

MAPPING OF DISTRIBUTION OF THE SPECIES OF IRIS IN KUHITANG BOTANICAL-GEOGRAPHICAL REGION (UZBEKISTAN)

D. M. Tajetdinova, A. J. Ibragimov, E. A. Ortikov

Received 2024.07.13; accepted for publication 2024.10.09

Tajetdinova, D.M., Ibragimov, A.J. & Ortikov, E.A. 2024.12.30. Mapping of distribution of the species of *Iris* in Kuhitang botanical-geographical region (Uzbekistan). *Iran. J. Bot.* 30 (2): 145-154. Tehran.

This article presents the results of field studies (2021-2022) focusing on the diversity of the genus *Iris* in the Kuhitang botanical-geographical region of the Western Hissar district, as well as a critical study of specimens from the National Herbarium of Uzbekistan (TASH). *Iris svetlanae* a rare species listed in the Red Book of the Republic of Uzbekistan (2019) is recorded as an addition to the flora of Kuhitang Ridge. Moreover, expansion in the distribution ranges of endemics *I. stolonifera* and *I. warleyensis* of the Western Pamir-Alay are also recorded. All available data were organized in MS Excel database, and analyzed in the point-to-grid analysis tool of ArcGIS 10.6.1 software, using 5 × 5 km grid maps. The grid maps of the study show the distribution of *Iris* species.

Dilarom Mnajatdinovna Tajetdinova (correspondence <dilarom.tajetdinova@yahoo.com>), senior researcher, Institute of Botany, Academy of Science of the Republic, Tashkent, Uzbekistan, - Akrom Javliyevich Ibragimov, dotsent, Termiz State University, Termiz, Uzbekistan, - Elyor Abdumajidovich Ortikov, PhD student, Institute of Botany, Academy of Science of the Republic, Tashkent, Uzbekistan.

Keywords: Endemics; grid map; *Iris*; Kuhitang; new record; Uzbekistan

نقشه پراکنش گونه‌های جنس زنبق در منطقه فیتوجغرافیایی کوهیتنگ ازبکستان

دیلا روم تاجتدینووا: محقق ارشد موسسه گیاه‌شناسی آکادمی علوم، تاشکند جمهوری ازبکستان

اکروم ایبراگیم او: دانشگاه ایالتی ترمیز، ترمیز، ازبکستان

الیور اورتیک او: دانشجوی دکتری، موسسه گیاه‌شناسی آکادمی علوم، تاشکند جمهوری ازبکستان

این مقاله نتایج مطالعات صحرایی در سالهای ۲۰۲۱ تا ۲۰۲۲ است و بر تنوع جنس زنبق (*Iris*) در منطقه فیتوجغرافیایی کوهیتنگ از بخش حصار غربی تمرکز می‌کند. به‌علاوه مطالعه دقیق روی نمونه‌های هرباریوم ملی ازبکستان (TASH) انجام گردیده است. گونه نادر *Iris svetlanae* علاوه توسعه محدوده پراکنش گونه‌های انحصاری *I. stolonifera* Maxim و *I. warleyensis* Foster از پامیر آلائی غربی، گزارش می‌شود. همه داده‌های قابل دسترسی در فایل‌های اکسل وارد و با نرم افزار point-to-grid در آرک جی آی اس نسخه ۱۰.۶.۱ با استفاده از نقشه‌های گرید ۵×۵ کیلومتری آنالیز شدند. نقشه‌های گرید پراکندگی جغرافیایی زنبق را مشخص نمود.

INTRODUCTION

Members of the genus *Iris* L. are mainly distributed in Eurasia, North America, and North Africa (Ikinci & al. 2011). Mountainous regions of Central Asia have high species diversity for the genus

Iris. These areas include the Western Hissar district of the Mountainous Central Asian province (Kamelin 1973; Tojibaev & al. 2016). Species of the genus *Iris* distributed in the flora of Uzbekistan are divided into 4 subgenera, 10 sections, and 9 aggregations

(Sennikov & al. 2023)

The first reliable data on the diversity of the genus *Iris* in this area were given in the work of Nevsky (1937), who recorded five species for the western macro slope of the Kuhitang ridge. Later, Khassanov (1987) recorded five species of *Iris* in the communities of xerophytic trees and shrubs of the Kuhitang Range. Ibragimov (2009) indicated the largest number of species in his latest work on the flora of Surkhan Reserve in the territory of Kuhitang. Two new species including *Iris victoris* F.O.Khass., Khuzhan. & Rakhimova and *I. rudolphii* F.O.Khass., Esankulov & Achilova have been described from Surkhan-Sherabad valley (Khassanov & al. 2013), while another new species - *I. petri* F.O. Khass., Rakhimova & Achilova was described by Khassanov & al. (2014). Later, a new species - *I. chrysopetala* Sennikov, F.O.Khass. & Pulatov from the Surkhandarya region was recorded (Sennikov & al. 2022).

Modern botanical research on floristic diversity and geographic distribution in Uzbekistan is conducted on a grid basis (Khassanov & al. 2018; Tojibaev & al. 2022; Levichev & al. 2023; Tajetdinova 2023; Tajetdinova 2024a & Tajetdinova 2024b). Over the past five years, the laboratory of Flora Uzbekistan in the Institute of Botany of the Academy of Sciences has been conducting new research on grid mapping of the country's flora Since 2021, the vascular flora of the Surkhandarya region has been mapped. This territory was divided into 882 cells for this purpose with an area of 5 × 5 km each

(Tojibaev & al. 2022). All data on species diversity (number of species, species richness) and density of herbarium collections (number of herbarium collections, field records, and collection density) are accumulated in the grid cells. The grid map contains over a hundred years of taxonomic information and serves as a reliable digital platform for collecting and analyzing botanical data.

