

Research article

Taxonomic revision of the *Allium filidens* group (Amaryllidaceae) in Kyrgyzstan

Alexander N. Sennikov¹✉ and Georgy A. Lazkov^{2,3}

¹Botanical Museum, Finnish Museum of Natural History, University of Helsinki, Finland

²Institute of Biology, Academy of Sciences of Kyrgyzstan, Bishkek, Kyrgyzstan

³Research Centre for Ecology and Environment of Central Asia, Bishkek, Kyrgyzstan

Correspondence: Alexander N. Sennikov (alexander.sennikov@helsinki.fi)

Nordic Journal of Botany

2023: e04050

doi: [10.1111/njb.04050](https://doi.org/10.1111/njb.04050)

Subject Editor: Torbjörn Tyler

Editor-in-Chief: Torbjörn Tyler

Accepted 14 June 2023

Published 1 August 2023



On the basis of herbarium specimens and documented observations, the taxonomic confusion around *Allium filidens* s.l. (including *A. filidentiforme*) in Kyrgyzstan is resolved. The species status of *A. filidentiforme* is confirmed, and this species is classified in *A.* subsect. *Crystallina*, comb. nov. In Central Asia, the *A. filidens* group (*A.* subsect. *Filidentia*) includes species with whitish perianth colours (*A. filidens* s.str., *A. karakense*, *A. ugami*) and greenish perianth colours (*A. mogianense*, *A. valentinae*). The occurrence of *A. filidens* s.str. in Kyrgyzstan is confirmed. *Allium valentinae* is reported as new to Kyrgyzstan. The nomenclature of *A. filidens* is clarified, and its neotype is designated. The complete distributions of *A. filidens*, *A. filidentiforme*, *A. mogianense*, *A. ugami* and *A. valentinae* are mapped.

Keywords: Central Asia, mapping, nomenclature, onion, taxonomy, vascular plants

Introduction

The genus *Allium* L. (Amaryllidaceae) is one of the most species-rich and taxonomically complicated genera in the World, with 1063 species currently accepted (POWO 2023). Its distribution is largely Holarctic, with the majority of species occurring in Eurasia and North America, with some taxa in the Mediterranean Africa and the Cape Floristic Region (Friesen et al. 2006, POWO 2023). Its global phylogenetic framework was provided by Friesen et al. (2006), who circumscribed 15 monophyletic subgenera and many sections.

Allium is extraordinarily species-rich in Central Asia, being represented by 262 species (Khassanov and Yusupov 2022). Kyrgyzstan hosts a large proportion of this diversity; its most recent checklist (Lazkov and Sultanova 2014) listed 87 species. The taxonomic classification of *Allium* in Central Asia is still far from being complete, especially in regard of the circumscription of sections (Khassanov and Yusupov 2022).

In the latest decade, *Allium* studies have seen significant progress in Central Asia, with a growing knowledge of the species diversity and distribution in Kyrgyzstan. The



www.nordicbotany.org

most significant contributions were a comprehensive inventory of the genus in Uzbekistan (Khassanov 2017), a phylogeny-based revision of the *Allium saxatile* group (Seregin et al. 2015), and morphology-based descriptions of new species (Sennikov and Lazkov 2013, Khassanov 2015, Krasovskaya 2018, Khassanov et al. 2023). Besides, quite a number of new distribution records were published from all countries, in particular Kyrgyzstan (Lazkov and Turdumatova 2010, 2021, Lazkov et al. 2013, Lazkov and Sennikov 2017). Since the most recent checklist (Lazkov and Sultanova 2014), one species was described as new to science from Kyrgyzstan and four species were reported as new to Kyrgyzstan in the aforementioned publications, thus bringing the total number of *Allium* species in this country to 92.

As the Flora of Kyrgyzstan, the only detailed treatment of vascular plants of Kyrgyzstan, was published already in the Soviet times (Nikitina 1960), it appears to be heavily outdated; moreover, it was produced with the use of very fragmentary taxonomic and floristic resources. For these reasons, its detailed distributional data may be largely unreliable. The latest checklist (Lazkov and Sultanova 2014) provides distributional data only by major biogeographic provinces, without mentioning particular mountain ranges or localities. Some contributions (Lazkov and Sennikov 2017, Lazkov and Turdumatova 2021) provided lists of precise localities for the least fully known species, which were, however, very few in comparisons to the total number.

One of the species least known in Kyrgyzstan, *A. filidens* Regel, is rather widespread in Central Asia and neighbouring countries, reaching as far south as Afghanistan and Pakistan (POWO 2023). This plant is characterised by long, protruding reticulate tunics, narrow fistulose leaves and a rather dense inflorescence of numerous whitish flowers whose triangular, basally connate anther filaments reach the perianth length and possess a pair of very long lateral teeth (Regel 1875, Vvedensky 1935).

Vvedensky (1923a) described a further species of this affinity, *A. ugami* Vved. from the eastern vicinities of Tashkent in the western Tian-Shan, which he, however, compared with the distantly related *A. margaritaceum* Sm. nom. illeg. (*A. sardoum* Moris). Vvedensky (1923b) distinguished this species from *A. filidens* by different outer tunics of its bulbs, but later (Vvedensky 1935, 1971) merged it with the latter without any explanation, together with another white-flowered species, *A. karakense* Regel from outcrops in the Kyzylkum Desert, which was reinstated by Khassanov (2017).

When the knowledge progressed, further species similar to *A. filidens* were discovered in the western Tian-Shan. Vvedensky (1952) described *A. filidentiforme* Vved. from the foothills in the easternmost part of the Fergana Depression in Kyrgyzstan, which mainly differed from *A. filidens* by the length of anther filaments (exserted from the perianth, whereas filaments were enclosed in the perianth in *A. filidens*). This species was accepted by Nikitina (1951), who received this yet unpublished information directly from Vvedensky, and in all subsequent works (Vvedensky 1971, Khassanov

2008, Lazkov and Sultanova 2011, 2014, Khassanov and Yusupov 2022) except for the latest publication in Kyrgyzstan (Lazkov and Turdumatova 2021).

