

The nomenclatural history of *Iris orchioides* (Iridaceae)

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The protologue of *Iris orchioides* described and illustrated a juno iris of uncertain provenance, which was characterised by an elongated stem, glossy green leaves which were not prominently folded, and yellow flowers with unwinged claws of the outer tepals. When the native juno irises of Central Asia had been taxonomically classified, the name *I. orchioides* was misapplied to a species of the Western Tian-Shan with an abbreviated stem, dark green folded leaves and flowers with winged claws. We demonstrate that this species name was originally applied to a plant currently named as *I. bucharica*, which was collected by N. Maev in 1875 in the Hissar District, Emirate of Bukhara (now Tajikistan), and its current application is maintained due to the erroneous epitypification. *Iris orchioides* and *I. bucharica* are mapped for the first time, and the route of the Hissar Expedition in 1875 is traced and mapped.

Introduction

Irises are among the most popular ornamental plants in the world, widely attracting common people and specialised plant collectors due to their spectacular flowers. *Iris* sect. *Juno* (Tratt.) Maxim. is a monophyletic group of bulbous irises (Ikinci et al. 2011; Mavrodiev et al. 2014), whose diversity is centred in South-Western and Central Asia (Crespo et al. 2015). Recent estimations believe that as many as 70 species can be accepted in this group worldwide (Crespo et al. 2018).

Due to the compact growth and beauty of juno irises, this group quickly gained recognition among horticulturalists. In recognition of the species diversity of juno irises, plant enthusiasts sometimes were ahead of taxonomic experts. During the 1870s, in the beginning of the botan-

ical exploration of the mountainous Central Asia (Tian-Shan and Pamir), only a single species of this group was recognised due to the broad taxonomic concept held by early monographers (Baker 1876; Maximowicz 1880), whereas its current diversity, with the latest additions and corrections (Vvedensky 1971; Rukšāns 2007; Khassanov & Rakhimova 2012; Khassanov et al. 2013, 2014; Lazkov & Naumenko 2014; Tojibaev & Turginov 2014; Tojibaev et al. 2014; Lazkov & Sennikov 2017), may reach 32 species in that region. On the opposite, new species descriptions based on the material from commercial nurseries and private gardens of botanical enthusiasts immediately emerged when Central Asian plants had been encountered in cultivation (Carrière 1880; Foster 1899, 1901, 1902). The fragmental character of such early studies, the paucity of these original

descriptions, and the virtual absence of any original material outside the protologues led to extensive difficulties in the interpretation of those species names in emerging taxonomic revisions (Vvedensky 1935, 1971).

Recent phylogenetic studies of the juno irises (Ikinci et al. 2011) demonstrated that the Central Asian species group represents a separate evolutionary branch, which is only distantly related to the Western Asian and Caucasian groups. The taxonomic understanding of this group has always been difficult, and the latest comprehensive revision (Vvedensky 1971) was still considered provisional due to the incomplete knowledge on the variability and taxonomic assignment of many populations (e.g. Lazkov & Sennikov 2017).

The nomenclature of Central Asian species of juno irises has been recently overviewed by Boltenkov (2016), who routinely provided lecto- or neotypifications for each species name. In doing so, he paid little attention to the history of the species names and the diagnostic characters involved. Most notably, Boltenkov had not realised that his epitype of *Iris orchioides* Carrière, the earliest species name for juno irises in Central Asia, widely differs from the plants described in the protologue (Carrière 1880).

Our present study aims to resolve the longstanding confusion surrounding the taxonomic application of *Iris orchioides*, its geographic origin, and the history of its discovery. This paper contributes to the Flora of Uzbekistan Project (Sennikov et al. 2016).

Material and methods

Two species were examined in detail, *Iris orchioides* and *I. bucharica* Foster, which were involved in the confusion. Plant morphology (diagnostic characters and their variability) was studied and described in living populations and herbarium collections using the taxonomy developed by Vvedensky (1935, 1941, 1963, 1971).

The protologue of *Iris orchioides* (Carrière 1880) was scrutinised for diagnostic characters. The contemporary gardener's literature was screened for further details on the early cultivation of juno irises in Europe. The history of the botanical exploration in Central Asia and herbar-

ium collections from that territory was consulted from Lipsky (1903, 1905). The route of the Hissar expedition was traced from Maev (1879).

The historical collections from Central Asia were studied at LE. Species distributions were mapped using the herbarium collections of FRU, LE, MW and TASH, published herbarium records from Vvedensky (1963) and Wendelbo & Mathew (1975), and documented field observations on Plantarium (www.plantarium.ru) and iNaturalist (www.inaturalist.org). The resulting dataset was made available through GBIF (Sennikov et al. 2021).

