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## The endemic species to the vascular flora of Mongolia updated

### Обзор эндемичных сосудистых растений флоры Монголии

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**Summary.** The findings of checklist of endemic vascular plant species to the flora of Mongolia, which on the species level have been made by last conspectus of the “Conspectus of the vascular plants of Mongolia” (Urgamal et al., 2014). At a present, a total of 120 species (included 12 subspecies) are endemic vascular plants (3.83 %) belonging to 49 genera and 19 families of Mongolia. The richest families and genera in endemic species are Fabaceae (40 species), Asteraceae (23 species), Rosaceae (16 species) families and *Astragalus* (22 species), *Oxytropis* (13 species), and *Potentilla* (12 species) genera, and the largest number of endemic species is in Altai mountains (45 species), Khangai mountains (26 species), and Gobi regions (13 species). Also 25 species paleoendemics (20.8%) and 95 species of neoendemics (79.2 %) are included in the vascular flora of Mongolia.

**Реферат.** В связи с выпуском нового «Conspectus of the vascular plants of Mongolia» (Urgamal et al., 2014) был составлен новый список эндемичных сосудистых растений флоры Монголии. В настоящее время в Монголии выявлено 120 видов (включая 12 подвидов) эндемичных растений (3,83 %), относящихся к 49 родам и 19 семействам. Богатыми по числу эндемиков являются семейства Fabaceae (40 видов), Asteraceae (23 вида), Rosaceae (16 видов) и роды *Astragalus* (22 видов), *Oxytropis* (13 видов), *Potentilla* (12 видов), районы – Алтай (45 видов), Хангай (26 видов) и Гоби (13 видов). Среди них 25 видов палеоэндемиков (20,8 %) и 95 видов неоэндемиков (79,2 %) флоры Монголии.

#### Background

The Mongolia Republic is situated in the temperate zone and lies between longitudes 87°52' and 119°58' to the east and latitudes 41°45' and 51°05' to the north within the territory of the East Asia.

Based on field data obtained since Gubanov's conspectus (1996) and all available literature, we present an updated list of the endemic taxa of vascular plants of the Mongolia including distribution, habitat and estimated population size. The Database of Mongolian flora project aims to evaluate and enumerate the native and naturalized vascular plant flora of Mongolia. In light of the last two decades of intensive collecting and taxonomic work, all relevant published literature and available specimens were being reassessed in order to evaluate the taxonomic status and distribution of the native and naturalized taxa of vascular plants. Here we provide current figures for the total numbers of vascular plants and levels of endemism at the order, family, genus, and species levels, comparing them to previous historical counts and analyzing the distribution of the non-endemic element of the flora.

The 143 endemic plant species are listed for the flora of Mongolia according to Gubanov (1996) and another information sources about the endemic plants of the Altai mountains (Bekket et al., 2015; Pyak et al., 2008), Khangai mountains (Ganbold, 2010), and to the vascular flora of Mongolia given by Grubov (1976, 1982, 1984, 1989), Ulziykhutag (1984, 1989, 2003, 2004), Dariimaa (2014), Oyuntsetseg, Urgamal (2014), Urgamal et al. (2014, 2015, 2016), and Urgamal (2016), and etc. (Table 1).

Knowledge of the endemic vascular plants of the flora of Mongolia has been compiled by Gubanov's conspectus (1996) and “Conspectus of the vascular plants of Mongolia” (Urgamal et al., 2014) published a list of the endemic plant species and their distribution known at that time from Mongolia.

Table 1

The numbers of the endemic vascular plant taxa known from Mongolia

Sources and references	Family	Genera	Species	Percent of total flora
Grubov (1976)	–	–	77	3.70
Ulziykhutag (1984)	–	–	74	3.50
Ulziykhutag (1989)	–	–	145	5.94
Gubanov (1996)	–	–	143	5.06
Urgamal et al. (2014)	26	65	153	4.89
Urgamal et al. (2015)	25	64	151	4.82
At present (as of March 2017)	19	49	120	3.83

### Material and Method

The present checklist is based on “Conspectus of the vascular plants of Mongolia” (Urgamal et al., 2014) and was compiled in the Database of the Mongolian Flora (Urgamal, 2008–2017). The Herbarium (UBA) at the Department of Botany, Institute of General and Experimental Biology, Mongolian Academy of Sciences, and Herbarium (UBU) at the Department of Biology of the National University of Mongolia were checked for new findings, and the material was partly revised critically. Monographs and published papers dealing with the endemic plants and flora of Mongolia were systematically evaluated for new endemic vascular plant taxa for Mongolia.