Pavlov (1953) described *A. valentinae*, a rather unusual species from the westernmost extensions of the Transile Range, the Şu-Ile Mts in Kazakhstan, which he compared with *A. filidentiforme* but distinguished from the latter by its shorter filaments, obtuse tepals and yellow flowers. The tepals and filaments indicate a relationship of *A. valentinae* with *A. filidens* rather than *A. filidentiforme*, whereas the yellow flowers are indeed very unusual in this group. Pavlov described his new species based on herbarium specimens and probably a personal communication from the collector, V. P. Mikhailova. No photographs or recent field observations are available for this species; moreover, it is missing in the recent illustrated guide to the flora of the Şu-Ile Mts (Kokoreva et al. 2018). Our examination of the type collection and another specimen of *A. valentinae* collected in the Şu-Ile Mts shows that the dominant colour in its dry specimens is green (visible mostly on the central nerves of the tepals), whereas the former presence of the yellow tint can be inferred from the membranous margin of the tepals.

In Kyrgyzstan, *A. filidens* was originally reported from the Alay Range and characterised by the bluish tepals with a green nerve (Nikitina 1951); this character may actually have been based on field observations made in Uzbekistan in populations referable to *A. ugami*. Further inventories (Lazkov and Sultanova 2011, 2014) stated that this species occurs in the mountains surrounding the Fergana Depression. Lazkov and Turdumatova (2021) reported many new localities of the species but treated it broadly, with the inclusion of *A. filidentiforme*.

During the recent fieldwork, an unknown species of the *A. filidens* group was observed on the northern side of the Kirghiz Range near Bishkek, the capital of Kyrgyzstan. This species was first collected by E. V. Nikitina from the Paspeldyk [Kyrgyz spelling Basböltök] Mt, immediately south of Bishkek. This population was identified as *A. filidentiforme* Vved. (Nikitina 1960) and subsequently accepted as such by Lazkov and Sultanova (2011, 2014), in spite of the later name change to *A. filidens* by Nikitina (1962). This species is characterised by rather small greenish flowers with a widely open perianth and short anthers, thus indicating its affinity with *A. filidens* s.str.

In order to identify this plant, we examined similar species of the *A. filidens* group (treated broadly) in Central Asia. Similar green-flowered plants were described from the Hissar Range, Tajikistan, but the plants collected in Kyrgyzstan differed in the presence of the yellowish tint in the perianth. This colour brought our attention to *A. valentinae*, whose type locality is situated very close to Bishkek. We reassessed the flower colour of *A. valentinae* as yellowish-green rather than yellow as stated in the protologue, and realised that the plants collected from Kyrgyzstan are otherwise morphologically identical with those collected from Kazakhstan. These collections make a new record of *A. valentinae* from Kyrgyzstan.

The present contribution summarises the revised knowledge on the distribution and diagnostic characters of the *A.*

filidens group (including *A. filidentiforme* due to the ongoing taxonomic confusion) in Kyrgyzstan, placed in the context of taxonomic studies in Central Asia. For this purpose, we provide updated descriptions and trace complete distribution areas of every species involved in the taxonomic confusion. *Allium mogianense*, although occurring far from Kyrgyzstan, was added to comparisons due to its morphological similarity.

Material and methods

This work was based on the examination and critical evaluation of morphological characters. The morphology was examined on the basis of herbarium specimens, photographs of plants in nature, and our field observations.

Herbarium collections from Kyrgyzstan were examined at Institute of Biology, Bishkek, Kyrgyzstan (FRU), Komarov Botanical Institute, St -Petersburg, Russia (LE) and Moscow State University, Russia (MW). Specimens were examined *de visu* (FRU, LE) or online (MW). Herbarium data were complemented with documented observations available through Plantarium (www.plantarium.ru) and GBIF (www.gbif.org). Distribution maps were compiled on the basis of specimens examined and documented observations; when specimens and observations were largely unavailable, the occurrence data were borrowed from reliable treatments (Wendelbo 1971). Vouchers were recorded in the Darwin Core format and deposited at Dryad.

Results

Diagnostic characters

Although species in the *Allium filidens* group share the essential characters in their vegetative parts, their flowers are obviously different.

The most prominent character is perianth shape and filament length. By this character, *A. filidentiforme* (Fig. 1B) is sharply different from the other species because of its ovoid perianth, which is only partly open at flowering time, whereas the other species are characterised by a cupular perianth, which opens widely during flowering time. This character correlates with the shape of tepals, which are apically obtuse in *A. filidentiforme* but with a short mucro in the other species. Fritsch and Khassanov (2008) also noted that this species has longer pedicels and crystal-like tunics of the bulbs, and should be better referred to the *A. crystallinum* Vved. group (*A. sect. Crystallina* F. O. Khass. and Yengal.: Khassanov 2000). We agree with this assessment but keep this species in our comparisons because of the common and ongoing confusion of *A. filidentiforme* with *A. filidens* s.l.

The other four species under consideration differ in their perianth size: the green-flowered species have their flowers slightly smaller (perianth ca 4 mm long) than the flowers of the whitish-flowered species (4–5 mm).

In *A. filidens* s.l., flower colour is most important in species diagnostics. *Allium filidens* (Fig. 1A) and *A. ugami* (Fig. 1C)