Taxonomy and morphology

Despite the great interest to juno irises in taxonomic and horticultural literature, their identification has been much obscured by taxonomic confusions, resulting from the similar morphology of their vegetative body and the difficulties in preservation of their floral parts. In his classical works on juno irises in Central Asia, Vvedensky (1935, 1941, 1963, 1971) recommended to establish the taxonomic identity of their populations on the basis of living plants and field observations because herbarium collections may be unreliable. Another difficulty comes from imprecisely circumscribed distribution areas; most of the species in Central Asia have never been mapped, with very few exceptions (Lazkov et al. 2014; Lazkov & Sennikov 2017).

Iris orchioides, as currently understood (Vvedensky 1971; Tojibaev et al. 2020), is widely distributed in the Tian-Shan (Fig. 1), occurring in Kazakhstan (Pavlov & Poliakov 1958), Kyrgyzstan (Nikitina 1951), Tajikistan (Vvedensky 1963) and Uzbekistan (Vvedensky 1941). It is characterised by rigid, falcate, folded leaves with completely indistinct internodes; the leaves are dark green above with a conspicuous white margin. The flower colouring is white and yellow, the background tone being most commonly pale yellow (varying from pure white to bright yellow); outer tepals (falls) with a broadly winged claw, blade expanded, crest finely dissected, surrounded by a golden-yellow spot with a few faint violet veins; inner tepals minute. The most similar species, *I. maracandica* (Vved.) Weldelbo, is dis-

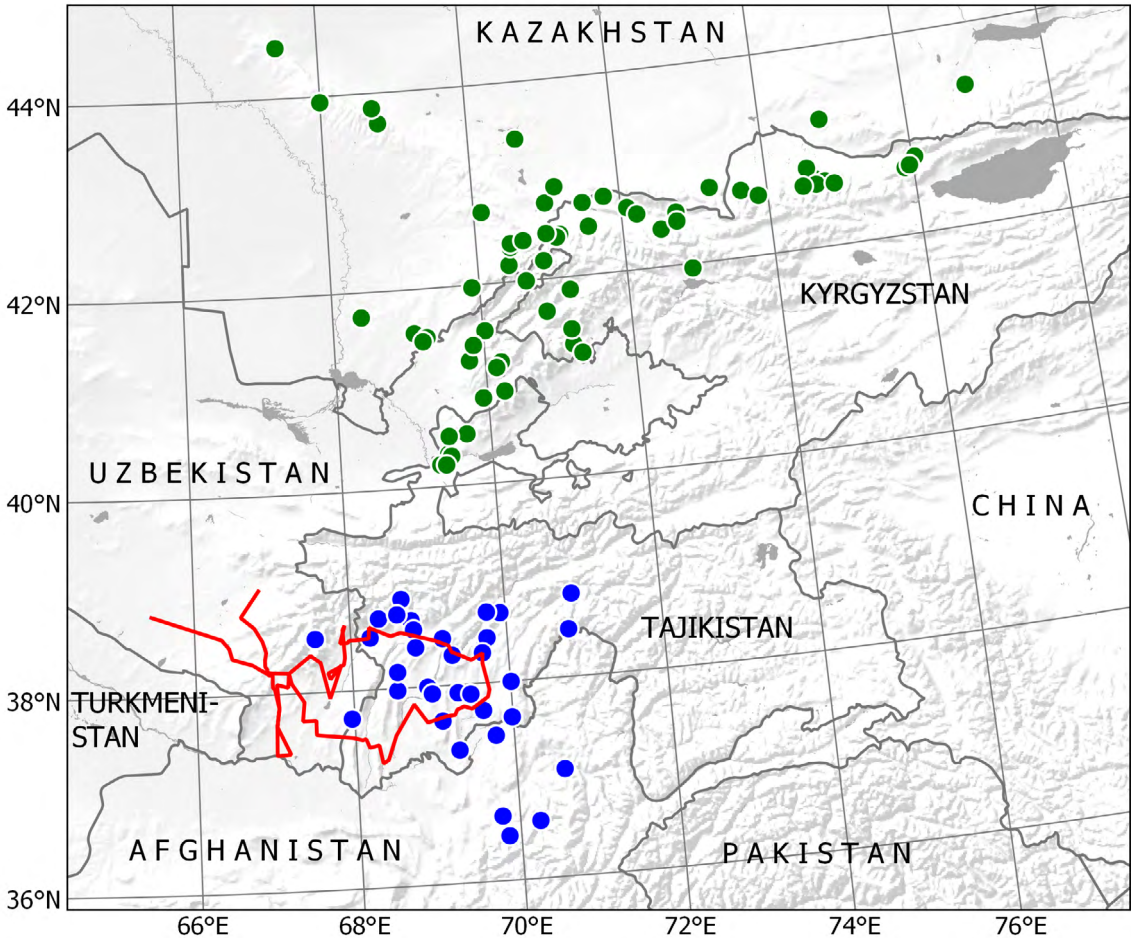


Fig. 1. Distribution areas of *Iris orchioides* sensu Vved. (●) and *I. bucharica* sensu Vved. (●), and the route of the Hissar expedition in 1875 (red line).

