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The Conservation Status of *Euphorbia L.* in the Fergana Valley of Central Asia

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Abstract---*In this article, the Euphorbia L category, species, and distribution levels located in the Fergana Valley Natural Area are listed based on the International Red Book categories. Based on the IUCN categories, 24 species were evaluated. In the study of Central Asian herbarium funds, samples are taken, and virtual herbarium funds and targeted Field Research were used. Distribution is a narrow circle of euphorbia mucronate Prok at risk of extinction, category (EN) corresponded to criterion B, and based on the data, the types of synopsis GeoCAT maps were brought.*

Keywords---*Conservation status, Critically Endangered, Endangered, Euphorbia, Fergana Valley, GeoCAT, IUCN, Left Concern.*

Introduction

Fergana Valley, as one of the densely populated (300–400 people per 1 km²) areas in Central Asia (CEPF, 2017) is of particular importance for the relevance of the problem of shrinking and preserving natural landscapes as a result of anthropogenic factors. In the last decade throughout the region, the impact of human beings on the environment has increased sensitively. This led to a sharp reduction in the population of species with local endemic, rare and high economic importance (Elliott et al., 2001). The presence of one reserve (sari-bucket, Kyrgyzstan) and 5 natural monuments in the Fergana Valley further complicated the situation (Tajibaev et al., 2018).

Carried out throughout the Valley flora to this day (1871–2020) in Floristic and geobotanic Research tasks, the identification and preservation of species in need of protection in the composition of phytosenoses are not defined as a priority task (Gulomov, 2022), which means that there is a need for modern research under the takh did or for the protection of vulnerable species at the national and international levels. Including, studies are being carried out to

assess the taxonomy, geography, pharmaceutical characteristics and anthropogenic effects on growth areas of the *Euphorbia* genus species distributed in the Fergana Valley (Corbane et al., 2015; Phillips et al., 2016).