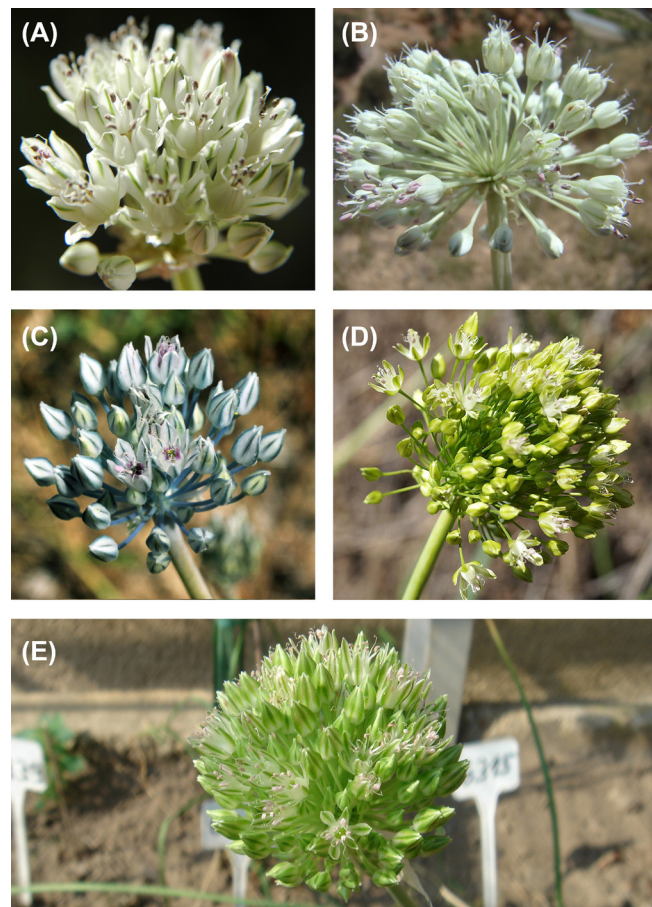


Figure 1. Inflorescences of *Allium filidens* (A), *A. filidentiforme* (B), *A. ugami* (C), *A. valentinae* (D) and *A. mogianense* (E). Sources: (A): Uzbekistan 30 May 2007, F. O. Khassanov; (B): Kyrgyzstan, pass between Osh and Naukat 19 July 2016, G. A. Lazkov; (C): Uzbekistan, Taskent City, Ulugbek District 26 May 2013, A. J. Gaziev; (D): Kyrgyzstan, Orto-Say 27 June 2015, G. V. Chulanova; (E): Cultivation in Gatersleben 24 June 2005, R. M. Fritsch.

occur sympatrically in the Western Tian-Shan. These two species differ in the presence or absence of a bluish tint on pedicels and tepals; the bluish tint distinguishes *A. ugami* very well in the field and collections. Similarly, *A. mogianense* (Fig. 1E) and *A. valentinae* (Fig. 1D) share the green flower colour but differ in the presence or absence of a yellowish tint, which is constantly present in *A. valentinae*.

The main diagnostic characters in the *A. filidens* group (incl. *A. filidentiforme*) are summarised in Table 1.

Taxonomy and ranking

Vvedensky (1935, 1971) accepted only the species level in this taxonomic group.

Fritsch and Khassanov (2008) downgraded some most similar taxa, which differed primarily in the shape of filaments and the colour of floral parts, to the level of subspecies, but later (Khassanov 2017, Khassanov and Yussupov 2022) reverted from this taxonomy, accepting the rank of species as the only primary taxonomic rank in the group.

Table 1. Diagnostic characters in the *Allium filidens* group.

	<i>A. filidens</i>	<i>A. ugami</i>	<i>A. filidentiforme</i>	<i>A. valentinae</i>	<i>A. mogianense</i>
Perianth, shape	cupular	cupular	ovoid	cupular	cupular
Tepals, apex	shortly mucronate	shortly mucronate	obtuse	shortly mucronate	shortly mucronate
Tepals, colour	white	bluish-white	greenish-white	greenish-yellow	greenish
Tepals, veins	green	bluish-green	dark green	dark green	dark green
Tepals, length (mm)	4–5	4–5	4.0–4.5	4	4
Filaments to perianth	equal	equal	1.5 times longer	equal	equal

As the taxa included in the group are perfectly clear-cut in morphology and their diagnostic characters are completely stable, the decision for the subspecies rank seems to be largely psychologic and based on the overall morphological similarity due to the largely microscopic diagnostic characters in the minute flowers in *Allium*. The phylogenetic relationships and genetic distance in the *Allium filidens* group, as well as the monophyly and integrity of the group itself, has not been tested using a comprehensive sampling, and the need for a subspecies rank has not therefore been confirmed. Considering the stable diagnostic characters and the ease of recognition of the taxa in the field, we adhere to the species rank in agreement with the common usage.

Allium filidens and *A. filidentiforme*, when the latter is taxonomically recognised, have been traditionally classified in *A. sect. Porrum* G.Don (Vvedensky 1971) or *A. sect. Allium* in its broader circumscription (Khassanov and Yusupov 2022). Although the broadly circumscribed *A. subgen. Allium* is monophyletic, it is characterised by a complex phylogenetic structure (Friesen et al. 2006). The system of narrowly defined sections, developed by Khassanov (1996, 2000) and supported by Friesen et al. (2006), reflects the phylogenetic relationships in *A. subgen. Allium* but rather exaggerates differences in the very closely related group of *A. filidens* (*A. sect. Costulata* F.O.Khass. and Yengal.), *A. crystallinum* (*A. sect. Crystallina* F.O.Khass. and Yengal.), *A. brevidens* Vved. (*A. sect. Brevidentia* F.O.Khass. and Yengal.) and related taxa, which has been constantly found as sister to *A. sect. Allium* in phylogenetic analyses (Friesen et al. 2006, Khassanov et al. 2023). To reflect the sister position of this group to *A. sect. Allium* and the high level of morphological similarity within this group, which appeared monophyletic in the preliminary phylogeny produced by Khassanov et al. (2023), we propose to treat it as a single section, for which we choose the common name *A. sect. Costulata*. The three sections separated within this group by Khassanov (1996, 2000) can be treated as subsections. Two new combinations are needed to update this taxonomy, of which one is proposed here (*Allium* subsect. *Brevidentia* (F.O.Khass. and Yengal.) Sennikov, comb. nov. Basionym: *Allium* sect. *Brevidentia* F.O.Khass. and Yengal. (Khassanov 1996, p. 147)), and the other is validated in the synopsis below.

Taxonomic synopsis

Allium sect. *Costulata* F.O.Khass. and Yengal. (Khassanov 1996, p. 147).

Type: *Allium filidens* Regel.

Allium subsect. *Filidentia* (Tzag.) F.O.Khass. and Yengal. (Khassanov 1996, p. 147).

Basionym: *Allium* ser. *Filidentia* Tzag. (Tzagolova 1975, p. 10).

Type: *Allium filidens* Regel.

***Allium filidens* Regel (Regel 1875, p. 174)**

Type: Tajikistan, Southern side of Mogol-Tau, 20 Apr. 1868, N. Sewerzow (neotype LE0050015, designated here).

