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About the taxonomic affiliation of Svetlana's onion – *Allium svetlanae* Vved. ex Filim.

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Dedicated to the memory of Dr. Sergei Volis, who died prematurely in 2025.

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Summary. This article clarifies the taxonomic relationship of the endemic species *Allium svetlanae* Vved. ex Filim. from the Nuratau Range in Uzbekistan. While reviewing unpublished materials by A. I. Vvedensky, Z. N. Filimonova discovered four herbarium specimens of *Allium svetlanae*, which had been prepared for description, in a folder containing *Allium oliganthum*. Unfortunately, when describing the species, Z. N. Filimonova erroneously assigned the species to the section *Haplostemon*. Subsequently, F. O. Khassanov automatically transferred this species to the section *Coerulea* of the subgenus *Allium*. Analysis of morphological and molecular data unambiguously assigns this species to the section *Schoenoprasum* of the subgenus *Cepa*. In terms of ecological association and morphology, *Allium svetlanae* is closest to *A. oliganthum*, common in the Kazakh Uplands, but differs from the latter in a number of features.

О таксономической принадлежности лука Светланы – *Allium svetlanae* Vved. ex Filim.

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Посвящается памяти д-ра Сергея Волис, преждевременно скончавшегося в 2025 году.

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Ключевые слова: А. И. Введенский, секция *Schoenoprasum*, хребет Нуратау, *Allium oliganthum*, nrITS.

Аннотация. В статье уточняется таксономическое родство эндемичного вида *Allium svetlanae*, произрастающего на хребте Нуратау в Узбекистане. При разборе неопубликованных материалов А. И. Введенского З. Н. Филимонова обнаружила в папке с *Allium oliganthum* четыре гербарных экземпляра *Allium svetlanae* – вида, подготовленного к описанию. К сожалению, З. Н. Филимонова при описании вида ошибочно отнесла его к секции *Haplostemon*. Ф. О. Хасанов впоследствии автоматически перенёс этот вид в секцию *Coerulea* из подрода *Allium*. Анализ морфологии и молекулярных данных однозначно свидетельствует в пользу отнесения

этого вида к секции *Schoenoprasum* подрода *Cepa*. По экологической приуроченности и по морфологии *Allium svetlanae* ближе всего к *A. oliganthum*, распространённому в Казахском мелкосопочнике, но отличается от него рядом признаков.

Introduction

In September 2024, the first author obtained for the study several bulbs of a rare onion, *Allium svetlanae* Vved. ex Filim., collected shortly before by Dr. Sergey Volis and the second author in the Ustyuk-Sai Gorge (Nuratau Ridge), a *locus classicus* of the species. *Allium svetlanae* was initially classified by Z. N. Filimonova in the section *Haplostemon* Boiss. (Filimonova, 1982) and was subsequently assigned by F. O. Khassanov to the section *Codonoprasum* Reichb. (Khassanov, 1992) and later to the section *Coerulea* (Omelczuk.) F. O. Khass. of the subgenus *Allium* (Khassanov et al., 2013; Khassanov, 2016). Because there was no further information, we examined this species molecularly and morphologically to determine its phylogenetic position and relationship.

Material and Methods

Total genomic DNA was isolated from bulbs using the InnuPREPP Plant DNA Kit (Analytic Jena AG) according to the manufacturer's instructions and used directly in PCR amplification. The complete nuclear ribosomal ITS region (ITS1, 5.8S and ITS2) was amplified using the primers ITS-A (Blattner, 1999) and ITS4 (White et al., 1990). PCR products were sent to Microsynth SeqLab (Göttingen, www.microsynth.seqlab.de) for sequencing.

The sequences were manually edited in Chromas Lite 2.1 (Technelysium Pty Ltd) and aligned with ClustalX (Thompson et al., 1997). The alignment was manually corrected using MEGA 7 (Kumar et al., 2016). Alignment of nrITS, including known sequences from all species of section *Schoenoprasum*, was analysed through Fitch parsimony with the heuristic search option in PAUP version 4.0 b10 (Swofford, 2002). Bayesian phylogenetic analyses were also performed using MrBayes 3.1.23 (Ronquist, 2002). The sequence evolution model was chosen following the Akaike Information Criterion (AIC) obtained from jModelTest2 (Darriba et al., 2012). *Allium altaicum* Pall., *A. oschaninii* B. Fedtsch. ex O. Fedtsch., *A. pskemense* B. Fedtsch. and *A. galanthum* Kar. et Kir. of the section *Cepa* (Mill.) Prokh. and *A. atrosanguineum* Schrenk (section *Annuloprasum* T. V. Egorova) were used as outgroups. Newly sequenced accessions are marked with Am numbers in the trees, and their origin is shown in Table 1. Sequences from NCBI GenBank are labelled with GenBank accession numbers in the tree.

