

Global and Regional IUCN Red List Assessments: 20

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Abstract

In this contribution, the conservation status assessment of five vascular plants according to IUCN categories and criteria are presented. It includes the assessment of *Iris kuschakewiczii* B.Fedtsch., *Lepidium olgae* (R.M.Vinogr.) Al-Shehbaz & Mummenhoff, *Parrya saxifraga* Botsch. & Vved., *Phleum sardoum* (Hack.) Hack. and *Tanacetum ulutavicum* Tzvelev at global level.

Keywords

Conservation, extinction risk, IUCN protocol, threats

How to contribute

The text of the global and regional assessments should be submitted electronically to Simone Orsenigo (simone.orsenigo@unipv.it) or to Giuseppe Fenu (gfenu@unica.it); the text, up to 8000 characters in length (spaces included), must include a distribution map and a picture of the assessed species.

Red List Assessments

Iris kuschakewiczii B.Fedtsch.

Global assessment

Taxonomy and nomenclature

Order: Asparagales Family: Iridaceae

Common name: Kuschakewicz's Iris (En); ирис Кушакевича (Ru); Кушакевич шиқылдағы (Kz).

Geographic distribution range: *Iris kuschakewiczii* (Fig. 1) is a narrow endemic of the northern Tian-Shan within the biodiversity hotspot of the mountains of Central Asia (Tojibaev et al. 2021), located in south-eastern Kazakhstan and adjacent northern Kyrgyzstan. In Kazakhstan, the species has been recorded mainly from the Chu–Ili mountains and the Trans-Ili Alatau, with additional localities in the Moyunkum transition zone and southern Betpakdala, while in Kyrgyzstan it is confirmed from the Chüy Region (including Ala-Archa), at elevation of approximately 400–1,100 m a.s.l. (Alihanova et al. 2025; Fig. 2).

Distribution: *Countries of occurrence:* Kazakhstan, Kyrgyzstan.

Biology: *Plant growth form:* perennial (geophyte).

Flowering and fruiting time: flowering in March–April (locally extending to early May at higher elevations), fruiting in April–May; sometimes into June depending on site conditions (Fedtschenko 1905; Ivaschenko and Belyalov 2015; Sennikov et al. 2023; Alihanova et al. 2025).

Reproduction: The species reproduces primarily by seeds and may also undergo vegetative renewal through bulb offsets, as is typical of early-spring bulbous irises in subg. *Scorpiris*. Pollination, seed set, dispersal and recruitment remain poorly studied; no long-distance dispersal mechanism is known (Kokoreva et al. 2013). However, a limited seed dispersal ability could be expected since seeds are primary dispersed by barochory.

Habitat and ecology: *Iris kuschakewiczii* B.Fedtsch. is an early-spring bulbous geophyte of the northern Tian-Shan, inhabiting open, arid foothill and lower montane habitats on rocky and gravelly slopes, ridges and saddles, mainly on loamy to stony serozem soils. It occurs on a range of slope aspects, most commonly south- to west-facing, within a mosaic of shrub–forb and grassland communities characterized by sparse to moderate vegetation cover (25–45%) and, locally, high surface stoniness (up to 70–80%). Frequently associated species include *Atraphaxis pyrifolia* (L.) Bunge, *Ephedra distachya* L., *Prunus tianschanica* (Pojark.) Rehder, *Artemisia terrae-albae* Krasch., *Rheum maximowiczii* Losinsk., *Goniolimon cuspidatum* (Bunge) Boiss., *Tulipa biflora* Pall., *T. alberti* Regel, *Gagea bulbifera* (Pall.) Salisb., *Agropyron cristatum* (L.) Gaertn. and *Stipa* sp. pl. Many localities are strongly affected by grazing, leading to habitat degradation and reduced generative recruitment at some sites, while other populations remain extensive across watersheds and adjacent slopes (Kokoreva et al. 2013; Ivaschenko and Belyalov 2015).

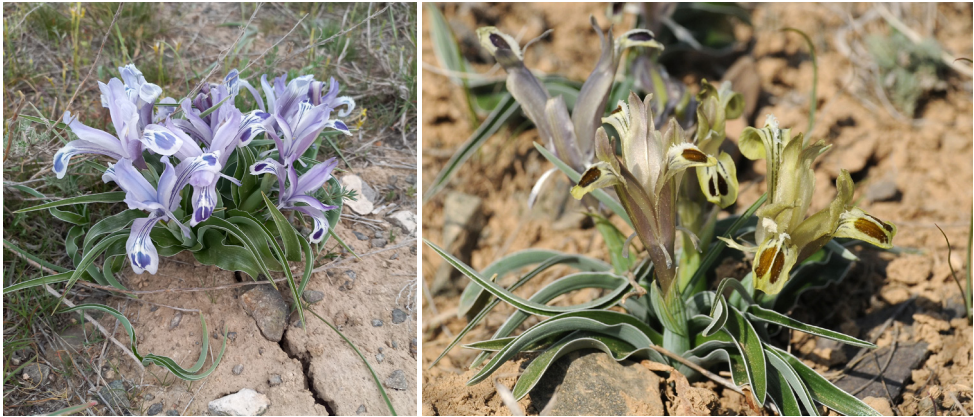


Figure 1. *Iris kuschakewiczii* B. Fedtsch. Photo by A. Dubynin and V. Epiktetov (greenish-yellow morph).

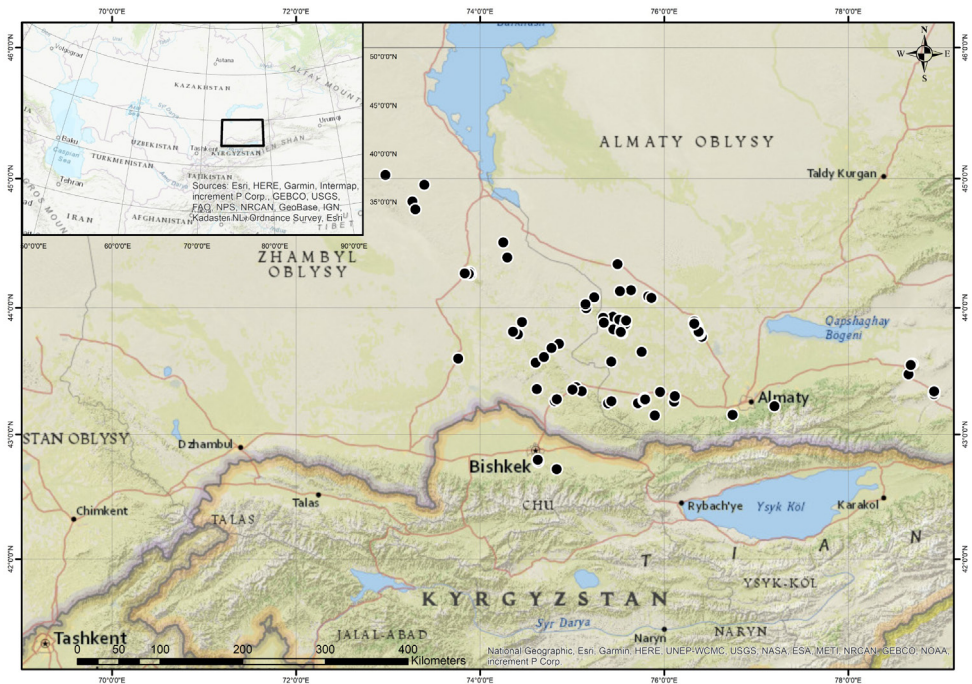


Figure 2. Geographic range and distribution map of *Iris kuschakewiczii* in Kazakhstan and Kyrgyzstan.