Perennial, bulbiferous herb without rhizomes. Bulbs ovoid, 1–2 cm in diameter. Outer tunics coarse, reticulate, protruding above; inner tunics papery. Bulblets sparse, whitish or brown, large, ovoid. Stems 20–60 mm tall. Leaves 3–4, fistulose; blade 20–30 cm long, 1–3 mm in diam., semiterete, glabrous or nearly so. Inflorescence ca 5 cm in diameter, globose or nearly so, dense, multiflorous. Spathe ovate, with a long beak, white-membranous. Pedicels nearly equal, 2–5 times longer than the perianth, green, glabrous, bracteolate at base; bracts numerous, white-membranous. Perianth cupular, widely opening in flower. Tepals tapering into a short mucro at apex, white with a narrow green median vein; outer ones oblong, 4–5 mm long, 1.5 mm wide; inner ones narrowly oblong, 4–5 mm long, 1.2 mm wide. Filaments white, as long as or slightly longer than the perianth, with finely ciliate margin; outer ones basally triangular, apically filiform; inner ones basally ovate, broader than the outer filaments, narrowly attenuated in the upper third to form an anther-bearing cusp, 1-toothed on each side with teeth 1.5–3.5 times as long as the central cusp. Anthers pink. Pistil linear, enclosed in the perianth. Capsule 4 mm long, 5 mm in diam. Seeds compressed, black.

Phenology

Flowering in May and June, fruiting in June and July.

Ecology

The species occurs on sun-exposed clayey slopes at altitudes ranging from lowlands (300 m) to the middle mountain belt, up to 2000 m a.s.l.

Distribution

Figure 2. Afghanistan, Pakistan (Wendelbo 1971), Kazakhstan, Kyrgyzstan (Chatkal Range, Echki-Too Mts, Atoinok Mts, Fergana Range, Alay Range, Turkestan Range), Tajikistan, Uzbekistan (Vvedensky 1971, Khassanov 2017), Turkmenistan (Vvedensky 1936, Nikitin and Geldikhanov 1988).

The occurrence in Kazakhstan was considered doubtful (Khassanov 2017). It is confirmed in the Western Tian-Shan part of Kazakhstan, in the area adjacent to the Fergana Depression.

Nomenclatural note: Khassanov (2017) cited the holotype of *Allium filidens* as collected by N. Sewerzow in the Mogol-Tau Mts (now in Tajikistan) on 20 April 1877, i.e. 2 years after the protologue was published. This citation stems on the label data of the relevant specimen which cannot be accepted as correct.

Nikolai A. Sewerzow (the spelling traditionally adopted in the botanical literature), a famous Russian zoologist and geographer, studied physical geography, geology and zoology and botany during the primary scientific exploration of Turkestan, the mountainous territories of Central Asia that were in the focus of Russian military interests during the 19th century. Sewerzow, already experienced with previous work in the Kazakh steppes, was originally seconded to the acting army of General M. G. Cherniaev in 1864, during its offense to the Khanate of Kokand until the fall of Shymkent (Sewerzow 1873, Lipsky 1905). Immediately after the fall of Tashkent, on 1 July 1865, Russian Emperor Alexander II commanded the Turkestan Scientific Expedition to be organised for the exploration of new lands; Sewerzow was appointed the head of the physical department of the expedition. His work during 1866 was concentrated on the western and northern Tian-Shan (Sewerzow 1873, Lipsky 1905). In the second part of 1867, without botanical collections, Sewerzow explored the high mountains of the Inner Tian-Shan, along the Naryn River and the Aksay River. In the first part of 1868, he travelled to Xujand (now in Tajikistan) in order to explore the extreme south-western protrusion of

the Tian-Shan. During this time, from mid-March to the end of May (Lipsky 1905), which was incorrectly stated as mid-April to May in Sewerzow (1873), Sewerzow collected many plant and animal specimens in the mountains around Xujand, including the Mogol-Tau. He had no opportunity to visit the Mogol-Tau again before 1875, when *A. filidens* was described, and his later botanical collections made in 1878 were labelled as belonging to A. Kushakevich or I. Skornyakov (Lipsky 1905); this history provides firm evidence that the specimens of *A. filidens* were collected in the Mogol-Tau during 1868 only.

The authentic specimen of *A. filidens* at LE was actually dated to the day and month, but the collection year was lacking, typical of Sewerzow's collections in general (Lipsky 1905). Besides the original data, the label bears a later inscription by A. Regel, who received the specimen in March 1877. It is unclear why this part of Sewerzow's collection was not donated to LE in time as the other specimens; as evident from Regel (1875), Sewerzow had sent his main collections immediately after his return to Saint Petersburg in the end of 1868. Besides, the specimen bears no identification in E. Regel's hand, thus indicating that it was not seen by the species author when the protologue was prepared for publication.

The protologue of *A. filidens* stated that the original specimen was collected by Sewerzow in the Mogol-Tau but the collection date was not specified. Since Sewerzow visited these mountains repeatedly during his 2.5-month long stay at Xujand (Lipsky 1905), more than one specimen of the same species may have been collected and the specimen indicated in the protologue was therefore not precisely cited (it is not a syntype under the rules of botanical nomenclature).

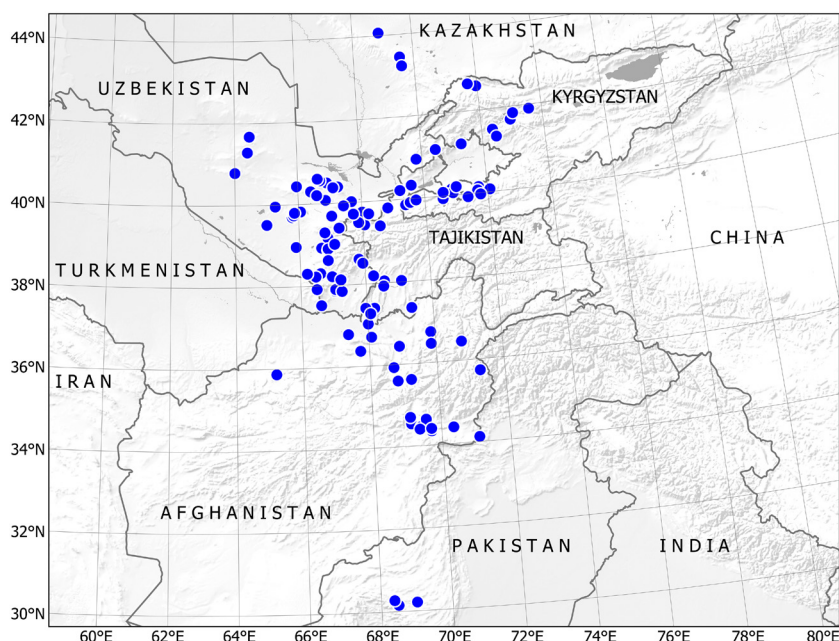


Figure 2. Distribution of *Allium filidens* according to the specimens examined, documented observations and reliable literature (Wendelbo 1971).