### Results

In March 2017 the Mongolian flora has registered a total of 120 species (included 12 subspecies) as indigenous endemic (3.83%) belonging to 49 genera and 19 families of the vascular flora of Mongolia according to the most recent Angiosperm Phylogeny Group (APG IV, 2016) classification and last conspectus (Urgamal, 2016).

Table 2

The most endemic species in the top five families to the vascular flora of Mongolia

Family name	Genera number	Species number	Percent of total flora
1. Fabaceae	6	40	1.28
2. Asteraceae	12	23	0.74
3. Rosaceae	3	16	0.51
4. Ranunculaceae	6	9	0.29
5. Papaveraceae	2	6	0.19

The richest in endemic species families and genera are Fabaceae (40 species), Asteraceae (23 species), Rosaceae (16 species) families and *Astragalus* (22 species), *Oxytropis* (13 species) and *Potentilla* (12 species) genera (Table 2, 3, 4).

Table 3

The richest in the endemic species genera of the vascular flora of Mongolia

Genus name	Species number	Percent of total flora
1. <i>Astragalus</i>	22	0.70
2. <i>Oxytropis</i>	13	0.42
3. <i>Potentilla</i>	12	0.38
4. <i>Saussurea</i>	5	0.16
5. <i>Taraxacum</i>	5	0.16
6. <i>Papaver</i>	5	0.16
7. <i>Artemisia</i>	4	0.13
8. <i>Limonium</i>	3	0.10

The Mongolian Red Book (2013) includes 8 species as “very rare”, 14 species as “rare”, and 1 species as “relict” and 8 species (CR-1, EN-1, VU-4, DD-2) are in the Mongolian Red List Book (Nyambayar et al., 2011) of the vascular flora of Mongolia.