Results

BLAST analysis of the ITS sequences unambiguously assigned this species to the section *Schoenoprasum* Dumort. Previous studies of species in the section *Schoenoprasum* showed that ITS

Table 1. Origin and GenBank accession numbers of studied plants *Allium oliganthum* and *A. svetlanae*

| Accession | Species | Origin | Coordinates | GenBank accession |
|-----------|--------------------------|---------------------------------------|-----------------------------|-------------------|
| Am1510 | <i>Allium oliganthum</i> | Kazakhstan, Bektau-Ata | N47.3948557°, E74.7813796° | PX705530 |
| Am1525 | <i>Allium oliganthum</i> | Kazakhstan, Kayrakty | N 48.4356874°, E73.3349982° | PX705531 |
| Am1537-1 | <i>Allium svetlanae</i> | Uzbekistan, Nuratau, Ustyuk-Sai Gorge | N40.537000°, E66.563000° | PX705532 |
| Am1537-2 | <i>Allium svetlanae</i> | Uzbekistan, Nuratau, Ustyuk-Sai Gorge | N40.537002°, E66.563005° | PX705533 |

sequences of most species are virtually identical, with rare exceptions (Friesen et al., 2006). We downloaded ITS sequences for all available species in the section *Schoenoprasum* from GenBank and constructed a phylogenetic tree (Fig. 1). The ITS of *Allium svetlanae* is absolutely similar to most species in the section *Schoenoprasum*.

In the summer of 2025, plants emerged from bulbs that were very similar in appearance to *A. oliganthum* Kar. et Kir., with only some morphological differences in the flowers. See details

in the key below. Any remaining doubts about the species' belonging to the *Schoenoprasum* section vanished (Fig. 2).

But the most interesting thing happened when we obtained and read Filimonova's article (Filimonova, 1982). In the first paragraph, she writes: "While reviewing herbarium materials for *Allium*, we discovered in a bundle of *A. oliganthum* four herbarium sheets of A. I. Vvedensky's collections from the Nuratau Ridge, intended for description as a new species, and rough notes of his Latin

