

## Research Article

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### **Endemic species *Allium kujukense* Vved. in Kazakhstan: distribution, history, and prospects for study**

The article presents the results of a comprehensive analysis of the distribution of *Allium kujukense* Vved., a rare paleoendemic species of the mountains of southern Kazakhstan, based on the study of herbarium materials and modern electronic databases. A total of 49 documented records were analyzed, including 43 herbarium specimens from collections in Kazakhstan (AA) and Russia (MW, LE), as well as the collections of the Institute of Plant Biology and Biotechnology (IPBB), and 6 occurrence records obtained from the electronic resources Plantarium and GBIF/iNaturalist. Comparison of data from different periods made it possible to clarify the spatial structure of the species' range and to confirm its confinement to the Syrdarya Karatau mountain system (including the Boraldytau Range) and several adjacent small mountain massifs of the Western Tien Shan, forming a mosaic and geographically restricted distribution area. The presented materials substantiate the importance of conducting targeted studies on the distribution and assessment of the feasibility of measures to protect this species.

**Keywords:** *Allium kujukense*, Kazakhstan, Syrdarya Karatau, herbarium data, electronic databases, distribution.

#### *Introduction*

The genus *Allium*, belonging to the family Amaryllidaceae J. St. -Hil. (formerly Alliaceae J. Agardh), is characterized by extreme variability and represents one of the most taxonomically complex groups, currently comprising more than 900 accepted species and over 1,100 synonymous names at the species and infraspecific levels [1, 2]. These taxa are distributed among 15 subgenera, approximately 85 sections, and more than 30 groups below the sectional level [3–6]. For systematic purposes, a wide range of morphological characters has traditionally been employed [6–9], supplemented by data from anatomical studies [10], karyology [11–16], chemical and phenological investigations [17, 18], as well as molecular markers [19–25], which has significantly expanded the methodological basis for taxonomic decision-making.

One of the representatives of this genus that is of particular interest is the endemic species *Allium kujukense* Vved. *Allium kujukense* is a perennial herbaceous plant, a rare species endemic to the southern regions of Kazakhstan [2, 26–29], occurring on clayey and gravelly slopes of the lower mountain belt (Fig. 1).



Figure 1. *Allium kujukense* in nature (Karatau ridge, Berkara gorge) [30]

The species was described on the basis of herbarium specimens collected by V.P. Drobov, M.G. Popov, and A.I. Vvedensky in the Syrdarya Karatau (Kujuk Mountains) in 1922. Its phylogenetic relationships remained unclear for a long time: in the original description, the species was compared with the Central Asian *Allium oreophilum* C.A. Mey., from which it differs markedly by the presence of fistulose leaves [31]. R.V. Kamelin (1973) [32] assigned this clearly isolated species to the monotypic section *Vvedenskya* Kamelin within the subgenus *Melanocrommyum* (Webb et Berthel.) Rouy; later, this section was elevated to the rank of subgenus *Vvedenskya* (Kamelin) R.M. Fritsch [4, 33]. According to R.V. Kamelin (1990) [34], this species is a paleoendemic of presumed Miocene-Pliocene age and represents a narrowly localized endemic of the Syrdarya Karatau [35–37]. In the northwestern part of the Boralday Range, only a single locality of this species is currently known, situated in the valley of the Boralday River [38]. The peculiarities of the morphology, phenology, and distribution of this poorly studied species make it a significant object for botanical-geographical and floristic research.

Morphologically, *A. kujukense* is characterized by an ovoid bulb up to 1 cm in diameter with gray, papery tunics, a single hollow cylindrical leaf, and a short stem reaching up to 20 cm in height, partially enclosed by the leaf sheath. The flowers, with a purple perianth and a characteristic dark midvein, are arranged in a loose hemispherical umbel. Flowering occurs in spring (April-May) [39]. The distribution of the species is restricted to local areas of the Syrdarya Karatau and the Western Tian Shan, including the Mashat and Duany-Tau regions. In recent years, it has also been recorded from the Kazygurt Range, which is located at a considerable distance from the main part of the species' range [40].

