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CONTRIBUTION TO THE FLORA OF ULZIIT MOUNTAIN IN FOREST STEPPE REGION OF MONGOLIA

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Abstract

The Ulziit Mountain has a unique ecosystem which is one of northern branch mountains of Khangai mountain range in Mongolia. Several field survey were conducted in summer in all habitats in different altitudes. A total of 314 taxa were registered belonging to 161 genera from 52 families in Ulziit Mountain flora. The family Asteraceae was found to be the largest with 37 taxa, followed by Poaceae with 30 taxa, Ranunculaceae with 24 taxa, Cyperaceae, Caryophyllaceae and Rosaceae each with 17 taxa, Salicaceae with 16 taxa, and Fabaceae with 15 taxa; in total, these comprised 55.1% of all flora complements in this mountain. During the investigation, 5 species were newly recorded in the Khangai mountains forest-steppe region. The most represented life forms in the flora are hemicryptophytes (71.97%), which are common for mountain steppe vegetation. In a time of climate change, effective conservation of nature is needed at an ecosystem such as a single mountain particularly for endemic, relict and other salient species. Furthermore, such a detailed floristic survey is important for finding new records in the field of plant taxonomy and conservation of nature in these specific areas.

Introduction

The Ulziit Mountain is the northwestern branch of Noyon-Khangai Mountains in the main ridge that stretches from the northwest to the Khangai mountain range (Shagdar, 2007). The Khangai mountain range is one of the large mountain systems in Mongolia which includes the Bulnai, Tarbagatai, Khan-Khukhii, and Buren mountains (Tsegmid, 1969). It is a continuation of the Siberian taiga forest, which opens to the steppe and belongs to the Khangai mountain forest-steppe based on phytogeographical division (Grubov, 1982).

Regarding the climate of the Khangai mountain range, the average minimum temperature is -32ºC in January and the average maximum temperature is lower than 15ºC in July. The annual mean precipitation is 300-400 mm and about 85% of the total precipitation falls from April to September (Batima *et al.,* 2005). In the past decades, the mountainous regions Mongolia, including larch forest belts are the most affected by climate change and a substantial increase in aridity (Batima *et al.,* 2005; Dulamsuren *et al.,* 2010) and high mountain vegetation here is the most sensitive to global warming (Klinge *et al.,* 2018).

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The vegetation of the Khangai mountain forest-steppe region is characterized by elements of the Siberian taiga, Asian steppe, and Daurian (Junatov, 1977; Ulziikhutag, 1989). This region is mainly composed of mountain forest-steppe, dominated by larch forest and Siberian pine forest; the mountain slopes are predominantly grass-forb, forb-grass meadow, with the southern region revealing steppe vegetation for example, fescue and junegrass. The upper elevations of the forests are composed of rocky outcroppings with shrubby vegetation (Munkhbayar, 2008).

In the flora of Mongolia, 2,823 taxa of vascular plants belonging 662 genera and 128 families have been registered (Gubanov, 1996). According to the literatures, the flora and vegetation of the Khangai mountain range was investigated by earlier botanists; initially Grubov (1955) registered 899 species and in 1982 he updated it to 1018 species (Grubov, 1982). Moreover, the flora of Khangai mountain range was specifically investigated by Byazrov *et al.* (1983, 1989) who detected 1468 taxa under 443 genera belonging to 94 families.

Finally, based on all previous investigations Gubanov (1996) updated 1491 taxa, 440 genera and 106 families in the Khangai mountain forest-steppe, which includes about 50% of the total flora in Mongolia. In general, the flora and vegetation of the whole Khangai mountain range has been relatively well investigated; however, there is no detailed investigation in this mountain.

Dariimaa and Mandakh (1984) noted that the outcomes of the detailed taxonomic investigation in certain area can be of great importance for future investigations and Munkhbayar (2008) also stated scientists regular investigate specific areas to determine the proper use of natural resources. Recently, Mongolian researchers have been investigating the flora of vascular plants in specific areas such as protected areas and national parks and continue to record new species (Tserendulam *et al.*, 2018; Baasanmunkh *et al.*, 2019).

We aimed to conduct detailed floral investigations for the Ulziit Mountain, to clarify this mountain's specificity of vegetation, plant diversity and ecology. Because endemic, glacial relict, threatened and other salient species which have narrow distribution must be carefully investigated for conservation in the face of climate change and human impacts.

Materials and Methods

Ulziit Mountain is located in the northern part of the Khangai mountain range (N 47°43'–47°48", E 99°11'–99°19') and 12-15 km from the western part of the center of Khangai soum, Arkhangai province, at a relative altitude of 2,100–2,600 m above the sea level (asl) and an absolute altitude of 2,953 m asl (Fig. 1). This mountain borders Untaa–Yamaat to the western and Noyon-Khangai mountain to the east-southern parts. "Tsurkhat," a small lake located along the eastern foothills of Ulziit, is fed from this mountain and flows into the Terkh river. The investigated area is part of the Khangai mountain forest-steppe phytogeographical region of Mongolia (Grubov, 1982), as shown in Fig. 1.

In the Ulziit Mountain, the mean annual temperature is −3.5ºC, with a maximum temperature of 16.0ºC in July and a minimum temperature of −32.4ºC in January. The annual total precipitation is 199 mm, summer precipitation occurs between May and September and accounts for 85%–90% of the total annual rainfall (Fig. 2).

We conducted field survey in 2015, 2017, and 2019; and collected 450 voucher specimens (in duplicate) from all following habitats including valleys, flat areas, riversides, mountain slopes, larch forest fringe, larch forests, timberline, rock outcrops, rock cliffs, and high mountain meadows (Table 1).

Samples of each taxon was prepared following herbarium collection techniques (Maden, 2004) and deposited in the Herbarium (UBA) of the Botanic Garden and Research Institute of the

Mongolian Academy of Sciences and Mongolian Museum of Natural History. These specimens were identified using the Key to the Vascular Plants of Mongolia (Grubov, 1982) and several volumes of Flora of Mongolia (Nyambayar, 2009; Urgamal, 2009; Dariimaa, 2014a,b; Dariimaa *et al.*, 2015; Dariimaa and Saruul, 2017). All taxa in the floristic nomenclature are given according to Plants of the World Online (PWO, 2020) and International Plant Names Index (IPNI, 2020). In the appendix, family names are listed in alphabetical order and each is presented with the following details: valid name with authority, family name, lifeform, IUCN and Mongolian red list categories, endemism, relict, and chorotypes. To compare floristic similarities, Jaccard's similarity index was used (Niwattanakul *et al.*, 2013).

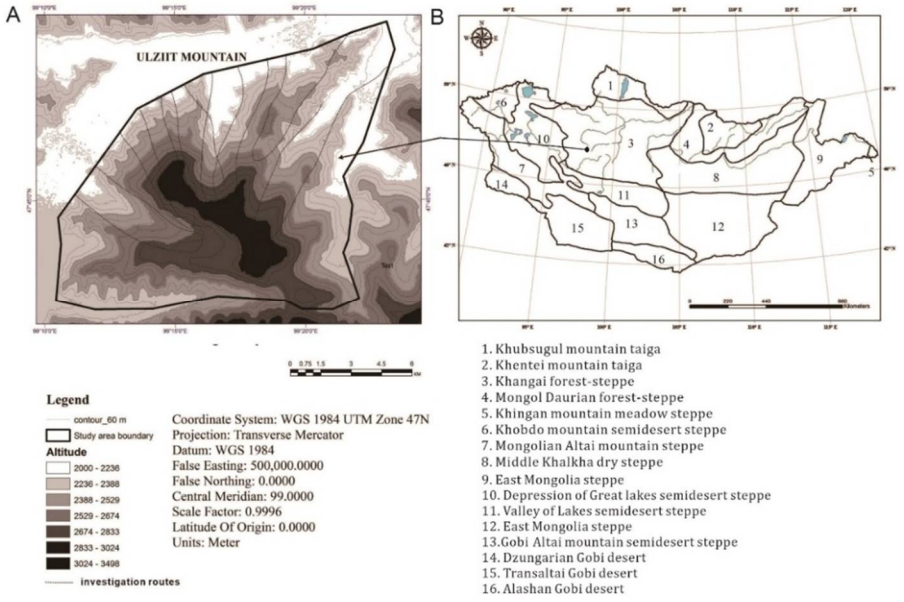

Fig. 1. Maps of the investigated area (A) including phytogeographical region in Mongolia (B).