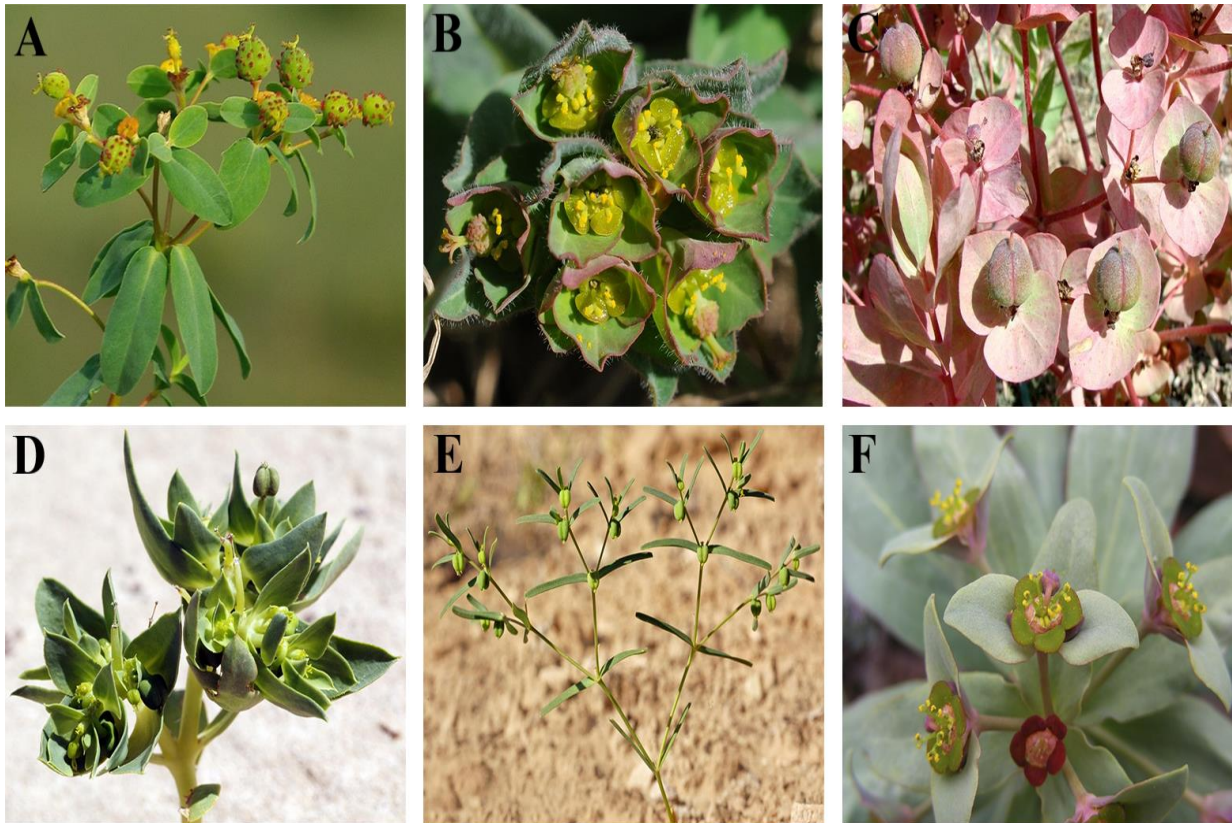


Figure 1. Species of *Euphorbia* distributed in the Fergana Valley (Central Asia): A) *E. pachyrrhiza* (photo by); B) *E. alata* (photo by V. Epictetov); C) *E. ferganensis* (photo by N. Beshko); D) *E. turczaninowii* (photo by P. Gorbunov); E) *E. inderensis* (photo by P. Gorbunov); F) *E. rapulum* (photo by L. Valdshmit).

As one of the main centers of distribution of *Euphorbia* species, the territories of Turkey (103 species), Iran (90 species), Syria (50 species) and Pakistan (46 species) are listed, according to the results of a study carried out in recent years, 96 endemic species distributed in the territory of South Asia were evaluated at a global level (CR, EN, Wu) 2020). As a continuation of these studies, for the first time, the results of the GeoCAT map of the distribution of 24 species distributed in the Fergana Valley and their assessment by IUCN categories were presented (Duenas et al., 2021; Köndgen et al., 2008).

Materials and Methods

Study area

This study was conducted in the elliptical-shaped Fergana Valley (Fig.1). The valley represents less than 1% of Central Asia and covers an area of 22,000 km². It is 300 km long (east to west) and 80–100 km wide (north to south). The elevation of the valley is approximately 3,300 m in the eastern part of Kyrgyzstan and 1,050 m in the western part (Tajikistan, Khojand) (Kaparkar, 2019).