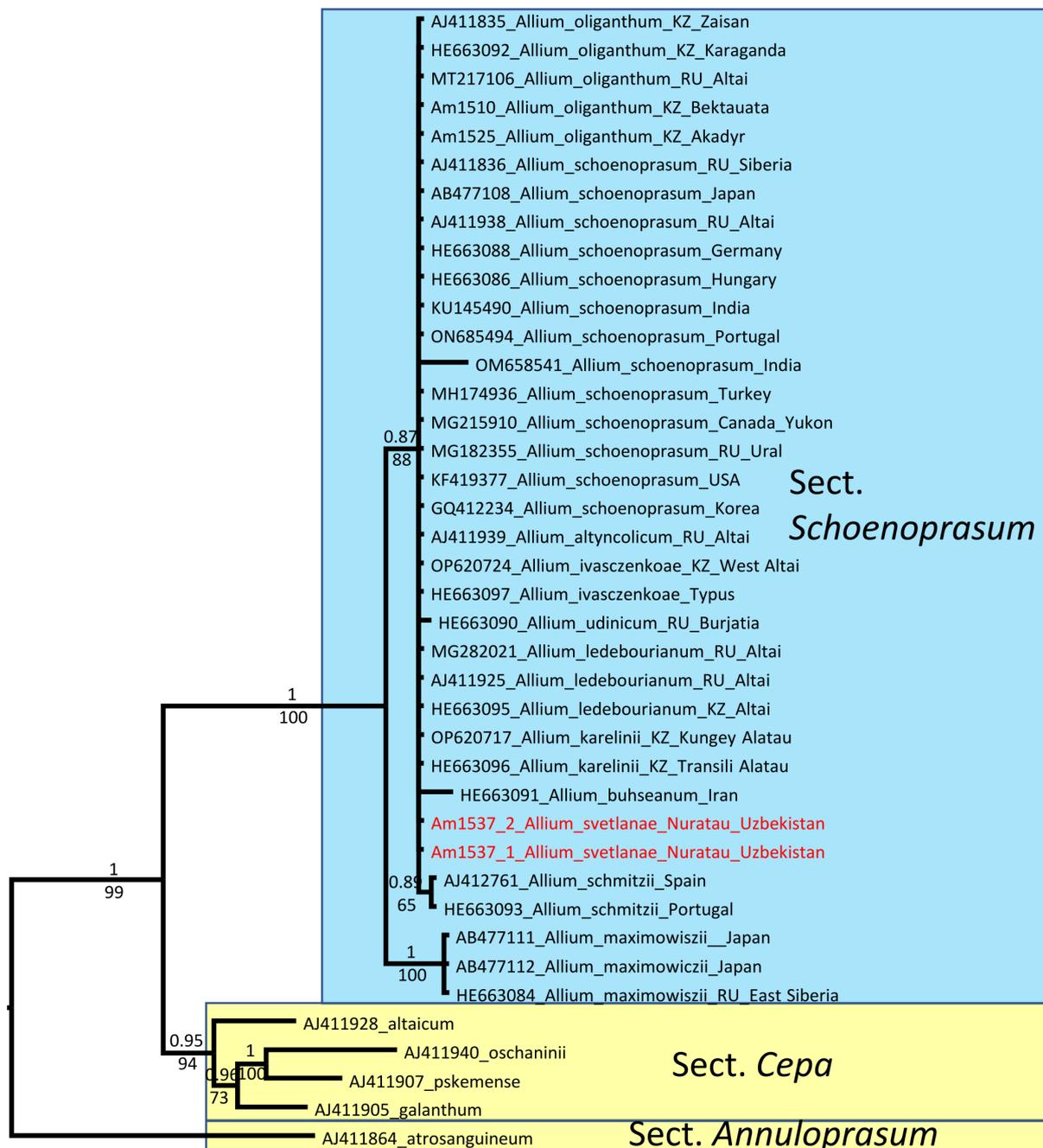


Fig. 1. Phylogenetic nrITS tree of the section *Schoenoprasum*. Numbers over the nodes represent Bayesian probabilities, under the nodes bootstrap support (1000 replicates). For the origin of the Am Accessions, see Table 1.