The relevance of studying this species is determined by its endemism, morphological and taxonomic uniqueness, narrow ecological specialization, low population numbers, and the isolation of its populations, as well as its potential vulnerability to anthropogenic impacts and insufficient level of study. These factors underscore the need for further research and for the development of conservation measures aimed at protecting natural populations. The present study focuses on investigating the biological characteristics of *A. kujukense*, including its morphology, ecological preferences, and geographic distribution. The results obtained may be used to assess the current status of natural populations, thereby contributing to an evaluation of the species' conservation status in accordance with the IUCN Red List categories (International Union for Conservation of Nature), and may also serve as a basis for further population-genetic and phylogenetic studies.

### Experimental

To clarify the range and prepare a summary of the species *A. kujukense* in Kazakhstan, an analysis of herbarium materials collected between 1922 and 1993 was conducted. The study included specimens from the Herbarium of the Institute of Botany and Phytointroduction (AA, Almaty, Kazakhstan), comprising 12 herbarium sheets; the Digital Herbarium of Lomonosov Moscow State University (MW, "Noah's Ark" Depository of Living Systems, Moscow, Russia), comprising 19 herbarium sheets; and the collections of the Herbarium of the Komarov Botanical Institute of the Russian Academy of Sciences (LE, Saint Petersburg,

Russia), comprising 11 herbarium sheets (Table 1). In addition, herbarium material from the Institute of Plant Biology and Biotechnology (IPBB, Almaty, Kazakhstan) was included in the analysis, represented by a single herbarium specimen collected in 2015. Furthermore, 6 occurrence records obtained between 2009 and 2019 from the electronic databases Plantarium and GBIF/iNaturalist were also included in the analysis (Table 1).

Table 1

**Herbarium data of the *Allium kujukense* species**

Species	Number of documented records	Herbarium fund/electronic databases
<i>Allium kujukense</i>	12	AA
	19	MW
	11	LE
	1	IPBB
	4	Plantarium
	2	GBIF/iNaturalist
Total:	49	

*Results and Discussion*

The analysis of herbarium materials of *A. kujukense*, comprising 49 specimens from three major herbarium collections—the Institute of Botany and Phytointroduction (AA, Almaty; 12 specimens), the Digital Herbarium of Lomonosov Moscow State University (MW; 19 specimens), and the Herbarium of the Komarov Botanical Institute of the Russian Academy of Sciences (LE, Saint Petersburg; 11 specimens)—as well as material from the Institute of Plant Biology and Biotechnology (IPBB; 1 specimen) and data from electronic databases (6 occurrence records from Plantarium and GBIF/iNaturalist), made it possible to significantly refine current knowledge of the species' distribution range and ecological preferences. The examined herbarium collections cover the period from 1922 to 1993, while records from electronic databases extend the temporal framework of field observations to 2009–2019, providing an almost century-long time span for studying the species in nature.

The combined data confirm that *A. kujukense* is an endemic species of the mountainous regions of southern Kazakhstan, occurring predominantly within the Karatau Range system and adjacent mountain massifs in its central part. The majority of records originate from the Syrdarya Karatau, including the Ikansu and Bayaldyr gorges, the area of the Achisai settlement, the surroundings of the Koynar-Kul tract, the Boralday Range (Bukeytau), and the foothills in the vicinity of the Karnak village, as well as from individual massifs and gorges of the Lesser Karatau, such as the Kujuk Mountains, the Berkera and Sayasu gorges, and Ulkun-Burul Mountains. Additional data from the LE collection expand the known distribution by providing repeated records from the Ulkun-Burul Mountains (west of Taraz), the Almalysay Gorge (Biylikol Basin), and central Karatau, including the Mynzhylky massif (Rais Gorge) and the Kan-Sai Gorge. Taken together, these data indicate that the species' range encompasses not only the main Karatau Range but also parallel, closely adjacent mountain massifs (the Boraldaytau Range, the Mashat-Daubaba Mountains, and the Kazygurt Range) that maintain similar orographic and ecological-coenotic conditions. At the same time, the distribution range remains geographically narrow and mosaic, a pattern typical of endemic petrophilous taxa of the Western Tien Shan.