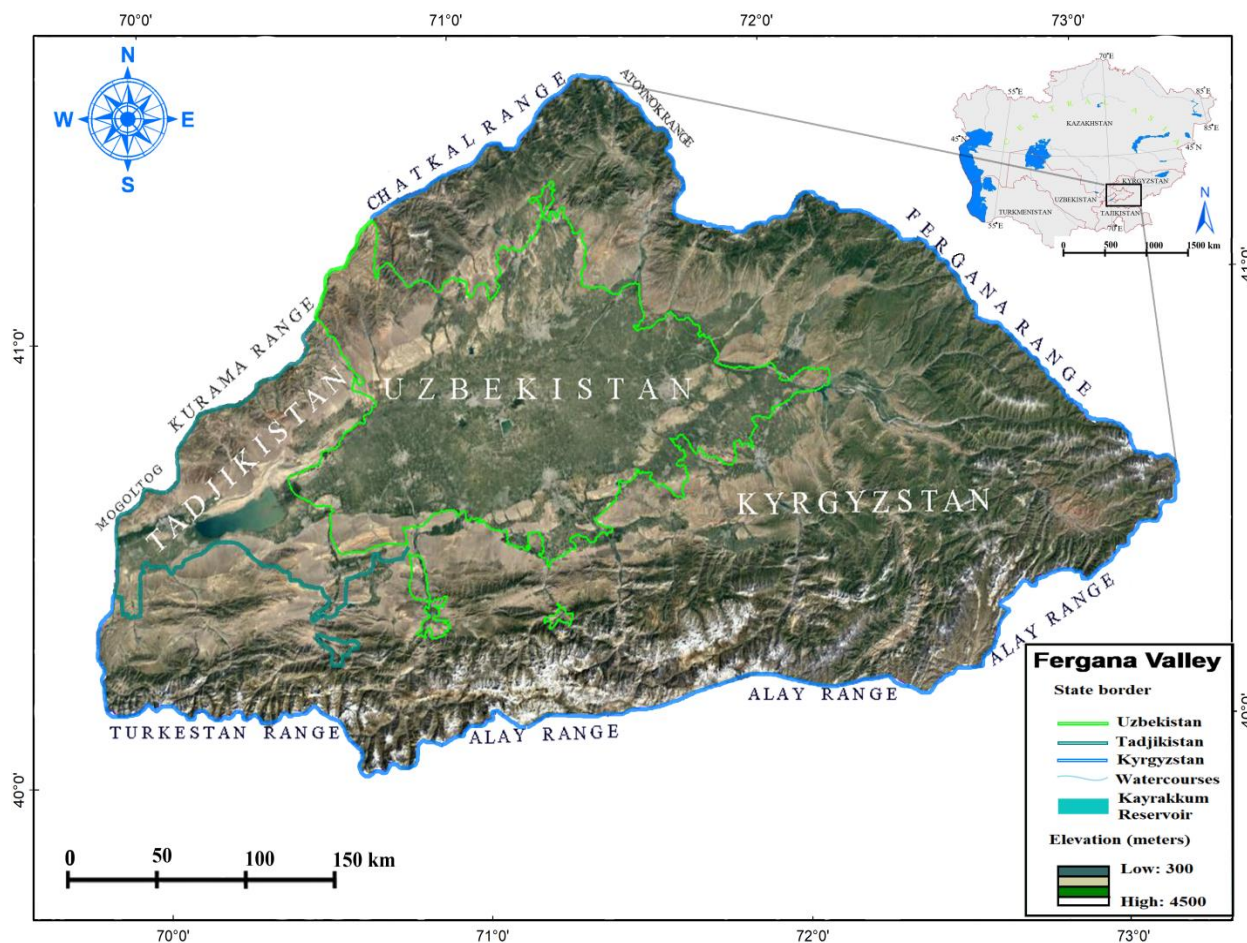


Figure 2. General topography of the Fergana Valley in Central Asia

Analysis of the herbarium specimens

The National Herbarium of Uzbekistan (TASH), Khujand State University and Moscow State University in the assessment of the species in the herbarium funds (<https://plant.depo.msu.ru>, accessed on 5 August 2022) analyzed a total of more than 560 samples and about 100 herbarium samples collected during a targeted field study conducted in 2022. Global Biodiversity Information Facility (<https://www.gbif.org/ru>, accessed on 7 September 2022) used international databases as an additional source of information. Taxon nomenclature Plants of the World Online (<http://www.plantsoftheworldonline.org>, accessed on 5 October 2022), International Plant Name Index (<https://www.ipni.org>, accessed on 6 October 2022) checked from international bases.

Assessment of conservation status of the taxon

To classify the threat status of taxa, it was brought by the IUCN (International Union for the Conservation of Nature) based on the relevant categories (CR, LC+EN) (IUCN, 2012B). The minimum living space (AOO) was assessed based on a grid cell defined by 2 km² users recommended by IUCN. The geographic coordinates of the herbarium samples representing the growth points of the Google Earth Pro 7.1 program (<https://www.Google.com/earth/>, accessed on 3 September 2022) were georeferenced using and combined with the coordinates obtained during field research. GeoCAT of the evaluated species (Geospatial Conservation Assessment Web Tool; Bachman et al., 2011) the coordinates determined when making a map of CSV based on an online application by transferring to the file view (<http://geocat.kew.org/editor>, accessed on 10 September 2022) prepared (Listed in Appendix A).

Results and Discussion

For the first time, 24 species of the *Euphorbia* genus distributed in the Fergana Valley of the Central Asian region were evaluated by the IUCN Red List categories (Table 1). *Euphorbia mochranulata* Prokh. (*Tithymalus mucranulatus* Prokh.) originally dialled type samples were dialled from the Tashkent region (west of the Chatkal Ridge) (Masar Babai Togdar auf dem Aktau bei Tashkent, 12. VII. 1880 (LE)). Herbarium specimens of the species are kept in the appropriate funds (LE, TASH). The label addresses of the preserved samples showed them to be dialled in 4 areas located at a distance of 30–60 km, and they are located from the Chatkal Ridge (Obraztsi sobrannye v nizovyakh r. Chatkal (Uzbekistana, Dolina Chatkala bliz ustya Akbulaka, osipi, 25 VI 1972. R. Gamelin, No. 337 i 14. VII. 1973. R. Kamelin, sn (LE); Parkenta (Tashkent ABL. Parkentasky r–n, Bashi–kizil–say, Salikhova, Amiraev, 21. VI. 1961 (LE) is represented by some herbarium samples sought. The species was last sought after by K. Sh. Tajibaev from Fergana Valley (Zapad. Tien–Cheerful. Kuraminsky HR. Bass. Reg. Chadak. Spusk s uroch. Betagalik V dolinu Kainlisay, 2700 m. 05.08.2012). Since the limited distribution area and population of the species are not fully studied, it becomes the basis for assessing the category (EN) under the threat of extinction of the IUCN red book by Criterion B.