The specimen found at LE cannot therefore be automatically treated as a duplicate of the material used by Regel.

Moreover, as evident from the original description of *A. filidens*, the plants used for the description were collected in flower (floral details and ovaries were described, capsules and seeds were not mentioned), whereas the specimen found at LE is in nearly ripe fruit with easily observable seeds. This indicates that this specimen, although belonging to the species and collected by the original collector in the original locality during the same year, is not part of the original material and therefore cannot be used for lectotypification. This conclusion is corroborated by the late year when the specimen was received by A. Regel from the collector. The collection date is also uncertain and is likely incorrect because fruiting plants of *A. filidens* may not be encountered in April.

Although the specimen at LE cannot be used for lectotypification, it is a good option for neotype designation. For this reason, the typification published by Khassanov (2017) is formalised here. This typification was not effected by Wendelbo (1971, p. 48), even though he may have meant the same specimen by his reference to 'Typus: In montibus Mogol-Tau Turkestanicae, Sewerzow, LE!', because the particulars of the actual specimen (collection date) were not cited and the specimen citation was combined with a quotation of the type locality from the protologue.

***Allium ugami* Vved. (Vvedensky 1923a, p. 123)**

Based on the same type: *Allium filidens* subsp. *ugami* (Vved.) R.M.Fritsch and F.O.Khass. (Fritsch and Khassanov 2008, p. 628).

Type: Uzbekistan. Ugam River, heading to Irgailyk, 17 June 1921, A. Uranov 895 (lectotype TASH 3864, designated by Fritsch and Khassanov 2008, p. 628).

Perennial, bulbiferous herb without rhizomes. Bulbs ovoid, 1–2 cm in diameter. Outer tunics delicate, reticulate, protruding above; inner tunics papery. Bulblets sparse, whitish, small, ovoid. Stems 20–40 mm tall. Leaves 3–4, fistulose; blade 20–30 cm long, 1–3 mm in diameter, semiterete, glabrous. Inflorescence ca 5 cm in diameter, globose or nearly so, dense, multiflorous. Spathe ovate, with a short beak, white-membranous. Pedicels nearly equal, 2–5 times longer than the perianth, bluish-green, glabrous, bracteolate at the base; bracts numerous, white-membranous. Perianth cupular, widely opening in flower. Tepals tapering into a short mucro at apex, slightly bluish-white with a narrow bluish-green median vein; outer ones oblong, 4–5 mm long, 1.5 mm wide; inner ones narrowly oblong, 4–5 mm long, 1.2 mm wide. Filaments basally pink, apically whitish, as long as or slightly longer than the perianth, with finely ciliate margin; outer ones basally triangular, apically filiform; inner ones basally ovate, broader than the outer filaments, narrowly attenuated in the upper third part forming an anther-bearing cusp, 1-toothed on each side with teeth 1.5–3.0 times as long as the central cusp. Anthers pink. Pistil linear, enclosed in the perianth. Capsule 4 mm long, 5 mm in diam. Seeds compressed, black.

Phenology

Flowering in May and June, fruiting in June.

Ecology

The species occurs on sun-exposed clayey slopes at altitudes of 900–1300 m a.s.l.

Distribution

Figure 3. Kazakhstan, Uzbekistan (Khassanov 2017). Its occurrence in Kyrgyzstan is expected.

***Allium valentinae* Pavlov (Pavlov 1953, p. 1). Fig. 4**

Type: Kazakhstan. Şu-Ile Mts: Karakpetok River, grassy slopes, 28 June 1952, V. P. Mikhailova (holotype AA, isotypes MW0591708, TK).

Perennial, bulbiferous herb without rhizomes. Bulbs ovoid, up to 3 cm long, 1.8 cm in diameter. Outer tunics dark-brown, reticulate; bulb neck not protruding above ground; inner tunics papery with prominent veins. Bulblets numerous, ovoid, laterally slightly compressed. Stems 30–50 cm tall, 2.5–4.0 mm in diameter, terete, finely angled, glabrous, covered with leaf sheaths for 1/3–2/5 of their length. Leaves 3, fistulose, spaced; blades 20–35 cm long, 2–5 mm in diameter, gradually tapering to apex, glabrous, green. Inflorescence 5–7 cm in diam., globose or nearly so, lax, multiflorous. Spathe ovate, up to 1.5 cm long, without a conspicuous beak, white-membranous with brown veins. Pedicels slightly unequal, many times longer than the perianth, pale green, glabrous, bracteolate at base; bracts numerous, oblong-ovate to linear, dissected or emarginate at apex, white-membranous. Perianth cupular, widely opening in flower. Tepals tapering into a short mucro at apex, greenish-yellow with a broad dark green median vein, with very narrowly white-membranous margin; outer ones lanceolate, 4 mm long, 1.2 mm wide; inner ones linear-lanceolate, 4 mm long, 1 mm wide. Filaments white, as long as or slightly longer than the perianth, with finely ciliate margin; outer ones basally triangular, apically filiform; inner ones basally ovate, broader than the outer filaments, narrowly attenuated in the upper third part to form an anther-bearing cusp, 1-toothed on each side with teeth 1.5–2.0 times as long as the central cusp. Anthers pink. Pistil linear, up to 2 mm long, enclosed in the perianth; stigma globular, indistinct. Capsule 3 mm long, 5 mm in diameter, valves rugose when dry, glabrous. Seeds compressed, 3 mm long, 2 mm wide, ovate, black.

Phenology

Flowering in May and June, fruiting in June and July.

Ecology

The species occurs on sun-exposed, denudated clayey slopes in foothills at altitudes of 900–1100 m a.s.l.

Distribution

Figure 3. Kazakhstan (Şu-Ile Mts: Vvedensky 1971), Kyrgyzstan (northern side of Kyrgyz Range: new record).