tributed in the Nuratau Mts. and Turkestan Range and differs primarily in the entire crest (Vvedensky 1971; Lazkov & Sennikov 2015). Another similar species, *I. tubergeniana* Foster, occupies a narrow area in the Western Tian-Shan and is completely sympatric with *I. orchioides*, being different from the latter in a bright yellow background tone of the flowers (often with a slight tinge of green), outer tepals without a distinct spot but with more prominent violet veins on the blade, and a narrowly winged claw (Foster 1899; Vvedensky 1971).

The distribution of *Iris bucharica* is confined to the south-western part of the Pamir, between the Hissar Valley in the north and the Kokcha River in the south (Fig. 1), occurring in Afghanistan (Wendelbo & Mathew 1975), Tajikistan (Vve-

densky 1963), Turkmenistan (Nikitin & Geldyhanov 1988) and Uzbekistan (Vvedensky 1941). This is a taller plant with a distinct stem and conspicuous internodes. Its leaves are not rigid, flat but much twisted, bright green above, with indistinct white margin. The flower colouring as in *I. orchioides*; outer tepals (falls) with a linear claw, blade expanded, nearly completely golden-yellow, crest entire, with prominent violet veins around; inner tepals minute. In Central Asia, two plants pass under this name, with white and yellow flower colour or with yellow to golden flower colour (Vvedensky 1935, 1971). Two similar species with unwinged claws occur in the same area, *I. vicaria* (Vved.) T.Hall & Seisums with pale violet flowers and *I. warleyensis* Foster with dark violet flowers (Vvedensky 1971). Two more

species, *I. magnifica* Vved. (Turkestan Range, Uzbekistan) and *I. graeberiana* Sealy (Western Tian-Shan, Kyrgyzstan), are similar to *I. bucharica* in their vegetative parts but differ in the blue background tone of their flowers and winged claws of the outer tepals (Vvedensky 1971; Lazkov et al. 2014).

Iris orchiooides and *I. bucharica* are immediately distinct in the habit (internodes short vs. elongated), foliage (leaves dark and folded vs. bright and flat), claws (winged or not), and colour of the outer tepals (shape of the dark spot, tone of violet veins) (Fig. 2).

Protologue of *Iris orchiooides*

The protologue of *Iris orchiooides* (Carrière 1880) was very short and consisted of introductory notes, an extremely brief description and a drawing.

Diagnostic characters included the stem with long internodes and distichous foliage and lateral branches, which make it looking like a *Tradescantia* or an orchid (illustrated), leaves very long ("très-longuement"), much twisted (illustrated) and shiny green ("vert luisant") above, and flowers greenish-yellow ("vert jaunâtre"). The flow-