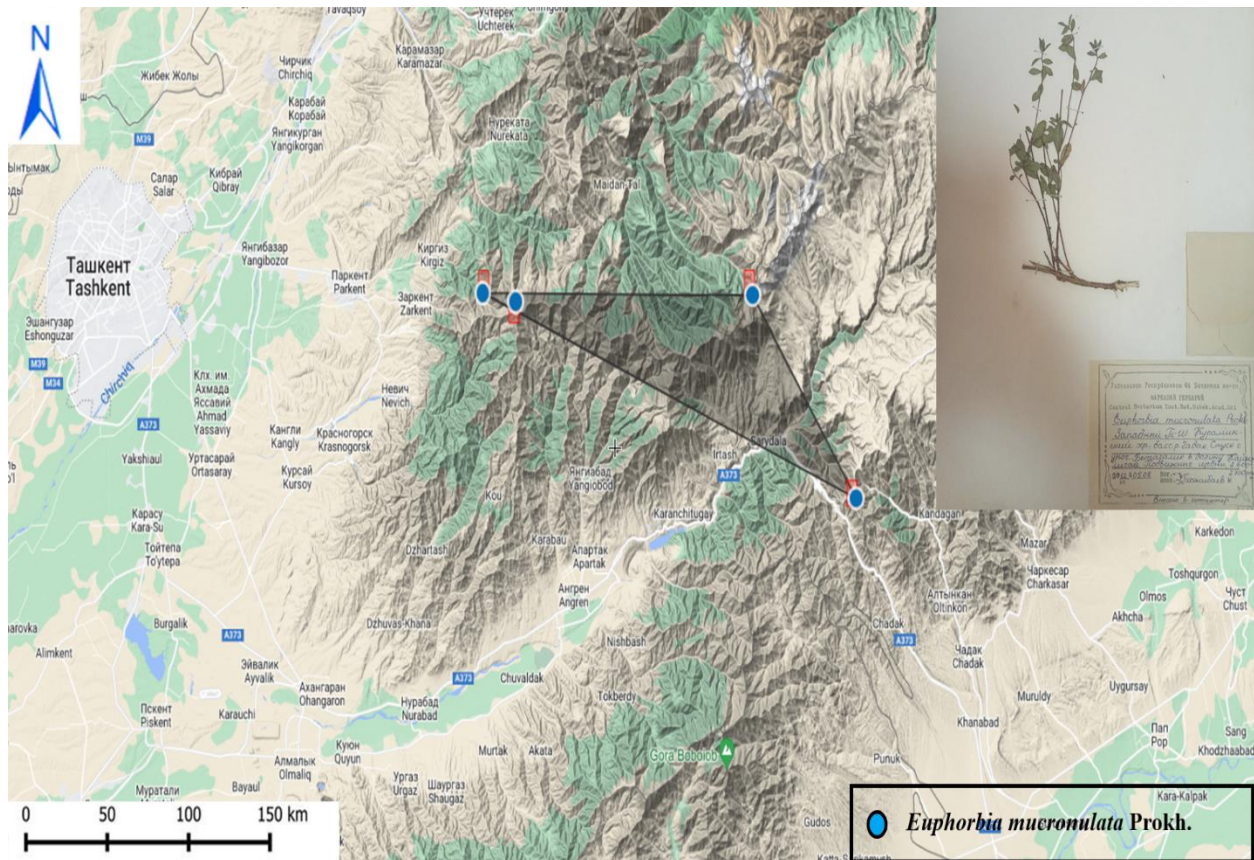


Figure 3. *Euphorbia mucronulata* Prokh. distribution GeoCAT map and herbarium (TASH)

It is required to carry out repeated field research to protect the species as an endemic of the flora of Uzbekistan, and to search for new growth areas. In addition, the exact number and composition of the species population may be weaker and more diffuse than predicted. The reason is that no targeted studies have been carried out on areas adjacent to the previously recorded areas of the species (Zhao et al., 2022; Jassbi, 2006).

Today, attention to this category of species is growing from a pharmaceutical point of view. This requires monitoring the distribution areas of the species and determining the state of their population. In the Fergana Valley, due to the growing influence of anthropogenic factors, there is a serious threat to the distribution areas of the species (Cazalis et al., 2022; Leroux et al., 2010).