The above overview and implementation of new methods for biodocumentation of plant diversity show the presence of high species diversity of *Iris*es in this area and the fragmented nature of existing data. Therefore, this article aims to compile an annotated list of species of the genus of *Iris* in Kuhitang botanical-geographical region of the Western Hissar district, taking into account the newly described species and compiling GIS grid maps for distribution.

The studies were carried out within the framework of the state program - The Grid mapping of the flora of West Hissar, Hissar-Darvaz, and Panj districts (within the Surkhandarya region).

MATERIALS AND METHODS

Research area

The Kuhitang botanical-geographical region includes the Kuhitang ridge and its northeastern spur, the Susyztau Mountains, and the southern slope of the Tyuber-Oland Mountains. It borders on the Surkhan-Sherabad and Tarkapchigai regions of the Western Hissar district. The western part of the district is located within the territory of the Republic of Turkmenistan (Tojibaev & al. 2016), (Fig. 1).

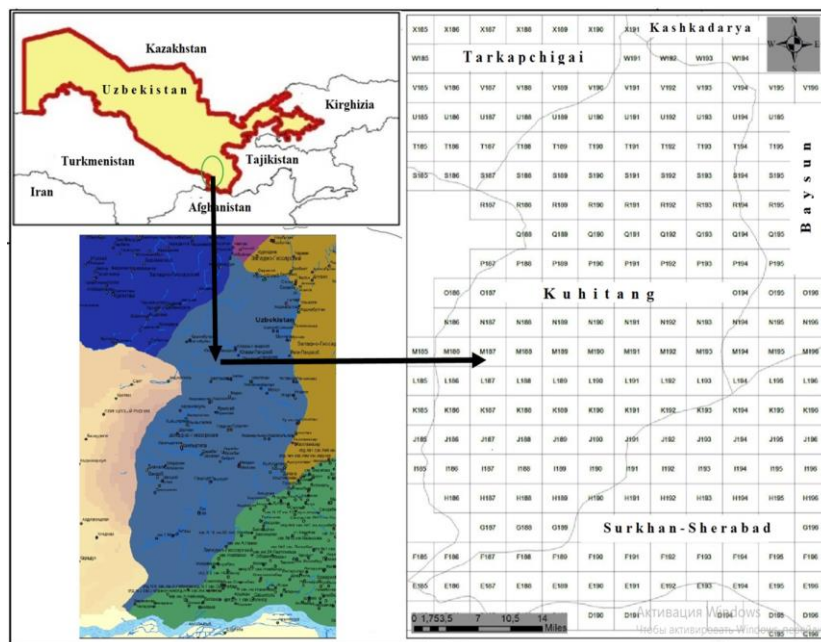


Fig. 1. The territory of Kuhitang botanical-geographical region.

To compile a primary list of species of the genus *Iris* in the study area, herbarium specimens stored in Tashkent (TASH), St. Petersburg (LE), Moscow (MW), and the online platform Plantarium (www.plantarium.ru) were critically studied. A total of 162 specimens dating from 1915-2023 were examined. The main collectors were M.G. Popov, A.I. Vvedensky (1915-1927), A. Kayumov (1965), Kh.K. Dzhumaev (1970-1973), F.O. Khassanov (2013), A.Zh. Ibragimov and others (2013, 2021-2023). Historical herbarium collections (until 2010) were georeferenced and coordinates were determined using Google Earth, and SAS Planet. Release 191221 and then imported and converted into an ArcGIS 10.6.1 point map layer. The geographical coordinate system WGS84 was used as a reference point.

Study of herbarium specimens

To collect new herbarium material and determine the species and boundaries of areas, fieldwork was carried out jointly with bachelors and masters from Termez State University during 2019-2023. The sampling route covered all sections of the Kuhitang ridge and the adjacent Piedmont plains. The total length of field routes is more than 3500 km. During the field research, 124 herbarium specimens were collected and 12 floristic descriptions were compiled with georeferenced data. Species identification was carried out using the “*Conspectus Florae Asiae Mediae*” (Vvedensky & Cherneva 1971) and “*Flora of Uzbekistan*” (Vvedensky 1941). Accepted scientific

names of taxa and authors were checked using POWO (<https://powo.science.kew.org/>) and IPNI (<https://ipni.org/>). Digitized herbarium samples were obtained by scanning with a HerbScan™ 224 p EpsonExpression 10000 XL.

Grid mapping

The grid map of the study area was created based on the WGS 1984 projection (World Geodetic System 1984) in the ArcGIS version 10.6.1 program, taking into account the compatibility of the administrative map of the Republic of Uzbekistan and the scheme of botanical-geographical zoning of the flora of Uzbekistan. As part of the study focusing on the floristic diversity of the Surkhandarya region on a grid basis, the Kuhitang botanical-geographical region is divided into 130 grid cells, 5 × 5 km in size. Each cell is named by indexes in a combination of letters of the English alphabet and numbers.

RESULTS AND DISCUSSION

The genus *Iris* is represented by ten species from four sections in Kuhitang botanical-geographical region (Figs. 2 & 3), of which one species (*I. vvedenskyi*) is endemic to Kuhitang, two species (*I. victoris*, *I. rudolphii*) are endemic to Uzbekistan, four species (*I. stolonifera*, *I. vicaria*, *I. warleyensis*, *I. svetlanae*) do not go beyond the South-Western Pamir-Alay and three species (*I. longiscapa*, *I. songarica*, *I. narbutii*) are found outside of Central Asia.