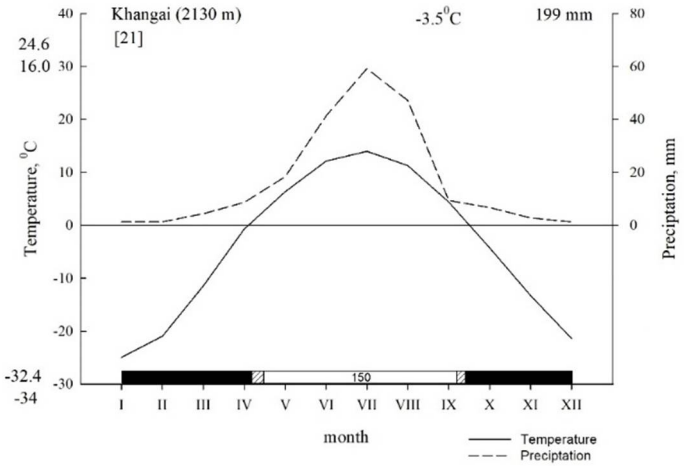

Fig. 2. Climate diagram of Khangai station near Ulziit Mountain.

The climatic diagram in Fig. 2 was prepared using Walter *et al.* (1975)'s method based on the data from the Khangai station in Khangai soum, obtained between 1999 and 2019 (NAMEM, 2019).

The plant lifeform categories are according to the classification by Raunkiaer (1937) based on the location of winter buds are Ph (phanerophytes), Ch (chamaephytes), Th (therophytes), H (hemicriptophytes), G (geophytes), and Hy (hydrophytes).

Table 1. The dates and investigation routes.

No.	Dates	Investigation routes
1	2015 June 15-20	Tsurkhat lake → Buun mod → Top → Baits khad
2	2015 August 22-27	Terkh river → Luutiin am → Larch forest → Top Buun mod
3	2017 July 20-25	Mukhariin am → Larch forest → Top
4	2017 June 23-24	Tsurkhatiin uzuur → Larch forest → Turagiin nuur
5	2017 August 1-3	Nariin nuur → Mountain rock slope → Top
6	2019 July 21-26	Tsagaan tolgoi → Tsurkhat lake → Kharuul tsohio → Turagiin nuur → Top
7	2019 August 13-20	Tsagaan tolgoi → Gol asga → Davaa nuur

A biogeographical analysis was performed according to Tolmachev (1974) and Ganbold's (2010) methods based on plant distribution and phytogeographic origin. Each taxon was categorized into five large distributional groups; the Asian group was divided into 10 subgroups. Chorotypes are marked with their abbreviations in Appendix 1.

Threatened status is defined according to the International Union for Conservation of Nature (IUCN, 2019), Mongolian Red Book (Shiirevdamba *et al.*, 2013), and Mongolian Red List (Nyambayar *et al.*, 2011; Tsendeekhuu *et al.*, 2019). The abbreviations for the categories are as follows: Endangered (EN), Vulnerable (VU), Near Threatened (NT), and Least Concern (LC). Endemism is defined according to Urgamal and Oyuntsetseg (2017) and Urgamal *et al.* (2014) as endemic (E) and subendemic (SE). Relict plants are marked RL according to Ulziikhutag (1989) and Munkhbayar (2008).

Results and Discussion

We recorded 314 vascular plants taxa belonging to 161 genera and 52 families for the flora of Ulziit Mountain (App. 1). These species belong to 26 orders and 4 classes which include 4 taxa of Polipodiopsida, 2 taxa of Pinopsida, 62 taxa of Liliopsida, and 246 taxa of Magnoliopsida (Table 2). The largest family is Asteraceae (37 taxa, 11.78% of total flora), followed by Poaceae (30 taxa, 9.55%), Ranunculaceae (24 taxa, 7.64%), Cyperaceae, Caryophyllaceae and Rosaceae (each 17 taxa, 5.41%), Salicaceae (16 taxa, 5.1%), and Fabaceae (15 taxa, 4.78%); these predominant families comprise 55.1% of all floral groups on the mountain (Table 3). The most represented genera are *Carex* (16), *Salix* (15 taxa), *Pedicularis* (10), *Saussurea* (9), and *Artemisia* (8); they constitute 18.06% of the flora of Ulziit Mountain. The largest genera are including taxa following, *Carex: C. amgunensis, C. bigelowii* subsp. *ensifolia, C. coriophora, C. dichroa, C. duriuscula, C. eleusinoides, C. ledebouriana, C. macroprophylla, C. melanantha, C. melanocephala, C. microglochin, C. myosuroides, C. norvegica, C. pediformis, C. rupestris, C. stenocarpa; Salix: S abscondita, S. berberifolia, S. caesia, S. divaricata, S. glauca, S. saposhnikovii, S. kochiana, S. nummularia, S. pseudopentandra, S. recurvigemmis, S. rhamnifolia, S. rosmarinifolia, S. taraikensis, S. vestita; Pedicularis: P. abrotanifolia, P. flava, P. longiflora, P. myriophylla, P. oederi, P. resupinata, P. rubens, P. sibirica, P. tristis, P. verticillata; Saussurea: S. alpina, S.*

arctecapitulata, S. baicalensis, S. controversa, S. involucrata, S. leucophylla, S. parviflora, S. salicifolia, S. schanginiana; and Artemisia: A. frigida, A. glauca, A. laciniata, A. leucophylla, A. mongolica, A. palustris, A. phaeolepis, A. pubescens var. *monostachya.* We newly recorded 5 species (*Salix abscondita* Laksch., *Salix alatavica* Kar. *ex* Stschegl., *Silene mongolica* Maxim., *Polygonum valerii* A.K. Skvortsov, and *Campanula dasyantha* M. Bieb.) in the flora of the Khangai mountain forest-steppe region.

Table 2. The number of vascular plants distributed in Mount Ulziit.

Class	Order	Family	Genus	Species	Subspecies	Variety	Total taxa
Magnoliopsida	19	37	125	233	9	4	246
Liliopsida	4	9	30	59	3	0	62
Polypodiopsida	2	4	4	4	0	0	4
Pinopsida	1	2	2	2	0	0	2
Total	26	52	161	298	12	4	314

Table 3. The most abundant families found in Mount Ulziit.

Largest families	Number genus	Number species	% of flora
Asteraceae	16	37	11.78
Poaceae	19	30	9.68
Ranunculaceae	12	24	7.74
Cyperaceae	3	17	5.41
Rosaceae	8	17	5.41
Caryophyllaceae	6	17	5.41
Salicaceae	2	16	5.1
Fabaceae	8	15	4.78
Total	74	173	55.1

The flora of Ulziit Mountain is similar by 27% to Khubsugul mountain-taiga region (region number 1), 23% to the Khentei mountain-taiga region (2), 20% to the Khangai mountain forest-steppe region (3), and 21% to the Khobdo mountain semidesert-steppe region (6) (Fig. 3).

The life-form spectrum of each taxon is shown in Fig. 4 as follows: chamaephytes with 6 taxa (1.91% of the total flora), geophytes 23 (7.32%), hemicryptophytes 226 (71.97%), hydrophytes 2 (0.64%), phanerophytes 26 (8.28%), and therophytes 31 (9.87%). Hemicrypto-phytes are the most represented class in the investigated area.

