



The Flora of Uzbekistan Project

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Abstract

A new project, ‘Flora of Uzbekistan’, is announced to start with publication in 2017. It aims at publishing a multi-volume taxonomic treatment of vascular plants of Uzbekistan, with complete synonymy, nomenclature, distribution data, descriptions and identification keys. The taxonomic treatment is supported by an extensive database of distribution records, used to generate distribution maps. The background information for the *Flora* is provided, and the structure and the format of the work are outlined.

Key words: Central Asia, databasing, plant distribution, plant nomenclature, plant taxonomy, taxonomic synopsis

Introduction

After declaring independence from the Soviet Union in 1991, young countries of the former Soviet Central Asia (including Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan) were facing the need for establishing national scientific programs and bringing scientific activities to the modern level of technology. In Uzbekistan, botany in general and floristic studies in particular had been largely dormant in the early period of independence.

The country experiences the continuing industrialization, accompanied with the expansion of mining. The increasing anthropogenic pressure (overgrazing, clear-cutting of trees and shrubs, further expansion of irrigated agriculture and dry farming, increase of built environment, extraction of minerals, road construction, uncontrolled collection of medical and other economically valuable plants, “wild” recreation), coupled with the environmental pollution, set demands for an up-to-date, comprehensive inventory of the taxonomic and spatial diversity of vascular plants that may serve the scientific basis for the future nature conservation measures.

With such data at hands, it will be possible to evaluate the present-day condition of endemic, rare and declining species according to the IUCN criteria, and to develop precise recommendations on the vegetation conservation. A new inventory should also help to identify the less studied parts of the flora, for which new research can be prioritised.

To achieve these goals, the Institute of Gene Pool of Plants and Animals of the Academy Sciences of Uzbekistan (Tashkent) has decided to start a new project, ‘Flora of Uzbekistan’, which will include the systematic investigation of the country’s flora of vascular plants, ultimately aiming at publishing a detailed standard Flora based on modern principles and requirements. The object of this Flora is to provide a working basis for applied scientists and the broad public for the solution of agricultural, conservational, educational and recreational problems.

Territory

Uzbekistan is a landlocked, largely mountainous country of Central Asia. Its territory totals 447,400 km², with the mountains covering ca. 15% of the country. The territory lies between 37°11' and 45°36' of northern latitude and

56° and 73°10' of eastern longitude, stretching for ca. 1,400 km from west to east and 925 km from north to south. Uzbekistan shares borders with Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Afghanistan.

The altitudes vary between 12 and 4643 m above sea level (Akramov 1982; Aramov 2012). Lowlands occupy northern, western and central parts of the country and are largely deserted, except for the depressions of Ferghana, Zeravshan and Surkhon-Sherobod with mild climatic conditions, which are mostly turned into arable lands. The main mountainous systems in Uzbekistan include the Western Tian-Shan and the Pamir-Alay, which are represented by small portions of their territories with most of the larger mountain ranges shared with neighbouring countries.

Uzbekistan is almost entirely situated in the north temperate climate zone, except for its extreme south being subtropical (Akramov 1982; Aramov 2012). In the Köppen climate classification (Peel *et al.* 2007), the territory of Uzbekistan falls into the areas of cold desert, cold semi-arid and humid continental climates. The climates of Uzbekistan are mostly continental arid, with a wide diurnal and seasonal temperature variation: mean January temperatures ranging from + 4°C in the south to -10 °C in the north, and mean July temperatures ranging from + 22°C in the south to + 32°C in the north. Mean July temperatures vary from + 26° in the north to + 30°C in the south in lowlands, whereas in the mountains they are within 16–18 °C. Mean annual temperatures range from + 9.8° in the north to + 17.3°C in the south, whereas in the mountains this parameter varies from + 0.7°C at 3,100 m a.s.l. (Turkestan Range) to + 5.8°C at 2,150 m a.s.l. (Kurama Range). Mean annual precipitation is ca. 80–200 mm in the lowlands, ca. 300–400 mm in the foothills and ca. 600–800 mm in the mountains, whereas in some places of the Western Tian-Shan at higher altitudes the precipitation may exceed 2,000 mm.

Uzbekistan is the most populated country in Central Asia, with the population of over 30 million people (of which ca. 50% are living in urban areas). Arable lands cover ca. 9.6% of the country's territory. Population density is 63 per km², the highest in Central Asia.