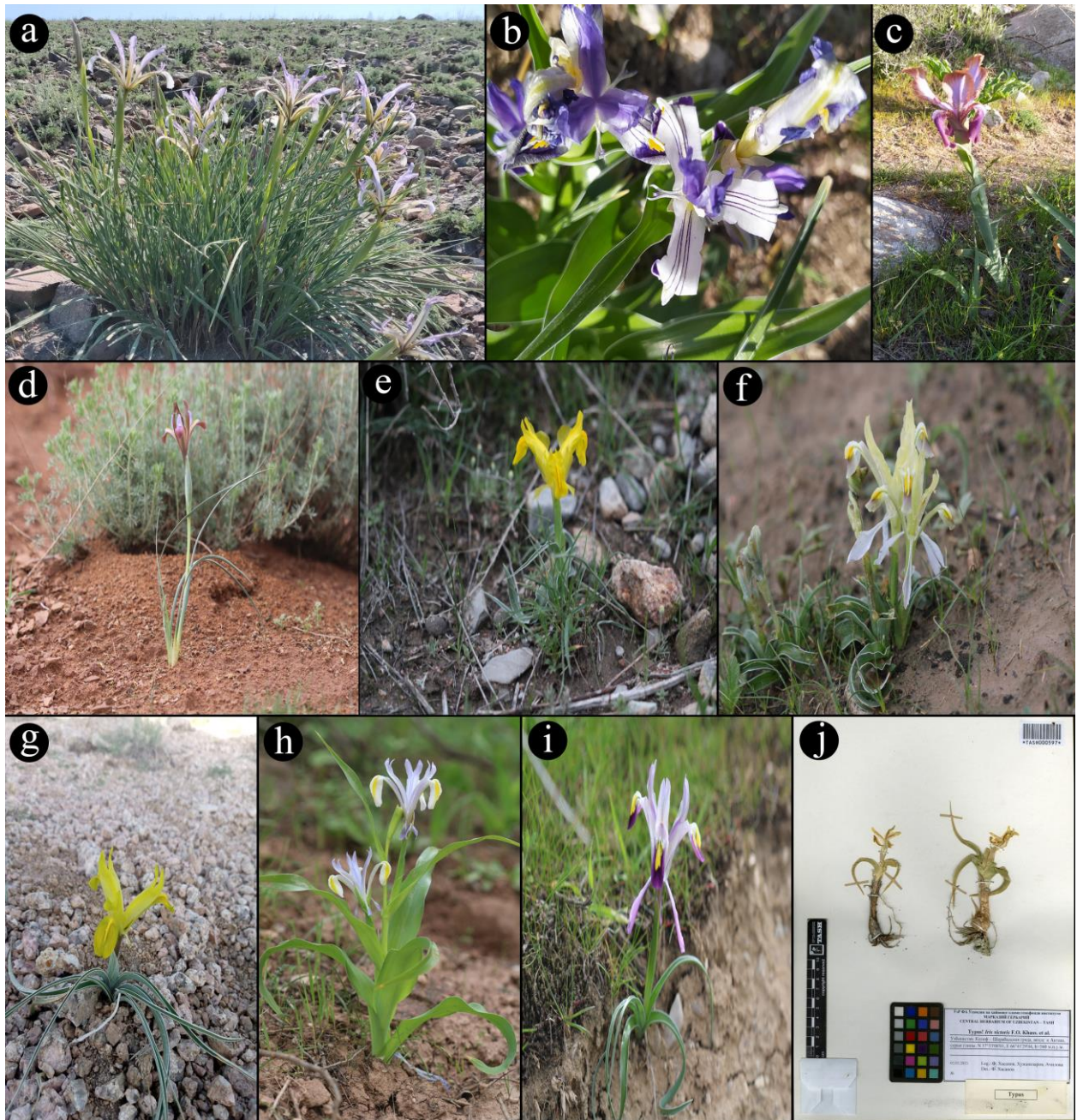


Fig. 2. The species of the genus *Iris*: a, *I. songarica*; b, *I. longiscapa*; c, *I. stolonifera*; d, *I. vicaria*; e, *I. warleyensis*; f, *I. svetlanae*; g, *I. victoris*; h, *I. vvedenskyi*; i, *I. narbutii*; j, *I. rudolphii*.