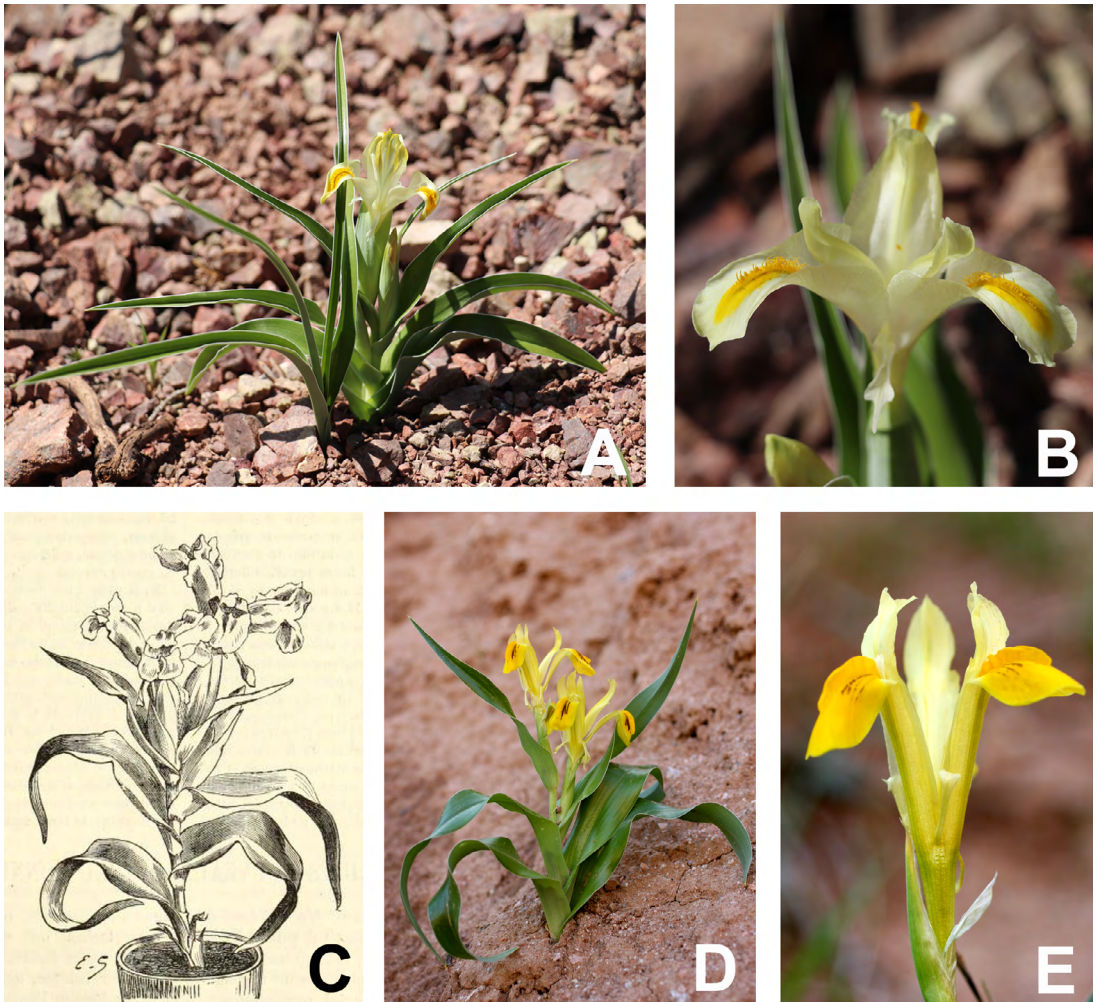


Fig. 2. Morphological comparisons of *Iris orchiooides* sensu Vved. and *I. bucharica* sensu Vved. A, Habit of *I. orchiooides*, with an abbreviated stem and rigid, falcate, folded leaves; B, Flower of *I. orchiooides*, with prominently winged claws and dissected crests; C, Original illustration of *I. orchiooides* (Carrière 1880); D, Habit of *I. bucharica*, with an elongated stem and flat but twisted leaves; E, Flower of *I. bucharica*, with unwinged claws and entire crests. — Photos: A, B © N.Yu. Beshko (Chimgan, 26 April 2021); D, E © E.A. Davkaev (Luchob, 21 April 2011).

er description was practically lacking in the protologue, leaving room for ambiguous interpretations. Carrière's comparison of the flower shape with that of *Iris xiphioides* Ehrh. (= *I. latifolia* (Mill.) Voss) was interpreted as an evidence of winged claws (Hedge & Wendelbo 1972); however, such wings cannot be seen in the picture and no yellow-flowered species of juno irises with taller stems and winged claws has been found in Central Asia (Vvedensky 1971). Besides, the crest on the outer tepals was clearly depicted as entire rather than dissected.

Among the Central Asian species of juno irises, these characters undoubtedly indicate *Iris bucharica*, whereas *I. orchioides* in its current sense is immediately ruled out due to the different habit, shape and colour of leaves, and floral details.

Provenance of *Iris orchioides*

The provenance of *Iris orchioides* was reportedly Asiatic, without a further specification. It was described from a private garden of Alexandre Godfroy-Lebeuf at Argenteuil near Paris, France (Carrière 1880). However, shortly later (in April of 1881), Maximilian Leichtlin, a prominent plant enthusiast from Baden-Baden, Germany (Nagy 1884), reported the discovery of a new species of *Iris* from "Bokhara", which was characterised by "deep golden-yellow flowers which are produced in numbers in the leaf notches along the main stem" (Leichtlin 1881a). This was a clear allusion on the same plant as described by Carrière, which had probably not been noticed by Leichtlin at that time.

Leichtlin promised to the readers that the species is new and "will shortly be named by the writer of the Turkestan flora". That "writer" was apparently Eduard Regel, Director of the Imperial Botanical Garden in Saint-Petersburg, who described dozens of new species of vascular plants from Central Asia on the basis of living and dried collections of the Garden; Regel (1884) reported that a number of living bulbous plants were received in Saint-Petersburg from Leichtlin in 1882. In confirmation of this conclusion, we found a fragment specimen at LE, which was sent by Leichtlin to Saint-Petersburg in March 1882 as "*Iris orchioides*" collected in "Buchará". As evi-

dent from the handwritten annotation, the specimen was preserved in the Garden and passed to Karl Maximowicz, who treated *Iris* in Regel's work (Maximowicz 1879). Its characters and provenance agree with those of *I. bucharica*.