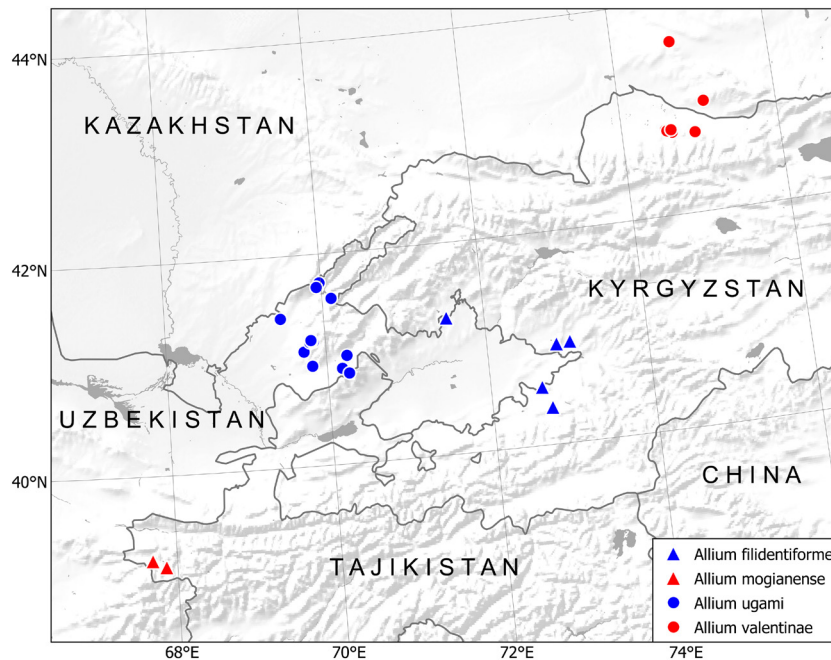


Figure 3. Distribution of *Allium filidentiforme*, *A. mogianense*, *A. ugami* and *A. valentinae* according to the specimens examined and documented observations.

Notes

This species was previously misidentified as *Allium filidentiforme* (Nikitina 1960, p. 30, Lazkov and Sultanova 2011, 2014) or *A. filidens* (Nikitina 1962, p. 255).

Precise locations for the historical collections of this species are not known. No recent observations are available from Kazakhstan. Our effort in 2022 to trace the type locality in the field regrettably failed.



Figure 4. A plant of *Allium valentinae* near Bishkek, Kyrgyzstan. Photo: G. A. Lazkov.

***Allium mogianense* (R.M.Fritsch and F.O.Khass.) F.O.Khass. and Yusupov (Khassanov and Yusupov 2022, p. 414)**

Basionym: *Allium filidens* subsp. *mogianense* R.M.Fritsch and F.O.Khass. (Fritsch and Khassanov 2008, p. 628).

Type: Cultivated in Gatersleben no. TAX6309, leg. 5 July 2006, bulbs collected in Tajikistan, Panjakent region, valley of river Obi-Borik, Dahani Magali Safarak, at rock terraces and on rubble, S exposed, 1650 m, ca 39°12' N, 67°42' E, 29 June 2004, R. M. Fritsch, M. Keusgen, H. Hisoriev 6165 (holotype: GAT).

Perennial, bulbiferous herb without rhizomes. Bulbs ovoid, 1.0–1.5 cm in diameter. Outer tunics greyish-brown, reticulate; bulb neck not protruding above ground. Stems 25–40(–60) cm tall, 3–4 mm in diameter, terete, glabrous, covered with leaf sheaths for 1/3–1/5 of their length. Leaves 3, fistulose, spaced; blades 15–30(–45) cm long, 3–6 mm in diameter, gradually tapering to apex, glabrous, green with a glaucous tint. Inflorescence 4 cm in diameter, globose, very dense, multiflorous. Spathe ovate, with a long beak, brownish with brown veins. Pedicels nearly equal, many times as long as the perianth, green, glabrous, bracteolate at the base; bracts numerous, elongate, white. Perianth cupular, widely opening in flower. Tepals obtuse, tapering into a short mucro at apex, greenish with a broad darker green median vein; outer ones broadly lanceolate, 4 mm long, 1 mm wide; inner ones linear-lanceolate, 4 mm long, 0.8 mm wide. Filaments white, nearly as long as the perianth, with finely ciliate margin; outer ones basally triangular, apically filiform; inner ones basally ovate, broader than the outer filaments, narrowly attenuated in the upper third part to form an anther-bearing cusp, 1-toothed on each side with teeth

2.0–2.5 times as long as the central cusp. Anthers pink. Pistil linear, up to 2 mm long, enclosed in the perianth. Capsule and seeds unknown.

Phenology

Flowering in June and July, fruiting in July.

Ecology

The species occurs on rocky slopes at altitudes of 1600–2100 m a.s.l.

Distribution

Figure 3. Tajikistan (northern side of Hissar Range) (Fritsch and Khassanov 2008).

Allium subsect. *Crystallina* (F.O.Khass. and Yengal.) Sennikov, **comb. nov.**

Basionym: *Allium* sect. *Crystallina* F.O.Khass. and Yengal. (Khassanov 1996, p. 147).

Type: *Allium crystallinum* Vved.

Allium filidentiforme Vved. (Vvedensky 1952, p. 32)

Type: Kyrgyzstan, Northern part of Suzak Mts, 4 July 1945, Kalinina and Moreva 71 (holotype: LE).

Perennial, bulbiferous herb without rhizomes. Bulbs ovoid, up to 2.5 cm in diameter. Outer tunics brown, reticulate; bulb neck not protruding above ground; inner tunics papery with prominent veins. Bulblets few, solitary. Stems 50–70 cm tall, 5 mm in diameter, terete, glabrous, covered with leaf sheaths for 1/3 of their length. Leaves 3–4, fistulose, spaced, blades 20–40 cm long, 3 mm in diameter, gradually tapering to apex, glabrous, green. Inflorescence 5 cm in diameter, globose or nearly so, rather lax, multiflorous. Spathe ovate, with a short beak, white-membranous. Pedicels nearly equal, many times as long as the perianth, pale green, glabrous, bracteolate at base; bracts numerous, linear or filiform, white-membranous. Perianth ovoid, indistinctly opening in flower. Tepals obtuse, apically rounded or slightly emarginated, greenish-white with a very narrow darker green median vein; outer ones broadly lanceolate, 4.0–4.5 mm long, 1.5 mm wide; inner ones linear-lanceolate, 4 mm long, 1 mm wide. Filaments white, 1.5 times as long as the perianth, with finely ciliate margin; outer ones basally triangular, apically filiform; inner ones basally ovate, broader than the outer filaments, narrowly attenuated in the upper third part to form an anther-bearing cusp, 1-toothed on each side with teeth about as long as the central cusp. Anthers pink. Pistil linear, up to 2 mm long, enclosed in the perianth. Capsule 4 mm long, 5 mm in diameter; valves rugose when dry, glabrous. Seeds compressed, black.