Fig. 5 shows Cosmopolitan chorotype with 4 taxa (1.27%), Asia–American 6 taxa (1.91%), Holarctic 44 taxa (14.01%), Eurasian 88 taxa (28.02%), and Asian 172 taxa (54.8%). The most important global distribution occurs in the Asian category with 10 subgroups. South Siberia Mongolian elements represent 48 taxa (15.29% of the total flora), followed by Asian Endemics 31 (9.87%), East Siberia–Mongolian 32 (10.19%), Eastern Asian 15 (4.78%), Central Asian 10 (3.18%), West Siberia Mongolian 9 (2.87%), Altai–Northern Mongolian 9 (2.87%), Altai–Dzungarian Mongolian 8 (2.55%), Siberia Mongolian 7 (2.23%), and Mongolian Endemic 3 (0.95%).

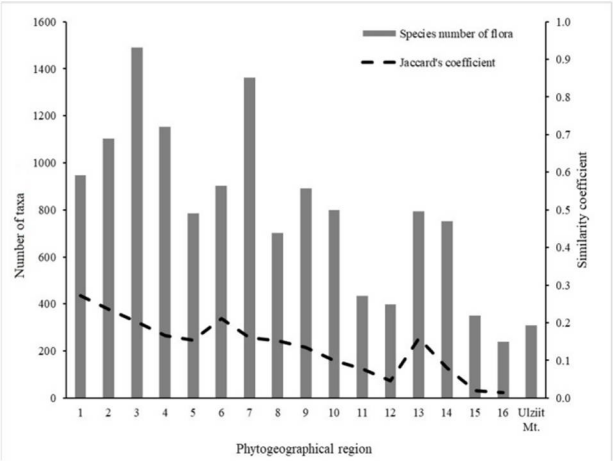

Fig. 3. Similarity coefficients of Mount Ulziit compared to 16 phytogeographical regions (names of 1-16 regions are shown in Fig. 1).

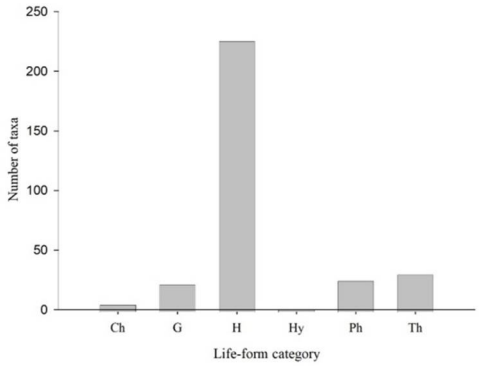

Fig. 4. The life-form spectrum of the vascular flora of Mt. Ulziit.

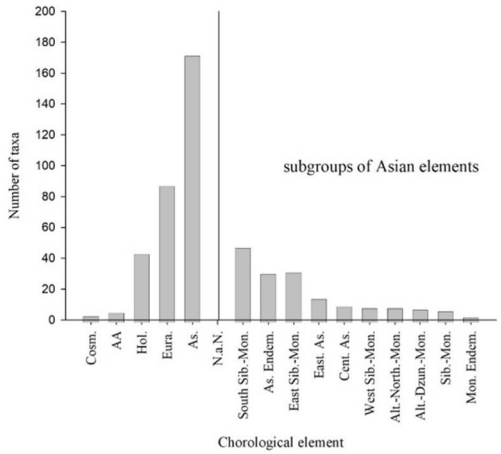

Fig. 5. The species number of chorological elements and Asian subgroups to total flora.

According to the global red list, a total of 24 taxa are listed on the IUCN Red List, including one species (*Allium altaicum* Pall.) which is categorized as Near Threatened, and 23 taxa are listed as Least Concern. Also according to the regional red list (Nyambayar *et al.,* 2011; Tsendeekhuu *et al.,* 2019), 23 taxa have been registered as threatened, which consist of 5 as Least Concern species (*Allium lineare, Valeriana officinalis, Sedum aizoon, Gentianopsis barbata*, and *Trisetum sibiricum*), 6 as Near-threatened species (*Aconitum turczaninovii*, *Ribes aciculare*, *Silene songarica*, *Spiraea media*, *Taraxacum glabrum*, and *Vicia geminiflora*), 5 Vulnerable taxa (*Allium altaicum*, *Armeria maritima* subsp. *sibirica*, *Artemisia glauca*, *Chelidonium majus*, and *Comastoma pulmonarium*) and 7 Endangered species (*Astragalus changaicus*, *Gentiana algida*, *Juniperus pseudosabina*, *Saussurea involucrata*, *Saxifraga hirculus*, *Silene chamarensis*, and *Silene mongolica*).

In the Mongolian Red Book, *Saussurea involucrata* (Kar. & Kir.) Sch. Bip. was categorized in very rare status (like endangered species) (App. 1). Of these, three endemic species (*Astragalus changaicus*, *Silene mongolica*, and *Thymus gobicus*), nine subendemic species (*Allium altaicum*, *Astragalus filiformis*, *Eremogone formosa*, *Oxytropis oligantha*, *Pedicularis abrotanifolia*, *Pedicularis flava*, *Saussurea arctecapitulata*, *Saussurea baicalensis*, and *Vicia geminiflora*), and five relict species (*Allium altaicum*, *Caragana jubata*, *Dryas oxyodonta*, *Ptilagrostis mongholica*, and *Saussurea involucrata*) are now registered in the flora of Ulziit Mountain.

In this floristic survey, we registered 314 taxa that constitute 21.39% of the flora of Khangai mountain forest-steppe and 11.12% of Mongolian vascular flora, which indicates high diversity and specificity of the flora of the Ulziit mountain. This biodiversity also shows characters of the phytogeographical region. We found five unrecorded species, *Salix abscondita* Laksch., *Salix alatavica* Kar. ex Stschegl., *Silene mongolica* Maxim., *Polygonum valerii* A.K. Skvortsov, and *Campanula dasyantha* M. Bieb. in the region of the Khangai mountain forest-steppe. All of our new records are from the alpine belt in a timberline habitat. According to past literatures (Gubanov, 1996; Urgamal *et al.,* 2014), *Salix abscondita* Laksch. was recorded in the phytogeographical regions of Khubsugul, Khentei, Mongol Daurian, Great Khingan, and Gobi–Altai; *Salix alatavica* Kar. *ex* Stschegl. in the Khobdo and Mongolian Altai; *Silene mongolica* Maxim. in the Gobi–Altai and Depression of Great Lakes regions; *Polygonum valerii* A.K. Skvortsov in the Khentei, Mongol–Daurian, Great Khingan, and Middle Khalkha; and *Campanula dasyantha* M. Bieb in the Khubsugul and Khentei.

In addition, we also found some very important species which are not so common occurring in flora of every high mountain of this phytogeographical region and herbarium collection, for example, *Salix nummularia* Anderss., *S. vestita* Pursh., *S. recurvigemmis* A.K. Skvortsov, *Armeria maritima* subsp. *sibirica* (Turcz. *ex* Boiss.) Nyman, *Micranthes hieraciifolia* (Waldst. & Kit. *ex* Willd.) Haw., *Saussurea arctecapitulata* Lipsch., *S. baicalensis* B.L. Rob. and *S. schanginiana* (Wydler) Fisch. *ex* Herder. The different altitudes of Ulziit Mountain (foothills, mountain slope, larch forest, and alpine) revealed variable ecological conditions in association with vegetation types and species composition.

For the similarity coefficient of this mountain flora reveals the similarity of the characteristics of the adjacent area's phytogeographical region, especially for certain species' habitats (Dariimaa and Saruul, 2016). The Ulziit Mountain flora is most similar to the flora of Khubsugul followed by the Khentei, mountain-taiga regions and these areas have relatively similar landscapes with high mountains and forest steppe vegetation.