Population information: The global population of *I. kuschakewiczii* is estimated at 6,000–18,000 mature individuals, based on expert assessment. The species occurs in discrete, patchily distributed populations, ranging from isolated individuals and small groups (with only a few flowering plants at some sites) to extensive populations along watersheds and adjacent slopes. Because it is confined to discontinuous rocky and gravelly habitats, populations are separated by unsuitable terrain with limited connectivity;

recolonization events and the share of mature individuals in isolated patches remain unlikely. The rugged topography and mosaic distribution of suitable substrates restrict survey access, making population estimates necessarily approximate. Field data indicate strong spatial variation in abundance, with mean densities ranging from 0.6 to 8.8 individuals m^{-2} and from 17 to 1,056 individuals estimated within surveyed patches of 15–276 m^2 . In the Chu–Ili Mountains, local studies recorded densities of 5.5–46.7 individuals m^{-2} and a complete ontogenetic spectrum above 900 m, indicating active recruitment under favorable conditions. Despite local abundance in some areas, many sites are heavily disturbed, and overgrazing has reduced certain populations to only a few flowering plants. Consequently, the quality and extent of the habitat are declining in parts of the species' range; decline in mature individuals is inferred locally, while other populations remain locally abundant but vulnerable to ongoing land-use pressure (Kokoreva et al. 2013; Ivaschenko and Belyalov 2015).

Threats:

1.1 Housing & urban areas (peri-urban expansion): In lower foothills near settlements, infrastructure development and land conversion fragment and degrade habitats.

2.3 Livestock farming & ranching (2.3.1 Nomadic grazing; 2.3.2 Small-holder grazing): *Iris kuschakewiczii* often occupies accessible foothill slopes, watersheds and saddles used as seasonal pastures. Chronic overgrazing and trampling, especially during flowering and early fruiting, degrade vegetation and soils and can directly damage plants; in several localities' populations were explicitly reported as affected by overgrazing and reduced to only a few flowering individuals.

3.2 Mining & quarrying and 4.1 Roads & railroads: Localized quarrying/extraction and road works can remove or alter the rocky–gravelly substrates on which the species depends, causing irreversible habitat loss and local extirpations.

11.1 Habitat shifting & alteration and 11.2 Droughts: Increasing spring drought and altered snowmelt timing may reduce reproductive success and recruitment of this early-spring geophyte.

CRITERIA APPLIED

Criterion B: **EOO:** 57,592 km^2 , calculated using GeoCAT (Geospatial Conservation Assessment Tool) based on verified georeferenced occurrences.

AOO: 312 km^2 , calculated in GeoCAT using 2×2 km grid cells (Bachman et al. 2011).

- a) The geographic distribution of *I. kuschakewiczii* is severely fragmented, as the species is confined to small, isolated rocky–gravelly habitat patches separated by unsuitable terrain across the foothills and lower mountain zone. Connectivity among populations is limited or absent and recolonization is unlikely.
- b) A continuing decline is observed, inferred and projected in (iii) area, extent and quality of habitat and (v) number of mature individuals, primarily driven by chronic overgrazing, habitat degradation, localized quarrying, road construction and peri-urban expansion.

Red List category and criteria (Global assessment)

EN	Endangered	B2ab(iii,v)
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Rationale for the assessment: *Iris kuschakewiczii* is a geographically restricted species confined to discontinuous rocky and gravelly habitats of the northern Tian-Shan, where it occurs in severely fragmented populations separated by unsuitable or strongly degraded areas, including plains, agricultural land, settlements, roads, overgrazed foothills and non-petrophytic vegetation. The species has a restricted Area of Occupancy (AOO) of 312 km² and a relatively limited Extent of Occurrence (EOO) of 57,592 km². Because of its strict association with patchily distributed edaphic conditions, connectivity among populations is low and recolonization of degraded or extirpated patches is unlikely also due to the seeds' limited capacity for long-distance dispersal. Although locally abundant in some sites, the species is undergoing a continuing observed, inferred and projected decline in habitat extent and quality, as well as in the number of mature individuals. This decline is driven primarily by chronic overgrazing, land-use change, and localized quarrying and infrastructure development. On this basis, the species meets qualifies as Endangered under criterion B2ab(iii,v) at the global level.

Previous assessment: The taxon has never been assessed at global level (IUCN 2025).

Conservation actions: *Iris kuschakewiczii* is included in the Red Data Book of Kazakhstan (Category II). A small proportion of its range falls within protected or *de facto* protected areas (e.g. Ala-Archa in Kyrgyzstan), but most populations occur outside formally protected sites, where grazing pressure, land-use change and localized quarrying remain active threats.

Conservation actions needed: priority conservation measures include: (i) restricting quarrying, substrate extraction and construction activities within occupied habitats; (ii) regulation livestock grazing, particularly during the early spring growth and flowering period; (iii) conducting targeted field surveys and mapping of extant subpopulations to inform land-use planning; and (iv) implementing standardized long-term monitoring of population occupancy, reproductive success and habitat condition. *Ex situ* conservation measures, including seed banking and cultivation in botanical gardens, are also recommended as precautionary safeguards.

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***Lepidium olgae* (R.M.Vinogr.) Al-Shehbaz & Mummenhoff**

Global assessment

Taxonomy and nomenclature

Order: Brassicales. *Family:* Brassicaceae (Cruciferae)

Lepidium olgae (R.M.Vinogr.) Al-Shehbaz & Mummenhoff, Edinburgh J. Bot. 68: 169 (2011) ≡ *Stubendorffia olgae* R.M.Vinogr., Bot. Mater. Gerb. Inst. Bot. Akad. Nauk Uzbeksk. S.S.R. 19: 8 (1974).

Common name: клоповник Ольги, пштубENDORFIA Ольги (Rus); *Olga lepidiumi* (Uzb).