Before 1880, most of the Russian botanical expeditions in Central Asia actively explored the Tian-Shan. The expeditions made by two main correspondents of the Saint-Petersburg Botanical Garden, Alexei M. Fetissoff and Albert Regel, were concentrated on the Northern Tian-Shan (including Kulja, a previously unexplored territory in Chinese Turkestan that was occupied by Russia at that time) and did not approach Bukhara (Lipsky 1903). No herbarium specimens of *Iris bucharica* were delivered to LE by other collectors, either (Maximowicz 1880). This means that the bulbs of *I. bucharica* cultivated in Europe were unknown in Saint-Petersburg at that time.

According to contemporary evidence (e.g. short notes in *Der Obstgarten* 3(6): 70. 20 Feb 1881), in the late 1870s, seeds and bulbs from Central Asia were distributed to Leichtlin from Berlin and sourced from Karl Koopmann, then Director of Experimental Station for Forestry, Fruit and Wine Culture in Margelan, Fergana Region, Russian Turkestan. At that time, the distribution area of *Iris bucharica* (the real identity of "*I. orchioides*") north of the Panj River belonged to the Emirate of Bukhara, which was very recently conquered by the Russian Empire to become its protectorate. By the agreement made in 1873, Bukhara retained its government and traditional laws but lost its political independence and admitted Russian activities in its territory.

Only one expedition explored the mountainous Bukhara to deliver living specimens of spring flowers before 1879, i.e. the beginning of the cultivation of "*Iris orchioides*" in Europe. In 1875 (24 April – 13 June), the first Hissar expedition was organised by the Governor-General of Turkestan, K.P. von Kaufmann, and headed by military geographer Nikolai A. Maev, then the editor of the weekly official newspaper *Turkestanskije Vedomosti*. The expedition was tasked with the first geographical survey of the Hissar District, which was completely unknown to the Europeans at that time. Maev was interested in the local history and geography, and collected specimens of animals and plants; one plant species (*Acan-*

tholimon maewianum Regel) was named in his honour on the basis of his specimens delivered from the Hissar expedition (Regel 1879). Maev was not a botanist and therefore made no regular floristic exploration; nevertheless, he admired colourful flowers (Maev 1879), was interested in horticulture and introduced a number of new plants to ornamental cultivation in Tashkent (Lipschitz 1952). During the expedition, Maev visited a large part of the distribution area of *I. bucharica* and had an opportunity to collect its bulbs in many places: e.g. along the Hisor Valley, the Kafirnigan or Kyzyl-Suu rivers (Fig. 1).

The Hissar expedition was omitted from the history of the early botanical exploration of Central Asia (Lipsky 1903), probably due to the paucity of its herbarium collections delivered to the Imperial Botanical Garden in Saint-Petersburg (Lipsky 1905). Maev was more inclined towards a garden use of the plants; for example, another spectacular species seems to have been originally introduced to Europe with the material from the same expedition – *Allium stipitatum* Regel, whose bulbs were also imported in 1879 from "Bucharra" (Leichtlin 1881b) before its formal taxonomic description was published on the basis of herbarium specimens in Saint-Petersburg (Regel 1880).

Taxonomic interpretations

In early works, *Iris orchioides* was uniformly interpreted as a robust plant with long glossy leaves and unwinged claws of the outer tepals (Baker 1890; Foster 1892; Dykes 1913). Dykes (1913) correctly circumscribed its distribution area as the Hissar District and cited correctly identified historical specimens, which belong to *I. bucharica* as currently understood.

The first plants of "*Iris orchioides*" cultivated in Europe and described by Carrière (1880) belonged to a colour variant of *I. bucharica* with a bright yellow background tone of the flowers. When another variant of this species, with a white to very pale yellow background tone of the flowers, had reached Europe from the Surxob River in the Hissar District, it was immediately distinguished from the original *I. orchioides* and described as *I. bucharica* (Foster 1902; Dykes

1913). This apparent difference in the flower colouration led to their separation as two species before Wendelbo & Mathew (1975) merged the two variants into a single species. This taxonomic issue is dealt with elsewhere (Sennikov et al. 2022).

Fedtschenko (1902) was the first to apply the name *Iris orchioides* to plants collected in the wild. However, she provided no taxonomic opinion, and her plants were later described as *I. magnifica* (Vvedensky 1935). In the first revision of *Iris* in Central Asia, Fedtschenko & Fedtschenko (1905) included *I. bucharica* in the broadly defined *I. orchioides*. Fedtschenko (1909, 1915) interpreted *I. orchioides* as plants with a tall stem and yellow flowers but with winged claws, indicating its distribution in the Western Tian-Shan and the Pamir-Alay. In this interpretation, the exact application of the species name became uncertain but the mention of winged claws opposed the species to *I. bucharica* and laid the basis for its further misinterpretations.