From the life form analysis, the most abundant life form group is the hemicryptophytes which is dominant in the high mountain steppe as described by Tuvshintogtokh (2014). Therophytes are included in the 15 families (eight species belonging to Gentianaceae; six species belonging to

Brassicaceae; three species belonging to Asteraceae; two species belonging each to Brassicaceae and Polygonaceae; and one species each to Caryophyllaceae, Euphorbiaceae, Lamiaceae, Onagraceae, Orobanchaceae, Papaveraceae, Primulaceae, Ranunculaceae, Rosaceae, and Scrophulariaceae), and these therophyte species directly illustrate their ecological relevance. In particular, most of the species of Gentianaceae are annual, mesophyte, and usually occur in high mountain meadows, while some annual species of some families (Brassicaceae and Polygonaceae) are related to the disturbed and degraded areas due to livestock grazing. A majority of these annual species (therophytes) occur in degraded areas. The northern part of Ulziit mountain as a whole is the main pasture for households in that soum during the spring, summer and autumn.

As Ulziikhutag (1989) noted that endemic and neoendemic species mainly occurs in the high mountain regions, it indicates the peculiarity of the Mongolian flora. We also found three endemic and five relict species from the ice age on Ulziit Mountain. Relict species are evidence that glacial traces are most likely to be found in the high mountains of Mongolia (Ulziikhutag, 1989). Of those five relict species, *Allium altaicum* Pall., *Caragana jubata* (Pall.) Poir., *Dryas oxyodonta* Juz., and *Saussurea involucrata* (Kar. & Kir.) Sch. Bip. grow along forest fringes, stone fields, riverbanks, screes, and cliffs in the alpine belt, and one is *Ptilagrostis mongholica* (Turcz. *ex* Trin.) Griseb. grows in waterside swampy tussock meadows in the forest and alpine belts. All relict species are Asian, with two from Central Asia and others are Asian Endemic, South Siberian-Mongolia, and West Siberian-Mongolia.

The study revealed that the Ulziit Mountain has a unique ecosystem including five new unrecorded taxa and other salient species, in different habitats such as valleys, flat areas, riversides, mountain slopes, larch forest fringe, larch forests, timberline, rock outcrops, rock cliffs, and high mountain meadows. Most important species from this mountain flora and plant diversity mainly occur in larch forest, timberline, and high mountain meadow which are very limited for their distribution. In the face of intense climate change, human impacts and livestock overgrazing, effective nature conservation is needed in such specific areas, narrow species distribution, particularly for those endemic, relict, and other salient species. Furthermore, our result shows that the importance of the floristic detailed survey in specific areas to reveal new recordings/findings in plant taxonomy, for nature conservation activity and nature conservationist to prevent species extinction.

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Appendix 1. Taxa list for the Vascular plant flora of the Ulziit mountain, Khangai mountain range, Mongolia.

No.	Scientific name	Voucher code	Life-form	IUCN red list	Mongolian red list	Ende-mism	Relict	Chorotypes
Adoxaceae								
1	*Adoxa moschatellina* L.	ZAG-73	G					Hol.
Amaryllidaceae								
2	*Allium altaicum* Pall.	BGBE2015-40	G	NT	VU	SE	RL	Cent.-As.
3	*A. flavidum* Ledeb.	BGBE2015-41	G					West-Sib.-Mon.
4	*A. lineare* L.	Ulziit2017-73	G		LC			Eura.
5	*A. schoenoprasum* L.	BGBE2015-42, ZAG-33	G					Hol.
6	*A. senescens* L.	BGBE2015-30, BGBE2015-43	G					Eura.
Apiaceae								
7	*Aegopodium alpestre* Ledeb.	ZAG-75	H					South Sib.-Mon.
8	*Angelica decurrens* B. Fedtsch.	G2017-11	H					Eura.
9	*Bupleurum bicaule* Helm	BGBE2015-54	H					South Sib.-Mon.
10	*Carum carvi* L.	BGBE2015-61	H					Eura.
11	*Neogaya simplex* (L.) Meisn.	Ulziit2017-47	G					West-Sib.-Mon.
12	*Pleurospermum uralense* Hoffm.	BGBE2015-11	H					Eura.
13	*Seseli condensatum* (L.) Rchb. f.	G2017-63	H					South Sib.-Mon.
Asparagaceae								
14	*Maianthemum bifolium* (L.) F. Schmidt.	Ulziit2017-23	H					Eura.
Aspleniaceae								
15	*Cystopteris fragilis* (L.) Bernh.	Ulziit2017-38	H					Hol.
Asteraceae								
16	*Artemisia frigida* Willd.	G2017-14	H					Hol.
17	*A. glauca* Pall. *ex* Willd.	BGBE2015-28	H		VU			Hol.
18	*A. laciniata* Willd.	Ulziit2017-84, ZAG-3	H					Eura.
19	*A. leucophylla* C.B. Clarke	BGBE2015-50	H					Alt.-North.-Mon.
20	*A. mongolica* (Fisch. *ex* Besser) Nakai	BGBE2015-27, G2017-16	H					Cent.-As.
21	*A. palustris* L.	G2017-18	Th					South Sib.-Mon.
22	*A. phaeolepis* Krasch.	Ulziit2017-31	H					Cent.-As.
23	*A. pubescens* var. *monostachya (*Bge. *ex* Maxim.) Y.R. Ling	ZAG-2	H					South Sib.-Mon.

Noted abbreviations: *- new record and **Life-form:** Ph (phanerophytes), Ch (chamaephytes), Th (therophytes), H (hemicriptophytes), G (geophytes), and Hy (hydrophytes); **IUCN and Mongolian red list:** EN (Endangered), VU (Vulnerable), NT (Near Threatened), LC (Least Concern); **Endemism:** E (endemic), SE (subendemic); **Relict:** relict (RL); **Chorotypes:** Cosmopolitan (Cosm.), Asia–American (AA), Holarctic (Hol.), Eurasian (Eura.), Asian (As.); **subgroups:** South Siberia Mongolian (South Sib.-Mon.), Asian Endemics (As. Endem.), East Siberia-Mongolian (East Sib.-Mon.), Eastern Asian (East. As.), Central Asian (Cent. As.), West Siberia-Mongolian (West Sib.-Mon.), Altai–Northern Mongolian (Alt.-North-Mon.), Altai–Dzungarian Mongolian (Alt.-Dzun.-Mon.), Siberia-Mongolian (Sib.-Mon.), and Mongolian Endemic (Mon. Endem.).

Appendix contd.

