

# Localities of *Euphorbia Sclerocyathium* Cenopopulations on the Territory of Karakalpak Ustyurt

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**Abstract** The article discusses the brief ecologo-phytocenotic nature of the scattered *Euphorbia sclerocyathium* in the Karakalpakstan part of the Ustyurt of the 5 tsenopopulia. The extent of covering the soil surface of the community, Floristic composition, scattered area of the tsenopopulia, geographical points and coordinates have been cited. Negative effects of anthropogenic and other environmental factors have been shown. *Euphorbia sclerocyathium* is a rare and species in demand for conservation. This species is endemic to the southern Ustyurt plateau.

**Keywords** *Euphorbia sclerocyathium*, Ustyurt plateau, Tsenopopulia, Community, Phytocenosis, Relief, Geographical point, Red Book, Environmental factors

## 1. Introduction

The urgency of studying rare and endangered plant species is determined by the importance of the tasks of their preservation as elements of biodiversity. This problem may be solved on the basis of a comprehensive study of rare and endangered plant species, their bioecological features, and survival strategy. Such studies are necessary for protecting rare and economically valuable plant species, as well as for the rational use of natural communities and creation of artificial plant communities (Baktasheva and Indzheeva, 2014). The coenopopulation approach is the optimal method for assessing the current status of populations of rare and endangered species. Such studies are widely used in Russia, Belarus, Ukraine, the Baltic states, and in Central Asia. Systematic research to assess the status of populations of rare and endangered species using coenopopulation approaches was started in Uzbekistan not long ago. Since 2012, employees of the Laboratory of Geobotany of the Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan have performed studies to identify rare plant communities in the plant cover of Uzbekistan (including the Ustyurt Plateau) that need protection to assess their current status, and to develop protection measures. The territory of the study. The Ustyurt Plateau is represented by dry clay desert located in the area of three Central Asian states: Uzbekistan, Kazakhstan, and Turkmenistan. The plateau is bordered on almost all sides by cliffs. Ustyurt is surrounded by the Caspian Lowland from the north, by the drained bottom of the Aral Sea from the east, by the Amu Darya delta and the Sarykamysh depression from the south, and by the

Caspian Sea from the west. The total area of Ustyurt is 21.2 million ha, and the Karakalpak part comprises 7.2 million ha. The flora of the Ustyurt Plateau includes 724 species assigned to 295 genera and 60 families (Sarybaev, 1994). The plant cover includes a few species, forming monodominant communities: *Salsola arbusculiformis*, *Anabasis salsa*, *Artemisia terrae-alba*, *Haloxylon aphyllum*, and *Salsola orientalis*. Less often, the dominants and subdominants of plant communities are represented by *Salsola arbuscula*, *Atraphaxis spinosa*, *Stipa richteriana*, *S. hohenackeriana*, *S. gemmascens*, and *Nanophyton erinaceum*. Endemics of the Ustyurt and of the drained bottom of the Aral Sea include species of gypsum deserts: *Salsola chiwensis* and *Sisymbrium subspinescens*, as well as *Crataegus korolkowii*, *Artemisia austriaca*, *Atriplex pratovii*, and *Crambe edentula*. Among species listed in the Red Data Book of Uzbekistan (2019) are *Malocarpus crithmifolius*, *Climacoptera ptiloptera*, *Euphorbia sclerocyathium*, and *Xylosalsola chiwensis*. The species composition of the Karakalpak Ustyurt has not yet been completely studied. [7, p. 189–195; 6, p.377-382].

*Euphorbia sclerocyathium* is one of the few rare endemics of the insular and Caspian regions that have the potential for active vegetative propagation.

The species is extremely interesting, both in terms of its morphology, as well as in its rheographic distribution. Ero family ties to other genera have not yet been established. The authors of the species note in their diagnosis ero a separate position. It is possible that the genus fragment of African vegetation he represents. The range of this plant is also extremely curious. Outside the noted localities, which stretch in a narrow strip between the eastern coast of the Caspian Sea and the outskirts of the Ust-Urt Upland, this species has not been observed anywhere else [5, p. 336].

*Euphorbia sclerocyathium* is distributed in Uzbekistan (Karakalpakstan, Ustyurt), Kazakhstan (Mangishlok), Turkmenistan (Karakum, Krasnovodsk).