Floristic studies

The flora of Uzbekistan has a long tradition of studies, perhaps the strongest in the whole of Central Asia. After a period of the first plant descriptions from the area (1840–1920), published mainly by botanists affiliated with the Russian Academy of Sciences in St. Petersburg on the basis of materials collected in the course of the Russian colonization of Central Asia, and culminated in the first synopsis of the flora of Central Asia (Fedtschenko & Fedtschenko 1906–1916), the first university in Central Asia was established in Tashkent in 1920. The University of Turkestan, subsequently the State University of Central Asia and now the National University of Uzbekistan, took the leading part in studies on the flora and vegetation of Uzbekistan in particular and Central Asia as a whole during the period of the Soviet Union (1922–1991). During that period, with the efforts of M.G. Popov, R.I. Abolin (Āboliņš), E.P. Korovin, A.I. Vvedensky, V.P. Botschantzev and many other prominent botanists who worked in Tashkent, on the basis of large collections of the University and the Institute of Botany of the Academy of Sciences, a solid knowledge in the flora of Uzbekistan was achieved.

The knowledge of the vegetation of Uzbekistan was summarized in Korovin (1934, 1961–1962) and Granitov & Babushkin (1971, 1973); it was updated later by Rachkovskaya *et al.* (2003). Spatial patterns of the vegetation diversity of Uzbekistan were treated by Babushkin & Kogai (1971) and Maylun (1982).

The scheme of phytogeographic districts of Central Asia, based on the features of plant diversity, was first developed by Abolin (1929), Korovin (1941) and further elaborated by Kamelin (1973, 1979, 1990); particular schemes of the phytogeography of Uzbekistan have been developed on the basis of Kamelin (1973) by Tojibaev *et al.* (2012), taking into account later corrections by Kamelin (1979, 1990, 2012) and Tojibaev (2010, 2013). Its current version is presented in Fig. 1.

The old 'Flora of Uzbekistan' (Kudryashev 1941, Vvedensky 1953–1962) provided the first detailed treatment of vascular plants of Uzbekistan, largely following but sometimes (as for part of the Asteraceae) being ahead of the 'Flora of the USSR'. When completed, this Flora included treatments of 3,663 native species. The most recent treatment including the vascular plants of Uzbekistan was published as the 'Conspectus Florae Asiae Mediae', or Manual of Vascular Plants of Central Asia (Kovalevskaya 1968–1971, Bondarenko & Nabiev 1972, Pakhomova 1974–1976, Kamelin *et al.* 1981, Adylov 1983, 1987; Nabiev 1986, Adylov & Zuckerwanik 1993). This treatment, although of the highest quality possible in those times, is largely outdated, especially in respect of generic delimitations, but also because many species new to science continuously emerge from floristic explorations. Since the completion of the 'Flora of Uzbekistan', over 100 new species and even three genera (*Kamelinia* F.O.Khass. & I.I.Malzev, *Autumnalia*

Pimenov, *Kuramosciadium* Pimenov *et al.*; all belonging to Apiaceae) have been described from the country. Besides, distribution data of many plant species became outdated. Another problem is that the Conspectus cannot be used directly as a standard flora of Uzbekistan because species distributions in this book were detailed to the level of mountain ranges but not mentioning particular countries, whereas in Central Asia country borders show a large discrepancy with natural landscape units. This problem has not found its solution in the recently published supplementary volume 11 of the Conspectus (Khassanov 2015).