The ecological preferences of *A. kujukense*, based on all analyzed materials, appear to be highly consistent. The species has been recorded predominantly on gravelly and rocky slopes of varying steepness and exposure, often on rocky or strongly stony substrates with a thin fine-earth layer, as well as on clayey slopes of the foothills. Its habitats are characteristic of petrophytic and shrub-steppe ecosystems, including petrophytic shrub communities (e.g., the Rais Gorge, Mynzhylky Massif) and shrub thickets involving the relict species *Spiraeanthus schrenkianus* Maxim. (Bayaldyr Gorge). Records from clayey slopes in the foothills of the Karatau Range (beyond the village of Karnak, the lateral site of Kentik-Sai) indicate that the species is capable of inhabiting not only distinctly stony sites but also substrates with a higher proportion of fine earth, provided that good drainage and open, insolated exposure are maintained. Nevertheless, in all cases the habitats are characterized by a combination of arid conditions, nutrient-poor soils, and pronounced stoniness of the substrate, which confirms a high degree of xerophytism and petrophily of the species.

The phenological features of *A. kujukense*, inferred from collection dates in herbarium specimens, become more clearly defined after the inclusion of materials from the LE collection. The earliest specimens were collected in early May (10 May 1977, Bayaldyr Gorge; 19 May 1930 and 27 May 1930, foothills of the Karatau Range in the Turkestan District), corresponding to the onset of flowering. Peak flowering is recorded in late May and the first half of June (collections dated 7 June 1956, 13 June 1931, as well as numerous specimens from AA and MW), whereas specimens collected in July and August (3 July 1931, 3 July 1973, 5 July 1974, 7 August 1973) indicate a transition to the fruiting stage and the completion of the vegetative cycle, particularly at higher elevations and on stony substrates. Thus, based on herbarium data, the period of active flowering of the species under natural conditions generally extends from early-mid-May to mid-June, while fruiting occurs in July and may continue until early August.

The chronological analysis (Table 2) indicates that the earliest records of the species date back to the 1920s–1930s (collections by E.A. Mokeeva, S. Yu. Lipschits, and N.V. Pavlov), demonstrating its long-standing presence in botanical literature and herbarium collections. The peak of field activity related to the collection of *A. kujukense* occurred during the 1950s–1970s, when significant contributions to the study of the species were made by A.I. Vvedensky, S.S. Kovalevskaya, V.P. Goloskokov, R.V. Kamelin, and their colleagues. Later collections from the 1970s–1980s and the 1990s (Table 2), represented mainly by materials from the Almaty (AA) and Moscow (MW) herbaria, indicate the persistence of the species in its traditional localities and the absence of clear evidence for a contraction of its range. At the same time, interpretation of this pattern is complicated by temporal heterogeneity in the intensity of botanical exploration across the region. According to GBIF/iNaturalist data, Ebel A. L. et al. (2018) [41] recorded a small population of the species on a south-facing rocky slope in the Boralday River valley at an elevation of approximately 800 m a.s.l. In 2019, new occurrences of *A. kujukense* were documented by V.G. Epiktetov within Zhambyl Region (Sayasu Gorge) [42, 43].

Table 2

Chronological analysis of *A. kujukense* collections

Period	Data source	Main herbarium authors / observers	Data characteristics
1922	Herbarium collections	Drobov V.P., Popov M.G., Vvedensky A.I.	Material for the description of a new species for science; the first documented data;
1920s–1930s	Herbarium collections (AA, MW)	Mokeeva E.A., Lipshits S.Yu., Pavlov N.V.	Formation of a basic understanding of the area
1950s–1970s	Herbarium collections (AA, MW, LE)	Vvedensky A.I., Kovalevskaya S.S., Goloskokov V.P., Kamelin R.V., et al.	Peak of field survey; maximum number of collections, clarification of distribution, morphology and ecology
1970s–1980s	Herbarium collections (AA, MW)	Kamelin R.V.; Mikhailova T.A., Meshcheryakova A.P., Safronova I.N., Solovyov V.I.; Myrzakulov P.M.; Baytenov M.S.	Confirmation of species persistence in known locations
1990s	Herbarium collections (AA)	Japarova N.K.; Ivashchenko A.A., SamoiloVA V.A.;	The latest herbarium data from the end of the 20th century
2009	Electronic databases (Plantarium)	Belousov E.M. [44]	Finds in the Karatau Mountains: eastern macroslope, Berkara tract
2012	Electronic databases (Plantarium)	Kolbintsev V.G. [45]	Finds in the Berkara tract
2015	IPBB collection	collected by: G.B. Sakauova identified by: A.A. Ivaschenko	Finds in Karatau, Kazanbulak tract, Kobylandy-Sai gorge
2016	Electronic databases (Plantarium)	Grebenjuk A.V. [46]	Finds in the central part of the Syrdarya Karatau ridge: southwestern macroslope, Biresik River valley (middle reaches), left side of the gorge