Geographic distribution range: *Lepidium olgae* (Fig. 3) is a perennial herb 30–70 cm tall with a thickened vertical rhizome. It is endemic to the Nuratau Range, located in the north-western spurs of Pamir-Alay mountain system, and is a national endemic of Uzbekistan with a narrow distribution range and small population size (Beshko 2018; Khassanov et al. 2019; Beshko 2020; Tojibaev et al. 2021; Volis and Beshko 2023). The species occurs in the Farish District (Jizzakh Region), in the central part of the Nuratau Range, and is restricted to only in three valleys (Hayatsay, Karysay and Tykchasay) (Fig. 4).

Distribution: *Countries of occurrence:* Uzbekistan.

Biology: *Plant growth form:* perennial (hemicryptophyte).

Flowering and fruiting time: flowering in April, fruiting in May–June (Vinogradova 1974; Beshko 2020).

Reproduction: Propagation by seeds. No detailed information on the reproductive biology of this species is available. It seems that *L. olgae* has a low reproductive rate and low competition capacity. The number of flowering and fruiting individuals fluctuates significantly depending on climatic conditions. In dry years, only a few individual plants flower, while in some years neither flowering nor fruiting occurs. The results of species distribution modeling (SDM) indicated that *L. olgae* is highly sensitive to water limitation during the growing season (Abulfayzov et al. 2026). In addition, damage to flowers and fruits by insects are observed.

Habitat and ecology: *Lepidium olgae* is a perennial plant which grows on stony and shistaceous slopes in montane zone, at elevations from 1,000 to 1,400 meters a.s.l., under semi-arid climatic conditions. It occurs among sparse thermophilous deciduous shrubs, including *Prunus bucharica* (Korsh.) B.Fedtsch. ex Rehder, *Crataegus turkestanica* Pojark., *Lonicera nummulariifolia* Jaub. & Spach and *Atraphaxis pyrifolia* Bunge, as well as in forb-grass-sagebrush communities dominated by species such as *Arctium korolkowii* (Regel & Schmalh.) Kuntze, *Artemisia tenuisecta* Nevski, *Dianthus helenae* Vved., *Ferula angreni* Korovin, *Festuca valesiaca* Schleich. & Gaudin, *Phlomis nubilans* Zakirov, *Poa bulbosa* L., *Prangos ornata* Kuzjmina, *Ziziphora clinopodioides* Lam., etc. Several associated species, including *Dianthus helenae* Vved. and *Phlomis nubilans* Zakirov are endemic to the Nuratau mountains. The results of SDM demonstrated that the species occupies an extremely narrow ecological niche; it is strongly dependent on specific environmental conditions of restricted microhabitats (Abulfayzov et al. 2026).

Population information: *Lepidium olgae* occurs in isolated groups of 50–70 to 100–200 individuals and exhibits a highly fragmented distribution within its geographical range. In total, four localities have been documented in the central part of the Nuratau Range, in valleys Hayatsay, Karysay and Tykchasay. The field studies performed during the last 20 years have documented about 1,000–1,500 individuals of *L. olgae*, with extreme fluctuations in number of flowering and fruiting individuals depending on climatic factors (Umarov et al. 2009; Beshko 2018; Khassanov et al. 2019; Tojibaev et al. 2021; Volis and Beshko 2023). No data on the demographic structure of populations is available.



Figure 3. *Lepidium olgae* (R.M.Vinogr.) Al-Shehbaz & Mummenhoff and its natural habitat in the Nuratau Nature Reserve, Nuratau Range (Uzbekistan, Jizzakh Region). Photo by N.Yu. Beshko.

Threats:

2.3 Livestock farming & ranching (2.3.1 Nomadic grazing and 2.3.2 Small-holder grazing, ranching or farming): for a long time, the mountain pastures of the Nuratau Range have been subject to excessive grazing, including within the territory of the nature reserve and its buffer zone, where illegal grazing occurs regularly. Overgrazing represents the principal direct and indirect threat to populations of *L. olgae*, contributing to habitat degradation and declines in population size and density. The direct impact is associated with grazing and trampling of individuals, particularly seedlings and juvenile plants, whereas indirect effects include soil erosion, vegetation succession, and overall habitat degradation resulting from intensive pasture use.

5 Biological resource use (5.2 Gathering terrestrial plants, 5.2.1 Intentional use (species being assessed is the target): The underground part of *L. olgae* is used by the local people for medicinal and veterinary purposes, for the treatment of diseases of the digestive system. This plant is especially valued for the treatment of racehorses used in the traditional equestrian games called *kupkari* (*ulak*). The volumes of rhizome harvesting are unknown.

10 Geological events (10.3 Avalanches/landslides): On strongly eroded steep slopes with unstable stony and gravelly substrate, a significant part of seedlings and young plants are eliminated as a result of avalanches and mudflows.

11 Climate change & severe weather (11.1 Habitat shifting & alteration and 11.2 Droughts): Droughts occurs regularly (every 5–6 years) in the region of Nuratau Range and adjacent Kyzylkum Desert. The field observations performed during the last 20

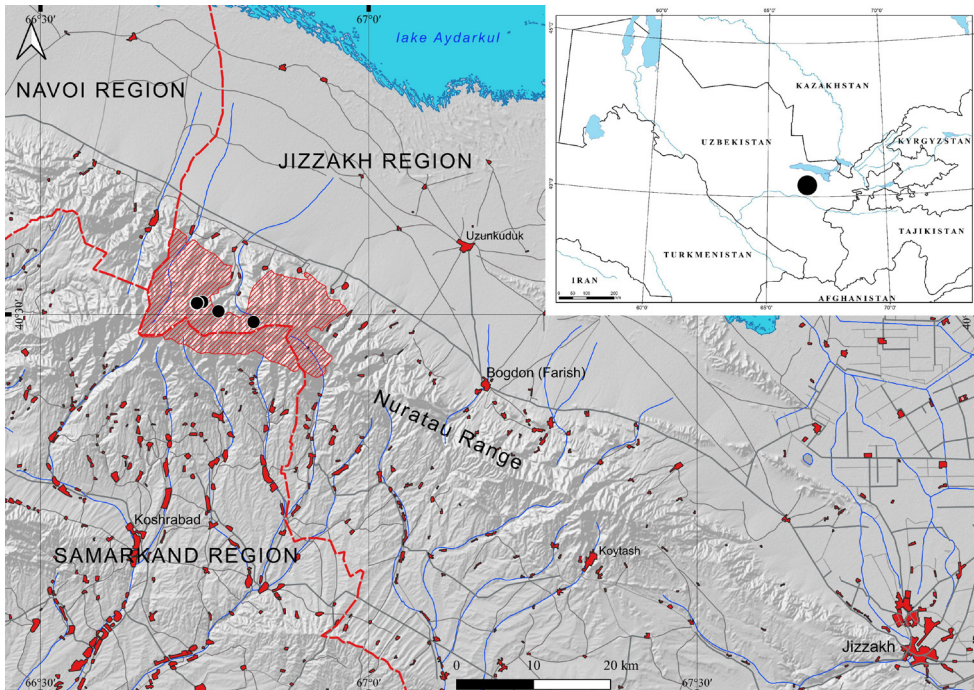


Figure 4. Geographic range and distribution map of *Lepidium olgae* on the Nuratau Range (Uzbekistan). The protected area of the Nuratau State Nature Reserve is shown in red hatch.