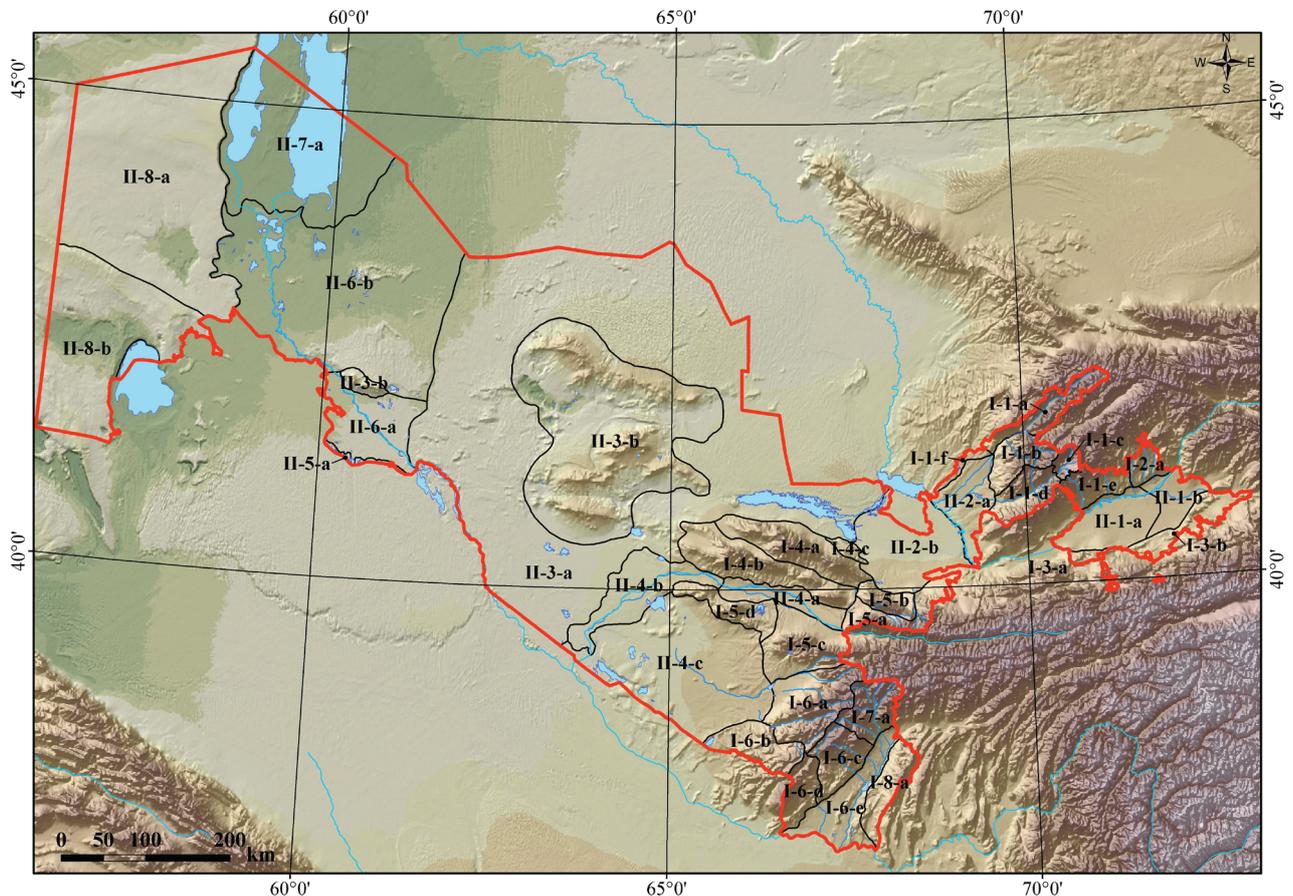


FIGURE 1. Phytogeographical division of Uzbekistan. **I Central Asian Mountain Province:** I-1 Western Tien Shan (I-1-a Ugam-Pskem, I-1-b Western Chatkal (Chimgan), I-1-c Arashan, I-1-d Kurama (Akhangan), I-1-e Chorkesar, I-1-f Tashkent), I-2 Fergana (I-2-a South Chatkal), I-3 Fergana-Alay (I-3-a Western Alay, I-3-b Eastern Alay), I-4 Nuratau (I-4-a Nuratau, I-4-b Aktau, I-4-c Nuratau Relic Mountains), I-5 Kuhistan (I-5-a North Turkestan, I-5-b Malguzar, I-5-c Urgut, I-5-d Ziadin-Zirabulak), I-6 Western Hissar (I-6-a Kashkadarya, I-6-b Tarkapchigay, I-6-c Bayssun, I-6-d Kuhitang, I-6-e Surkhan-Sherabad), I-7 Hissar-Darvaz (I-7-a Sangardak-Tupalang), I-8 Panj (I-8-a Babatag). **II Turan Province:** II-1 Central Fergana (II-1-a Kayrakum-Yazyavan, II-1-b East Fergana), II-2 Middle-Syrdarya (II-2-a Chinaz, II-2-b Mirzachul), II-3 Kyzylkum (II-3-a Kyzylkum, II-3-b Kyzylkum Relic Mountains), II-4 Bukhara (II-4-a Middle Zeravschan, II-4-b Lower Zeravschan, II-4-c Karshi-Karnabchul), II-5 Karakum (II-5-a North-East Karakum), II-6 South Aral (II-6-a Khorezm, II-6-b Amudarya Delta), II-7 Aral (II-7-a Aral Sea Bottom), II-8 Ustyurt (II-8-a North Ustyurt, II-8-b South Ustyurt).

In spite of all the achievements, an updated checklist of vascular plants of Uzbekistan is still lacking. Summarising the published data, we estimate that the number of native species of vascular plants in the country is no less than 4,300 (currently 4,344 species recorded: www.floruz.uz).

Floristic coverage

Although the tradition of botanical studies in Uzbekistan is long, its floristic coverage remains very uneven. As seen in Fig. 2, the greatest level of botanical information is available from the territories surrounding the Aral Lake and situated south of it (Sherbaev 1988), Nuratau Mts. (Beshko 2000, 2011), and Western Tian-Shan (Tojibaev 2010, 2013). The lowest level of floristic knowledge is available from the depressions of Fergana and Mirzachul situated

along the Syrdarya River, the Karshi Lowland situated along the Kashkadarya River, and high mountainous areas of the Hissar-Darvaz and Babatag Mts. The vegetation of the Ferghana and Mirzachul, as well as the Karshi, is highly transformed and largely turned into fields, thus hampering floristic and vegetation studies of these areas because of the lack of maps of reconstructed natural vegetation. Among other territories, good (although incomplete) data with published floristic treatments are available from the Chatkal Nature Reserve (Krasovskaya & Levichev 1986), Surkhan Nature Reserve (Ibragimov 2010), Zaamin Nature Reserve (Khassanov *et al.* 2012), and others.

