

Endemic and relic species plants of Badakhshsan (Pamirs) and new approach to their conservation

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Badakhshsan, situated in Pamir is one of Eurasia's biodiversity hotspots. Research shows that Badakhshsan has 95 narrowly endemic species that are not found in other areas of Tajikistan and Afghanistan. Of these, 50 species grow only in the Tajik part, 36 species - only in the Afghan part, and 9 are found in both parts of Badakhshsan. There are 52 preglacial relicts restricted to the Tajik part and 24 - to the Afghan part as well. We proposed to add 39 of the relict species in the Tajik part to the Red Data Book of Republic of Tajikistan and all 24 relict species in the Afghan part to add to the Afghanistan National Red List. The areas of special protected - Important Plant Area (IPA), are the base for supporting natural plant biodiversity. We also suggested to include 75 additional species in the national lists of vulnerable species (73 species in Tajikistan, and 65 species in Afghanistan).

Keywords: conservation, Important Plant Areas, endemics, Pamirs

Introduction

The problem of biological diversity and its conservation for future generations has now become a global issue. It has become obvious that the extinction of any species or distinctive plant communities, even in remote area, whatever its cause, reduces the biological diversity of a given territory and disrupts the ecological balance of the landscape. This in turn it affects the overall genetic resources and the ecological balance of the earth's biosphere (McNeely et al., 1990; Raven, Wilson, 1992). The conservation of biological diversity is one of the most important conditions for the sustainable development of any area (Pavlov et al., 2009), so the issues of studying and preserving the gene pool, and in particular the plant genetic of any biota (local, regional and global), are priorities in the environmental policy of many countries.

Badakhshsan is a historical region located within the Pamir. It includes the Gorno-Badakhshsan Autonomous region (GBAR) of Tajikistan and Badakhshsan province in North-Eastern Afghanistan (Fig. 1).

The territory of Badakhshsan on the both sides of the border river Pyanj is one of the most elevated mountain systems of the continent. Due to its location in the central part of the continent, this territory has a peculiar climate with a dry summer and precipitation during the autumn-winter-spring period (Navruzshoev, 1996; Breckle et al., 2013). Mountainous regions, because of the heterogeneity of the environment, heterogeneity that arises from the diversity of their terrain, soils, and climate, offer a wide range of ecological conditions. As result, they have a wide range of plant species and vegetation types (Shengji, 1996; Orme et al., 2005).

The mountainous territories of Central Asia are known as hotspots of global importance (Myers et al., 2000). The position of Badakhshsan at the junction of the Near-Asian and Sahara-Gobi floristic regions of the Ancient Mediterranean subkingdom and in the immediate vicinity of the Sino-Himalayan region of the East Asian subkingdom (Kamelin, 1973, 2017) caused its special floristic richness. At the same time, its position at the junction of the Western Asian and Sahara-Gobi floristic regions of the Ancient-Mediterranean subkingdom and at the close proximity to the Sino-Himalayan region of the East Asian subkingdom (Kamelin, 2017) has resulted in an exceptional floral richness as has been noted by many researchers (e.g., Agakhanyants, 1958; Ikonnikov, 1963, 1979; Podlech, 2012; Breckle et al., 2013; Navruzshoev, 1996; Saboiev, 2002). M. Nobis and his colleagues (Novak et al., 2020) undertook detailed research of endemic species in Tajikistan and their distribution within mountain belts. Navruzshoev (2008) stated that the Tajik portion of mountains of Badakhshsan region has 1650 species, 515 genera, and 97 families of vascular plants. He noted that the Afghan portion of the area (Vakhan) was much more poorly known. However, Podlech and Anders (1977) listed 672 vascular plant species for the territory of Wakhan alone (Afghanistan), supporting Navruzshoev's statement. The year after publication of Navruzshoev's paper, Breckle et al. (2013) listed 888 species for the province of Badakhshsan. This is 18.20% of all vascular plants known from Afghanistan. These lists are based on extensive field work, but their authors acknowledge that there are many unexplored areas within the region. Moreover, the status of some of

the names has been questioned by authors of the World Flora Online (WFO, 2020). It is essential to continue taxonomic research in the area, exploring the parts that so far have escaped to develop better knowledge of the species present and their prevalence. At present, many species that are known from only a few collections are not protected because there too few data to evaluate their status.