Phenology

Flowering in June and July, fruiting in July.

Ecology

The species occurs on sandstone deposits of various kinds, at altitudes of 900–1500 m a.s.l.

Distribution

Figure 3. Kyrgyzstan, Uzbekistan (foothills and low mountains surrounding the Fergana Depression) (Vvedensky 1971, Khassanov 2017).

Discussion and conclusions

Allium filidens and *A. filidentiforme* should be recognised as separate taxa due to the ample differences in the morphology of their flowers and bulbs. The latter species is endemic to the Fergana Depression, confined to its arid foothills with sandstone deposits.

Allium valentinae seems to be part of the *A. filidens* group but differs by flower size and colour. These characters make it most similar to *A. mogianense*, from which it differs mostly by shades of the flower colour. These two species are geographically most distant, *A. valentinae* being confined to the Northern Tian-Shan and *A. mogianense* being restricted to a small area in the Hissar Range of the Pamir-Alay Mountain System.

Allium filidens s.str. and *A. ugami* are most similar. They differ in the flower colour details and the structure of bulb tunics. Both characters are difficult to observe in herbarium collections; for this reason, their distribution areas have not been clarified yet. It is likely, as suggested by Khassanov (2017), that *A. ugami* replaces *A. filidens* s.str. in the north-western parts of the Western Tian-Shan, whereas *A. filidens* occurs in the territories surrounding the Fergana Depression and further south. So far, *A. ugami* has not been seen in Kyrgyzstan.

Another similar species, not considered here, is *A. karakense*, which is closely related to *A. filidens* s.str. but occurs on outcrops in the Kyzylkum Desert (Khassanov 2017).

Allium sect. *Costulata*, as redefined here with the inclusion of *A. sect. Crystallina* and *A. sect. Brevidentia*, still requires taxonomic revision. We expect that future studies will clarify taxonomic assignments of particular species to the subsections, and further new species will most likely be uncovered. Species distributions in the *A. filidens* group should be further studied in the field.

Identification key to the species of the *Allium filidens* group in Kyrgyzstan and adjacent countries

1. Perianth ovoid, narrowly opened at anthesis; tepals obtuse; filaments prominently exerted from the perianth *A. filidentiforme*
– Perianth cupular, widely opened at anthesis; tepals shortly mucronulate; filaments nearly as long as the perianth 2
2. Perianth greenish or yellowish-green, ca 4 mm long 3
– Perianth whitish or bluish-white with greenish veins, 4–5 mm long 4
3. Perianth white *A. filidens*

- Perianth bluish-white *A. ugami*
- 4. Perianth greenish *A. mogianense*
- Perianth greenish-yellow *A. valentinae*

Acknowledgements – We are grateful to Furkat O. Khassanov (Tashkent) for useful discussions. F. O. Khassanov, Alim J. Gaziev (Tashkent) and Galina V. Chulanova (Volkhov) kindly shared their field photographs.

Funding – No external funding has been received for this study. Open access publication has been funded by the Library of the University of Helsinki.

Author contributions

Alexander Sennikov: Conceptualization (lead); Data curation (equal); Investigation (equal); Writing – original draft (lead); Writing – review and editing (lead). **Georgy Lazkov:** Conceptualization (supporting); Data curation (equal); Investigation (equal); Writing – original draft (supporting); Writing – review and editing (supporting).

Data availability statement

Data are available from the Dryad Digital Repository: <https://doi.org/10.5061/dryad.b2rbnzsmt> (Sennikov and Lazkov 2023).