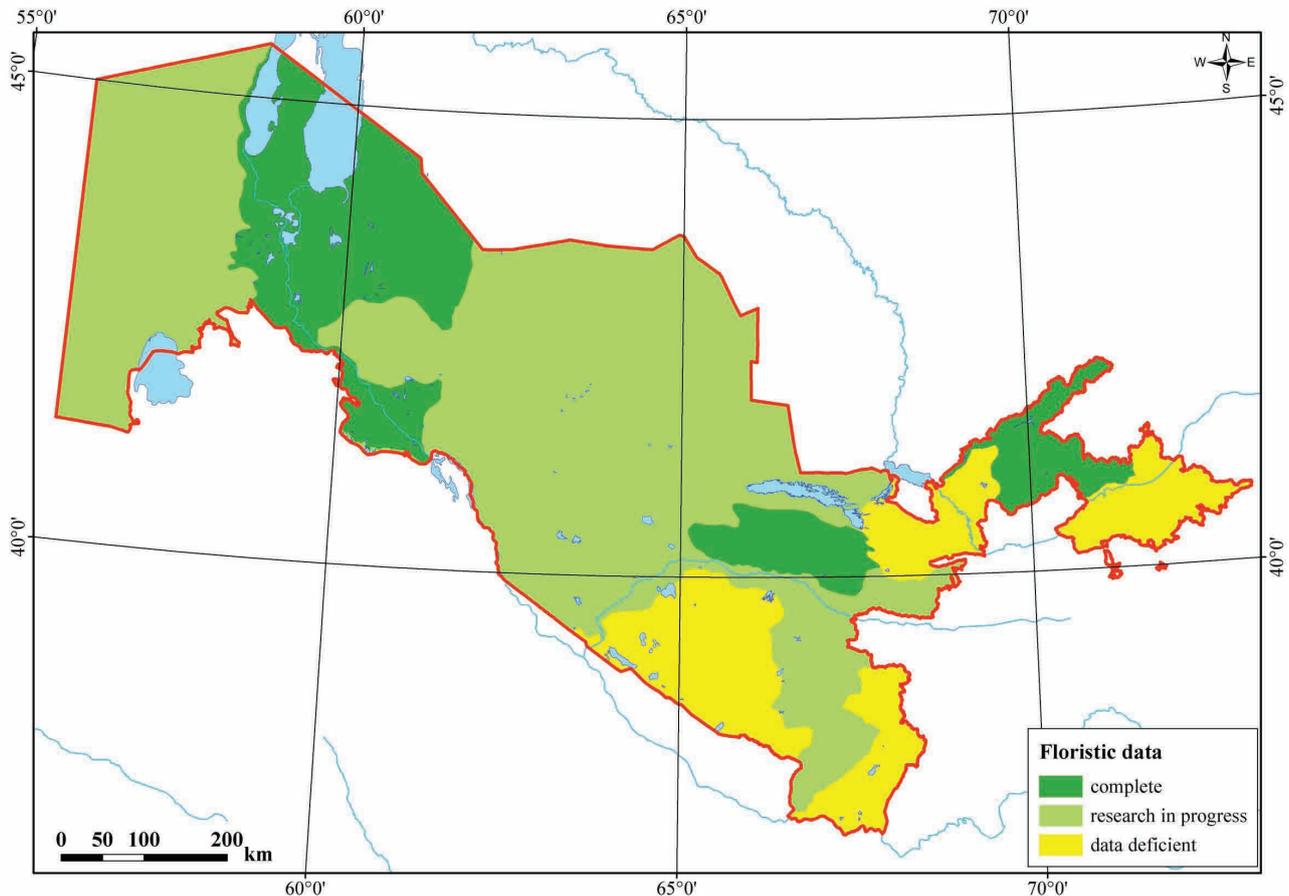


FIGURE 2. Level of floristic knowledge in Uzbekistan. Floristic borders follow the phytogeographic division of the country.