The species grows in places that differ in the forms of relief, the mechanical composition of the soil [2, p. 82-84]. However, territories with surface location of saline soils and parent rock are considered suitable for this species. In the island region, the species is widely distributed in stony and sandy deserts, on saline gray-brown and gypsum soils [12, p. 27-32].

## 2. Objects and Methods

The objects of study were: *Euphorbia sclerocyathium*

Korovin & Popov.

*E. sclerocyathium* is a perennial herbaceous plant, 20-40 cm high. The stems are numerous, erect, strongly branched from the base. Leaves are fleshy, sessile, entire, lanceolate-elliptic, rarely linear-lanceolate. Capsule 4.5 mm long, spherical-ovoid, smooth. Seeds ovoid, 2-3 mm long, pale gray. Flowering in May-August, fruiting in June-September. Propagated by seed and vegetative (due to the rhizome) methods. [9, p. 174; 4, p. 96].

The territory of Karakalpakstan: Ustyurt plateau - around the Tabansu well, distributed in geographical points of Karabaur, Korin-Yarik, Barsakelmas. In addition to Uzbekistan, it is found in the Mangyshlak Peninsula and Karakum (near the Krasnovodsk Bay) in Turkmenistan (Fig. 3) [13, p.494-499].



**Figure 1.** Distribution areas of *Euphorbia sclerocyathium*



**Figure 2.** *Euphorbia sclerocyathium* (Karabovur point, Central Karakalpak Ustyurti)

The species is widespread in stony and sandy deserts, in saline gray-brown and gypsum soils.

Geobotanical descriptions of the localities of *Euphorbia sclerocyathium* were carried out on the territory of Karakalpak Ustyurt, according to the generally accepted

methodology, on plots of 100 m<sup>2</sup>. [3, p. 230; 11, p. 447].

Bioclimatic modeling of *Euphorbia sclerocyathium* was performed using the MaxEnt program (Phillips and dudik, 2008) based on the maximum entropy model. In this case, 15 localizations of the form

Localities of *Euphorbia sclerocyathium*

ID	Coordinates		Place collected herbarium	Region
1	56,033383°	43,033797°	Ustyurt, Kos kuduk (TASH)	Uzbekistan
2	56,279167°	43,036111°	Surroundings of Djan well (TASH)	Uzbekistan
3	56,432725°	42,539339°	Ustyurt, from Assakeau (field survey data)	Uzbekistan
4	56,408350°	42,582583°	Ustyurt, from Assakeau (field survey data)	Uzbekistan
5	56,481306°	42,949344°	Ustyurt, Karabaur (field survey data)	Uzbekistan
6	57,275833°	42,992222°	Ustyurt, Karabaur (field survey data)	Uzbekistan
7	56,286389°	42,610833°	Ustyurt, Shakhpakhta (field research data)	Uzbekistan
8	56,339169°	42,631603°	Ustyurt, Shakhpakhta (field research data)	Uzbekistan
9	57,349792°	43,286978°	Ustyurt, Tabyn-su (TASH)	Uzbekistan
10	57,633222°	43,830817°	Ustyurt, Kara-kuduk (TASH)	Uzbekistan
11	56,092000°	41,378000°	Ustyurt, Kaplankir (field survey data)	Uzbekistan
12	56,049678°	41,367797°	Ustyurt, Kaplankir (field survey data)	Uzbekistan
13	56,062553°	41,358650°	Ustyurt, Kaplankir (field survey data)	Uzbekistan
14	57,569386°	43,230311°	Ustyurta "Barca Kelmes" (TASH)	Uzbekistan
15	53,174867°	40,111333°	Krasnovodskoe Plateau (TASH)	Turkmenistan



Figure 3. Areas where *Euphorbia sclerocyathium* is distributed

The material was collected in 2019-2022. Route studies covered various ecotopes in the central and southern parts of the Karakalpak Ustyurt.

