

Poisonous Plants of the Karakalpak Part of the Ustyurt Plateau (Uzbekistan)

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Abstract

The article presents the composition and current state of poisonous plants distributed on the Ustyurt plateau. Ustyurt is one of the largest deserts in Central Asia, differing from other deserts of the world in geographical location, relief, flora and fauna and other features. The territory of Ustyurt occupies 21.3 million hectares, of which the Karakalpak part accounts for 7.2 million hectares. Poisonous alkaloid-bearing plants of the Karakalpak part of the Ustyurt plateau *Anabasis aphylla*, *Atriplex flabellum*, *Kalidium capsicum*, *Salsola arbusculaeformis*, *Salsola foliosa*, *Aellenia subaphylla*, *Anabasis brachiatata*, *Rheum tataricum*, *Capparis spinosa*, *Glycyrrhiza aspera*. Alkaloid-bearing plants that are not eaten or poorly eaten by cattle *Ephedra distachya*, *Delphinium songaricum*, *Anabasis salsa*, alkaloid-bearing plants eaten by animals without harm *Carex physodes*, *Eremopyrum orientale*, *Agrophyllum repens*, *Astragalus amodendron*, *Astragalus villosissimus*, species of the genera *Calligonum*, *Salsola*. Poisonous plants of the Karakalpak part of the Ustyurt plateau. An analysis of the pasture flora of the Karakalpak part of the Ustyurt plateau shows that 62 species of wild poisonous plants belonging to 49 genera and 19 families grow here. Although these plants are considered poisonous, but in modern pharmaceuticals and medicine, they are used as medicinal.

Keywords

Ustyurt Plateau, Species, Poisonous, Desert, Climate Change

1. Introduction

The Ustyurt Plateau is an ecosystem of global importance and is included in the

Global 200 ecosystem rating list of the World Wildlife Fund (WWF) as part of the Central Asian deserts. The Saigachiy Industrial Park is located in the zone of temperate Deserts, which stretch from northern Iran through Central Asia to Mongolia and are unique natural zones on a global scale. They represent important migration areas for birds, as well as for wild ungulate species, which include saigas, gazelles, and kulans. The vast expanses of temperate deserts represent countless ecosystem services.

There are 2 types of representative ecosystems on the territory of the reserve: Deserts and semi-deserts.

Foothills and low mountains, represented by cliffs of the Ustyurt plateau and low mountains, partially occupying the territory between the main chink and the coast of the Aral Sea. The territory is representative of the botanical and geographical region—the Ustyurt District of the Turan Desert Province. Vegetation types characteristic of this province are presented here—semi-shrubby vegetation of the gypsum desert, *Haloxylon* vegetation of salt marsh deserts, annual saline vegetation of salt marshes, tugai vegetation (**Figure 1**).

The surface of Ustyurt is a wide-undulating plain, some parts of which are disturbed by quite significant uplifts and large depressions located between them. The relief of Ustyurt has been thoroughly studied [1] [2] and others. The soil cover is characterized by significant variegation, its basis is formed by gray-brown



Figure 1. Study area.

gypsum-bearing soils 40 - 180 cm thick. The soil cover was studied [3] [4]. The depth of groundwater, depending on the terrain, ranges from 3 - 15 to 60 - 90 m. Mineralization—2.6 - 30.0 g/l.

The climate is sharply continental, characterized by hot, dry summers and rather harsh winters, accompanied by strong winds, low precipitation (70 - 110 mm/year), unstable snow cover, high evaporation and a sharp change in temperatures according to the seasons and during the day. Climatic conditions have been studied. The absolute maximum temperature is +45.5°C (July), the minimum is 37.0°C (January). The date of transition of the average daily air temperature +10°C is the third decade of April. In winter, the soil freezes at a depth of 5 - 15 cm.

The degree of continental climate increases from southern to northern regions. The annual amplitude of air temperature fluctuations in the southern part is 32°C - 34°C, in the northern part—36°C. The duration of the frost-free period in the northern part is 175 - 187 days, in the southern part—187 - 215 days. Long-term average annual precipitation in the southern part is 60 - 100 mm, in the northern part—80 - 120 mm. The evaporation rate reaches huge values (1500 - 2000 mm), the moisture coefficient has a minimum value (-5 - 7). Taking into account the physical and geographical conditions of the Karakalpak Ustyurt, we divide this region into four microdistricts: the southern, central, northern and primorsky strips.