Vvedensky (1935, 1941, 1963, 1971) had a precise species concept which was largely based on field observations. He applied the name *Iris orchioides* to the species of the Tian-Shan with abbreviated stems and yellow-blotched flowers with broadly winged claws, and this interpretation became broadly accepted (e.g. Wendelbo & Mathew 1975). After the influential works of Vvedensky, the early understanding of *I. orchioides* as the yellow-flowered *I. bucharica* was considered misapplication (e.g. Species Group of the British Iris Society 1997).

Current nomenclature

Vvedensky (1935) indicated that *Iris orchioides* was described from Darbaza Village near Tashkent (now in Turkestan Region, Kazakhstan) and its type is kept at Tashkent (present-day TASH). This statement reflects Vvedensky's personal observations of the species in the field and stands for a surrogate type designation (corresponding to neotypification of our times). However, the type specimen was not cited by Vvedensky and his presumed neotypification cannot be effective in the presence of at least one original element that is eligible for lectotypification, i.e. a drawing published in the protologue.

The herbarium collections of Elie-Abel Carrière are unknown and probably have never been systematically preserved (Williams 2004). Boltenkov (2016) designated the drawing in the protologue as the lectotype of *Iris orchioides*. Since the drawing portrayed a potted plant alive, with its underground parts hidden in the soil, he designated the intended "neotype" of Vvedensky (1935) as an epitype solely in order to cover the underground parts. In doing so, Boltenkov (2016) followed the taxonomic concept shaped by Vvedensky (1935) but neglected the apparent mismatch in a number of diagnostic characters which can be seen in the lectotype drawing (referable to *I. bucharica*) and the epitype specimen (referable to *I. orchioides* sensu Vved.).

Our analysis demonstrated that the name *Iris orchioides* has been taxonomically misapplied for 85 years, when the protologue was misinterpreted and the name was consistently used in a sense different from the designated lectotype. In this case, conservation of the species name is required under Art. 57.1 (Turland et al. 2018). Nevertheless, due to the taxonomic mismatch between the epitype and the lectotype it supports, the species name may be applied in the sense of the epitype under Art. 9.20, until the logical conflict in the nomenclatural rules is resolved (Mazumdar et al. 2020).

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References

- Baker, J.G. 1876: A synopsis of the known species of *Iris*, IV. — *Gard. Chron.*, ser. 2, 5: 692.
- Baker, J.G. 1890: *Iris orchioides*. — *Curtis's Bot. Mag.* 116: Tab. 7111.
- Boltenkov, E.V. 2016: Typification and nomenclatural notes on twenty eight names of *Juno* irises (Iridaceae) from Central and South Asia. — *Phytotaxa* 260: 223–234. doi.org/10.11646/phytotaxa.260.3.2
- Carrière, É.A. 1880: *Iris orchioides*. — *Rev. Hort.* 52: 337.