years showed that the number of flowering and fruiting individuals of *L. olgae* in dry years is extremely low (nearly absent), and the reproduction of this species is highly dependent on climatic factors. In addition, the results of SDM demonstrated that the species occupies an extremely narrow ecological niche tightly constrained by seasonal moisture availability (Abulfayzov et al. 2026). The suitable range of this species will decrease significantly with further climate aridization (scenario RCP8.5), and the extinction risk of this species will increase (Volis and Beshko 2023).

CRITERIA APPLIED

Criterion B: **EOO:** 16 km² calculated with a GeoCAT (Geospatial Conservation Assessment Tool) software (Bachman et al. 2011).

AOO: 16 km² calculated with GeoCAT software using 2 × 2 km cells (Bachman et al. 2011).

- a) Number of locations is less than five according to the main threat 2.3 (the species occurs in three valleys only).
- b) Continuing decline in extent and quality of habitat is observed (iii).

Criterion C: Population size estimated to number less than 2,500 mature individuals (the total population size is estimated at about 1,000–1,500 individuals).

2a) All individuals in one subpopulation (ii).

Red List category and Criteria (Global Assessment)

EN	Endangered	B1ab(iii)+2ab(iii), C2a(ii)
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Rationale for the assessment: *Lepidium olgae* is an endemic species with restricted distribution range and habitat, with small population, low reproductive rate and competition capacity. The species has an estimated total population of about 1,000–1,500 mature individuals (with observed extreme fluctuations in the number of flowering and fruiting individuals), all in one subpopulation. The EOO and AOO both are 16 km². Despite the entire known population of this species grows in a protected area, it is affected by human activities such as livestock farming and harvesting of rhizomes, as well as by climate change. By applying the criteria B and C, considering the continuing decline, observed in extent and quality of habitat, and existence of identified threats, which remain unmitigated, the quality of the species habitat is projected to deteriorate in the future. Therefore, this species meets quantitative requirements of criteria B and C and can be assessed as Endangered (EN) at a global level.

Previous assessment: The taxon has never been assessed at the global level (IUCN 2026).

Conservation actions: Approximately 75% of the overall population of *Lepidium olgae* is protected in the Nuratau Nature Reserve. *Lepidium olgae* is included in the Red Data Book of Uzbekistan under category 2 (corresponding approximately to IUCN category EN) (Umarov et al. 2009; Khassanov et al. 2019). The species has never been cultivated *ex situ*, and its seeds are not conserved in any germplasm bank.

Conservation actions needed: Improving the protection of the territory of the Nuratau Nature Reserve, targeting the illegal harvesting of rhizomes. Research and monitoring activities are recommended to better understand the reproductive biology of the species, ecology, threats, and population trends, as well as the development of cultivation methods, re-introduction and seed banking.

Acknowledgement: This research was conducted by the Academy of Sciences of the Republic of Uzbekistan within the framework of the state program “Digital Nature”, and the fundamental research project F-FA-2021-450 “History of formation and modern development trends of Tugai vegetation cover of Uzbekistan against the background of global hydroclimatic changes and anthropogenic transformation”.

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Parrya saxifraga Botsch. & Vved.

Global assessment

Taxonomy and nomenclature*Order*: Brassicales. *Family*: Brassicaceae (Cruciferae)

Parrya saxifraga Botsch. & Vved., Bot. Mater. Gerb. Glavn. Bot. Sada R.S.F.S.R. 5: 92 (1924) ≡ *Achoriphragma saxifragum* (Botsch. & Vved.) Soják, Sborn. Nár. Mus. v Praze, Řada B, Přír. Vědy 1982: 106 (1982); *Neuroloma saxifraga* (Botsch. & Vved.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 672 (1972).

Common name: паррия камнеломка (Rus); toshbuzar parriyasi (Uzb).

Geographic distribution range: *Parrya saxifraga* (Fig. 5) is perennial pulvinate plant up to 10 cm tall. It is national endemic of Uzbekistan with restricted distribution range and small population. This species is distributed in the western Tian Shan mountain range, in Tashkent and Namangan Regions of Uzbekistan, on the high-mountain Angren Plateau located in the upper reaches of the river Akhangaran, at the junction of the Chatkal and Kurama Ranges (Botschantzev and Vvedensky 1941; Botschantzev 1972; Pachomova 1974; Khassanov et al. 2019; Tojibaev et al. 2019, 2020; Sennikov and Tojibaev 2021; Li and Tojibaev 2024; Madaminov 2025). In total, only 17 occurrence records in 10 localities are known to date, mostly on the Chatkal Range in the border zone with Kyrgyzstan (Fig. 6). The presence of the species in six localities is confirmed by field observations of 2018–2025, while the remaining four localities are known only from herbarium specimens collected in the mid-20th century. Several special expeditions focused on the study of populations of threatened plant species on the Angren Plateau (in particular, *Parrya saxifraga*) have been carried out in recent years, but the populations of *Parrya saxifraga* were not found in the four sites mentioned above. Thus, is likely that these populations disappeared due to intense livestock grazing and habitat degradation. The reduction analysis performed using a GeoCAT (Geospatial Conservation Assessment Tool) software (Bachman et al. 2011) showed that an estimated decline in AOO is around 34%.

Distribution: *Countries of occurrence:* Uzbekistan.

Biology: *Plant growth form:* pulvinate perennial herb (hemicryptophyte).

Flowering and fruiting time: flowering in June–July, fruiting in July–August (Pachomova 1974; Khassanov et al. 2019; Tojibaev et al. 2019).

Reproduction: Propagation by seeds. Reproductive biology of this species has not been studied.