In the vegetation cover of the Ustyurt plateau desert, there are many species containing biologically active substances that can cause various kinds of poisoning in animals. The toxicity of most plants is due to the presence of alkaloids in them. In addition, a number of plants are found on the pastures of the region, the use of which causes mechanical damage to animal organs. Some information on harmful and poisonous plants of the Karakalpak part of the Ustyurt plateau is also found in the multi-volume “Flora of Karakalpakstan” by S.E. Yerezhepov [5] and others [6]-[13].

Currently, many studies are carried out on the coating of natural plants and their condition [14]-[21]. It is also in Uzbekistan that a lot of scientific work is being done on plant cover, rare plants, their populations, conservation measures [22]-[27]. In recent years, much scientific results have been achieved in this direction [28] [29] [30] [31].

2. Object and Methods of Research

In the performance of the study classical botanical research methods were used. The main method, used during the field research was route reconnaissance. The laboratory processing of the initial material was performed in strict accordance with all requirements, and the herbarium samples were stored in the National herbarium (TASH). Species of the poisonous plants, distributed in Ustyurt plateau (Uzbekistan).

In determining the taxonomic units of the species, 11 volumes of the work

“Determinant of plants in Central Asia” (1968-2015) were used [32]. The names of the categories and species “Determinant of plants in Central Asia” (1968-2015) and International Plants Names Index [33], Plant of the world online [34] [<http://powo.science.kew.org/>] authors of taxis “Authors of Plant Names” R.K. Brummit, C.E. The Powell [35] manual was used. In the determination of the areal types, it was carried out using the published publications on flora [36].

At the same time, many modern and classical techniques were used [37] [38] [39] [40] [41].

3. Result and Discussion

Poisonous and harmful plants are abundant in natural hayfields and pastures, poisoning animals causing great damage to agriculture. Meadows and grasslands are one of the most important natural resources in the region. These areas are the cheapest sources of production where our need for animal nutrition is met, as well as where the need for roughage is met so that animals can produce high yields. As a result of continuous excessive and uncontrolled grazing of meadows and grasslands, losses have occurred in the existing vegetation cover [42]. Meadows and pastures are of great importance for the future and the continuity of life [43] [44] [45]. At the same time, Ustyurt region received much of his dissertation work [46] [47] [48] [49] [50].

The forage flora of the Karakalpak Ustyurt is estimated by 232 species belonging to 145 genera and 28 families. The leading families in the spectrum are Amaranthaceae (63 species), Brassicaceae (33 species), Poaceae (24 species), Asteraceae (20 species), Boraginaceae (17 species), Fabaceae (16 species), Apiaceae (12 species). Representatives of these families make up 79.7% of the total number of forage plants in the research area. The remaining families are represented by less than 10 species (Figure 2).

Our research was carried out in the Ustyurt area. In the course of studies, poisonous plants in region were analyzed.

Poisonous alkaloid-bearing plants of the Karakalpak part of the Ustyurt plateau *Anabasis aphylla*, *Atriplex flabellum*, *Kalidium capsicum*, *Salsola arbusculaeformis*, *Salsola foliosa*, *Aellenia subaphylla*, *Anabasis brachiata*, *Rheum tataricum*, *Capparis spinosa*, *Glycyrrhiza aspera*. Alkaloid-bearing plants not eaten or poorly eaten by cattle *Ephedra distachya*, *Delphinium songaricum*, *Anabasis salsa*, alkaloid-bearing plants eaten by animals without harm *Carex physodes*, *Eremopyrum orientale*, *Agrophyllum repens*, *Astragalus amodendron*, *Astragalus villosissimus*, species of the genera *Calligonum*, *Salsola*.

