noted for the Palearctic region, where this family represents the largest fraction of Cimicomorpha diversity [17, 27].

For instance, in the Kharkiv fauna (Ukraine), Miridae was similarly the richest family in terms of species compared to Nabidae and Tingidae [28, 29]. The occurrence of the families Nabidae, Anthocoridae, and Reduviidae across multiple zoogeographical areas indicates their broad ecological adaptability to diverse environmental conditions. This is consistent with data on Heteroptera in Southeastern Kazakhstan, where representatives of these families were found to be widely distributed and play an important role in regulating the populations of other insects within natural communities [30].

It is also worth noting the diversity of zoogeographical realms represented in our material, including the Holarctic, Trans-Palaearctic, West-Eurasian, Trans-Eurasian, and several regional areas (e.g., Iran-Turanian, Central Tethyan, etc.). This indicates that the Western Tien Shan lies within the contact zone of several major zoogeographical complexes, creating unique conditions for the formation of a complex faunal structure, similar to those observed in adjacent parts of Central Asia and the Palaearctic. The predominance of species with wide-ranging distributions (Holarctic, Trans-Palaearctic and Trans-Eurasian) suggests their resilience to diverse climatic factors.

Conclusion

During the zoogeographical study of Cimicomorpha in the Western Tien Shan, a total of 89 species belonging to five families: Tingidae, Nabidae, Anthocoridae, Reduviidae, and Miridae were recorded. The zoogeographical analysis revealed that the most diverse realms are the Holarctic, Trans-Palaearctic, Trans-Eurasian and Western-Eurasian, which harbor the highest number of species. In local or regional realms, such as the Central Tethyan, Iran-Turanian and Turkestan Mountain, species richness was low, ranging from one to three species, reflecting the influence of historical, geographical, and ecological factors, including altitude, habitat species and climatic conditions.

The analysis of family-level spread demonstrated that Miridae are predominant across most domains, apart from particular local areas where Tingidae, Nabidae, or Reduviidae are dominant. Members of the Nabidae family were noted in six regions, with maximum species richness seen in the Trans-Eurasian.

These outcomes corroborate existing theories in Cimicomorpha zoogeography, suggesting that widely distributed species constitute the «base» of local fauna, while endemic species are confined to particular settings and fashioned by historical-geographical hindrances. The information concerning species makeup and zoogeographical spread of Cimicomorpha in the Western Tien Shan offers a useful starting point for forthcoming biodiversity tracking and the evaluation of the environmental condition of mountain biomes.

Author Contributions

G.E.M., P.A.E., M.B.Zh. and G.D.A. - conceptualization; **G.E.M., P.A.E., M.B.Zh. –** scientific design development**; G.E.M., P.A.E., M.B.Zh. and G.D.A. –** implementation of the declared scientific research.

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Conflicts of Interest

Authors declare no conflicts of interest.

Compliance with ethical standards

This article does not contain a description of studies performed by the authors involving people or using animals as objects.

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Зоогеографический анализ клопов (Cimicomorpha, Heteroptera) Западного Тянь-Шаня

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Аннотация. В статье представлен зоогеографический анализ клопов (Cimicomorpha, Heteroptera) Западного Тянь-Шаня. Образцы были собраны на нескольких участках Западного Тянь-Шаня, от предгорий до высокогорных зон. Собранные виды были отнесены к 18 зоогеографическим ареалам на основе их распределения. Всего выявлено 89 видов, относящихся к пяти семействам: Miridae, Tingidae, Nabidae, Anthocoridae и Reduviidae. Результаты показали, что голарктический зоогеографический ареал представлен 15 видами, включая 12 видов (80%) семейства Miridae, 2 вида семейства Nabidae и 1 вид семейства Anthocoridae. Транспалеарктический ареал включает 15 видов, с преобладанием Miridae (10 видов). В трансевразийском и западноевразийском ареалах зарегистрировано наибольшее видовое разнообразие -16 видов, что составляет 18% и 17 видов (19%) соответственно, при этом семейство Miridae составляет 50-65% видов ареала. В остальных локальных ареалах - таких как Голарктико-ориентальный, Голарктико-неотропический, Транспалеарктико-ориентальный, Западнопалеарктический, Восточнопалеарктический, Среднететийский, Ирано-Туранский, Эвксинско-иран-туранский, Туранско-туркестанско-алатау-гобийский, Эвксинско-Казахстанско-Алтайско-Северотуранский, Евро-