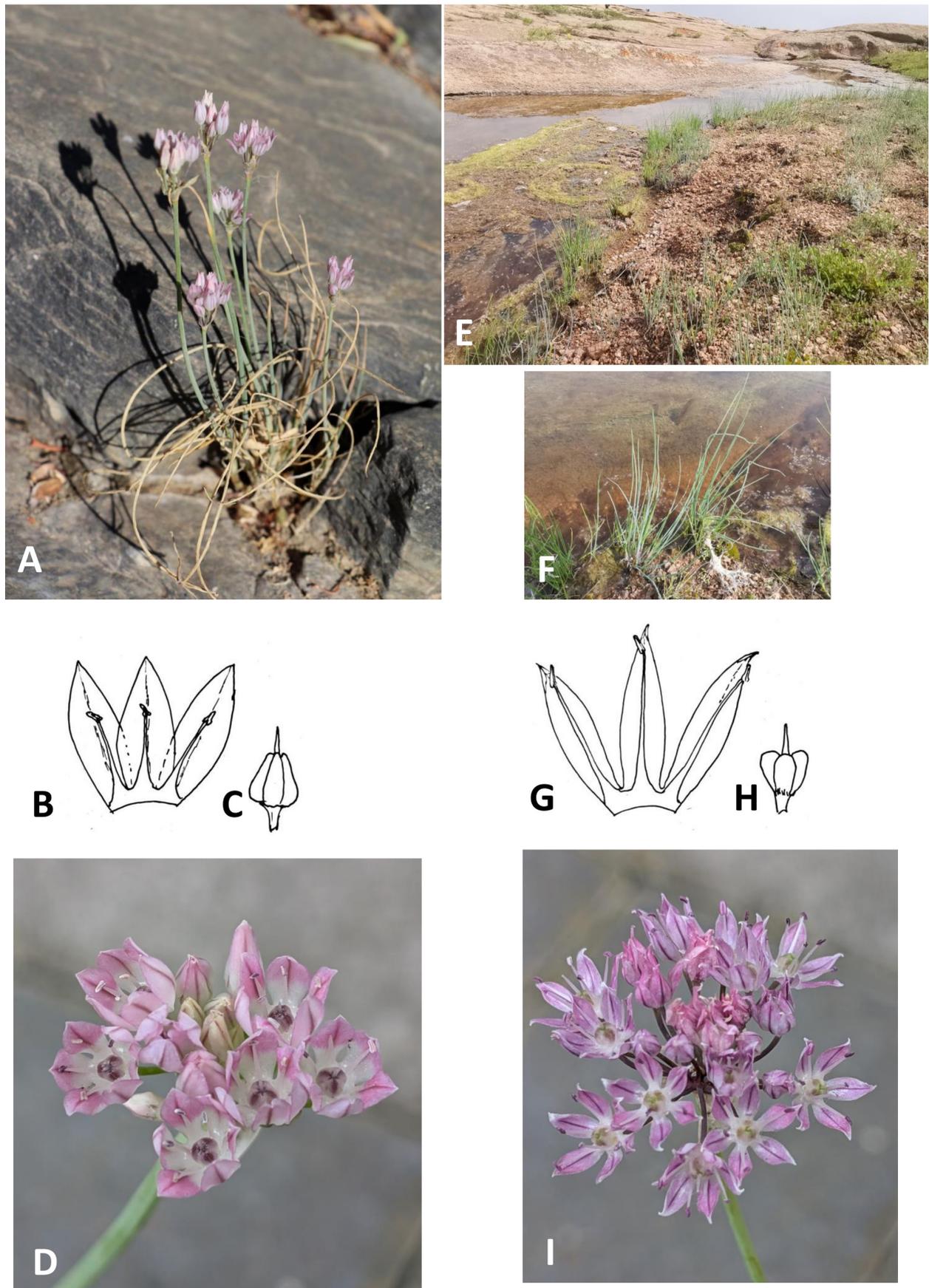


Fig. 2. Plant portraits: A–D – *Allium svetlanae*: A – in its natural habitat (Photo by N. Beschko); D–C – schematic drawing of the flower parts; D – inflorescence (Photo by N. Friesen). E–I – *Allium oliganthum* (Photos by N. Friesen): E–F – in its natural habitat; G–H – schematic drawing of the flower parts; I – inflorescence.

diagnosis. After reviewing A. I. Vvedensky's latest treatment of this genus for the Manual of Plants of Central Asia, Volume 2, 1971, we noticed that in addition to the main range of the Zaisan Basin, Balkhash, and Betpak-Dala, another locality was indicated for *A. oliganthum* – Nuratau Range (The text indicates the Turkestan Range, which in the corrections was replaced by the Nuratau Range). Consequently, A. I. Vvedensky assigned the new species to *A. oliganthum*, whose range had become

fragmented" (Filimonova, 1982: 39). Thus, the great onion expert Alexey Ivanovich Vvedensky initially correctly assessed the phylogenetic affiliation of *Allium svetlanae* to the section *Schoenoprasum*, and with this note, we merely correct Filimonova's error regarding the taxonomic relationship of *Allium svetlanae*. In her defence, it should be noted that she only had herbarium specimens at her disposal. And, as well known, many morphological features in dried plants are quite difficult to discern.

Key to distinguish *Allium svetlanae* from *A. oliganthum*

1. Perianth stellate and fully open. Stamen filaments equal to or slightly shorter than the petals, fused at the base with each other and with the perianth, entire, and subulate from a slightly widened base. Ovary capsule ovoid-triangular, the style subequaling the perianth *A. oliganthum* (Fig. 2G, H)
- + Perianth bell-shaped. Stamen filaments one and a half times shorter than the tepals, fused at the base with each other and with the perianth, entire, and subulate from a slightly widened base. Ovary capsule obovate-triangular, the style not protruding from the perianth *A. svetlanae* (Fig. 2B, C)

Discussion

The fact that there are almost no differences in the sequences (e. g. in the ITS) between the species of section *Schoenoprasum* shows that these taxa are very young and that the differentiation between taxa is in full swing. To investigate phylogenetic processes in the section *Schoenoprasum*, higher-resolution molecular genetic methods, such as genotyping-by-sequencing (GBS) and/or cp genome sequencing, should be used.

Allium schoenoprasum L. itself shows very strong morphological variability across its Holarctic distribution area, as evidenced by the almost 20 described species that are synonyms of *A. schoenoprasum* and over 30 subspecies, varieties or forms within the species (POWO, URL: <https://powo.science.kew.org/>). Among them, there are also taxa that have a similar ecology to *A. oliganthum* or *A. svetlanae*: e. g., *Allium schoenoprasum* var. *alvarense* Hyl.

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