Poisonous plants of the Karakalpak part of the Ustyurt plateau. An analysis of the pasture flora of the Karakalpak part of the Ustyurt plateau shows that 62 species of wild poisonous plants belonging to 49 genera and 19 families grow here (Figure 3). They are the most rich in poisonous plants of the family: Amaranthaceae (6 genera, 14 species), Asteraceae (8 genera, 9 species), Boraginaceae (6 genera, 7 species), Apiaceae (5 genera, 6 species), Brassicaceae (4 genera, 4 species),

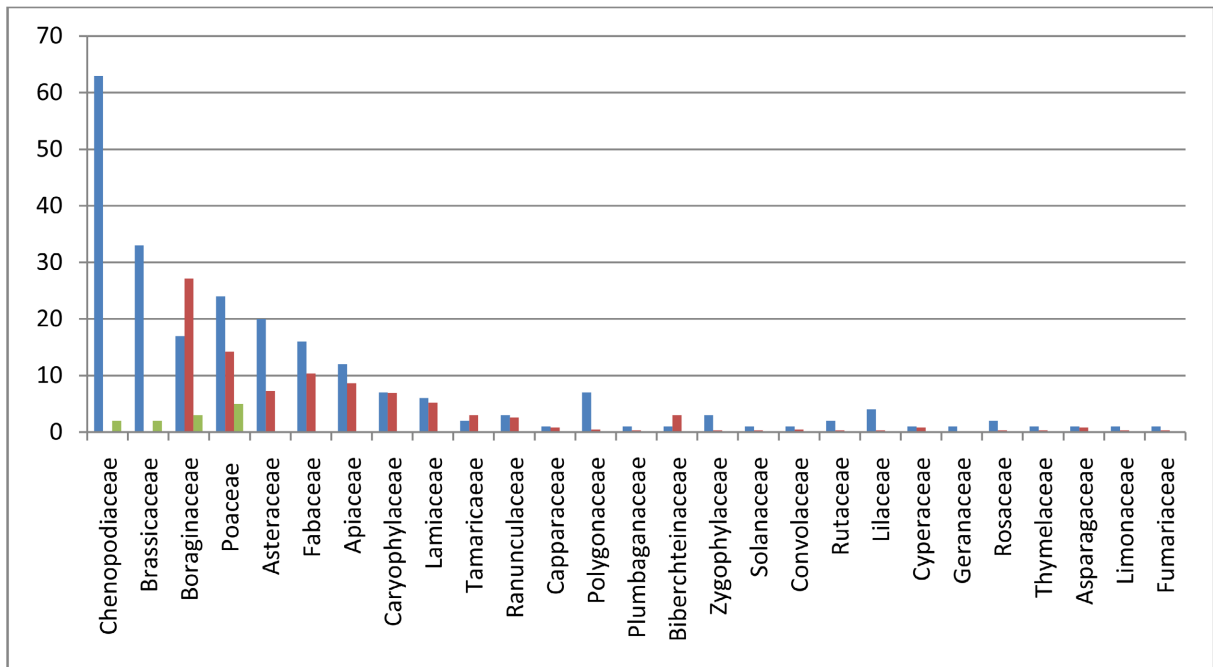


Figure 2. The main range of the forage base of the flora of the Karakalpak part of the Ustyurt plateau.