Fig. 1. Position of Badakhshan within Tajikistan and Afghanistan.

Plants of Badakhshan, even those on the high mountain ranges, are under severe grazing pressure from grazing load (Ikonnikov, 1963; Aknazarov, 2012) because raising the livestock is almost the only possible form of economic activity in this area. The area also has an enormous recreational potential, but this too can be a serious threat to its phytodiversity as roads and trails are built, leading to expanded settlements and travel. The combination of increased recreation, grazing, and ongoing climate change will cause many plants to disappear before their conservation status is known and, in some instances, before their species has been described.

According to the Global Strategy for Plant Conservation 2011–2020 (GSPC, [online](#)), species should be preserved both in situ and ex situ, in accessible collections, but preference should be given to the first form (Glowka et al., 1994). The strategy recommends that identification of special protected areas, also known as Important Plant Areas (IPA), should become the base for supporting natural plant biodiversity and for sustainable use of plant resources. Such areas should be identified at the national level using standard criteria and become, it is hoped, the basis for maintaining natural biodiversity and sustainable use of plant resources (Anderson, 2002). IPAs are identified using three basic criteria. Criterion A draws on the number of threatened and/or endemic species in area; criterion B is based on assessment of the botanical richness of an area; and criterion C on presence of threatened habitats (Darbyshire et al., 2017). Each criterion includes subcategories, primarily reflecting the size of the area considered in determining the status of the species, botanical richness or habitat uniqueness. For criterion A, three subcategories are distinguished: A(i) globally threatened species; A(ii) regionally threatened species; A(iii) highly restricted endemic species.

Currently, the governments and scientists of both Tajikistan and Afghanistan are working hard to reveal and preserve their plant diversity: (e.g., *Natsionalnaya strategiya ...*, 2003; *Biol. Profile...*, 2008; *Convention on biodiversity...*, 2014; *Islamic Republic of Afghanistan. Fifth national report...*, 2014). Tajikistan has had the greatest success in this regard, having published two editions of its Red Data Book (*Krasnaya kniga...*, 1988; *Kitobi Surkhi ...*, 2015). These reflect the intensive research on the region's rare and endangered plants conducted by scientists at the Biological Institute and the Botanical Garden in Khorog, including examination of species transplanted there for ex situ conservation (e.g., Dengubenko and Navruzshoev, 1993; Navruzshoev and Beknazarova, 2016; Beknazarova, 2019).

Identification of key botanical territories will contribute to the successful completion of effective conservation plans for the Badakhshan, but there are some difficulties in using the proposed criteria in different areas. As noted by Tojibaev et al. (2019), for the CIS (Commonwealth of Independent States) countries, in which part of Badakhshan is included, criterion A has to be the main criterion for identifying IPAs, because there are insufficient data for applying the other two criteria. This makes determination of the threatened and endemic species in Badakhshan, plus the evaluation of the subcategory of each species, the essential first step in determining whether the area should be recommended as an IPA and for developing effective, science-

based environmental protection activities that will promote conservation of its biodiversity. Ikonnikov's (1963, 1979) research is a critical resource in this regard but, since his findings were published, new species have been described, the taxonomic treatment of other species had been changed, and significantly more distribution data have become available. This paper presents an updated list of the endemic and relict plant species of Badakhshan and evaluates them in terms of criterion A for the designation of IPAs.