References

- Friesen, N., Fritsch, R. and Blattner, F. 2006. Phylogeny and new intrageneric classification of *Allium* (Alliaceae) based on nuclear ribosomal DNA ITS sequences. – *Aliso* 22: 372–395.
- Fritsch, R. M. and Khassanov, F. O. 2008. New taxa of *Allium* L. subg. *Allium* (Alliaceae) from Tajikistan and Uzbekistan. – *Feddes Rep.* 119: 625–633
- Khassanov, F. O. 1996. Conspectus of the wild growing *Allium* species of Middle Asia. – In: Öztürk, M., Seçmen, Ö. and Görk, G. (eds), *Plant life in southwest and Central Asia*, vol. 1. EGE Üniversitesi Press, pp. 141–159
- Khassanov, F. O. 2000. Subinfrageneric grouping in genus *Allium* subgenus *Allium*. – In: Ashurmetov, O., Khassanov, F. O. and Salieva, Y. (eds), *Plant life in southwest and Central Asia*, Proceedings of the 5th International Symposium, 18–22 May 1998. Tashkent, Uzbekistan: Botanical Institute and Botanical Garden, Academy of Sciences of the Republic of Uzbekistan, pp. 107–112.
- Khassanov, F. O. 2008. The genus *Allium* L. in the flora of Central Asia. – Abstract of PhD thesis. Scientific-Applied Research Centre ‘Botany’. Uzbek Academy of Sciences, In Russian.
- Khassanov, F. O. 2015. Diagnoses of new species of *Allium*. – In: Khassanov, F. O. (ed.), *Manual of vascular plants of Central Asia*. Critical synopsis of the flora of Central Asia, vol. 11. Academy of Sciences of the Republic of Uzbekistan, pp. 453–454.
- Khassanov, F. O. 2017. Amaryllidaceae. – In: Sennikov, A. N. (ed.), *Flora of Uzbekistan*, vol. 1. Navro‘z Publishers, pp. 1–119, in Russian.
- Khassanov, F. O. and Yussupov, Z. 2022. A taxonomic revision of *Allium* (Amaryllidaceae) in the flora of Middle Asia. – In: Öztürk, M., Khan, S. M., Altay, V., Efe, R., Egamberdieva, D. and Khassanov, F. O. (eds), *Biodiversity, conservation and sustainability in Asia*, vol. 2. Springer, pp. 403–433.
- Khassanov, F. O., Pulatov, S., Asatulloev, T., Ergashov, I., Tojibaev, K. S. and Yusupov, Z. 2023. *Allium sunhangii* – a new species from section *Brevidentia* F. O. Khass. & Iengal. (Amaryllidaceae) from Southern Pamir-Alay, Uzbekistan. – *PhytoKeys* 219: 35–48.
- Kokoreva, I. I., Sytpaeva, G. T., Kudabaeva, G. M., Otradnych, I. G. and S’edyna, I. A. 2018. Flora of the northern Tien shan. The Chu-Ili mountains. – Korea National Arboretum.
- Krasovskaya, L. S. 2018. *Allium sarychelekense* (Alliaceae), a new species from Kirghizia (Western Tien shan). – *Nov. Sist. Vissh. Rast.* 49: 14–18, in Russian.
- Lazkov, G. A. and Turdumatova, N. K. 2010. New and rare species of the genus *Allium* (Alliaceae) in the flora of Kyrgyzstan. – *Bot. Zhurn.* 95: 1637–1639, in Russian.
- Lazkov, G. A. and Sultanova, B. A. 2011. Checklist of vascular plants of Kyrgyzstan. – *Norrlinia* 24: 1–166, in Russian.
- Lazkov, G. A. and Sultanova, B. A. 2014. Checklist of vascular plants of Kyrgyzstan. – United Nations Development Programme, in Russian.
- Lazkov, G. A. and Sennikov, A. N. 2017. Taxonomic corrections and new records in vascular plants of Kyrgyzstan, 5. – *Memo. Soc. Fauna Flora Fenn.* 93: 79–100
- Lazkov, G. A. and Turdumatova, N. K. 2021. New records in *Allium* in Kyrgyzstan. – *Nauk. Novye Tekhnol. Innovatsii Kyrgyzstana* 2021: 43–48, in Russian.
- Lazkov, G. A., Geltman, D. V., Neveraev, U. A. and Turdumatova, N. K. 2013. New and rare species from the Pamir-Alay (Kyrgyzstan). – *Bot. Zhurn.* 98: 638–644, 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.
- Nikitin, V. V. and Geldikhanov, A. M. 1988. Manual of vascular plants of Turkmenistan. – Science Publishers, in Russian.
- Nikitina, E. V. and Kaschenko, L. I. 1951. *Allium* L. – In: Vvedensky, A. I. (ed.), *Flora of Kirghizia*, vol. 3. Kirghiz Branch of the Academy of Sciences of the USSR, pp. 50–96, in Russian.
- Nikitina, E. V. 1960. To the flora of the northern side of the Kirghiz Alatau Mountain Range. – Academy of Sciences of the Kirghiz SSR, in Russian.
- Nikitina, E. V. 1962. Flora and vegetation of pastures and hayfields of the Kirghiz Alatau Mountain Range. – Academy of Sciences of the Kirghiz SSR, in Russian.
- Pavlov, N. V. 1953. A new species of *Allium* from the Tian-Shan. – *Sist. Zametki Mater. Gerb Krylova Tomsk Gosud Univ. Kuybysheva* 75–76: 1–2, in Russian.
- Pavlov, N. V. and Poliakov, P. P. 1958. *Allium* L. – In: Pavlov, N. V. (ed.), *Flora of Kazakhstan*, vol. 2. Academy of Sciences of the Kazakh SSR-Ata, pp. 142–193, in Russian.
- POWO 2023. Plants of the world online. – Facilitated by the Royal Botanic Gardens, Kew. Published.
- Regel, E. 1875. *Alliorum adhuc cognitorum monographia*. – *Acta Horti Petrop.* 3: 1–266
- Sennikov, A. N. and Lazkov, G. A. 2013. *Allium formosum* Sennikov & Lazkov (Amaryllidaceae), a new species from Kyrgyzstan. – *PhytoKeys* 21: 29–36.

- Sennikov, A. N. and Lazkov, G. A. 2023. Data from: Taxonomic revision of the *Allium flidens* group (Amaryllidaceae) in Kyrgyzstan. – Dryad Digital Repository, <https://doi.org/10.5061/dryad.b2rbnzsmt>.
- Seregin, A. P., Anačkov, G. and Friesen, N. 2015. Molecular and morphological revision of the *Allium saxatile* group (Amaryllidaceae): geographical isolation as the driving force of underestimated speciation. – Bot. J. Linn. Soc. 178: 67–101.
- Sewerzow, N. A. 1873. Travels to the Turkestan Region and explorations of the Tian-Shan Mountain country. – Russian Geographical Society, in Russian.
- Tzagolova, V. G. 1975. Taxonomic notes on *Allium* sect. *Porrum* G. Don in Kazakhstan. – Bot. Mater. Gerb. Bot. Inst. Bot. Akad. Nauk Kazakhsk. S.S.R. 9: 10–11, in Russian.
- Vvedensky, A. I. 1923a. Allii species novae turkestanicae. – Trudy Turkestansk Nauchn Obsc 1: 123–126, in Russian.
- Vvedensky, A. I. 1923b. Liliaceae. – In: Popov, M. G. (ed.), Manual of vascular plants of the vicinities of Tashkent, vol. 1. Turkestan State Univ., pp. 55–71, in Russian.
- Vvedensky, A. I. 1935. *Allium* L. – In: Komarov, V. L. (ed.), Flora U.S.S.R, vol. 4. Academy of Sciences of the USSR, pp. 112–280, in Russian.
- Vvedensky, A. I. 1936. *Allium* L. In: Nevsky, S. A., Flora of the Kuitang Mts. – Trudy Bot. Inst. Akad. Nauk S.S.S.R., Ser. 1, Fl. Sist. Vyssh. Rast. 4: 330–331.
- Vvedensky, A. I. 1952. Liliaceae novae Kirghizicae. – Not. Syst. Herb. Inst. Bot. Acad. Sci. Uzbekistan 13: 26–34, in Russian.
- Vvedensky, A. I. 1971. *Allium* L. – In: Kovalevskaya, S. S. (ed.), Manual of vascular plants of Central Asia. Critical synopsis of the flora of Central Asia, vol. 2. Science Publishers, Uzbek Academy of Sciences, pp. 39–89, in Russian.
- Wendelbo, P. 1971. Alliaceae. – In: Rechinger, K. H. (ed.), Flora iranica, vol. 76. Akademische Druck und Verlagsanstalt, pp. 1–99.