Habitat and ecology: *Parrya saxifraga* is an endemic stenotopic plant that grows in highlands, on eroded clayey-gravelly and gravelly-stony nearly flat or slightly inclined slopes and crests of mountain ridges, on Mollis Leptosol soils, at elevations from 2,600 to 3,500 m a.s.l., in the zone with mean annual temperature of about 0 °C and annual precipitation of about 600 mm (Madaminov 2025). The species occurs among sparse subalpine and alpine forb communities with *Androsace dasyphylla* Bunge, *Chorispora sabulosa* Cambess., *Dichodon cerastoides* (L.) Rchb., *Draba alberti* Regel & Schmalh.,

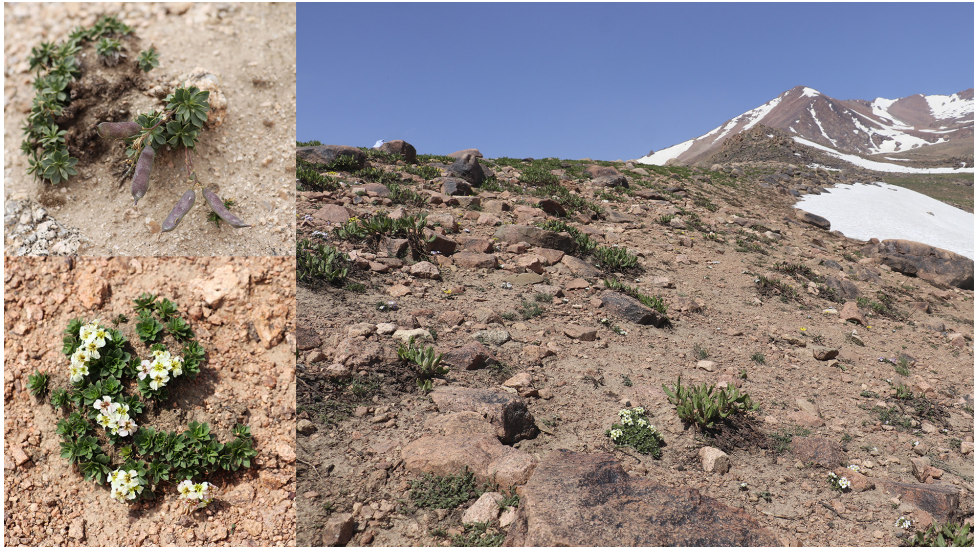


Figure 5. *Parrya saxifraga* Botsch. & Vved. and its natural habitat on the Angren Plateau (Uzbekistan, Namangan Region). Photo by N.Y. Beshko.

Eremogone griffithii (Boiss.) Ikonn., *Koenigia rumicifolia* (Royle ex Bab.) T.M.Schust. & Reveal, *Ligularia alpigena* Pojark., *Oxytropis arassanica* Gontsch. and *O. leucocyanea* Bunge (Fig. 5).

Population information: *Parrya saxifraga* occurs sporadically, in small isolated groups (10–50, rarely up to 100–200 mature individuals). A single subpopulation of the species is recognized. Based on the data of our field surveys, the overall population of the species can be estimated at around 1,500–2,000 mature individuals. No data on the demographic structure of populations is available, but mainly adult and sub-senile individuals were observed, which indicate low reproductive rate and low competition capacity of this species. The overall trend indicates a continuing decline in habitat extent and quality, as well as in population size, due to extremely intense grazing pressure (Madaminov 2025).

Threats:

1 Residential & commercial development (1.3 Tourism & recreation areas): The Angren Plateau, especially Arashan lakes and Arashan thermal springs, is a popular recreational and tourism area. The development of touristic infrastructure is a direct threat for *P. saxifraga* populations and habitat. In the near future, this threat will increase due to the construction of a new tourist complex “Arashan Resort” spanning 600 hectares near the Arashan lakes, which began in 2026. The large-scale construction works and increasing in recreation activities will negatively affect the population of *P. saxifraga* growing in this site and will lead to further declining of quality and extent of the species habitats.

2.3 Livestock farming & ranching (2.3.1 Nomadic grazing): The main anthropogenic threat for populations of the species within the whole distribution area is trampling of plants (especially plantlets) and habitat degradation caused by extremely heavy grazing

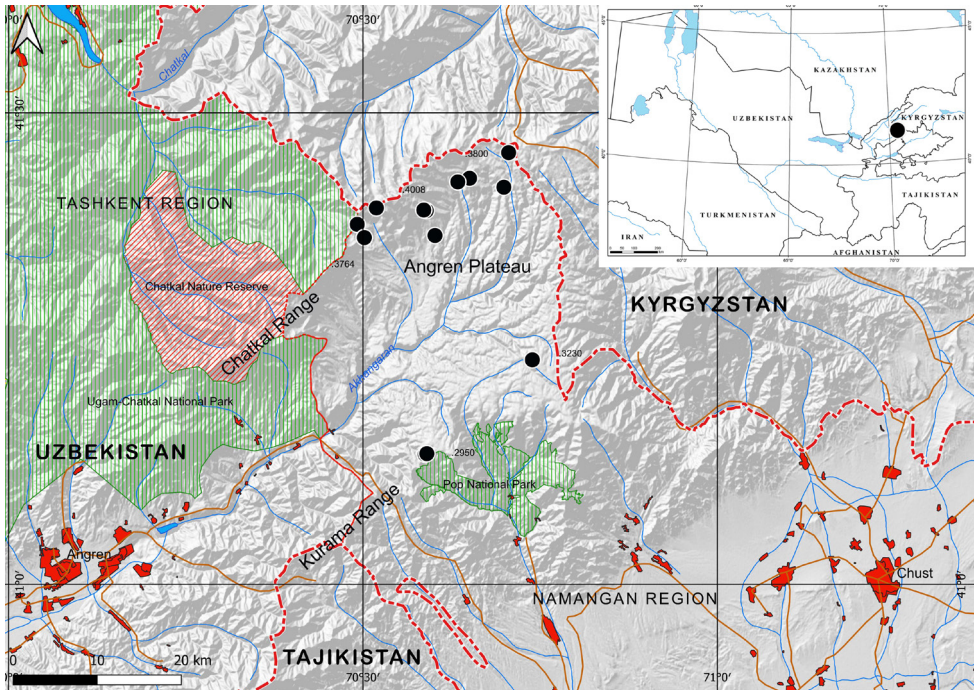


Figure 6. Geographic range and distribution map of *Parrya saxifraga* in Uzbekistan. The protected area of the Chatkal State Nature Reserve is shown in red hatch, Ugam-Chatkal and Pop national parks are shown in green hatch.

pressure (Khabibullaev et al. 2026). Animal husbandry is one of the main sources of subsistence for local people, and for a long time, the summer alpine pastures of the Angren Plateau have been subject to excessive grazing.

4 Transportation & service corridors (4.1 Roads & railroads): Another direct threat is associated with planned construction of a new major toll road connecting Tashkent and Andijan near the Kamchik Pass. This project potentially affects one of ten known locations of the species.