- Crespo, M.B., Martínez-Azorín, M. & Mavrodiev, E.V. 2015: Can a rainbow consist of a single colour? A new comprehensive generic arrangement of the 'Iris sensu latissimo' clade (Iridaceae), congruent with morphology and molecular data. — *Phytotaxa* 232: 1–78. doi.org/10.11646/phytotaxa.232.1.1
- Crespo, M.B., Martínez-Azorín, M. & Mavrodiev, E.V. 2018: Notes on taxonomy and nomenclature of *Juno* irises (*Juno*, Iridaceae). — *Phytotaxa* 376: 185–200. doi.org/10.11646/phytotaxa.376.4.4
- Dykes, W.R. 1913: The genus *Iris*. — Cambridge University Press, Cambridge.
- Fedtschenko, B.A. 1915: The plants of Turkestan. — General Administration of Land Use and Agriculture, Petrograd. (In Russian).
- Fedtschenko, O.A. 1902: List of plants collected in Turkestan in 1869, 1870 and 1871. — *Izv. Imp. Obshch. Lyubit. Estestv. Moskovsk. Univ.* 103: 1–183. (In Russian).
- Fedtschenko, O.A. 1909: Identification key to the species of *Iris* in Turkestan. — *Russk. Bot. Zhurn.* 1909: 73–79. (In Russian).
- Fedtschenko, O.A. & Fedtschenko, B.A. 1905: Iridaceae of the Russian Turkestan. — *Izv. Imp. S.-Peterburgsk. Bot. Sada* 5: 153–162. (In Russian).
- Foster, M. 1892: Bulbous irises. — Royal Horticultural Society, London.
- Foster, M. 1899: *Iris Tubergeniana*, sp. n. — *Gard. Chron.*, ser. 3, 25: 225–226.
- Foster, M. 1901: *Iris willmottiana*. — *Gard. Chron.*, ser. 3, 29: 261–262.
- Foster, M. 1902: New irises. — *Gard. Chron.*, ser. 3, 31: 385–387.
- Hedge, I. & Wendelbo, P. 1972: Studies in the flora of Afghanistan XIII: Various new taxa and records. — *Notes Roy. Bot. Gard. Edinburgh* 31: 331–350.
- Ikin, N., Hall, T., Lledó, M.D., Clarkson, J.J., Tillie, N., Seisums, A., Saito, T., Harley, M. & Chase, M.W. 2011: Molecular phylogenetics of the *Juno* irises, *Iris* subgenus *Scorpiris* (Iridaceae), based on six plastid markers. — *Bot. J. Linn. Soc.* 167: 281–300. doi.org/10.1111/j.1095-8339.2011.01176.x
- 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., 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: A new species of *Iris* from Uzbekistan. — *Stapfia* 101: 19–20.
- Lazkov, G.A. & Naumenko, A.N. 2014: A new species of *Juno* Tratt. (Iridaceae) from Kyrgyzstan. — *Turczanianowia* 17: 32–34.
- Lazkov, G.A. & Sennikov, A.N. 2015: Taxonomic corrections and new records in vascular plants of Kyrgyzstan, 4. — *Memoranda Soc. Fauna Fl. Fenn.* 91: 67–83.
- Lazkov, G.A. & Sennikov, A.N. 2017: Taxonomy of two blue-flowered *Juno* Irises (*Iris* subgen. *Scorpiris*, Iridaceae) from the Western Tian-Shan. — *Ann. Bot. Fenn.* 54: 297–305. doi.org/10.5735/085.054.0613
- Lazkov, G.A., Sennikov, A.N., Koichubekova, G.A. & Naumenko, A.N. 2014: Taxonomic corrections and new records in vascular plants of Kyrgyzstan, 3. — *Memoranda Soc. Fauna Fl. Fenn.* 90: 91–110.
- Leichtlin, M. 1881a: Spring flowers at Baden-Baden. — *The Garden* 19: 344.
- Leichtlin, M. 1881b: The new Bokhara *Allium*. — *Gard. Chron.*, ser. 2, 16: 50.
- Lipschitz, S.Y. 1952: Russian botanists (botanists of Russia and USSR), vol. 5. — Moscow Society of Naturalists, Moscow. (In Russian).
- Lipsky, V.I. 1903: Flora of Central Asia, i.e. Russian Turkestan and the khanates of Bukhara and Khiva, 2. The history of the botani-