Materials and methods

The list of species endemic to Badakhshan was determined by combining information from existing literature, evaluating herbarium specimens in several herbaria, consulting records in the Global Biodiversity Information Facility (GBIF, online), and our own fieldwork. The initial list of endemic species and their distribution was compiled from the following publications: Ikonnikov (1963, 1979), Dengubenko (1984), Podlech with colleague (Podlech, Anders, 1977; Podlech, 2012), Red Data Books of Tajikistan (Krasnaya kniga..., 1988; Kitobi Surkhi ..., 2015), List of Protected Species, Afghanistan (2007), Biodiversity profile of Afghanistan (2008), Breckle et al. (2013), Navruzshoev (1996, 2018), and Khisoriev et al. (2011). In addition, the following floras were consulted: Flora of Tajikistan; Flora of Iran; Flora of Pakistan; Flora of China; Flora of Xinjiang. Specimens in the following herbaria were examined: CDBI, E, K, KHOR, KUN, LE, M, MSB, PE, SZ, TAD, TASH, XJA, XJBI (Holmgren et al., 1997). In searching GBIF, the search terms were: scientific name = Tracheophyta combined with both country = Tajikistan and country = Afghanistan. The records found came from seven additional herbaria: MW, P, MSB, E, TASH, K, and W.

Relict species are species now represented by outlying populations in an area such as Badakhshan, but with their primary distribution being farther north. The Badakhshan populations are considered relicts from preglacial times, during which the species concerned extended farther south than they do now. The populations in Badakhshan are considered to be at their ecological limits and consequently, particularly threatened by environmental change such as a change in temperature or precipitation. Badakhshan's relict species were identified using a similar approach and the same resources as for determining its endemic species.

Because the resources consulted used different taxonomic treatments, the names were standardized using the treatment adopted by the World Flora Online (WFO 2020) and Plant List (on line). Taxa identified by names considered ambiguous, illegitimate, or invalid in that resource were excluded from our lists of endemic and/or relict species.

Result and discussion

Using the criteria described, Badakhshan has 95 globally endemic plant species (Appendix, Table 1). Because the area of Badakhshan is relatively small, all these species meet the criteria for being considered narrow endemics and hence globally threatened, i.e., to meet criterion Aiii. Protection of such species is of particular importance. The number represents a conservative assessment because taxa that were incompletely identified, for example by adding a qualifier such as "aff." or "cf." to the name cited, as well as those with names that did not meet the criteria described in the in the previous section, were excluded. Use of a qualifier was most common for species in large, taxonomically difficult genera such as *Astragalus*, *Oxytropis*, *Rosa*, *Pedicularis*. Genera with the largest number of endemic species were *Astragalus* (9), *Oxytropis*, and *Cousinia* (7).

Biodiversity protection inevitably requires legislative action. For this reason, we determined how many of the endemics were located each of the two countries involved, Tajikistan and Afghanistan. The data show that nine of the endemic species grow in both the Tajik and Afghan portions of Badakhshan, an additional 50 species are known only from the Tajik portion and a further 36 only from the Afghan portion.

Other species previously listed as endemic to Badakhshan have been excluded from Table 1, because they are now known to grow outside the region. Among such species are *Pulsatilla kostyzevii* (Korsh.) Juz., *Tulipa anisophylla* Vved., *Iris hoogiana* Dykes, and *Chaetolimon sogdiana* Lincz. *Saxifraga albertii* Regel et Schamlh., *Seseli sclerophyllum* Korovin, *Rochelia pamirica* Dengub.), listed as endemic by (Ikonnikov, 1963, 1979) were excluded because WFO (2020) considers their taxonomic status ambiguous.

Fewer relict than endemic species were identified for Badakhshan, partly because less work has been done on identifying them. Fifty-two are known from Tajik Badakhshan (Table 1), of which 25 also grow in Afghan Badakhshan (Ikonnikov, 1963, 1979; Kamelin, 1973; Dengubenko, 1984; Novruzshoev, 1996; Beknazarova, 2019). There are no data on relict species in Afghanistan, so it was not possible to determine the number of such species known only from the Afghan portion of Badakhshan. Three relict species, *Allium schugnanicum*, *Prunus tadjikistanica*, and *Iris zaprjagaevii*, are also endemic to Badakhshan and are therefore included in Table 1. Unfortunately, the unclear taxonomic interpretation of several species previously mentioned as relicts (e.g., *Lonicera simulatix*, *Rochelia pamirica* Dengub., *Scrophularia tadshikorum*) resulted in their exclusion from Table 1 despite their having been mentioned as relicts by others (Ikonnikov, 1976; Dengubenko, 1984; Navruzshoev, 1996).