Table 4

The list and numbers of endemic plants of the vascular flora of Mongolia

Family name (total species)	Species name list
1. Asteraceae (23 species)	<i>Ajania grubovii</i> Muldashev, <i>Artemisia desertorum</i> subsp. <i>pseudojaponica</i> Darijma et Kamelin, <i>A. feddei</i> subsp. <i>arschantinica</i> (Darijma) Gubanov et Kamelin, <i>A. santolinifolia</i> subsp. <i>stepposa</i> Darijma, <i>A. vulgaris</i> subsp. <i>inundata</i> Darijma, <i>Aster sanczirii</i> Kamelin et Gubanov, <i>Asterothamnus molliusculus</i> Novopokr, <i>Brachanthemum mongolorum</i> Grubov, <i>Chrysanthemum chalchingolicum</i> Grubov, <i>Pyrethrum changaicum</i> Krasch. ex Grubov, <i>Rhinactinidia eremophila</i> subsp. <i>grubovii</i> Botsch., <i>Saussurea catharinae</i> Lipsch., <i>S. gubanovii</i> Kamelin, <i>S. klementzii</i> , <i>S. ramosa</i> Lipsch., <i>S. saichanensis</i> Kom. ex Lipsch., <i>Scorzonera grubovii</i> Lipsch., <i>Senecio kenteicus</i> Grubov, <i>Taraxacum bornuurensense</i> R. Doll, <i>T. inimitabile</i> Kirschn. et Step., <i>T. junatovii</i> Tzvelev, <i>T. selengensis</i> Tzvelev, <i>T. submacilentum</i> Tzvelev
2. Boraginaceae (1 species)	<i>Anoplocaryum tenellum</i> A. L. Ebel et Rudaya
3. Brassicaceae (5 species)	<i>Crucihimalaya rupicola</i> (Krylov) A.L. Ebel et D. A. German, <i>Galitzkya macrocarpa</i> (Ikonn.-Gal.) V.V. Botschantz., <i>Neotorularia grubovii</i> (Botsch.) Botsch., <i>N. mongolica</i> Botsch. et Gubanov, <i>Smelowskia mongolica</i> Kom.
4. Campanulaceae (1 species)	<i>Adenophora changaica</i> Gubanov et Kamelin
5. Caprifoliaceae (1 species)	<i>Valeriana saichanensis</i> Kom.
6. Caryophyllaceae (3 species)	<i>Silene iche-bogdo</i> Grubov, <i>S. mongolica</i> Maxim., <i>Stellaria pulvinata</i> Grubov
7. Cleomaceae (1 species)	<i>Cleome gobica</i> Grubov
8. Fabaceae (40 species)	<i>Astragalus baitagensis</i> Sanczir ex N. Ulzij., <i>A. banzragczii</i> N. Ulzij., <i>A. changaicus</i> Sanczir ex N. Ulzij., <i>A. chubsugulicus</i> Gontsch. ex N. Ulzij., <i>A. gobi-altaicus</i> N. Ulzij., <i>A. gobicus</i> Hanelt & Davazamc, <i>A. granitovii</i> Sanczir ex N. Ulzij., <i>A. gregorii</i> B. Fedtsch. et Basil., <i>A. gubanovii</i> N. Ulzij., <i>A. kenteicus</i> N. Ulzij., <i>A. klementzii</i> N. Ulzij., <i>A. koslovii</i> B. Fedtsch. & Basil. ex N. Ulzij., <i>A. potaninii</i> N. Ulzij., <i>A. pseudochorinensis</i> N. Ulzij., <i>A. pseudotesticulatus</i> Sanczir ex N. Ulzij., <i>A. pseudovulpinus</i> Sanczir ex N. Ulzij., <i>A. rudolfii</i> N. Ulzij., <i>A. saichanensis</i> Sanczir, <i>A. sanczirii</i> N. Ulzij., <i>A. tamiricus</i> N. Ulzij., <i>A. ulziykhutagii</i> Sytin, <i>A. viridiflavus</i> N. Ulzij., <i>Caragana gobica</i> Sanczir, <i>C. gobica</i> subsp. <i>occidentalis</i> Kamelin et Yakovlev, <i>Chesneya grubovii</i> Yakovlev, <i>Hedysarum chalchorum</i> N. Ulzij., <i>H. kamelinii</i> N. Ulzij., <i>Oxytropis bungei</i> Kom., <i>O. diantha</i> Bunge ex Maxim., <i>O. fragilifolia</i> N. Ulzij., <i>O. junatovii</i> Sanczir, <i>O. klementzii</i> N. Ulzij., <i>O. lavrenkoi</i> N. Ulzij., <i>O. micrantha</i> Bunge ex Maxim., <i>O. pavlovii</i> B. Fedtsch. et Basil., <i>O. potaninii</i> Bunge ex Palub., <i>O. rhizantha</i> Palib., <i>O. sutaica</i> N. Ulzij., <i>O. tenuis</i> Palib., <i>O. ulziykhutagii</i> Sanczir
9. Gentianaceae (1 species)	<i>Swertia banzragczii</i> Sanczir
10. Juncaceae (2 species)	<i>Juncus arcticus</i> subsp. <i>grubovii</i> (Novikov) Novikov, Kirschner et Snogerup, <i>Luzula changaica</i> V. S. Novikov
11. Lamiaceae (3 species)	<i>Lagopsis darwiniana</i> Pjak, <i>Scutellaria grandiflora</i> subsp. <i>gymnosperma</i> Kamelin et Gubanov, <i>Thymus gobi-altaicus</i> (N. Ulzij.) Kamelin et A. L. Budantzev
12. Papaveraceae (6 species)	<i>Corydalis grubovii</i> Mikhailova, <i>Papaver baitagense</i> Kamelin et Gubanov, <i>P. pseudotenellum</i> Grubov, <i>P. rubro-aurantiacum</i> subsp. <i>chalchorum</i> Kamelin, <i>P. rubro-aurantiacum</i> subsp. <i>changaicum</i> (Kamelin) Kamelin, <i>P. rubro-aurantiacum</i> subsp. <i>saichanense</i> (Grubov) Kamelin et Gubanov
13. Plantaginaceae (2 species)	<i>Veronica sapozhnikovii</i> Kossatschev, <i>V. smirnovii</i> Kossatschev
14. Plumbaginaceae (3 species)	<i>Limonium gobicum</i> Ik.-Gal., <i>L. grubovii</i> Lincz., <i>L. klementzii</i> Ik.-Gal.
15. Ranunculaceae (9 species)	<i>Aconitum gubanovii</i> Lufarov et Vorosch., <i>A. kamelinii</i> Solovjev, <i>Adonis mongolica</i> Simonovicz, <i>Aquilegia ganboldii</i> Kamelin et Gubanov, <i>Delphinium changaicum</i> Friesen, <i>D. gubanovii</i> Friesen, <i>Ranunculus arschantynicus</i> Kamelin, Schmakov et S. Smirnov, <i>R. sapozhnikovii</i> Schegoleva, <i>Thalictrum minus</i> subsp. <i>appendiculatum</i> (C.A. Mey.) Gubanov