Table 1. Red List of *Euphorbia* species distributed in the Fergana Valley (EOO, the extent of occurrence; AOO, area of occupancy; *Critically Endangered* – CR, *Endangered* – EN, *Least Concern* – LC)

№	Accepted taxon name	Conservation status (IUCN)			GeoCAT map	Endemism status	Number of coordinates	General distribution	Preserved Herbaria
		EOO km ²	AOO km ²	Category					
1	<i>Euphorbia alaica</i> (Prokh.) Prokh.	133,362.758	56.000	LC+EN	Fig.4.(A)	Mountainous Central Asia	14	UZ, KG, TJ	LE, FRU
2	<i>Euphorbia alata</i> Boiss.	860,884.454	92.000	LC+EN	Fig.4.(B)	–	23	KG, TJ, KZ, CN	LE, MW, FRU, W,
3	<i>Euphorbia ferganensis</i> B. Fedtsch.	152,342.215	128.000	LC+EN	Fig.4.(C)	Mountainous Central Asia	34	UZ, KG, TJ	LE, MW, TASH, FRU, P, W
4	<i>Euphorbia helioscopia</i> L.	9,360,407.601	192.000	LC+EN	Fig.4.(D)	–	51	UZ, KG, TJ, KZ, TM, AFG et al.	LE, MW, TASH, FRU, TAD
5	<i>Euphorbia humifusa</i> Willd.	7,485,397.786	84.000	LC+EN	Fig.4.(E)	–	23	ASIA et al.,	LE, FRU, TASH
6	<i>Euphorbia humilis</i> Ledeb.	3,894,499.752	72.000	LC+EN	Fig.4.(F)	–	18	UZ, KG, TJ, TM, KZ, IRN, CN	LE, MW, TASH, FRU, TAD, E, G
7	<i>Euphorbia inderiensis</i> Less. ex Kar. & Kir.	5,308,736.406	256.000	LC+EN	Fig.4.(G)	–	66	UZ, KG, TJ, TM, KZ, IRN, AFG, PK, CN	LE, MW, TASH, FRU, TAD
8	<i>Euphorbia virgata</i> Waldst. & Kit.	561,116.604	264.000	LC+EN	Fig.4.(H)	–	72	TJ, IRN, AFG,	LE, MW, TASH, FRU, TAD, NSK, P.
9	<i>Euphorbia monocyathium</i> Prokhanov	123,716.003	68.000	LC+EN	Fig.5.(I)	–	18	KG, TJ, KZ, CN	LE, MW, TASH, FRU, TAD, P
10	<i>Euphorbia mucronulata</i> Prokh.	405.187	16.000	EN	Fig.5.(J)	Endemic	1	UZ	LE, TASH
11	<i>Euphorbia pachyrrhiza</i> Kar. & Kir.	263,988.989	72.000	LC+EN	Fig.5.(K)	–	19	KG, TJ, KZ, MN, CN	LE, MW, FRU ALTB, TASH
12	<i>Euphorbia rapulum</i> Kar. & Kir.	726,358.643	128.000	LC+EN	Fig.5.(L)	–	35	UZ, KG, TJ, TM, KZ, CN	LE, MW, TASH, FRU, TAD, WU
13	<i>Euphorbia sewerzowii</i> (Prokh.) Pavlov	79,993.021	44.000	LC+EN	Fig.5.(M)	Mountainous Central Asia	11	UZ, KG	MW, AA, TASH, FRU, TAD
14	<i>Euphorbia szovitsii</i> Fisch. & C.A. Mey.	1,879,618.577	112.000	LC+EN	Fig.5.(N)	–	28	UZ, KG, TJ, TM, IRN, AFG, PK et al.	LE, MW, FRU, TASH

15	<i>Euphorbia talastavica</i> (Prokh.) Prokh.	77,170.430	48.000	LC+EN	Fig.5.(O)	–	13	UZ, KG, KZ	LE, TASH, FRU
16	<i>Euphorbia tibetica</i> Boiss.	1,593,734.550	52.000	LC+EN	Fig.5.(P)	–	13	KG, TJ, PK, CN.	LE, MW, TASH, FRU, TAD, E, WU, P, WAG, W, US
17	<i>Euphorbia transoxana</i> (Prokh.) Prokh.	116,141.336	44.000	LC+EN	Fig.6.(Q)	Mountainous Central Asia	12	UZ, KG, TJ.	LE, MW, TASH, FRU, TAD, E, W, P
18	<i>Euphorbia turczaninowii</i> Kar. et Kir.	1,456,087.249	92.000	LC+EN	Fig.6.(R)	–	23	UZ, KG, TJ, TM, IRN, AFG, MN, CN.	LE, TASH, FRU
19	<i>Euphorbia turkestanica</i> Regel	818,168.241	40.000	LC+EN	Fig.6.(S)	–	11	UZ, KG, TJ, TM, KZ, IRN, CN.	LE, MW, TASH, FRU, TAD, E, P
20	<i>Euphorbia lamprocarpa</i> (Prokh.) Prokh.	901,612.360	232.000	LC+EN	Fig.6.(T)	–	59	UZ, KG, TJ, KZ, CN	LE, MW, TASH, FRU, TAD
21	<i>Euphorbia franchetii</i> B. Fedtsch.	2,670,659.236	180.000	LC+EN	Fig.6.(U)	–	46	UZ, KG, TJ, KZ, IRN, AFG, CN.	LE, MW, AA, TASH, FRU, TAD, BRNU, CSBG (NS), PE, P, W, NY
22	<i>Euphorbia glomerulans</i> Prokh.	2,371,413.747	148.000	LC+EN	Fig.6.(V)	–	40	Central Asia, Eurasia.	LE, TASH, FRU
23	<i>Euphorbia chamaesyce</i> L.	620,086.434	28.000	LC+EN	Fig.6.(W)	–	9	UZ, KG, TJ, TM, KZ, IRN, AFG et al.	LE, MW, TASH, FRU, PE, P, W, ERE, COI
24	<i>Euphorbia sarawschanica</i> Regel	93,446.637	88.000	LC+EN	Fig.6.(X)	Mountainous Central Asia	23	UZ, KG, TJ, KZ.	LE, TASH, FRU