The latest edition of the Red Data Book of the Republic of Tajikistan (2015) includes 242 species of flowering plants. Of these, 50 are found on the territory of the Gorno-Badakhshan Autonomous Region. In addition to endemic and relict species, this Red Book includes other species that need protection, for example, species located on the edge of their range and/or subject to uncontrolled destruction by humans because of their value for medicine, food, decoration, and fuel). Many scientists (e.g., Navruzshoev, 1996; Saboiev, 2002; Ali and Akobirshoeva, 2013; Aknazarov, 2012.) include medicinal plants among those needing protection for this reason, but often only at the generic level because, in many instances, all species of a genus will be harvested for the same purpose. Thus gold root (*Rhodiola*), licorice (*Glycyrrhiza*), zizifora (*Ziziphora*), mint (*Mentha*), and macrotomy (*Macrotomia*) have all been identified as being threatened from uncontrolled harvesting. Despite this, no species of these genera was included in the Red Data Book of the Republic of Tajikistan (Kitobi Surkhi ..., 2015).

The National Red List of Afghanistan (online) includes five species, but only one of them, *Corydalis hindukushensis* Wendelbo et Gray-Wilson in Rech. f., is found in Badakhshan. Undoubtedly, more of the region's species should be protected because uncontrolled harvesting is a major threat to medicinal plants throughout the world.

In accordance with the Criteria for the identification of IPA, the endemic species *Cornus darvasica* (Pojark.) Pilip and *Zygophyllum darvasicum* Boriss., being included in the list of threatened plants of IUCN (IUCN Red List, online) with Critic Endangered (CR) status, were classified in Category A(i) (globally threatened species). This list also includes five relic species (Table 1), which were mentioned in the list of threatened plants of International Union for Conservation of Nature (IUCN).

A(ii) - regionally threatened species, listed in the Red Book of the Republic of Tajikistan (2015), not included in the list of A(i). This list includes 29 species: 23 neoendemic, 1 paleoendemic and 5 relict species, whose range is limited by Badakhshan (Table 1).

A(iii) - includes local or national endemic species, not included in the lists of species of categories A(i) and A(ii), which are under threat. It should be noted, that the narrow endemic species, that are revealed in this work, are obviously at risk in the territory, which is subject to overgrazing and feel a huge recreational load and all of them (Table 1) that were not included in the lists A(i) and A(ii), a total of 103 species, should be included in list A(iii).

There are 39 relict species, that are not endemic, and are included neither in the Red Data Book of the Republic of Tajikistan, nor in the National Red List of Afghanistan. Undoubtedly, all of them need the special protection. In order to ensure it, these species should be additionally included in the Red Data Book of Republic Tajikistan, and 24 species, which occur in the Afghan province of Badakhshan as well, should be included in the National Red List of Afghanistan.

Category A(iv) includes subendemics whose ranges extend beyond the studied region, in this case, Badakhshan. The compilation of this list causes the greatest difficulty, since their selection is quite subjective. Badakhshan subendemics can be recognized as Badakhshan species with 2-3 locations in neighboring Pakistan and even growing in other regions of Tajikistan or other provinces of Afghanistan (such as *Corydalis fedtschenkoana* Regel, an Afghan endemic growing in addition to Badakhshan in the provinces Bamyan and Baghlan), and species, widely settled in neighboring regions of Central Asia. Given these difficulties, we do not list sub-endemics. The formation of this list should be addressed individually for each species, taking into account their environmental and biological characteristics and distribution, and there is not enough data for this yet.

Conclusions

Investigation of the flora of Badakhshan, and especially its poorly studied border territories, now is an urgent task, since the unclear taxonomic status of many endemic and relict species prevents their inclusion in the protected list. This poses a real threat of biodiversity loss.

A total of 95 narrowly endemic species of Badakhshan, that are not found in other areas of Tajikistan and Afghanistan, have been revealed; 50 of these grow only on the territory of the GBAR of Tajikistan, 36 – only in the Afghan province Badakhshan; the ranges of nine species occurs on the both parts of Badakhshan. We also registered that 52 relicts of the preglacial period grow on the territory of the GBAR of the Republic of Tajikistan, 24 of them are grow in Afghanistan part of Badakhshan.