10 Geological events (10.3 Avalanches/landslides): A significant part of seedlings and young plants are eliminated as a result of mudflows, which reduces reproductive success of the species.

CRITERIA APPLIED

Criterion C: Population size estimated to less than 2,500 mature individuals (the total population size is estimated at around 1500–2000 mature individuals, all in one subpopulation). A continuing decline in number of mature individuals is observed.

- 2a(i) Number of mature individuals in largest population is less than 250.
- (ii) at least 95% of mature individuals in one subpopulation.

Red List category and Criteria (Global Assessment)

EN	Endangered	C2a(i,ii)
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Rationale for the assessment: *Parrya saxifraga* is an endemic stenotopic species with small population, and restricted distribution range and habitat. The overall population size is estimated at about 1500–2000 mature individuals, all in one subpopulation. The EOO is estimated at 468 km², and the AOO is 48 km². The species grows outside protected areas, and it is significantly affected by human activities (overgrazing, tourism and recreation). Continuing decline in area of occupancy, number of locations, number of mature individuals, and in the extent and quality of habitats are observed. Overgrazing is considered the main anthropogenic threat to the species. Other direct threats are related to tourism and recreation development and planned construction of a new highway. In addition, the species is affected by climatic factors (avalanches and mudflows). Considering the presence of identified threats, which remain unmitigated, and construction of a new major resort and toll road planned for 2026–2030, the condition of species' habitat and populations is projected to deteriorate in the near future. The species meets quantitative requirements of criterion C, and can be assessed as EN at a global level on the basis of the very small and declining population, and continuing decline in AOO, number of locations, the extent and/or quality of habitat and in the number of mature individuals.

Previous assessment: The taxon has never been assessed at the global level (IUCN 2025).

Conservation actions: *Parrya saxifraga* is included in the Red Data Book of Uzbekistan under category 2 (corresponding approximately to IUCN category EN) (Khassanov et al. 2019). All known populations of the species grow outside protected areas, but some known localities are situated near the boundaries of the Ugam-Chatkal and Pop national parks. This species has never been cultivated *ex situ*, and its seeds are not conserved in any germplasm bank.

Conservation actions needed: Expansion of the territory of the national parks to protect the species' habitat; restriction and control of pasture load on the Angren Plateau; restriction and control of construction works and recreation activities within the species' habitat. Targeted research to improve understanding of the species' reproductive biology, ecology, population trends and impact of anthropogenic and climatic factors; regular monitoring of populations. The development of *ex situ* or *in vitro* cultivation methods and seed banking.

Acknowledgement: This research was conducted by the Academy of Sciences of the Republic of Uzbekistan within the framework of the state program “Digital Nature” and the fundamental research project FL–9024093685 “Transboundary territories of Uzbekistan as centers of biodiversity and their current state”. The authors express their sincere gratitude to Dr. Dmitriy A. German from South-Siberian Botanical Garden (Russian Federation) for his valuable advice and support during field research.

Phleum sardoum (Hack.) Hack.

Global Assessment

Taxonomy and nomenclature*Order*: Poales *Family*: Poaceae*Phleum sardoum* (Hack.) Hack. in Bull. Soc. Bot. France 39: 274 (1892)**Common name**: Codolina di Sardegna, Fleo di Sardegna (It).

Geographic distribution range: *Phleum sardoum* (Fig. 7) is endemic to Sardinia, where the species is found in various coastal dune systems in western and northern part of the island. The species was described from the coastal area of Rena Maggiore (Aglientu) and, for a long time, its known distribution was considered limited to only the two localities of Rena Maggiore and the dune system of Marina di Arbus. Subsequently, Arrigoni (2015) reported its presence in the countryside of Fluminimaggiore, without providing an exact location for this population.

More recently, several other populations have been discovered in the north of the island along the Trinita d'Agultu coastline (e.g. Lu Cinoni, near Costa Paradiso, and Cala Sarraina), in other localities in the Aglientu municipality (Lu Litarroni and Portobello) (Santo et al. 2013; Ruggero 2022) and in the Gulf of Asinara, north of Stagno di Pilo (Calvia et al. 2025). Conversely, the population reported near Badesi by Camarda (1995), despite extensive surveys in suitable areas, was not confirmed (Ruggero 2022). A further population of this species has recently been found in the Pistis dune system, in south-western Sardinia (Fig. 8).

Distribution: *Countries of occurrence*: Sardinia (Italy).

Biology: *Plant growth form*: therophyte.

Flowering and fruiting time: flowering from mid-March to early May, fruiting starting from the second half of May (Santo et al. 2013).

Reproduction: Propagation by seeds. Seed dispersal is primarily anemochorous and secondary barochorous. A myrmecochorous dispersal mechanism was reported by Mossa et al. (2003). Germination studies carried out in laboratory report an optimum temperature of approximately 10 °C and suggest that seed germination in the field takes place during the autumn–winter period under conditions of higher soil moisture availability (Santo et al. 2013, 2014).

Habitat and ecology: The species preferentially colonizes compact, exposed sands within coastal dune systems, as well as partially consolidated substrates of fossil dunes. It is a psammophilous, heliophilous, and xerophilous plant restricted to siliceous coastal sands, occurring from sea level up to c. 30 m elevation (Camarda 1995; Santo et al. 2013). This species can also be found in ecotonal situations of *Juniperus macrocarpa* Sm. stands and, occasionally, on moist substrates at the base of temporary back-dune depressions. It forms part of ephemeral plant assemblages dominated by annual plants, including *Malcolmia ramosissima* (Desf.) Gennari, *Polycarpon tetraphyllum* (L.) L. subsp. *alsinifolium* (Biv.) Ball, *Tuberaria praecox* Grosser, *Brassica tournefortii* Gouan. These communities



Figure 7. *Phleum sardoum* in its natural habitat at the Is Arenas locality. Photo by Donatella Cogoni.

may locally include endemic taxa of high conservation concern, such as *Anchusa littorea* Moris and *Linaria flava* (Poiret) Desf. subsp. *sardoa* (Sommier) A.Terracc. The species can be found within several habitat types of European conservation importance, including *Crucianellion maritimae* fixed beach dunes (Habitat 2210), *Malcolmietalia* dune grasslands (Habitat 2230), and coastal dunes with *Juniperus* spp. (Habitat 2250).

Population information: There is no specific data on the global populations and only some of them are regularly monitored; it is therefore not possible to estimate the global population size. Available monitoring data consistently show strong interannual fluctuations in the number of mature individuals in the monitored populations, with recurrent and substantial year-to-year changes in abundance; In particular, our monitoring data show an average density of individuals varying from year to year from 0.18 plants per m² to over 20 individuals per m² in the following year. Furthermore, a general decline in the population size has been documented over the last 10 years in populations of southern Sardinia..