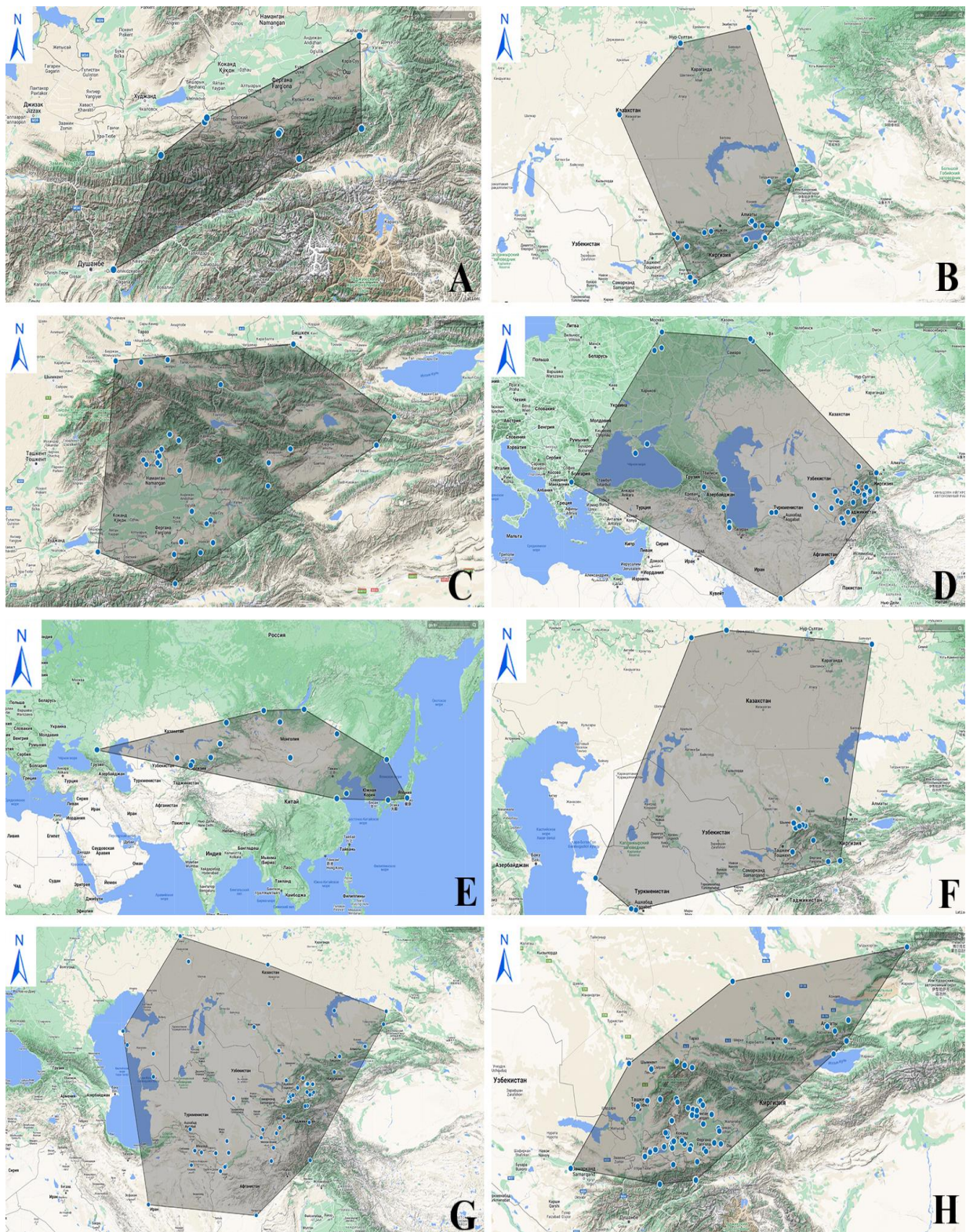
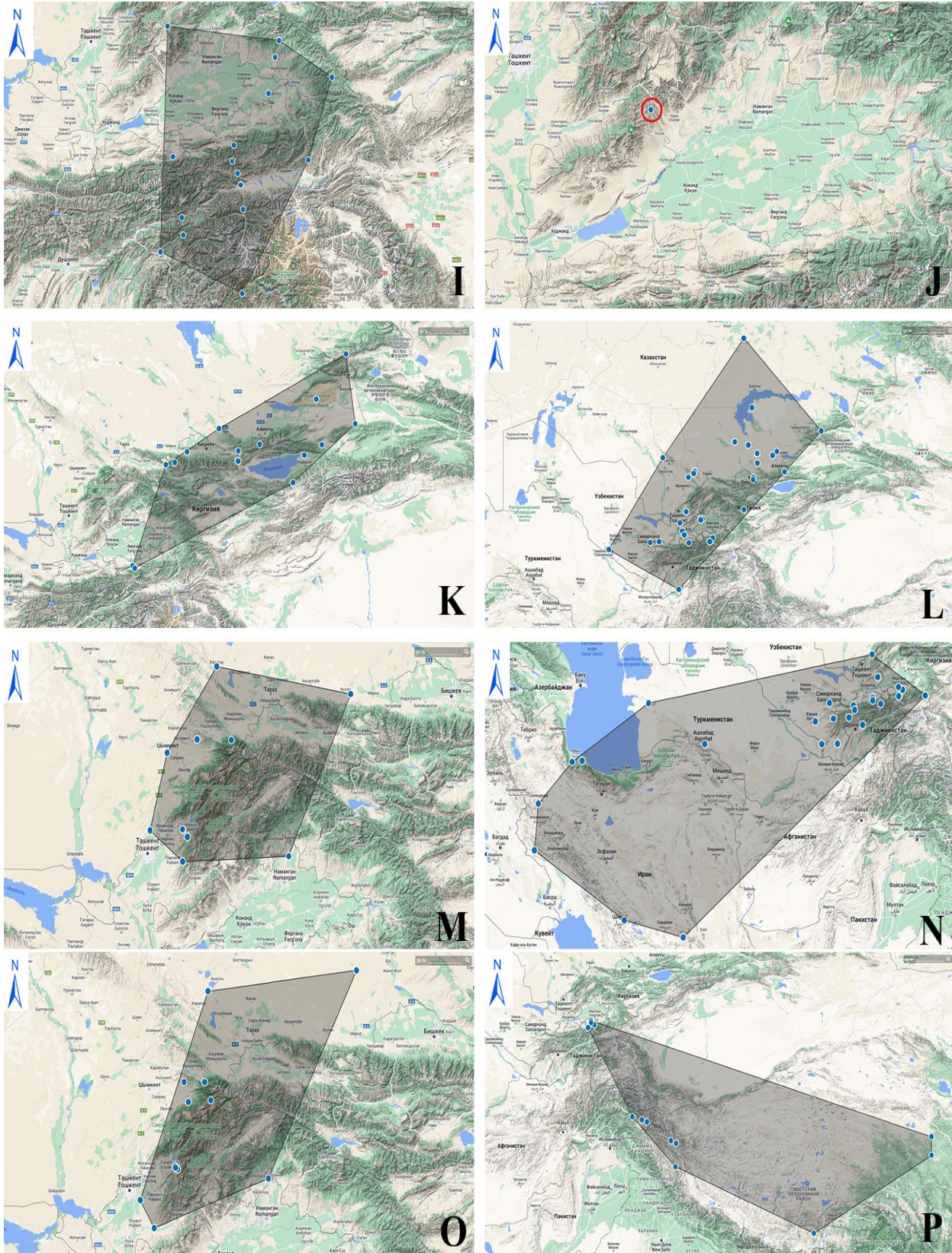
GeoCAT map of the distribution of species of the genus *Euphorbia* distributed in the Fergana Valley