Vegetation

The vegetation of Uzbekistan can be classified according to four major ecosystems (altitudinal zones). The main cause for zonation is changes in the hydrothermal conditions, where the precipitation closely correlates with the elevation (Belolipov *et al.* 2013). These altitudinal zones (named according to the traditional Uzbek and Russian terminology: Zakirov 1947) are as follows:

—the chul zone (arid plains, deserts) continues up to 450–500 m. This zone is occupied mainly by the desert saxaul forests (*Haloxylon aphyllum* (Minkw.) Iljin, *H. persicum* Bunge) and communities of *Artemisia* spp. (*A. turanica* Krasch., *A. diffusa* Krasch. ex Poljakov) and perennial (small shrubs and semishrubs) species of *Salsola* L.;

—the adyr zone (lowlands and foothills) continues from the chul zone up to 1,200–1,450 m. This zone is characterized by the ephemeroïd vegetation (*Poa bulbosa* L., *Carex pachystylis* J.Gay), dry forb steppes (*Hordeum bulbosum* L., *Tulipa* spp., *Eremurus* spp., *Phlomis* spp., *Phlomoides* spp., *Inula macrophylla* L., *Verbascum songoricum* Schrenk), shrub communities (*Rosa* spp., *Lonicera* spp., *Berberis* spp., *Cerasus* spp.).

—the tau zone (mid-mountain zone) continues up to 2,700–2,800 m. It is distinguished by the dominance of juniper forests (*Juniperus seravschanica* Kom., *J. semiglobosa* Regel, and *J. turkestanica* Kom.). Small areas are occupied by deciduous forests (*Juglans regia* L., *Malus sieversii* (Ledeb.) M.Roem., *Acer semenovii* Regel & Herder, *A. turkestanica* Pax, *Sorbus persica* Hedl., *S. tianschanica* Rupr., *Prunus sogdiana* Vass., etc.).

—the yailau zone (high mountain zone, subalpine and alpine zone) continues up to 4,600 m. This zone is

covered by tall grass meadows (*Aconogonon coriarium* (Grig.) Soják, *A. hissaricum* (Popov) Soják, *Ferula tenuisecta* Korovin, *Prangos pabularia* Lindl., and also *Alopecurus* spp., *Geranium regelii* Nevski, *Lagotis korolkowii* Maxim.), communities of spiny cushion-shaped plants (*Astragalus* spp., *Acantholimon* spp., *Oxytropis* spp., *Onobrychis echidna* Lipsky), and alpine steppes (*Festuca valesiaca* Gaudin, *Puccinellia subspicata* V.Krecz.).

Uzbekistan is a forest-poor country. In 2014, state forest lands comprised 21.7% of the total area of Uzbekistan, totalling 9,600,000 ha. Included in these figures, forested are 3,300,000 ha, which constitute 7.5% of the total area of the country. The overwhelming majority of forests of Uzbekistan (86%) are situated in the desert zone. In spite of the small territorial coverage, forests are greatly important in Uzbekistan, contributing to the development of the country. A particular importance of forests includes combating desertification and natural disasters prevention (e.g. mudflows, floods, droughts, etc.), and also improving the environmental situation (United Nations Economic Commission for Europe; National Workshop report, Tashkent, Uzbekistan, 21–23 October 2014).

Main features of the flora and the level of endemism

With 4,344 species of native vascular plants registered to date (www.floruz.uz), Uzbekistan possesses the third species-rich flora in Central Asia, being behind Kazakhstan (5,460 species: Abdulina 1999) and Tajikistan (4,513 species: Ovchinnikov 1957–1991) but ahead of Kyrgyzstan (3800 species: Lazkov & Sultanova 2014) and Turkmenistan (2800 species: Nikitin & Geldykhonov 1988). This high species diversity is determined by several factors: the territory extensively stretching in the east-west direction, a high diversity of physiographic conditions (ranging from deserts to mesic forests), a long autochthonous history of development, the number of biogeographic zones, etc.

The most species-rich plant families are Asteraceae (624 species), Fabaceae (512), Poaceae (301), Lamiaceae (238), Brassicaceae (235), Apiaceae (231), Rosaceae (231), and Boraginaceae (123). Most notable among the species-rich genera are *Astragalus* L. (273 species), *Cousinia* Cass. (149), *Allium* L. (137), *Gagea* Salisb. (82 species), *Oxytropis* DC. (63), *Ferula* L. (59 species), *Artemisia* L. (47), *Phlomooides* Moench (45), *Silene* L. (44), *Iris* L. s.l. (41 species, of which 24 species belong to *Juno* Tratt.), *Tulipa* L. (34 species), *Hedysarum* L. (30 species), etc.

Flora of Uzbekistan has a large number of endemic, threatened and globally important species. Ten percent of the flora, more precisely 378 species, are considered as national endemics (K.S. Tojibaev and collaborators, in preparation). The latest edition of the National Red Data Book includes 324 species of vascular plants (Khassanov & Pratov 2009).