No.	Scientific name	Voucher code	Life-form	IUCN red list	Mongolian red list	Ende-mism	Relict	Chorotypes
24	*Aster alpinus* L.	BGBE2015-51	H					Hol.
25	*A. biennis* Ledeb.	ZAG-4	Th					East. As.
26	*A. flaccidus* subsp. *flaccidus*	BGBE2015-90, ZAG-1	H					Alt.-Dzun.-Mon.
27	*Chrysanthemum zawadzkii* Herbich	BGBE2015-65	H					Eura.
28	*Cirsium esculentum* (Siev.) C.A. Mey.	BGBE2015-12, 66	H					Eura.
29	*Crepis chrysantha* (Ledeb.) Turcz.	Ulziit2017-61	H					Eura.
30	*C. tectorum* L.	BGBE2015-69	T					West-Sib.-Mon.
31	*Echinops latifolius* Tausch.	BGBE2015-79	H					East-Sib.-Mon.
32	*Erigeron flaccidus* (Bunge) Botsch.	Ulziit2017-42	H					As. Endem.
33	*E. heterochaeta* (Benth.) Botsch.	BGBE2015-80	H					Cent.-As.
34	*Galatella dahurica* DC.	ZAG-6	H					Eura.
35	*Hieracium umbellatum* L.	G2017-55	H					Cosm.
36	*Klasea centauroides* (L.) Cass. *ex* Kitag.	BGBE2015-137	H					East-Sib.-Mon.
37	*Leontopodium ochroleucum* Beauverd	BGBE2015-95, ZAG-69	H					West-Sib.-Mon.
38	*Ligularia sibirica* (L.) Cass.	BGBE2015-17, 97	H					Eura.
39	*Saussurea alpina* (L.) DC.	ZAG-13	H					Eura.
40	*S. arctecapitulata* Lipsch.	ZAG-9	H			SE		Cent.-As.
41	*S. baicalensis* B.L. Rob.	ZAG-10	H			SE		South Sib.-Mon.
42	*S. controversa* DC.	BGBE2015-20, ZAG-12	H					West-Sib.-Mon.
43	*S. involucrata* (Kar. & Kir.) Sch. Bip.	Ulziit2017-93, BGBE2015-133	H		EN		RL	West-Sib.-Mon.
44	*S. leucophylla* Schrenk.	G2017-111	H					As. Endem.
45	*S. parviflora* (Poir.) DC.	Ulziit2017-14	H					Eura.
46	*S. salicifolia* (L.) DC.	ZAG-8	H					As. Endem.
47	*S. schanginiana* (Wydler) Fisch. *ex* Herder	Ulziit2017-94, ZAG-7	H					As. Endem.
48	*Scorzonera radiata* Fisch. *ex* Fisch.	Ulziit2017-101, BGBE2015-136	H					As. Endem.
49	*Taraxacum glabrum* DC.	Ulziit2017-57	H		NT			South Sib.-Mon.
50	*T. officinale* F.H.Wigg.	BGBE2015-142	H					Hol.
51	*Tephroseris integrifolia* (L.) Holub	BGBE2015-33, ZAG-5	H					Eura.
52	*T. pricei* (N.D. Simpson) Holub.	Ulziit2017-12	H					South Sib.-Mon.
Berberidaceae								
53	*Berberis sibirica* Pall.	BGBE2015-24, G2017-20	Ph					Sib.-Mon.
Betulaceae								
54	*Betula fruticosa* P. Hall.	Ulziit2017-33	Ph	LC				East. As.
55	*B. glandulosa* Michx.	ZAG-98	Ph	LC				South Sib.-Mon.
Boraginaceae								
56	*Amblynotus rupestris* (Pall.) Popov	BGBE2015-45	H					South Sib.-Mon.
57	*Anoplocaryum compressum* Ledeb.	Ulziit2017-3	H					East-Sib.-Mon.

Appendix contd.

No.	Scientific name	Voucher code	Life-form	IUCN red list	Mongolian red list	Ende-mism	Relict	Chorotypes
58	*Cynoglossum divaricatum* Stephan *ex* Lehm.	BGBE2015-70	Th					South Sib.-Mon.
59	*Eritrichium villosum* (Ledeb.) Bunge	Ulziit2017-8	H					Eura.
60	*Lappula intermedia* (Ledeb.) Popov	BGBE2015-23	Th					East-Sib.-Mon.
61	*Mertensia davurica* (Sims) G. Don	BGBE2015-101	H					Eura.
62	*Myosotis krylovii* Serg.	G2017-74	H					Hol.
63	*M. suaveolens* Waldst *et* Kit.	BGBE2015-102, ZAG-90	H					Eura.
64	*M. sylvatica* Ehrh. *ex* Hoffm.	ZAG-89	H					Hol.
Brassicaceae								
65	*Arabis hirsuta* (L.) Scop.	BGBE2015-47	Th					East-Sib.-Mon.
66	*Dontostemon integrifolius* (L.) C.A. Mey.	BGBE2015-75	Th					East-Sib.-Mon.
67	*Draba cana* Rydb.	G2017-12	H					East-Sib.-Mon.
68	*D. nemorosa* L.	BGBE2015-29, 76, ZAG-91	Th					Hol.
69	*Erysimum flavum* (Georgi) Bobrov	BGBE2015-81	Th					South Sib.-Mon.
70	*Lepidium ruderale* L.	BGBE2015-4	Th					Eura.
71	*Sisymbrium heteromallum* C.A. Mey.	BGBE2015-139	Th					South Sib.-Mon.
Campanulaceae								
72	*Campanula dasyantha* M. Bieb.*	BGBE2015-55, ZAG-100	H					East-Sib.-Mon.
73	*C. stevenii* subsp. *turczaninovii* (Fed.) Victorov	BGBE2015-56, ZAG-18	H					Eura.
Caprifoliacae								
74	*Lonicera caerulea* subsp. *altaica* (Pall.) Gladkova	BGBE2015-3, G2017-68	Ph					As. Endem.
75	*Patrinia sibirica* Juss.	Ulziit2017-111, BGBE2015-108	H					Eura.
76	*Valeriana officinalis* L.	BGBE2015-148	H		LC			AA
Caryophyllaceae								
77	*Cerastium pusillum* Ser.	ZAG-43	H					As. Endem.
78	*Dianthus chinensis* L.	BGBE2015-18, 74	H					Eura.
79	*D. superbus* L.	G2017-39	H					Eura.
80	*Eremogone capillaris* (Poir.) Fenzl	Ulziit2017-81, BGBE2015-49	H					East-Sib.-Mon.
81	*E. formosa* (Fisch. *ex* Ser.) Fenzl	G2017-12	H			SE		South Sib.-Mon.
82	*E. meyeri* (Fenzl) Ikonn.	ZAG-70	H					East-Sib.-Mon.
83	*Sabulina verna* (L.) Rchb.	BGBE2015-14	H					South Sib.-Mon.
84	*Silene apetala* Willd.	ZAG-74	H					Hol.
85	*S. aprica* Turcz.	BGBE2015-154, G2017-71	Th					South Sib.-Mon.

Appendix contd.

No.	Scientific name	Voucher code	Life-form	IUCN red list	Mongolian red list	Ende-mism	Relict	Chorotypes
86	*S. chamarensis* Turcz.	BGBE2015-138, ZAG-59	H		EN			South Sib.-Mon.
87	*S. jeniseensis* Willd.	G2017-118	H					South Sib.-Mon.
88	*S. mongolica* Maxim. *	Ulziit2017-113, ZAG-103	H		EN	E		Mon. Endem.
89	*S. repens Patrin*	Ulziit2017-11	H					Eura.
90	*S. songarica* (Fisch., C.A. Mey. & Avé-Lall.) Bocquet	G2017-72	H		NT			As. Endem.
91	*Stellaria brachypetala* Bunge.	BGBE2015-140	H					Alt.-Dzun.-Mon.
92	*S. dichotoma* L.	Ulziit2017-97, BGBE2015-141	H					South Sib.-Mon.
93	*S. longipes* Goldie	Ulziit2017-53	H					Eura.
Celastraceae								
94	*Parnassia palustris* L.	Ulziit2017-78, BGBE2015-107	H	LC				Hol.
Crassulaceae								
95	*Orostachys spinosa* (L.) A. Berger	Ulziit2017-86, BGBE2015-103	H					South Sib.-Mon.
96	*Phedimus aizoon* (L.) 't Hart	BGBE2015-19	H		LC			East. As.
97	*Rhodiola quadrifida (*Pall.) Fisch. & C.A. Mey.	Ulziiit2017-95, BGBE2015-127	H					South Sib.-Mon.
98	*R. rosea* L.	BGBE2015-21, 128	H					Eura.
Cupressaceae								
99	*Juniperus pseudosabina* Fisch. & C.A. Mey.	ZAG-34	Ch	LC	EN			South Sib.-Mon.
Cyperaceae								
100	*Carex amgunensis* F. Schmidt	Ulziit2017-64	G					Eura.
101	*C. bigelowii* subsp. *ensifolia* (Turcz. *ex* Gorodkov) Holub	Ulziit2017-62	G					East-Sib.-Mon.
102	*C. coriophora* Fisch. & C.A. Mey. *ex* Kunth	G2017-26	H					South Sib.-Mon.
103	*C. duriuscula* C. A. Mey.	BGBE2015-58	G					AA
104	*C. eleusinoides* Turcz. *ex* Kunth	BGBE2015-59	H					East. As.
105	*C. ledebouriana* C.A. Mey. ex Trevir.	Ulziit2017-74	H					South Sib.-Mon.
106	*C. macroprophylla* (Y.C.Yang) S.R. Zhang	Ulziit2017-24	G					Sib.-Mon.
107	*C. melanantha* C.A. Mey.	ZAG-31	G					Sib.-Mon.
108	*C. melanocephala* Turcz.	BGBE2015-60	G					As. Endem.
109	*C. microglochin* Wahlenb.	Ulziit2017-34	G	LC				Hol.
110	*C. myosuroides* Vill.	Ulziit2017-46	H					Hol.
111	*C. norvegica* Retz.	Ulziit2017-35	H	LC				Hol.
112	*C. pamirensis* subsp. *dichroa* Malyschev	Ulziit2017-34	G					Alt.-Dzun.-Mon.
113	*C. pediformis* C.A. Mey.	G2017-28	H					Eura.
114	*C. rupestris* Bell. *ex* All.	Ulziit2017-71	G					Hol.