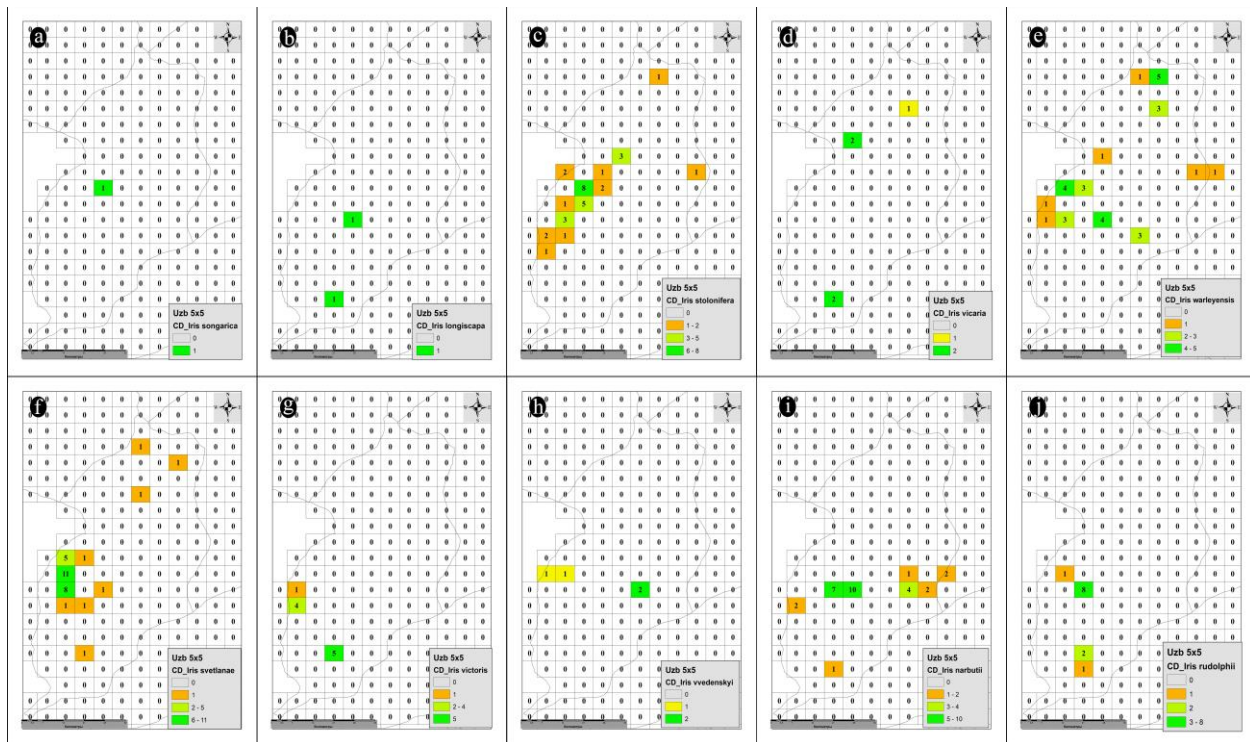


Fig. 3. Distribution and density (CD) of *Iris* species in KBGR. a, *I. songarica*; b, *I. longiscapa*; c, *I. stolonifera*; d, *I. vicaria*; e, *I. warleyensis*; f, *I. svetlanae*; g, *I. victoris*; h, *I. vvedenskyi*; i, *I. narbutii*; j, *I. rudolphii*.

Newly recorded species for the study area

A rare endemic of Western Hissar, *Iris svetlanae* was identified as a new record from the Kuhitang botanical-geographical region. *Iris svetlanae* was known from the Urgut district of the Kuhistan district (southwestern spurs of the Zarafshan Range) and the Kashkadarya district of the Western Hissar district (Khassanov & Rakhimova 2012). The locus classicus is the Kyzylcha state farm near Toychi, a part of the Tarkapchigai region of the Western Hissar district. During the research expedition conducted in 2021, the species was found on a rocky-rubbly slope 4-6 km NW from the village of Kampirtepa (V191). This point is located 45-50 km west of the locus classicus and is a new addition to the flora of the Kuhitang ridge, and new locations of relatively widespread *Iris stolonifera* and *Iris warleyensis* were identified.

***Iris* species reported from the Kuhitang botanical-geographical region**

Genus *Iris* L., Sp. Pl. 1: 38 (1753).

Type: *Iris germanica* L.

1. Sect. *Sclerosiphon* (Nevski) Sennikov & F.O. Khass. in Plant Diversity of Central Asia 2(1): 1-104(2023)

Type: *Iris songarica* Schrenk

Iris songarica Schrenk in Enum. pl. Nov. 1: 3 (1841).

Type: Kazakhstan: Ad fl. Ajagus, 30.05.1840, A.

Schrenk [lectotype LE 01017907, designated by Boltenkov & Schröder (2019: 290)].

Flowering and fruiting time: April-June.

Habitat: In the foothills in the sagebrush-steppe groups, at the outcrops of the low mountains.

Examined specimens of TASH: Kuhitang, Surkhan State Nature Reserve, Zarautsay, 15.04.2021, Ibragimov, Karimov, Atoev 26, index-O189.

2. Sect. *Hexapogon* (Bunge) Baker in Gard. Chron., n.s., 5: 527 (1876).

Type: *Iris falcifolia* Bunge [lectotype designated by Lawrence, 1953: 354].

Iris longiscapa Ledeb. in Fl. Ross. 4: 93 (1852).

Type: Uzbekistan: From Tashkent to Karak-Ata, 11.04.1873, Korolkow & Krause [neotype LE00050370, designated by Boltenkov (2016: 293)].

Flowering and fruiting time: April-May.

Habitat: In sands and loamy soil of deserts.

Examined specimens of TASH: Kuhitang, Talkhab-Dagan, 22.04.1965, Kayumov, index-H188.

3. Sect. *Regelia* (Foster) Foster in Garden 43: 131 (1893).

Type: *Iris korolkowii* Regel [designated by Regel 1873: 432].

Iris stolonifera Maxim. in Bull. Acad. Imp. Sci. Saint-Petersbourg XXVI. 535 (1880).

Type: Uzbekistan: Zarafshan Valley, Sangy-Dzhuman

Canyon, 25.05.1869, O. Fedtschenko [lectotype LE 00050109, designated by Sennikov & al. (2023: 26); isolectotypes 00050108, 00050110 LE].

Flowering and fruiting time: May-July.

Habitat: Wet meadows and near mountain streams.