In accordance with the criteria for identifying IPA, within revealed endemic and relict species, 7 species are assigned to category A (i), 29 species – to A (ii), and 103 species – to A (iii).

We proposed to include 39 in the Red Data Book of Republic of Tajikistan. The National red list of Afghanistan proposes to include an additional 24 relict plant species. As a whole, 73 species are proposed to add to Red Data Book of Republic of Tajikistan and 65 species – to the National red list of Afghanistan.

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APPENDIX

Table 1. Endemic and relic species of Badakhshan recommended for inclusion in the lists of protected species for the region.

| N | Taxon name | Tajikistan | | Afghanistan | | Tajikistan | Afghanistan | IUCN | IPA |
|----|--|------------|-------|-------------|-------|---------------|---------------------------|------|------|
| | | Endemic | Relic | Endemic | Relic | Red Data Book | List of Protected species | | |
| 1 | <i>Acantholimon alexeenkoanum</i> | | 1 | | | ADD | | | Aiii |
| 2 | <i>Acantholimon varivtzevae</i> | | 1 | | | 1 | | | Aii |
| 3 | <i>Acanthophyllum schugnanicum</i> | 1 | | | | ADD | | | Aiii |
| 4 | <i>Allium darvasicum</i> | | 1 | | 1 | ADD | ADD | | Aiii |
| 5 | <i>Allium macleanii</i> | | 1 | | | ADD | | | Aiii |
| 6 | <i>Allium oschaninii</i> | | 1 | | 1 | ADD | ADD | DD | Aiii |
| 7 | <i>Allium schugnanicum</i> | 1 | 1 | 1 | 1 | 1 | ADD | | Aii |
| 8 | <i>Anaphalis darvasica</i> | 1 | | 1 | | ADD | ADD | | Aiii |
| 9 | <i>Androsace bryomorpha</i> | 1 | | | | ADD | | | Aii |
| 10 | <i>Arum korolkovii</i> | | 1 | | | ADD | | | Aiii |
| 11 | <i>Astracantha alexeenkoana</i> | 1 | | | | 1 | | | Aii |
| 12 | <i>Astragalus bahrakianus</i> | | | 1 | | | ADD | | Aiii |
| 13 | <i>Astragalus darwasicus</i> | 1 | | | | 1 | | | Aii |
| 14 | <i>Astragalus djilgensis</i> | 1 | | | | ADD | | | Aiii |
| 15 | <i>Astragalus dolichopodus</i> | 1 | | | | ADD | | | Aiii |
| 16 | <i>Astragalus fursei</i> | 1 | | 1 | | ADD | ADD | | Aiii |