- cal exploration of Central Asia. — Trudy Tiflis. Bot. Sada 7: 249–337. (In Russian).
- Lipsky, V.I. 1905: Flora of Central Asia, i.e. Russian Turkestan and the khanates of Bukhara and Khiva, 3. Botanical collections from Central Asia. — Trudy Tiflis. Bot. Sada 7: 339–841. (In Russian).
- Maev, N.A. 1879: Essays on the Hissar District. In: Maev, N.A. (ed.), Materials for the statistics of the Turkestan Region, vol. 5. — Turkestan Statistic Committee, pp. 130–255. (In Russian).
- Maximowicz, C.J. 1879: Iridaceae. In: Regel, E., Descriptiones plantarum novarum et minus cognitarum, VII. — Trudy Imp. S.-Peterburgsk. Bot. Sada 6(2): 494–498.
- Maximowicz, C.J. 1880: Diagnoses de plantes nouvelles de l'Asie, III. — Bull. Acad. Imp. Sci. Saint-Petersbourg, sér. 3, 26: 420–542.
- Mavrodiev, E.V., Martínez-Azorin, M., Dranishnikov, P. & Crespo, M.B. 2014: At least 23 genera instead of one: The case of *Iris* L. s.l. (Iridaceae). — PLOS One 9(8): e106459. doi.org/10.1371/journal.pone.0106459
- Mazumdar, J., Bandyopadhyay, S. & Bhattacharjee, A. 2020: Proposal to amend Article 9.20. — Taxon 69: 631. doi.org/10.1002/tax.12253
- Nagy, L. von 1884: Der Leichtlin'sche Garten. — Garten-Zeitung 3: 109–111.
- Nikitin, V.V. & Geldykanov, A.M. 1988: Manual of vascular plants of Turkmenistan. — Science Publishers, Leningrad. (In Russian).
- Nikitina, E.V. 1951: Iridaceae. In: Vvedensky, A.I. (ed.), Flora of the Kirghiz SSR, vol. 3. — Kirghiz Branch of the Academy of Sciences of the USSR, Frunze, pp. 124–133. (In Russian).
- Pavlov, N.V. & Poliakov, P.P. 1958: Juno Tratt. In: Pavlov, N.V. (ed.), Flora of Kazakhstan, vol. 2. — Academy of Sciences of the Kazakh SSR, Alma-Ata, 247–252 pp. (In Russian).
- Regel, E. 1879: Descriptiones plantarum novarum et minus cognitarum, VII. — Trudy Imp. S.-Peterburgsk. Bot. Sada 6(2): 287–538.
- Regel, E. 1880: Descriptiones plantarum novarum et minus cognitarum, VIII. — Trudy Imp. S.-Peterburgsk. Bot. Sada 7(2): 541–690.
- Regel, E. 1884: An extract from the annual report of the Imperial Botanical Garden in Saint-Petersburg, 1882. — Trudy Imp. S.-Peterburgsk. Bot. Sada 8(3): 577–591. (In Russian).
- Ruksäns, J. 2007: Buried treasures: Finding and growing the world's choicest bulbs. — Timber Press.
- Sennikov, A.N., Tojibaev, K.S., Khassanov, F.O. & Beshko, N.Y. 2016: The Flora of Uzbekistan Project. — Phytotaxa 282: 107–118. doi.org/10.11646/phytotaxa.282.2.2
- Sennikov, A.N., Lazkov, G.A. & Khassanov, F.O. 2021: Distribution of Juno irises in Central Asia. — Komarov Botanical Institute. Occurrence dataset doi.org/10.15468/k4rncn accessed via GBIF.org on 2021-10-10.
- Sennikov, A.N., Khassanov, F.O. & Pulatov, S.O. 2022: *Iris bucharica* (Iridaceae): A century of confusion is resolved with the description of *I. chrysopetala*, a new species from southern Central Asia. — Memoranda Soc. Fauna Fl. Fenn. 98: 9–20.
- Species Group of the British Iris Society 1997: A guide to species irises: Their identification and cultivation. — Cambridge University Press, Cambridge.
- Tojibaev, K.S. & Turgunov, O. 2014: A new species and a new combination of *Iris* subgenus *Scorpiris* (Iridaceae) from Central Asia (Hissar Range, Pamir-Alai). — Phytotaxa 158: 224–228. doi.org/10.11646/phytotaxa.158.3.2
- Tojibaev, K.S., Karimov, F.I. & Turgunov, M.D. 2014: A new species of the genus *Iris* L. (Iridaceae Juss.) from the Ferghana Valley. — Turczaninowia 17: 12–16. (In Russian).
- Tojibaev, K.S., Jang, C.G., Lazkov, G.A., Chang, K.S., Sitpayeva, G.T., Safarov, N., Beshko, N.Y., Muktabayeva, S.K., Vesselova, P.V., Turakulov, I., Abdurakhmanova, Y.Y., Na, N.R., Park, M.S., Choi, K., Choi, H.J., Oh, B.U. & Oh, S.H. 2020: An annotated checklist of endemic vascular plants of the Tian-Shan Mountains in Central Asian countries. — Phytotaxa 464: 117–158. doi.org/10.11646/phytotaxa.464.2.1
- Turland, N.J., Wiersma, J.H., Barrie, F.R., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Kusber, W.-H., Li, D.-Z., Marhold, K., May, T.W., McNeill, J., Monro, A.M., Prado, J., Price, M.J. & Smith, G.F. (eds.) 2018: International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159. — Koeltz Botanical Books. doi.org/10.12705/Code2018
- Vvedensky, A.I. 1935: *Iris* sect. *Juno*. In: Komarov, V.L. (ed.), Flora of the USSR, vol. 4. — Academy of Sciences of the USSR, Moscow & Leningrad, 557–576 pp. (In Russian).
- Vvedensky, A.I. 1941: *Juno* Tratt. In: Kudriashev, S.N. (ed.), Flora of Uzbekistan, vol. 1. — Uzbek Branch of the Academy of Sciences of the USSR, Tashkent, 512–520 pp. (In Russian).
- Vvedensky, A.I. 1963: *Juno* Tratt. In: Ovchinnikov, P.N. (ed.), Flora of the Tajik SSR, vol. 2. — Academy of Sciences of the USSR, Leningrad, 384–394 & 425–426 pp. (In Russian).
- Vvedensky, A.I. 1971: *Juno* Tratt. In: Vvedensky, A.I. & Kovalevskaya, S.S. (eds.), Conspectus Florae Asiae Mediae, vol. 2. — Science Publishers, Tashkent, 132–139 & 321–323 pp. (In Russian).
- Wendelbo, P. & Mathew, B. 1975: Iridaceae. In: Rechinger, K.H. (ed.), Flora Iranica, vol. 112. — Akademische Druck- und Verlagsanstalt, Graz, 1–79 pp.
- Williams, R.L. 2004: An intellectual biography of Elie-Abel Carrière (1818–1896). — Brittonia 56: 365–374. www.jstor.org/stable/3218360