Examined specimens of TASH: Kuhitang, 24.04.2021, Karimov, index-K186; the village neighbourhood of Vandob, 25.05.1970, Dzhumaev, index-L186; the village neighbourhood of Vandob, 18.05.1970, Dzhumaev, index-L187; the basin of the river Sherabad, 1.5 km SE from Kuhitang mountain, 01.06.1965, Kayumov, index-M187; village Kampirtepa, 20.04.2021, Ibragimov, Karimov, Atoev 64, index-N187; village Kampyrtepa, 19.04.1915, Popov 323, index-N187; the village neighbourhood of Shalkan, 03.06.1973, Dzhumaev, index-N188; village Kyzylalma, 26.06.1927, Popov, Vvedensky 461, index-O188; the village neighbourhood of Shalkan, 04.06.1973, Dzhumaev, index-N188; 2-3 km to the NW from the village of Kyzylalma, 20.05.2021, Ortikov, Zhuramuradov, Turdiev 20052021365, 20052021367, 20052021382, 20052021389, index-O188; Surkhan State Nature Reserve, Zarautsay, 19.04.2021, Ibragimov, Karimov, Atoev 69, 71, index-O189; Kuhitang mountains, along the gorge on upper parts of mountains, 07.05.1915, Popov 496, index-P187; Katta-Kurchuk mountain, village Khodjaanka, 09.05.1915, Popov 554, index-P189; Suvsiztau, 15.04.2021, Turginov, Pulatov Zhabbarov, Rakhmatov, Turdibaev, Togaev, Akbarov, index-V192.

4. Sect. *Juno* (Tratt.) Maxim. in Bull. Acad. Imp. Sci. Saint-Petersbourg 26: 505 (1880).

Type: *Iris persica* L. [lectotype designated by Rodionenko (1961: 206)].

Iris vicaria Vved. in Komarov, Fl. URSS 4: 569 (1935).

Type: Uzbekistan: Surxondaryo Region: Inter lapides ad declivia saxosa in montibus Hissaricis supra p. Schargun, alt. ca. 1250 m], 14.04.1928, A.I. Vvedensky [neotype TASH0000322, designated by Vvedensky (1935b: 570, 1975: 61)].

Flowering and fruiting time: March-May.

Habitat: Stony slopes and among rocks in the lower mountain zone.

Examined specimens of TASH: Kuhitang, Tangidara gorge, 23.04.1916, Popov 356, index-R189, Kuhitang, Talkhan village, 01.04.2021, Tajetdinova, Rakhmatov, Kurbaniyazova 210333, index-H188.

Iris warleyensis Foster in Gardener's Chron. 31: 386 (1902).

Protologue citation Tajikistan: Habitat, same as *I. bucharica* [Eastern Bokhara, on mountain slopes, alt. 5000 to 6000 feet, on sides of river Sureh-ab]".

Lectotype: (Boltenkov, 2016: 231): [icon] "*Iris warleyensis*" in Gard. Chron. 31: 386, f. 134 (1902).

Flowering and fruiting time: March-May.

Habitat: In stony and shallow-earth slopes in the lower mountain belt.

Examined specimens of TASH: Surkhan State Nature Reserve, part of Sherzhan, 4-5 km W from the village Sherzhan, 25.04.1921, Ibragimov, Karimov, Atoev 89, indexes-M186, M187; Kuhitang, Zaharlisay and Zaharli tepa, 04.06.1948, Pyataeva 200, index-N186, Kuhitang, 8-9 km SW from Shurob, Yullisai dara, 29.03.2021, Tajetdinova, Rakhmatov, Zhabbarov, Kurbaniyazova 210020, index-V191; Kuhitang, Suvsyztau, 15.04.2021, Turginov et al., KG00666-KG00668, KG00672, index-V192.

Iris svetlanae (Vved.) T.Hall & Seisums in Bot. J. Linn. Soc. 167(3): 300 (2011).

Type: Uzbekistan: E bulbis a Kovalevskaja, Tscherneva et Vvedensky in collibus gypsaceis inter p.p. Tojtschi et Kzyltscha in valle fl. Kaschka-Darja a. 1958 lectis in Horto Botanico Academiae Scientiarum UzSSR enatus], 12.03.1962, S. Kovalevskaja, A. Vvedensky (holotype TASH 000321).

Flowering and fruiting time: April-May.

Habitat: In red gypsum clays.

Examined specimens of TASH: Kuhitang, 8 km south from the village of Aktash, 20.03.2020, Achilova, Pulatov, Kurbaniyazova, index-I188; 4-6 km NW from the village of Kampirtepa, Kampirtepasay, 19.04.2021, Ibragimov, Karimov, Atoev 2036; 2043; 2046, index-N187; village Kampirtepa, 27.04.2021, Ibragimov, Karimov, Atoev 20, index-N187; Kuhitang, Suvsyztau, 12.04.2021, Achilova, Turginov, index-U193; Kuhitang 8-9 km SW from Shurob, Yullisai dara, 29.03.2021, Tajetdinova, Rakhmatov, Zhabbarov, Kurbaniyazova 210019, index-V191.

Iris victoris F.O.Khass., Khuzhan. & Rakhimova in Stapfia 99: 207 (2013).

Type: Uzbekistan: Kelif-Sherabad Range, nearby village Aktash, grey clays, 37°33'08.01N, 66°41'29.44E, 560 m a. s. l., 02.03.2013, F.O. Khassanov, U. Khuzhanazarov & N. Achilova (holotype TASH).

Flowering and fruiting time: February-April.

Habitat: In gray clays and variegated soil.

Examined specimens of TASH: the village neighborhood of Aktash, 02.03.2013, Khasanov, Khujanazarov, Achilova, index-I188, 8 km to the south from the village of Aktash, 20.03.2020, Pulatov 369, 370, 371, index-I188; to the top from the village of Vandob, 29.03.2021, Ortikov 10032021001, 10032021002, indexes-L186; M186.

Iris vvedenskyi Nevski ex Woron. & Popov in

Fedtschenko & Popov, Fl. Turkmen. 1: 323 (1932).