### 3. Results and Discussion

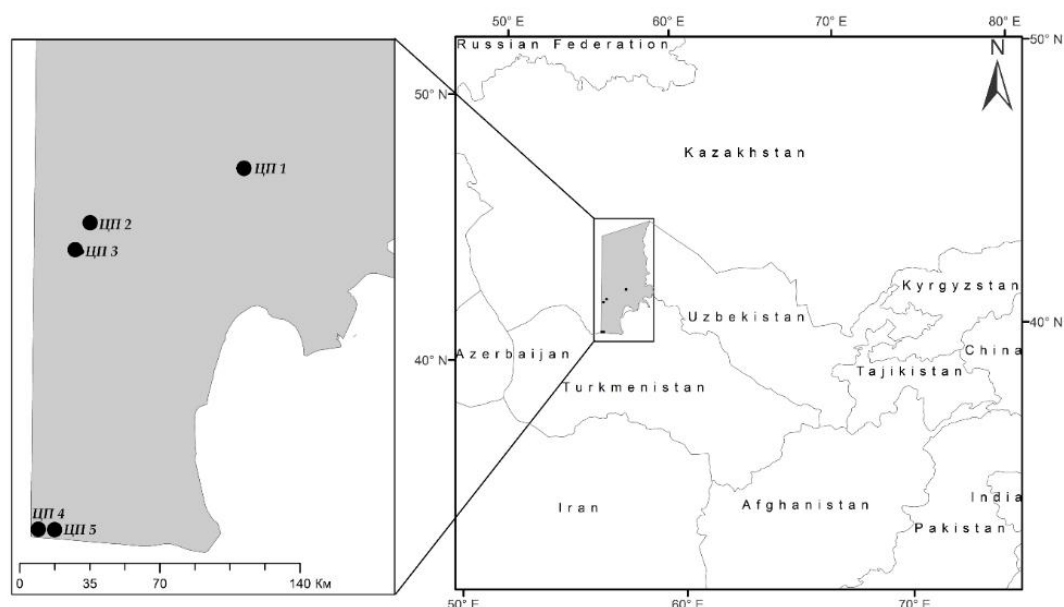
It was found that all cenopopulations of *Euphorbia sclerocyathium* are located in the central and southern parts of Karakalpak Ustyurt (Fig. 4).

5 cenopopulations of the species were found in the

geographical points of Karabaur, Shakhpakhta and Kaplankir (Table 1). The main threatening factors for CP1 and CP2 are the construction of the highway and gas pipelines due to the development of oil and gas infrastructure. As a result, the habitat of the species is destroyed. In addition, exposure to the destruction of cenopopulations on erosive processes (CP3, CP4, CA5), mainly water erosion, has been established. It is necessary to note the action of ground squirrels on the territory of CP3, which is estimated as their degree of impact as critical. [1, p. 5-7; 15, p. 26-28; 14, p.9-13.].

**Table 1.** Location of *E. sclerocyathium* cenopopulations in the Aral Sea region

CP	Region	X (°)	Y (°)	Threatening factors	
				types of factors	degree of impact
CP1	Ustyurt Karabaur	N42°59.32'	E057°16.33'	linear infrastructure	+++
CP2	Ustyurt Shakhpakhta 1	N20°37.51'	E056°19.41'	linear infrastructure	+
CP3	Ustyurt Shakhpakhta 2	N42°36.39'	E056°17.11'	erosion, action of gophers	+++
CP4	Ustyurt Kaplankir 1	N41°22.08'	E056°04.01'	erosion	++
CP5	Ustyurt Kaplankir 2	N41,36164814°	E56,04264649°	erosion	+

**Figure 4.** Location of cenopopulations of *Euphorbia sclerocyathium*

## 4. Conclusions

Over the past 10 years, the development of the oil and gas industry in the Aral Sea region, the construction of roads, the transfer of gas pipelines have had a negative impact on the vegetation cover. The development of heavy vehicles, the destruction of the fertile soil layer, and the mining activities in the regions have led to a reduction in the habitat of rare plant species. *E.sclerocyathium* is listed in the Red Data Book of the Republic of Kazakhstan (2014) with status 2. The species was included with status 2 in the 2009 edition of the Red Data Book of the Republic of Uzbekistan, while in the latest edition (2019) its status was upgraded (1) [10, p 127; 8, p. 256; 9, p. 174].

Most interesting is the fact that the island zone endem *Euphorbia sclerocyathium* is also distributed in these developed areas, the width of the distribution area, lability to soil conditions, biological features mark a critical consideration of the state of the species from the point of view of conservation.

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