Continuation of Table 2

Period	Data source	Main herbarium authors / observers	Data characteristics
2018	Electronic databases (Plantarium)	Kolbintsev V.G. [47]	Finds in the Syrdarya Karatau, Ulkunburultau Mountains, about 900 m above sea level, rocky slope with southern exposure
2018	Electronic databases (GBIF / iNaturalist)	Ebel A.L. et. al. [41]	Discovery of a small population in the Boraldai River valley ( $\approx$ 800 m above sea level)
2019	Electronic databases (GBIF/iNaturalist and Plantarium)	Epiktetov V.G. [42, 43]	Modern finds within the Karatau ridge: Sayasu gorge, dry rocky slope

A more detailed list of herbarium records of *A. kujukense*, including collection dates, is provided in Table 3.

Table 3

List of herbarium records of *Allium kujukense* arranged by collection date

Collection date	Region	Label data	Collectors / Identifiers	Herbarium fund
03.07.1923	Syrdarya Karatau (Karatau)	Kan-Sai Gorge	E.A. Mokeeva	LE
04.07.1923	Syrdarya Karatau (Karatau)	Syrdarya Province, Karatau Mountains, scree slopes of the Kur-Kuz spur, along the Min-Dzhilke route	E.A. Mokeeva	MW
27.05.1930	Syrdarya Karatau	Turkestan District, foothills of Karatau, clayey steppe beyond the village of Karnak	S. Yu. Lipschits	MW
19.05.1930	Syrdarya Karatau (Karatau)	Bayaldyr Gorge, clayey slope, lateral spurs of Kentyk-Sai	S. Yu. Lipschits	MW
19.05.1930	Syrdarya Karatau (Karatau)	Turkestan District, foothills of Karatau, clayey slope beyond the village of Karnak	S. Yu. Lipschits	LE
27.05.1930	Syrdarya Karatau (Karatau)	Turkestan District, foothills of Karatau, clayey steppe beyond the village of Karnak	S. Yu. Lipschits	MW
27.05.1930	Syrdarya Karatau (Karatau)	Turkestan District, Karatau Mountains, Bayaldyr Gorge, clayey slope near a lateral spur of Kentyk-Sai	S. Yu. Lipschits	LE
13.06.1931	Syrdarya Karatau (Karatau)	Karatau Mountains, gravelly slope near the Koynar-Kum Mountains	N.V. Pavlov	MW
13.06.1931	Syrdarya Karatau (Karatau)	Karatau Mountains, gravelly slope near the Kainar-Kul locality	N.V. Pavlov	MW
03.07.1931	Syrdarya Karatau (Boraldaytau)	Karatau Mountains, gravelly screes below the summit of Bukuy-Tau	N.V. Pavlov	MW
28.06.1931	Syrdarya Karatau (Boraldaytau)	Karatau Mountains, rocky slope near the summit of Bugazy-Tau, 1500 m a.s.l.	N.V. Pavlov	MW
13.06.1931	Syrdarya Karatau (Karatau)	Karatau Mountains, gravelly slope near the Koynar-Kul locality	N.V. Pavlov	LE
03.07.1931	Syrdarya Karatau (Boraldaytau)	Gravelly slope above the summit of Bukey-Tau	N.V. Pavlov	LE
21.06.1931	Syrdarya Karatau (Karatau)	Former Syrdarya District, Dzhualy District, spurs of Karatau, Chimbulak locality, north-facing slope toward the Tespe-Bulak stream	V.S. Kornilova	AA