Type: Turkmenistan: Kuhitang Range, near Khodzhañil-ata village, alpine meadows with spiny shrubs on stony slopes, 27.04.1931, S. Nevski 475 [lectotype LE 00050126, designated by Boltenkov (2016a: 230)].

Flowering and fruiting time: May.

Habitat: On rocky slopes in the upper belt of mountains.

Examined specimens of TASH: Ridge top opposite Maidan, 20.07.1935, Gnezdillo 135, index-M191; Kupitang, Zaharlisay and Zaharlitepa, 27.07.1935, Kayumov, indexes-N186, N187.

Iris narbutii O. Fedtsch in Izv. Imp. Obshch. Lyubit. Estestv. Moskovsk. Univ. 103: 147 (1902).

Type: Uzbekistan: Vicinity of Samarkand, 16.03.1869, O. Fedtschenko [lectotype LE 00050088, designated by Boltenkov (2016b: 229)].

Flowering and fruiting time: February-April.

Habitat: In fine-earth, gravel, and rocky slopes in the foothills.

Examined specimens of TASH: 2-3 km W from the village of Zarabag, 20.03.2022, Ibragimov, Karimov, Atoev, indexes-M188, M189; 3-4 km NW from Laylik, 01.03.2022, Ibragimov, Karimov, Atoev, index-M192.

Iris rudolphii F.O.Khass., Esankulov & Achilova in Stapfia 99: 207 (2013).

Type: Uzbekistan: Kelif-Sherabad range; near Aktash village, red sands; 37°32'0.75"N, 66°42'11.66E, 500 m s. l., 02.03.2013, F.O. Khassanov, Esankulov & N. Achilova (holotype TASH).

Flowering and fruiting time: February-March.

Habitat: In ordinary soils with gravelly and red soil.

Examined specimens of TASH: Kuhitang, the

village neighborhood of Aktash, 02.03.2013, Khassanov et al. (H188); Kuhitang, 8 km S from the village of Aktash, 02.03.2020, Pulatov 376, 377, index-I188; Kuhitang, between the villages Zarabag and Kampirtepa, 02.02.2021, Ortikov, indexes-N188, M188.

The grid map of the species of *Iris*

30.2% of the total number of species of the genus *Iris* recorded in the flora of Uzbekistan grow in the study area (Fig. 4-1 & 4-2). There are 23 low-density indexes (CD=1-4) of herbarium collections of representatives of the genus *Iris*. There are only six medium-density indexes (CD=5-10), and nine high-density indexes (CD=11-16).

Indexes with high and medium density of herbarium collections correspond mainly to the Surkhan State Reserve and the south of the KBGR. The maximum indicator of species diversity of *Iris* was 6 species on the index, corresponding to the index with the maximum density of species collections.

Much of the middle and upper belts of the Kuhitang are climatically suitable for *Iris* species, where they are widespread. In this territory, there are no grid cells with all species of *Iris* in the flora of Kuhitang.

ACKNOWLEDGMENT

We would like to thank the Institute of Botany, Academy of Science of the Republic of Uzbekistan (the state program - The Grid mapping of the flora of West Hissar, Hissar-Darvaz, and Panj districts (within the Surkhandarya region)). We also thank B.Q. Karimov and K.U. Atoev for their assistance in collecting herbarium specimens.