Appendix contd.

No.	Scientific name	Voucher code	Life-form	IUCN red list	Mongolian red list	Ende-mism	Relict	Chorotypes
115	*C. stenocarpa* Turcz. *ex* V.I. Krecz.	Ulziit2017-65	H					As. Endem.
116	*Eriophorum angustifolium* Honck.	ZAG-32	H					Hol.
Equisetaceae								
117	*Equisetum pratense* Ehrh.	Ulziit2017-75	H					Hol.
Ericaceae								
118	*Arctous rubra* (Rehder & E.H. Wilson) Nakai	BGBE2015-48	Ch					East-Sib.-Mon.
119	*Pyrola asarifolia* Michx.	Ulziit2017-89, G2017-91	H					Eura.
Euphorbiaceae								
120	*Euphorbia humifusa* Willd.	ZAG-56	Th					Eura.
Fabaceae								
121	*Astragalus changaicus* Sancz. *ex* N. Ulziykh.	Ulziit2017-32	H		EN	E		Mon. Endem.
122	*A. filiformis* Poir.	Ulziit2017-4	H			SE		South Sib.-Mon.
123	*A. frigidus* (L.) A.Gray	BGBE2015-52, ZAG-71	H					Eura.
124	*Caragana jubata* (Pall.) Poir.	Ulziit2017-83, BGBE2015-57	P				RL	As. Endem.
125	*Hedysarum alpinum* L.	BGBE2015-89, ZAG-35, 95	H					Eura.
126	*H. inundatum* Turcz.	ZAG-69	H					East-Sib.-Mon.
127	*Lathyrus humilis (*Ser.) Fisch. *ex* Spreng.	Ulziit2017-5	H					Eura.
128	*Oxytropis lapponica* (Wahlenb.) Gay	BGBE2015-105	H					Eura.
129	*O. oligantha* Bunge	Ulziit2017-58	H			SE		Eura.
130	*Thermopsis dahurica* Czefr.	BGBE2015-143	H					East-Sib.-Mon.
131	*Trifolium eximium* Stephan *ex* Ser.	BGBE2015-145	H					Sib.-Mon.
132	*T. lupinaster* L.	Ulziit2017-70	H					Eura.
133	*Vicia amoena* Fisch. ex Ser.	Ulziit2017-8	H	LC				East. As.
134	*V. cracca* L.	G2017-128	H					Eura.
135	*V. geminiflora* Trautv.	Ulziit2017-9	H		NT	SE		East-Sib.-Mon.
Gentianaceae								
136	*Comastoma pulmonarium* (Turcz.) Toyok.	ZAG-92	Th		VU			East-Sib.-Mon.
137	*C. tenellum* (Rottb.) Toyok.	ZAG-93	Th					As. Endem.
138	*Gentiana algida* Pall.	BGBE2015-84	H		EN			As. Endem.
139	*G. aquatica* L.	ZAG-94	Th					AA
140	*G. decumbens* L.F.	BGBE2015-86	H					Eura.
141	*G. macrophylla* Pall.	Ulziit2017-80, G2017-47	H					East. As.
142	*G. aquatica* var. *pseudoaquatica* (Kusn.) S. Agrawal	BGBE2015-87	Th					East. As.
143	*G. squarrosa* Ledeb.	G2017-48	Th					As. Endem.
144	*Gentianopsis barbata* (Froel.) Ma	BGBE2015-85	Th		LC			Eura.

Appendix contd.

No.	Scientific name	Voucher code	Life-form	IUCN red list	Mongolian red list	Ende-mism	Relict	Chorotypes
145	*Halenia corniculata* (L.) Cornaz.	BGBE2015-151, Ulziit2017-26	Th					As. Endem.
146	*Lomatogonium carinthiacum* (Wulfen) A. Braun	BGBE2015-2, 100	Th					East-Sib.-Mon.
Geraniaceae								
147	*Geranium pratense* L.	Ulziit2017-44	H					Eura.
148	*G. pseudosibiricum* J. Mayer	Ulziit2017-25	H					Eura.
Grossulariaceae								
149	*Ribes aciculare* Sm.	Ulziit2017-90, BGBE2015-88	Ph		NT			Alt.-Dzun.-Mon.
150	*R. petraeum* Wulfen	Ulziit2017-104, BGBE2015-129	Ph					South Sib.-Mon.
Iridaceae								
151	*Iris humilis* Georgi	Ulziit2017-45	H					Eura.
152	*I. lactea* Pall.	BGBE2015-92	H					Cent.-As.
Juncaceae								
153	*Juncus castaneus* subsp. *leucochlamys* (V.J. Zinger *ex* V.I.Krecz.) Hultén	ZAG-66	H					East-Sib.-Mon.
154	*Juncus triglumis* L.	BGBE2015-157, ZAG-38	H					Eura.
155	*Luzula multiflora* subsp. *sibirica* V.I. Krecz.	ZAG-67	H					Eura.
Juncaginaceae								
156	*Triglochin palustris* L.	ZAG-36	H					Cosm.
Lamiaceae								
157	*Dracocephalum foetidum* Bunge	BGBE2015-77	Th					Alt.-North.-Mon.
158	*D. grandiflorum* L.	BGBE2015-10, 78, ZAG-53	H					As. Endem.
159	*Lagopsis marrubiastrum* (Stephan) Ikonn.-Gal.	Ulziit2017-79, BGBE2015-1, 93	H					Alt.-North.-Mon.
160	*Nepeta multifida* L.	ZAG-65	H					Eura.
161	*Thymus gobicus* Czern.	BGBE2015-144, G2017-124	Ch			E		Mon. Endem.
Liliaceae								
162	*Gagea pauciflora* (Turcz. *ex* Trautv.) Ledeb.	BGBE2015-82	G					East-Sib.-Mon.
163	*G. serotina* (L.) Ker Gawl.	ZAG-30	G					Hol.
Montiaceae								
164	*Claytonia joanneana* Roem.*et* Schult.	BGBE2015-67, ZAG-72	H					South Sib.-Mon.
Onagraceae								
165	*Epilobium angustifolium* L.	BGBE2015-158, Ulziit2017-43	H	LC				Hol.
166	*E. latifolium* L.	Ulziit2017-67	H					Hol.
167	*E. palustre* L.	G2017-43	Th	LC				Hol.
Orchidaceae								
168	*Dactylorhiza viridis* (L.) R.M. Bateman, Pridgeon & M.W. Chase	ZAG-60	G					Hol.

Appendix contd.