Collection date	Region	Label data	Collectors / Identifiers	Herbarium fund
01.07.1934	Syrdarya Karatau (Boraldaytau)	Karatau Range, near the village of Mikhailovka, gravelly slope	L. Chilikina	MW
13.07.1934	Talas Alatau	Syrdarya District, rocky slope of the Mashat Mountains opposite Tyulkubas Station	N.V. Pavlov	MW
12.06.1934	Syrdarya Karatau (Karatau)	Kainar-Bastau area, lower terrace plateau of Kyzyl-Nayza	G. Mikeshein	MW
14.06.1936	Syrdarya Karatau (Karatau)	Eastern Karatau (Syrdarya), Elekty-Sai locality, gravelly slope	L. Chilikina	MW
31.05.1936	Syrdarya Karatau (Karatau)	Little Karatau Valley, gravelly slope near the Shamdy River valley	L. Chilikina	MW
12.06.1936	Syrdarya Karatau (Karatau)	Western Tien Shan, eastern part of the Karatau Range, gravelly summit in the upper reaches of the Arbatas River	L. Chilikina	MW
24.05.1939	Syrdarya Karatau (Little Karatau)	Karatau Mountains, gravelly slopes at the Kujuk Pass (3 sheets)	N.V. Pavlov	MW
27.05.1940	Syrdarya Karatau (Central Karatau)	Zhambyl Region, Karatau Mountains, rocky slopes of hills at the foot of Mynzhylky Peak	N.M. Kuznetsov	AA
27.06.1940	Syrdarya Karatau (Central Karatau)	Zhambyl Region, Karatau Mountains, rocky slopes of hills at the foot of Mynzhylky Peak	N.M. Kuznetsov, N.V. Pavlov	MW
27.05.1948	Syrdarya Karatau (Central Karatau)	Zhambyl Region, rocky slope on Mount Ulkun-Burul	N.V. Pavlov	MW
27.05.1948	Syrdarya Karatau (Little Karatau)	Rocky slope on the piedmont apron of Mount Ulken-Burul	N.V. Pavlov	AA
28.05.1952	Syrdarya Karatau (Karatau)	Karatau Mountains, mountain ridge between the Birlik and Dzhengilchik rivers, upper slopes of the mountain, southeastern exposure	N. Parfentyeva	MW
07.06.1956	Syrdarya Karatau (Boraldaytau)	Fine-earth patches on a rocky slope between the village of Kitaevka and the Boralday River	A.I. Vvedensky, S.S. Kovalevskaya	LE
06.06.1956	Syrdarya Karatau (Little Karatau)	Kujuk Mountains, gravelly slopes	M.S. Baitenov	AA
20.05.1963	Syrdarya Karatau (Little Karatau)	Central part of the northern slope of the Ulkun-Burul Mountains (west of Zhambyl), southern rocky slopes	V.P. Goloskokov	AA
20.05.1963	Syrdarya Karatau (Little Karatau)	Central part of the northern slope of the Ulkun-Burul Mountains, west of Zhambyl; southern rocky slopes	V.P. Goloskokov	LE
03.07.1973	Syrdarya Karatau (Little Karatau)	Eastern part of Almalysai Gorge (Biylikol Basin), gravelly slope	R.V. Kamelin	LE
07.08.1973	Syrdarya Karatau (Central Karatau)	Central massif of the Syrdarya Karatau, ridge above the settlement of Achisai	R.V. Kamelin	LE
05.07.1974	Syrdarya Karatau (Central Karatau)	Mynzhylky Massif, Rais Gorge, petrophytic shrub-steppe	R.V. Kamelin	LE
10.05.1977	Syrdarya Karatau (Central Karatau)	Bayaldyr Gorge, 5 km above Bayaldyr Lake, in <i>Spiraeanthus</i> thickets	R.V. Kamelin, T.A. Mikhailova, A.P. Mishrenkova, I.N. Safronova, V.I. Solovyov	LE
11.06.1981	Syrdarya Karatau (Central Karatau)	Karatau Range, Kelinchek Massif, meadow-steppe slopes	M.S. Baitenov	AA
22.05.1985	Syrdarya Karatau (Central Karatau)	Central Karatau, northern macroslope, Kelenizek Gorge, rocky sites	P.M. Myrzakulov	AA