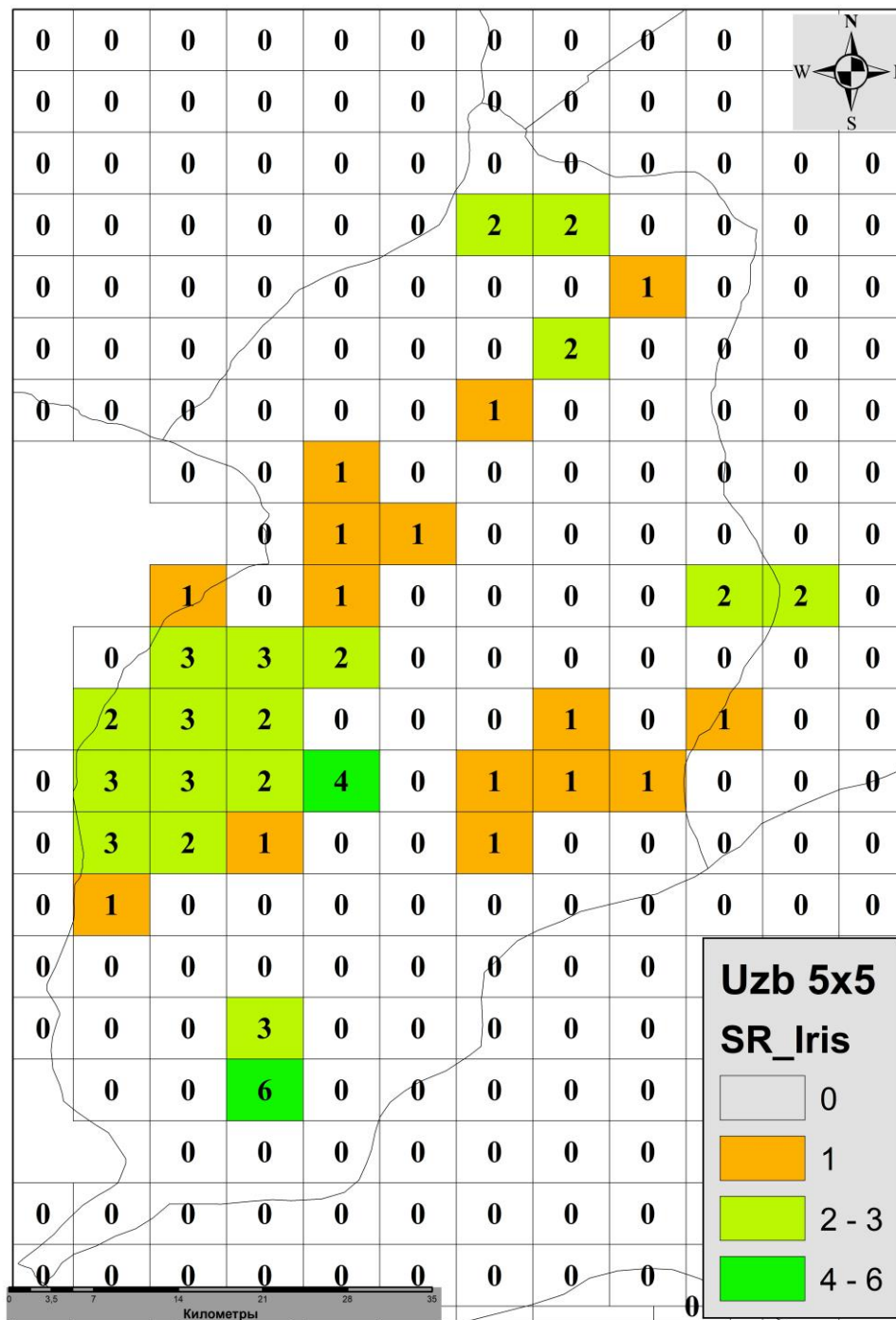


Fig. 4-1. The species richness (SR) and collection density (CD) of *Iris* in KBGR.

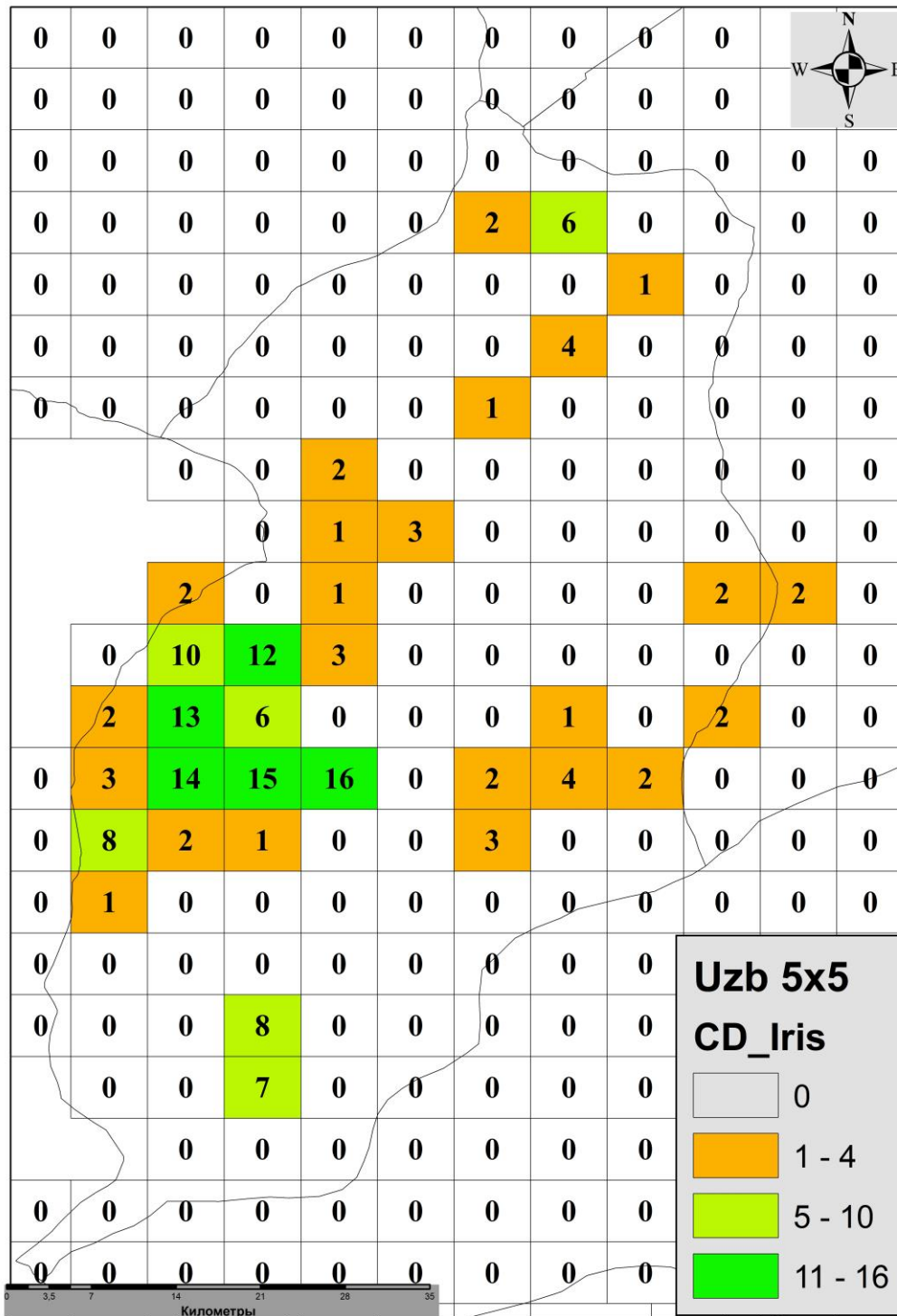


Fig. 4-2. The species richness (SR) and collection density (CD) of *Iris* in KBGR.