No.	Scientific name	Voucher code	Life-form	IUCN red list	Mongolian red list	Ende-mism	Relict	Chorotypes
Orobanchaceae								
169	*Pedicularis abrotanifolia* M.B. *ex* Steven	Ulziit2017-22	Th			SE		Alt.-North.-Mon.
170	*P. flava* Pall.	BGBE2015-109, ZAG-37	H			SE		South Sib.-Mon.
171	*P. longiflora* Rudolph.	BGBE2015-25, 110	H					Cent.-As.
172	*P. myriophylla* Pall.	Ulziit2017-54	H					South Sib.-Mon.
173	*P. oederi* Vahl	Ulziit2017-48	H					Eura.
174	*P. resupinata* L.	Ulziit2017-21, 110	H					Eura.
175	*P. rubens* Steph. *ex* Willd.	Ulziit2017-109, G2017-76	H					East-Sib.-Mon.
176	*P. sibirica* Vved.	G2017-77	H					South Sib.-Mon.
177	*P. tristis* L.	ZAG-83	H					As. Endem.
178	*P. verticillata* L.	BGBE2015-16, 111	H					Eura.
Papaveraceae								
179	*Chelidonium majus* L.	Ulziit2017-66	H		VU			Eura.
180	*Corydalis sibirica* (L. f.) Pers.	ZAG-77	Th					East. As.
181	*Papaver nudicaule* L.	BGBE2015-106, ZAG-55	H					As. Endem.
Pinaceae								
182	*Larix sibirica* Ledeb.	BGBE2015-94	P	LC				Eura.
Plantaginaceae								
183	*Hippuris vulgaris* L.	BGBE2015-6, G2017-56	Hy	LC				Cosm.
184	*Lagotis integrifolia* (Willd.) Schischk.	BGBE2015-155, G2017-62	H					West-Sib.-Mon.
185	*Linaria acutiloba* Fisch.	BGBE2015-99	H					Hol.
186	*L. buriatica T*urcz. ex Ledeb.	ZAG-82	H					South Sib.-Mon.
187	*Plantago major* L.	BGBE2015-13, 112	H	LC				Eura.
188	*Veronica ciliata* Fisch.	BGBE2015-7, 149, G2017-131	H					South Sib.-Mon.
189	*V. incana* L.	BGBE2015-15	H					Eura
Plumbaginaceae								
190	*Armeria maritima* subsp. *sibirica* (Turcz. *ex* Boiss.) Nyman	ZAG-84	H		VU			East-Sib.-Mon.
191	*Limonium flexuosum* (L.) Chaz.	BGBE2015-98, ZAG-80	H					Eura.
Poaceae								
192	*Agropyron cristatum* (L.) Gaertn.	BGBE2015-38	H					Eura.
193	*Agrostis vinealis* Schreb.	BGBE2015-39	H					East-Sib.-Mon.
194	*Alopecurus brachystachyus* M. Bieb.	BGBE2015-44, ZAG-20	H					East-Sib.-Mon.
195	*A. turczaninovii* O.D. Nikif.	Ulziit2017-72	H					South Sib.-Mon.
196	*Anthoxanthum glabrum* (Trin.) Veldkamp	Ulziit2017-63	H					South Sib.-Mon.
197	*A. nitens* (Weber) Y. Schouten & Veldkamp	Ulziit2017-30	H					Hol.

Appendix contd.

No.	Scientific name	Voucher code	Life-form	IUCN red list	Mongolian red list	Ende-mism	Relict	Chorotypes
198	*Arctopoa subfastigiata* (Trin.) Prob.	Ulziit2017-55	H					Alt.-Dzun.-Mon.
199	*Beckmannia syzigachne* (Steud.) Fernald	BGBE2015-53	H	LC				Eura.
200	*Bromus inermis* Leyss.	ZAG-29	H					Hol.
201	*B. inermis* Leyss.	ZAG-21	H					Eura.
202	*B. pumpellianus* Scribn.	ZAG-28	H					Eura.
203	*Bromus. pumpellianus* Scribn.	Ulziit2017-68	H					AA.
204	*Deschampsia cespitosa* (L.) Beauv.	BGBE2015-73	H					Hol.
205	*D. cespitosa* (L.) Beauv.	Ulziit2017-27	H					As. Endem.
206	*Festuca lenensis* Drobow	BGBE2015-150, ZAG-22, ZAG-44	H					South Sib.-Mon.
207	*F. ovina* L.	Ulziit2017-60	H					Eura.
208	*F. sibirica* Hack. *ex* Boiss.	Ulziit2017-43	H					As. Endem.
209	*Helictochloa hookeri* (Scribn.) Romero Zarco	G2017-51	H					Eura.
210	*Helictotrichon desertorum* (Less.) Pilg.	ZAG-26	H					East-Sib.-Mon.
211	*Hordeum brevisubulatum* (Trin) Link.	BGBE2015-91	H	LC				As. Endem.
212	*Koeleria macrantha* (Ledeb.) Schult.	ZAG-19, 23	H					Hol.
213	*Leymus secalinus* (Georgi) Tzvelev	Ulziit2017-23	H					As. Endem.
214	*Phleum phleoides* (L.) H.Karst.	Ulziit2017-108, G2017-80	H	LC				Eura.
215	*Poa attenuata* Trin.	Ulziit2017-20	H					South Sib.-Mon.
216	*P. pratensis* L.	BGBE2015-113	H					Eura.
217	*P. sibirica* Roshev.	Ulziit2017-49	H					Eura.
218	*Pseudoroegneria reflexiaristata* (Nevski) A.N. Lavrenko	Ulziit2017-41	H					Alt.-North.-Mon.
219	*Ptilagrostis mongholica* (Turcz. *ex* Trin.) Griseb.	Ulziit2017-105, ZAG-24	H				RL	Cent.-As.
220	*Puccinellia macranthera* (V.I. Krecz.) Norl.	Ulziit2017-18, 88	H					East-Sib.-Mon.
221	*Sibirotrisetum sibiricum (*Rupr.) Barberá	BGBE2015-146, ZAG-25	H		LC			Hol.
Polygonaceae								
222	*Bistorta alopecuroides* (Turcz. *ex* Kom.) Nakai	BGBE2015-114, ZAG-45	G					As. Endem.
223	*B. vivipara* (L.) Delarbre	BGBE2015-117	G					Hol.
224	*Knorringia sibirica* (Laxm.) Tzvelev	BGBE2015-115, G2017-83	H					Alt.-Dzun.-Mon.
225	*Koenigia alpina* (All.) T.M. Schust. & Reveal	Ulziit2017-25	H					Eura.
226	*K. divaricata* (L.) T.M. Schust. & Reveal	Ulziit2017-69	H					Eura.
227	*K. islandica* L.	Ulziit2017-59	Th	LC				Eura.
228	*Persicaria amphibia* (L.) Delarbre	BGBE2015-5, G2017-79	Hy	LC				Hol.

Appendix contd.