Threats:

6: *Human intrusions and disturbance (6.1: Recreational activities)*: this threat is linked to the high tourist pressure during the summer season. This results in intense trampling and the creation of informal paths and access routes across dune habitats, leading to habitat degradation.

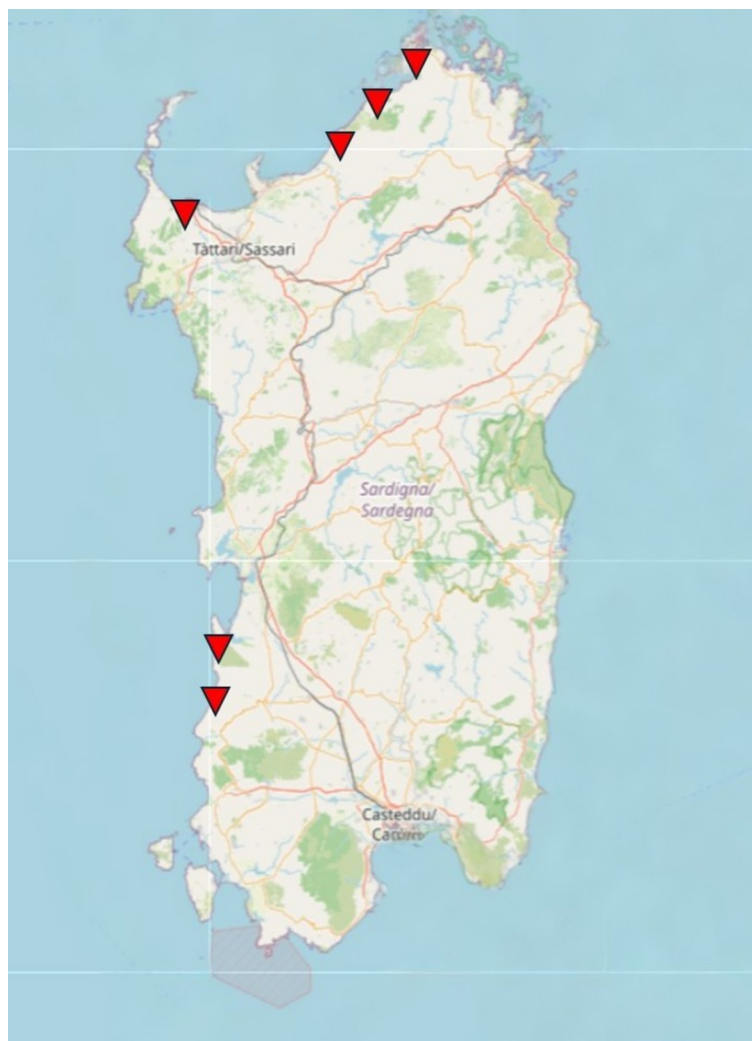


Figure 8. Geographic distribution map of *Phleum sardoum* in Sardinia.

8.1: *Invasive Non-Native/Alien Species/Diseases* (8.1.2: *Named Species*): the spread of invasive alien plant species represents a significant and ongoing threat, particularly at Rena Maggiore, where *Acacia saligna* (Labill.) H.L.Wendl. and *Carpobrotus acinaciformis* (L.) L.Bolus competes with native dune vegetation and alter habitat structure.

CRITERIA APPLIED

Criterion B: **EOO:** 7435.49 km², calculated with a GeoCAT (Geospatial Conservation Assessment Tool) software (Bachman et al. 2011).

AOO: 48 km², calculated with GeoCAT software and based on user defined cell width (2 × 2 km grid cells) (Bachman et al. 2011).

- a) seven locations based on the main threat (*Recreational activities*)
- b) supposed continuing decline in extent and quality of habitat (iii) and number of mature individuals (v).
- c) extreme fluctuations in the number of mature individuals (iv).

Red List category and Criteria (Global Assessment)

EN	Endangered	B2b(iii,v)c(iv)
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Rationale for the assessment: *Phleum sardoum* is a plant endemic to Sardinia currently occurring in several coastal dune systems in the northern and western part of the island. The new populations of this species discovered in recent years allow a reduction of the risk category; however, the populations, subjected to extreme annual fluctuations in the number of mature individuals, are mainly exposed to anthropogenic threats. Therefore, considering the restricted AOO, the supposed continuous decline in habitat quality and the number of mature individuals, associated with the observed extreme annual fluctuations in population size, this species is assessed as Endangered (EN) at global level.

Previous assessment: The taxon has been assessed Critically Endangered (CR) at global level (Orsenigo et al. 2018)

Conservation actions: *P. sardoum* is currently not listed under any international conventions and is not protected by national legislation. Almost all known populations are located within Sites of Community Importance (SCI) under the Natura 2000 network but there are no active monitoring and conservation plans for the species. Only the populations of south-western Sardinia are periodically monitored. *Ex situ* conservation has been implemented at the University of Cagliari, where eight seed lots are preserved at BG-SAR (Calvia et al. 2025).

Conservation actions needed: Ensuring measures to restore degraded habitats and mitigate threats from fragmentation or human activities are required. Additionally, research into the species' reproductive biology is important to optimize conservation and potential reintroduction efforts. To preserve the existing population, regular monitoring and appropriate management of tourist traffic are also necessary to reduce disturbance and habitat degradation.

Donatella Cogoni, Giuseppe Fenu

Tanacetum ulutavicum Tzvelev

Taxonomy and nomenclature

Order: Asterales *Family:* Asteraceae

Tanacetum ulutavicum Tzvelev in V.L.Komarov (ed.), Fl. URSS 26: 350, 878 (1961)

Common name: Ulytau tansy (En); пижма улутавская (Ru).

Geographic distribution range: *Tanacetum ulutavicum* (Fig. 9) is confined to central Kazakhstan and is associated with the Ulytau low-mountain massif within the Kazakh Uplands (Kubentayev et al. 2024; POWO 2026) (Fig. 10).

Distribution: *Countries of occurrence:* Kazakhstan

Biology: *Plant growth form:* perennial herb.

Reproduction: Pollination, seed set, dispersal and recruitment remain poorly studied; no long-distance dispersal mechanism is known. However, a limited seed dispersal ability could be expected since seeds lack of long dispersal structures like pappus.

Habitat and ecology: The species is confined to petrophytic steppe habitats and granite-based rocky microhabitats (outcrops, fissures and ledges, stony/rocky slopes with skeletal soils). Communities hosting the species are reported as species-rich (82 vascular plants) and includes recurrent steppe–petrophyte associates that are important for IPA assessments, such as *Artemisia semiarida* (Krasch. & Lavrenko) Filatova, *Atraphaxis decipiens* Jaub. & Spach, *Juniperus sabina* L., *Ziziphora clinopodioides* Lam., *Thymus pannonicus* All. (Izbassarova et al. 2026). This fine-scale restriction to rocky substrates strongly constrains the species' effective habitat area.