REFERENCES

- Boltenkov, E. V. 2016: Typification and nomenclatural notes on twenty-eight names of Juno irises (Iridaceae) from Central and South Asia. - *Phytotaxa*, 260 (3): 223-234.
- Boltenkov, E. V., Schroder, Ch.N. 2019: Nomenclatural notes on *Iris songarica* (Iridaceae) and two related names. - *Phytotaxa*, 387 (4): 289-294.
- Ibragimov, I. J. 2009: Flora Surkhanskogo gosudarstvennogo zapovednika (Sistema Kuhitang). Abstr. Ph D. Diss. Tashkent, 43 pp. (In Uzbek).
- Ikinci, N., Hall, T., Lledo, M. D., Clarkson J. J., Tillie N., Seisums A., Saito T., Harley M. and Chase M. W. 2011: Molecular phylogenetics of the Juno irises, *Iris* subgenus *Scorpiris* (Iridaceae), based on six plastid markers. - *Botanical Journal of the Linnean Society*, 167: 281-300.
- IPNI. 2023: International Plant Names Index. Kew: The Royal Botanic Gardens; Harvard University Herbaria; Libraries and Australian National Botanic Gardens. URL: <http://www.ipni.org/> (Accessed 10 July 2024).
- Kamelin, R. V. 1973: Florogenetic analysis of the natural flora of Mountainous Central Asia, Nauka Press, Leningrad (in Russian): 353.
- Khassanov, F. O. 1987: Kserofilnaya derevesno-kustarnikovaya rastitelnost Kuhitangtau. PhD, Institute of Botany ASR, Tashkent, 20 pp. (In Russian).
- Khassanov, F. O., Khuzhanazarov, U., Rakhimova, N., Esankulov, A., Achilova, N. 2013: Two new species of *Iris* L. (Iridaceae Juss.) from Uzbekistan. - *Stapfia*, 99: 205-207.
- Khassanov, F. O., Rakhimova, N., Achilova, N. 2014: One more new species of *Iris* L. from Uzbekistan. - *Stapfia*, 101: 19-20.
- Khassanov, F. O., Rakhimova, N. 2012: Taxonomic revision of the genus *Iris* L. (Iridaceae Juss.) for the flora of Central Asia. - *Stapfia*, 97: 174-179.
- Khassanov, F. O., Kodyrov, U. H., Myrzagaliyeva A. 2018: A new species of genus *Codonopsis* Wall. (Campanulaceae) from Middle Asia. - *Iranian Journal of Botany*, 24 (2): 119-123.
- Khassanov, F. O. (Eds.). 2019: The Red data book of the Republic of Uzbekistan. Vol: 2. Chinor ENK Press, Tashkent (in Russian), pp. 77-82.
- Levichev, I. G., Beshko, N. Yu., Kurbaniyazova, G. T., Turginov, O. T., Tajetdinova, D. M. 2023: New findings of species of the genus *Gagea* in Uzbekistan (in russ.). - *Turczaninowia*, 26 (3): 184-193.
- Nevski, S. A. 1937: Materiali k flore Kuhitanga i ego predgoriy. - *Trudi BIN AN SSSR*, 4: 199-346 (in Russian).
- POWO. 2023: Plants of the World Online. Kew: Facilitated by the Royal Botanic Gardens. URL: <http://www.plantsoftheworldonline.org> (Accessed 10 July 2024).
- Sennikov, A., Khassanov, F., Ortikov, E., Kurbonaliyeva, M., Tojibaev, K. 2023: The genus *Iris* L. s. l. (Iridaceae) in the Mountains of Central Asia biodiversity hotspot. - *Plant Diversity of Central Asia*, 2 (1): 1-104.
- Tajetdinova, D. M. 2023: Grid mapping of distribution of the species of *Artemisia* in Kuhitang botanical-geographical region. - *Botany and botanists in a changing world [Electronic edition]: Proceedings of the International Scientific Conference dedicated to the 135th anniversary of the Department of Botany and the 145th anniversary of Tomsk State University, Tomsk, Russia*, pp. 162-164.
- Tajetdinova, D. M. 2024a: The grid mapping of the species of Poaceae in Kunitang botanical-geographical region. - *Proceedings of the International Conference on Plant biology and Biotechnology (ICPBB 2024)*, Almaty, Kazakhstan, pp. 15.
- Tajetdinova, D. M. 2024b: The grid mapping of the species of Asteraceae in fl ora of Kuhitang botanical-geographical region. - *Problems of Botany of South Siberia and Mongolia*, 1:71-84.
- Tojibaev, K. Sh., Beshko, N. Yu., Popov, V. A. 2016.: Botanical-geographical regionalization of Uzbekistan. - *Journal of Botany*, 101(10):1105-1132.
- Tojibaev, K. Sh., Khassanov, F. O., Turginov, O. T., Akbarov, F., Pulatov, S. A. 2022: Endemic plant species richness of Surkhondaryo province, Uzbekistan. - *Plant Diversity of Central Asia*, 1:71-84.
- Vvedensky, A. I., Cherneva, O. V. 1971: Iridaceae. In: Kovalaevskaia, S.S. (Eds.), *Conspectus Florae Asiae Mediae*. Vol: 2. UzAS URSS Press, Tashkent, pp. 122-141 (in Russian).
- Vvedensky, A. I. 1941: Iridaceae. In: Schreder, R. R., Kudrjashev, S.N. (Ed.). *Flora Uzbekistanica*. Vol: I. 1st ed. UzAS URSS Press, Tashkent, pp. 502-522 (in Russian).