| 17 | <i>Astragalus innominatus</i> | 1 | | | | ADD | | | Aiii |
| 18 | <i>Astragalus mundulus</i> | | | 1 | | | ADD | | Aiii |
| 19 | <i>Astragalus pseudotomentellus</i> | | | 1 | | | ADD | | Aiii |
| 20 | <i>Astragalus schachdarinus</i> | 1 | | 1 | | | ADD | | Aiii |
| 21 | <i>Aulacospermum ikonnikovii</i> | 1 | | | | ADD | | | Aiii |
| 22 | <i>Betula murgabica</i> | | 1 | | 1 | ADD | ADD | | Aiii |
| 23 | <i>Betula pamirica</i> | | 1 | | | ADD | | | Aiii |
| 24 | <i>Betula procurva subsp. schugnanica (B.Fedtsch.) Ovcz.</i> | | 1 | | | ADD | | | Aiii |
| 25 | <i>Biebersteinia multifida</i> | | 1 | | 1 | ADD | ADD | | Aiii |
| 26 | <i>Botrychium lunaria</i> | | 1 | | 1 | ADD | ADD | | Aiii |
| 27 | <i>Braya gamosepala</i> | | | 1 | | | ADD | | Aiii |
| 28 | <i>Calamagrostis korzhinskii</i> | 1 | | | | ADD | | | Aiii |
| 29 | <i>Celtis australis subsp. caucasica</i> | | 1 | | | ADD | | LC | Aiii |
| 30 | <i>Cephalopodium badachshanicum</i> | 1 | | | | 1 | | | Aii |
| 31 | <i>Cercis griffithii</i> | | 1 | | 1 | ADD | ADD | DD | Aiii |
| 32 | <i>Chenopodium badachschanicum</i> | 1 | | 1 | | ADD | ADD | | Aiii |
| 33 | <i>Chesneya tadjikistana</i> | 1 | | 1 | | ADD | 1 | | Aii |
| 34 | <i>Clematis saresica</i> | 1 | 1 | | | ADD | | | Aiii |
| 35 | <i>Corispermum gelidum</i> | 1 | | | | ADD | | | Aiii |
| 36 | <i>Cornus darvasica</i> | 1 | | | | 1 | | CR | Ai |
| 37 | <i>Corydalis hindukushensis</i> | | | 1 | | | 1 | | Aii |
| 38 | <i>Cousinia corymbosa</i> | 1 | | | | 1 | | | Aii |
| 39 | <i>Cousinia hilariae</i> | 1 | | | | 1 | | | Aii |
| 40 | <i>Cousinia khashensis</i> | | | 1 | | | ADD | | Aiii |
| 41 | <i>Cousinia koelzii</i> | | | 1 | | | ADD | | Aiii |
| 42 | <i>Cousinia pseudocirsium</i> | | | 1 | | | ADD | | Aiii |
| 43 | <i>Cousinia semilacera</i> | 1 | | 1 | | | ADD | | Aiii |
| 44 | <i>Cryptogramma stelleri</i> | | 1 | | 1 | 1 | ADD | | Aii |
| 45 | <i>Cuscuta pamirica</i> | 1 | | | | ADD | | | Aiii |
| 46 | <i>Delphinium brunonianum</i> | | 1 | | 1 | ADD | ADD | | Aiii |
| 47 | <i>Desmatodon altipes</i> | 1 | | | | 1 | | | Aii |