Herbarium collections

The main Herbarium of Uzbekistan (TASH) is a centralised national depository of scientific collections. The Herbarium was established in 1937 at the Committee for Sciences of the Council of People's Commissars of the Uzbek SSR and subsequently affiliated to the Botanical Institute, Institute of Botany and Zoology, and Institute of Botany of the Academy of Sciences of the Uzbek SSR. In the times of independence, the Herbarium was part of the Research and Production Centre "Botany", and currently the Institute of Gene Pool of Plants and Animals of the Academy Sciences of Uzbekistan. In the Soviet times, the Herbarium possessed over 100,000 specimens (Vasilchenko & Vasilieva 1975).

Two other historical collections of Uzbekistan had been incorporated into TASH. The Herbarium of the Republic Nature Museum of Uzbekistan (RNMUT) contained ca. 40,000 specimens collected in 1920–1960s. The Herbarium of the National University of Uzbekistan (TAK) housed many type specimens of Alexei Vvedensky and Olga and Boris Fedtschenko, with over 500,000 specimens in total; its collections dated back to the Bureau of Soil and Plant Studies at the Ministry of Agriculture and State Property established in Tashkent in 1909 (Vasilchenko & Vasilieva 1975).

With the merger of TAK and RNMUT with TASH in 1987, the latter harbours about 1,000,000 specimens (Thiers 2016), with type specimens of ca. 1500 plant names. The current annual growth of collections is 1500–3000 specimens.

The collections of TASH have the best coverage for the flora of Uzbekistan in the world, and also represent the flora of Central Asia as a whole. The second Herbarium with the largest representation of the flora of Uzbekistan is the Komarov Botanical Institute (LE), possessing the greatest number of type collections mostly from the times of the early botanical exploration of Central Asia and the 'Flora of the USSR'. Minor important collections, especially

of particular taxonomic groups (e.g., Apiaceae) are kept at the Moscow State University (MW). Botanical collections from Uzbekistan present in other Herbaria are insignificant.

These herbarium collections are the most important basis for the new 'Flora of Uzbekistan', which is planned as a largely museum-based taxonomic monograph.

Databasing

The database for the 'Flora of Uzbekistan' has been started at the basis of herbarium collections at TASH and published literature sources as a background data collection for the future Flora.

The present database contains information on species names, properties and records. Plant records from herbarium labels and literature are entered into the database accompanied with the information on locality, collection date, collector, and source of information. Species properties include life forms (Raunkiaer 1934), soil preferences, typical altitudes, periods of blossom and fruit, phytocoenotic preferences, types of distribution areas, endemic status, and protection status. The taxonomic part of the database includes the hierarchy of families, genera, and species. The nomenclatural part includes Latin and Russian plant names and authorship.

The occurrence data in the database are derived mostly from herbarium labels, with georeferenced positions of records traced with the aid of Google Maps or printed topographic maps. The second source of information is literature data, still included very incompletely. Field records have not been used in the database yet because of the lack of the relevant tradition. Plant species distributions are visualised through the scheme of the phytogeographical division of Uzbekistan (Fig. 1) developed by Tojibaev *et al.* (2012, 2013).

Currently, the database includes 250,000 records of plant occurrences, documenting the distribution of about 2600 species of vascular plants in Uzbekistan. The present dataset covers approximately 59% of the flora of Uzbekistan, and about 25% of the total holdings of TASH.

TABLE 1. Basic statistics of the databasing of selected large genera at TASH.

genus	number of species	number of specimens	number of databased specimens	number of scanned specimens	number of new country records
<i>Allium</i>	195	7561	7561	7512	7
<i>Astragalus</i>	320	12000	7282	893 (main collection), 272 (type specimens)	6

The databasing revealed that a significant part of herbarium materials at TASH had not been revised during the preparation of the 'Flora of Uzbekistan' and the compilation of floristic checklists of various regions of Uzbekistan. In course of this inventory, 47 species records new to Uzbekistan were detected as a result of studies on the flora of the South-Western Tian-Shan (Tojibaev 2010, Tojibaev *et al.* 2014b, 2014d). As part of the databasing, selected scanning of herbarium specimens is going on (image quality 300 to 600 dpi). A sample statistics resulted from the databasing is presented in Table 1.

As a pilot project based on this database, an electronic resource on the monocotyledonous geophytes of the Ferghana depression has been developed (Karimov 2015a, 2015b). This resource includes a taxonomic synopsis of the geophytes, species characteristics, and species distribution maps.

A future development to the database may include more detailed information on nomenclature (synonyms, references to protologues, type citations).

Recent fieldwork

Since the beginning of the 1990s, Uzbek botanists in an active collaboration with European scientists described many new species of the genus *Allium* (Fritsch *et al.* 1993, 1998, 2002, Fritsch & Khassanov 2008). The results of these investigations contributed to the development of the taxonomic and phylogenetic knowledge of this genus (Friesen *et al.* 2006).