Continuation of Table 3

Collection date	Region	Label data	Collectors / Identifiers	Herbarium fund
15.05.1985	Syrdarya Karatau (Central Karatau)	Central Karatau, Ikansu Gorge	P.M. Myrzakulov	AA
17.05.1985	Syrdarya Karatau (Central Karatau)	Central Karatau, southern macroslope, 10–12 km NW of the Achisai mine, vicinity of Itsanylgil, clay–gravelly slope	P.M. Myrzakulov	AA
08.05.1989	Syrdarya Karatau (Karatau)	Karatau Range, Berisek Gorge, south-facing slope	A.A. Ivashchenko, V.A. Samoilova	AA
25.05.1993	Syrdarya Karatau (Karatau)	Syrdarya Karatau Range, Ikansu River Gorge, rocky east-facing slope	N.K. Zhaparova	AA
май, 2009	Syrdarya Karatau	Karatau, eastern macroslope, Berkera locality	E.M. Belousov	Plantarium
26.05.2012	Syrdarya Karatau	Berkera locality	V.G. Kolbintsev	Plantarium
17.06.2015	Syrdarya Karatau (Central Karatau)	Kazanbulak, Kabylandy-Sai Gorge	Collected by G.B. Sakauova; identified by A.A. Ivashchenko	IPBB collection
28.05.2016	Syrdarya Karatau	Central part of the Syrdarya Karatau Range: southwestern macroslope, Biresik River valley	A.V. Grebenyuk	Plantarium
31.05.2018	Syrdarya Karatau	Syrdarya Karatau, Ulkunburultau Mountains, ca. 900 m a.s.l., rocky slope	V.G. Kolbintsev	Plantarium
23.05.2018	Syrdarya Karatau (Boraldaytau)	Turkestan Region, Baidibek District, Boralday River valley (≈800 m a.s.l.)	A.L. Ebel	GBIF / iNaturalist
03.06.2019	Syrdarya Karatau	Zhambyl Region, Zhualy District, Sayasu Gorge, dry rocky slope	V. Epiktetov	GBIF / iNaturalist

*Notes.* AA — Herbarium of the Institute of Botany and Phytointroduction (Almaty, Kazakhstan); MW — Digital Herbarium of Lomonosov Moscow State University (Noah's Ark Depository of Living Systems, Moscow, Russia); LE — Herbarium of the Komarov Botanical Institute, Russian Academy of Sciences (Saint Petersburg, Russia); IPBB — collection of the Institute of Plant Biology and Biotechnology.

Based on the analysis of herbarium materials and published literature data, a distribution map of *A. kujukense* within the currently known range in Kazakhstan was compiled (Fig. 2).



Figure 2. Map of the distribution of *Allium kujukense* in Kazakhstan

Summarizing the results, it can be concluded that *A. kujukense* remains an endemic species of the mountains of southern Kazakhstan, characterized by a narrow yet structurally complex range encompassing the Syrdarya Karatau Range and several morphologically and ecologically similar small mountain massifs. Its stable association with arid petrophytic and shrub-steppe habitats, rocky and clayey slopes, together with a relatively short vegetative period, makes the species potentially vulnerable to anthropogenic pressures related to the transformation of mountain landscapes, including grazing, cultivation of foothills, mining activities, and increasing recreational impacts. The overall body of herbarium evidence highlights the necessity of updating field surveys in key localities, refining estimates of population size, and, if warranted, considering the inclusion of the species in regional and national lists of protected plants. This is particularly relevant given that the species is not mentioned in the Red Data Books of two regions — Zhambyl (2007) [48] and Turkestan (formerly South Kazakhstan, 2002) [49] — whereas the much more widely distributed *Allium karataviense* Regel is included.