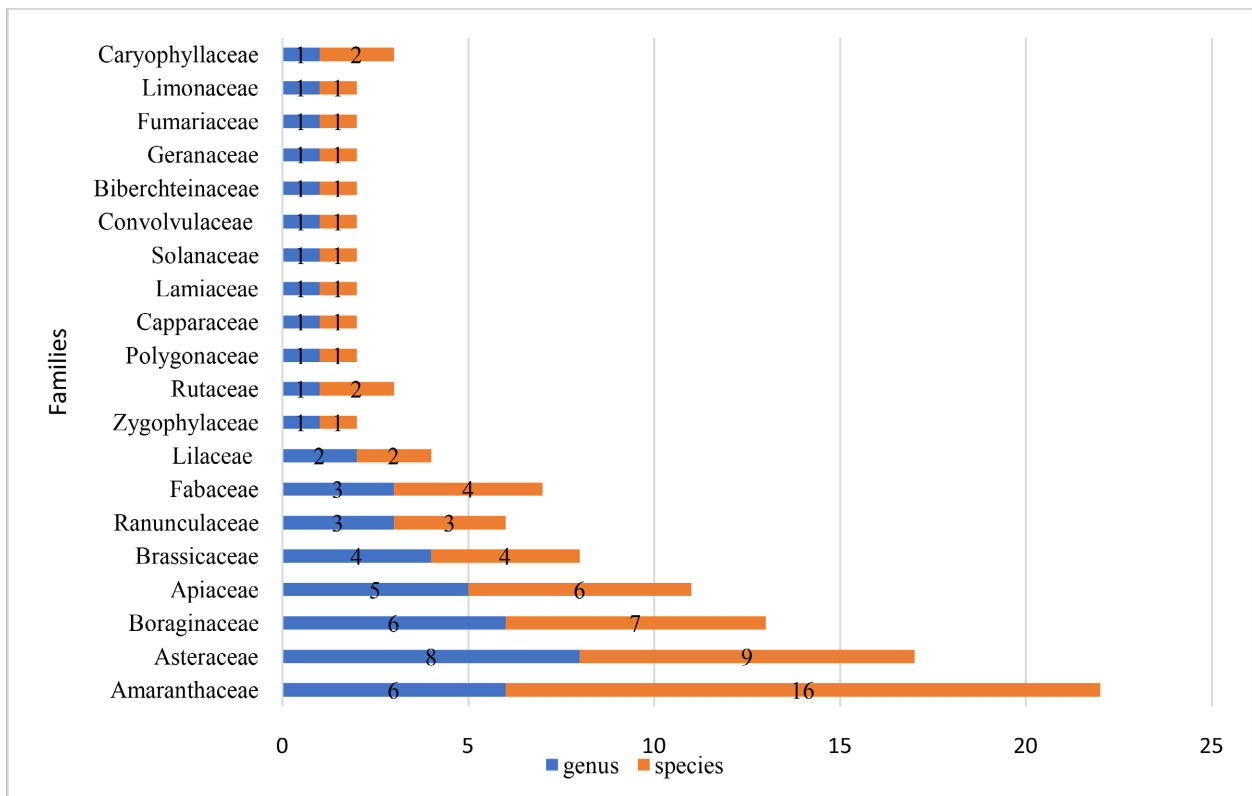


Figure 3. A poisonous plant of the Karakalpak part of the Ustyurt plateau.

Ranunculaceae (3 genera, 3 species), Fabaceae (3 genera, 4 species), Lilaceae (2 genera, 2 species), Zygophyllaceae (1 genus, 1 species), Rutaceae (1 genus, 2 species), Polygonaceae (1 genus, 1 species), Capparaceae (1 genus, 1 species), Lamiaceae

ceae (1 genus, 1 species), Solanaceae (1 genus, 1 species), Convolvulaceae (1 genus, 1 species), Biberchteinaceae (1 genus, 1 species), Geranaceae (1 genus, 1 species), Fumariaceae (1 genus, 1 species), Limonaceae (1 genus, 1 species), Caryophyllaceae (1 genus, 2 species).

The poisonous plants of the Karakalpak part of the Ustyurt plateau were classified according to life forms. Herbaceous poisonous plants predominate in the flora of the Karakalpak part of the Ustyurt plateau. They make up 82.1% of the total number of poisonous plants in the studied area. This indicates that in wetter years, the probability of poisoning from herbaceous plants is much higher compared to dry years, since in precipitation-favorable years, herbaceous plants predominate in the vegetation cover of the desert. Semi-shrubs, shrubs, shrubs and herbaceous plants are edificers of desert pastures (Table 1).

The analysis of poisonous plants of the studied territory in relation to soil moisture showed that more than half of them are gypsophytes, which confirms the arid nature of the pasture flora of the Karakalpak part of the Ustyurt plateau.

In the Karakalpak part of the Ustyurt plateau, many poisonous plants in the initial phase of development are completely not eaten by animals, whereas after autumn precipitation and frost they may turn out to be harmless and used as food. Such plants include *Peganum harmala* L., *Sophora lehmannii* (Bunge) Yakovlev, *Ammodendron conollyi* Bunge ex Boiss, *Anabasis aphylla*. On the other hand, there are several species, when eaten even in a dry state, poisoning is observed, often ending in the death of animals. In this regard, the poisonous plants of the Karakalpak part of the Ustyurt plateau can be conditionally divided into two groups: not eaten (causing acute poisoning with fatal outcome) and eaten.