End of table 4

Family name (total species)	Species name list
16. Rosaceae (16 species)	<i>Alchemilla changaica</i> V. Tichomirov, <i>A. gubanovii</i> V. Tichomirov, <i>A. pavlovii</i> Juz., <i>Potentilla chenteica</i> Sojak, <i>P. drymeja</i> Sojak, <i>P. gobica</i> Sojak, <i>P. hilbigii</i> Sojak, <i>P. hubsugulica</i> Sojak, <i>P. ikonnikovii</i> Juz., <i>P. inopinata</i> Sojak, <i>P. laevipes</i> Sojak, <i>P. laevissima</i> Kamelin, <i>P. mongolica</i> Krasch., <i>P. rhipidophylla</i> Sojak, <i>P. serrata</i> Sojak, <i>Rosa baitagensis</i> Kamelin et Gubanov
17. Rubiaceae (1 species)	<i>Asperula saxicola</i> Ehrend.
18. Scrophulariaceae (1 species)	<i>Scrophularia hilbigii</i> Jager
19. Solanaceae (1 species)	<i>Physochlaina albiflora</i> Grubov

The most of indigenous endemic species are in Altai mountains (45 species), Khangai mountains (26 species), and Gobi regions (13 species) (Table 5).

Table 5

The numbers of the endemic species in regions and mountain ranges of Mongolia

Name of regions and mountain ranges	Family	Genera	Species	Percent of total endemics
1. Altai mountain	12	24	45	37.50
2. Khangai mountain	8	17	26	21.66
3. Gobi region	5	9	13	10.83
4. Gobi Altai mountain	7	8	9	7.50
5. Eastern Mongolia	3	6	7	5.83
6. Mongolian	3	4	6	5.00
7. Khentei mountain	3	4	5	4.16
8. Dzungarian Gobi	3	3	5	4.16
9. Khovsgol mountain	3	3	4	3.33
total	–	–	120	100.00

### Conclusion

For the first time the article reports about the indigenous endemic 120 species records of the vascular flora of Mongolia. It includes 25 paleoendemics (20.8 %) and 95 of neoendemics (79.2 %) species in Mongolia.

The following list of previous endemic species are out from the present endemics of Mongolia at this time. *Artemisia blepharolepis* Bunge, *A. changaica* Krasch., *A. globosa* Krasch., *A. klementzae* Krasch., *A. mongolorum* subsp. *gobica* Krasch., *A. xylorrhiza* Krasch. ex Filatova, *Astragalus pavlovii* B. Fedtsch. et Basil., *A. urunguensis* N. Ulzij., *Calligonum gobicum* Bunge ex Meissn., *Caragana brachypoda* Pojark., *C. davazamcii* Sanczir, *Cynanchum gobicum* Grubov, *Dracocephalum junatovii* A. Budantzev, *Euphorbia potaninii* Prokh., *Glycyrrhiza inflata* Batalin, *Goldbachia ikonnikovii* Vass., *Gymnocarpos przewalskii* Bunge et Maxim., *Hieracium czadanense* Tupitz., *Hippolytia trifida* (Turcz.) Poljak., *Incarvillea potaninii* Batalin, *Leonurus pseudopanzerioides* Krestovsk., *Luzula spicata* subsp. *mongolica* V. Novikov, *Lycium truncatum* Y. C. Wang, *Microstigma brachycarpum* Botsch., *Nanophyton grubovii* Prato, *N. mongolicum* Prato, *Oxytropis monophylla* Grubov, *Oxytropis pseudoglandulosa* Gontsch. ex Grubov, *O. sacciformis* H.C. Fu, *O. viridiflava* Kom., *Pedicularis moschata* Maxim., *Potaninia mongolica* Maxim., *Scutellaria paulsenii* Briq., *Seriphidium assurgens* (Filat.) K. Bremer et Humphries ex Y. R. Ling, *Silene songarica* (Fisch., C. A. Mey. et Ave-Lall.) Bocquet, *Zygophyllum neglectum* Grubov (these species occur in territory of China, Kazakhstan, and Russia), a total 36 species, are included into subendemic species group of the vascular plants of Mongolia.

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