After a "quiet period" of post-Soviet times, from 2009 on, a team of young botanists formed in the Central

Herbarium of Uzbekistan had set themselves a new task, to resume the floristic studies and to update the botanical knowledge according to modern standards. Field work, herbarization, inventory and identification of old herbarium specimens, databasing and digitizing of the national collections are actively going on.

During this period, as a result of the extensive fieldwork and the targeted search for unknown taxa in less explored areas, several new species (e.g., Tojibaev 2009, Khassanov & Tojibaev 2009, 2010, Tojibaev & Turginov 2013, 2014, Tojibaev *et al.* 2014a, 2014b, Beshko 2015) and even a new genus, *Kuramosciadium* Pimenov *et al.* (2011: 492), appeared exclusively because of field-based rather than collection-based research. The descriptions of new taxa were published mostly by Uzbek botanists alone or in co-authorship, although foreign researchers also contributed to a minor extent (Sukhorukov 2007, Fritsch 2009, Sennikov 2011, Seregin 2015). This observation on the importance of fieldwork in plant diversity studies does not confirm the pessimistic conclusion of Bebbler *et al.* (2010) who stated that most of new species are now being discovered among existing collections in herbaria. On the contrary, young countries like Uzbekistan with the active development of national infrastructures may experience a renaissance of floristic studies and taxonomic botany.

Besides discovering new taxa, many new country records resulted from the recent fieldwork. Those records are being published continuously (Tojibaev *et al.* 2014b, 2014d).

Project timeline

Since having started with preparations in 2012, the project comes to the stage of published outputs now. Primary results are to be published in the paper book format. Intermediate results can be published as articles in peer-reviewed journals (for which a separate series to be placed at *Phytotaxa*, 'Notes on the Flora of Uzbekistan', is preferred). At the same time, the information will be entered into the database which may serve as the basis for the future web-presentation of the flora of Uzbekistan. The first steps of this publishing activity are:

2016—Publication of a descriptive phytogeography of Uzbekistan.

2016—Publication of a checklist of vascular plants of Uzbekistan.

Early 2017—Publication of the first part of the Flora of Uzbekistan.

Further parts of the Flora are expected with publication in 2017–2026, so that the whole system of vascular plants is to be covered in 10 years. Each part may contain treatments of a taxon of considerable taxonomic coverage in the country (family or its large subdivision), or groups of related taxa. Publication of particular parts depends on the availability of treatments and may not follow a taxonomic system. As a conclusion, a general volume is expected to summarize the results and to provide an analysis of the whole flora on the basis of the new inventory.

Responsibility and participation

The project is governed by the Committee for Coordination Science and Technology Development under the Cabinet of Ministers of Uzbekistan (<http://www.uzscience.uz/en/home/index>) and the Academy of Sciences of the Republic of Uzbekistan (<http://academy.uz/en/index.php>). The leading participant is the Institute of Gene Pool of Plants and Animals of the Academy Sciences of Uzbekistan. At present, partners are invited from the Komarov Botanical Institute of the Russian Academy of Sciences (St. Petersburg, Russia), Moscow State University (Russia), University of Helsinki (Finland), Institute of Biology and Soil Science of the National Academy of Sciences of Kyrgyzstan (Bishkek, Kyrgyzstan), Altai State University (Barnaul, Russia).

Editor-in-Chief—Alexander N. Sennikov (Helsinki/Saint-Petersburg). Editorial Committee: Komiljon Sh. Tojibaev (Chairman; Tashkent), Furkat O. Khassanov (Tashkent), Georgy A. Lazkov (Bishkek), Dmitry A. German (Heidelberg/Barnaul), Natalya Yu. Beshko (Tashkent), Khabibulla F. Shomurodov (Tashkent).

Plant taxonomists from Uzbekistan and abroad are welcome to contribute to the project with critical taxonomic revisions of larger and smaller plant groups. The participation can be secured through correspondence with the Editor-in-Chief and Editorial Committee.

Structure of the Flora

Basic structure and format:—The ‘Flora of Uzbekistan’ is a full-size comprehensive taxonomic treatment of vascular plants of Uzbekistan. The treatment includes a taxonomic synopsis with nomenclature, descriptions, distributional, ecological and conservational information, as well as identification keys to accepted taxa at all levels. Illustrations (line drawings and photographs) will be included when available.

Coverage:—The treatments include all native taxa of vascular plants in Uzbekistan, and also all alien taxa (regardless the invasion status) ever recorded from its territory. Cultivated taxa are excluded, except for those escaped from cultivation.

Language:—The main language of the ‘Flora of Uzbekistan’ is Russian. The choice of this language is dictated by the wealth of botanical literature accumulated in the Soviet times, which is almost exclusively in Russian. However, future translations into the Uzbek and English languages are planned to deliver the information to the broad public in Uzbekistan and to the international botanical community.