The first group of satisfactorily eaten ones includes *Silene media* (Litv.) Kleopow, *Silene viscosa* (L.) Pers., *Gypsophila perfoliate* L., *Krascheninnikovia ceratoides* (L.) Gueldenst. *Salsola acutifolia* (Bunge) Botsch., *Atraphaxis spinosa* L., *Limonium gmelinii* (Willd.) Kuntze., *Lepidium songaricum* Schrenk ex Fisch.C.A. Mey., *Melilotus albus* Medik., *Ferula capsica* M.Bieb. The remaining poorly eaten species *Anabasis aphylla* L., *Kalidium caspium* (L.) Ung.-Sternb., *Soda foliosa* (L.) Akhani, *Anabasis brachiata* Fisch. & C.A.Mey. ex Kar. & Kir., *Lepidium perfoliatum* L., *Cynoglossum viridifolium* Pall, *Dorema sabulosum* Litv.

Table 1. The life form of poisonous plants of the Karakalpak part of the Ustyurt plateau.

№	Life form	Number of species	% of the number of poisonous species
1	Trees	-	-
2	Shrubs	2	3.17
4	Semi-shrubs	3	4.76
6	Perennials	37	58.7
7	Annuals	17	28.5
8	Biennials	3	4.76
	Total	62	100

belong to the second group.

Anabasis aphylla L. is a semi-shrub. It is part of the Amaranthaceae family. It grows on saline soils, often on deposits and saline sands. All parts of the plant are poisonous and contain the alkaloids Lupinin and lipocaine, they are used for local anesthesia, it exceeds the duration of the effect of cocaine, but is less toxic. *Kalidium capsicum* is a shrub. It is part of the Amaranthaceae family. It is found in Ustyurt on takyrs, blinders and salt marshes. It is characterized in the literature as a malting, poisonous and insecticidal plant. Green shoots in the growing season contain an alkaloid (Figure 4).