Population: Robust estimates of the total number of mature individuals are not yet available, and available sources treat the species as rare and spatially restricted (Baitulin 2014; Izbassarova et al. 2026). Based on field descriptions in the IPA “Petrophytic



Figure 9. *Tanacetum ulutavicum* in its natural habitat (Ulytau Mountains, central Kazakhstan).

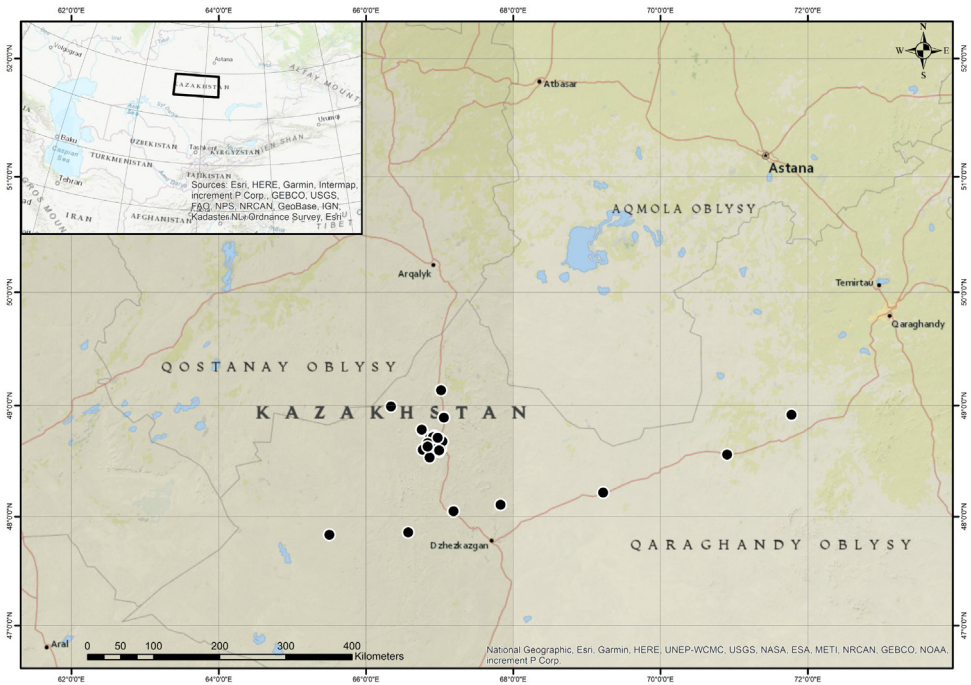


Figure 10. Geographic distribution of *Tanacetum ulutavicum* in Kazakhstan.

steppes of Ulytau with *Tanacetum ulutavicum*”, local stands are confined to small rocky patches (ca 207–1200 m²) and show low to moderate densities (ca 0.06–3 individuals m²), indicating highly uneven occupancy. The patches are tied to discontinuous granite outcrops and fissures within an unsuitable steppe matrix; connectivity among subpopulations is likely limited and the population is consistent with severe fragmentation *sensu* IUCN (IUCN 2012).

Threats:

2.3 Livestock farming & ranching (2.3.1 Nomadic grazing; 2.3.2 Small-holder grazing): chronic grazing pressure and trampling on accessible rocky slopes and near-route microhabitats degrade vegetation cover and shallow soils and can directly damage plants in small patches.

6.1 Recreational activities: unregulated recreation and visitor trampling along informal routes increase disturbance on rocky outcrops and reduce habitat quality at site scale.

CRITERIA APPLIED

Criterion B: **EOO:** ca 39,000 km², calculated in GeoCAT based on georeferenced occurrence data.

AOO: 136 km², calculated in GeoCAT using 2 × 2 km grid cells (Bachman et al. 2011;).

The species is severely fragmented, as occupancy is concentrated in small, isolated rocky microsites embedded in a broader steppe matrix and connectivity among patches is likely limited or absent and recolonization is unlikely (IUCN 2012; Izbassarova et al. 2026).

A continuing decline is inferred and projected in (iii) habitat quality and (v) mature individuals, driven by grazing/trampling, unregulated recreation and localized quarrying/substrate disturbance.

Red List category and criteria (Global Assessment)

EN	Endangered	B2ab(iii,v)
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Rationale for the assessment: *Tanacetum ulutavicum* is a narrow-range endemic of central Kazakhstan associated with petrophytic steppe and granite-based rocky microhabitats of the Ulytau massif. Although its EOO is moderately large, the species has a restricted AOO (136 km²) and occurs in discrete, discontinuous patches tied to scarce edaphic microsites, resulting in severe fragmentation and low connectivity among subpopulations. Due to limited dispersal capabilities and presence of large patches of unsuitable habitats, recolonization of degraded or extirpated populations is unlikely. Under ongoing site-level pressures (i.e., grazing/trampling, unregulated recreation and local quarrying/substrate disturbance) continuing decline in habitat quality and, consequently, mature individuals are inferred and projected. On this basis, the species meets the thresholds for the Endangered (EN) category under criterion B2ab(iii,v) at the global level.

Previous assessment: The species is listed nationally in the Red Data Book of Kazakhstan (rarity category III) (Baitulin 2014) and has not previously been assessed at the global level.

Conservation actions: *Tanacetum ulutavicum* is legally protected through national Red Data Book listing (Baitulin 2014). A substantial part of the known core sites overlaps with the proposed IPA “Petrophytic steppes of Ulytau with *Tanacetum ulutavicum*”, supported by delineated polygons and an openly published checklist dataset (Izbassarova et al. 2026). *Ex situ* conservation of the species is maintained at the Zhezkazgan Botanical Garden; at the Almaty Botanical Garden, the species is conserved in the seed collection.

Conservation actions needed: priority measures include (i) restriction of quarrying, substrate extraction and any construction/road works on occupied rocky slopes and outcrops; (ii) regulation of livestock grazing and trampling in core sites, particularly during flowering and seed set; (iii) targeted field surveys and mapping to delimit threat-defined locations for planning; and (iv) standardized long-term monitoring of occupancy, reproductive output proxies and habitat condition.

Alexander Dubynin; Simone Orsenigo; Inessa Selyutina; Vladimir Epiktetov

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Artificial Intelligence (AI) use

The authors accept full responsibility for the content of the manuscript, including the disclosure of any use of AI.
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Author contributions

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Data availability

All of the data that support the findings of this study are available in the main text.