| | | | | | | | | | |
|----|---|---|---|---|---|---|-----|-----|------|
| 48 | <i>Dianthus dilepis</i> | | | 1 | | | ADD | | Aiii |
| 49 | <i>Dianthus lindbergii</i> | | | 1 | | | ADD | | Aiii |
| 50 | <i>Dielsiocharis bactriana</i> (Ovcz. & Junussov) Al-Shehbaz & Junussov | 1 | | | | 1 | | | Aii |
| 51 | <i>Diospyros lotus</i> | | 1 | | | 1 | | LC | Aii |
| 52 | <i>Draba odudiana</i> | 1 | | | | 1 | | | Aii |
| 53 | <i>Dracocephalum lindbergii</i> | | | 1 | | | ADD | | Aiii |
| 54 | <i>Ephedra fedtschenkoae</i> | | 1 | | 1 | | ADD | ADD | Aiii |
| 55 | <i>Ephedra glauca</i> | | 1 | | | | ADD | | Aiii |
| 56 | <i>Epipactis helleborine</i> | | 1 | | | | | VU | Ai |
| 57 | <i>Eremurus bactrianus</i> | | | 1 | | | ADD | | Aiii |
| 58 | <i>Erigeron badachschanicus</i> | 1 | | | | 1 | | | Aii |
| 59 | <i>Erigeron brachyspermus</i> | 1 | | | | | ADD | | Aiii |
| 60 | <i>Eriophyton rhomboideum</i> | | 1 | | 1 | | ADD | ADD | Aiii |
| 61 | <i>Eritrichium pseudostrictum</i> | 1 | | | | | ADD | | Aiii |
| 62 | <i>Eritrichium subjaquemontii</i> | 1 | | | | | ADD | | Aiii |
| 63 | <i>Ferula koso-poljanskyi</i> | 1 | | 1 | | 1 | ADD | | Aii |
| 64 | <i>Ficus carica</i> | | 1 | | | | ADD | LC | Aii |
| 65 | <i>Fraxinus raibocarpa</i> | | 1 | | | | ADD | LC | Aiii |
| 66 | <i>Gagea schugnanica</i> | 1 | | | | | ADD | | Aiii |
| 67 | <i>Hackelia tectimundi</i> | 1 | | | | | ADD | | Aiii |
| 68 | <i>Hedysarum wakhanicum</i> | | | 1 | | | ADD | | Aiii |
| 69 | <i>Hesperis kunawarensis</i> | | | 1 | | | ADD | | Aiii |
| 70 | <i>Hippolytia schugnanica</i> | 1 | | | | | ADD | | Aiii |
| 71 | <i>Holosteum kobresietorum</i> | | | 1 | | | ADD | | Aiii |
| 72 | <i>Iris baldshuanica</i> | 1 | | | | 1 | | | Aii |
| 73 | <i>Iris darwasica</i> | 1 | | | | 1 | | | Aii |
| 74 | <i>Iris tadshikorum</i> | 1 | | | | 1 | | | Aii |
| 75 | <i>Iris zaprjagajevii</i> | 1 | 1 | | | 1 | | | Aii |
| 76 | <i>Ixiolirion karateginum</i> | | 1 | | | | ADD | | Aiii |
| 77 | <i>Juncus triglumis subsp. wakhanensis</i> | | | 1 | | | ADD | | Aiii |
| 78 | <i>Juniperus semiglobosa</i> | | 1 | | 1 | | ADD | ADD | LC |
| 79 | <i>Kudrjaschevia korshinskyi</i> | 1 | | 1 | | 1 | ADD | | Aii |
| 80 | <i>Kudrjaschevia nadinae</i> | 1 | | | | 1 | | | Aii |
| 81 | <i>Kudrjaschevia pojarkovae</i> | 1 | | | | | ADD | | Aiii |
| 82 | <i>Lappula dubia</i> | 1 | | | | | ADD | | Aiii |
| 83 | <i>Ligularia thomsonii</i> | | 1 | | 1 | | ADD | ADD | Aiii |
| 84 | <i>Lonicera nummulariifolia</i> | | 1 | | 1 | | ADD | ADD | LC |
| 85 | <i>Lonicera stenantha</i> | | 1 | | 1 | | ADD | ADD | Aiii |
| 86 | <i>Malus niedzwetzkyana</i> | | 1 | | | | | VU | Ai |
| 87 | <i>Malus sieversii</i> | | 1 | | | | | VU | Ai |
| 88 | <i>Megacarpaea schugnanica</i> | 1 | | | | 1 | | | Aii |
| 89 | <i>Mesostemma alexeenkoana</i> | 1 | | | | | ADD | | Aiii |
| 90 | <i>Myricaria elegans</i> | | 1 | | 1 | 1 | ADD | | Aii |
| 91 | <i>Nitraria schoberi</i> | | 1 | | | | ADD | LC | Aiii |
| 92 | <i>Oreogenia paulsenii</i> | 1 | | | | | ADD | | Aiii |
| 93 | <i>Oxytropis astragaloides</i> | 1 | | 1 | | 1 | | | Aii |
| 94 | <i>Oxytropis guntensis</i> | 1 | | 1 | | | ADD | ADD | Aiii |
| 95 | <i>Oxytropis kazidanica</i> | | | 1 | | | | ADD | Aiii |
| 96 | <i>Oxytropis minjanensis</i> | | | 1 | | | | ADD | Aiii |
| 97 | <i>Oxytropis salicetorum</i> | | | 1 | | | | ADD | Aiii |