Taxonomic concept and classification:—The taxonomic concept employed in the ‘Flora of Uzbekistan’ follows modern phylogenetic studies. When phylogenetic data are available, the concept of monophyletic taxa is preferred. The delimitation of angiosperm families is based on APG IV (2016). The system of pteridophytes follows Lehtonen (2011).

Nomenclature:—The nomenclature part of the synopsis includes accepted names, synonymy as it pertains to the territory of the Flora (those appeared in earlier treatments in Uzbekistan or accepted in neighbouring countries), full references to protologues and standard treatments, type designations when available, and also scientific plant names in Russian and Uzbek. Standard treatments to be cited in the synopsis include the ‘Flora of the USSR’ (Komarov 1934–1964), the old ‘Flora of Uzbekistan’ (Kudryashev 1941, Vvedensky 1953–1962), ‘Conspectus Florae Asiae Mediae’ (Kovalevskaya 1968–1971, Bondarenko & Nabiev 1972, Pakhomova 1974–1976, Kamelin *et al.* 1981, Adylov 1983, 1987, Nabiev 1986, Adylov & Zuckerwanik 1993), and relevant monographic treatments of particular taxonomic groups. The nomenclature strictly follows the rules of the current ‘International code of nomenclature for algae, fungi, and plants’ (Melbourne Code) (McNeill *et al.* 2012; Wiersema *et al.* 2015).

Descriptions and identification keys:—Morphological descriptions are provided for accepted taxa at all levels. The descriptions are fully structured and compatible, thus allowing for direct comparison of related taxa. Identification keys are provided for accepted taxa at principal ranks (species, genera, families), and also for subspecies.

Distributional data:—The distribution of accepted species and subspecies in Uzbekistan is indicated by the phytogeographic regions of Uzbekistan (Tojibaev *et al.* 2012, 2014c). The distribution is based on examined specimens which are mandatorily listed under corresponding phytogeographic regions. This practice, as used in e.g. the ‘Flora of the Tajik SSR’ (Ovchinnikov 1957–1991), was proven to be very useful and highly important in providing documentation for species records which can be verified in further monographic revisions and compilations (Koponen *et al.* 2014). Native and alien occurrences are indicated separately. The assessment of invasion status (casual, naturalized, or invasive) follows Richardson *et al.* (2000). The complete distribution of accepted species and subspecies is provided according to continents, with particular countries or their parts indicated when necessary. Individual records of accepted species and subspecies are entered into the database on the basis of herbarium labels. Dot maps are generated from the database to display distribution areas in the country.

Phenology:—Flowering and fruiting periods are recorded on the basis of herbarium specimens and observations in nature.

Ecology:—Typical habitats for accepted species and subspecies are provided. Ecotopes are characterised with free text. Altitudinal zonation is regularly provided with the following elevation levels: desert zone (20–500 m a.s.l.), foothill zone (500–1500 m a.s.l.), montane zone (1500–2600 m a.s.l.; low-mountain belt of Russian authors), subalpine zone (2600–3200 m a.s.l.; middle-mountain belt of Russian authors), and alpine zone (3200–4600 m a.s.l.; high-mountain belt of Russian authors).

Notes:—Notes on taxonomy or distribution are facultative and can be added to taxonomic accounts when necessary.

Future development

In spite of the considerable progress in floristic studies, the flora of Uzbekistan still remains in the need for active development. The following steps are deemed necessary for updating and advancing the current knowledge.

1. Further fieldwork to cover the white spots on the map of floristic coverage of the country.
2. Complete databasing of the collections at TASH.
3. Databasing and scanning the type collections at TASH.
4. Complete nomenclatural inventory of the flora of Uzbekistan, with research on protologues, type specimens and historical collections.
5. Taxonomic inventory of critical plant groups in the country (currently many treatments are outdated).
6. Making the taxonomic literature published in Uzbekistan available through digital libraries (copyright restrictions apply).
7. Developing the taxonomic database of the flora of Uzbekistan, enriched with the data in plant taxonomy, morphology and distribution.
8. Further, more detailed representation of the flora of Uzbekistan in the Internet.
9. Training the young generation of botanists in botanical monography and phylogenetic studies.

Conclusions

Floristic checklists and standard floras are essential in using, conserving and analysing plant diversity in any country. They need to be updated regularly to comply with contemporary scientific developments and social demands. The latest 'Flora of Uzbekistan' was published 50–70 years ago and is largely out of date in respect of species diversity, taxonomy and distribution. The present project aims at ending this backlog in the studies of the flora of Uzbekistan and bringing the knowledge of the flora to the standards of modern botany.

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