Сибирско-Казахстанский, Европейско-Казахстанский, Среднеазиатско-Казахстанский, - а также в горах Туркестанского хребта встречается от 1 до 3 видов клопов, с отдельным преобладанием Nabidae, Tingidae и Reduviidae в некоторых ареалах. Полученные данные дополняют сведения о зоогеографическом распределении клопов Cimicomorpha в горных экосистемах Западного Тянь-Шаня и могут служить базой для дальнейших исследований биоразнообразия и охраны эндемичных видов.

Ключевые слова: Cimicomorpha, Западный Тянь-Шань, Heteroptera, Miridae, зоогеография, видовое разнообразие, горные экосистемы

Батыс Тянь-Шань қандалаларын (Cimicomorpha, Heteroptera) зоогеографиялық талдау

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Аңдатпа. Мақалада Батыс Тянь-Шань қандалаларының (Cimicomorpha, Heteroptera) зоогеографиялық талдауы берілген. Қандала түрлері Батыс Тянь-Шань аймағының бірнеше аумағынан, аласа таулы белдеулерден бастап жоғары таулы аймақтарға дейін жиналды. Қандалалардың жиналған түрлері таралуына негізделе отырып, 18 зоогеографиялық аймаққа топтастырылды. Барлығы 89 түр жиналып, реттік және түрлік деңгейге дейін анықталды және олар бес тұқымдасқа жатқызылды: Miridae, Tingidae, Nabidae, Anthocoridae және Reduviidae. Алынған нәтижелерге сәйкес, голарктикалық зоогеографиялық таралу аймағында 15 түр анықталды, оның ішінде 12 түр (80%) Miridae тұқымдасынан, 2 түрі Nabidae тұқымдасынан және 1 түрі Anthocoridae тұқымдасынан болды. Транспалеарктикалық таралу аймағында да 15 түр тіркелді, олардың көпшілігі Miridae (10 түр) тұқымдасынан болды. Трансеуразиялық және Батысеуразиялық таралу аймақтарында әртүрлі түрлер байқалады, олардың 16 түрі немесе 18% аталған бірінші аймаққа тиесілі болса, 17 түр (19%) Батысеуразиялық аймақтан анықталды және оның ішінде Miridae отбасына жататын түрлердің мөлшері 50–65%-ды құрады. Басқа да таралу аймақтарында мысалы, Голарктикалық-ориентальды, Голарктикалық-неотропикалық, Транспалеарктикалық-ориентальды, Батыспалеарктикалық, Шығыспалеарктикалық, Ортатетийлік, Иран-тұран, Евксинді-иран-тұран, Тұран-түркістан-алатау-гобийлік, Евксинді-қазақстандық-алтай-солтүстік тұран, Еуросібірлік-қазақстандық, Еуропалық-қазақстандық, Ортаазиялық-қазақстандық және Түркістан тауларында 1–3 қандала түрлері кездесті, соның ішінде кейбір аймақтарда Nabidae, Tingidae және Reduviidae тұқымдастары басым болды. Аталған мәліметтер Батыс Тянь-Шань таулы экожүйелеріндегі қандалалардың (Cimicomorpha) зоогеографиялық таралуын толықтырады және биоәртүрлілікті зерттеу мен эндемдік түрлерді қорғауға арналған басқа да зерттеулер үшін негіз бола алады.

Түйін сөздер: Cimicomorpha, Батыс Тянь-Шань, Heteroptera, Miridae, зоогеография, түр құрамы, таулы экожүйе

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