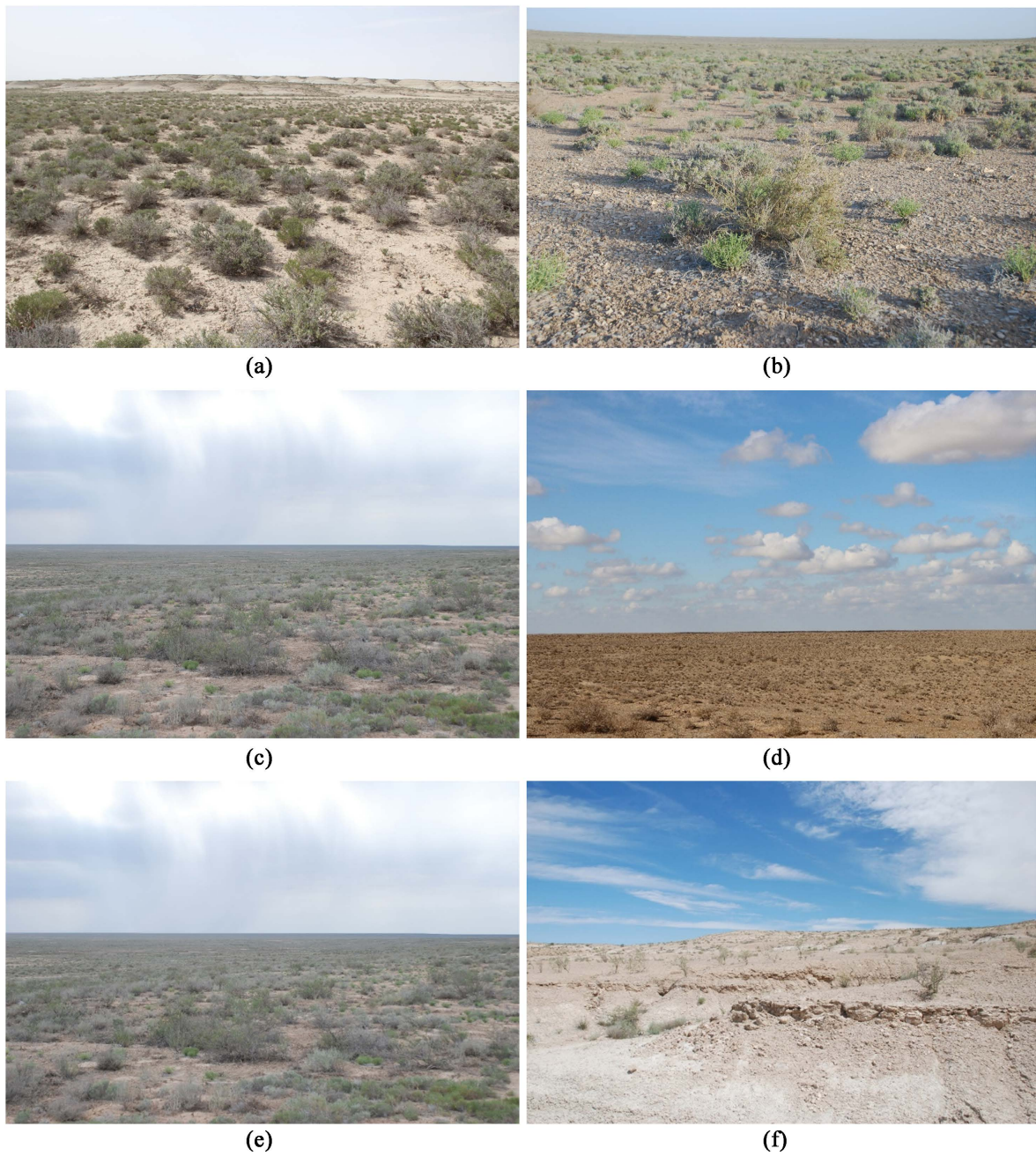


Figure 4. Plant communities of Ustyurt plateau.

Salsola foliosa is an annual herbaceous plant. It is part of the Amaranthaceae family. It is found in Ustyurt on saline sands, salt marshes, takyrs and tugai. In the literature, this species is classified as a poisonous plant, probably contains alkaloids, but has not been studied. It is not eaten by cattle at all. *Anabasis brachiata* is a monolithic herbaceous plant. It is part of the Amaranthaceae family. It is found on the gypsum slopes of the eastern chink of Ustyurt. In the literature, this species is considered an alkaloid.

Lepidium perfoliatum is an annual herbaceous plant. It is part of the Brassicaceae family. It is found in Ustyurt on the gravelly slopes of the outliers, sands and takyrs. In the literature, it is considered a food and even a poisonous plant.

Cynoglossum viridiflorum Pall is a monolithic herbaceous plant. It is part of the Boraginaceae family. It is found only on Ustyurt (Kassarma district), sandy-salty depressions. In the literature, this species is considered poisonous. *Dorema sabulosum* is a monolithic herbaceous plant. It is part of the Apiaceae family. It is rarely found on the bumpy sands of Ustyurt. In the literature, this species is considered poisonous.

4. Conclusions

Ustyurt is one of the largest deserts in Central Asia, differing from other deserts of the world in geographical location, relief, flora and fauna and other features. In the Karakalpak part of the Ustyurt plateau, 232 species of forage plants are found, of which 124 species are valuable and readily eaten, 46 are satisfactorily eaten, 62 are poorly eaten. Perennial, woody-shrubby, annual and ephemeral plants are dominant.

The main threats to biodiversity and habitats in this area are: poaching, the consequences of industrial development of the region—the laying of gas pipelines and road communications, exploration and drilling operations. Engineering and technical structures on the border with Kazakhstan impede the normal migration of saigas, often lead to the death of these animals trying to overcome the barbed wire. Livestock grazing poses a threat to the flora and vegetation of the territory, however, the degree of threat is low due to the sparsely populated area. Extreme weather conditions have a negative impact on the animal and plant world—severe winters with a strong decrease in temperatures and jute, summer droughts. They represent important migration areas for birds, as well as for wild ungulate species, which include saigas, gazelles, and kulans.

The results obtained from the studies are used in the conservation, use and monitoring of species.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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