| | | | | | | | | | | |
|-----|---------------------------------------|----|----|----|----|--|---------|-----|--------|---------|
| 98 | <i>Oxytropis surculosa</i> | | | 1 | | | | ADD | | Aiii |
| 99 | <i>Oxytropis vakhdzhiri</i> | | | 1 | | | | ADD | | Aiii |
| 100 | <i>Parrya schugnana</i> | 1 | | | | | | ADD | | Aiii |
| 101 | <i>Pentaphylloides dryadanthoides</i> | | 1 | | 1 | | | ADD | ADD | Aiii |
| 102 | <i>Phlomoides badakhanica</i> | | | 1 | | | | | ADD | Aiii |
| 103 | <i>Phlomoides calophyta</i> | | | 1 | | | | | ADD | Aiii |
| 104 | <i>Phlomoides sanglechensis</i> | | | 1 | | | | | ADD | Aiii |
| 105 | <i>Pinacantha porandica</i> | | | 1 | | | | | ADD | Aiii |
| 106 | <i>Piptatherum pamiralaicum</i> | 1 | | | | | | ADD | | Aiii |
| 107 | <i>Pistacia vera</i> | | 1 | | | | | ADD | | NT Aiii |
| 108 | <i>Platanus orientalis</i> | | 1 | | 1 | | | ADD | ADD | DD Aiii |
| 109 | <i>Polygonum coriarium</i> | | 1 | | | | | ADD | | Aiii |
| 110 | <i>Populus pamirica</i> | | 1 | | 1 | | | ADD | ADD | Aiii |
| 111 | <i>Populus pruinosa</i> | | 1 | | | | | ADD | | NT Aiii |
| 112 | <i>Potamogeton tubulatus</i> | 1 | | | | | | ADD | | Aiii |
| 113 | <i>Primula chrysostoma</i> | | | 1 | | | | | ADD | Aiii |
| 114 | <i>Primula flexuosa</i> | 1 | | | | | 1 | | | Aii |
| 115 | <i>Prunus brahuica</i> | | 1 | | | | | ADD | | Aiii |
| 116 | <i>Prunus erythrocarpa</i> | | 1 | | | | | ADD | | Aiii |
| 117 | <i>Prunus sogdiana</i> | | 1 | | | | | ADD | | Aiii |
| 118 | <i>Prunus tadjikistanica</i> | 1 | 1 | | | | 1 | ADD | | EN Ai |
| 119 | <i>Pyrola rotundifolia</i> | | 1 | | 1 | | | ADD | ADD | Aiii |
| 120 | <i>Pyrus cajon</i> | | 1 | | | | 1 | | | EN Ai |
| 121 | <i>Ranunculus chrysocyclus</i> | | | 1 | | | | ADD | ADD | Aiii |
| 122 | <i>Rhamnus minuta</i> | | 1 | | | | | ADD | | Aiii |
| 123 | <i>Ribes janczewskii</i> | | 1 | | 1 | | | ADD | ADD | LC Aiii |
| 124 | <i>Ribes meyeri</i> | | 1 | | 1 | | | ADD | ADD | Aiii |
| 125 | <i>Rosa beggeriana</i> | | 1 | | 1 | | | ADD | ADD | Aiii |
| 126 | <i>Saussurea caprifolia</i> | 1 | | | | | 1 | | | Aii |
| 127 | <i>Scorzonera gracilis</i> | 1 | | | | | | ADD | | Aiii |
| 128 | <i>Scorzonera lindbergii</i> | | | 1 | | | | | ADD | Aiii |
| 129 | <i>Scrophularia badakhshanica</i> | | | 1 | | | | | ADD | Aiii |
| 130 | <i>Scutellaria amicomum</i> | | | 1 | | | | | ADD | Aiii |
| 131 | <i>Scutellaria lindbergii</i> | | | 1 | | | | | ADD | Aiii |
| 132 | <i>Seseli afghanicum</i> | 1 | | 1 | | | | ADD | ADD | Aiii |
| 133 | <i>Silene danielii</i> | | | 1 | | | | | ADD | Aiii |
| 134 | <i>Sorbus turkestanica</i> | | 1 | | 1 | | | ADD | ADD | DD Aiii |
| 135 | <i>Stellaria winkleri</i> | 1 | 1 | | | | | ADD | | Aiii |
| 136 | <i>Stipa okmirii</i> | 1 | | | | | | ADD | | Aiii |
| 137 | <i>Taraxacum guntense</i> | 1 | | | | | | ADD | | Aiii |
| 138 | <i>Zygophyllum darvasicum</i> | 1 | | | | | 1 | | | CR Ai |
| 139 | <i>Zygophyllum heterocladum</i> | | | 1 | | | | | ADD | Aiii |
| | Total: | 59 | 52 | 45 | 24 | | 29 + 73 | | 2 + 65 | 21 139 |

Criteria in accordance with IUCN Red List: EN – Endangered; VU – Vulnerable; NT – Near threatened; LC – Least concern; DD – Data deficient