#### Conclusion

Thus, based on the analysis of herbarium materials from the AA, MW, and LE collections, the IPBB collection, as well as data from the electronic databases Plantarium and GBIF/iNaturalist, the distribution range, ecological preferences, and history of study of *A. kujukense* within Kazakhstan have been clarified. The species is a narrowly localized endemic of the mountainous regions of southern Kazakhstan, occurring predominantly within the Syrdarya Karatau Range system (including the Boraldytau Range) and several adjacent small mountain massifs of the Western Tian Shan, forming a mosaic and geographically restricted range. *A. kujukense* is characterized by a stable ecological association with arid conditions, rocky and clayey slopes, and petrophytic shrub communities, as well as by a relatively short vegetative period. The chronological analysis of data spanning the period from 1922 to 2019 did not reveal clear evidence of range contraction based on herbarium records; however, heterogeneity in the intensity of regional botanical exploration and the presence of only a limited number of recent records indicate the need for further targeted field surveys. Given the potential vulnerability of the species to anthropogenic impacts, monitoring of *A. kujukense* populations in its main distribution areas will be continued in order to refine estimates of population size, assess population condition and dynamics, and evaluate the necessity of additional conservation measures.

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#### Author Contributions

The manuscript was written through contributions of all authors. All authors have given approval to the final version of the manuscript. CRediT: **Ivashchenko A.A.** — conceptualization, data curation, investigation, methodology, writing draft- editing; **Yermagambetova M.M.** — investigation, visualization, data curation, formal analysis, supervision, writing draft-editing.

#### Conflict of Interest

The authors declare no conflict of interest.

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**Қазақстандағы *Allium kujukense* Vved. эндем түрі:  
таралуы, тарихы және зерттеу перспективалары**

Мақалада гербарий материалдары мен заманауи электрондық деректер базасын зерделеу негізінде Оңтүстік Қазақстан тауларының сирек кездесетін палеоэндемигі күйік пиязының (*Allium kujukense* Vved.) таралуын кешенді талдау нәтижелері келтірілген. Жұмыста Қазақстан (AA) және Ресей (MW, LE) 43 гербарий парағын және ӨББИ жинағын, сондай-ақ Plantarium және GBIF/iNaturalist электрондық ресурстарынан 6 бақылауды қамтитын 49 құжатталған жазба талданды. Өртүрлі кезендердің деректерін салыстыру түрдің таралу аймағының кеңістіктік құрылымын нақтылауға және оның Сырдария Қаратауы жоталар жүйесіне (Боралдайтауды қоса алғанда) және Батыс Тянь-Шаньның мозаикалық және географиялық тұрғыдан шектеулі таралу аймағын құрайтын бірқатар жақын маңдағы шағын тау жоталарымен шектелгенін растауға мүмкіндік берді. Ұсынылған материалдар осы түрдің таралуы бойынша арнайы зерттеулер және оны қорғау шараларын жүргізудің маңыздылығын негіздейді.

*Клт сөздер:* *Allium kujukense*, Қазақстан, Сырдария Қаратауы, гербарий деректері, электрондық дерекқорлар, таралуы.

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**Эндемичный вид *Allium kujukense* Vved. в Казахстане:  
распространение, история и перспективы изучения**

В статье представлены результаты комплексного анализа распространения лука куюкского (*Allium kujukense* Vved.), редкого палеоэндемика гор Южного Казахстана, на основе изучения гербарных материалов и современных электронных баз данных. В работе проанализированы 49 документированных записей, включающих 43 гербарных листа из фондов Казахстана (AA) и России (MW, LE) и коллекции ИББР, а также 6 наблюдений из электронных ресурсов Plantarium и GBIF/iNaturalist. Сопоставление данных различных периодов позволило уточнить пространственную структуру ареала вида и подтвердить его приуроченность к системе хребта Сырдарьинский Каратау (включая Боралдайтау) и ряду близлежащих небольших горных массивов Западного Тянь-Шаня, формирующих мозаичный и географически ограниченный ареал. Представленные материалы обосновывают важность проведения специальных исследований по распространению и оценке целесообразности мер по охране данного вида.

*Ключевые слова:* *Allium kujukense*, Казахстан, Сырдарьинский Каратау, гербарные данные, электронные базы данных, распространение.

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