Figure 4. A) *E. alaica* B) *E. alata* C) *E. ferganensis* D) *E. helioscopia* E) *E. humifusa* F) *E. humilis* G) *E. indiensis* H) *E. virgata*



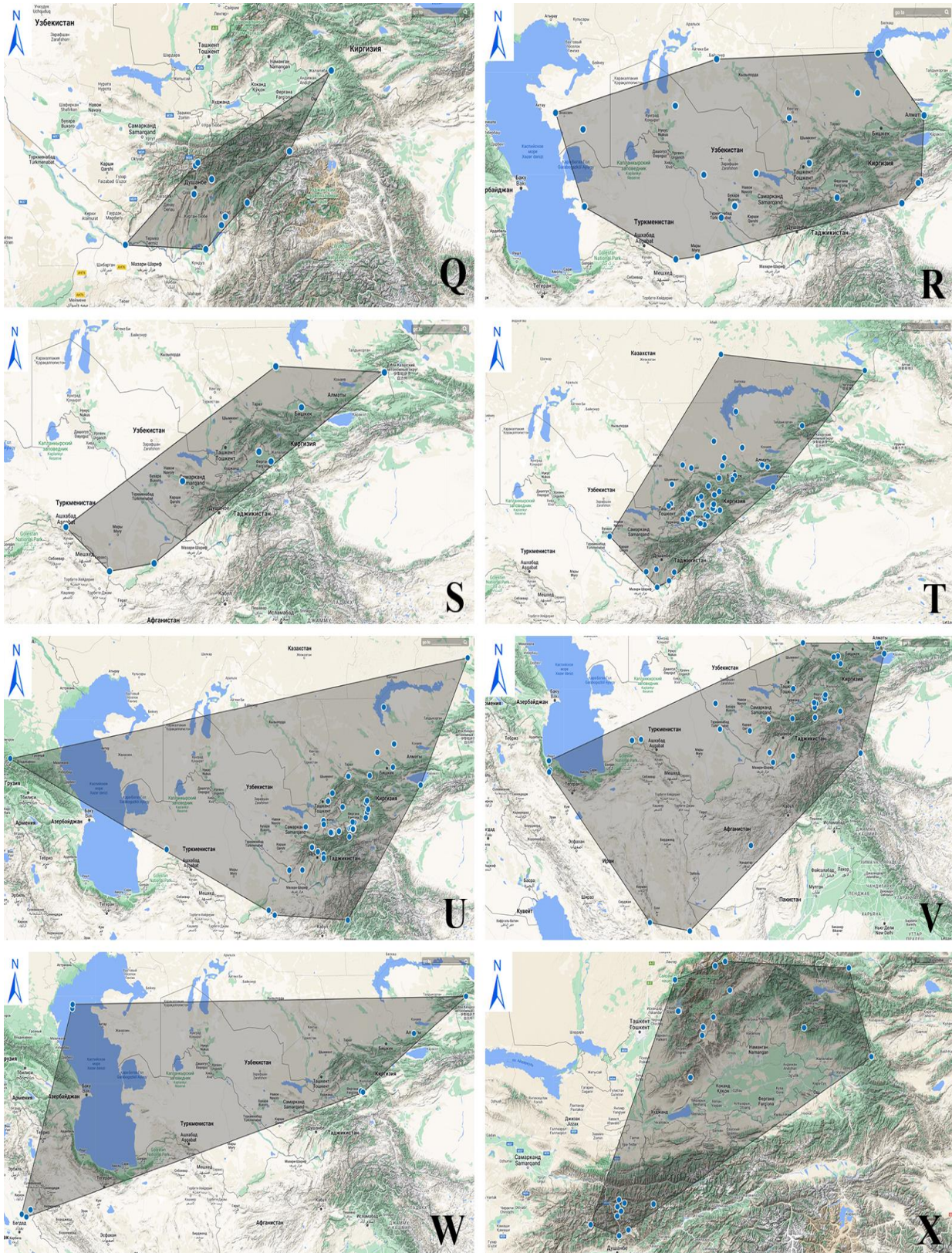


Figure 6. Q) *E. transoxana* R) *E. turczaninowii* S) *E. turkestanica* T) *E. lamprocarpa* U) *E. franchetii* V) *E. glomerulans* W) *E. chamaesyce* X) *E. sarawschanica*

Conclusion

Our study examined the distribution of the Euphorbia L category in the mountain, desert, adir and other areas of the Fergana Valley natural border of Central Asia. It turned out that 25 species belonging to the genus Euphorbia I have spread. In the course of the study, it was found that the species Euphorbia L category is widespread, but due to the influence of anthropogenic factors, their populations are shrinking and there are species with protection. Collected evidence E for Central Asia. *sarawschanica* Regel, *E.transaxana* (Prakh.) Prakh., *E.sewerzawii* (Prakh.) Pavlov, *E.ferganensis* B. Fedtsch, *E.alaica* (Prakh.) Prakh. endem, *E.mochranulata* Prakh. Endem is contributed to the chotkol and Kurama mountain ranges.

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