No.	Scientific name	Voucher code	Life-form	IUCN red list	Mongolian red list	Ende-mism	Relict	Chorotypes
229	*P. angustifolia* (Pall.) Ronse Decr.	ZAG-81	H					East-Sib.-Mon.
230	*Polygonum aviculare* L.	Ulziit2017-107, BGBE2015-116	T					Cosm.
231	*P. valerii* A.K. Skvortsov*	Ulziit2017-112, ZAG-99	H					Eura.
232	*Rheum compactum* L.	Ulziit2017-6	H					South Sib.-Mon.
233	*R. rhabarbarum* L.	BGBE2015-32, 126	H					East-Sib.-Mon.
234	*Rumex acetosa* L.	Ulziit2017-91, BGBE2015-131, ZAG-58	H					Hol.
235	*R. thyrsiflorus* Fingerh.	G2017-93	H					Eura.
Polypodiaceae								
236	*Dryopteris fragrans* (L.) Schott.	Ulziit2017-40	H					Hol.
Primulaceae								
237	*Androsace chamaejasme* Wulfen	ZAG-63	H					South Sib.-Mon.
238	*A. incana* Lam.	G2017-8	H					Hol.
239	*A. septentrionalis* L.	BGBE2015-9, 46	Th					Eura.
240	*A. dasyphylla* Bunge	Ulziit2017-29	H					As. Endem.
241	*Primula matthioli* subsp. *altaica* (Losinsk.) Kovt.	BGBE2015-68, ZAG-41	H					Eura.
242	*P. nivalis* subsp. *subintegerrima* (Regel) Vorosch	Ulziit2017-87, G2017-88	H					East-Sib.-Mon.
243	*P. nutans* Georgi.	BGBE2015-122	H					South Sib.-Mon.
Ranunculaceae								
244	*Aconitum glandulosum* Rapaics	ZAG-14	H					South Sib.-Mon.
245	*A. baicalense* (Regel) Turcz. *ex* Rapaics	Ulziit2017-1	H					East-Sib.-Mon.
246	*A. barbatum* Pers.	BGBE2015-35	H					South Sib.-Mon.
247	*A. turczaninovii* Worosch.	BGBE2015-36	H		NT			Sib.-Mon.
248	*Actaea cimicifuga* L.	Ulziit2017-2	H					Sib.-Mon.
249	*Anemonastrum crinitum* (Juz.) Holub	G2017-10	H					South Sib.-Mon.
250	*Caltha palustris* L.	ZAG-62	H					East. As.
251	*Clematis alpina* subsp. *sibirica* (L.) Kuntze	Ulziit2017-37	Ph					Eura.
252	*Delphinium cheilanthum* Fisch. *ex* DC.	ZAG-15	H					As. Endem.
253	*D. dissectum* Huth.	BGBE2015-26, 72, ZAG-17	H					South Sib.-Mon.
254	*D. elatum* L.	ZAG-16	H					Eura.
255	*Delphinium inconspicuum* Serg.	Ulziit2017-39	H					Alt.-North.-Mon.
256	*D. crassifolium* Schrad. *ex* Spreng.	G2017-27	H					East-Sib.-Mon.
257	*Leptopyrum fumarioides* (L.) Rchb.	BGBE2015-96	Th					AA
258	*Pulsatilla turczaninovii* Krylov & Serg.	ZAG-86	H					East. As.

Appendix contd.

No.	Scientific name	Voucher code	Life-form	IUCN red list	Mongolian red list	Ende-mism	Relict	Chorotypes
259	*P. bungeana* C.A. Mey.	BGBE2015-123	H					Alt.-North.-Mon.
260	*Ranunculus monophyllus* Ovcz.	BGBE2015-124	H					Eura.
261	*R. pedatifidus* Sm.	BGBE2015-125	H					Alt.-North.-Mon.
262	*R. pseudohirculus* (Trautv.) Schrenk	ZAG-40	H					West-Sib.-Mon.
263	*Thalictrum alpinum* L.	G2017-121	H					Hol.
264	*T. foetidum* L.	Ulziit2017-98, G2017-122	H					Eura.
265	*T. petaloideum* L.	ZAG-88	H					As. Endem.
266	*Trollius asiaticus* L.	BGBE2015-147	H					As. Endem.
267	*T. ledebourii* Rchb.	ZAG-87	H					East. As.
Rosaceae								
268	*Chamaerhodos altaica* (Laxm.) Bunge	Ulziit2017-82, BGBE2015-63	H					Alt.-Dzun.-Mon.
269	*C. erecta* (L.) Bunge	BGBE2015-64	Th					As. Endem.
270	*Dasiphora fruticosa* (L.) Rydb.	BGBE2015-71, 120	Ph					Hol.
271	*Dryas oxyodonta* Juz.	ZAG-78	H				RL	South Sib.-Mon.
272	*Argentina anserina* (L.) Rydb.	BGBE2015-34, 118	H	LC				Hol.
273	*Potentilla crantzii* (Crantz) Beck *ex* Fritsch	ZAG-97	H					As. Endem.
274	*P. kryloviana* Th. Wolf.	BGBE2015-121	H					Alt.-North.-Mon.
275	*P. multifida* L.	Ulziit2017-19, 106	H					Hol.
276	*P. sericea* L.	ZAG-64	H					Eura.
277	*P. virgata* Lehm.	BGBE2015-119, ZAG-96	H					Eura.
278	*P. viscosa* Donn	Ulziit2017-50	H					Eura.
279	*Rosa acicularis* Lindl.	BGBE2015-130	Ph	LC				East. As.
280	*Sanguisorba officinalis* L.	BGBE2015-132	H					Hol.
281	*Sibbaldianthe adpressa* (Bunge) Juz.	Ulziit2017-52	H					As. Endem.
282	*S. bifurca* (L.) Kurtto & T. Erikss.	Ulziit2017-56	H					Eura.
283	*Spiraea alpina* Pall.	Ulziit2017-96, ZAG-76	Ph					Cent.-As.
284	*S. media* Schmidt	BGBE2015-22, 154	Ph		NT			Eura.
Rubiaceae								
285	*Galium verum* L.	BGBE2015-83	H					Hol.
Salicaceae								
286	*Populus tremula* L.	BGBE2015-156, G2017-84	Ph	LC				Eura.
287	*Salix abscondita* Laksch. *	BGBE2015-152, ZAG-101	Ph					East. As.
288	*S. alatavica* Kar. *ex* Stschegl. *	BGBE2015-159, ZAG-102	Ph					West-Sib.-Mon.
289	*S. berberifolia* Pall.	Ulziit2017-77, G2017-96	Ch					South Sib.-Mon.
290	*S. caesia* Vill.	Ulziit2017-51, 103	Ph					Sib.-Mon.
291	*S. divaricata* Pall.	Ulziit2017-50	Ph					East. As.
292	*S. glauca* L.	G2017-98	Ph	LC				Hol.

Appendix contd.

No.	Scientific name	Voucher code	Life-form	IUCN red list	Mongolian red list	Ende-mism	Relict	Chorotypes
293	*S. saposhnikovii* A.K. Skortsov	Ulziit2017-15	Ph					Eura.
294	*S. kochiana* Trautv.	G2017-99	Ph					South Sib.-Mon.
295	*S. nummularia* Anders.	ZAG-52	Ch					Eura.
296	*S. pseudopentandra (*Flod.) Flod.	Ulziit2017-92, ZAG-48	Ph					Hol.
297	*S. recurvigemmata* A.K. Skvortsov	Ulziit2017-76, ZAG-46	Ph					Eura.
298	*S. rhamnifolia* Pall.	ZAG-51	Ph					Hol.
299	*S. rosmarinifolia* L.	ZAG-50	Ph					Eura.
300	*S. taraikensis* Kimura	ZAG-49	Ph					East. As.
301	*S. vestita* Pursh	BGBE2015-153, ZAG-47	Ch					South Sib.-Mon.
Santalaceae								
302	*Thesium refractum* C.A. Mey.	Ulziit2017-7	H					Cent.-As.
Saxifragaceae								
303	*Chrysosplenium peltatum* Turcz.	G2017-30	G					East-Sib.-Mon.
304	*C. sedakowii* Turcz.	Ulziit2017-36	G					South Sib.-Mon.
305	*Micranthes hieraciifolia* (Waldst. & Kit. *ex* Willd.) Haw.	ZAG-79	H					Eura.
306	*Saxifraga bronchialis* L.	Ulziit2017-13, 102	H					Eura.
307	*S. cernua* L.	ZAG-54	H					Eura.
308	*S. flagellaris* subsp. *setigera* (Pursh) Tolm.	BGBE2015-135	H					AA
309	*S. hirculus* L.	BGBE2015-134, ZAG-39, 61	H	LC	EN			Eura.
Scrophulariaceae								
310	*Limosella aquatica* L.	ZAG-57	T	LC				East-Sib.-Mon.
Solanaceae								
311	*Physochlaina physaloides* (L.) G. Don	BGBE2015-31	H					As. Endem.
Urticaceae								
312	*Urtica cannabina* L.	Ulziit2017-10, 99	H					Alt.-Dzun.-Mon.
Violaceae								
313	*Viola biflora* L.	Ulziit2017-100, G2017-129	H					Hol.
Woodsiaceae								
314	*Woodsia ilvensis* (L.) R. Br.	BGBE2015-8, G2017-130	H					Eura.

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